EPEE's side-event to 47th meeting of the OEWG of the Parties of the Montreal Protocol – Bangkok, Thailand

EU F-Gas Regulation: One year on

Challenges, opportunities and other related key issues

9 July 2025
1-3pm

EPEE

About EPEE: our members

Corporate members

Association members

With over **42 member** companies, national, and international associations in **22 countries**, we represent over **hundreds of thousands direct jobs** and millions of indirect jobs across Europe. Our members have **hundreds of manufacturing sites and R&D facilities** across the EU.

About EPEE: our sector

Industries

Transport refrigeration

Grocery stores

Homes

Hospitals

Offices and schools

Capacities range from less than 1 kW to several MW
Operating in harsh conditions and optimized for decades, and using a granularity of refrigerants

Our sector fulfills essential societal needs: **safe food supply and medicine**, productivity and comfort heating and cooling in homes, hospitals and offices, industrial **heating and cooling and process heating and cooling**, recovery of **waste heat** and **reduction of dependency on fossil fuels**.

EPEE

Content of the day

1. **Opening remarks & introduction of EPEE & today's side-event,** Juergen Goeller & Tanguy Roig, EPEE Secretariat -5 min

2. **Implementation of the EU F-gas Regulation,** by DG CLIMA -10 min

3. **Issues to be implemented by Member States - regulation EPaR (EU) 2024/573** by Czech F-gas Expert Jana Mašíčková -10 mins

4. **Understanding the challenges related to latest EU F-Gas Regulation 2024/573: an EU Market Analysis for EPEE,** by Ray Gluckman, Independent Expert -20min

5. **Opportunities for the Recovery, Reclamation and Recycling activities in Europe,** by Laurent Guégan - Climalife -10 min

6. **Panel discussion and Q&A,** moderated by EPEE Secretariat -20 min

7. **Wrap up,** by EPEE Secretariat -5min

Implementation of the EU F-gas Regulation

The Directorate-General for Climate Action

Main pillars of the EU F-gas Regulation

Reducing HFC use

- **Phase-down of HFCs (Quota system)**
- **Specific prohibitions on use of old / marketing new products & equipment**

Reducing HFC losses („life-cycle refrigerant management“)

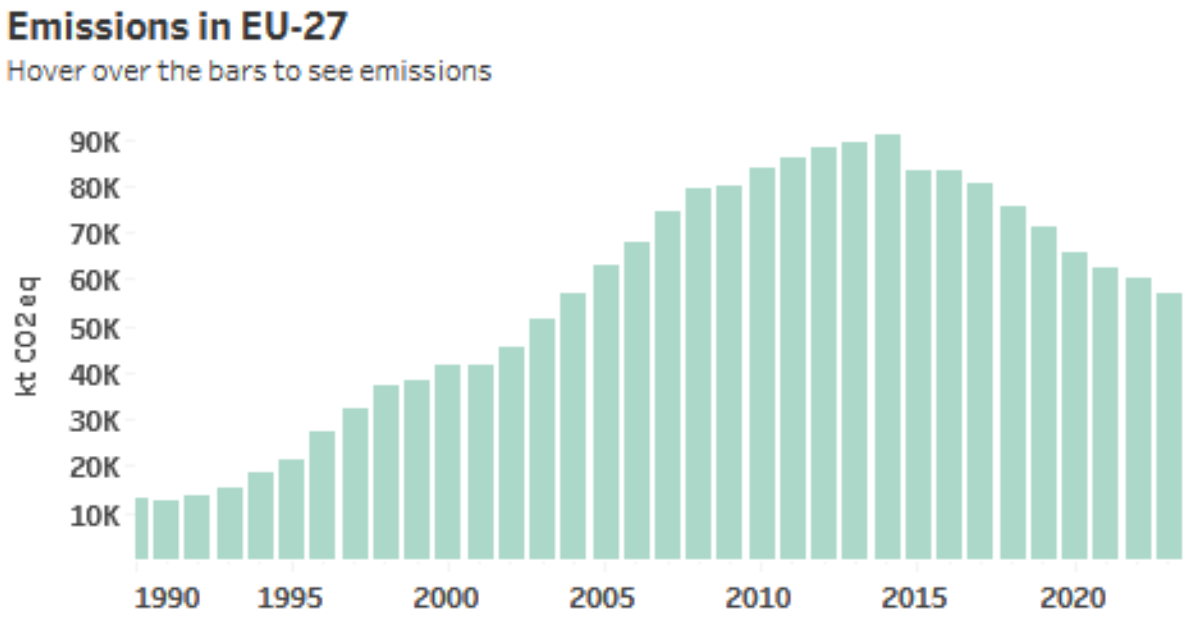
- **Emission prevention rules, Leak checks, Certification/Training of Technicians, Recovery Obligation, End-of-Life Treatment, …**

Controlling & enforcement

- **Licensing, Custom rules, Market surveillance, Labelling, Penalties, Reporting**

Policy yardstick: EU emissions

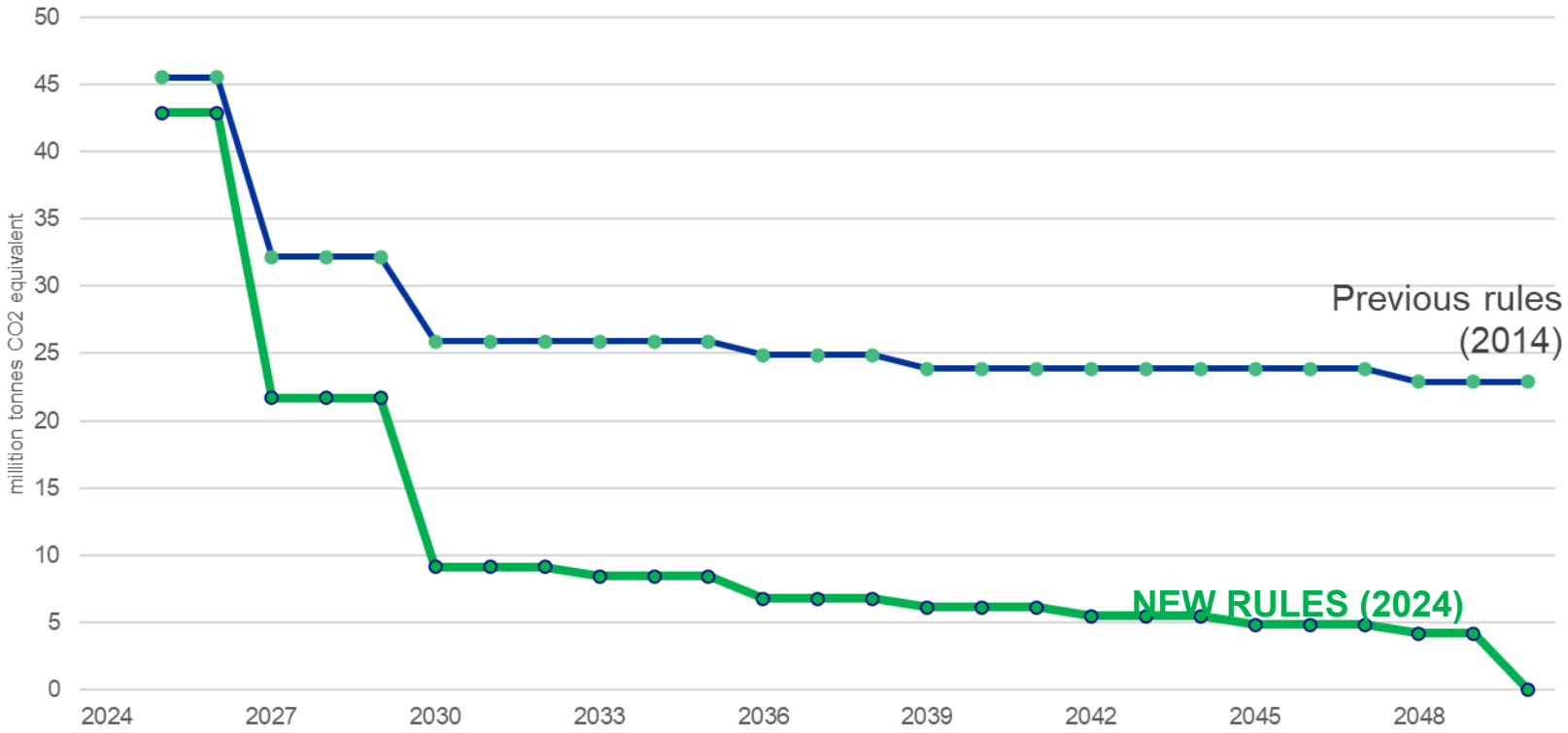
***HFC** emissions on steady decline since 2014* *--> 37% decline from peak (2014)*



Source: EEA GHG data viewer

Reinforced HFC quota system: Driver for innovation

(New) **placing on the EU market** of HFCs



MDI included from 2025

Reclamation grew by 250% from 2023 to 2024

Effects on innovation

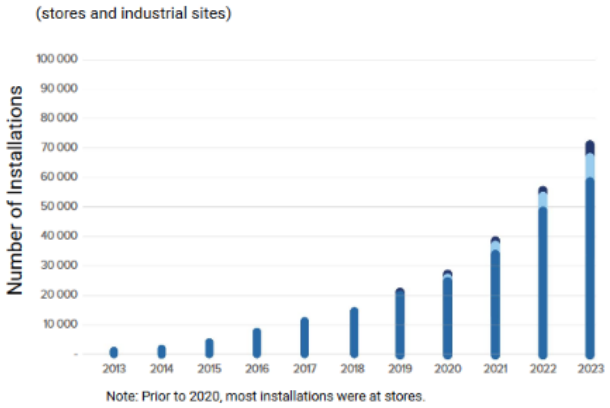
Strong trigger for green growth

- Today **71,800 *CO2* transcritical systems** installed in Europe;

of which 60,000 are centralised systems in food retail stores

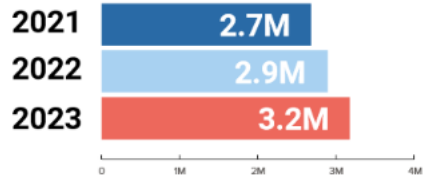
- **3.2 million hydrocarbon-based** retail cabinets (2023)
- 3,360 small charge **ammonia** systems (industrial sites)

Figure 10: Transcritical CO_2 Historical Installation Growth in Europe



All data from ATMO market report 2023

Figure 12: Self-Contained Hydrocarbon Cabinets, Historical Installation Growth in Europe



Technology adjustment costs only €6/tCO2eq (2015-19)

lower than estimated beforehand (€17/tCO2eq)

For many sectors we expect negative abatement costs going forward,

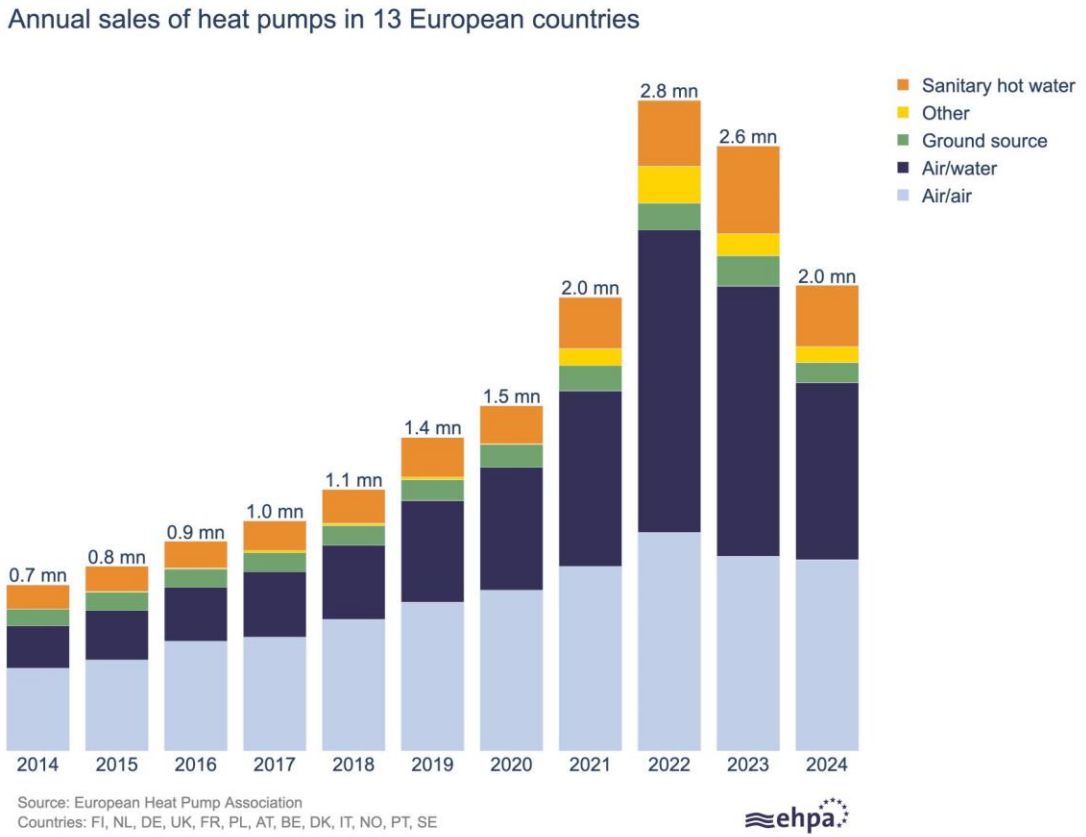
as a result of energy efficiency gains

Quota system monitoring (heatpumps)

- New monitoring activity:
  Update of heatpump component

- Market developments:
  Recent slump in HP sales, not related to
  F-gas Regulation

- Price monitoring:
  Relatively steady high prices for high GWP HFCs.

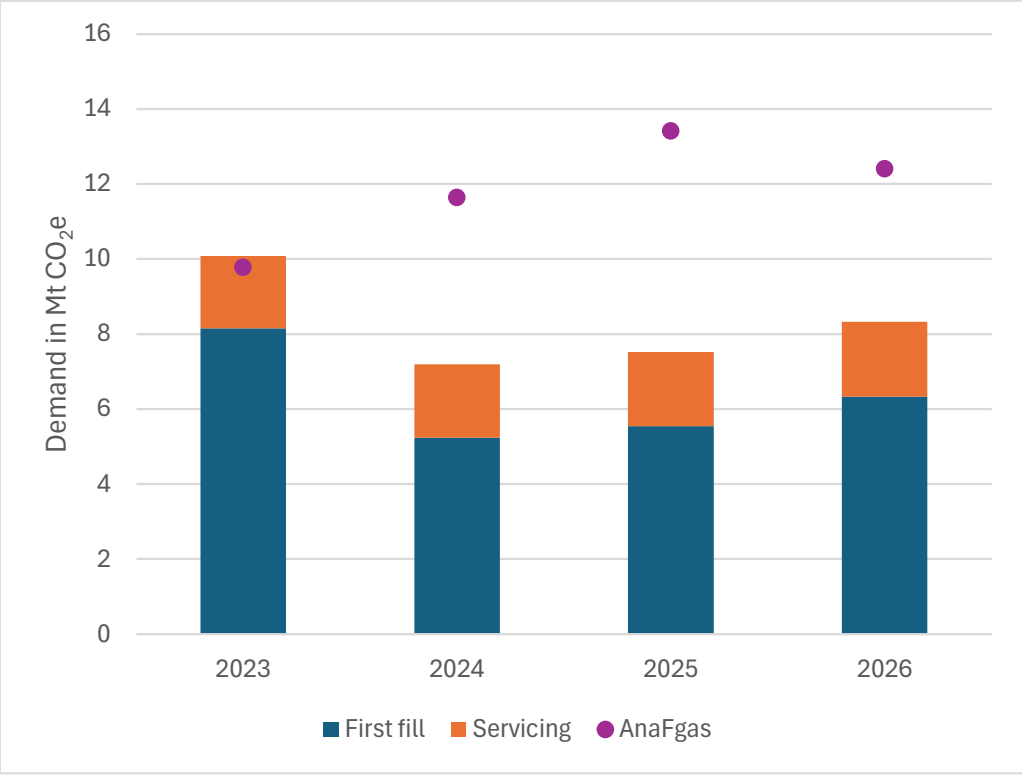


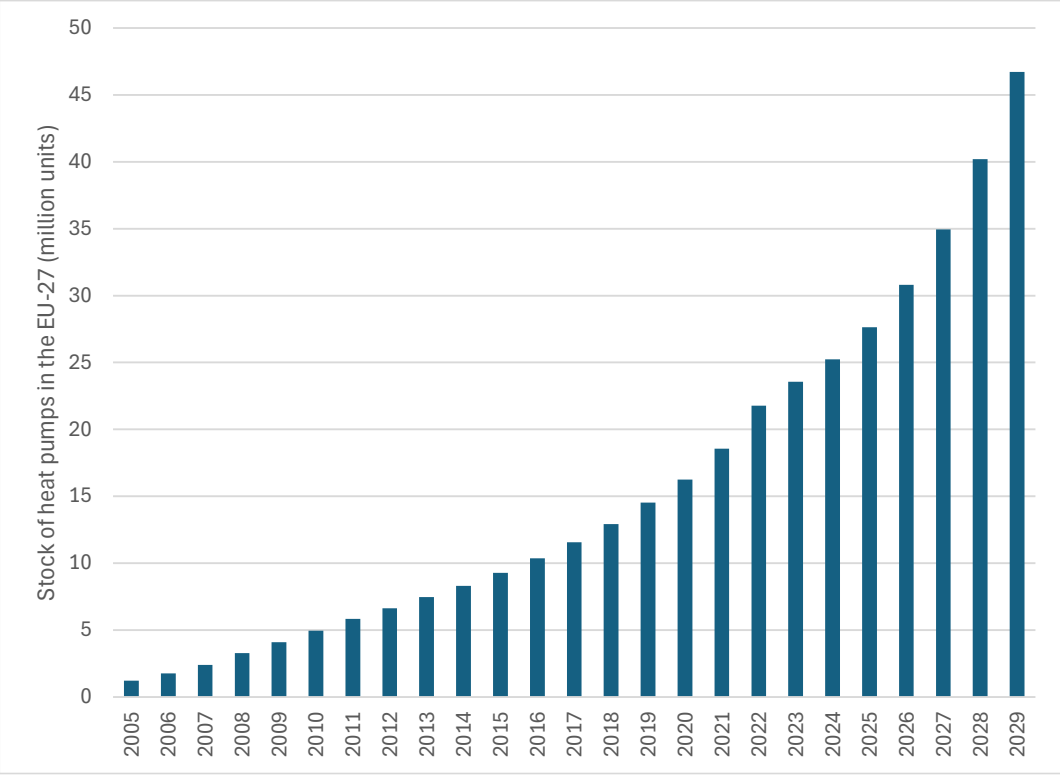
F-gas demand for heat pumps

Öko-Recherche
Büro für Umweltforschung und -beratung GmbH

New modelling data (2025) on heat pump demand with assumptions in quota system

→ **Sufficient quota available to allow for desirable heatpump growth**





Restrictions in new **AC** equipment

	Existing	Near term	Medium term (2030+)
Small self-contained AC/Heat Pumps <=12kW	**<GWP150** (2020) Movable plug-ins only	**<GWP150** (2027)	**No F-gases** (2032)
Large self-contained AC/Heat Pumps >12kW		**<GWP150** (2027) <=50kW	**<GWP150** (2030) >50kW
Small split AC/Heat Pumps <=12kW	**<GWP750** (2025) Single splits with max 3kg charge only	**<GWP150** (2027) A/W **<GWP150** (2029) A/A	**No F-gases** (2035)
Large split AC/Heat Pumps >12kW		**<GWP750** (2029)	**<GWP150** (2033)

Refrigerant developments

Öko-Recherche
Büro für Umweltforschung und -beratung GmbH

- Strong transition towards R-290 (propane) in air/water monobloc heat pumps
  → Multiple manufacturers have readily available solutions

- Current trade fairs
  - Single-split propane heat pumps up to 6 kW (up to around 700 g propane) presented by multiple manufacturers
  - Large propane chillers presented by multiple manufacturers
  - Combination of central propane air/water heat pumps for building complexes with individual small <150 g propane heat pumps inside (Panasonic)
  - VRV system with CO_2 (R-744)
  - Other multi-split heat pumps still relying on HFC-32

- Heat pump market is shifting swiftly towards natural refrigerants
- No quota shortage is foreseen for the near future

Implementing legislation

Review of the F-gas regulation comes with ongoing updates implementing legislation

https://climate.ec.europa.eu/eu-action/fluorinated-greenhouse-gases/documentation/documentation-f-gas-legislation_en

Certification of personnel recovering F-gas-based solvents
Certification of personnel for stationary electrical switchgear
Certification of personnel for F-gas stationary fire protection equipment
F-gas Portal registration rules
Certification for refrigeration, AC, heat pumps etc.
Reporting format for Article 26 compliance
Labelling Act

Life-cycle refrigerant management (since 2006)

Training & Certification of Technicians

- crucial (skills, safety, awareness, environment, enduser costs, market overview..)
- but took a while to accomplish (600.000 persons, 66.000 companies) **since 2006**
- **NOW: extension to alternatives (flammables like HFOs and naturals)**
- **NOW: extension to mobile equipment** (refrigerated van, trucks & trailers, containers, train waggons; AC in light and heavy duty vehicles, off road machinery, trains, metros, buses, trams and aircraft) in addition to stationary RAC, fire protection, ORC, electrical switchgear)

Leakage checks

- Equally important (awareness, energy efficiency, enduser costs)
- Combined with logbooks („record keeping“)
- Enforcement cumbersome, best implemented with centralised Database (Synergy with UNFCCC obligations): Example Poland (IT, BE,..)
- **NOW: extension to HFOs**

Life-cycle refrigerant management (since 2006)

Recovery & Destruction

End of life is crucial as many emissions can be avoided

- Recovery obligations (RACHP + some mobile + foams etc)
- **NOW: extension to HFOs**
- Rules on destruction (ban on halon destruction)
- Producer Responsibility Schemes
- Penalties: venting is a crime
- Synergies with waste legislation EU Waste Framework Directive / Waste from Electrical and Electronic Equipment Directive, Landfill Directive, Waste Shipment Regulation
- **MS go further**: deposit-refund, tax rebate, take back scheme, regional reclamation centers, registers,..
- Recycling and reclamation can reduce demand → link to quota system/service bans

KEY POINTS on illegal trade - Regulation 2024/573

New rules that:

- Broaden the scope of controls
- Specify what customs need as info
- Automatize customs controls
- Ensure effective sanctioning

From risk-based to automatic controls

I. Verification of Supporting Documents

Without EU CSW-CERTEX

Step 1. Economic operator submits a customs declaration in the national customs system, referencing the IDs of the supporting documents (certificates, authorisations, licences, permits, registrations, etc.).

Step 2. Economic operator makes the supporting documents available to customs upon request (**in paper or in a scanned copy**).

Step 3. Customs officer verifies the Customs Declaration and **manually checks the associated supporting documents** in the respective digital systems of Partner DGs or requesting them from the economic operator.

With EU CSW-CERTEX

Step 2. EU CSW-CERTEX is triggered, and it **automatically verifies the supporting documents** in the respective digital systems. The verification concerns their existence, status, commodity codes of the goods, quantities, EORI of the operator, etc.

Step 3. Customs officer intervenes only if the automated validation indicates a problem. When the goods are released, this is **automatically recorded** on the supporting document, thus ensuring that it cannot be fraudulently reused for another customs procedure (**EU-wide quantity management**).

A few final thoughts

- The F-gas Regulation has been a driver for green technologies
  - opportunities for early movers
  - costs are moderate
  - energy savings are made
- EU is phasing out HFCs by 2050
- Restrictions give clear market signals in RACHPs and other sectors
- A good F-gas policy rests on 3 pillars
    - Avoiding
    - Containing
    - Enforcing
- **Climate change will not go away**

Thank you

https://climate.ec.europa.eu/eu-action/fluorinated-greenhouse-gases_en

Issues to be implemented by MS - regulation EPaR (EU) 2024/573

on fluorinated greenhouse gases

CZ experience

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Ministry of the Environment, Czech Republic

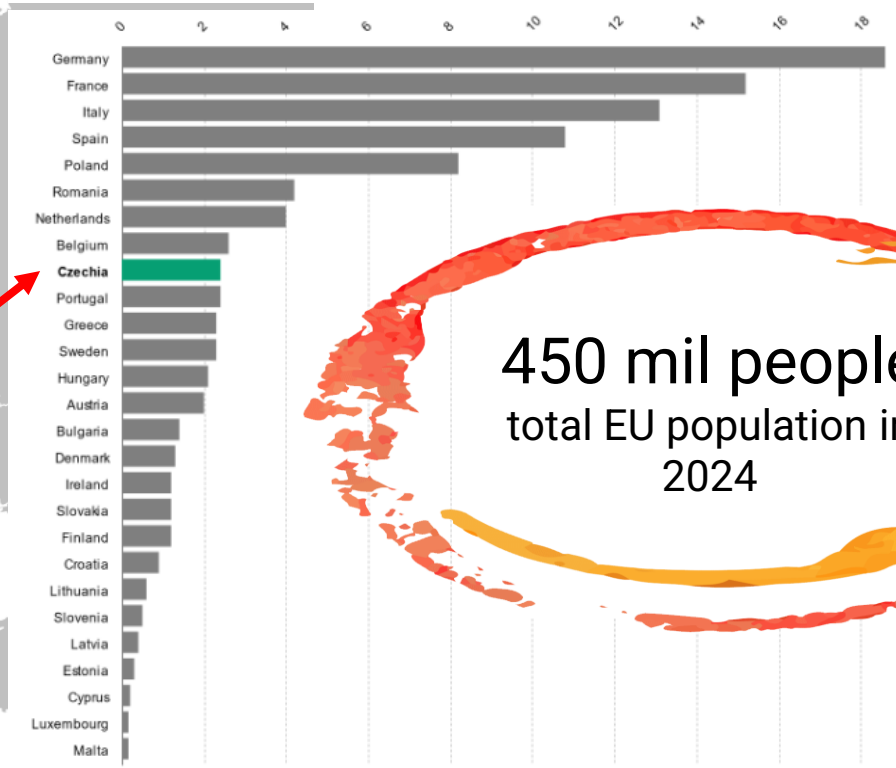
https://mzp.gov.cz/en

9. 7. 2025, OEWG47, EPEE Side event, Bangkok

The Czech Republic in the EU/Europe

Population

(% of EU population in 2024)



450 mil people

total EU population in 2024

Obligations resulting from the F-gas regulation

National implementation

Directly applicable

Member states

Need of national implementation

→ Act and Decree amendment and other supporting measures

→ reporting back to EC in required cases

Specific persons

manipulating/working with F-gases

- Natural & legal persons
- producer, importer, exporter, person which places on the market, distributor, seller
- Operator, owner, technician, …

(New) obligations for MS

= issues faced by MS

- → General aspects
- → Promotion of recovery, recycling, reclamation and destruction of F-gases
- → Certification and training
- → Collection of emissions data
- → Controls, cooperation and exchange of information
- → Penalties and responsibilities for enforcement

IMPLEMENTATION
→
ACT AMENDMENT
currently in status of
GOVERNMENT
CONSIDERATION

General aspects

- → Information sharing
- → Awareness raising = communication with
  - → National authorities involved (enforcement and control mechanism)
  - → Sectors, associations
  - → Stakeholders, etc.
- → Interpretation issues
- → Questions – answers, etc.

Promotion of recovery, recycling, reclamation and destruction of F-gases

IN LEGISLATIVE PROCESS

Refrigerant recovery and then?

REFRIGERANT X WASTE

WHEN?

CZ Legislation proposal:

→ **F-gases recovered for the purpose of recycling and reclamation are not subject to the national Waste legislation**

Recycling or reclamation

reuse for the original purpose

MATERIAL

Destruction in view of the degree of contamination

original purpose ceased

HAZARDOUS WASTE

Subsidy:

→ Financial support for collection centres, proper equipment for treatment with recovered F-gases

→ Recovered F-gases: 1 cylinder = 1 substance

→ Equipment for reclamation (smaller, economically accessible technologies)

Certification and training

Deadlines - Timing - Demand - Capacity

Regular refreshment courses/re-evaluation process for certified persons/holders of attestation at least every 7 years

- New scheme for certification **(F-gases and alternatives HCs, CO_2, NH_3)**
  - Certification scheme is set up at national level (Act)
  - Up to certification bodies to start with new scheme

- Refreshment courses/re-evaluation process
  - **No legal basis** at national level, Act amendment → time consuming
  - Need to **set up providers** → current Evaluation & certification body, Attestation body + newly Vocational schools (RACHP) **to increase capacity**
  - **Recognition of course** designed according to minimum requirements of Commission Implementing Regulations completed **before CZ Act Amendment is in force** as regular refreshment course → **make sure the capacity of training providers is sufficient**

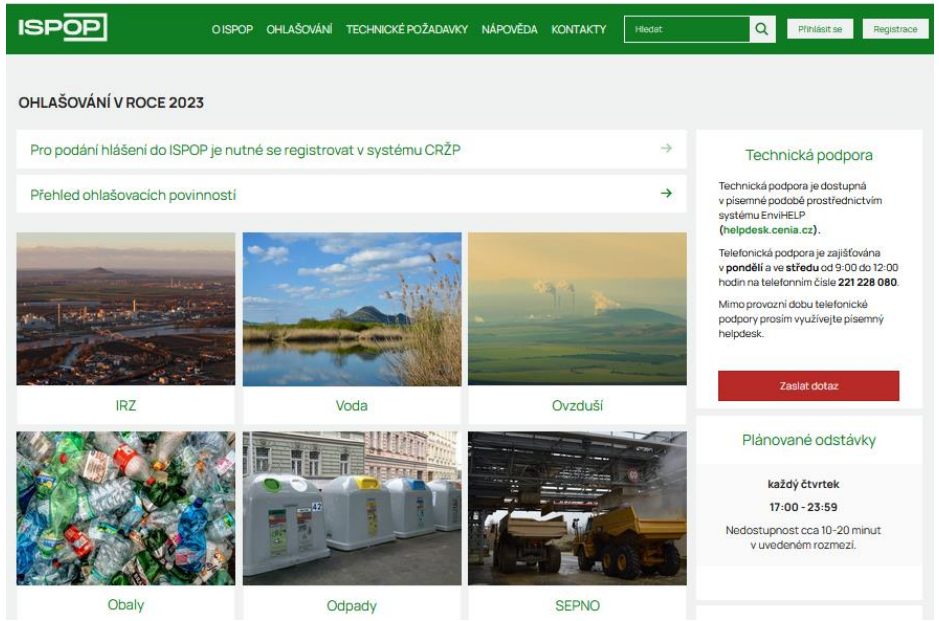
IN LEGISLATIVE PROCESS

Collection of emissions data

Improvement of the national emissions data collection

- Extension of current obligations to reflect better current use of F-gases, monitor F-gas emissions, control F-gas users and their compliance with the Regulation
- Keeping current frequency (1x per calendar year) and term for data delivery (by 31 March)

- Data from manufacturing and service companies
- Data of F-gas sellers in relation to Article 7(3) of Regulation (EU) 2024/573 (information on certificate numbers/certificates of purchasers and respective quantities by type of F-gas)



IN LEGISLATIVE PROCESS

Controls, cooperation and exchange of information

Ministry — Ministry of the Environment of the Czech Republic

Customs — CELNÍ SPRÁVA ČESKÉ REPUBLIKY

Trade Inspectorate — ČESKÁ OBCHODNÍ INSPEKCE

Environmental Inspectorate — CZECH ENVIRONMENTAL INSPECTORATE

Illegal trade

- Unique geographical position of CZ in EU → EU neighbours only
- Personnel expertise – increasing demand, training needed
- Difficulties to controll transit regime → Conditions easier for illegal importers than for control bodies
- Access of control bodies to necessary tools → missing refrigerant analyzers on the market
- EU Single Windows Environment for Customs (CSW-CERTEX) and interlinkage with F-gas portal helpful tool → CZ mainly for legal import

IN LEGISLATIVE PROCESS

Penalties

→ Effective, proportionate and dissuasive

→ Consideration of various circumstances of the regulation violation

Big issue:

→ **Financial penalties reflecting the market value of gases or products**

- Principle very much supported
- Difficulties expected while implemented and for the first applications (no experience of relevant bodies – inspectorates, need to develope new scheme/approach)

Responsibility for enforcement, controls and penalties

→ Determination of national bodies

IN LEGISLATIVE PROCESS

Thank you for your attention

Understanding the challenges related to latest EU F-Gas Regulation 2024/573

An EU Market Analysis for EPEE

presented by Ray Gluckman

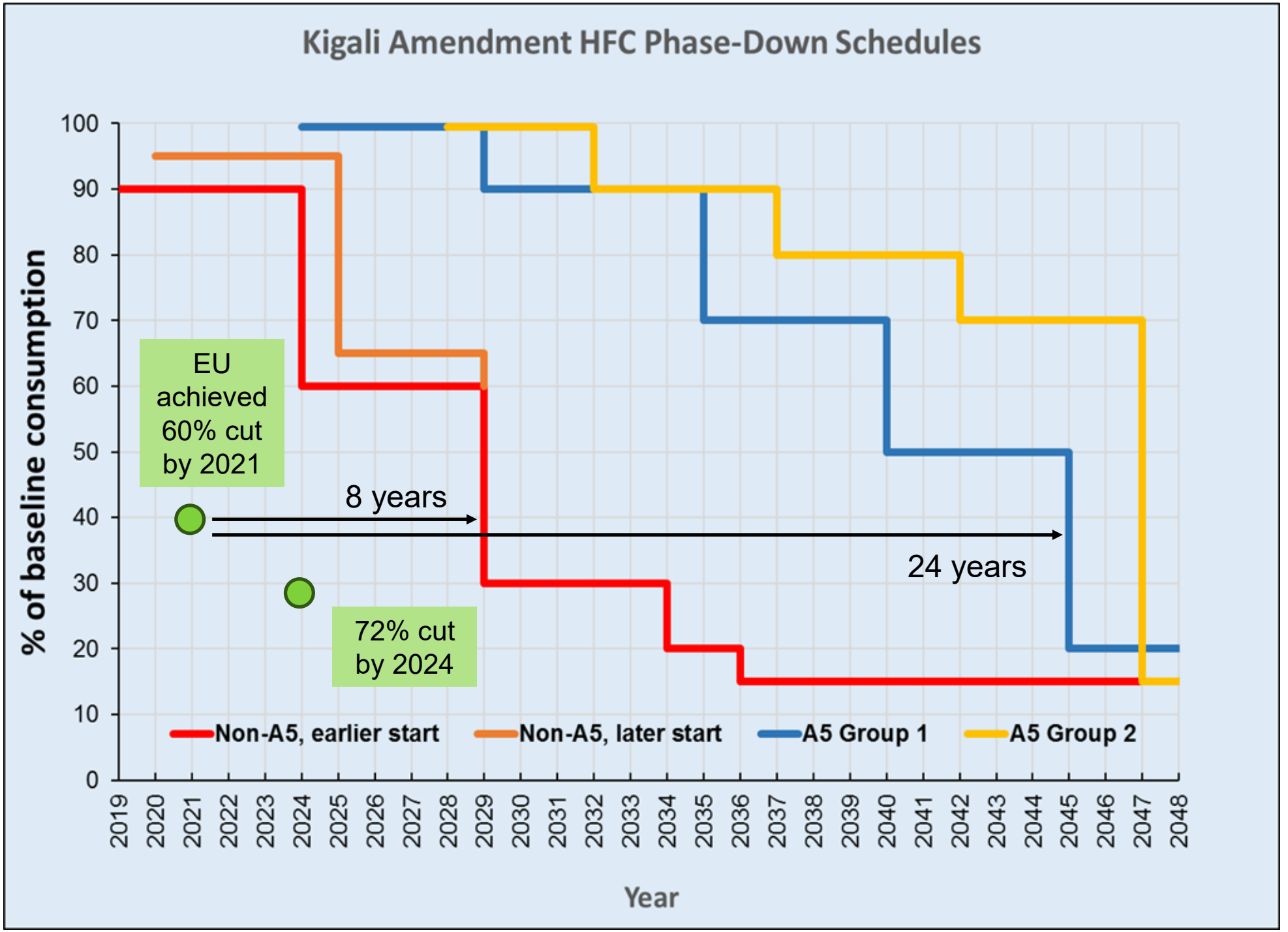
at OEWG Side Event, Bangkok

July 9th 2025

Gluckman Consulting
specialists in refrigeration and climate change

Background

- EU F-Gas market review carried out for EPEE by Gluckman Consulting
- data from EPEE members collected to provide understanding of the pathways to lower GWP refrigerants in different parts of the RACHP market
- *HFC Outlook* EU model updated to take account of:
  - 2024 EU F-Gas Regulation
  - views of EPEE members
  - Brexit


Kigali Amendment HFC Phase-Down Schedules
% of baseline consumption
100
90
80
70
60
50
40
30
20
10
0
EU achieved 60% cut by 2021
8 years
24 years
72% cut by 2024
Non-A5, earlier start
Non-A5, later start
A5 Group 1
A5 Group 2
2019
2020
2021
2022
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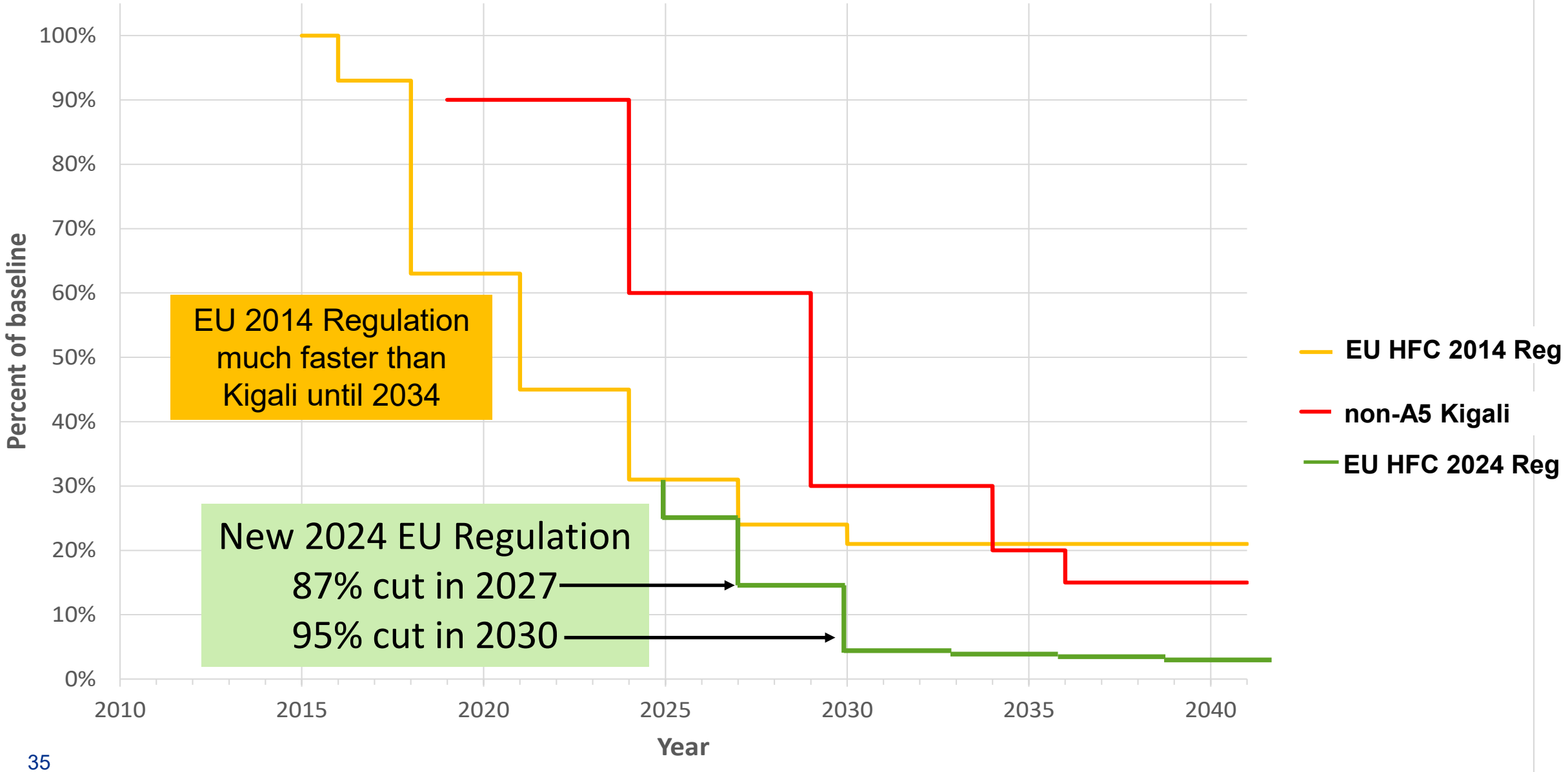
2048
Year

Comparison of EU and Kigali non-A5 HFC Schedules



2014 EU Regulation led to significant innovation

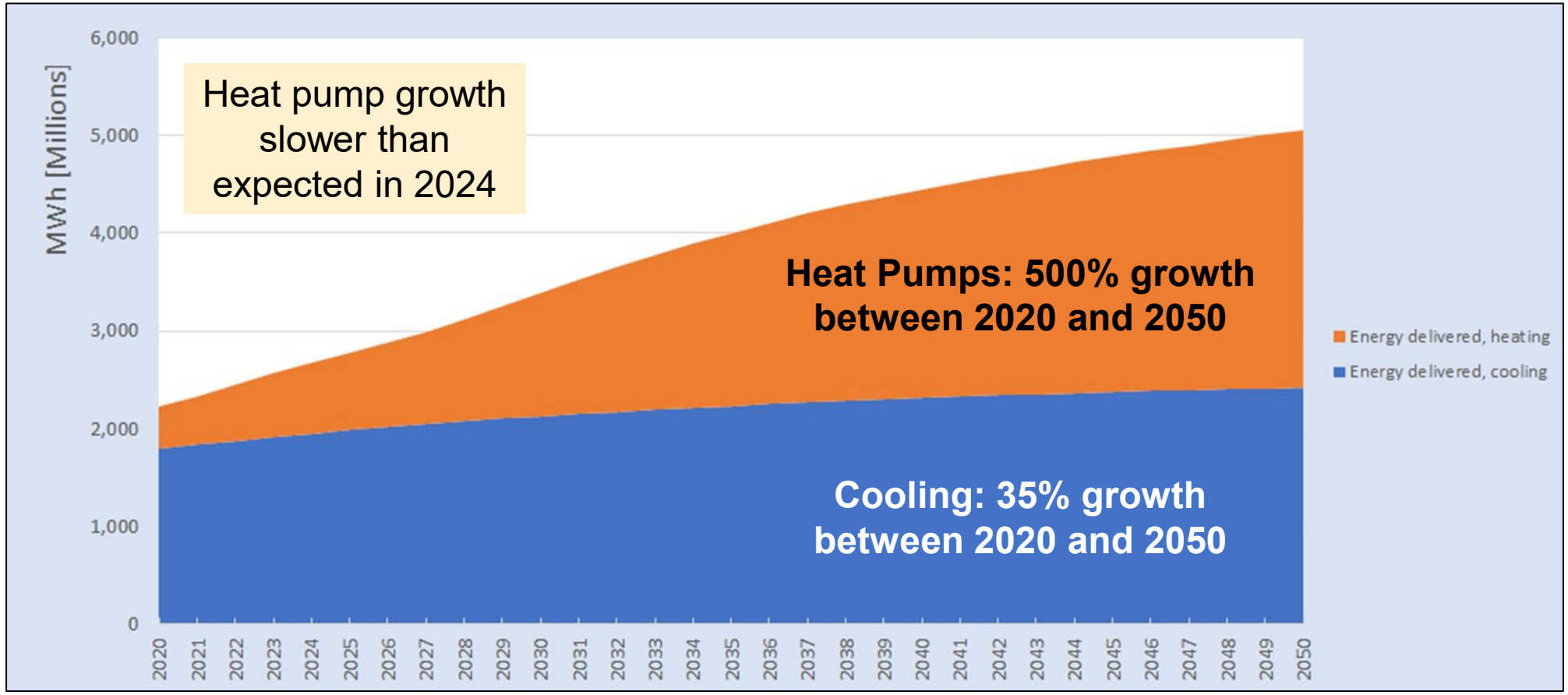
- the phase down schedule in the 2014 Regulation was ambitious
- most of the EU RACHP market now uses lower GWP refrigerants in new equipment e.g.:
  - R-404A quickly phased out in new commercial and industrial refrigeration
  - R-410A rapidly switched to HFC-32 in small and medium sized air-conditioning
  - HFC-134a relaced by HCs in domestic refrigerators and sealed commercial refrigeration
  - HFC-134a banned in car air-conditioning from 2017 and replaced by HFO-1234yf
- other important HFC mitigation strategies have also been adopted (linked to LRM) e.g.:
  - technician training and certification
  - leakage reduction
  - end-of-life HFC recovery and re-use

2024 EU F-Gas Regulation

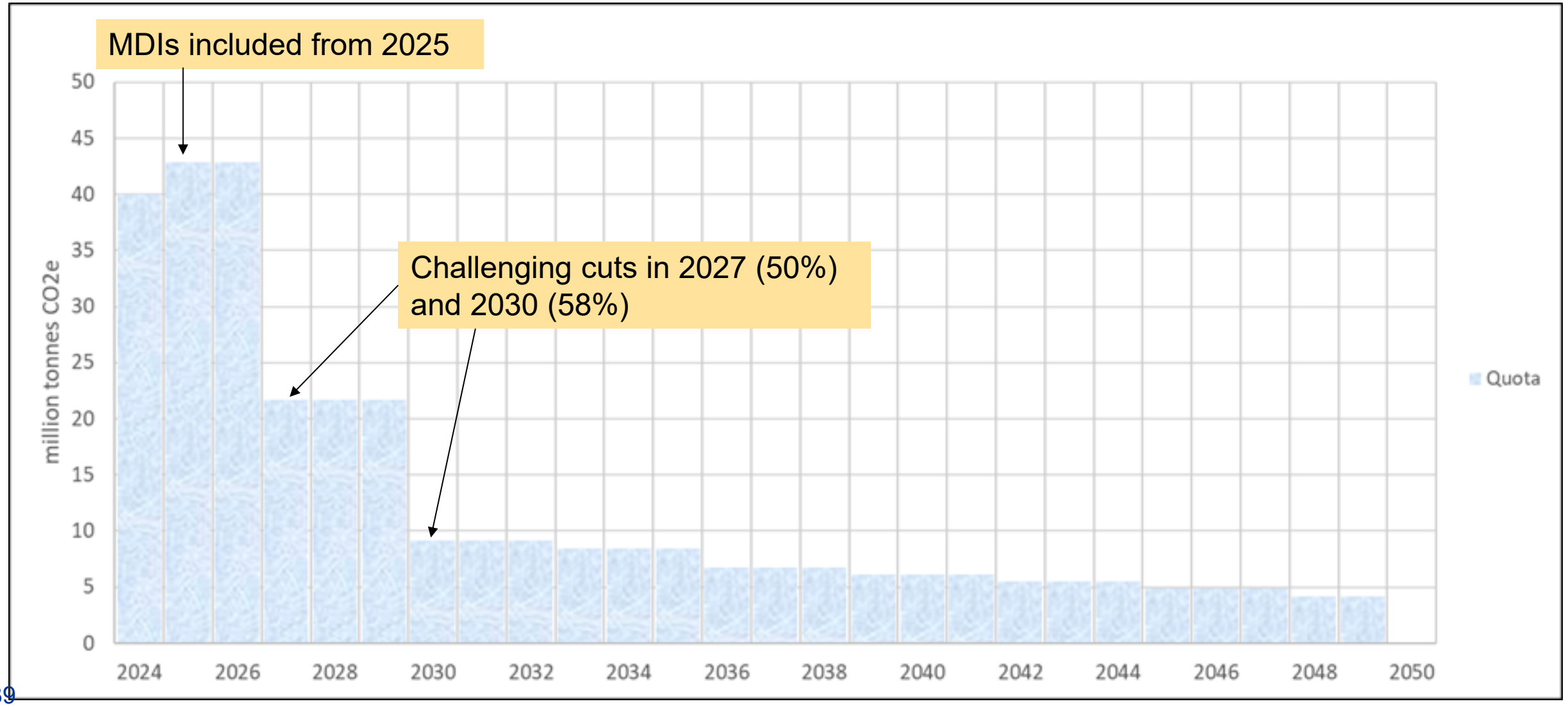
- the 2014 Regulation has been very successful
  - with much faster HFC phase down than Kigali
- the EU Commission recognised there was potential for even faster action
- the 2024 F-Gas Regulation has several new features e.g.:
  - a much more ambitious HFC phase down schedule
  - inclusion of MDIs in the HFC phase down
  - numerous new bans on certain categories of RACHP equipment
- how will the EU achieve the challenging targets?

EU RACHP Market Growth Forecasts

- the EU cooling market is fairly mature
- but the heat pump market is expected to grow rapidly



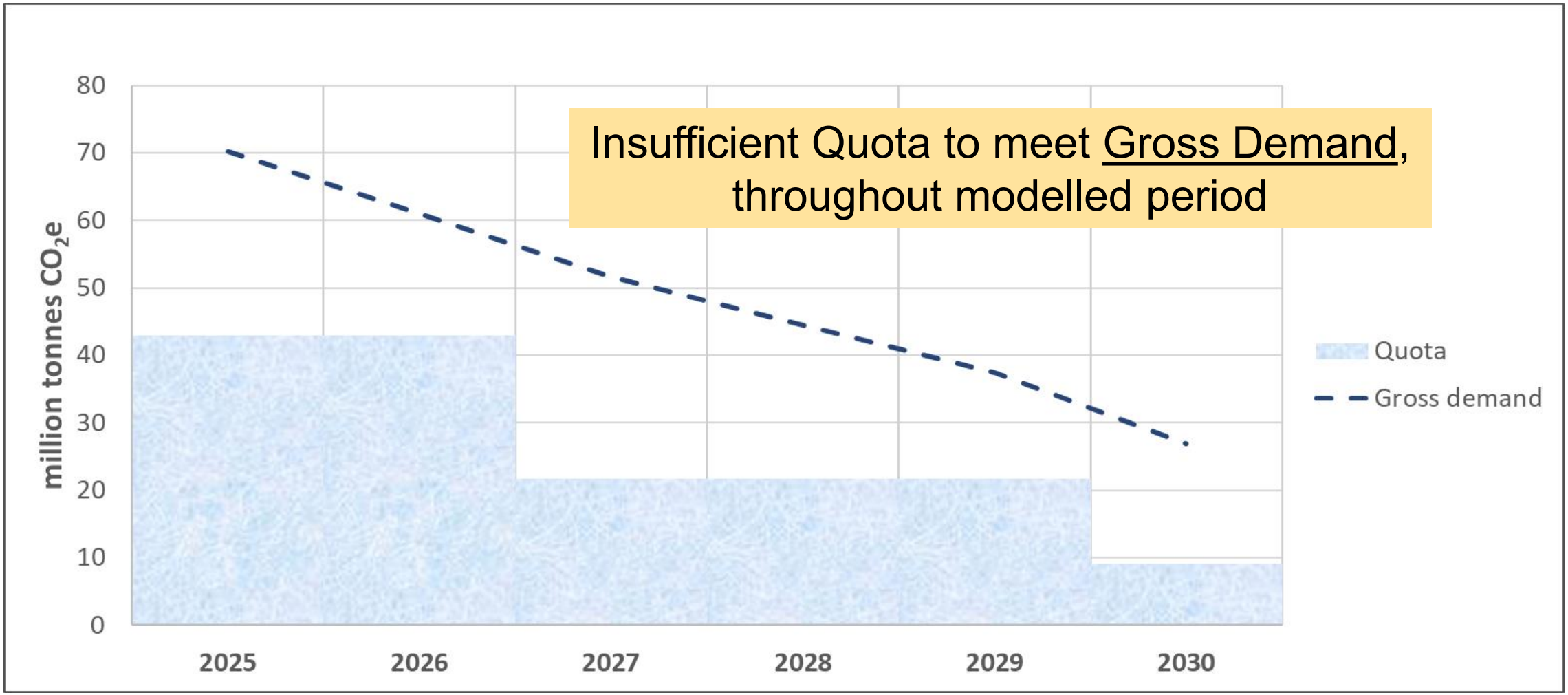
2024 EU F-Gas Regulation: Available HFC Quota, Mt CO_2e



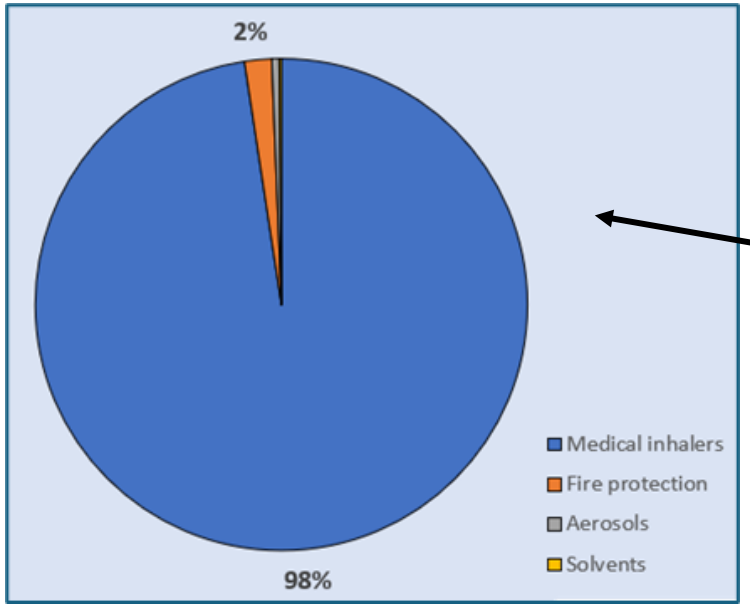
Consumption, Gross Demand and Net Demand

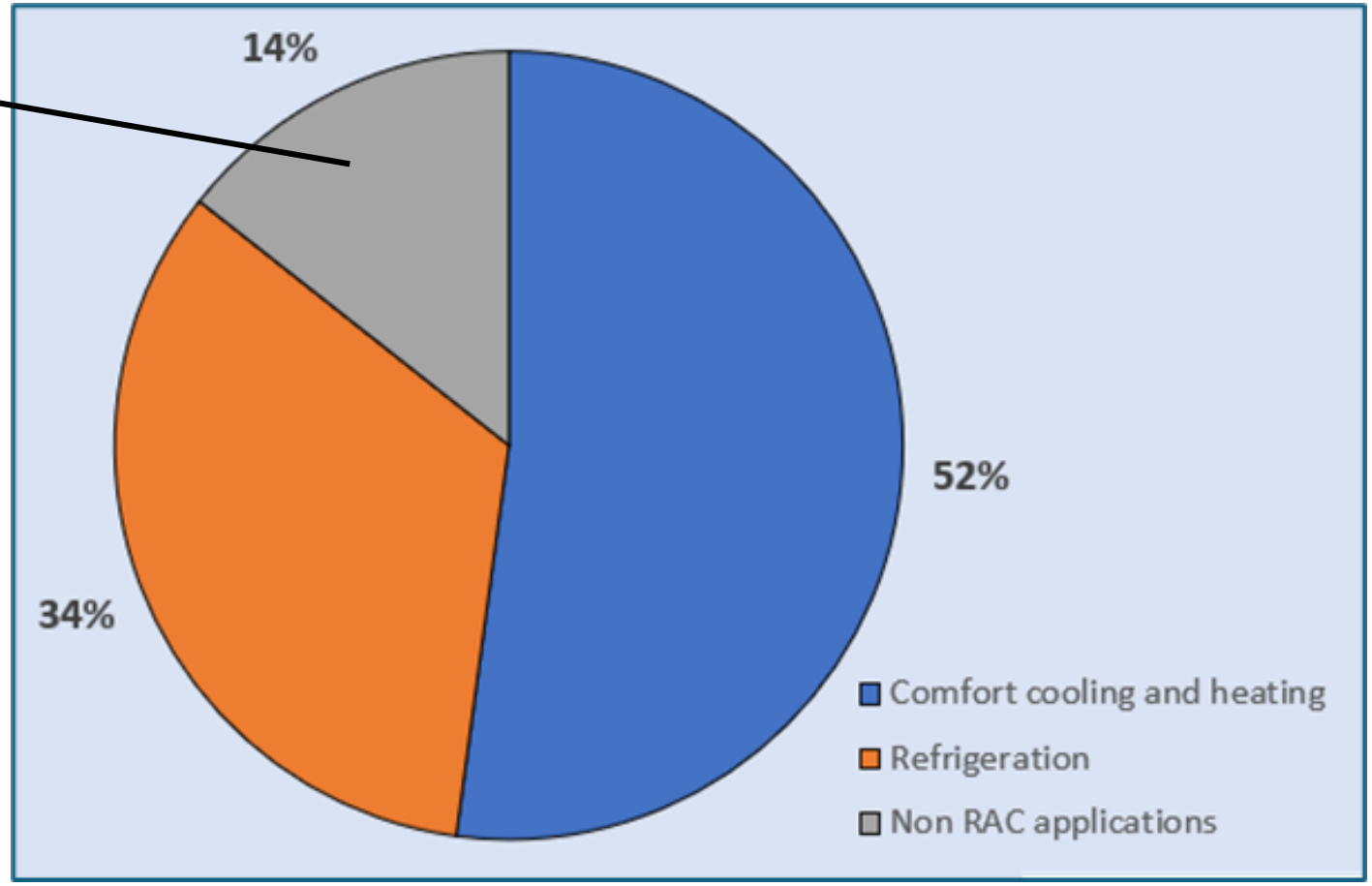
- important to understand how we model refrigerant consumption and demand
- Consumption
  - a Montreal Protocol definition:
    - refers to bulk gas production + imports – exports
- Demand includes all refrigerants used, including in equipment imports
  - Maintenance of existing equipment
  - Manufacture of pre-charged equipment in EU-27 factories
  - Imports of pre-charged equipment
  - On-site filling of new equipment
- Gross Demand is total amount of refrigerant required
- Net demand is total amount of virgin refrigerant required – which is constrained by the quota
  - Net demand = Gross demand – re-used refrigerant
- in *HFC Outlook* we model Gross Demand and then make estimates of refrigerant re-use

Quota and *HFC Outlook* Gross Demand Forecast, Mt CO_2e



Split of Gross HFC Demand, GWP weighted

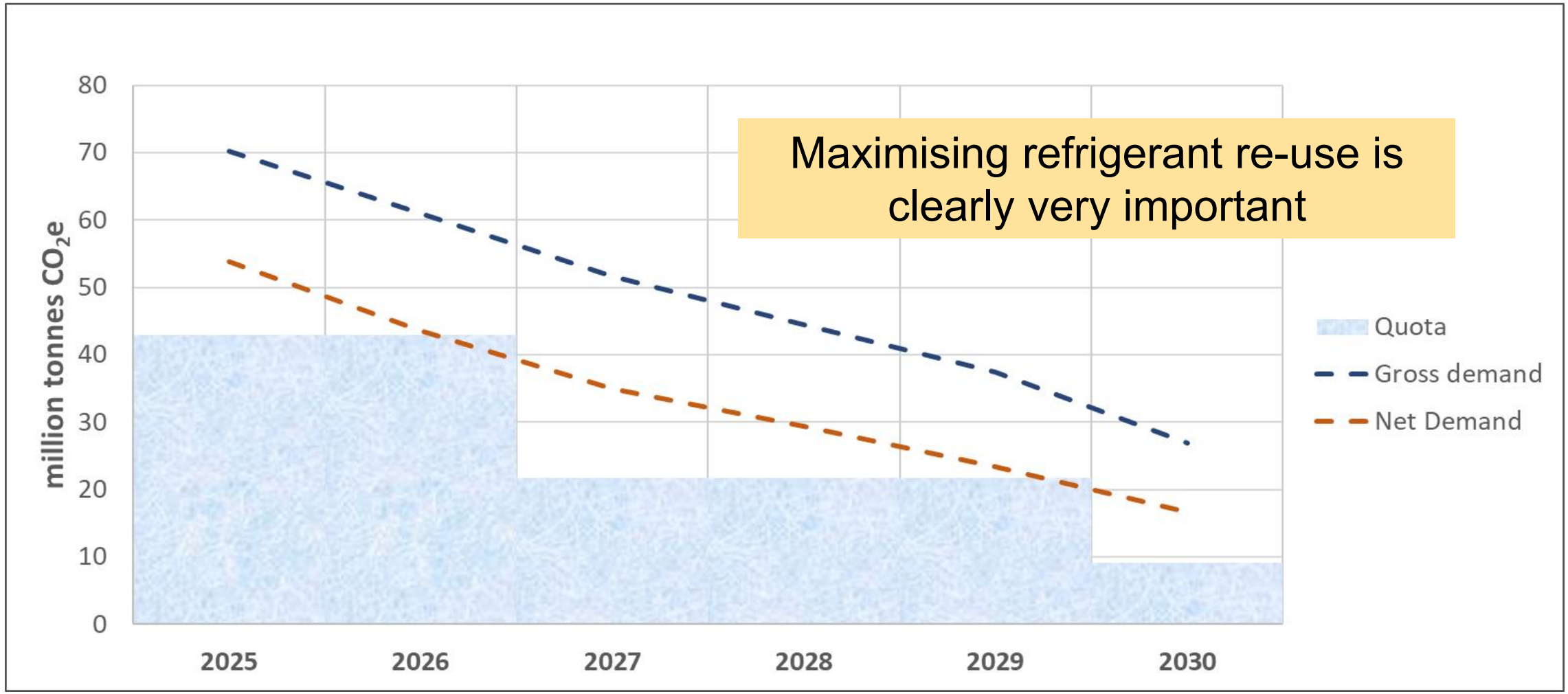




Status of re-used refrigerant

- the HFC quota system only relates to virgin refrigerants
  - manufactured in EU
  - imported in bulk into EU
  - imported in pre-charged equipment manufactured outside the EU
- recovered refrigerant can be re-used and is outside the quota system
  - recovered from equipment at end-of-life
  - or from equipment being retrofitted with a lower GWP alternative
- net demand = gross demand minus re-used refrigerant

Net Demand Forecast, allowing for HFC re-use, Mt CO_2e



Key Aspects of Meeting Challenging EU Targets

- use low GWP refrigerants in all new systems
- maximise refrigerant re-use
  - ensure recovery of refrigerants at end-of-life
  - avoid mixing different recovered refrigerants
  - set up good reclaim infrastructure
- minimise leakage
  - big improvements already achieved in many types of RACHP equipment
  - good reporting and good technician training help reduce leakage
- retrofit low GWP refrigerant where practical
- RACHP sector relies on MDI transition taking place (from HFC-134a and HFC-227ea)
  - adopt low GWP propellants (HFC-152a and HFO-1234ze being introduced)
  - switch to non-aerosol inhalers e.g. DPIs

New Equipment Refrigerant Transition Pathways (1)

- modelling includes refrigerant pathways in key parts of the market
  - to reflect the various bans in the new F-Gas Regulation
  - and based on market trends in the EU
- for some technologies, the bans should be achievable e.g.:

Product	Ban date	GWP	Example refrigerants
Self-contained refrigeration	2025	<150	HC-290 HC-600a
Split refrigeration	2030	<150	R-454C R-455A R-744
Water chillers (>12kW)	2027	<750	HFO-1234ze HFO-1233zd HCs HFC-32
Mobile air-conditioning	2017	<150	HFO-1234yf R-444A HCs R-744
Monobloc ACHP (<12 kW)	2027	<150	HC-290

New Equipment Refrigerant Transition Pathways (2)

- the most challenging technologies are split ACHP
  - air-to-air split systems; split hydronic heat pumps
  - before 2015 R-410A was the main refrigerant used (GWP 2088)
- the EU market has already transitioned to refrigerants with GWP <750
  - small systems (<12 kW) almost all use HFC-32
- the bans for split ACHP products <12 kW are especially challenging
  - air-to-water splits, GWP<150 by 2027 and no fluorocarbons by 2035*
  - air-to-air splits, GWP <150 by 2029 and no fluorocarbons by 2035*
- <12 kW bans assume the use of HCs for all sizes between ~2 and 12 kW
  - Challenge 1: HC safety, including installation restrictions
  - Challenge 2: HC energy efficiency, related to charge limitations

* the 2035 bans are subject to review

Ban Exemptions

- most of the bans include a safety exemption:
  - "*except if required to meet safety requirements at the site of operation*"
  - exemption is responsibility of the operator (i.e. the end user)
- possible ban exemptions of up to 4 years for specific applications where:
  - "*alternatives are not available, or cannot be used for technical or safety reasons or the use of technically feasible and safe alternatives would entail disproportionate costs*"
- possible quota exemptions of up to 4 years for specific applications
- ban exemption if:
  - "*lifecycle CO2e emissions would be lower than those of equivalent equipment which meets those relevant EcoDesign requirements*"
- limited potential to increase HFC quota if there is widespread use of exemptions

Concluding Comments

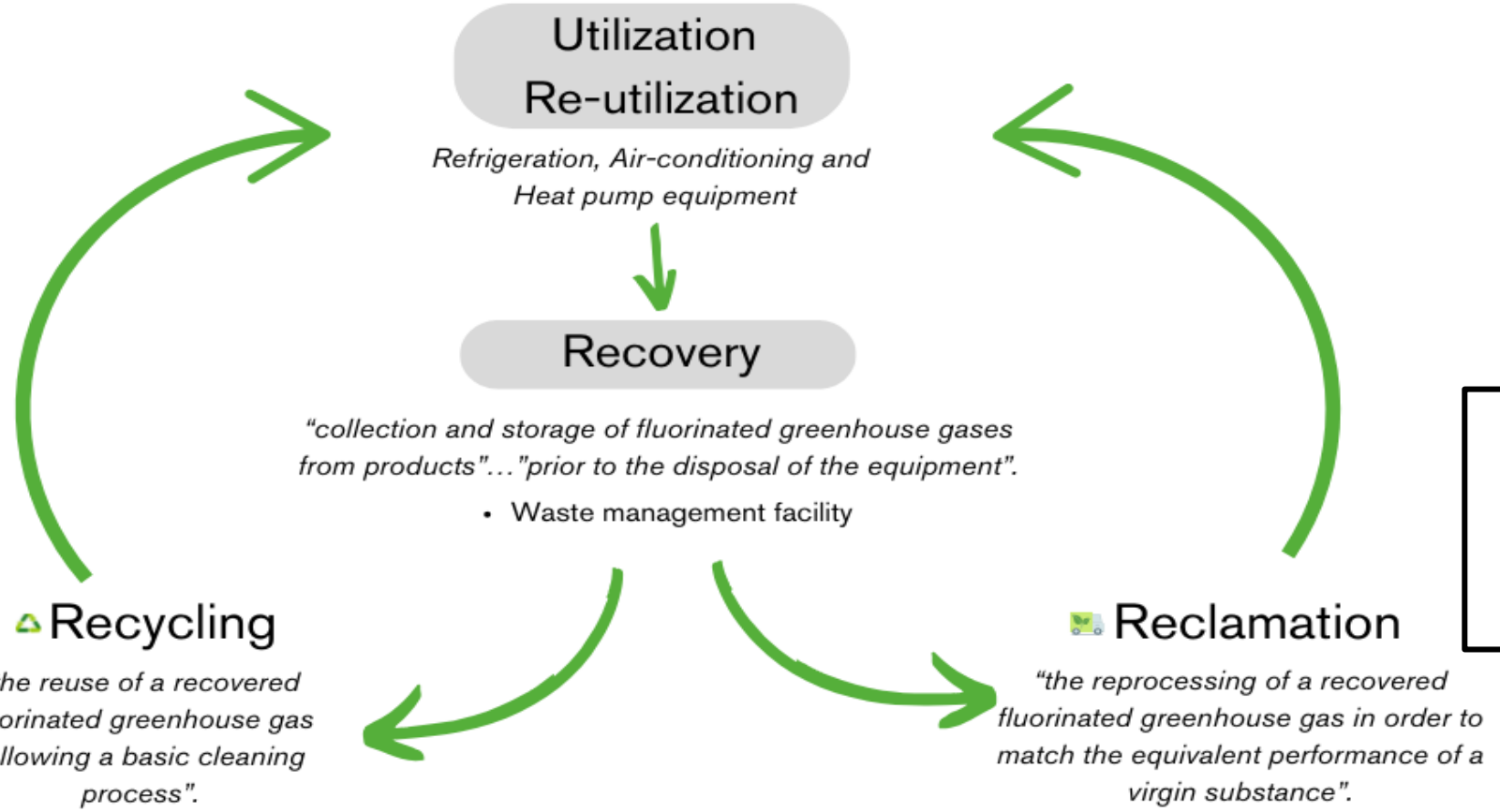
- the new EU F-Gas Regulation is very ambitious
- the updated *HFC Outlook* EU model shows that meeting phase-down targets requires:
  - rapid switch to low GWP refrigerants
  - significant re-use of refrigerant
  - successful introduction of low GWP alternatives to current MDIs
- key concerns related to bans are split ACHP applications
  - especially given the urgent need to decarbonise heating with heat pumps

Opportunities for the Recovery, Reclamation and Recycling activities in Europe
- Laurent Guégan - Climalife

EPEE

Recovery, recycling & reclamation

What are the RRR activities?



Reclamation is possible* for all refrigerants, incl. blends

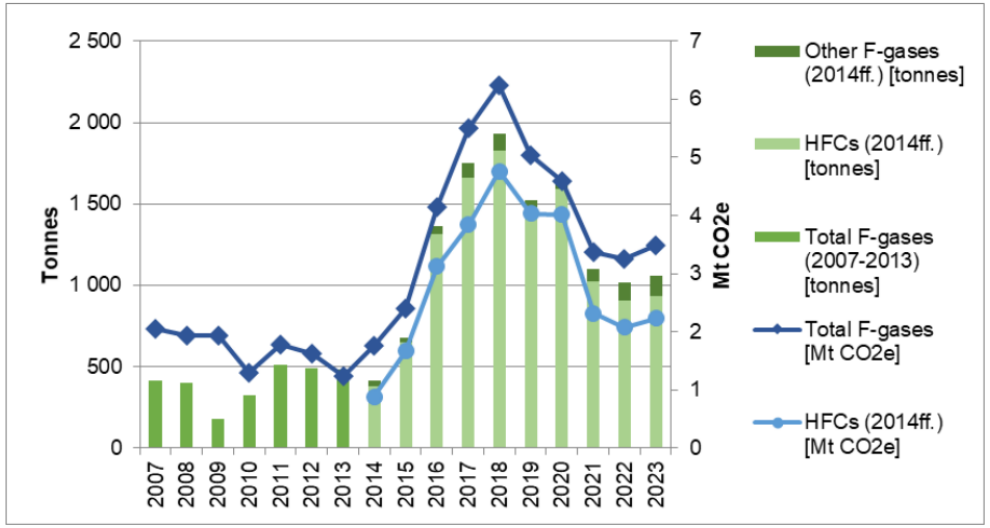
Recovery, recycling & reclamation

Current status in EU:

- There is a clear added value of what an efficient approach to recovery, recycling & reclamation of refrigerants can bring to the RACHP sector
- …But there is currently no view on the actual volumes corresponding to RRR activities
  - No EU data available on quantities recovered & recycled
  - The available data on reclaim does not give a complete view (since not every entity is required to report)

    ➔ *This will change under the new EU F-gas regulation*

Figure 3-2 **EU reclamation of fluorinated gases**



Note: The geographical scope of presented data is the EU-28 except Croatia for 2007-2008, EU-28 for 2009-2019, EU-27+UK for 2020, and EU-27 for 2021 and subsequent years. The scope of F-Gases in the data presented is determined by Regulation (EU) 517/2014. Annex II F-gases (unsaturated HFCs and HCFCs, HFEs and alcohols, and NF_3 and other perfluorinated compounds) were not subject to reporting for the years 2007-2013.

Sources: EC, 2011 and 2014; EEA, 2023a and 2024b.

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Future outlook:

It is anticipated that the new EU F-gas Regulation (published in 2024) will be a catalyst for increasing the importance of RRR activities in the RACHP sector:

- To counterbalance the steep quota reduction
  ➔ *Reclaimed/recycled refrigerants are not subject to quota*
- To support the industry in a smooth transitioning from high to low GWP refrigerants
- To maintain the functionality of the equipment during its lifetime by providing options for the maintenance and servicing of installed equipment in line with the new F-gas requirements
  ➔ *The new EU F-gas regulation is much more prescriptive on what is allowed for the maintenance and servicing of different types of installed equipment i.e. different approach on virgin vs. reclaimed/recycled refrigerants*
- But a successful implementation of RRR will also require properly addressing the illegal trade in refrigerants.

The advantages RRR activities bring for the circularity of refrigerants and the impact on emission reduction.

Recovery, recycling & reclamation

Why are RRR activities important?

- The 2024 F-gas Regulation introduced since March 2024 full products bans, stricter containment and leak detection, and a reduction of quotas for HFCs.
- In this context, the re-use of refrigerants becomes a substantial challenge for servicing existing equipment (incl. refrigeration and AC), and critical to the deployment of heat pumps.
- If the EU does not increase its of re-use of refrigerants, then there will be substantial shortage of refrigerants.
- Without a significant amount of gas recovery, reclamation and recycling it will be impossible to meet the challenges of the rapid phase-down over the next 10 years.
- Reduction of production or import.
  - **Each kg recycled or reclaimed = same Qty non produced or imported**
  - Direct impact on environment

Panel discussion and Q&A
- moderated by EPEE Secretariat

EPEE's side-event to 47th meeting of the OEWG of the Parties of the Montreal Protocol – Bangkok, Thailand

Thank you, all!

EU F-Gas Regulation: One year on.

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