EPEE

EPEE F-GAS INDUSTRY ROUNDTABE

26 Nov 2018

Agenda

12.00 – 13.00	**Registration of participants - Lunch**
13.00 – 13.10	Introduction by Andrea Voigt, EPEE
13.10 – 13.30	Evolution of HFC prices *Julia Kleinschmidt, Öko-Recherche*
13.30 – 14.10	EPEE Gapometer update *Ray Gluckman*
14.10 – 14.20	Update on an ongoing collaboration: the AREA, ASERCOM, EFCTC & EPEE F-gas communications campaign *Andrea Voigt, EPEE*
14.20 – 14.45	Q&A/debate
14.45 – 15.05	Update from DG CLIMA, European Commission, on illegal trade of refrigerants *Arno Kaschl, Bente Tranholm-Schwarz*
15.05 – 15.25	An action plan against illegal trade of refrigerants *Olivier Janin, AREA; Sébastien Gallet, EFCTC; Andrea Voigt, EPEE*
15.25 – 15:50	Q&A/debate
15.50 – 16.00	Closing remarks

Welcome

Andrea Voigt, EPEE

Evolution of HFC prices

Julia Kleinschmidt, Öko-Recherche

Öko-Recherche
Büro für Umweltforschung und -beratung GmbH

Development of HFC prices

EPEE F-gas Roundtable

26 November 2018
EPEE offices, Brussels

Julia Kleinschmidt
Öko-Recherche GmbH
Frankfurt am Main, Germany

Agenda

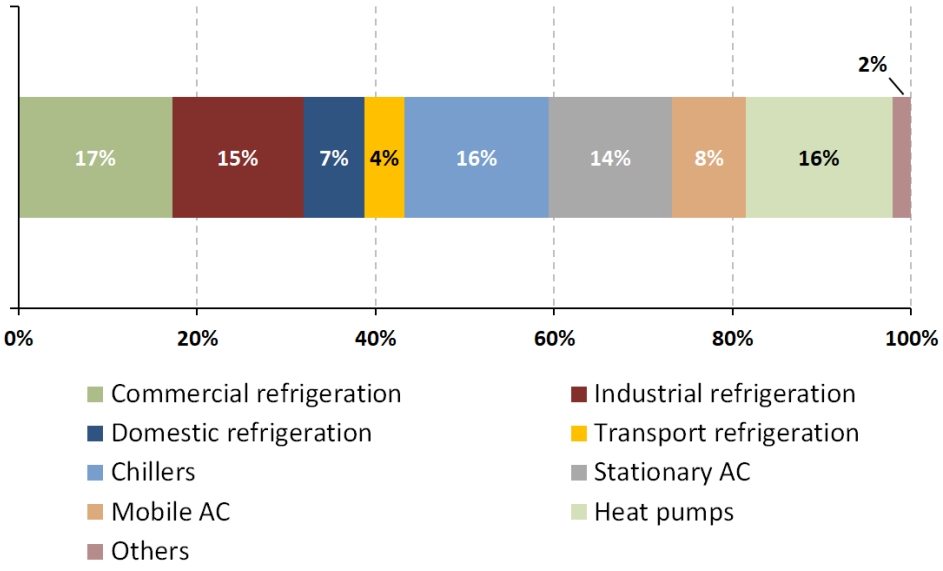
- About the HFC price monitoring analysis
- Price developments in 2018
- Short summary and outlook

About the HFC price monitoring analysis (I)

- **<u>Aim:</u> Monitoring the price effects of the HFC phase-down at different levels of the supply chain**
  - Commissioned by DG CLIMA, started in mid-2016
  - Takes into account results from a previous project (2015-2016)
  - CITEPA (France) as project partner
  - Close cooperation with national (ATF, BWP, VDKF, SNEFFCA) and EU associations (AREA, ASERCOM, EPEE, Eurovent)
  - Quarterly reports to DG CLIMA
  - Companies receive an excerpt from the last price monitoring report (with a three months delay)

About the HFC price monitoring analysis (II)

Sectoral coverage



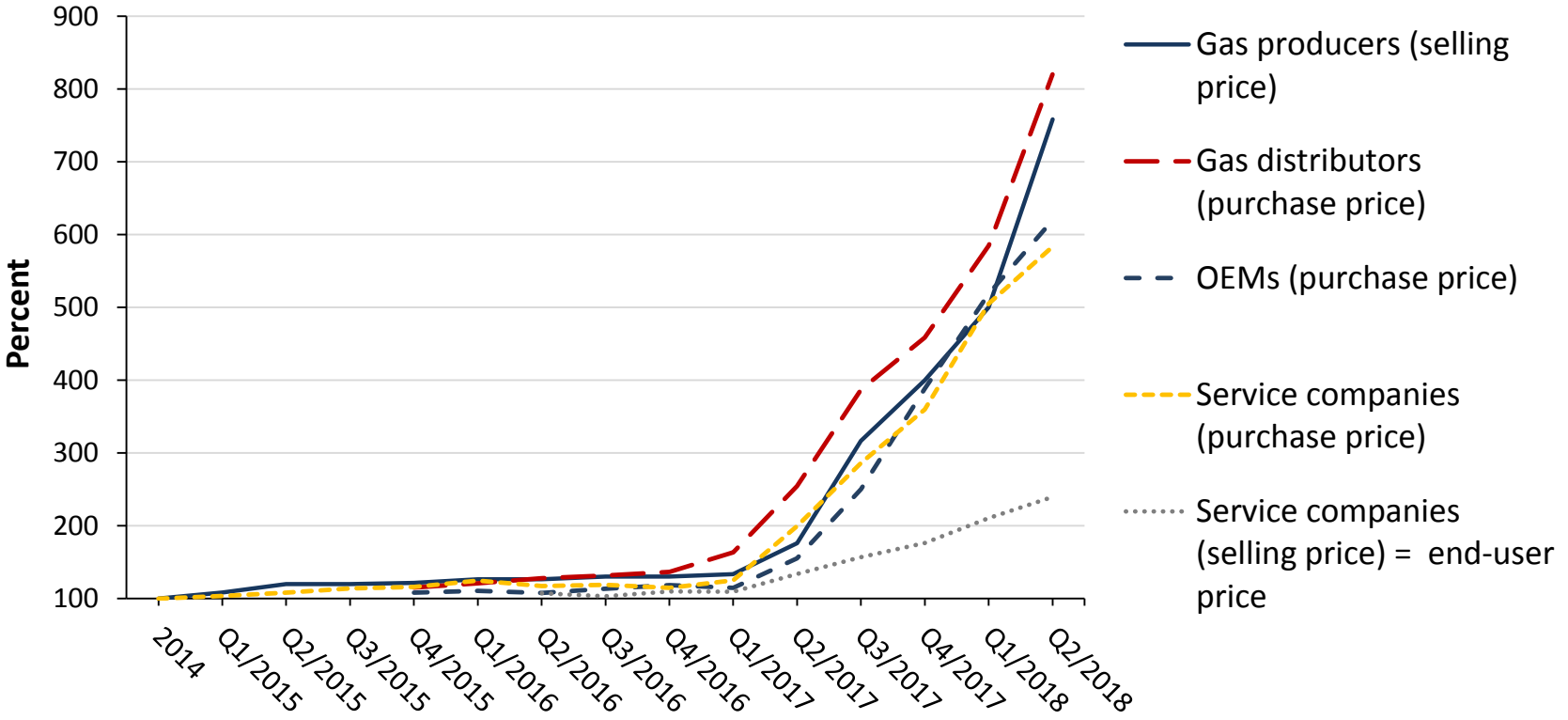
- 60 – 70 companies from RACHP sectors, different EU Member States and all levels of the supply chain
- Companies provide purchase and/or selling price data for refrigerants (HFCs and alternatives) and quota authorisations for the previous quarter
- End-users not included
- Assessment of price development for the entire supply chain and each supply chain level

Price developments in 2018 (I)

- R404A reached its price peak at the beginning of the year
- Price decreases of R410A and R134a after both have seen strong price rises
- Price increases have been completely passed on the end-users
- Lower GWP alternatives have shown rather moderate price increases
- Natural refrigerants still available at low prices
- Prices of quota authorisations vary from 25 to 40 €/t CO_2e

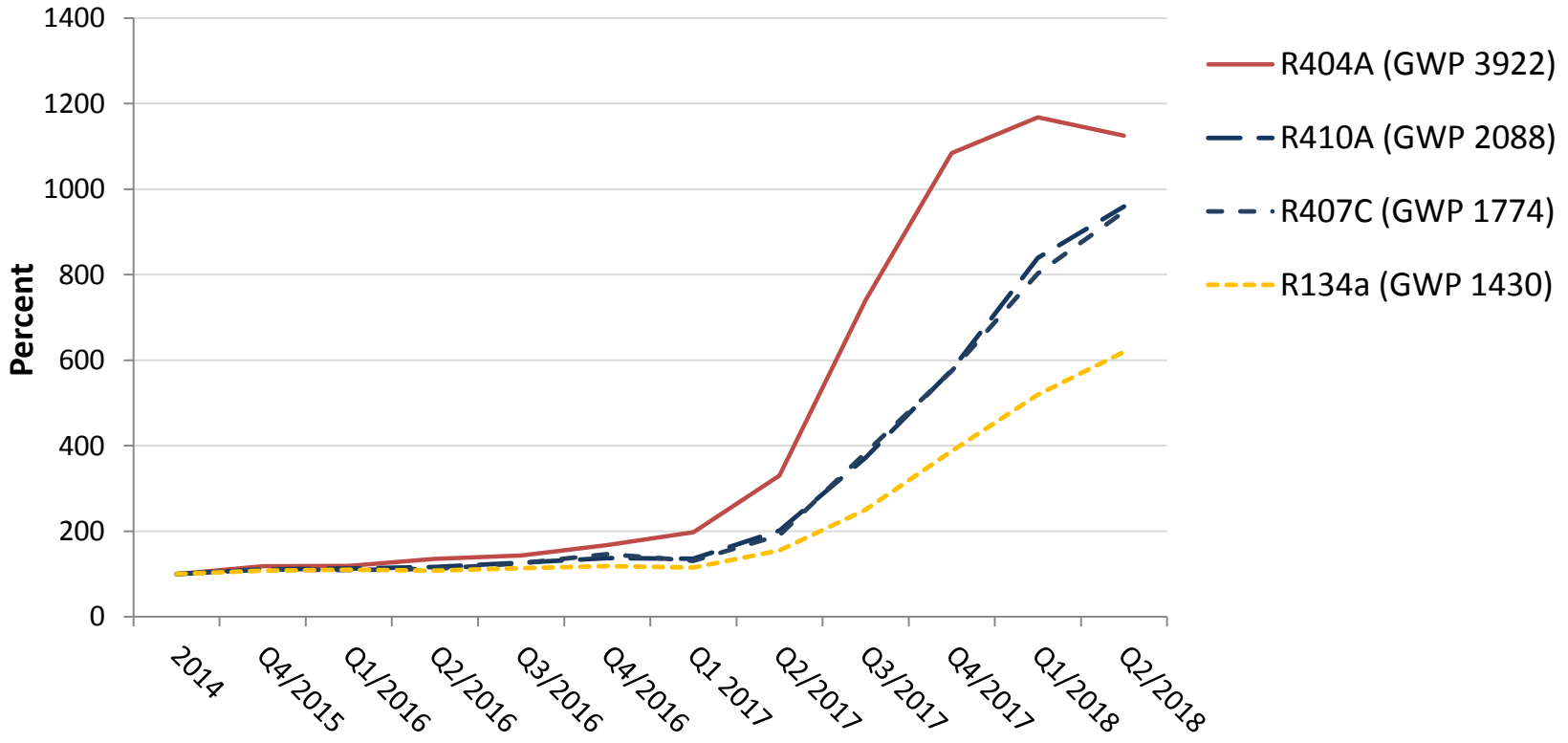
Price developments in 2018 (II)

Price development of R134a (GWP 1430) at all levels of the supply chain (price index, 2014 = 100 %)



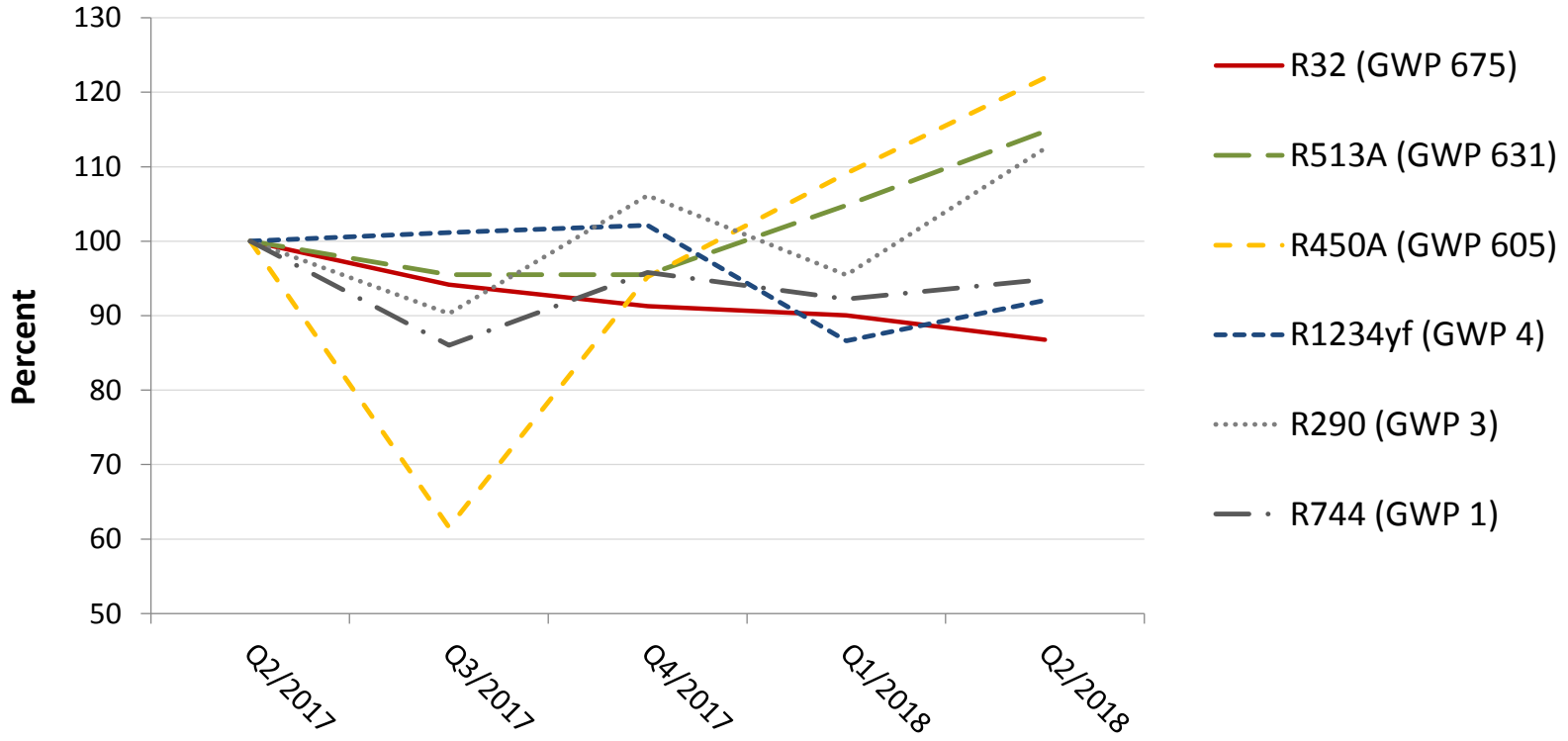
Price developments in 2018 (III)

Development of purchase prices of R404A, R410A, R407C and R134a at OEM level (price index, 2014 = 100 %)



Price developments in 2018 (IV)

Development of purchase prices of various alternative refrigerants at service company level (price index, Q2/2017 = 100 %)



Development of abatement costs

Prices expressed in €/t CO_2e in Q2/2018

		in €/t CO_2e
Gas producers (selling price)	R134a	15,91
	R410A	13,71
	R404A	6,88
OEMs (purchase price)	R134a	23,08
	R410A	23,65
	R404A	13,74
Service companies (purchase price)	R134a	23,30
	R410A	24,17
	R404A	16,99

**Study carried out for UBA in 2015*

- Prices still within the expected range (Forecast 2030* 35 €/t CO_2e, EU Roadmap 2050 50 €/t CO_2e)
- Widening gap between R404A and R134a/R410A → recent price increases of R134a/R410A much stronger than for R404A when considering the GWP
- Current price of ETS allowances ~ 20 €/t CO_2 (for comparison)
- Price range 35 to 50 €/t CO_2e for alternatives with GWP ~ 650 (at service company level)

Short summary and outlook

- According to some companies, different aspects might have affected refrigerant prices (e.g. stockpiling in previous years, increased care in handling refrigerants, illegal trade)
- 2018 divided into two parts - flattering of price increases after strong price rises at the beginning of the year
- Prices decreases in the second half of the year
- Some companies expect "wave-like" price trends for the future (i.e. price increases at the beginning, falling prices towards the end of the year)

Öko-Recherche
Büro für Umweltforschung und -beratung GmbH

Thank you very much for your attention!

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EPEE Gapometer update

Ray Gluckman

EPEE Gapometer Project

Update

November 26th 2018

Gluckman Consulting

specialists in refrigeration and climate change

Agenda

- Reminder: EPEE Gapometer Roadmap
- Results of Market Research, 2017
- Progress Towards the 2018 Phase-Down Step
- New EPEE Model: EU and UNEP Article 5 Models
- Concluding Comments

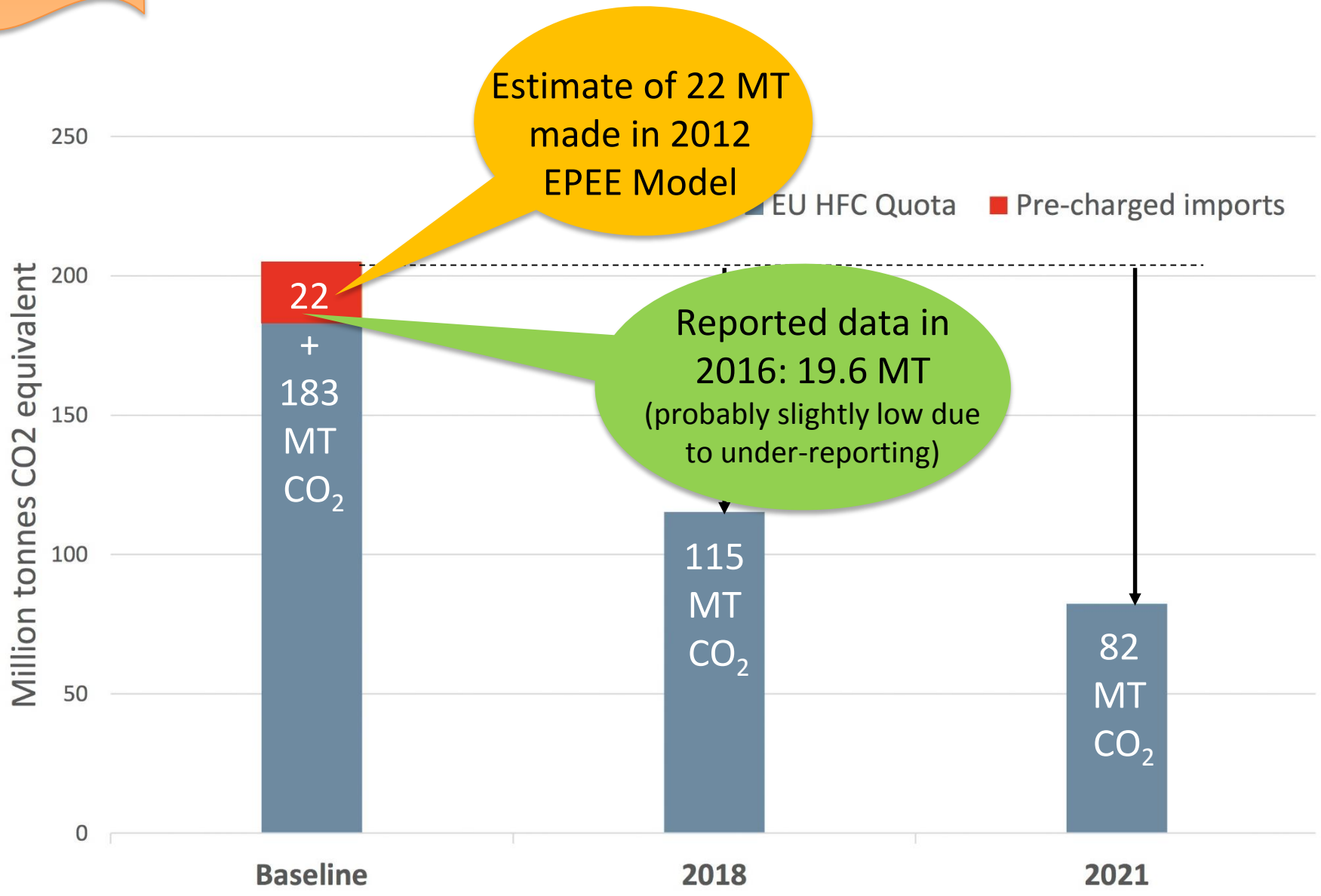
Reminder:

EPEE Gapometer Roadmap

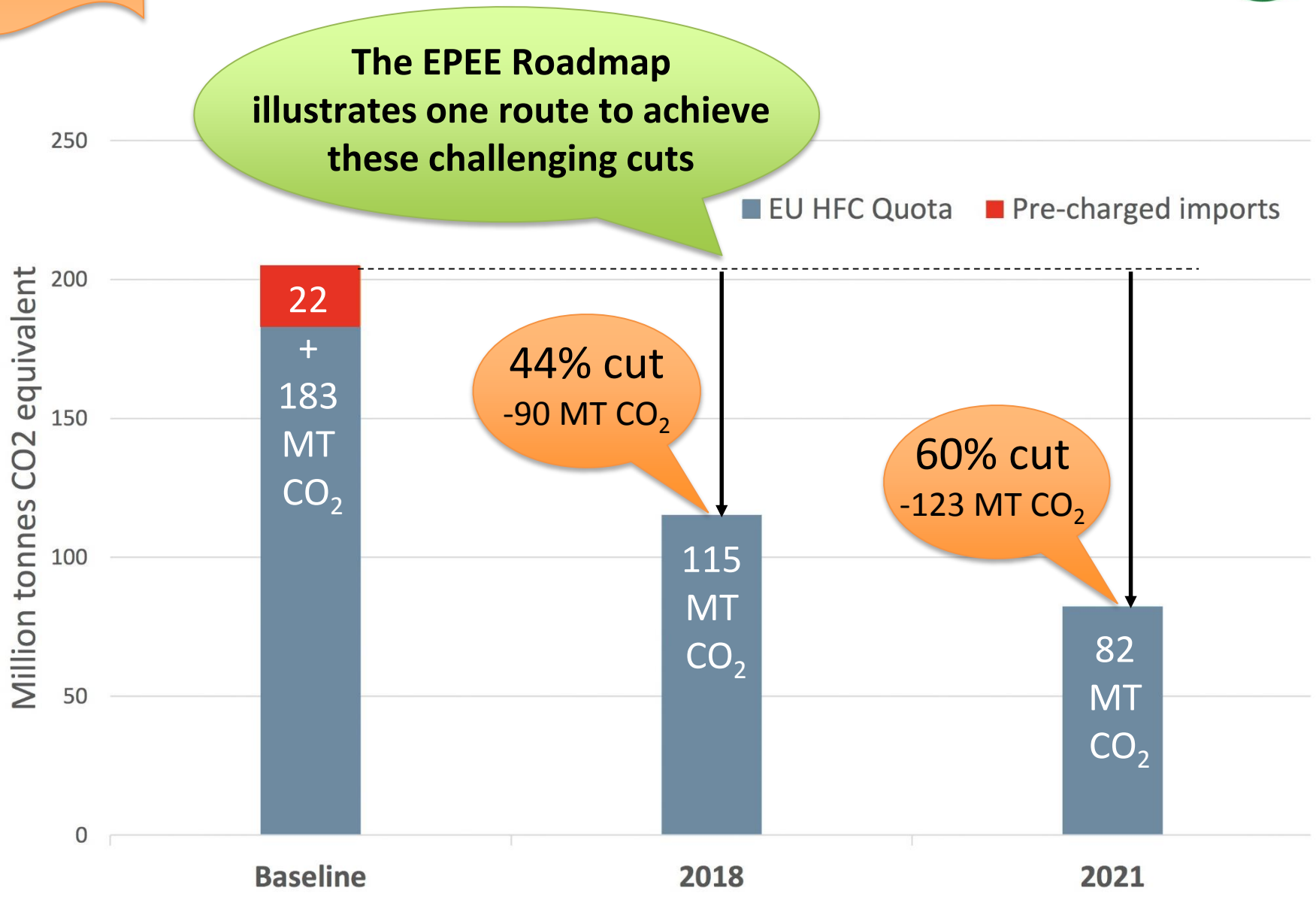
Gapometer Project Methodology

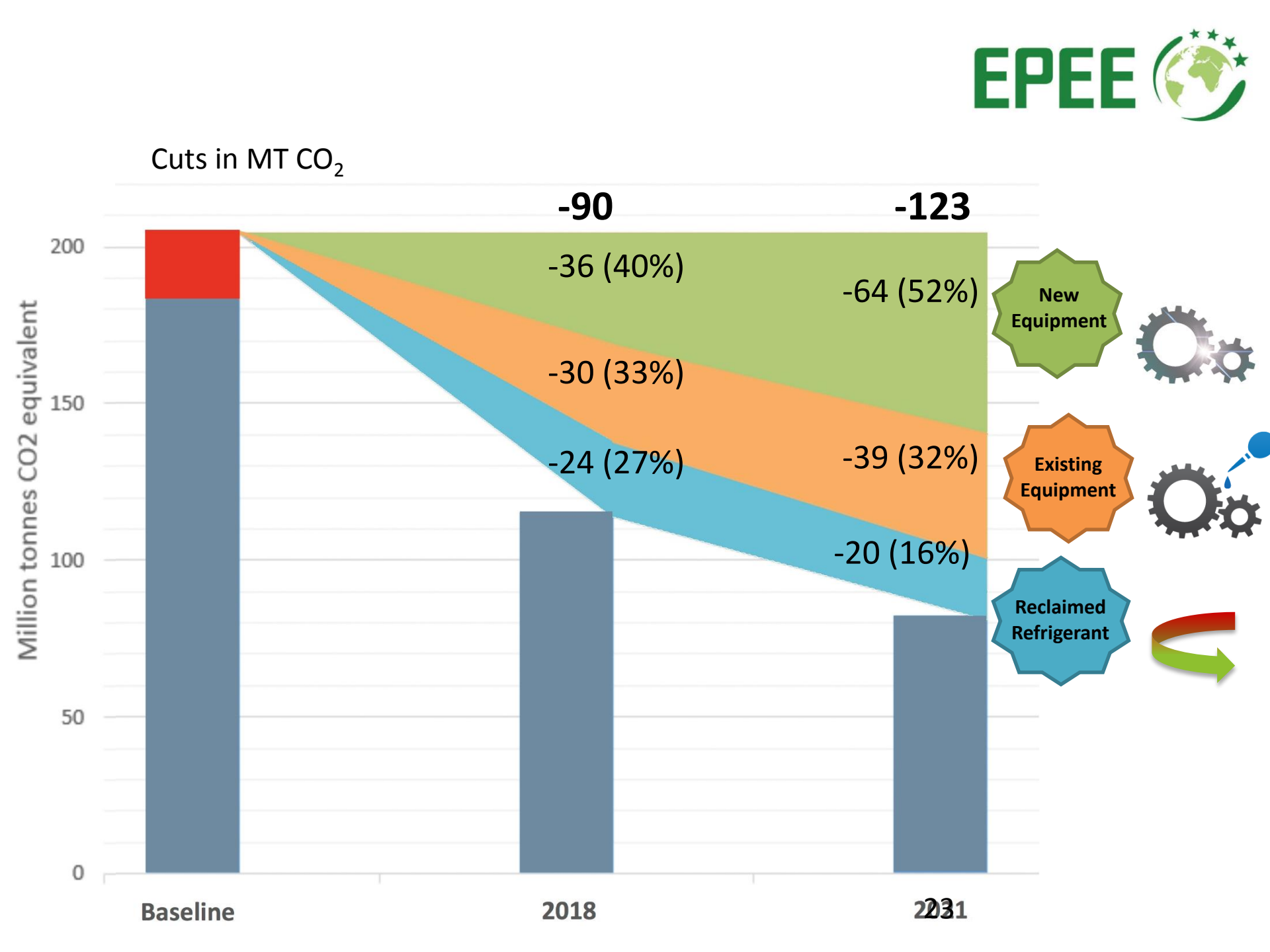
- Step 1: Develop Roadmap (2015)
  - based on previous modelling for EPEE in 2012
- Step 2: Monitor progress (2016 / 2017)
  - market research to monitor progress towards the key milestones identified in the Roadmap, i.e.:
    - rate of uptake of lower GWP alternatives for new equipment
    - actions related to supermarket systems
    - use of reclaimed and recycled HFCs

Intermediate Milestones



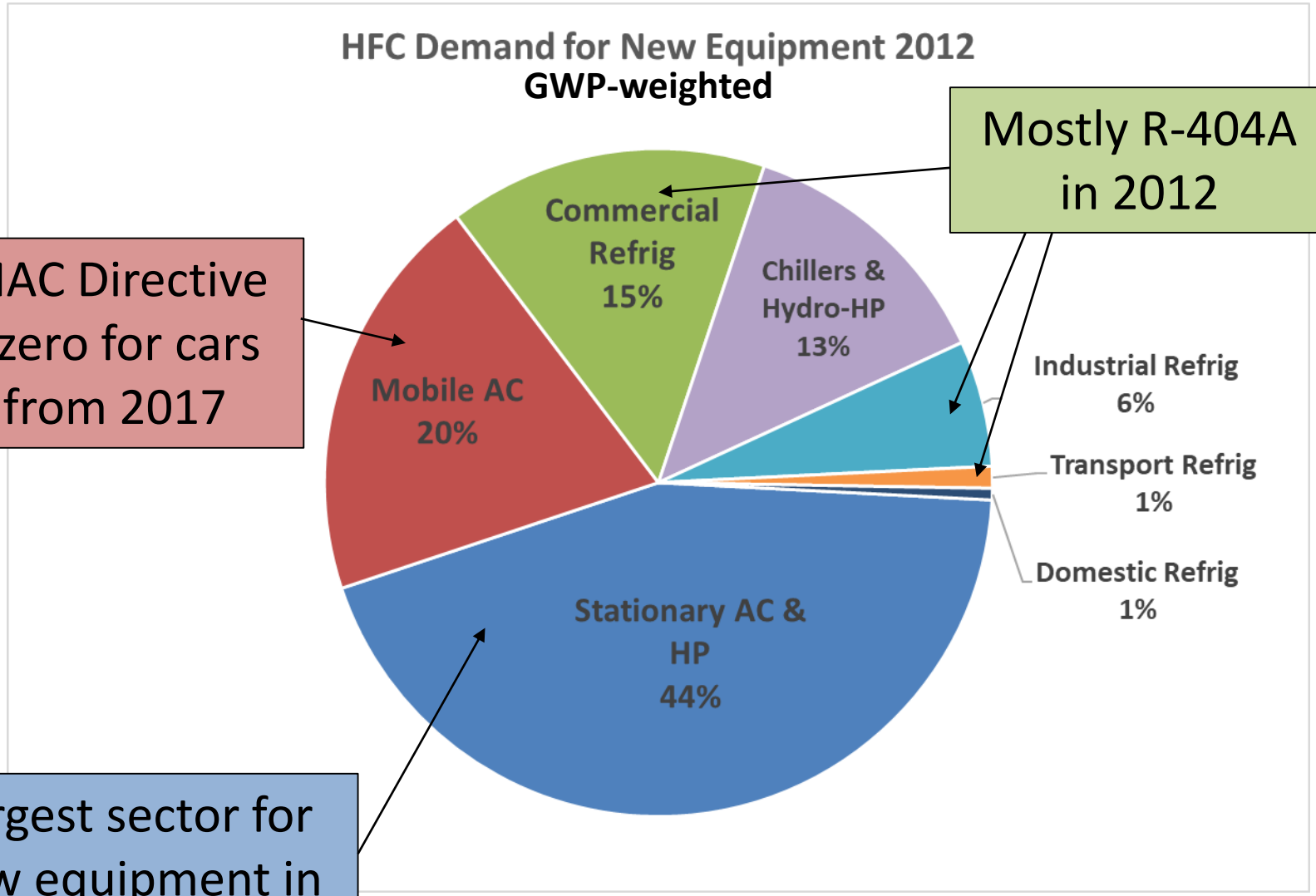
Intermediate Milestones




Cuts in MT CO_2
-90
-123
-36 (40%)
-64 (52%)
-30 (33%)
-39 (32%)
-24 (27%)
-20 (16%)
New Equipment
Existing Equipment
Reclaimed Refrigerant
Million tonnes CO2 equivalent
200
150
100
50
0
Baseline
2018
2031

Market Research Results

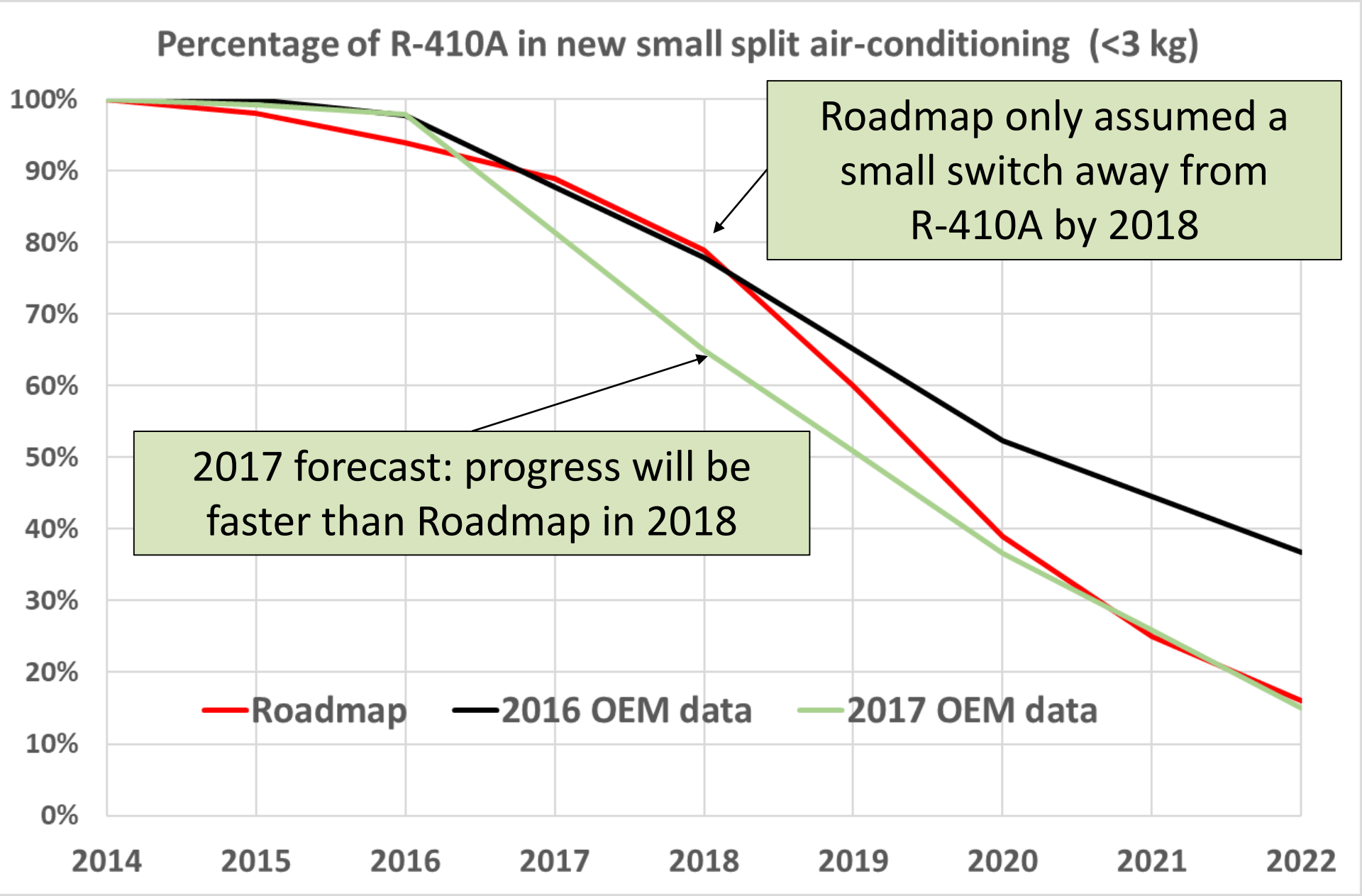
2016 and 2017

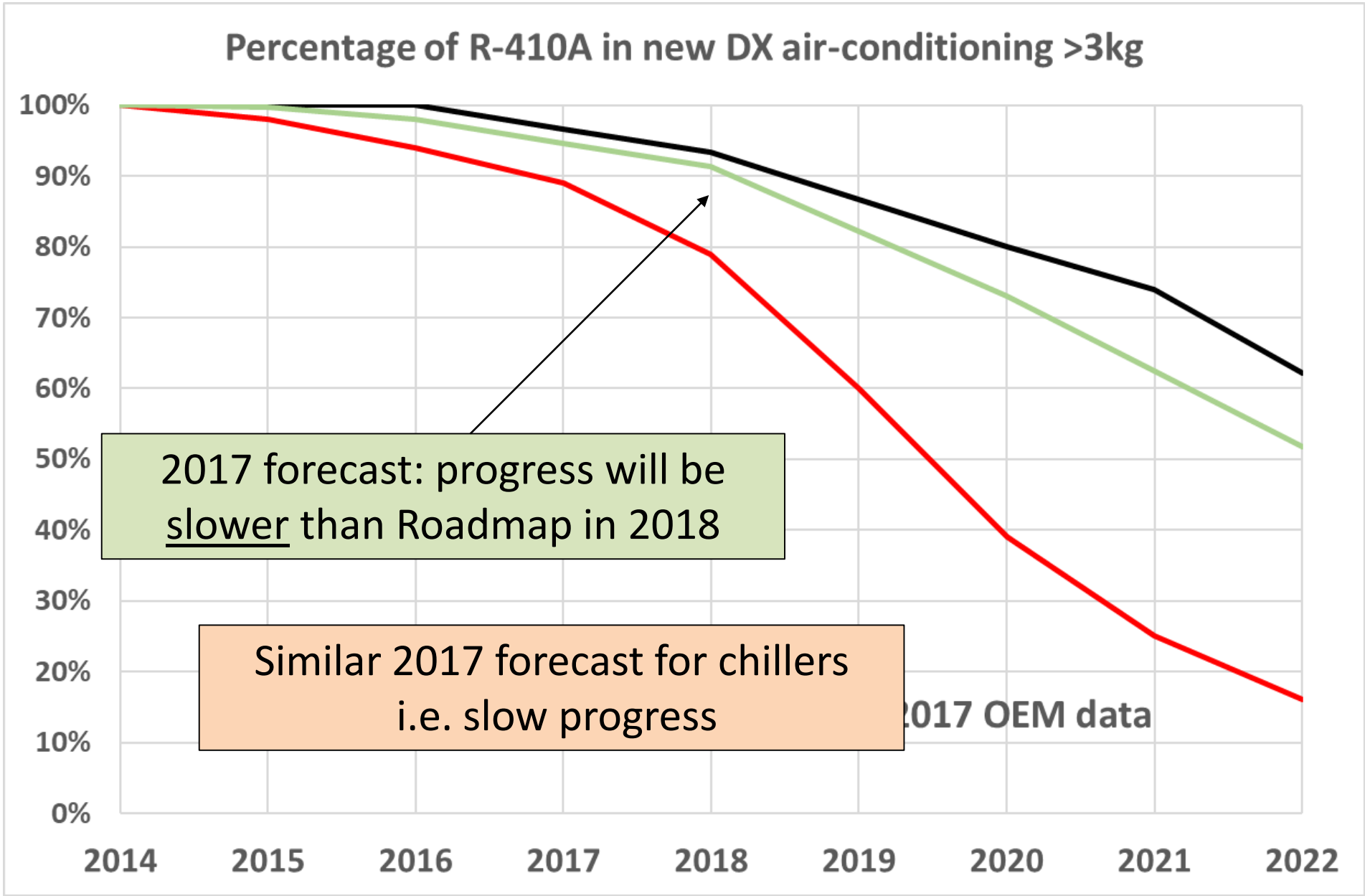


Mostly R-404A in 2012

MAC Directive - zero for cars from 2017

Largest sector for new equipment in 2012 (mostly R-410A)


Percentage of R-410A in new small split air-conditioning (<3 kg)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2014
2015
2016
2017
2018
2019
2020
2021
2022
Roadmap
2016 OEM data
2017 OEM data
Roadmap only assumed a small switch away from R-410A by 2018
2017 forecast: progress will be faster than Roadmap in 2018


Percentage of R-410A in new DX air-conditioning >3kg
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2014
2015
2016
2017
2018
2019
2020
2021
2022
2017 forecast: progress will be slower than Roadmap in 2018
Similar 2017 forecast for chillers i.e. slow progress
2017 OEM data

Key supermarket actions

- new equipment:
  - 2017 survey already showed good progress
  - virtually zero R-404A in new equipment
- leak reduction:
  - 2017 survey showed good progress
  - but many supermarkets did not send leakage data
- retrofills:
  - 2017 survey showed significant gap compared to Roadmap
  - i.e. not enough action

Actual Progress Towards the 2018 Phase-Down Step

How are we doing in 2018?

- Q4 of 2017 saw massive price rises
  - possible indicator of supply shortages in 2018, given the massive cut in supply
    - 44% below baseline (including pre-charged equipment)
- EPEE research in 2017 showed “gaps” compared to Roadmap
  - another indicator of possible shortfall of supply in 2018
- but, by Q4 of 2018, market seems to be coping
  - what has changed?

Possible reasons for unexpected drop in HFC demand

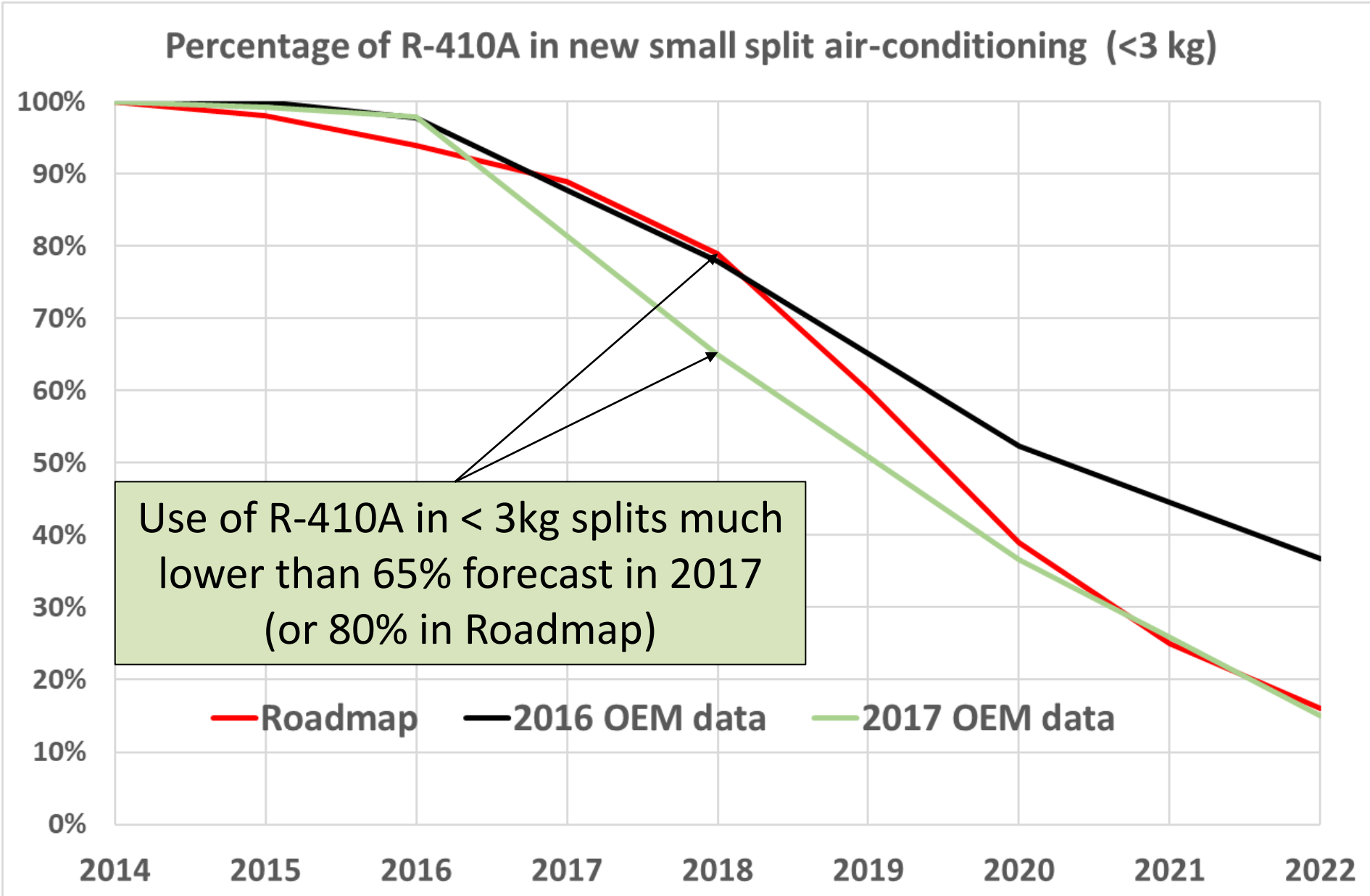
- faster uptake of low GWP refrigerants in new equipment
- leak reduction – in response to high prices
- faster rate of R-404A retrofits, especially by supermarkets
- improved rate of reclaim and recycling
- little demand for authorisations
  - due to 2015 / 2016 “pre-purchase”
- some bulk HFC stock-piling in 2017
- illegal imports of bulk HFCs

The Market is Rapidly Changing

- Chillventa 2016
  - still R-404A on display; little evidence of low GWP refrigerants
- Chillventa 2018
  - massive change; many stands highlighting low GWP technologies
- 2017 price rises
  - stimulated much activity:
    - new equipment refrigerant choices
    - retrofits
    - creates commercial viability for reclaim / recycle
- unfortunately, price rises also lead to opportunities for criminals!

Roadmap Data

- we can see areas where good progress is being made
- new equipment options
  - big changes in 2018
- retrofits
  - many supermarkets becoming “self-sufficient” in R-404A
- reclaim / recycle
  - much more activity than in 2016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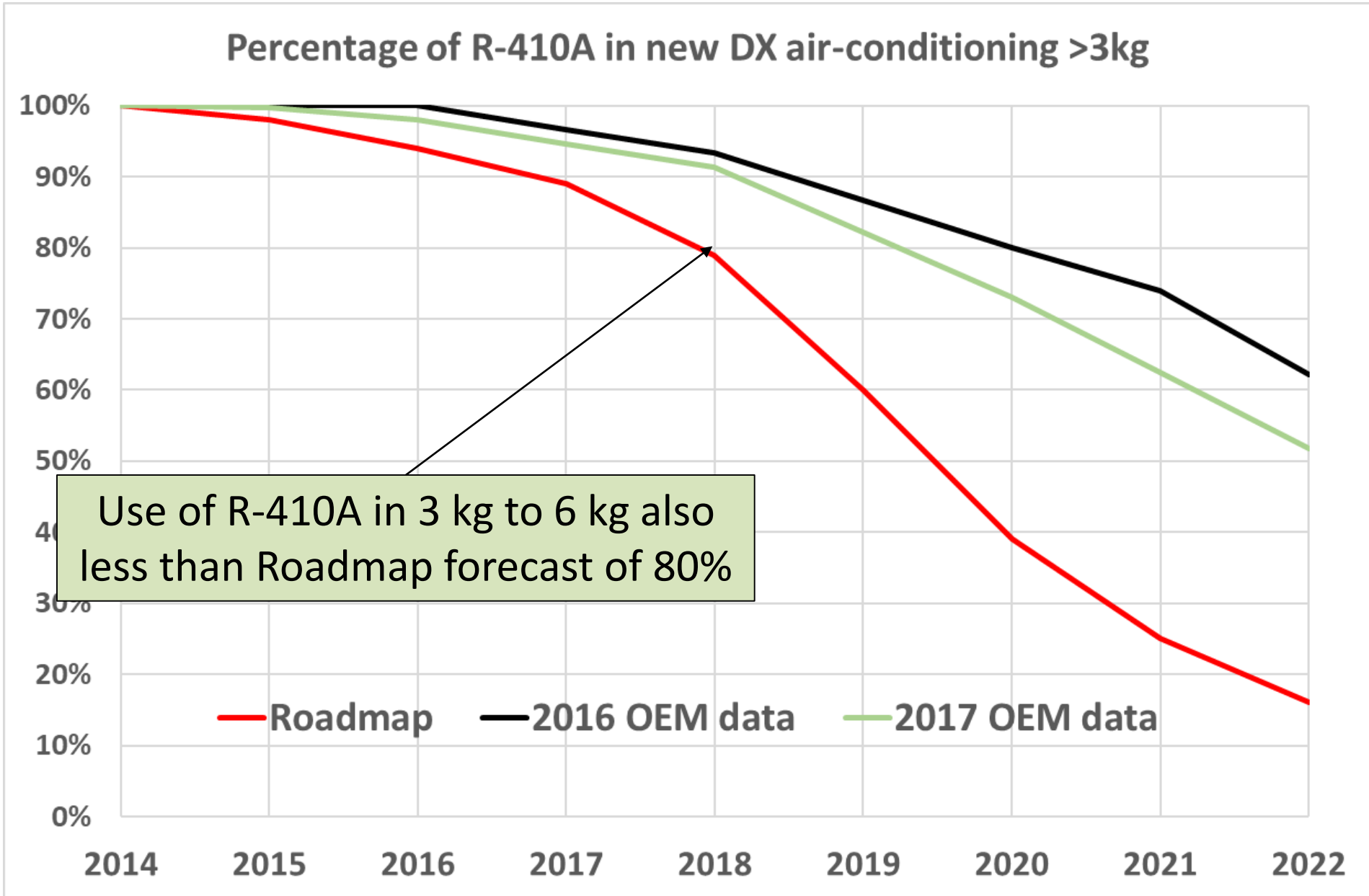
30%
20%
10%
0%
2014
2015
2016
2017
2018
2019
2020
2021
2022
Use of R-410A in < 3kg splits much lower than 65% forecast in 2017 (or 80% in Roadmap)
Roadmap
2016 OEM data
2017 OEM data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60%
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40%
30%
20%
10%
0%
2014
2015
2016
2017
2018
2019
2020
2021
2022
Use of R-410A in 3 kg to 6 kg also less than Roadmap forecast of 80%
Roadmap
2016 OEM data
2017 OEM data

Conclusions regarding new equipment in 2018

- 2016 and 2017 research shows some “gaps” between Roadmap assumptions and responder predictions
- but actual performance in 2018 is better
- small split AC < 3kg: very large proportion using HFC-32
- DX air-conditioning in 3 to 12 kg range: rapidly moving to HFC-32
- air-conditioning water chillers: lots of HFO models now available
- large commercial refrigeration: no R-404A; lots of CO_2 and HCs
  - also encouraging signs for medium sized equipment (CO_2,HCs and A2Ls)
- MACs in cars and vans: zero HFC-134a from 2017
  - but, later start than in Roadmap: creating more servicing needs

Supermarket Self-Sufficiency (1)

- supermarkets: about 75% of R-404A demand in 2012
- 2018: zero requirement for new equipment
- many have invested in leak reduction – leaks probably now average 10% to 12%
- many have begun retrofit programmes in 2017 / 2018
  - retrofits starting later than Roadmap, but still effective
- big supermarket companies becoming self-sufficient:
  - obtaining their own R-404A from retirements and retrofits
  - usually working with big wholesalers and repackers

Supermarket Self-Sufficiency (2)

Year 1:
Bank of R-404A equipment
100 tonnes

Retire 5% of plants: obtain 5 tonnes

Retrofit 10% of plants: obtain 10 tonnes

15 tonnes available for top-up (15%)

Year 2:
Bank of R-404A equipment
85 tonnes

Retire 5% of plants: obtain 4.2 tonnes

Retrofit 10% of plants: obtain 8.5 tonnes

12.7 tonnes available for top-up (15%)

Programme can be supported via:

a) retirement or retrofit of leakiest plants – improving average leak rate

b) using previously stockpiled virgin or reclaimed R-404A

Stockpiles of virgin HFCs

- use of stockpiled HFCs ease the pressure on quotas in 2018
- two periods when stockpiles created
  - in 2014, before quota system
  - in 2017, during “panic buying” as prices rose sharply
- 2014: good evidence from EEA annual report
  - around 30,000 tonnes of HFCs stockpiled
  - some used in 2015 – 16 (keeping HFC prices low)
  - some kept in reserve for big cut in 2018
- 2017: high demand fuelled price rises – some was stockpiled
  - harder to quantify, but estimated to have been significant

Routes to Refrigerant Re-use

- recycled refrigerant
  - *reuse of a recovered gas following a basic cleaning process*
  - can be done with limited facilities e.g. recovery machines used by RAC contractors
  - but, no guarantee of refrigerant quality when re-used
- reclaimed refrigerant
  - *reprocessing of a recovered gas to match the performance of a virgin substance, taking into account its intended use*
  - must include chemical analysis to ensure refrigerant quality
- 2 sub-options for reclaim
  - recovered gas **unmixed**, (e.g. only R-404A)
    - reprocessing relatively simple
  - recovered gas **mixed**: (e.g. R-404A and R-410A)
    - requires sophisticated distillation facilities to separate components and re-combine as required

Sources of Refrigerant for Re-use

- from equipment reaching end-of-life
  - mandatory requirement in F-Gas Regulation to recover gas
  - retiring equipment is a significant source of recovered gas
- from equipment being retrofitted
  - key aspect of R-404A retrofits is to ensure that old gas recovery is maximised and the gas is re-used
  - easy to avoid gas mixing in retrofit programmes
- what happened to old gas historically?
  - some was illegally vented
  - some was accidently vented during recovery
  - much was sent for incineration
  - some was re-used

Conclusions regarding re-use of refrigerant

- Roadmap shows requirement for significant use of reclaimed / recycled refrigerant in 2018 (24 MT CO2)
- rapid growth in available reclaim infrastructure
- high price of R-404A provides strong incentive for recovery / re-use
- difficult to assess quantities being reclaimed
  - capacity for reclaim >5,000 tonnes per year
  - supermarkets (major user of R-4040A) have managed programmes
- level of recycling very hard to quantify
  - 200,000 F-Gas qualified technicians in EU
  - if each engineer recycled just 5kg per year: 1,000 tonnes!
  - high gas prices incentivise recycling
  - but, reclaim should be encouraged as the preferred route

Reported Authorisations

- authorisations issued (from Commission report):
  - 2015: 17.2 MT CO2
  - 2016: 19.9 MT CO2
  - 2017: data not yet published
- none used for pre-charged equipment (PCE) imports prior to 2017
- annual requirement was ~ 20 MT CO2
  - mostly R-410A in small split air-conditioning
  - but this will fall significantly as R-410A replaced by HFC-32
- sufficient authorisations sold in 2015/2016 to supply most PCE requirements in both 2017 and 2018
  - “eases” pressure on phase-down in 2018
  - by around 20 MT CO2
  - 22% of the required cut of 90 MT CO2

Progress in 2018

Illegal imports

no data easily available!

Modelling of HFC Use and Emissions

for EU and for Article 5 Countries

Current Modelling Work

- UNEP Phase 1: Kuwait and Bahrain
  - models completed
- UNEP Phase 2: 8 countries, to be completed Q2 2019
  - Africa: Senegal, Gabon, Mali
  - Central America: Dominican Republic, Guatemala, Honduras
  - Bosnia
  - Sri Lanka
- new EU model for EPEE
  - to be completed Q1 2019

New EPEE Model of EU HFC Consumption

- easy to use and robust interface
  - readily usable by EPEE members
  - multi-lingual capability
- wide variety of output formats
  - to explore the data of greatest interest
- easy to modify input assumptions
  - to create new forecasts of future HFC demand
- can compare forecasts to:
  - current EU phase-down schedule
  - Kigali phase-down schedule
  - can easily be updated to assess any new proposals from Commission

Following slides are for an anonymous “Country X”

Equivalent data for EU model will be available in a few weeks time

EPEE UN environment

Chart View

CountryX

Scenario Selector

Policy Scenarios

- No Action
- Unconstrained BAU
- Compliant BAU
- Faster Action
- Leap-Frog

Growth Scenarios

Low | Mid | High

Viewing Options

Time Series | Single Year

Custom Views

Output Options

Scenario

Output

Main Sector | Sub-Sector

Gas Type | Gas

Units: ktCO2e

Other Options

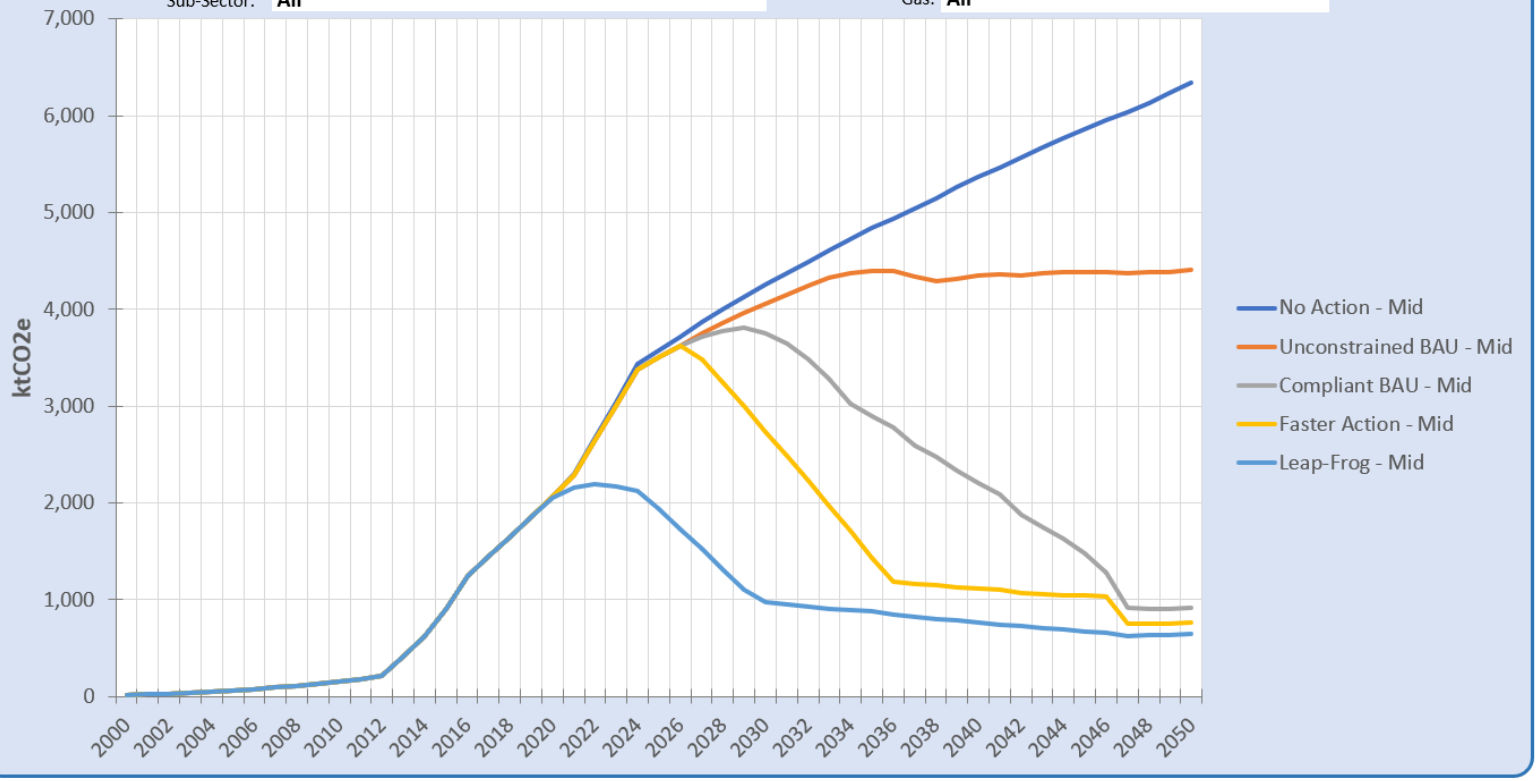
Output Selector

Market Selector

Gas Selector

Table View

Output Type: Gas consumption (ktCO2e)
Output Sub-Type: (Multiple Items)
Main Sector: All
Sub-Sector: All
Scenario: See legend
Economic Growth: See legend
Gas Type: HFC
Gas: All



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EPEE UN environment

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CountryX

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Low | Mid | High

Output Selector

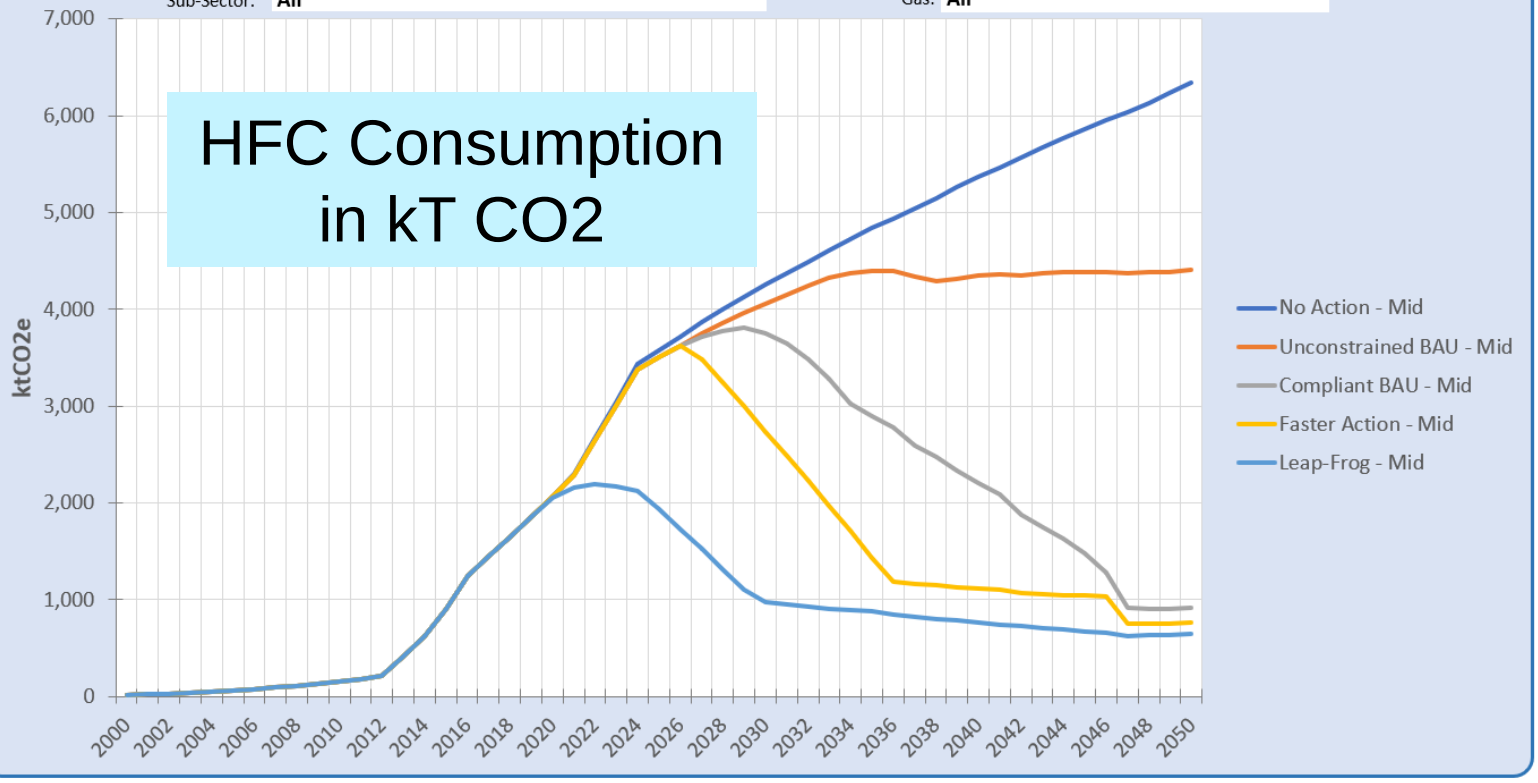
Market Selector

Gas Selector

Output Type: Gas consumption (ktCO2e)
Output Sub-Type: (Multiple Items)
Main Sector: All
Sub-Sector: All
Scenario: See legend
Economic Growth: See legend
Gas Type: HFC
Gas: All

Table View

HFC Consumption in kT CO2



Viewing Options

Time Series | Single Year

Custom Views

Output Options

Scenario

Output

Main Sector | Sub-Sector

Gas Type | Gas

Units: ktCO2e

Other Options

2000

2020

2040

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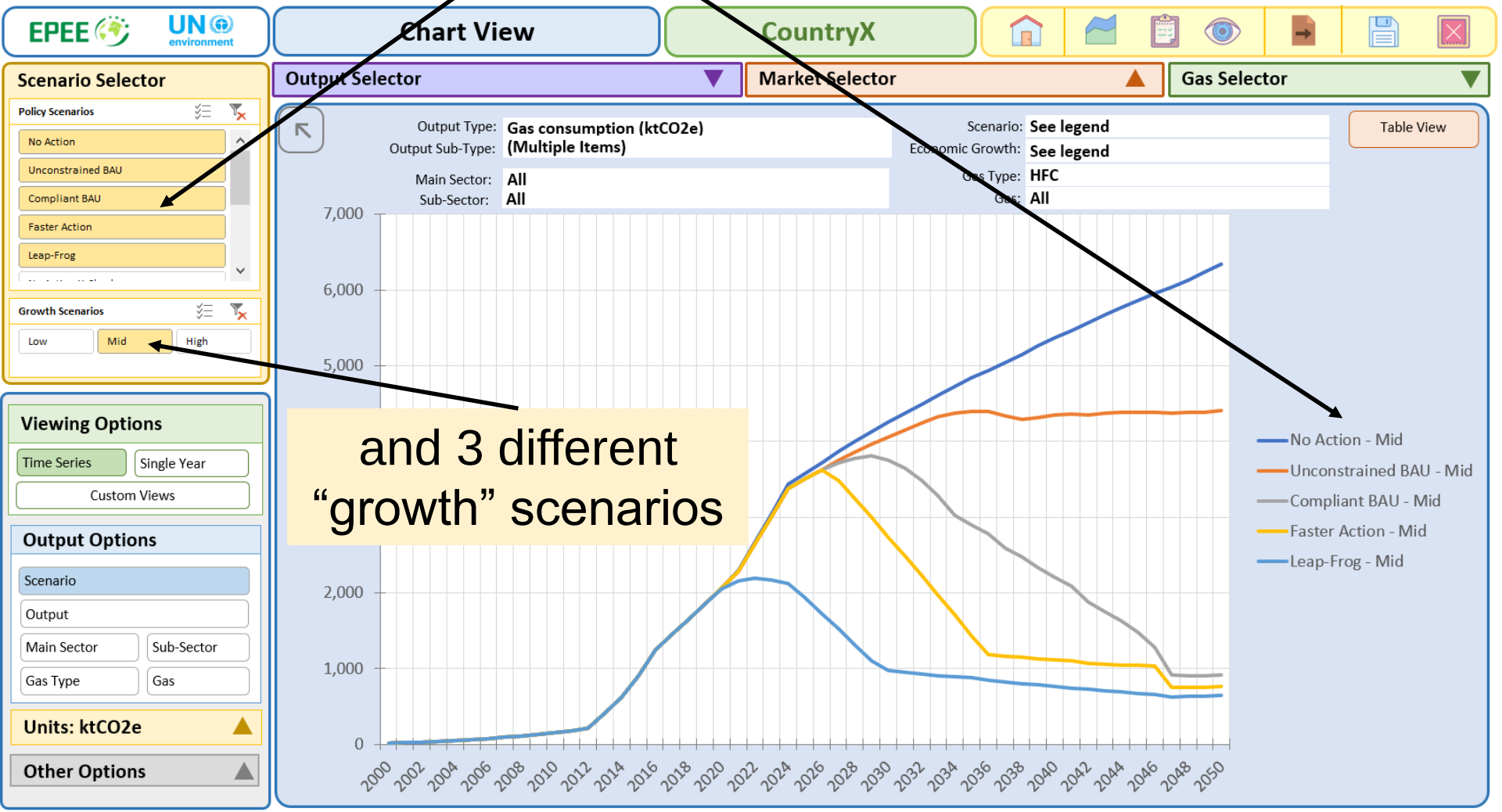
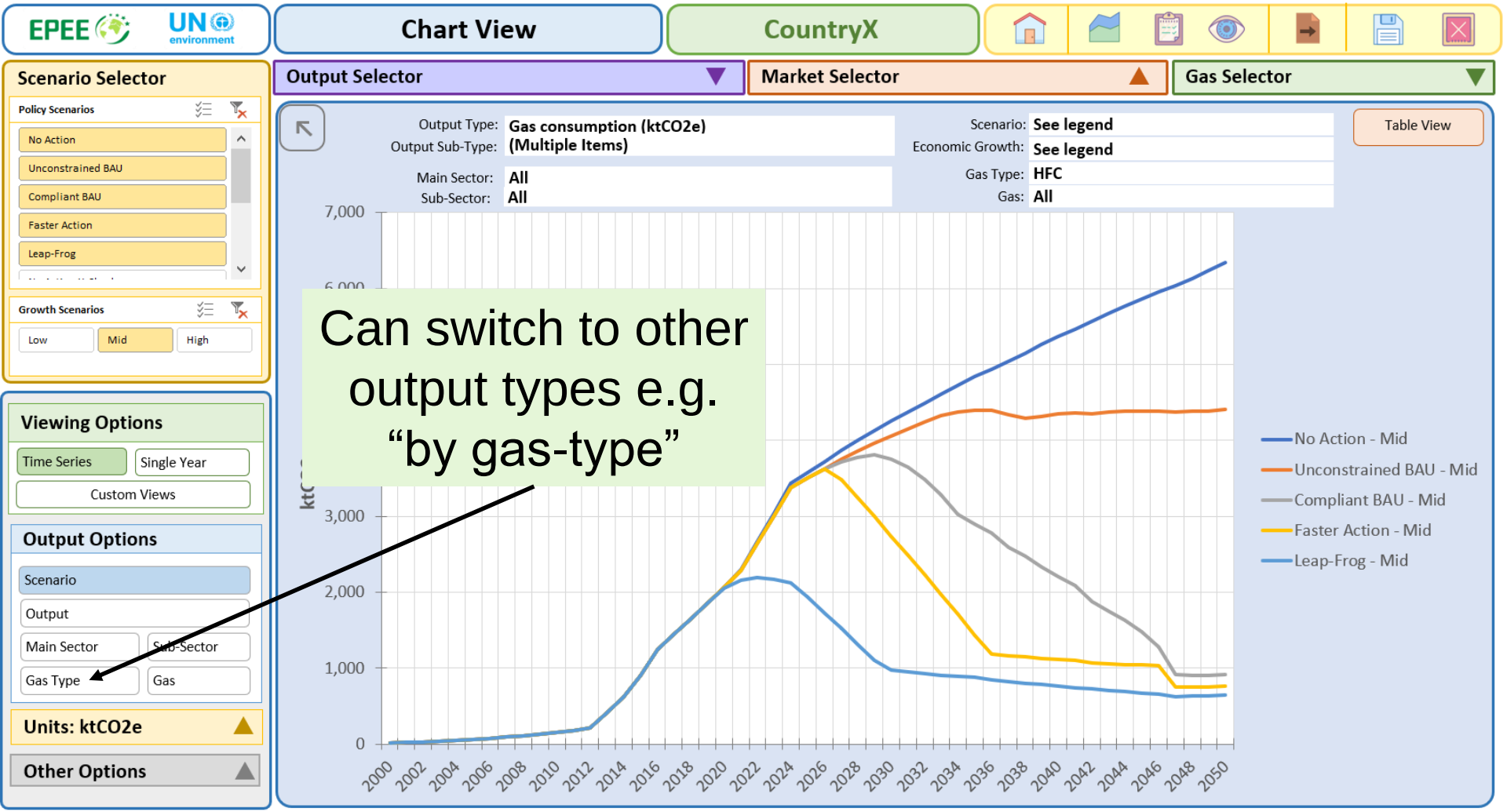
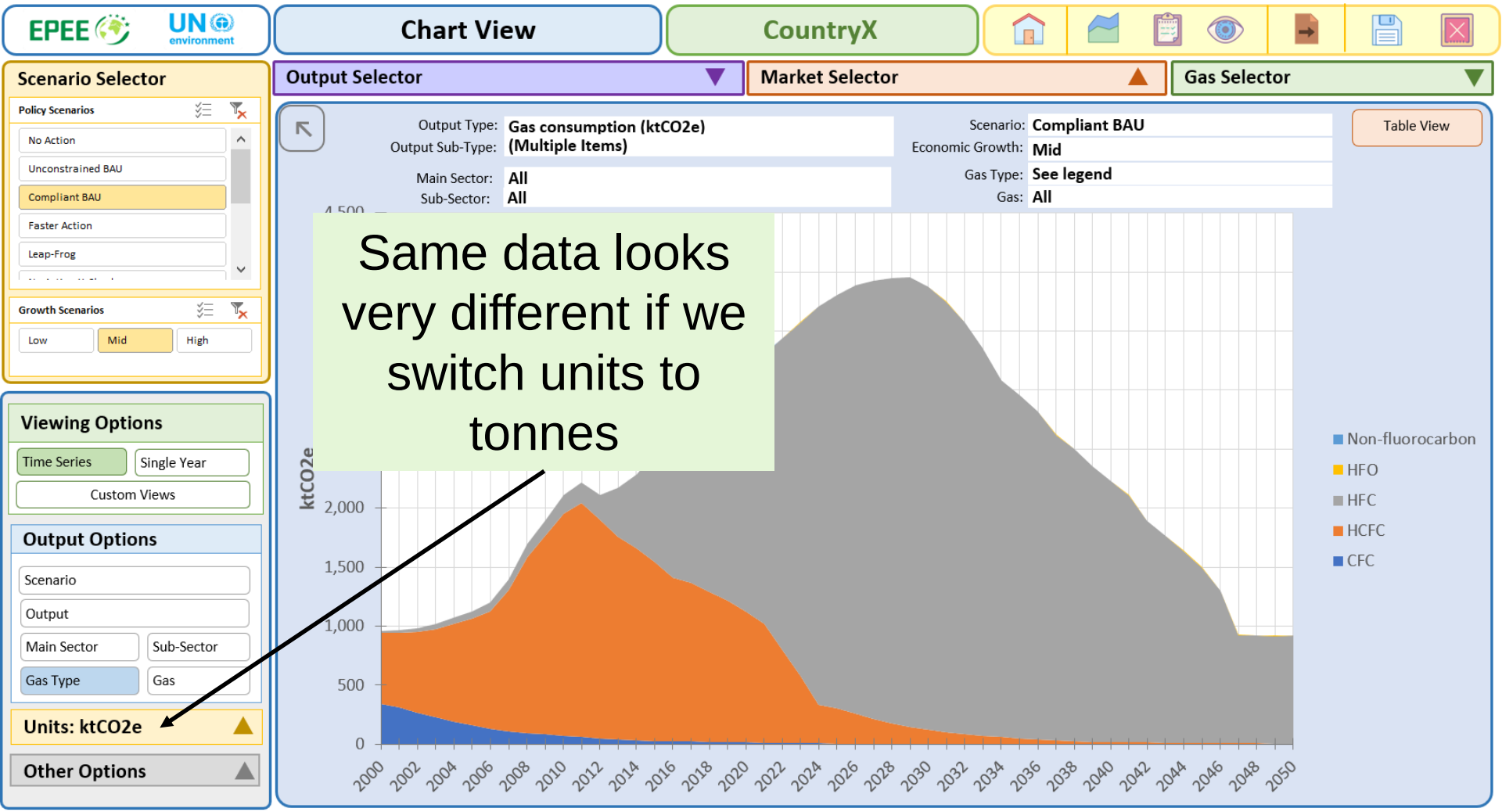
For 5 different "policy" scenarios



and 3 different "growth" scenarios


EPEE
UN environment
Chart View
CountryX
Scenario Selector
Policy Scenarios
No Action
Unconstrained BAU
Compliant BAU
Faster Action
Leap-Frog
Growth Scenarios
Low
Mid
High
Output Selector
Market Selector
Gas Selector
Output Type: Gas consumption (ktCO2e)
Output Sub-Type: (Multiple Items)
Main Sector: All
Sub-Sector: All
Scenario: See legend
Economic Growth: See legend
Gas Type: HFC
Gas: All
Table View
Can switch to other output types e.g. "by gas-type"
Viewing Options
Time Series
Single Year
Custom Views
Output Options
Scenario
Output
Main Sector
Sub-Sector
Gas Type
Gas
Units: ktCO2e
Other Options
7,000
3,000
2,000
1,000
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
No Action - Mid
Unconstrained BAU - Mid
Compliant BAU - Mid
Faster Action - Mid
Leap-Frog - Mid


EPEE
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No Action
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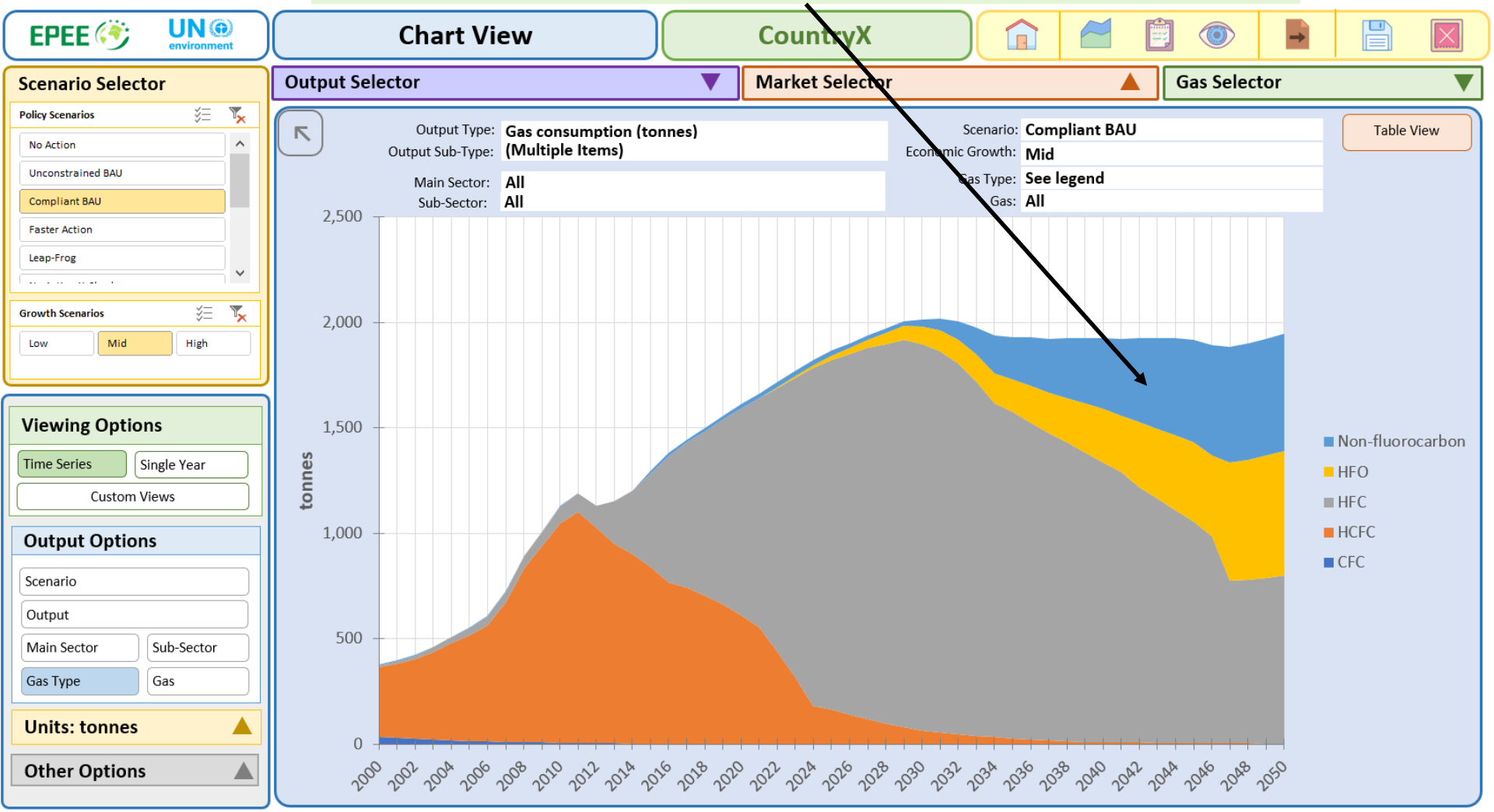
Growth Scenarios
Low
Mid
High
Output Selector
Market Selector
Gas Selector
Output Type: Gas consumption (ktCO2e)
Output Sub-Type: (Multiple Items)
Main Sector: All
Sub-Sector: All
Scenario: Compliant BAU
Economic Growth: Mid
Gas Type: See legend
Gas: All
Table View
Same data looks very different if we switch units to tonnes
ktCO2e
2,000
1,500
1,000
500
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
Non-fluorocarbon
HFO
HFC
HCFC
CFC
Viewing Options
Time Series
Single Year
Custom Views
Output Options
Scenario
Output
Main Sector
Sub-Sector
Gas Type
Gas
Units: ktCO2e
Other Options

Now we can see the use of ultra-low GWP HFOs and non-fluorocarbons



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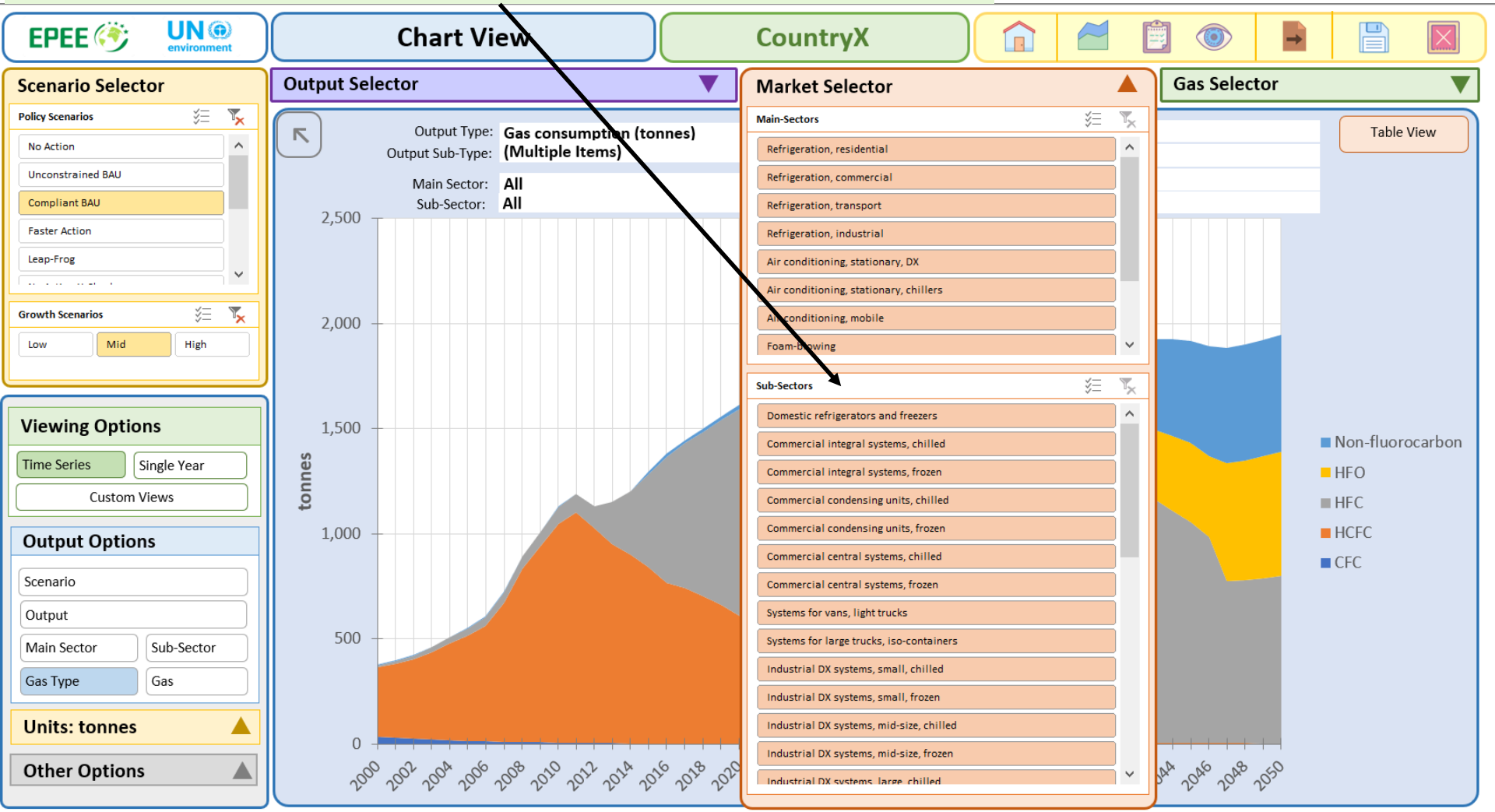
Can filter to individual market sectors or sub-sectors e.g. car air-conditioning



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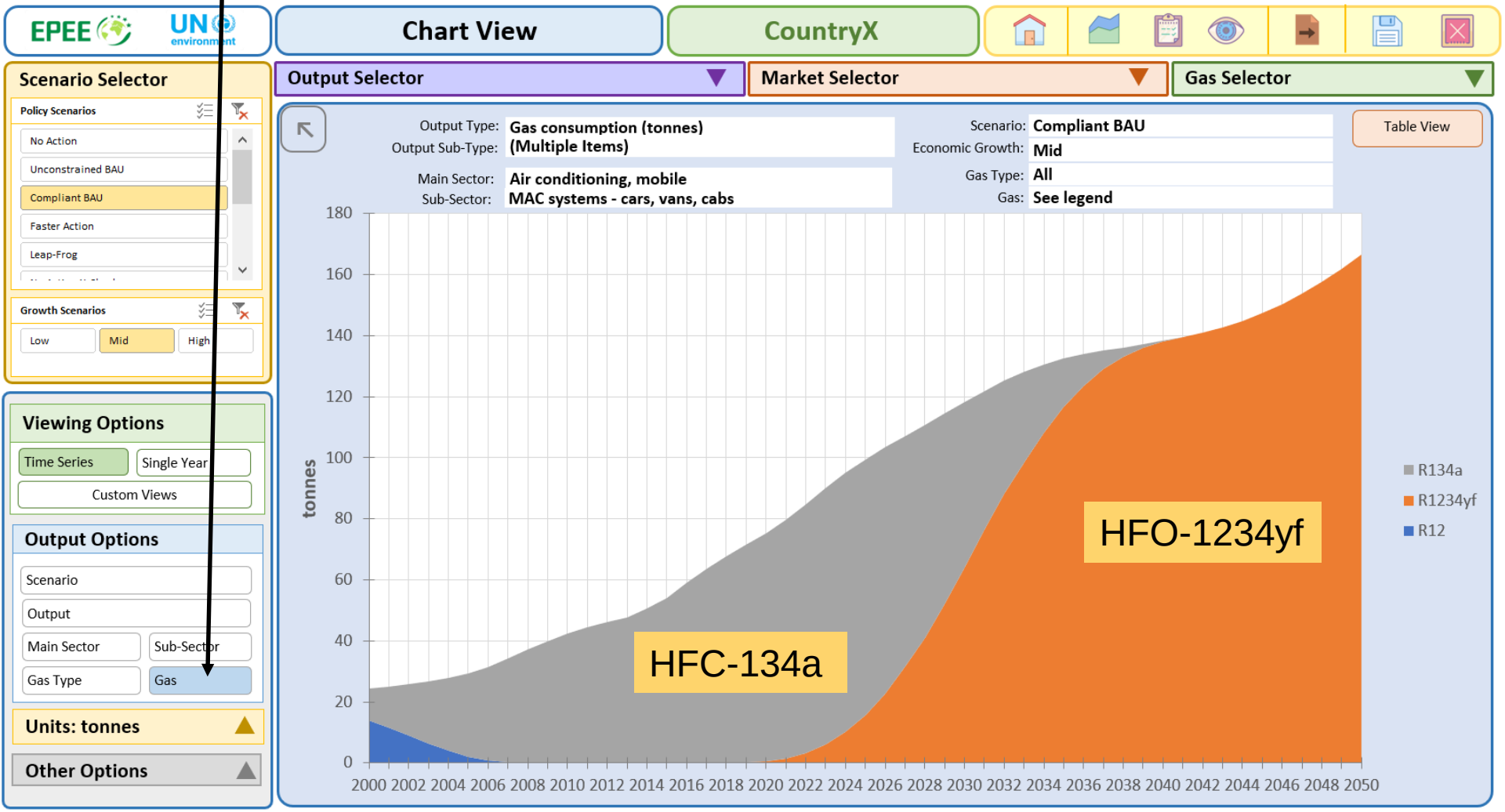
Displayed by individual gas



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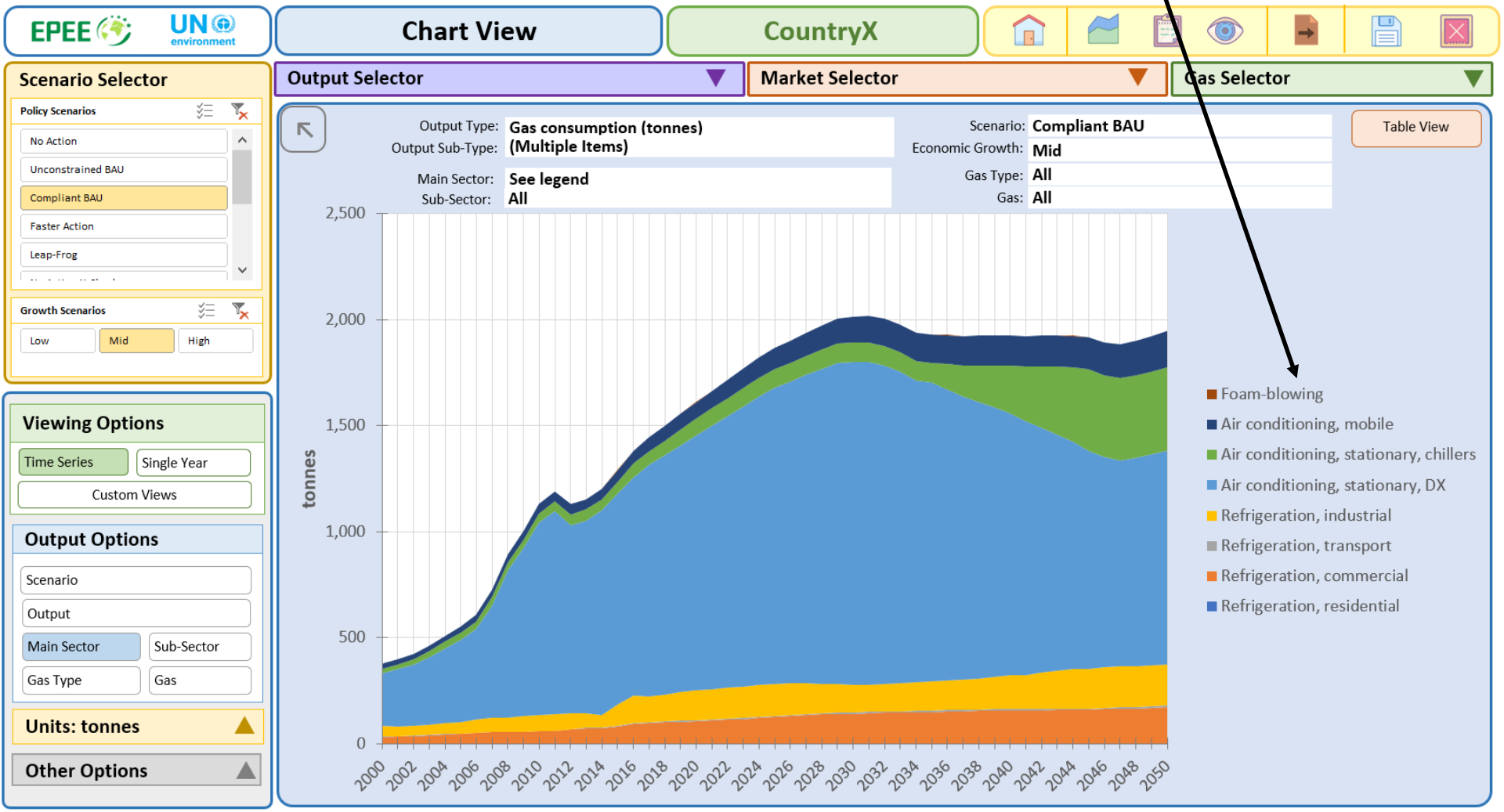
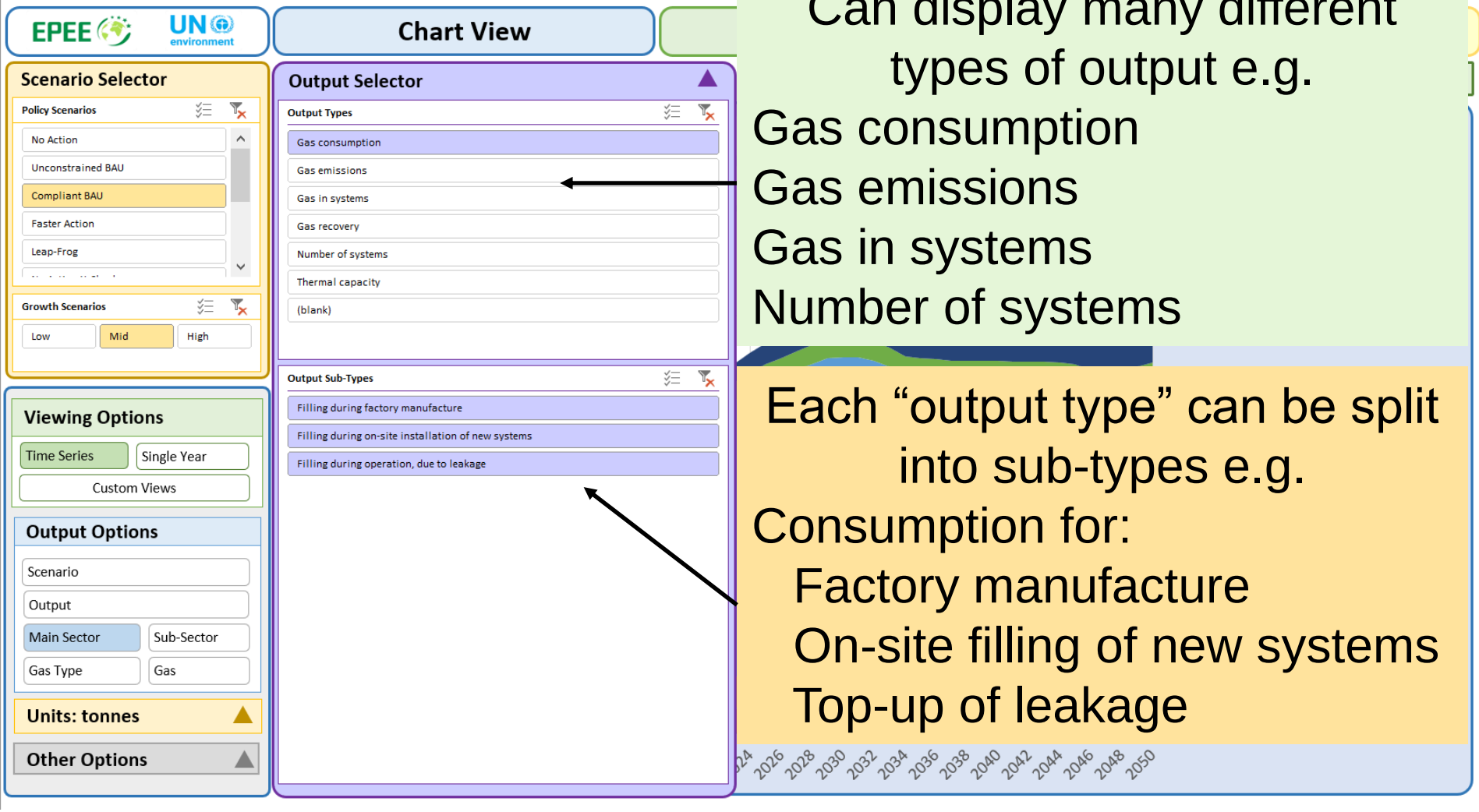
Consumption data split by main market sector





Can display many different types of output e.g.

Gas consumption

Gas emissions

Gas in systems

Number of systems

Each “output type” can be split into sub-types e.g.

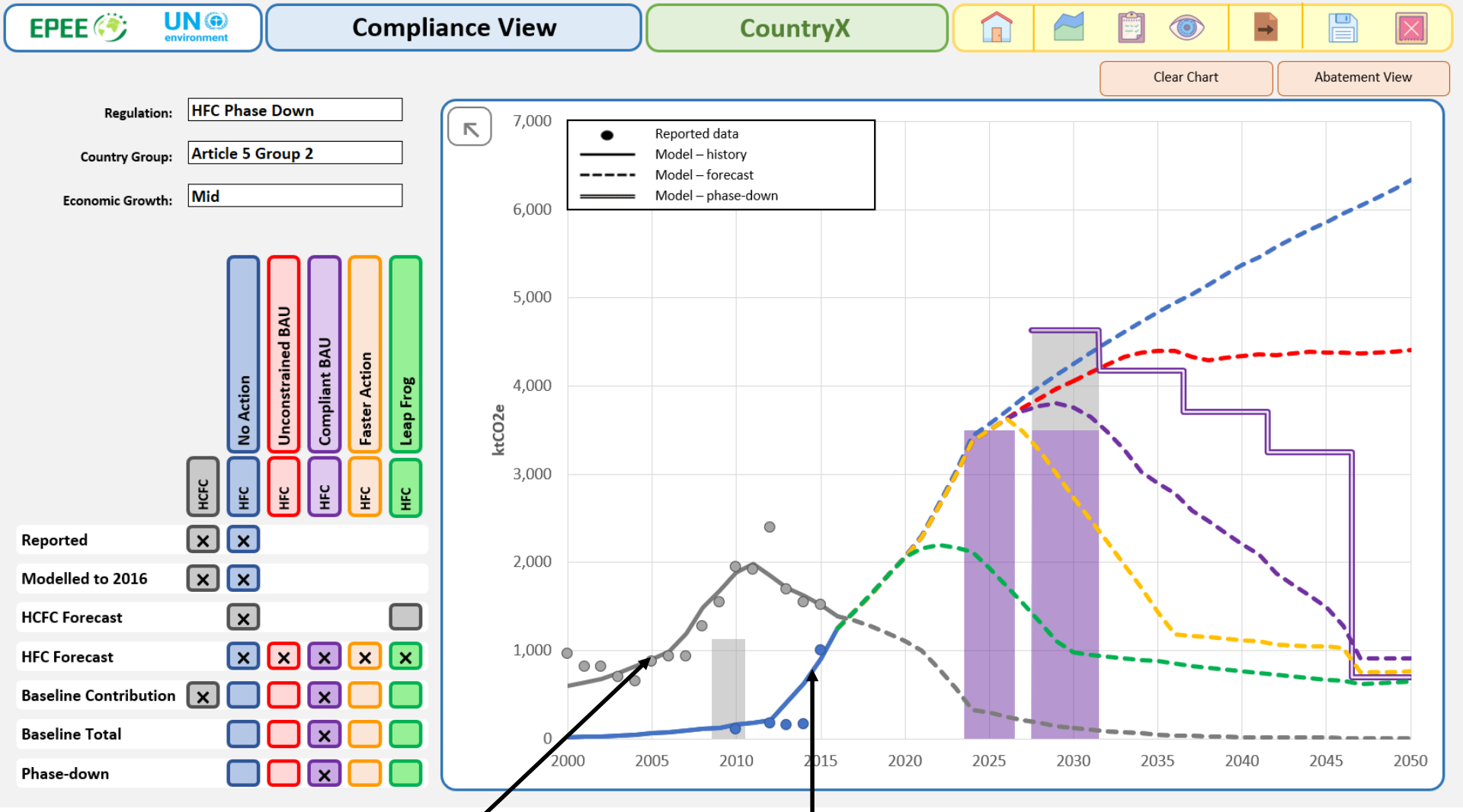
Consumption for:

- Factory manufacture
- On-site filling of new systems
- Top-up of leakage

Previous slides: a quick “taster” of new model

- many other views and outputs
  - individual years can be displayed with pie charts
  - all data can be viewed as tables
  - all tables and graphs can easily be exported e.g. to PowerPoint
- “Compliance View” shows progress to Regulations
  - historic consumption
  - baseline and phase-down steps
  - effectiveness of different future scenarios
- “Input Viewer” displays all input assumptions used in model

Compliance View for an Article 5 Group 2 Country



HCFCs

HFCs

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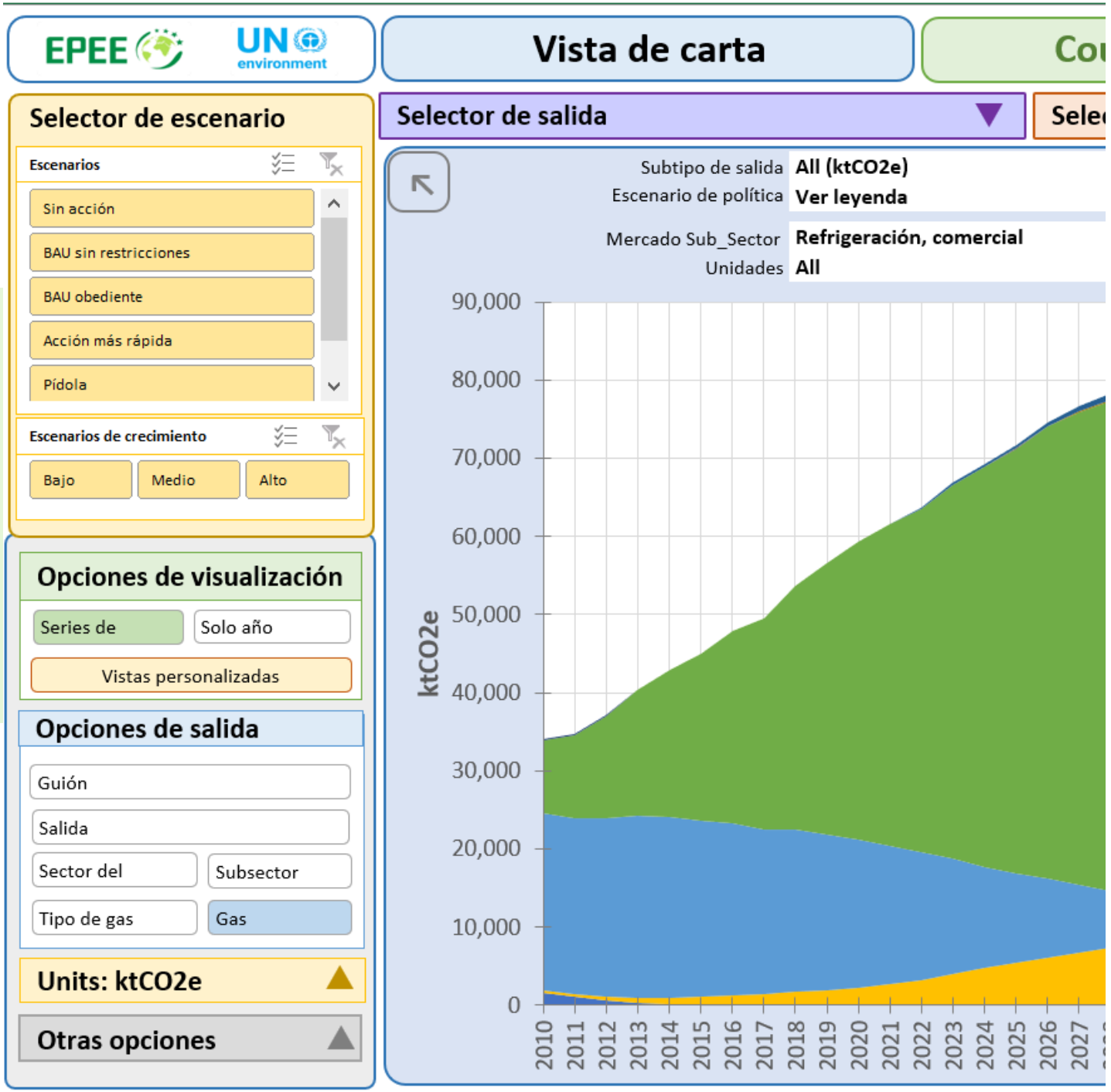
All screens can be easily translated into another language

e.g. Spanish



Concluding Comments

Achieving 2018 Phase-Down

- challenging cut in 2018 seems to have been achieved
- very high prices in Q3 / Q4 2017 were key signal to market
- activity in various areas has increased rapidly e.g.:
  - faster uptake of HFC-32 in new split air-conditioning
  - retrofills and refrigerant re-use in supermarkets
  - more refrigerant reclaim and recycling
- stockpiles from 2014 and 2017 are helping in 2018
- authorisations sold in 2015 – 2017 also helping
- however, significant concern about illegal imports

Contact Details

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Information Sheets about EU F-Gas Regulation:
www.gluckmanconsulting.com/f-gas-information-sheets/

Fact Sheets about low GWP alternatives to HFCs:
www.gluckmanconsulting.com/low-gwp-alternatives-to-hfcs/

Fact Sheets about Kigali Amendment:
www.gluckmanconsulting.com/kigali-amendment/

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Communications campaign on F-Gases

Andrea Voigt, EPEE

EPEE Gapometer: Identify and act on priorities

1. Information campaign to stop installing R-404A / R-507A

Stay in business: Stop installing R-404A/R-507A! Brochure & Video

Translations available in:
German, French, Spanish, Italian,
Polish, Romanian, Slovakian, Czech, Dutch, Greek, Norwegian, Portuguese, Croat, Danish, Estonian, Finnish, Hungarian, Maltese, Latvian, Slovene, Bulgarian, Lithuanian.

Remaining EU languages to come

EPEE Gapometer: Identify and act on priorities

2. Information campaign on flammable refrigerants

Grow your business: Get ready for flammable refrigerants!

Translations ongoing

New EPEE communication material (1)

EPEE FAQ on HFOs and HCFOs

New EPEE communication material (2)

EPEE 7 Lessons Learned from the EU F-Gas Regulation

Launched at Montreal Protocol Meeting in Quito on 7th Nov

Q&A/Debate

Update from DG CLIMA, European Commission, on illegal trade of refrigerants

Arno Kaschl

An action plan against illegal trade of refrigerants

Olivier Janin, AREA; Sébastien Gallet, EFCTC;
Andrea Voigt, EPEE

In a nutshell

- Press release to the trade press
- Letter to national associations
- Reaching out to EIA (survey)
- AREA survey
- Reaching out to Member States
- Cooperation with DG CLIMA
- Engagement with other relevant DGs

29 OCT 2018

End this illegal F-gas trade

BELGIUM: Europe's leading air conditioning and refrigeration associations have called on the authorities to properly enforce the F-gas regulations and stop the illegal trade...

Read More ›

14 NOV 2018

Industry call to end illegal F-gas sales

BELGIUM: European refrigeration and air conditioning contractors have called for action after a survey reveals that nearly 90% of the industry is aware of...

Read More ›

Q&A/Debate