



European Regulatory Framework

Edgar Timm

Senior Technical Expert, HEAT GmbH

CAPACITY BUILDING ON INNOVATIVE APPLICATIONS OF ENERGY-
EFFICIENT CLIMATE-FRIENDLY COOLING AND HEATING TECHNOLOGIES
IN UKRAINE

Workshop in Kyiv, Dnipro, Odessa

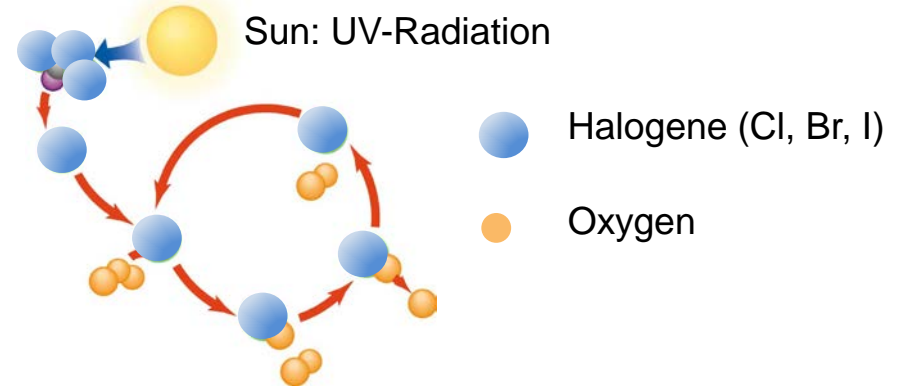
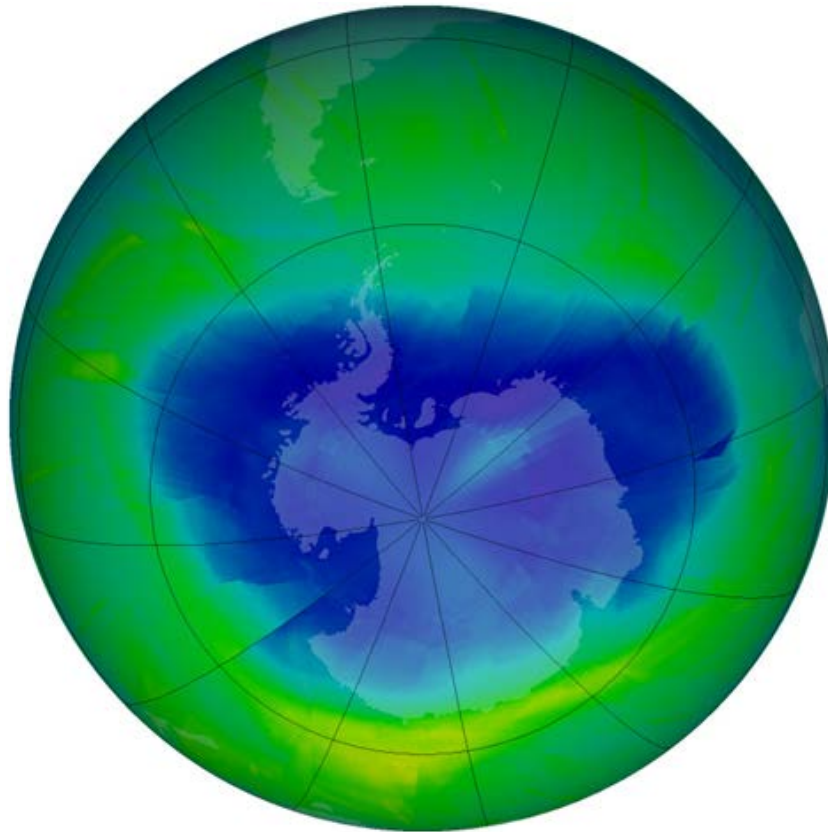
3.-6. September 2019

European Regulatory Framework

- Environment Regulation : Background / Motivation
- Environmental Regulation
- Direct Emissions
- Indirect Emissions
- Summary - Outlook



Ozone Depletion

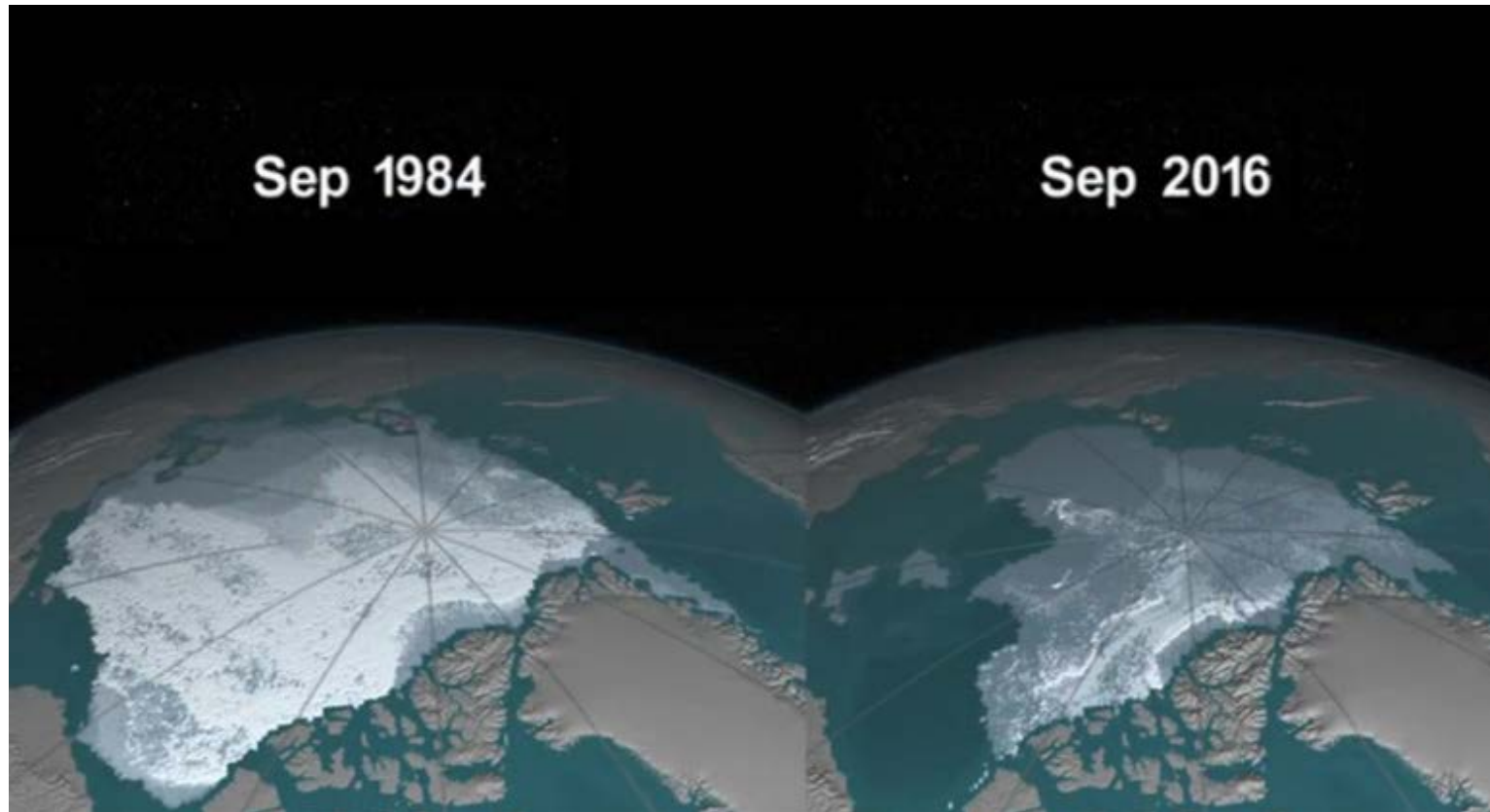


- Ozone Depletion Thesis:
Molina & Rowland & Crutzen 1974
- CFCs as major contributor

Source: NASA Goddard Space Flight Center from Greenbelt, MD, USA - Snapshot of the Antarctic Ozone Hole 2010, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=69017095>



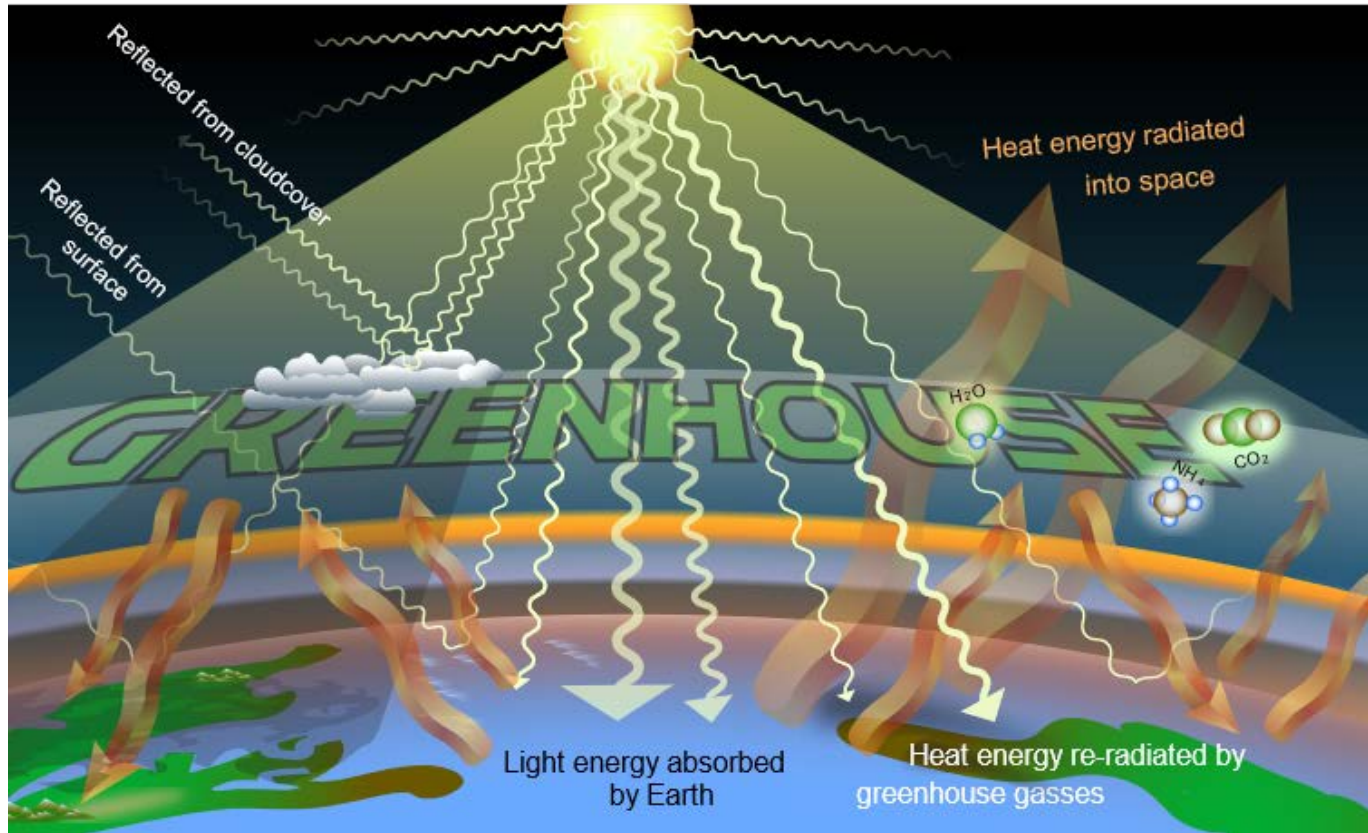
Global Warming



Quelle: © NASA Goddard Screenshot youtube.com



The Greenhouse Effect



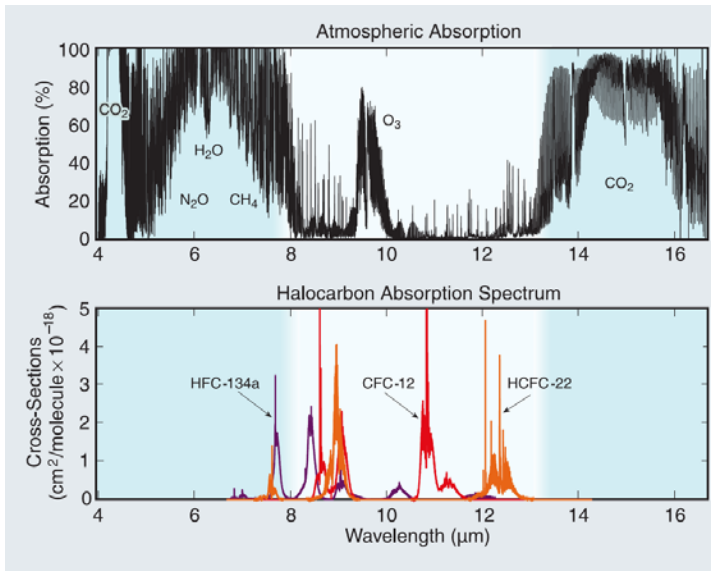
Source: A loose necktie - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=78336181>



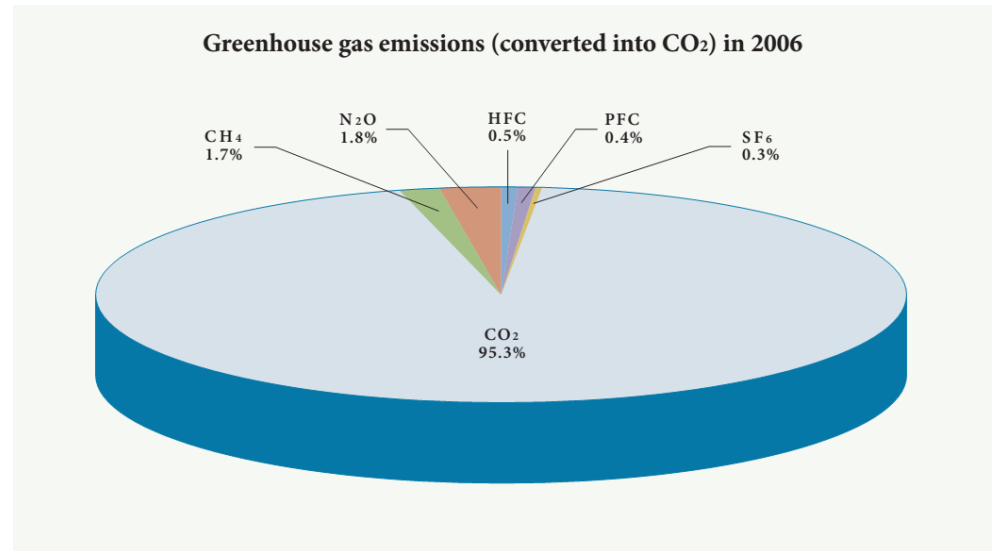
Global Warming

GWP: Global Warming Potential: relative contribution to Greenhouse Effect

- Relative to $\text{CO}_2 = 1$, e.g. R134a = 1430
- Calculated for a certain period (standard 100 years)



Quelle: IPCC / TEAP Special report: Safeguarding the Ozone Layer and the Global Climate System – Issues Related to Hydrofluorocarbons and Perfluorocarbons



Quelle: http://www.meti.go.jp/policy/chemical_management/ozone/files/pamplet/panel/08e_basic.pdf

European Regulatory Framework

- Environment Regulation : Background / Motivation
- Environmental Regulation
- Direct Emissions
- Indirect Emissions
- Summary - Outlook



Fighting the consequence: Environmental Legislation

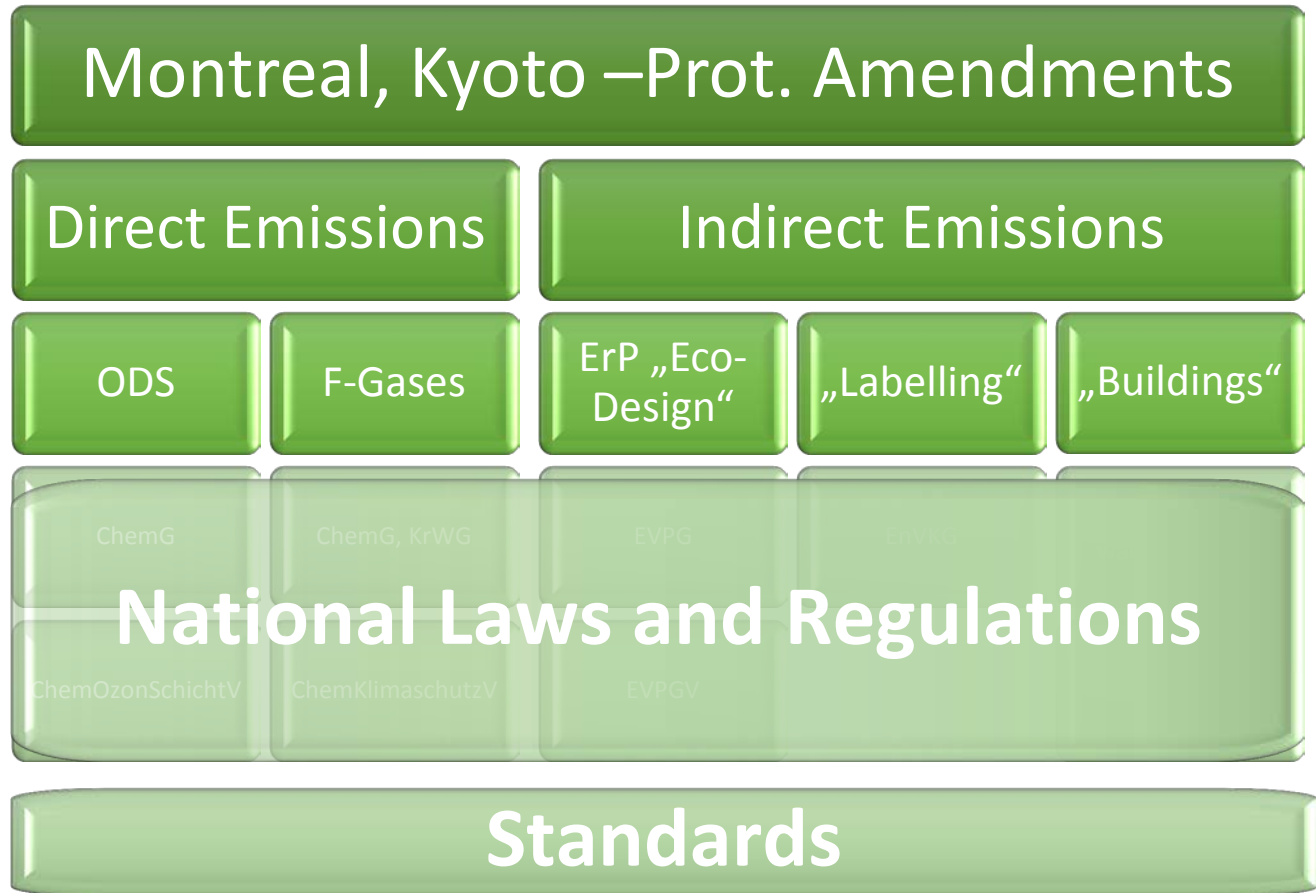


- Global Conventions
- Ratification

- EU Targets
- EU Legal Instruments

- National Laws
- „Standards“

Environmental Legislation: Example EU and Germany

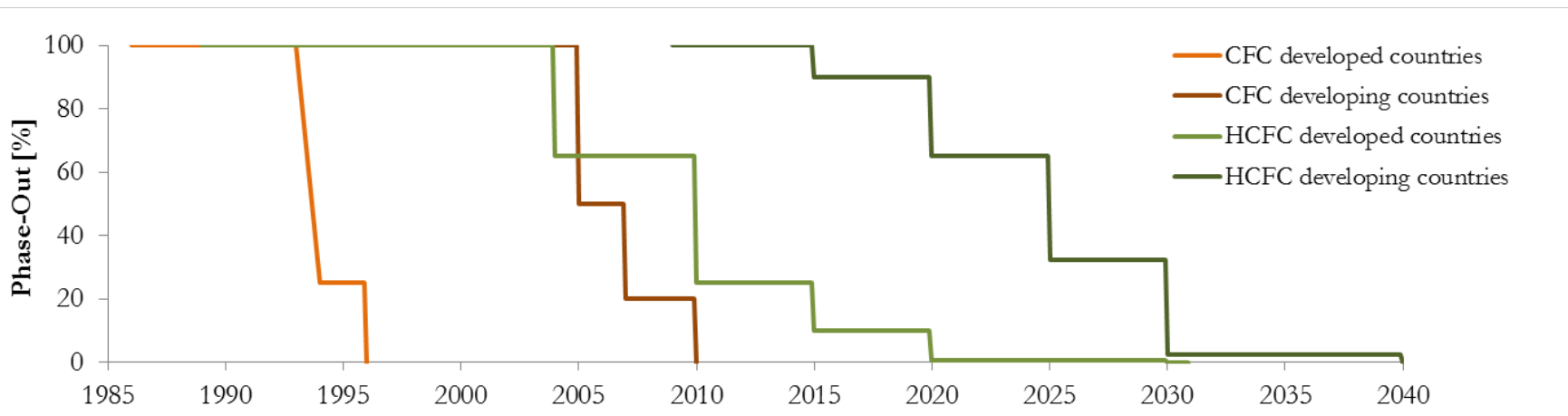


Climate Conventions

- Montreal Protocol (1987) 197 countries as parties (all UN members)
 - Based on Vienna Convention (1985)
 - Originally focussed on Protection of the Ozone layer
 - Phase out/down of ODS Ozone Depleting Substances
 - Broader approach on GHG Greenhouse Gases
 - Kigali Amendment (2016):
 - Focussed on phase down of F-Gases
 - 15% target value of baseline
- Kyoto Protocol (1997) 191 countries + EU ratified
 - Focussed on GHG emissions
 - Paris agreement (2015) to limit global warming to 1,5 °C, ratified by 185 nations

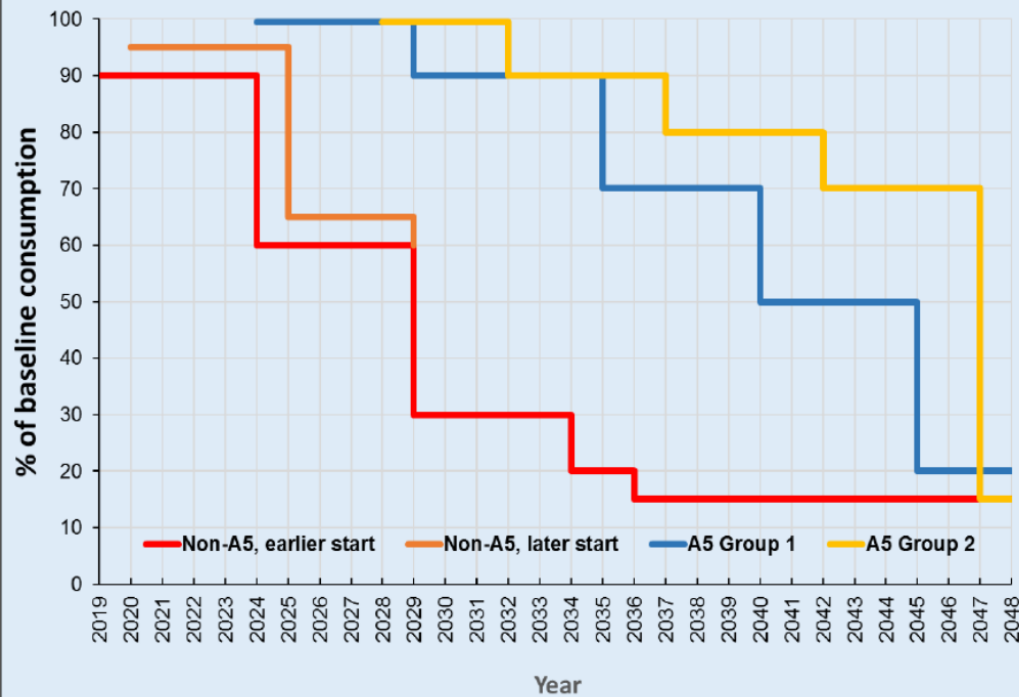
The Montreal Protocol: CFC, HCFC Phase-out

- Phase-down of production and consumption of ODS
- Higher requirements for industrial countries
- Most successful international environmental agreement



Kigali Amendment: HFC Phase down

Kigali Amendment HFC Phase-Down Schedules

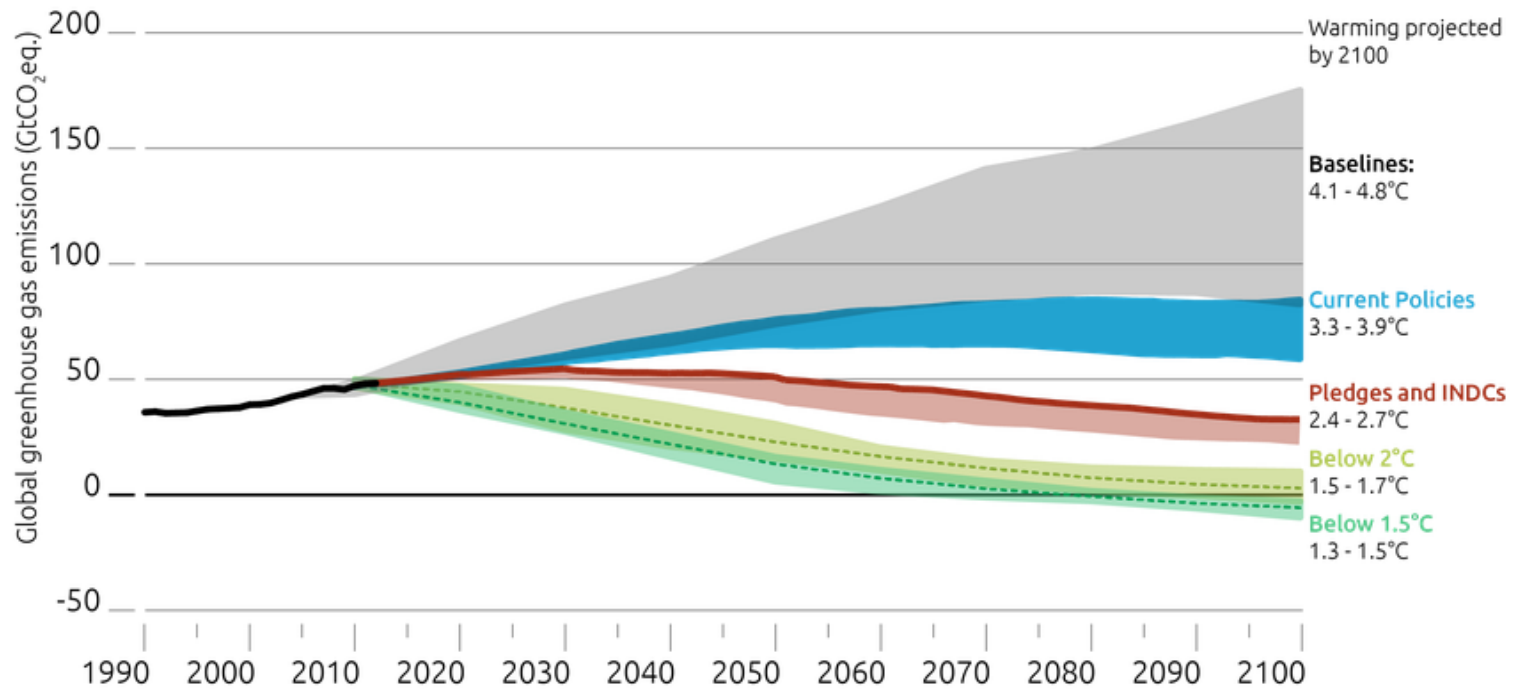


- A5 group: Developing Countries according Montreal Protocol (147 Parties)
 - A5 Group 1: Most A5 Countries
 - A5 Group 2: Bahrain, India, Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, UAE
- Non-A5 earlier start: most non A5 countries: **(e.g. Ukraine, DE)**
- Non-A5 later start: Belarus, the Russian Federation, Kazakhstan, Tajikistan, Uzbekistan

Quelle: <https://www.unenvironment.org/ozonaction/resources/factsheet/ozonaction-kigali-fact-sheet-5-hfc-baselines-and-phase-down-timetable>, Seite aufgerufen 2019-07-29



The need for global GHG mitigation



— Historical emissions, incl. LULUCF

■ Current

--- 2°C consistent median and range**

© www.climateactiontracker.org/
Climate Analytics/Ecofys/
NewClimate/PIK

■ Reference*

■ Pledge and INDCs

--- 1.5°C consistent median and range***

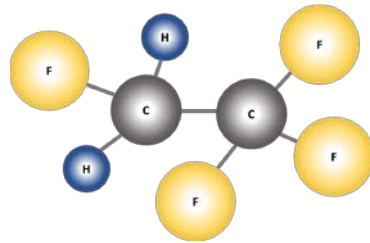


European Regulatory Framework

- Environment Regulation : Background / Motivation
- Environmental Regulation
- Direct Emissions
- Indirect Emissions
- Summary - Outlook

Direct Emissions

- Focus:
 - ODS 😊 😐
 - F-Gases 😡 😐
- F-Gases: “A hydrocarbon derivatives containing flour”
- Example: R134a



- Broad range of applications
 - HFCs: Refrigerants, Foams, Insulation, fire extinguisher, aerosols, solvents
 - PFCs: Aluminum-, PCB-, semiconductor-, ...production
 - SF₆: Switchgears, Al-cleaning, high-voltage capacitors, shoe soles, ...

Direct Emission EU-Regulations

- **ODS:**

“REGULATION (EC) No 1005/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 September 2009 on substances that deplete the ozone layer”

- **F-Gases:**

“REGULATION (EU) No 517/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006”

F-Gas Regulation

- **F-Gases:**

“REGULATION (EU) No **517/2014** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006”

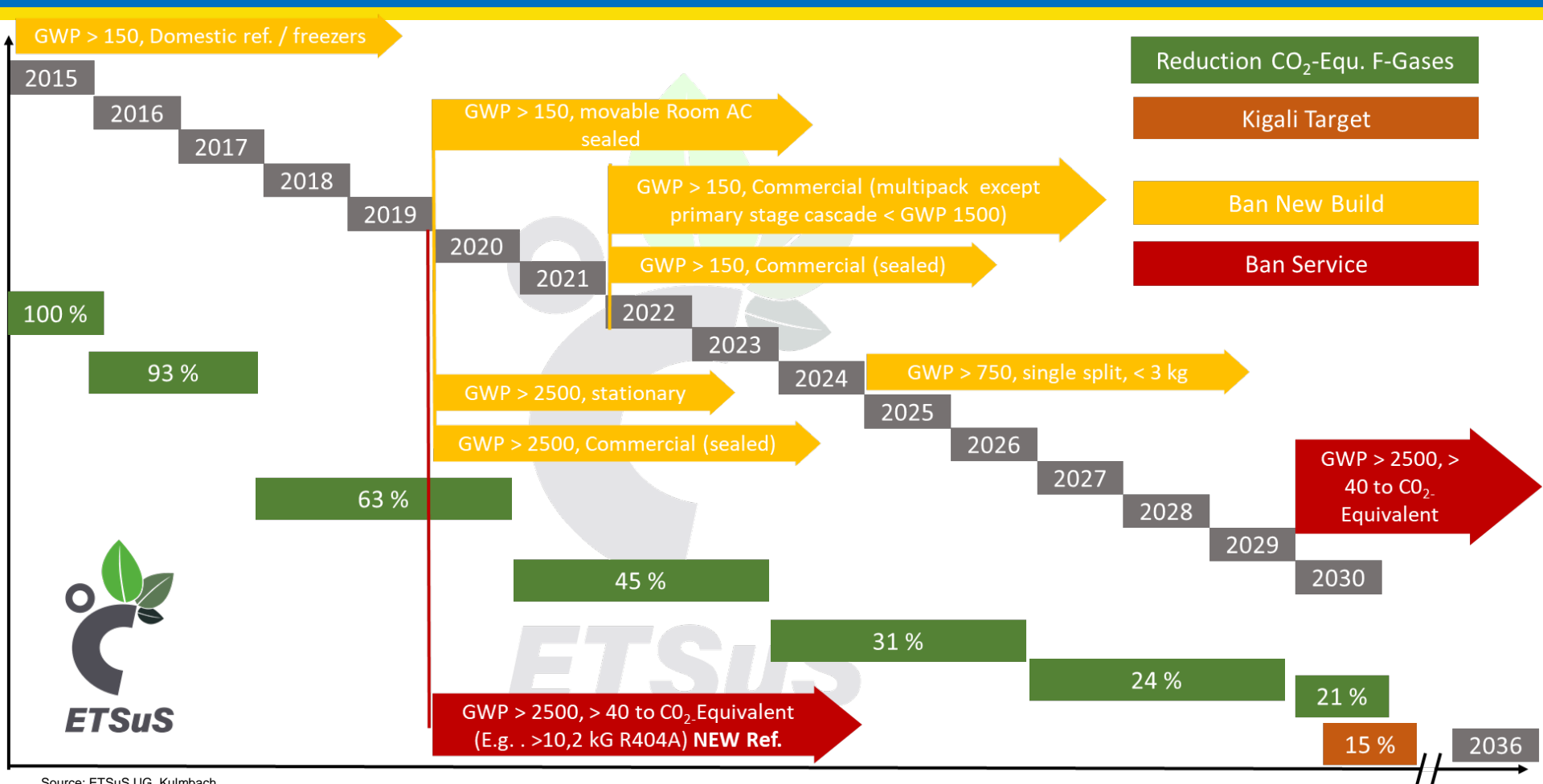
- **Implementing Acts for support e.g.:**

- Regulation (EU) 2015/2067 – certification of technicians and companies
- Regulation (EC) 1516/2007 – leakage checking procedures
- ...

F-Gas Regulation - Content

Chapter	Content	Articles
I	General Provisions	1-2
II	Containment (“Emission reduction”)	3-10
III	Placing on market – control of use	11-14
IV	Reduction of quantity (“Quota allocation”)	15-18
V	Reporting	19-20
VI	Final provisions	21-27
AI - AVIII	Annex I controlled substances	
	Annex II substances under reporting	
	Annex III Placing on market prohibitions (“Dates”)	
	Annex V Maximum quantities (“Phase down”)	

F- Gas Regulation at a glance



Source: ETSuS UG, Kulmbach

F-Gas Regulation Chapter II

- Article 3: Prevention of emission
- Article 4: Leak checks
- Article 5: Leakage detection systems
- Article 6: Record keeping
- Article 7: Production
- Article 8: Recovery
- Article 9: Producers responsibility schemes
- Article 10: Training and certification

F-Gas Regulation Chapter III

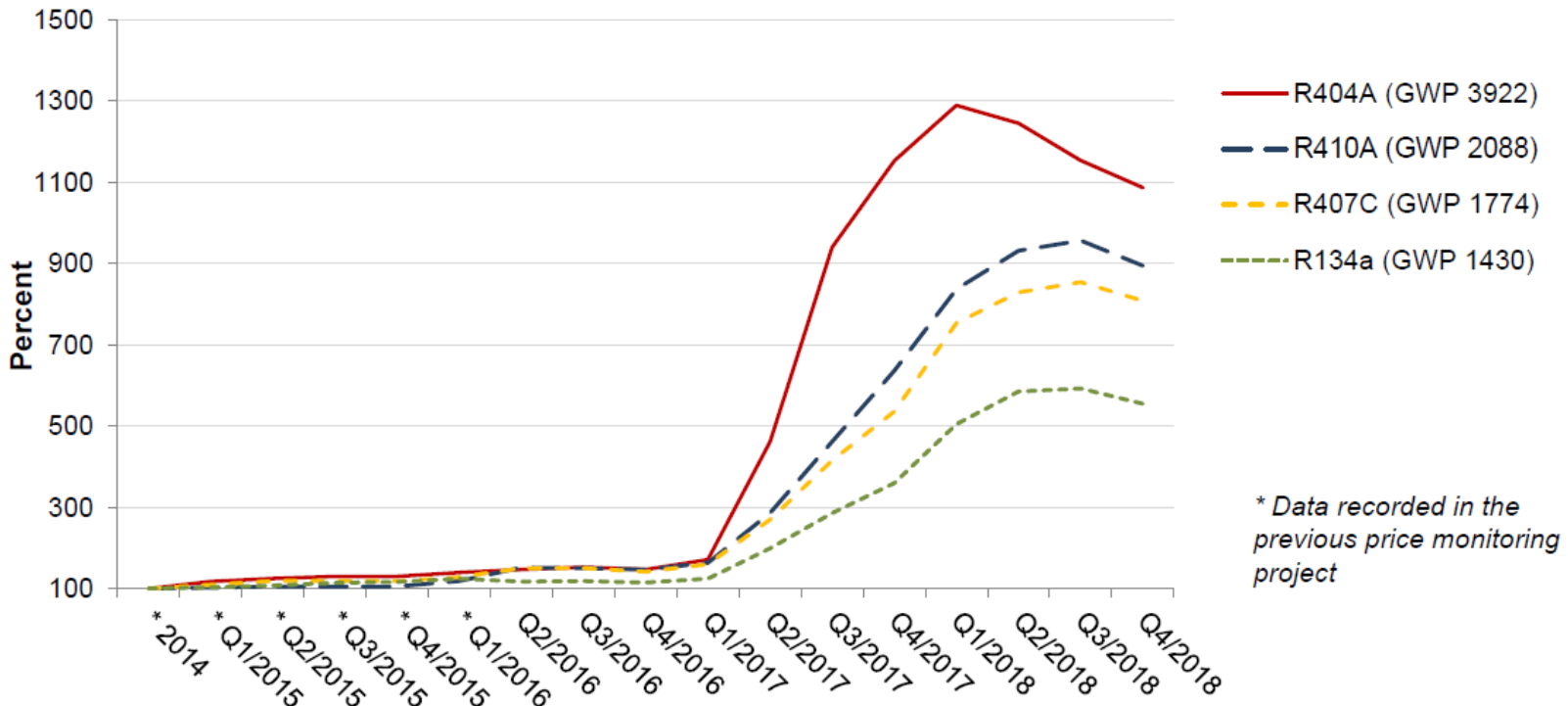
- Article 11: Restrictions on the placing on the market (see below)
- Article 12: Labelling (CE marking relevance)
- Article 13: Control of use (servicing – see below)
- Article 14: Pre-charges equipment

F-Gas Regulation Chapter IV

- Article 15: Reduction of quantity... (“of CO₂-Equivalent”)
- Article 16: Quota allocation (see below)
- Article 17: Registry
- Article 18: Transfer of quota

F-Gas Regulation: The quota effect

**Average purchase prices of various HFC refrigerants
(price index, 2014 = 100 %)**

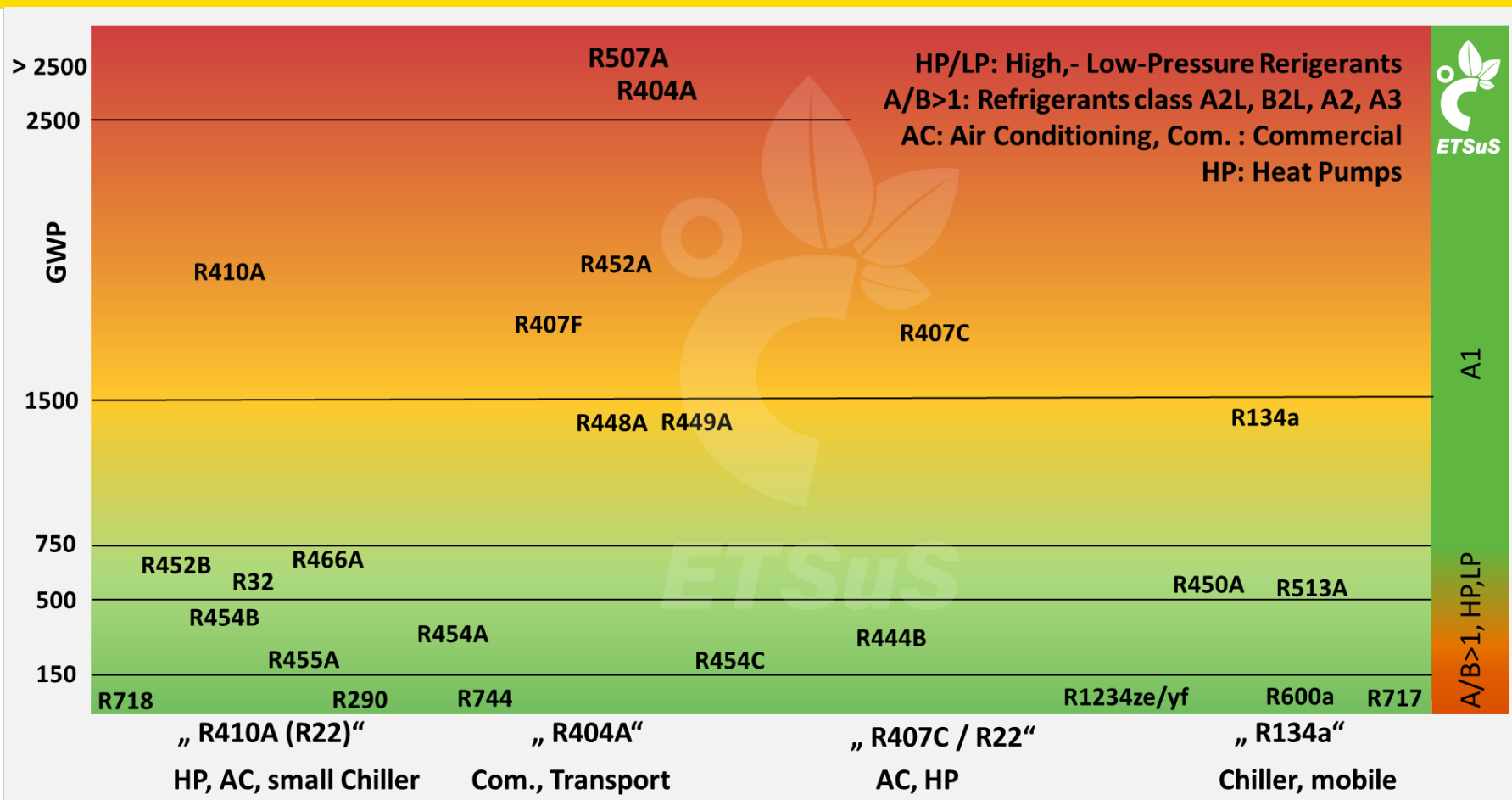


Source: Öko-Recherche (2019)





F-Gases and alternativ refrigerants



SOURCE: ETSuS UG, Kulmbach



A1

A/B>1, HP,LP



European Regulatory Framework

- Environment Regulation : Background / Motivation
- Environmental Regulation
- Direct Emissions
- Indirect Emissions
- Summary - Outlook

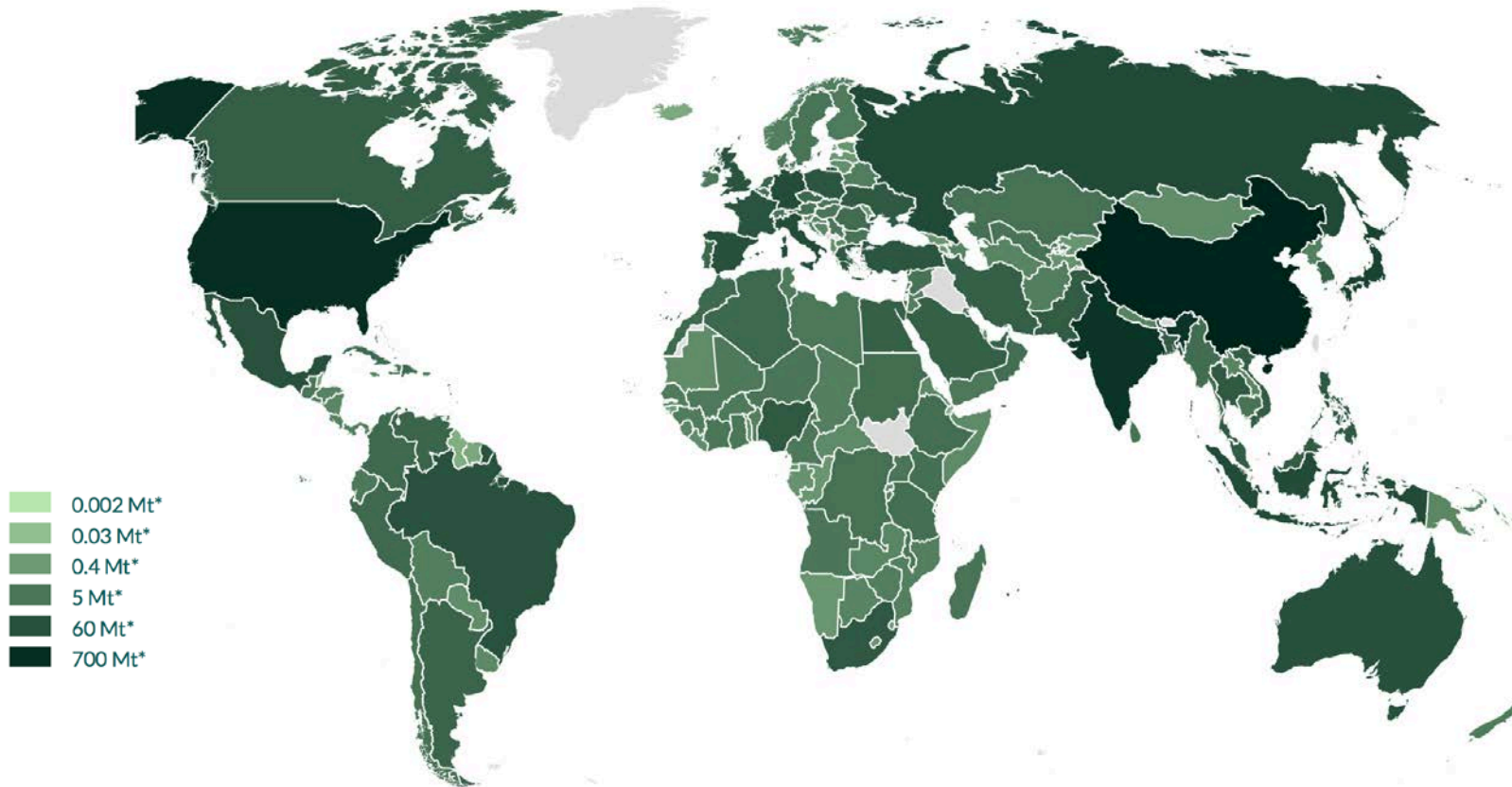
Indirect emissions

- Basic concepts of regulation
- ErP-Directive
- Labelling



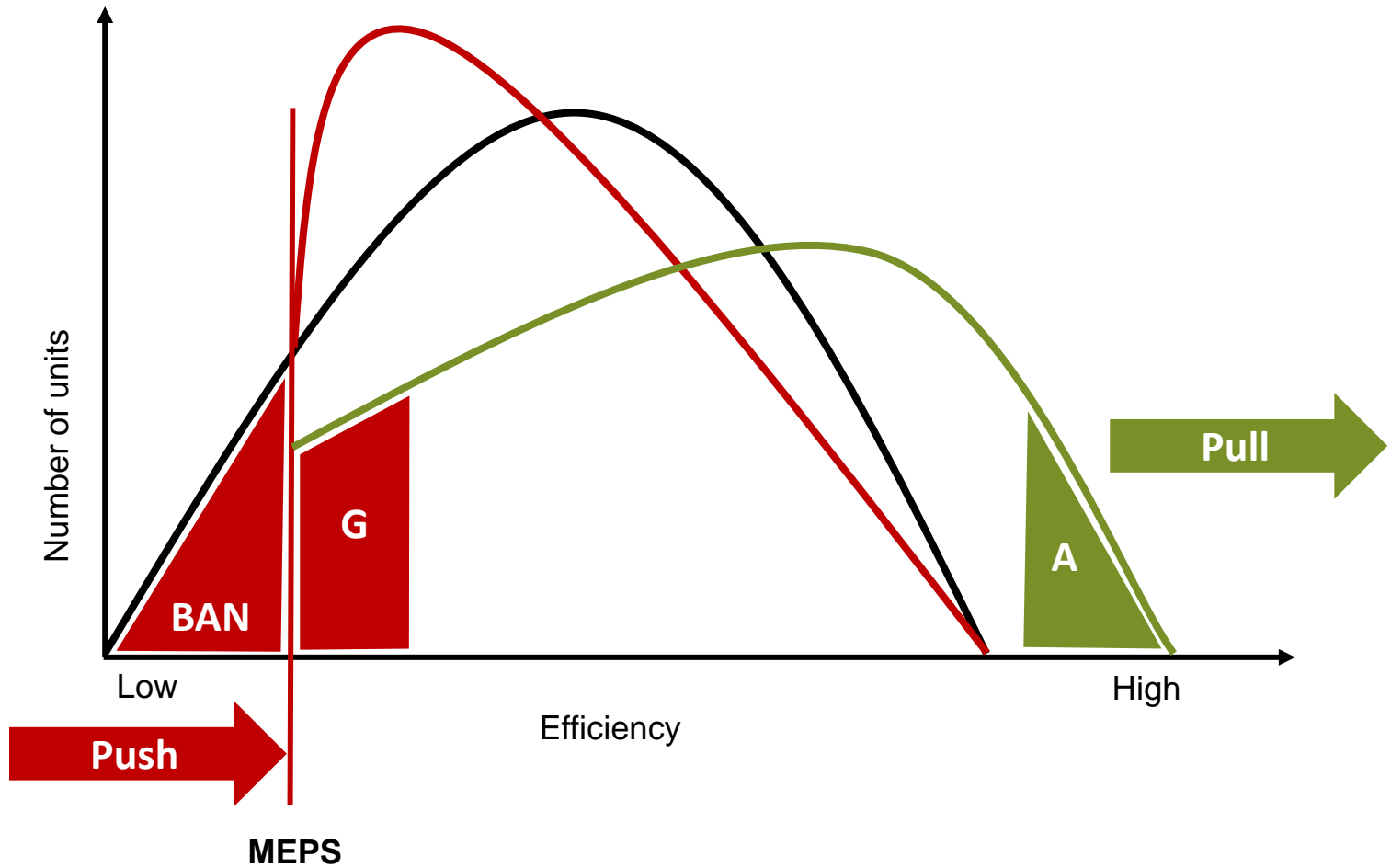
Global emissions from the RAC sector (abs.)

Unitary AC /Mt: 1230; 2050: BAU 4980, MIT 3360



Source: www.green-cooling-initiative.org/

Basic Concept of MEPS and Labelling

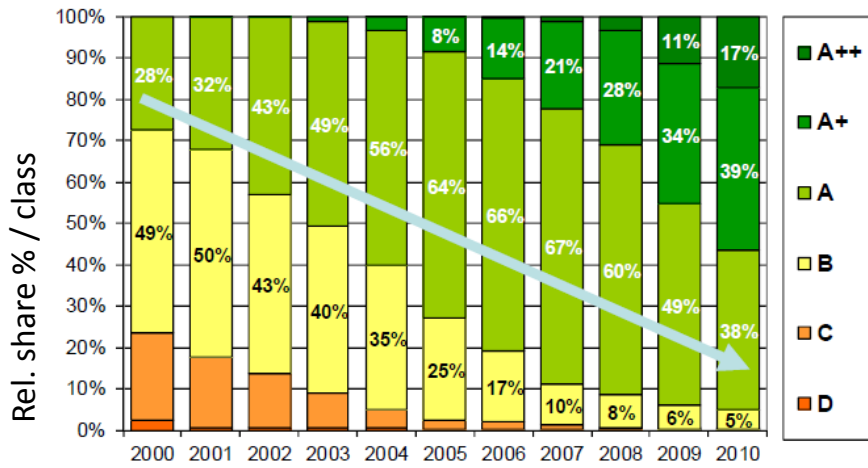




Labelling

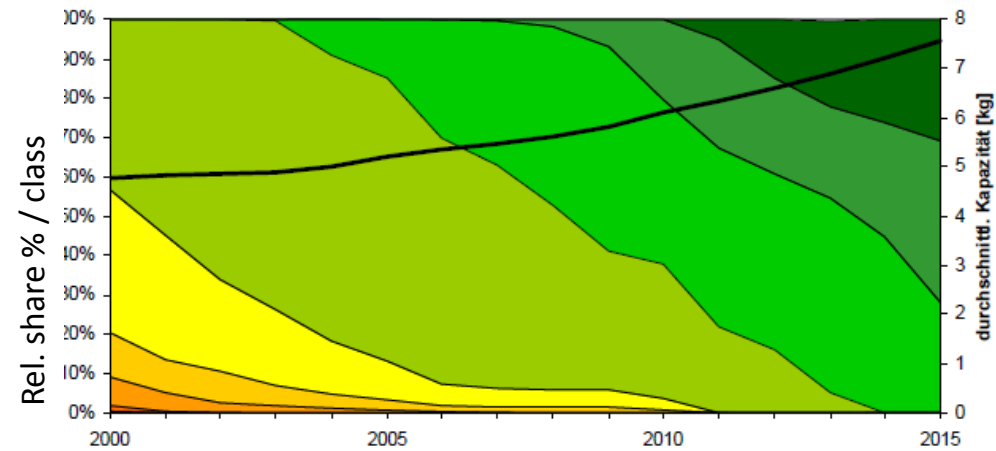
Effectiveness

Refrigerators DE



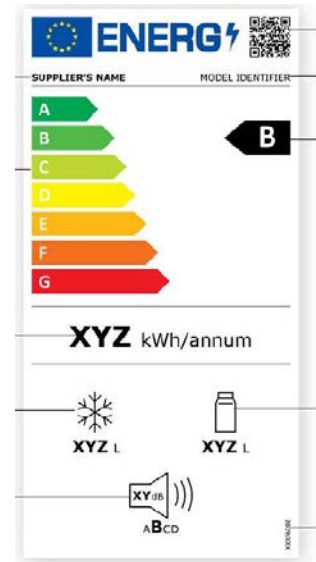
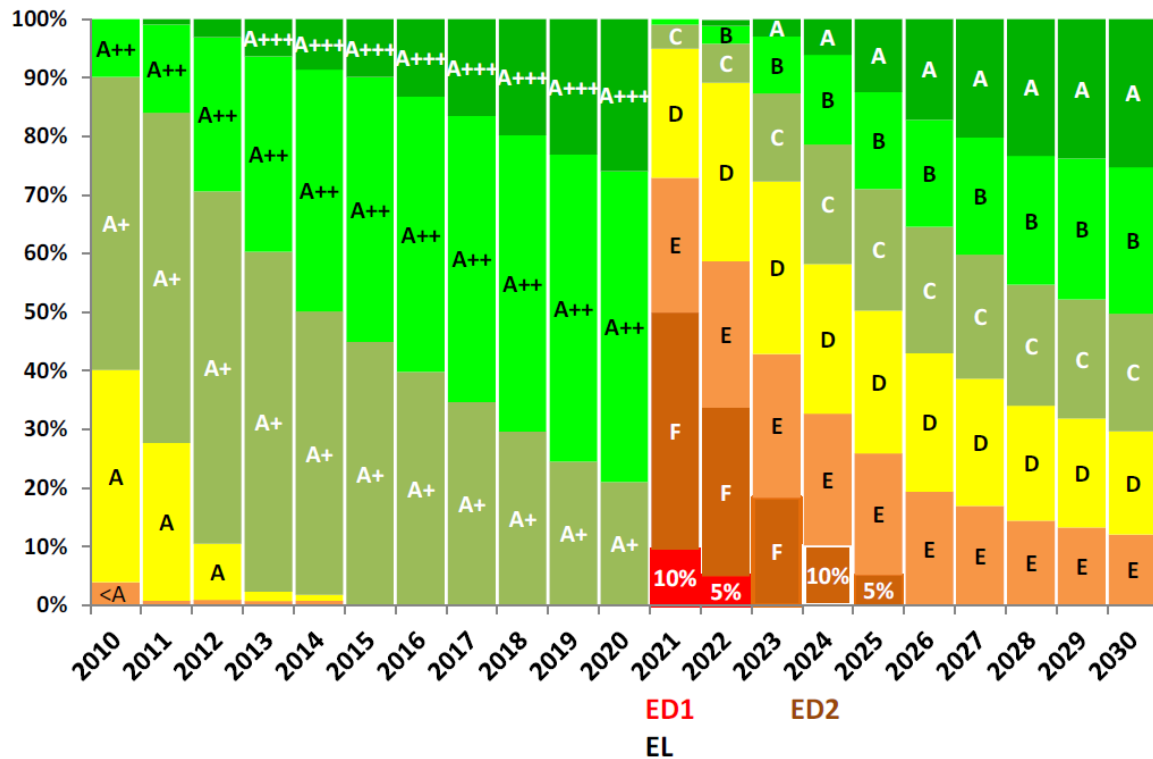
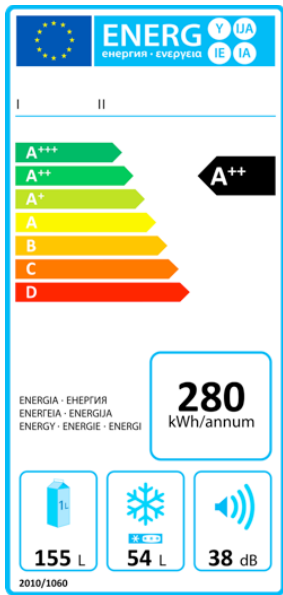
Sustainability?

Washing machines DE



Source: B. Schäppi, EU-Prozess zur Entwicklung von Ecodesign-Standards und Labels – Aktueller Status, Chancen und Herausforderungen für den Zeitraum 2012-2014

MEPS & Labels: Rescaling – the new case in the EU



Fuente: Draft regulation

Indirect Emission EU-Regulations

- **ErP-Directive (“Eco-Design”)**

“DIRECTIVE 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products”

- **Energy Performance of buildings (EPBD)**

“DIRECTIVE (EU) 2018/844 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency”

Eco-Design Directive: Lots

Lot	Product Group	Status
ENER 1	Space Heaters	VO (EU) 813/2013, VO (EU) 811/2013
ENER 2	Warmwater Heaters	VO (EU) 814/2013, VO (EU) 812/2013
ENER 10	Domestic AC	VO (EU) 206/2012, VO (EU) 626/2011
ENER 11	Electric motors	VO (EG) 640/2009
ENER 11	Pumps	VO (EG) 641/2009
ENER 11	Fans	VO (EU) 327/2011
ENER 13	Domestic Refrigeration	VO (EG) 643/2009, VO (EU) 1060/2010
ENER 17	Vacuum cleaners	VO (EU) 666/2013, VO (EU) 665/2013
ENER 21	Central air heaters	VO (EU) 2016/2281
ENER 31	Compressors	Consultation
ENTR 1	Process Chillers	VO (EU) 2015/1095, VO (EU) 2015/1094
ENTR 6	AC, Ventilation	VO (EU) 1253/2014, VO (EU) 1254/2014

Eco-Design Labelling

- [2009/125/EC](#) “ErP” – “Energy Related Products Directive – Eco-Design”
 - [EU/813/2013](#) Space Heaters (Lot 1)
 - [EU/814/2013](#) Warm Water heaters (Lot 2)
- (EU)2017/1369 replaces 2010/30/EU “Labelling”
 - [EU/811/2013](#) Space Heaters (Lot 1)
 - [EU/812/2013](#) Warm Water heaters (Lot 2)
- [2014/C 207/02](#) Communication EU/813/2013 und EU/811/2013 Space Heaters
- [2014/C 207/03](#) Communication EU/814/2013 und EU/812/2013 Warmwater Heaters
- Applicable Standards
 - [EN 14511](#)
 - EN 14825
 - EN16147
 - EN 12102



Key indicators for energy efficiency

Group L

COP
 EN 14511
 EER

MEASURED
 (Standard Rating
 Conditions)

Group C

JAZ (VDI 4650)
SCOP (EN 14825)
 SEER (ASHRAE 116)
 PLV

CALCULATED
 with defined
 methodology

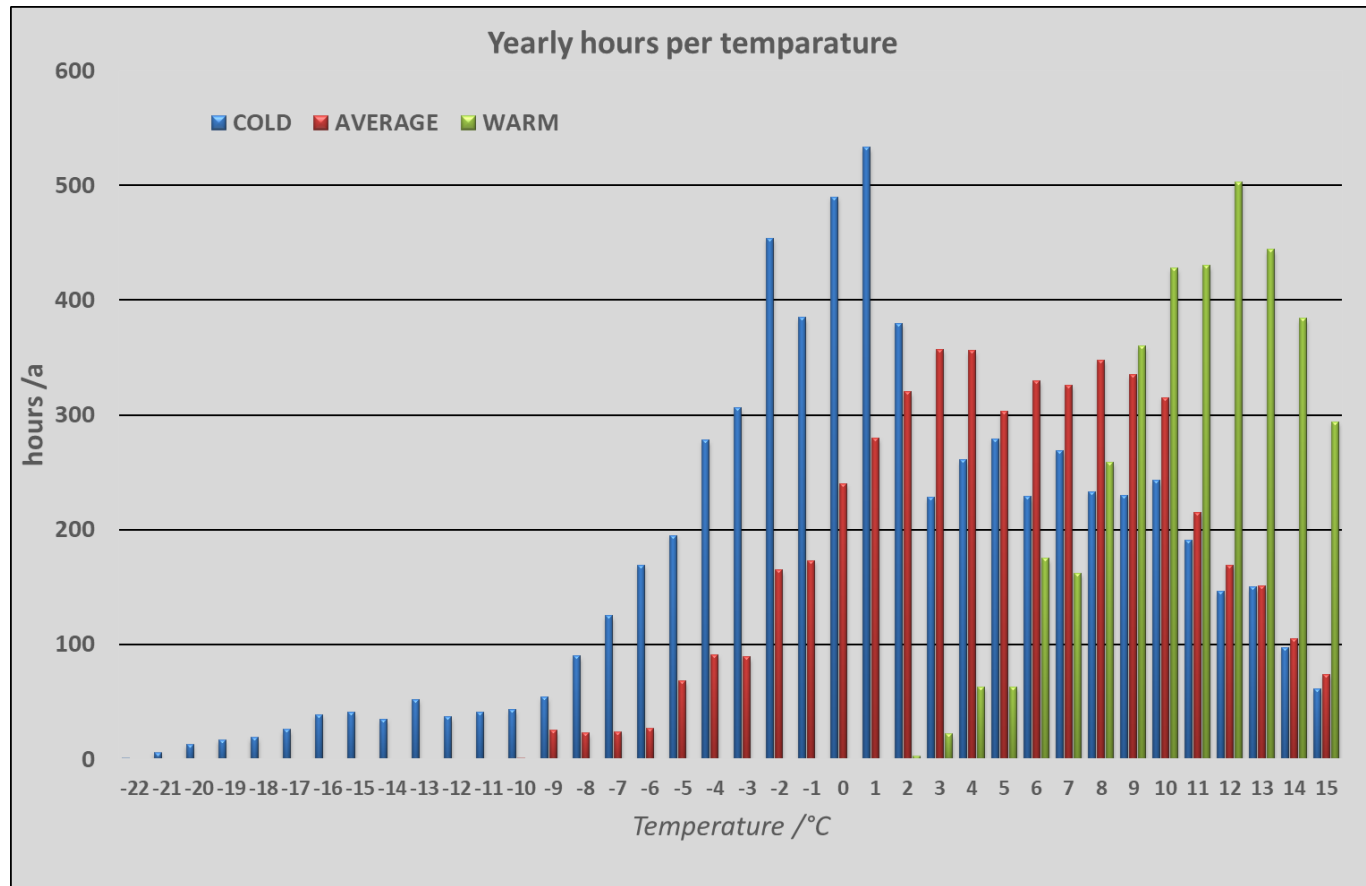
Groupe F

JAZ, **SPF**
 (Several Projects
 Market Surveillance)

MEASURED
 in field under real
 conditions

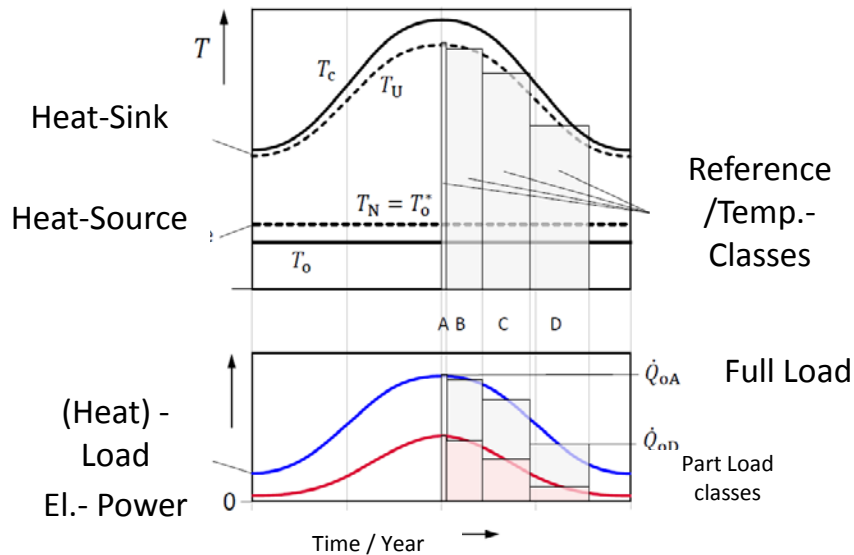
Source: According M. Miara et al "Wärmepumpen", Fraunhofer IRB Verlag 2013 own rework ETSuS UG

Seasonal efficiency

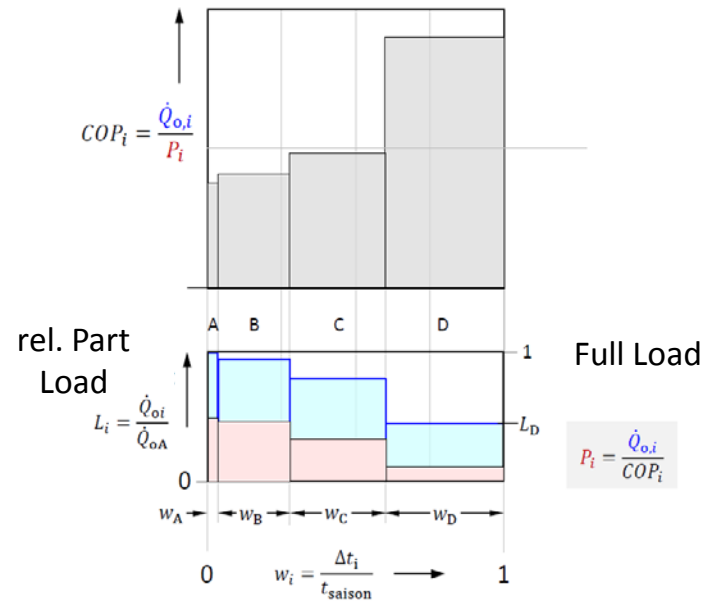


SCOP / SEER Evaluation Basic concept

Temp- / Load-Profiles



Temp- / Load-Profiles



Source: Prof. M. Arnemann, izw-Seminar 2019, Dramstadt, Re-Work ETSuS UG

European Regulatory Framework

- Environment Regulation : Background / Motivation
- Environmental Regulation
- Direct Emissions
- Indirect Emissions
- Summary - Outlook

Summary- Outlook

There is no Planet B!



Thank you for your attention !

Contact :

edgar.timm@heat-international.eu

regina.karakina@heat-international.de

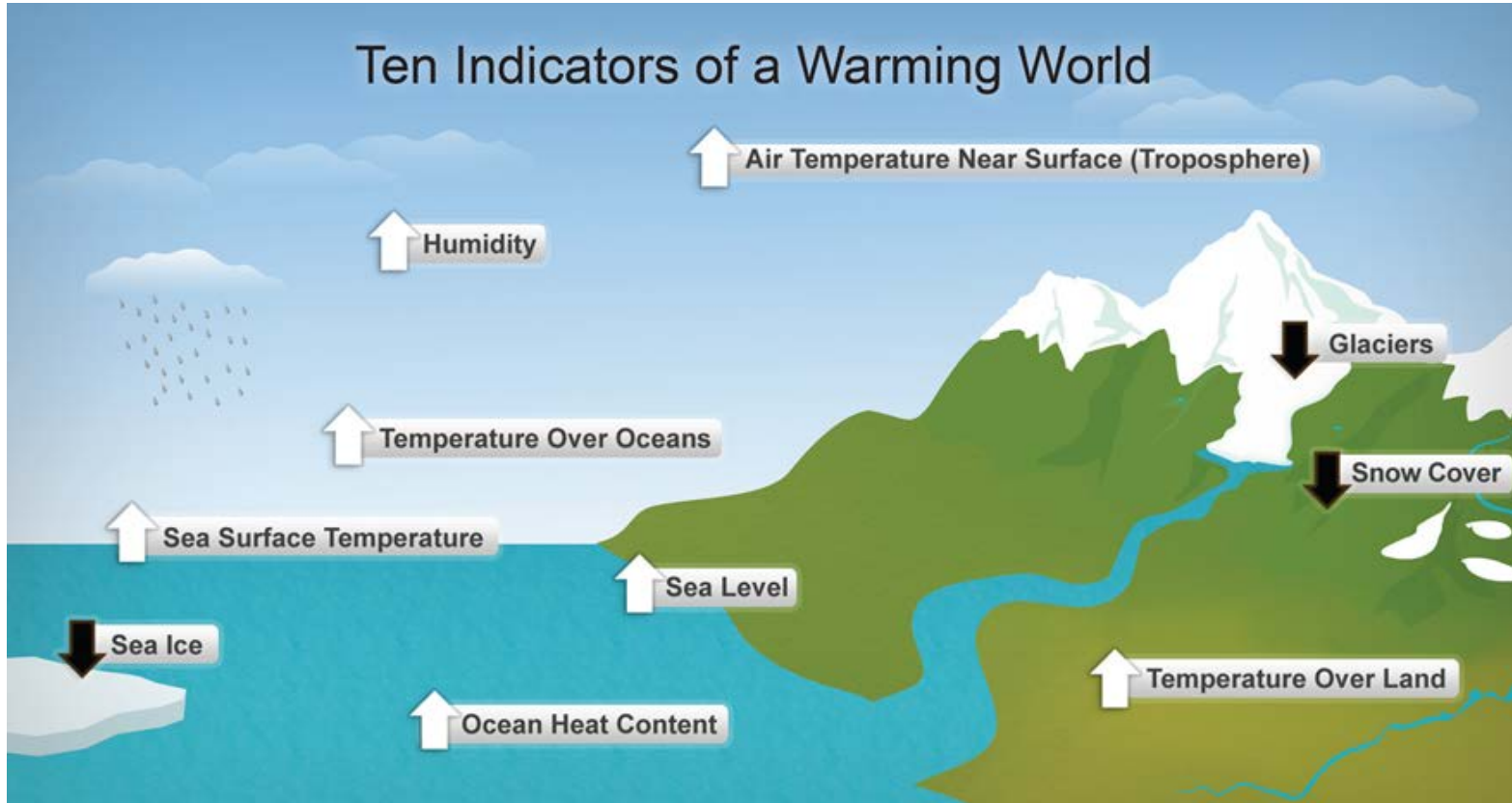
www.heat-international.de

Twitter @HEAT_GmbH

RESERVE

CAPACITY BUILDING ON INNOVATIVE APPLICATIONS OF ENERGY-
EFFICIENT CLIMATE-FRIENDLY COOLING AND HEATING TECHNOLOGIES
IN UKRAINE

The Greenhouse Effect - Consequences



Source By US National Oceanic and Atmospheric Administration: National Climatic Data Center - State of the Climate in 2009: Supplemental and Summary Materials: Report at a Glance: Highlights[1], US National Oceanic and Atmospheric Administration: National Climatic Data Center, (Please provide a date or year), page 2., Public Domain, <https://commons.wikimedia.org/w/index.php?curid=22913531>:



Montreal Protokoll

Montrealer Protokoll, Anhang F: Controlled substances

Gruppe I		GWP ₁
CHF ₂ CHF ₂	HFKW-134	1100
CH ₂ FCF ₃	HFKW-134a	1430
CH ₂ FCHF ₂	HFKW-143	353
CHF ₂ CH ₂ CF ₃	HFKW-245fa	1030
CF ₃ CH ₂ CF ₂ CH ₃	HFKW-365mfc	794
CF ₃ CHF ₂ CF ₃	HFKW-227ea	3220
CH ₂ FCF ₂ CF ₃	HFKW-236cb	1340
CHF ₂ CHF ₂ CF ₃	HFKW-236ea	1370
CF ₃ CH ₂ CF ₃	HFKW-236fa	9810
CH ₂ FCF ₂ CHF ₂	HFKW-245ca	693
CF ₃ CHF ₂ CHF ₂ CF ₃	HFKW-43-10mee	1640
CH ₂ F ₂	HFKW-32	675
CHF ₂ CF ₃	HFKW-125	3500
CH ₃ CF ₃	HFKW-143a	4470
CH ₃ F	HFKW-41	92
CH ₂ FCH ₂ F	HFKW-152	53
CH ₃ CHF ₂	HFKW-152a	124

1 Global Warming Potential

Quelle: Umweltbundesamt



Principle EU procedure



Kigali Meeting Protocol

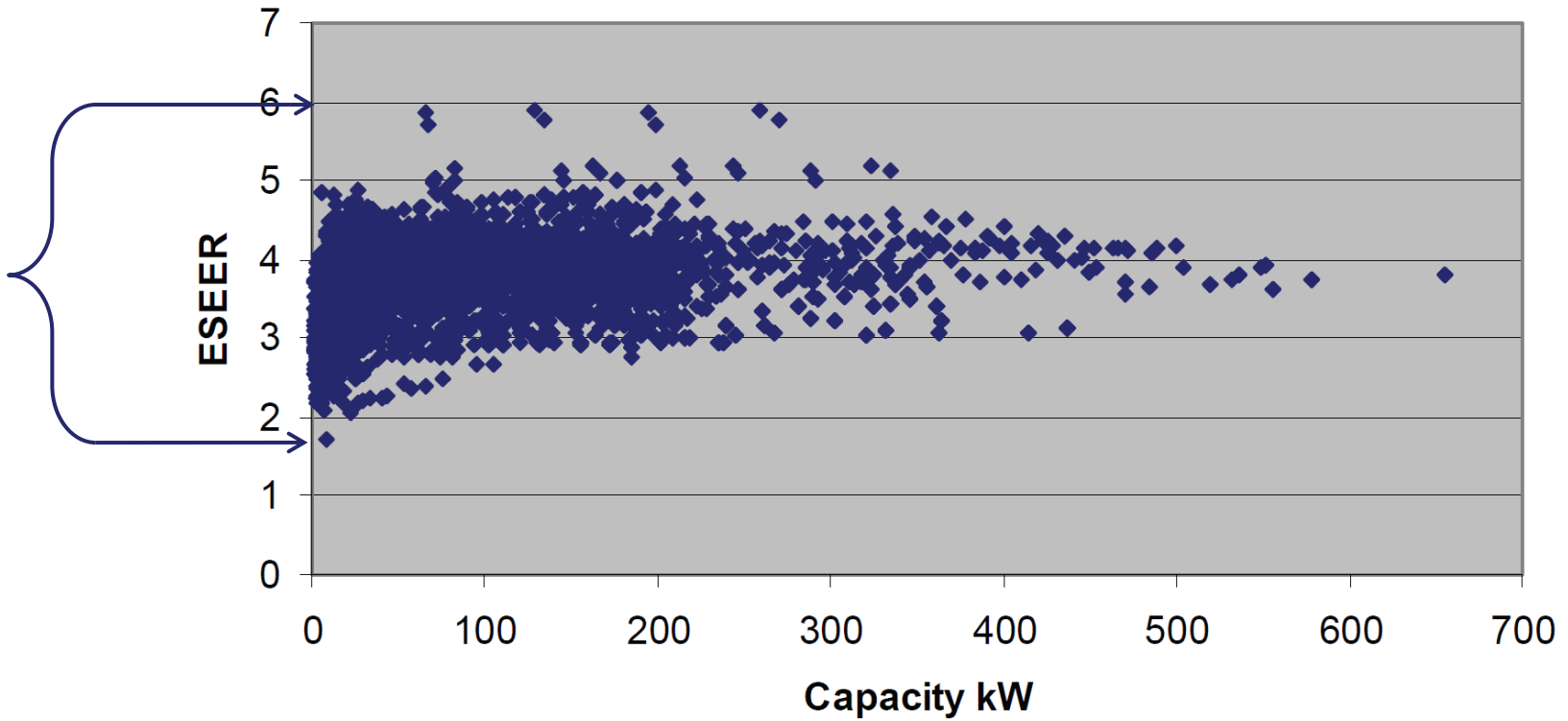
B. Existing plans of action to return to compliance:

3 . Ukraine (decision XXIV/18 and recommendation 56/4):

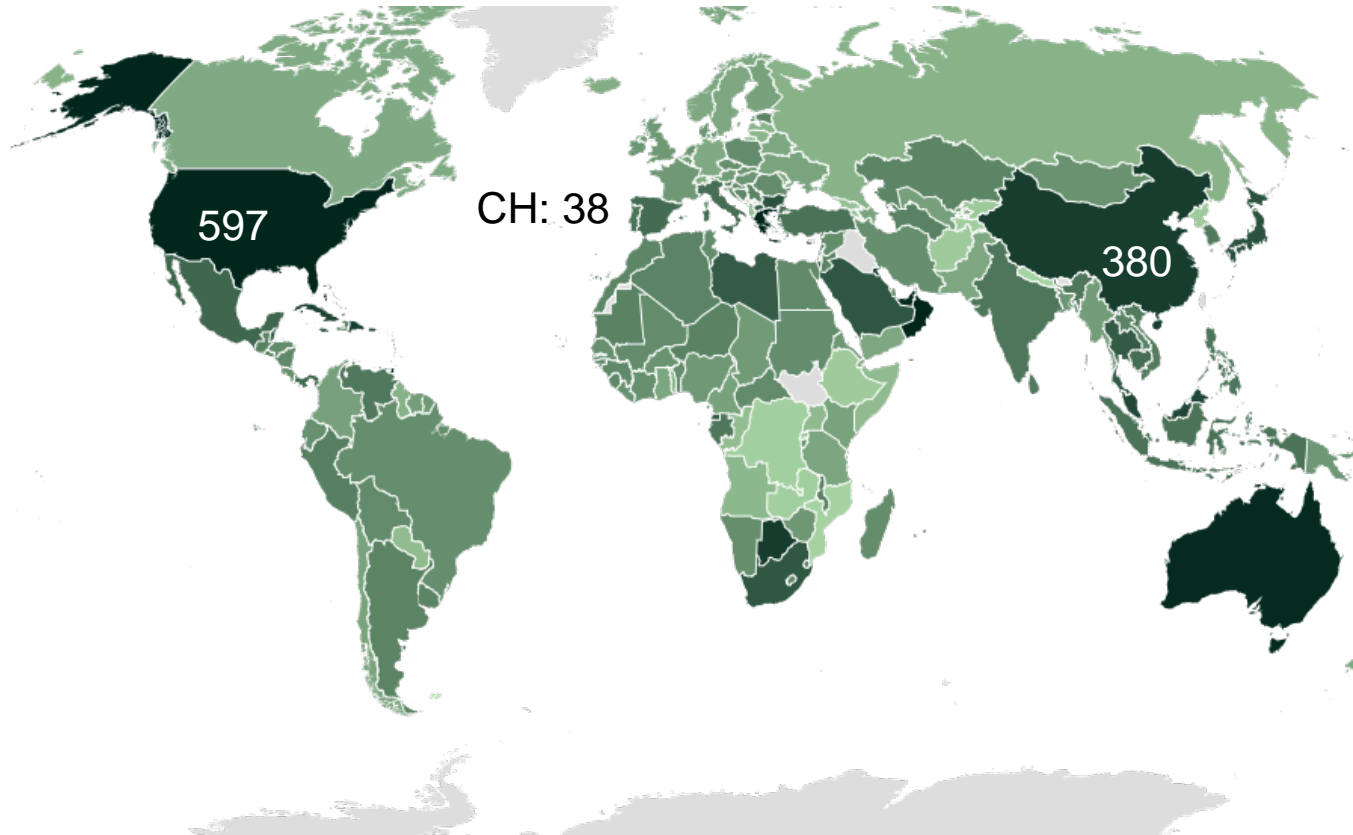
34. The representative of the Secretariat recalled that, in accordance with paragraphs 2 (b), (c) and (d) of decision XXIV/18, Ukraine was required to report information concerning its implementation of its HCFC control measures, including its quota system, its introduction of a gradual ban on imports of equipment containing or relying on ozone-depleting substances and new legislation to control ozone-depleting substances more closely.
35. The party had subsequently submitted the required information but had done so only shortly before the fifty-sixth meeting of the Implementation Committee. The Committee had therefore agreed, in recommendation 56/4, to postpone substantive discussion of Ukraine's situation until Committee members had had a chance to review the information and to return to the issue at the current meeting.
36. The information submitted showed that except for the legislative and regulatory process for controlling imports and exports of ozone-depleting substances, with regard to which a draft law was still being negotiated, the actions set out in decision XXIV/18 had been implemented. One member of the Committee pointed out that the proposed new legislation drew on a regulation of the European Union that had been repealed in 2009. The representative of the Secretariat agreed to communicate that fact to Ukraine, in case they were unaware of it.
37. The Committee therefore agreed:
 1. To note with appreciation Ukraine's submission of information:
 - (a) On its implementation, through a Cabinet decree adopted in 2015, of a licensing system for the import and export of ozone-depleting substances and, through a ministerial order in 2015, a quota system;
 - (b) On its introduction, through a ministerial order, of a gradual ban on imports of equipment containing or relying on ozone-depleting substances;
 - (c) On its drafting of new legislation, to enter into force in 2017, for strengthening its control of ozone-depleting substances and for gradually reducing its consumption of HCFCs;
 2. To encourage Ukraine to complete the legislative and regulatory process for controlling imports and exports of ozone-depleting substances and to update the Secretariat on its progress by 31 March 2017 so that the Committee might consider the issue at its fifty-eighth meeting.

Example – energy efficiency of chillers in EU10)

$$\eta_{low} = 0.4\eta_{high}$$

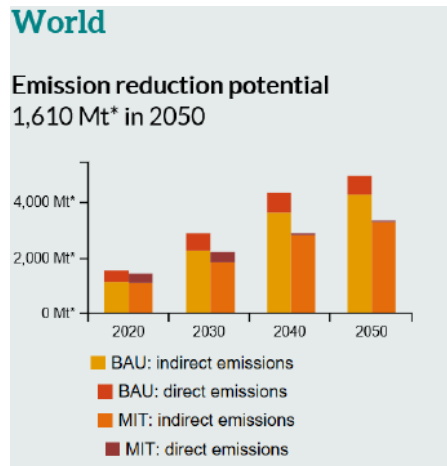
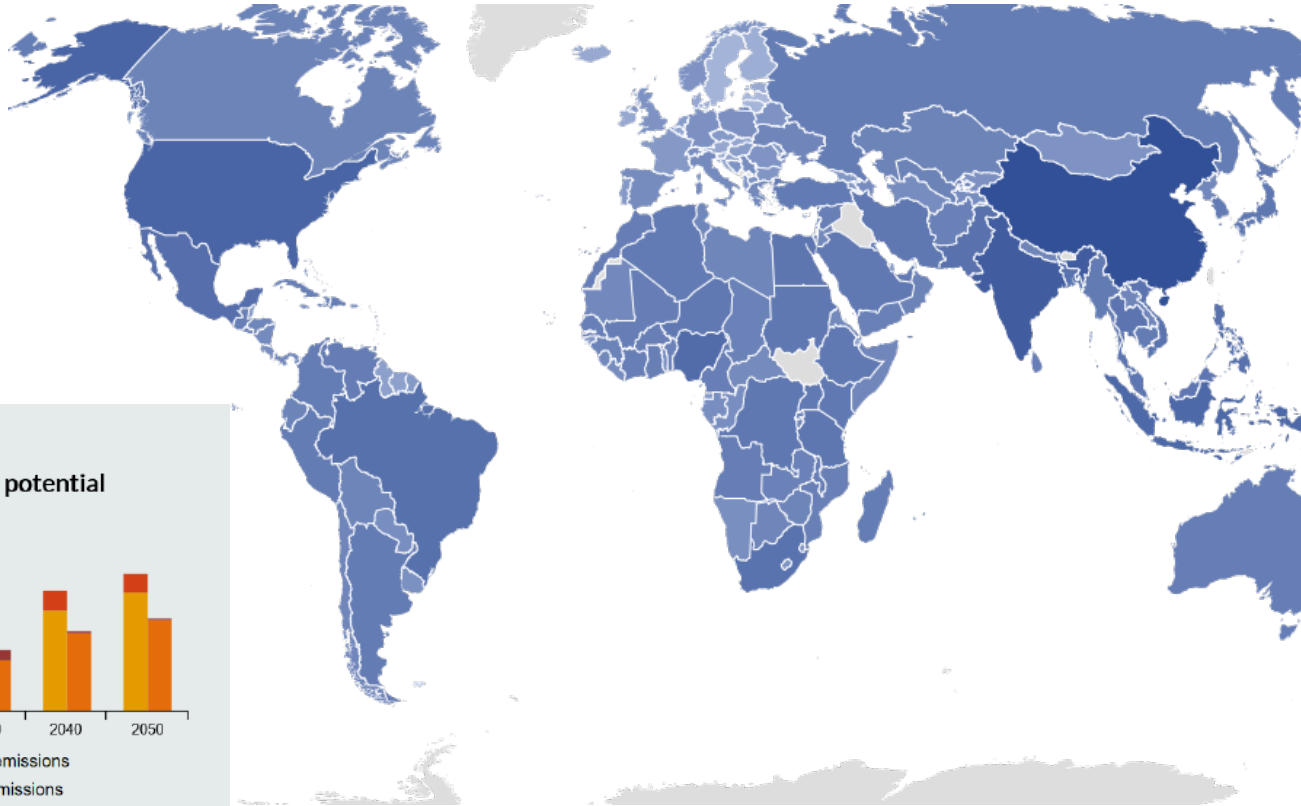
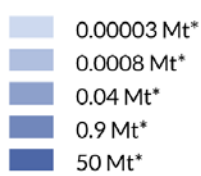


Global emissions from the RAC sector: Unitary AC kg/Capita



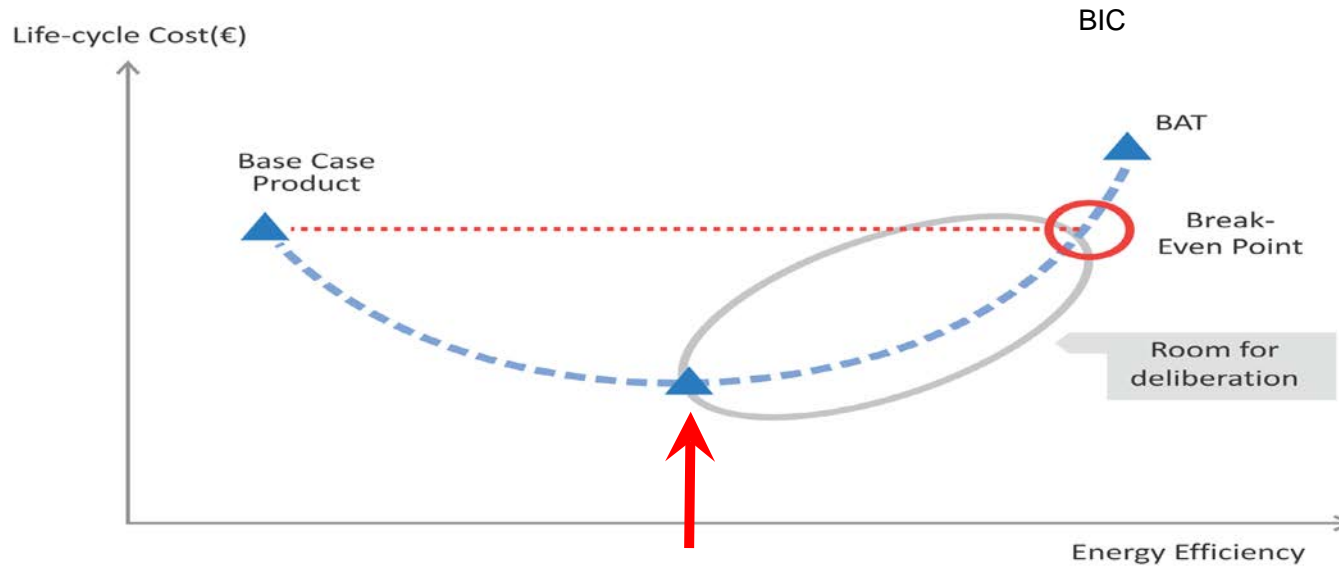
Source: www.green-cooling-initiative.org/

Emission reduction potential UAC



Source: www.green-cooling-initiative.org/

A basic concept: MEPS and LLCC



**MEPS =
point of lowest LLCC**

LLCC = Upfront investment costs + Operating costs over the lifetime of the product

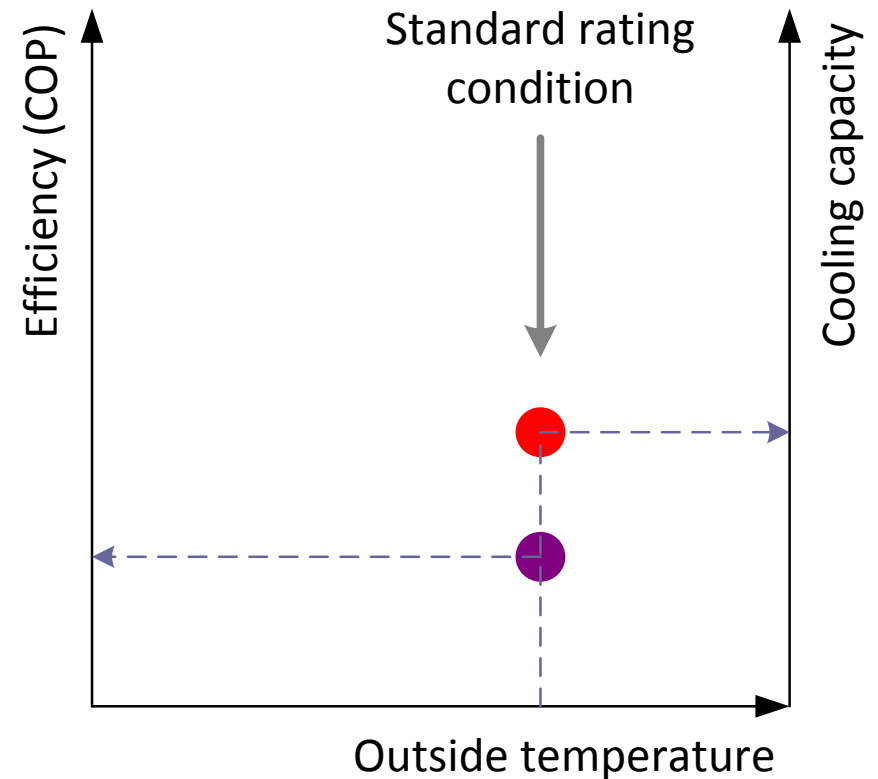
Further reading

Eco-Design

- http://ec.europa.eu/growth/industry/sustainability/ecodesign_de
- <https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/ecodesign>
- https://ec.europa.eu/growth/single-market/ce-marking/manufacturers_en
- https://ec.europa.eu/energy/sites/ener/files/documents/list_of_ecodesign_measures.pdf

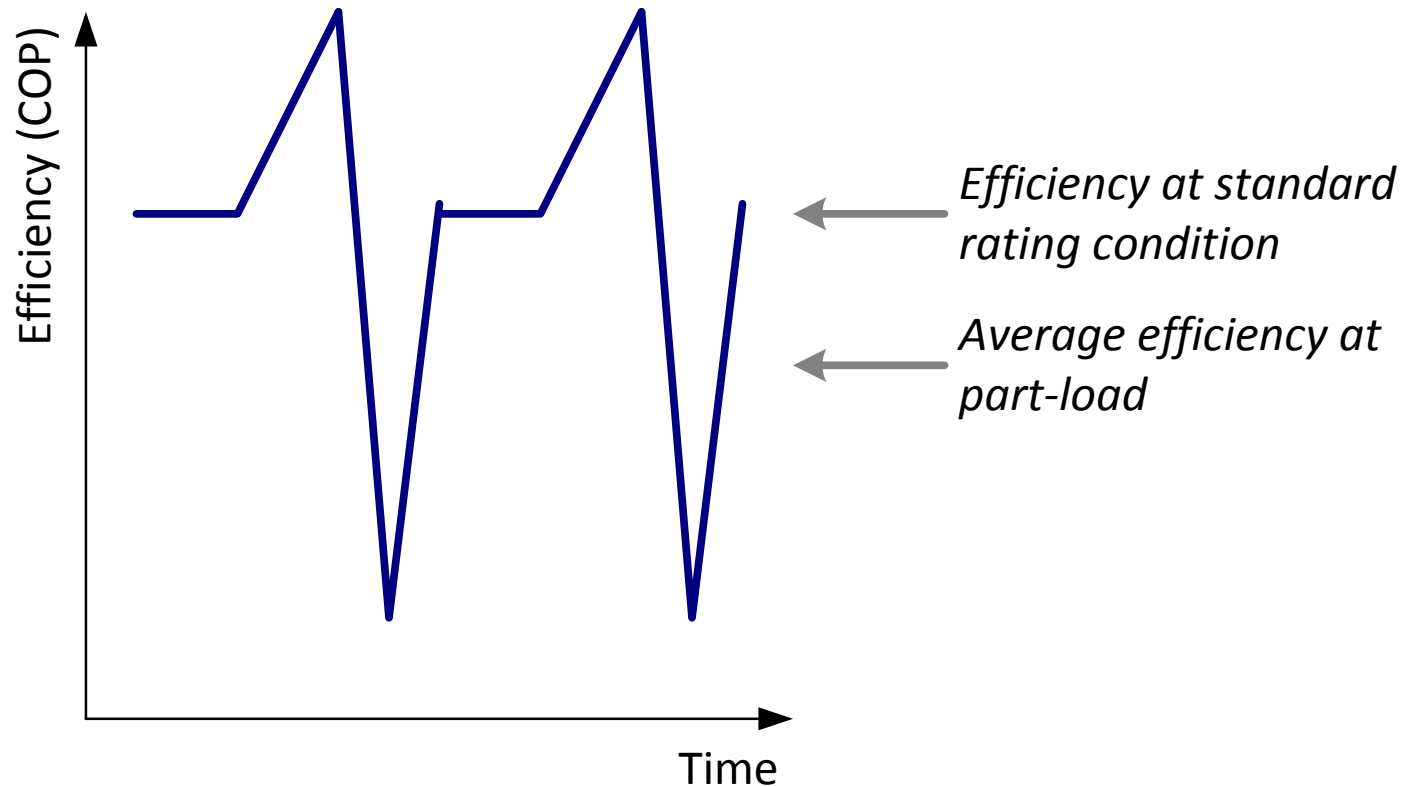
Evaluation of energy efficiency

- Concepts of efficiency rating
 - Standard rating condition
 - Seasonal efficiency
 - Part load performance
- Standard rating condition
 - Measurement of capacity and efficiency at a single condition



Evaluation of energy efficiency

- Part load efficiency: Provides more realistic representation of actual performance conditions



Okodesign - Kaltwassererzeuger
2015/1095 und 2016/2281

VERORDNUNG (EU) 2015/1095 DER KOMMISSION

zur Durchführung der Richtlinie 2009/125/EG des Europäischen Parlaments und des Rates im Hinblick auf die Festlegung von Anforderungen an die umweltgerechte Gestaltung von gewerblichen Kühltischschränken, Schnellkühlern/-froster, Verflüssigungssätzen und Prozesskühlern

VERORDNUNG (EU) 2016/2281 DER KOMMISSION

zur Durchführung der Richtlinie 2009/125/EG des Europäischen Parlaments und des Rates zur Schaffung eines Rahmens für die Festlegung von Anforderungen an die umweltgerechte Gestaltung energieverbrauchsrelevanter Produkte im Hinblick auf Luftheizungsprodukte, Kühlungsprodukte, Prozesskühler mit hoher Betriebstemperatur und Gebläsekonvektoren



Verordnung (EU) Nr. 517/2014

Zertifizierung, Dichtheitsprüfung,

Entsorgung, Kennzeichnung

Kapitel III: EMISSIONSBERGERNUNG

- Artikel 3: „Vermeidung...“
- Artikel 4: Dichtheitskontrollen
 - > 5 to CO₂-Äquivalent

Mengen F-Gase in Tonnen CO ₂ -Äquivalent	Anlage hat kein Leckage-Erkennungssystem	Leckage-Erkennungssystem Vorhanden
5-49	Mindestens alle 12 Monate	Mindestens alle 24 Monate
50-499	Mindestens alle 6 Monate	Mindestens alle 12 Monate
500 und mehr	Mindestens alle 3 Monate	Mindestens alle 6 Monate

Quelle: Bayrisches Landesamt für Umwelt: Die neue F-Gase-Verordnung 2014





Verordnung (EU) Nr. 517/2014

Zertifizierung, Dichtheitsprüfung,

Entsorgung, Kennzeichnung

Kapitel III: EMISSIONSBERGERNUNG

- Artikel 5: Leckage-Erkennungssysteme
 - WP ab 500 to CO₂-Äquivalent
- Artikel 6: Führung von Aufzeichnungen
 - Falls Dichtigkeitskontrolle vorgeschrieben ist
- Artikel 7: Emissionen ...Herstellung
 - Bestmögliche Begrenzung
- Artikel 8: Rückgewinnung

Quelle: Bundesministerium für Umwelt, Die neue F-Gas-Verordnung 2014



Betreiberpflicht 



Verordnung (EU) Nr. 517/2014

Zertifizierung, Dichtheitsprüfung, Entsorgung, Kennzeichnung

Kapitel III: EMISSIONSBEREINIGUNG

- Artikel 10: Ausbildung und Zertifizierung
 - Installation
 - Dichtheitskontrollen
 - Rückgewinnung
 - ...
- ...
- Artikel 12: Kennzeichnung
 - „Enthält F-Gase...“, Art, Menge und CO₂-Äquivalent
- ...
- Artikel 14: Vorbefüllung
 - Erfassung in Quotenregelung

Quelle: Bayrisches Landesamt für Umwelt: Die neue F-Gase-Verordnung 2014

