Green and high-efficient cooling technologies and their application

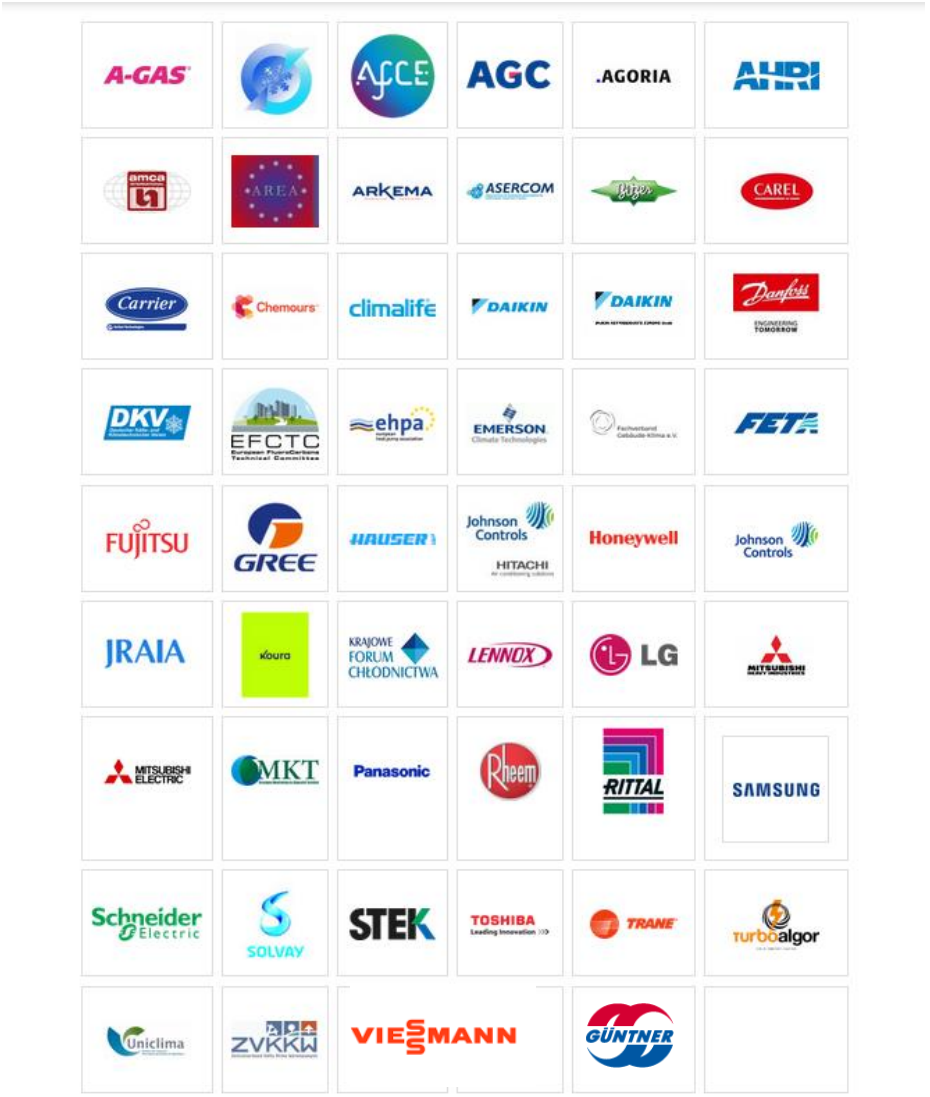
By Andrea Voigt, Director General EPEE

Shanghai, April 2021

Who is EPEE? The full value chain. A true voice.

EPEE represents the manufacturers of refrigeration, air-conditioning and heat pump technologies

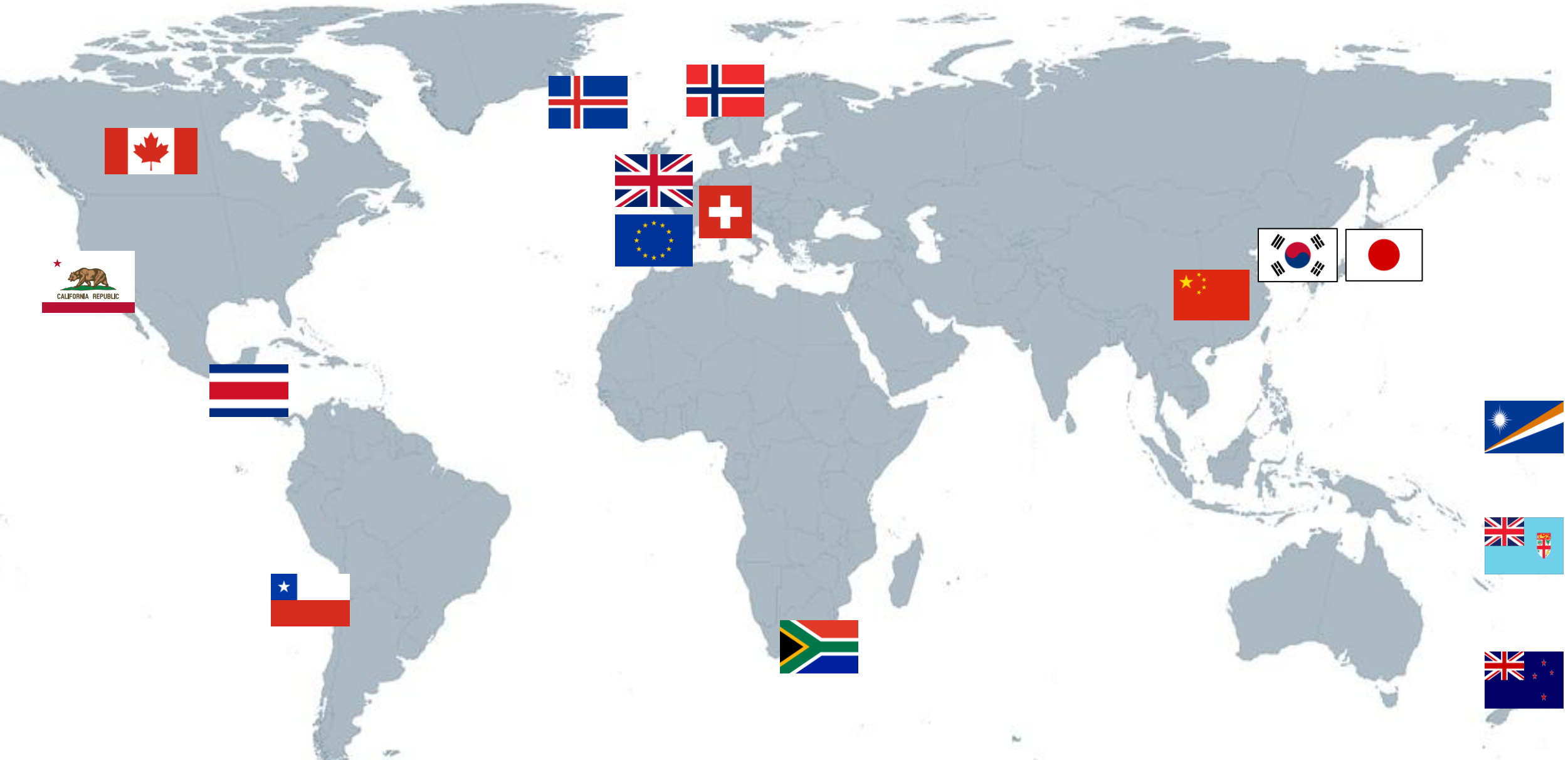
- Founded in 2000, headquartered in Brussels, Belgium
- Committed to promoting sustainable heating and cooling technologies
- Small – medium – large size companies
- Members from three continents: Europe, Asia, North America
- Over 200,000 direct employees, over €30bn turnover, production throughout Europe
- More about sustainable heating and cooling technologies here: www.countoncooling.eu



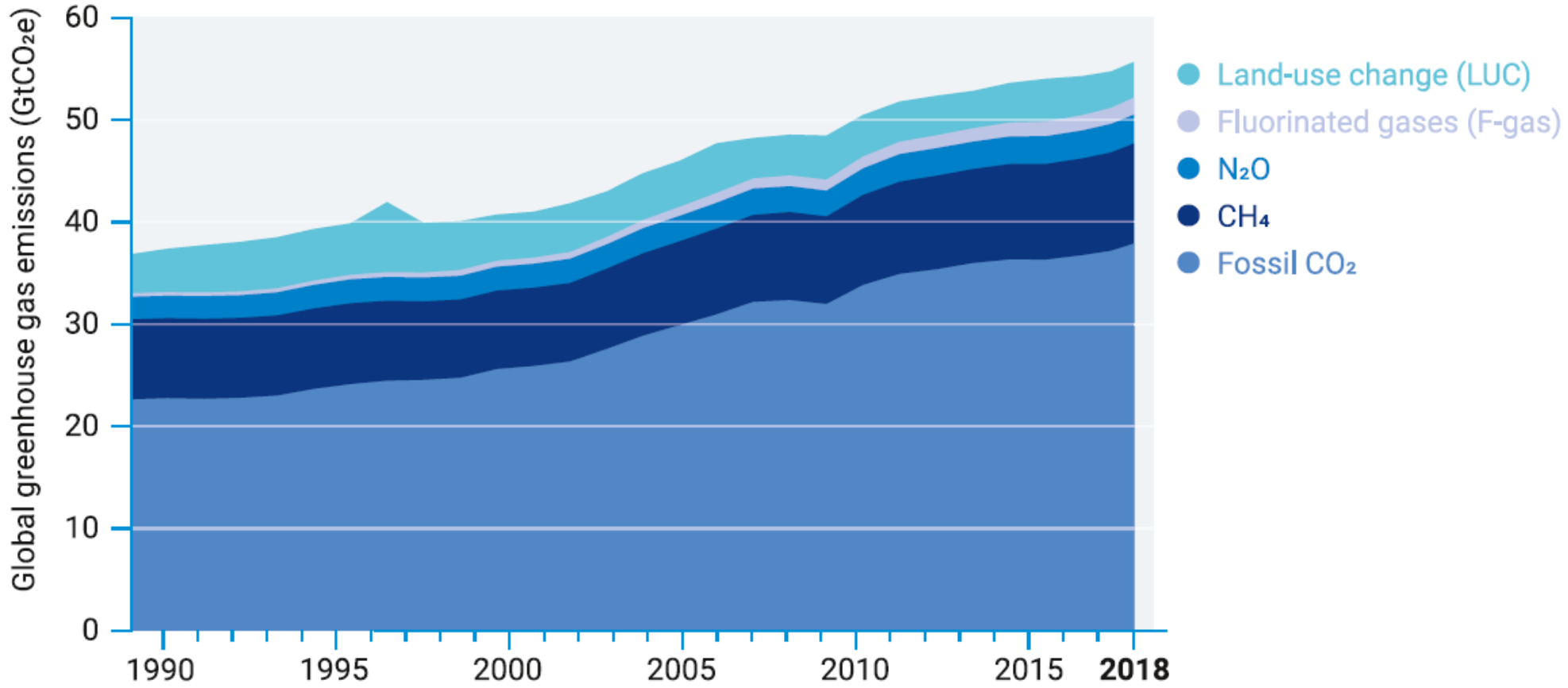
Setting the scene

WHY IT IS IMPORTANT TO ACT ON ENERGY

Carbon Neutrality: already a goal of several major economies



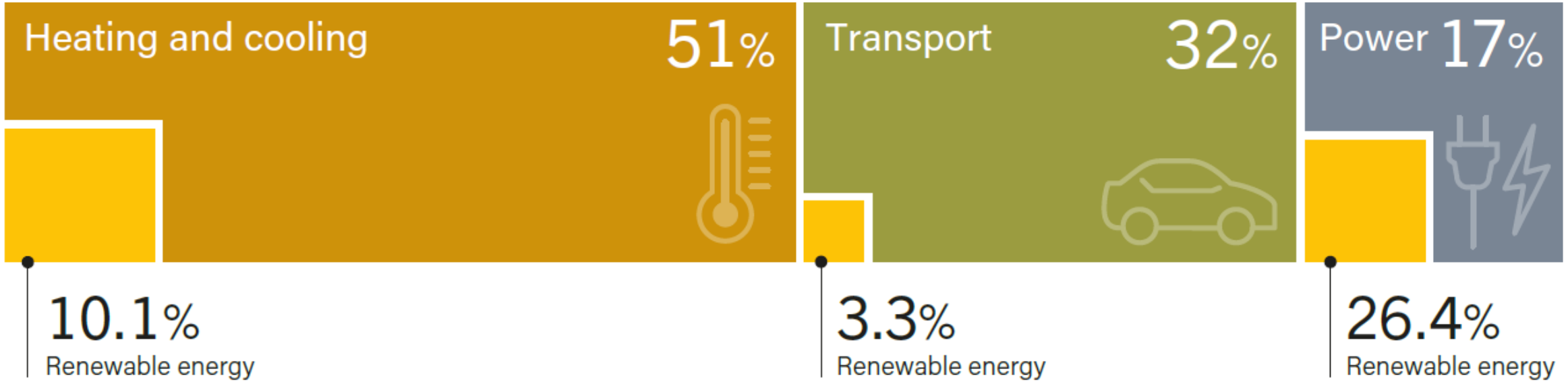
How to get there: Energy related CO2 emissions top the agenda



Source: Emissions Gap Report 2019, UN Environment

Three main areas that need to be addressed

Renewable Share of Total Final Energy Consumption, by Final Energy Use, 2017

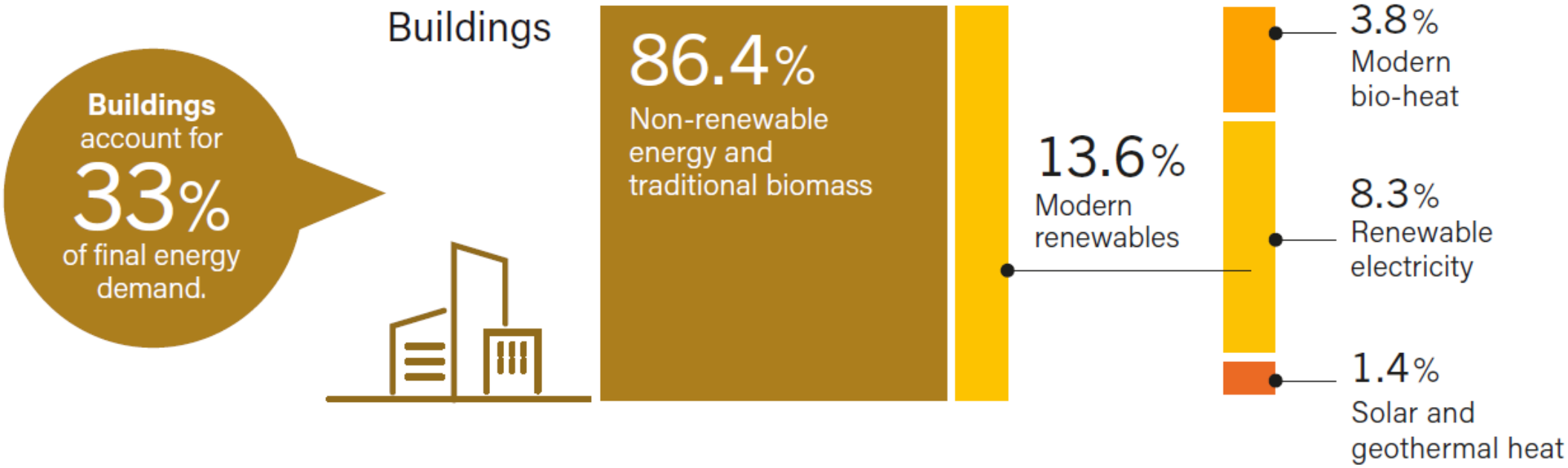


Note: Data should not be compared with previous years because of revisions due to improved or adjusted methodology.

Source: Based on IEA data.

Buildings play a key role: heating, cooling, hot water …

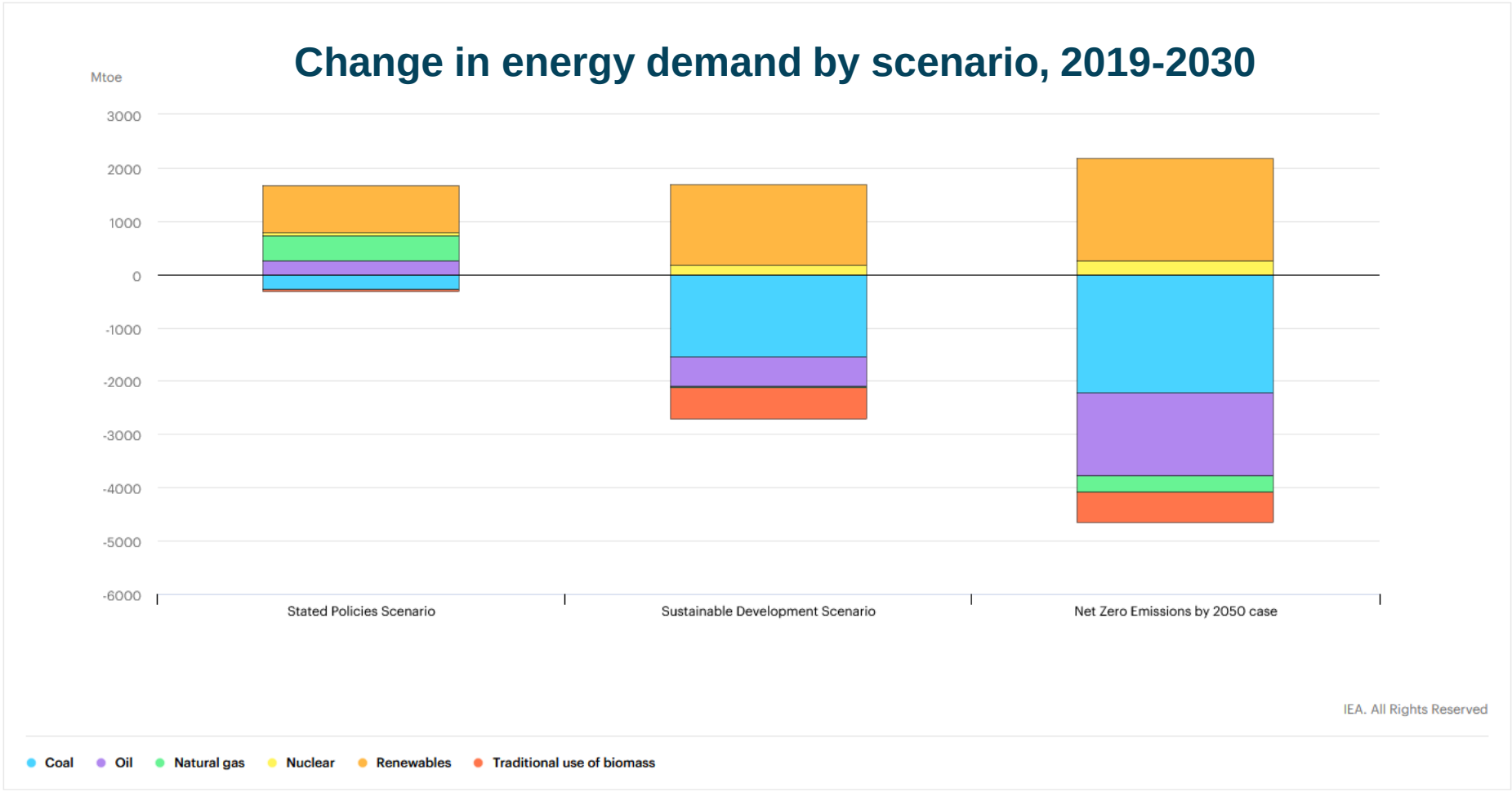
Renewable Share of Total Final Energy Consumption in Buildings, 2017



Note: Modern bio-heat includes heat supplied by district energy networks.
Totals may not add up due to rounding.

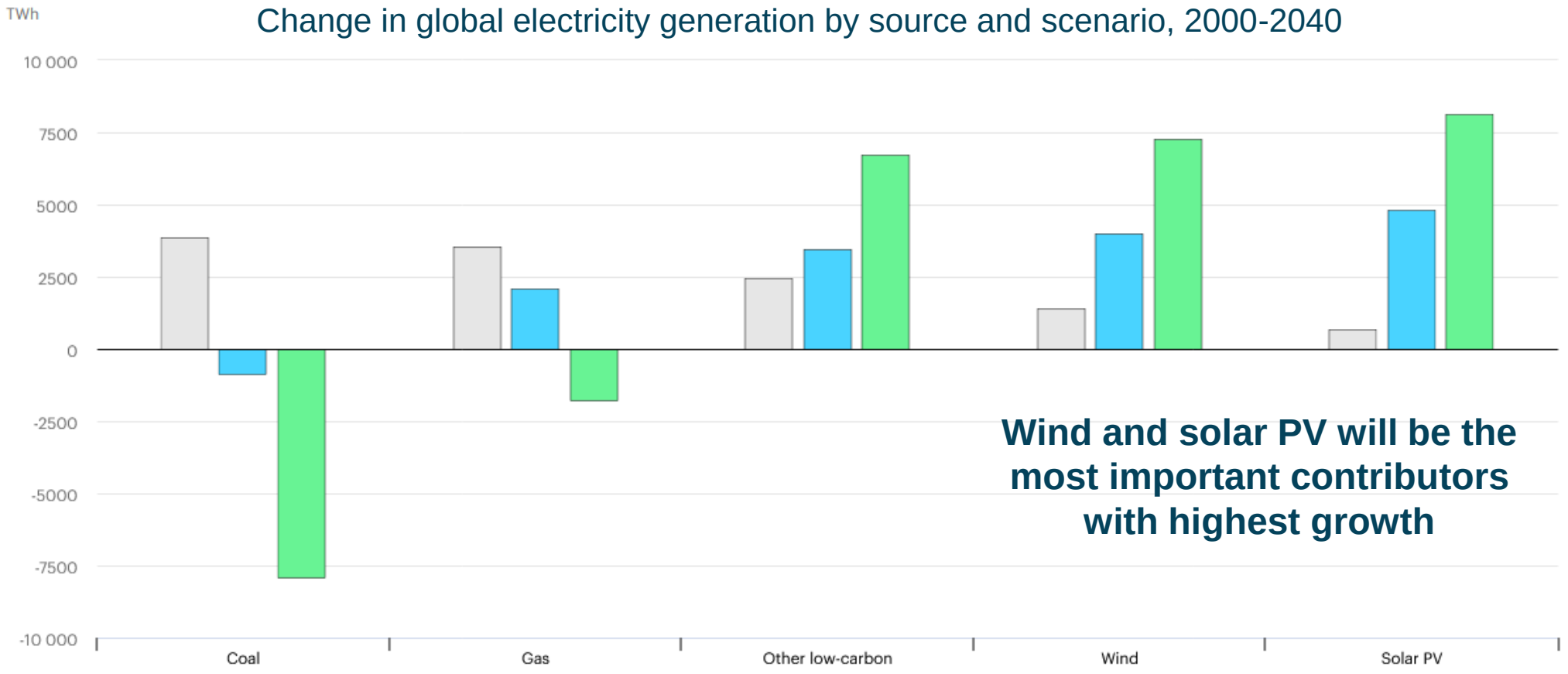
Source: Based on IEA data.

More Energy Efficiency – More Renewables

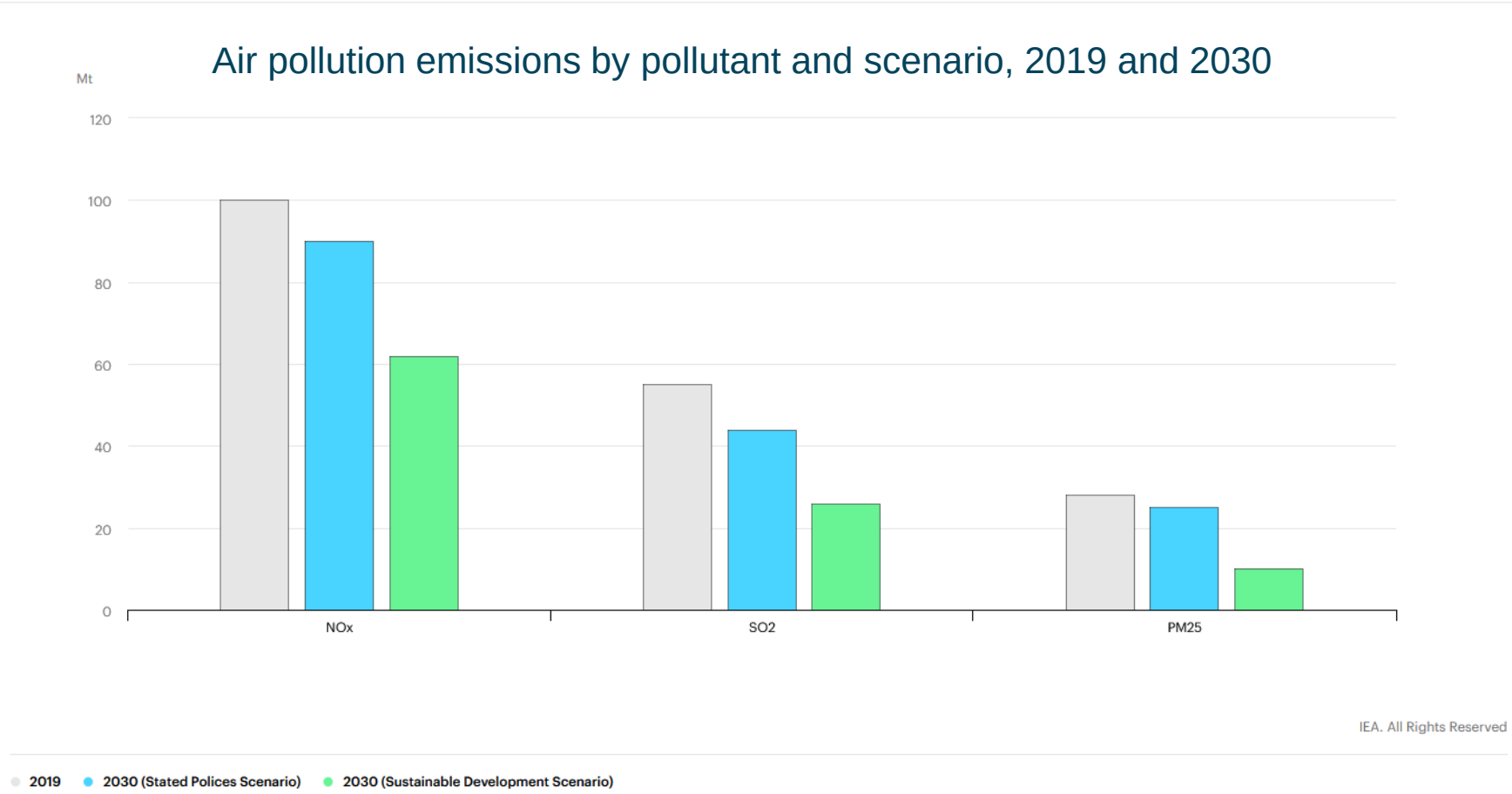


- Primary energy demand in the NZE2050 **falls by 17% between 2019 and 2030**, to a level similar to 2006, even though the global economy is twice as large.
- **Electrification, efficiency gains and behaviour changes** are central to achieving this.
- **Coal demand falls by almost 60%** over this period to a level last seen in the 1970s.

Greening the Power Mix will require more flexibility



Benefits go far beyond energy only



In 2018, air pollution from burning fossil fuels was responsible for:*

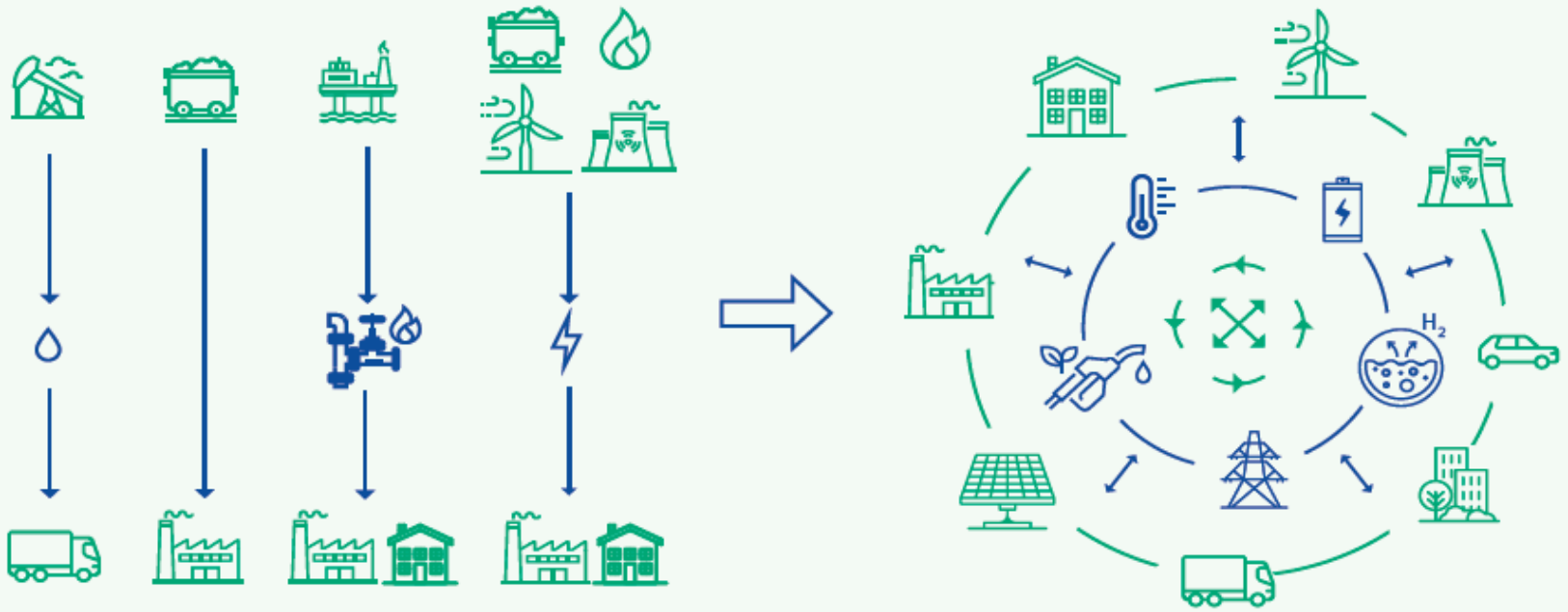
- 4.5 million deaths
- 1.8 billion days of work absence
- 4 million new cases of child asthma
- 2 million preterm births
- Economic costs of 2.9 trillion USD

**Source: Centre for research on energy and clean air*

Time to connect the dots: Energy System Integration

The energy system today : linear and wasteful flows of energy, in one direction only

Future EU integrated energy system : energy flows between users and producers, reducing wasted resources and money

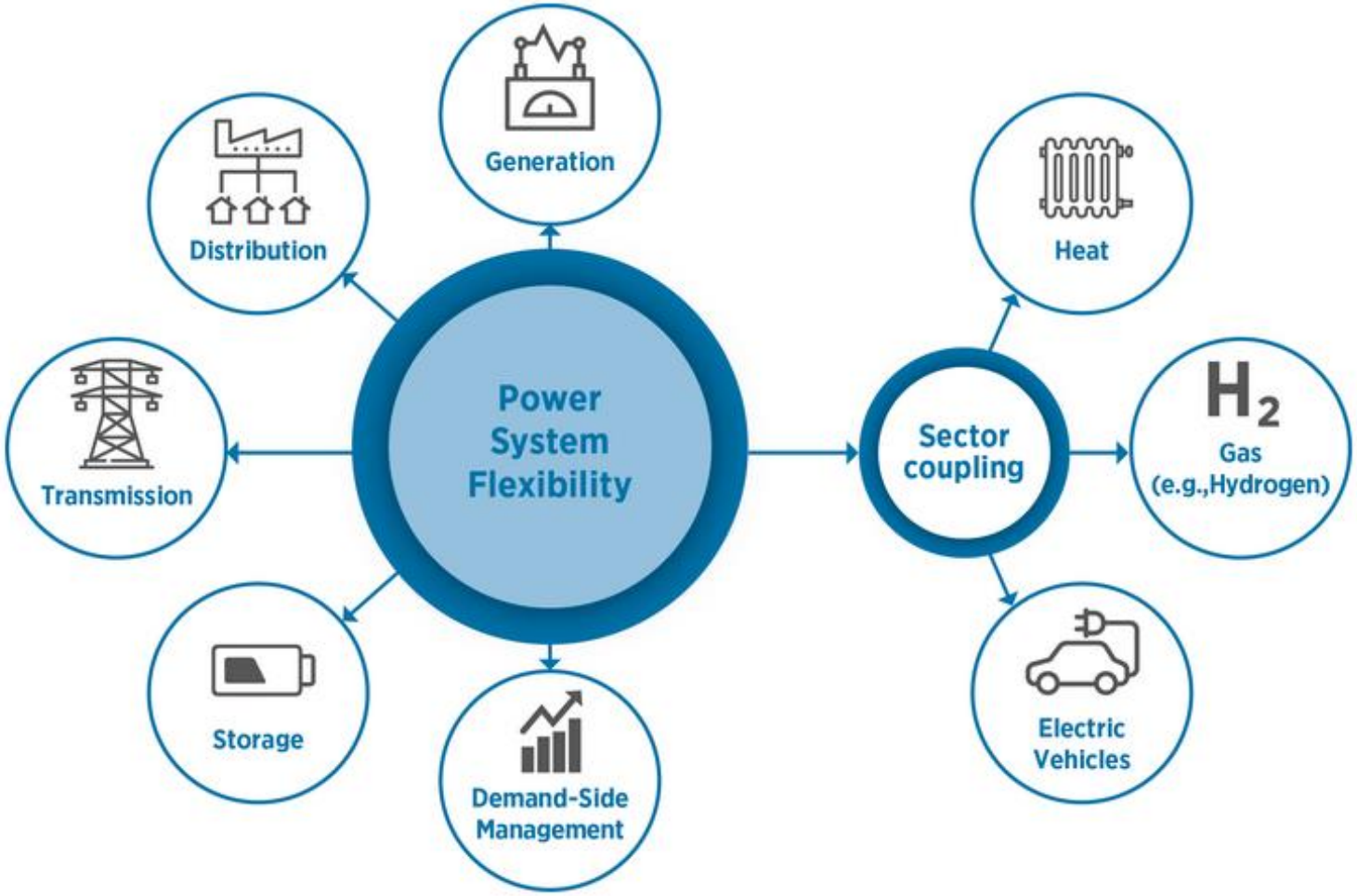


1. A more efficient and circular system where **waste energy** is captured and re-used

2. A cleaner power system with more **direct electrification** of end use sectors such as industry, heating of buildings and transport

3. A **cleaner fuel system** for hard to electrify sectors such as heavy industry or transport

Emerging Trends for Heating and Cooling



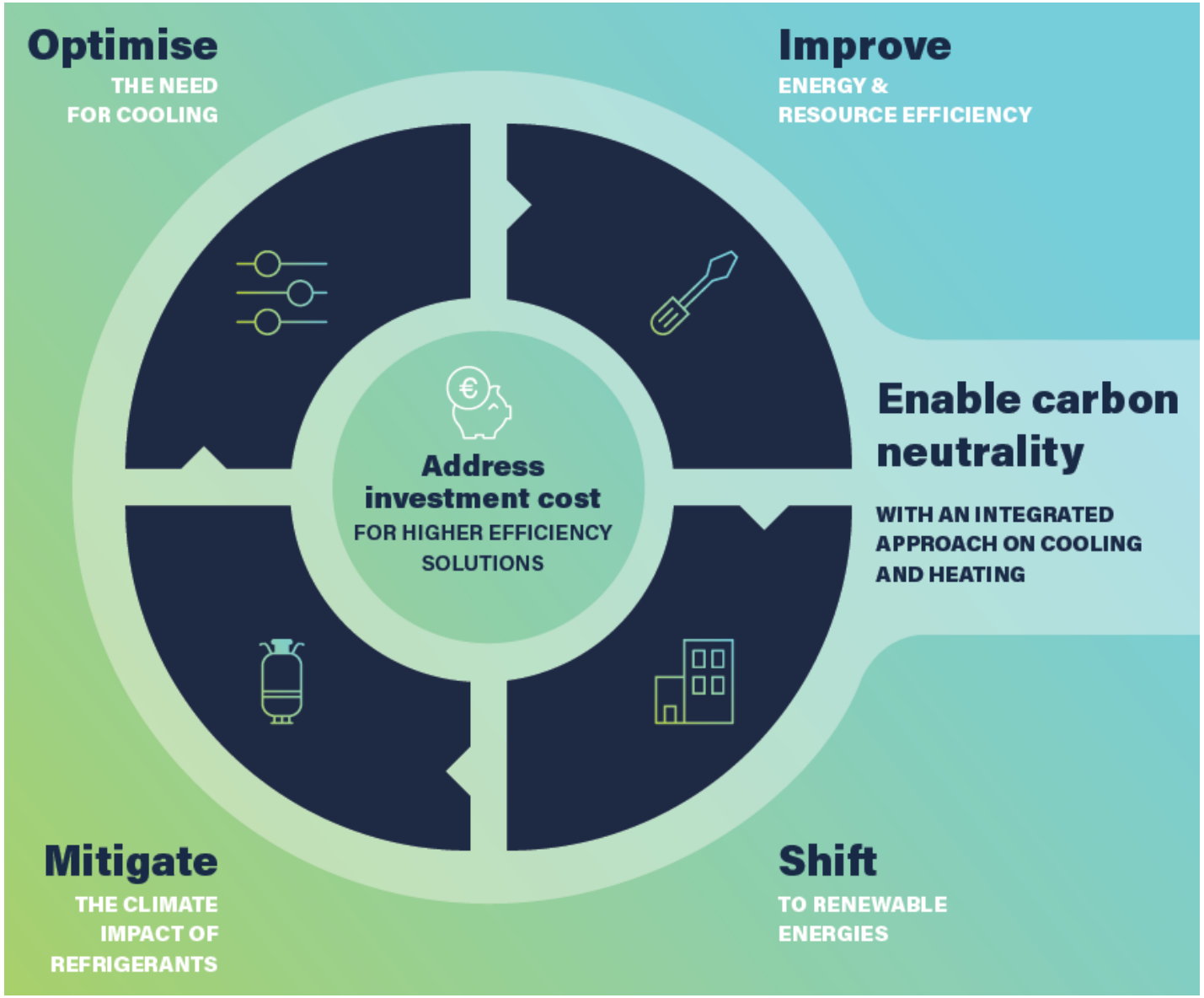
- Electrification of heating with heat pumps
- Providing demand side flexibility
- Increasing energy efficiency
- Increasing use of waste energy
- Providing thermal energy storage
- Contributing to behavioural change with digitalised solutions

Source: IRENA

Count On Cooling

EPEE‘S APPROACH TO SUSTAINABLE HEATING AND COOLING

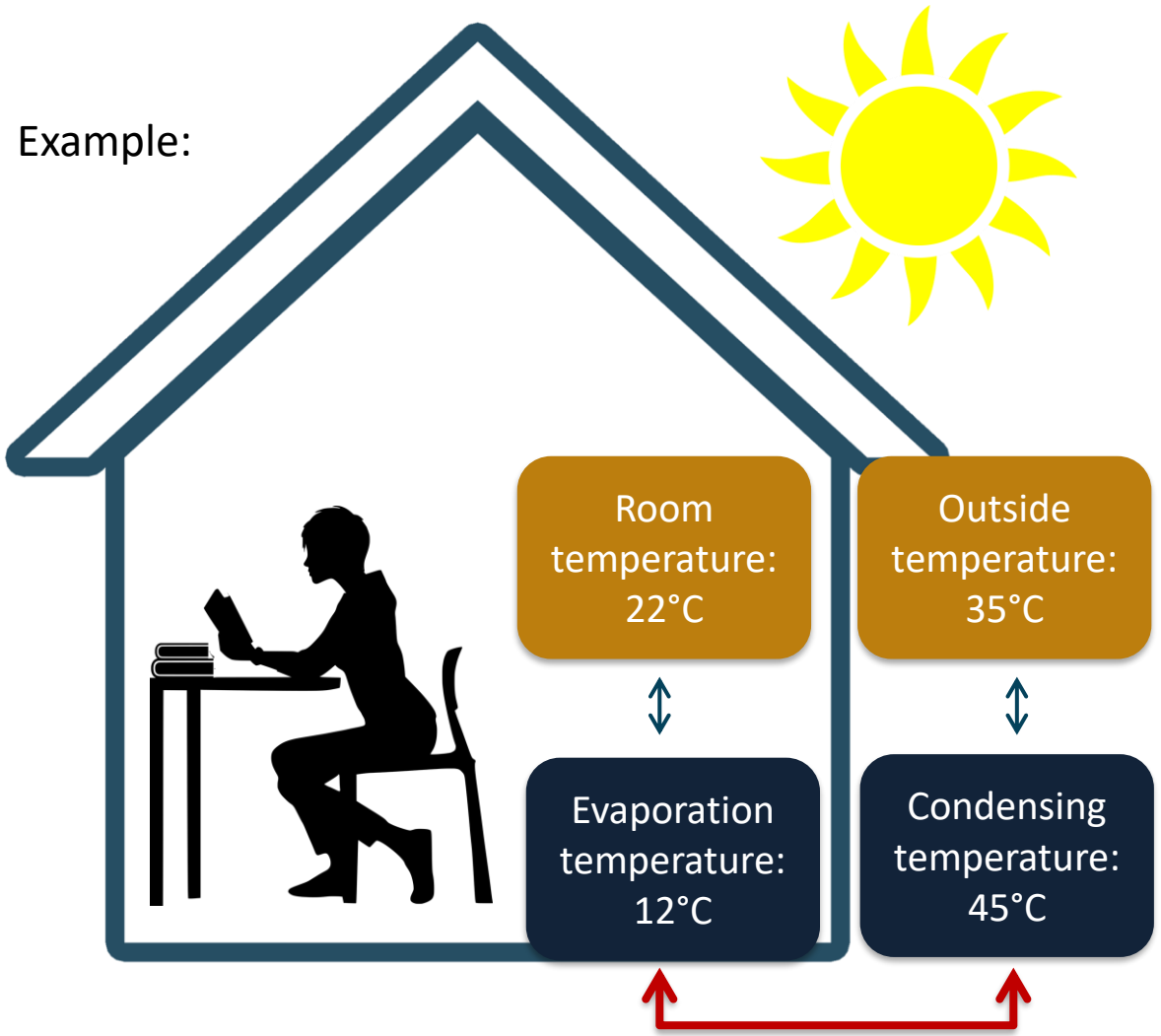
EPEE‘s approach to sustainable heating and cooling



For more detailed information on EPEE‘s 5 step approach, please check out www.countoncooling.eu

Understanding the basics of cooling efficiency

Example:



The higher the difference (temperature lift), the more energy will be consumed

What is the role of the temperature lift?

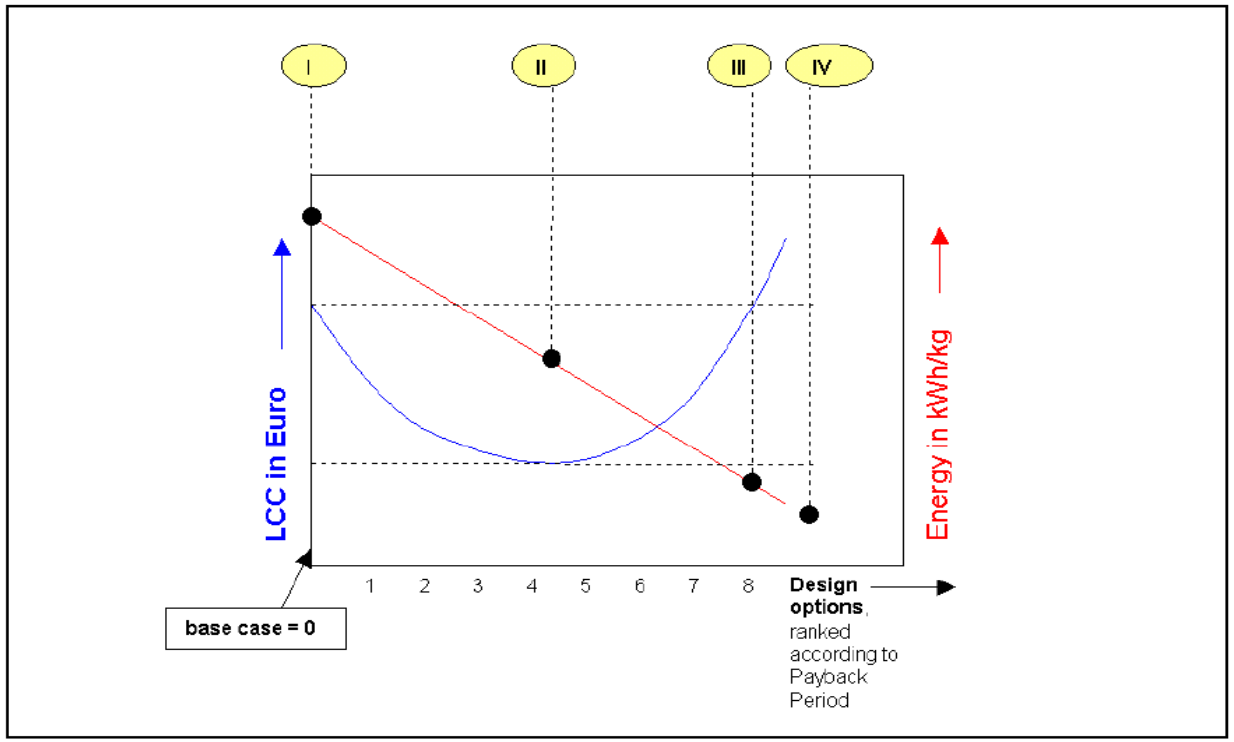
At the cold evaporation side, heat is removed (e.g. from a room to cool it down). At the hot condensing side, heat is released, i.e. to the outside air.

- ➔ The difference between these two temperature levels is called the **temperature lift**.
- ➔ The effort required to overcome that difference determines the efficiency of the process.
- ➔ High efficiency means that the temperature lift in the refrigeration cycle is as small as possible
- ➔ For every extra degree of temperature lift, the energy consumption can typcially increase by 2% to 4%

What influences directly the temperature lift?

- The outside and inside temperature levels
- The desired room temperature (set-point)
- The design and sizing of the equipment
- Service, maintenance, correct refrigerant charge
- Monitoring, Controls, BACS …

Ensuring product efficiency



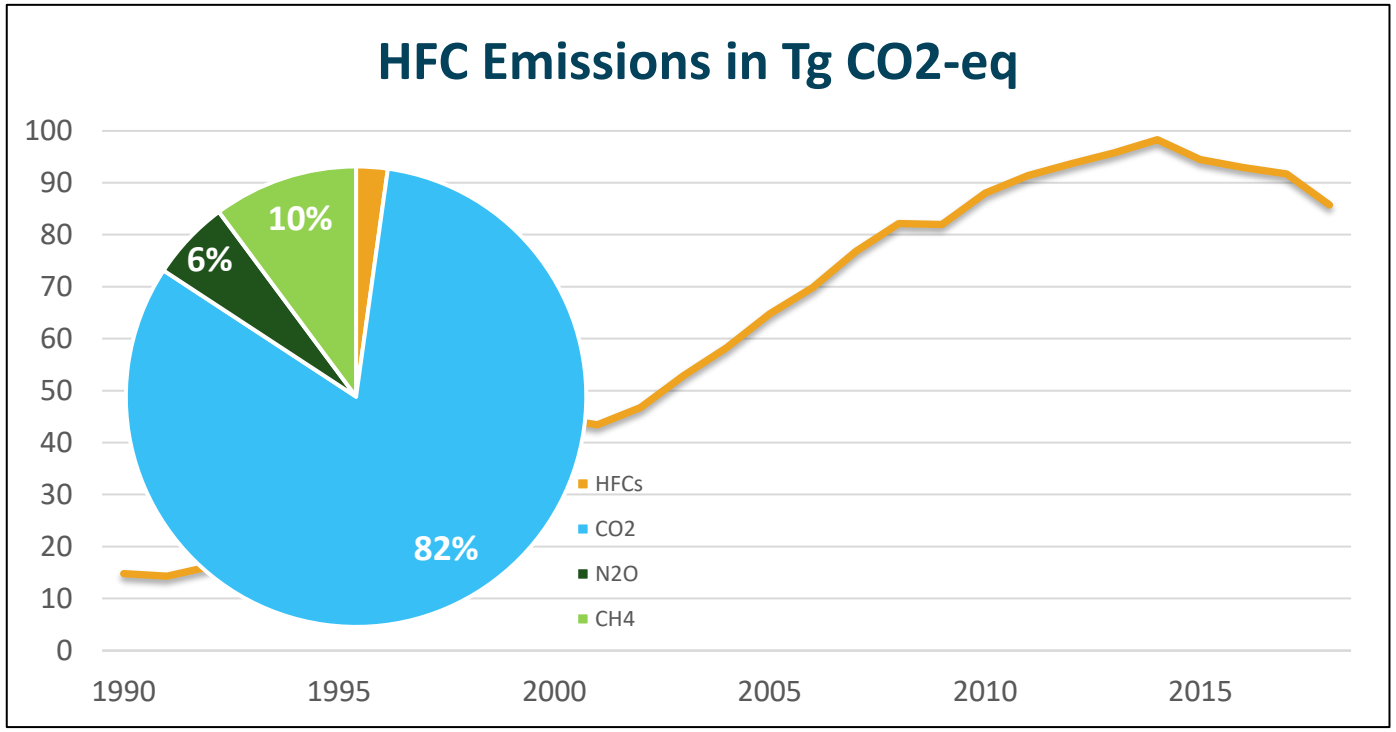
Archetype LCC curve: I = Base Case; II = LCC, III = no financial loss (break-even point); IV = BAT point

MEPS are important measures but represent only one part of the puzzle

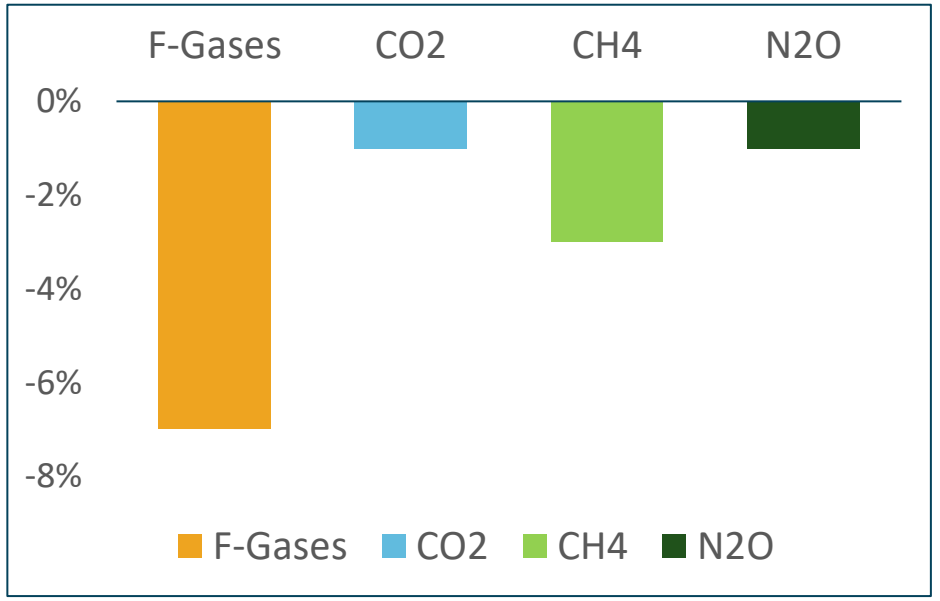
- **Minimum efficiency performance standards (MEPS)** are a well-known tool to reduce energy consumption of products.
- Lessons-learned from the EU Ecodesign Directive demonstrate that **Least Life Cycle Cost considerations** always needs to be part of the equation to ensure successful market transformation:
  - ➔ MEPS to be set at the point where the energy savings are highest and the increase of the purchase cost is lowest, i.e. at the lowest total cost of ownership (point II on the graph)
- **A transparent, inclusive and well-structured** stakeholder process and stringent enforcement rules are further essential success factors

Source: COWI, VHK: Methodology for Ecodesign of Energy-related Products, MEErP 2011, Methodology Report, Part 1: Methods

Refrigerants: the F-Gas Regulation in Europe works



Relative reduction in %
2018 vs. 2015



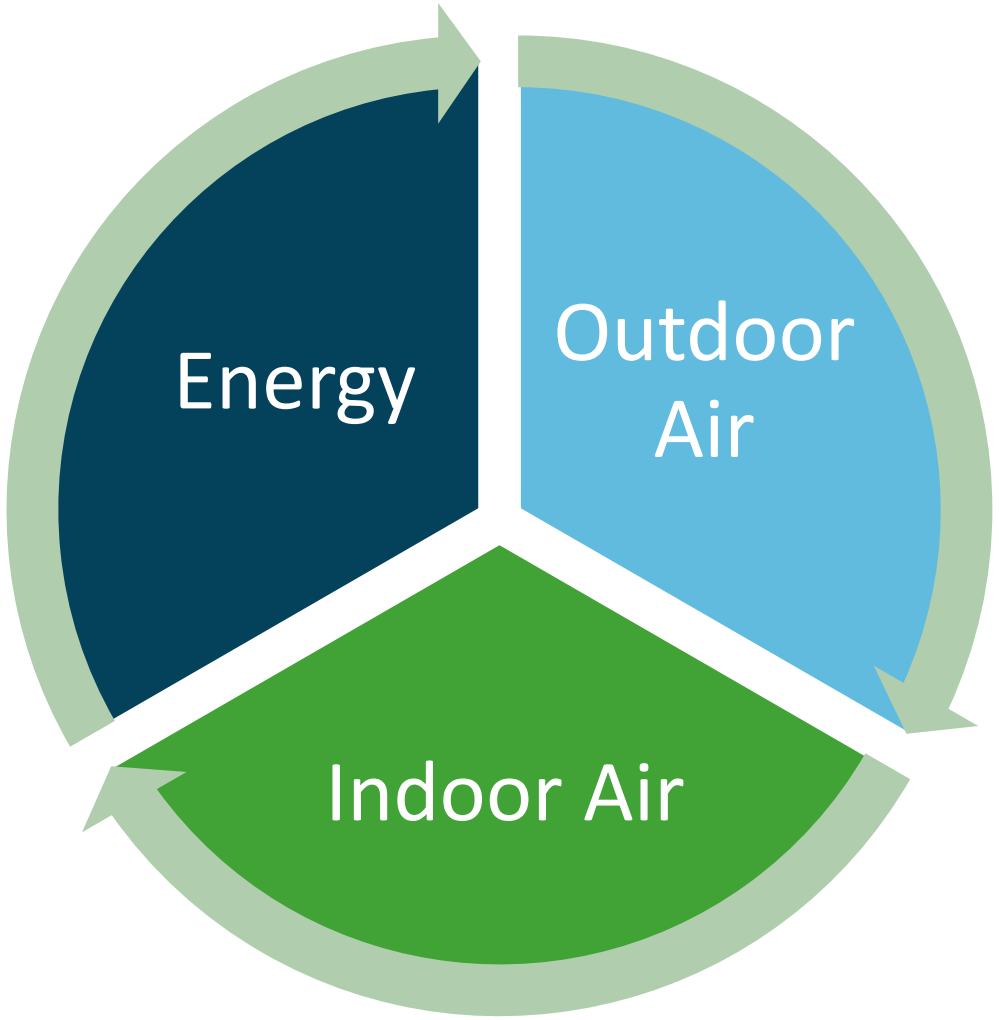
F-Gases are the only non-CO2 gases which have already achieved significant reductions since 2015

https://www.eea.europa.eu/themes/climate/eu-greenhouse-gas-inventory

Sustainable heating & Cooling: A win-win solution

Enabling the phase-out of fossil fuels by reducing and decarbonising energy use:

- ✓ **Energy efficiency:** design, sizing, monitoring & control (BACS), service & maintenance
- ✓ **System integration:** waste heat recovery, thermal energy use and storage, electrification of end use sectors (heating)
- ✓ **Centralised and decentralised solutions:** Heat pumps, solar PV, district networks
- ✓ **Connectivity and Consumers:** Demand side flexibility, Internet of Things (IoT)



Conclusions

Sustainable heating and cooling:

- A win-win solution for the health of people and the planet!
- Efficiency is a much broader concept than only based on the product itself.
- Systemic efficiency will be a critical success factor to reduce energy demand, achieve the energy transition and ultimately the Paris Agreement
- Affordability remains an essential success factor, especially in times of crisis.
- Policy can be an important driver but needs to be grounded in reality, allowing the freedom for industry to innovate and adapt to new challenges
- Many technologies are readily available. Now they need to be deployed.

Let's make it happen!
#CountOnCooling

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