THE ROLE OF ENERGY EFFICIENCY – GLOBAL VIEW

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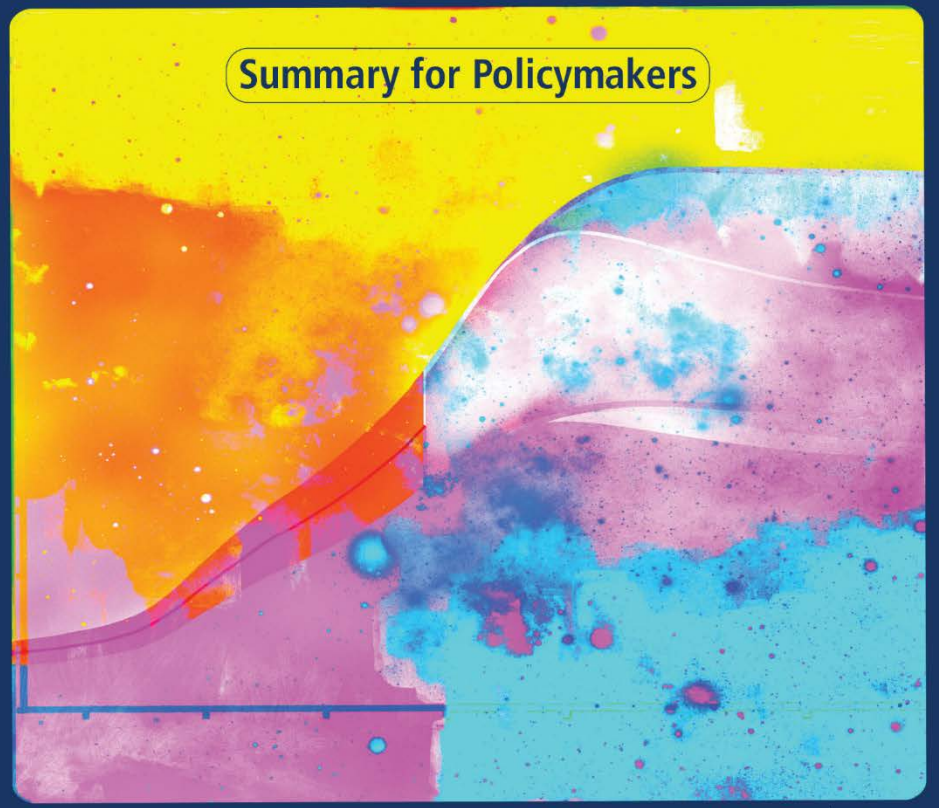
ipcc

INTERGOVERNMENTAL PANEL ON climate change

Global Warming of 1.5°C

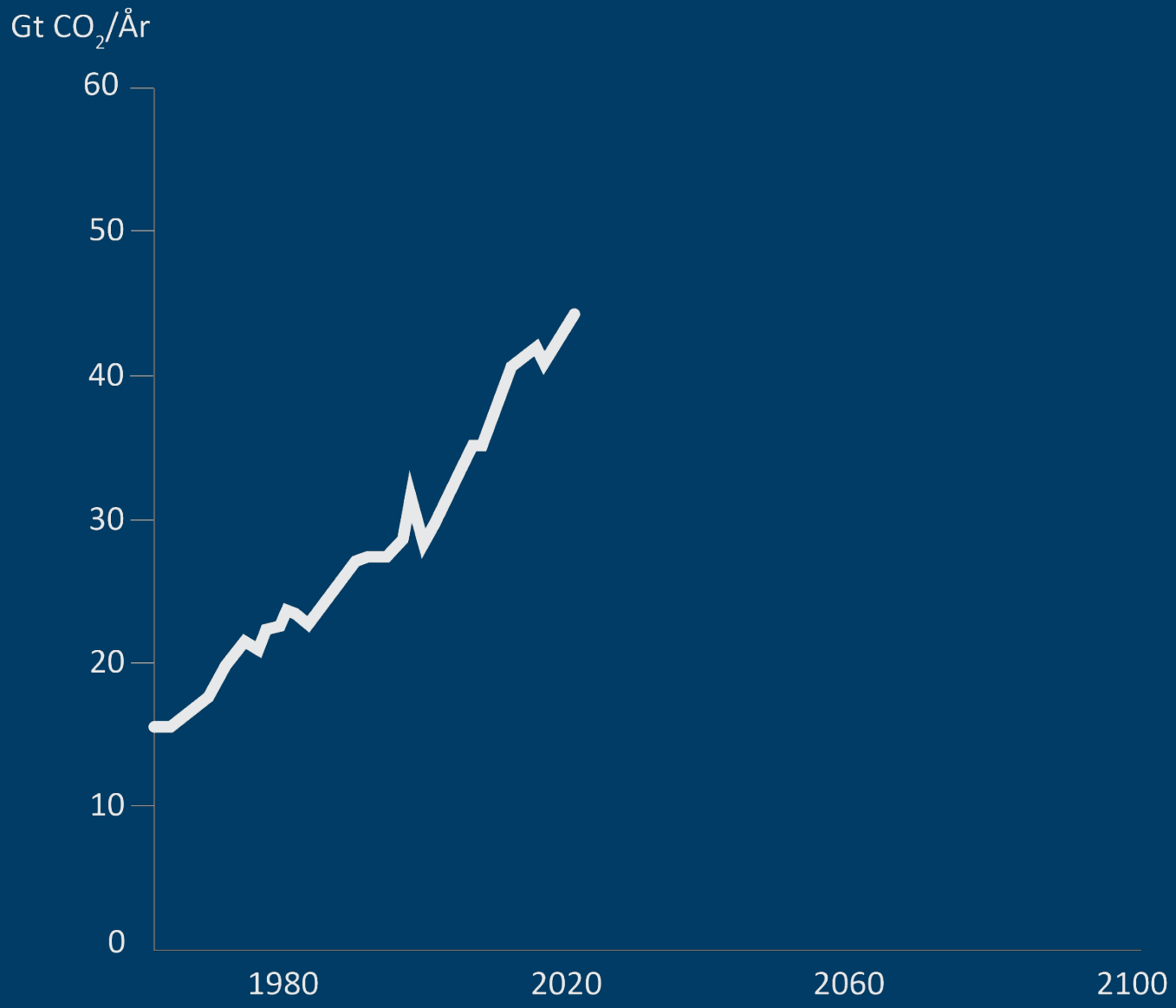
An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty



WG I WG II WG III

WMO UNEP

1,5 ^{O}C
IPCC



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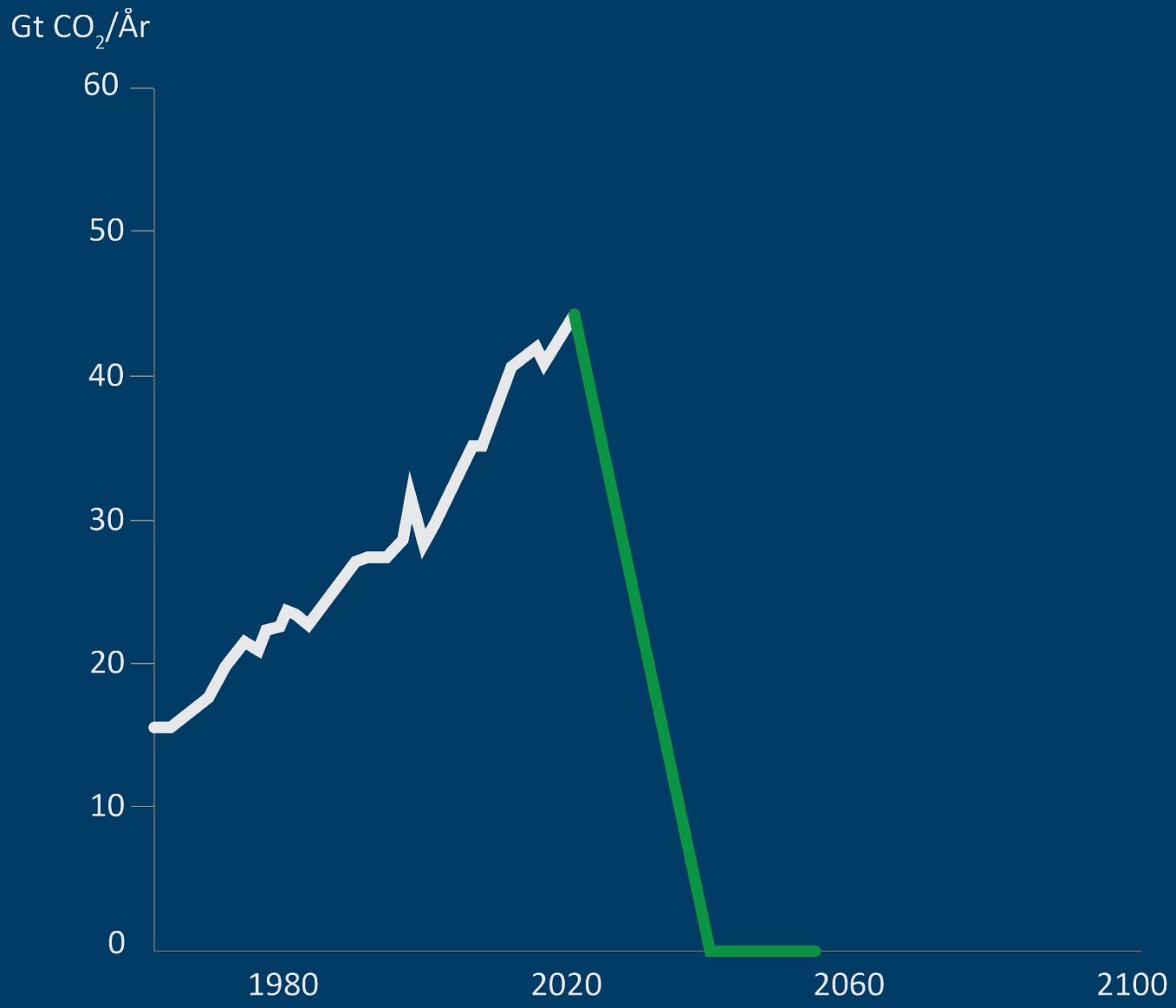
1,5 °C
IPCC



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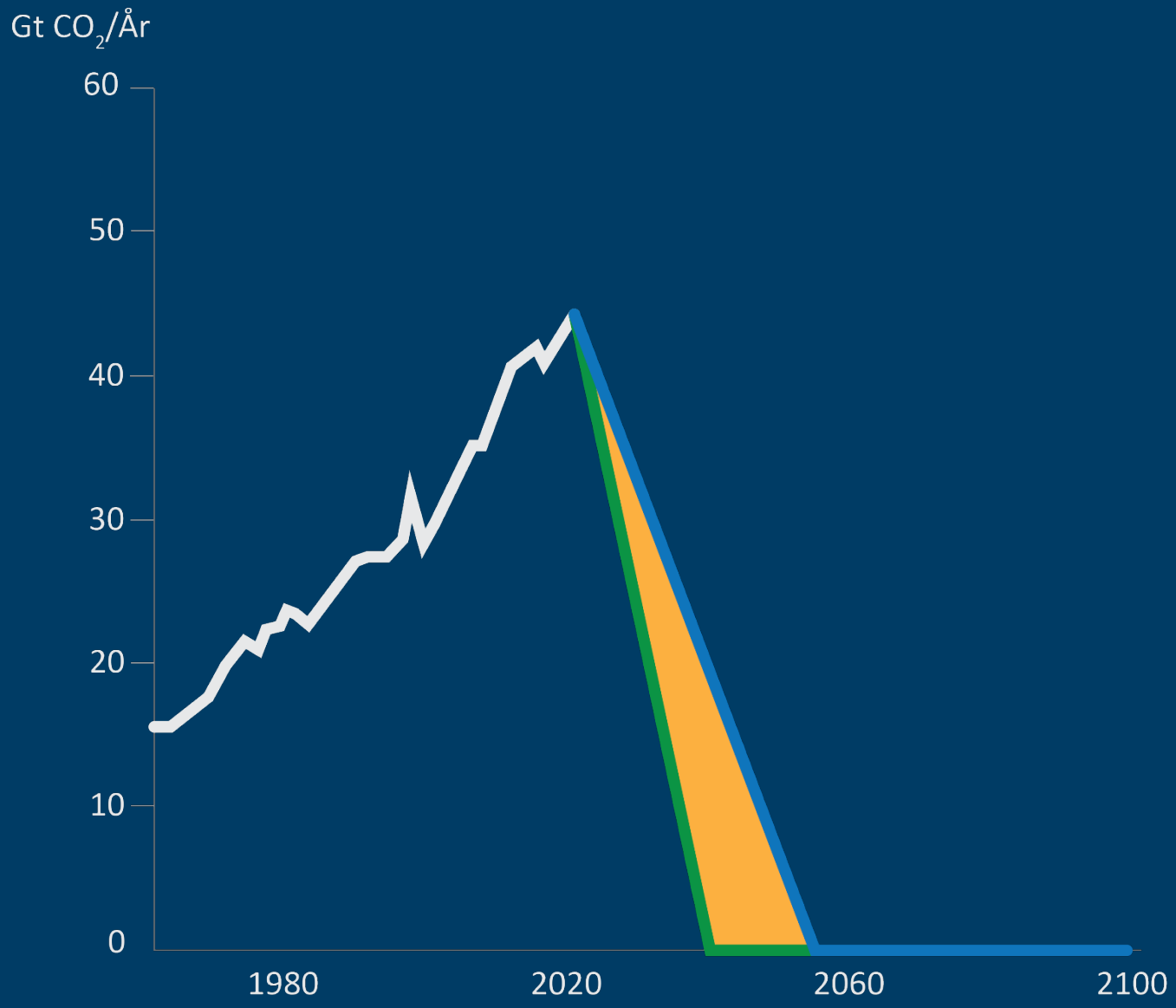
1,5 °C
IPCC



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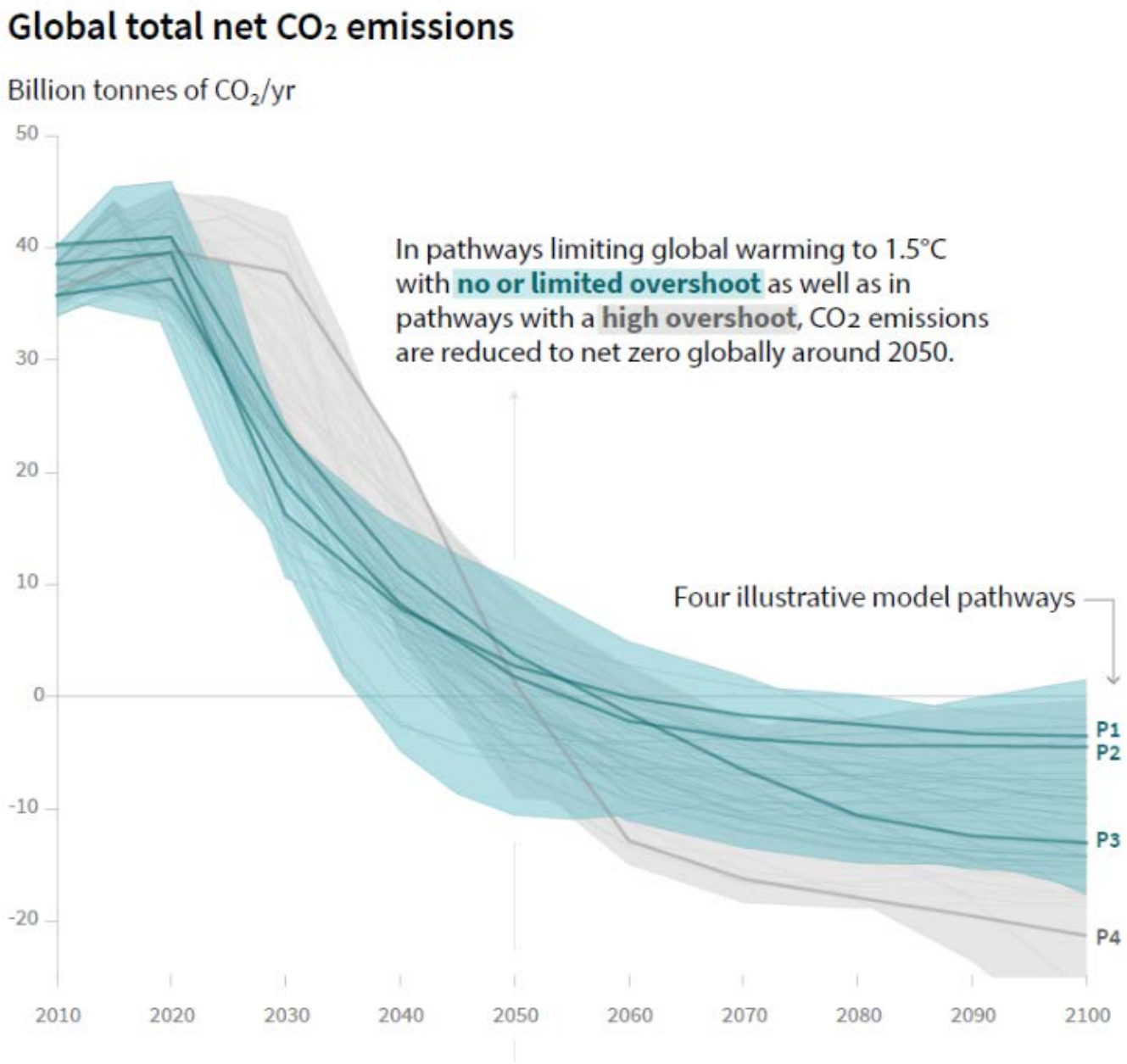
IPCC – Illustrative pathways



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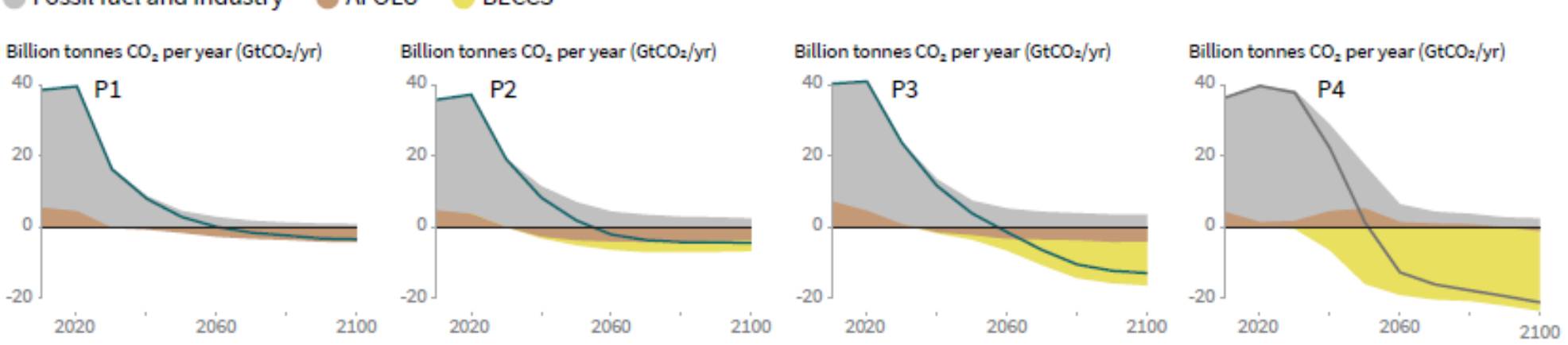
IPCC – Illustrative pathways

Breakdown of contributions to global net CO_2 emissions in four illustrative model pathways



P1: A scenario in which social, business, and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A down-sized energy system enables rapid decarbonisation of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

Global indicators	P1	P2	P3	P4	Interquartile range
Pathway classification	No or low overshoot	No or low overshoot	No or low overshoot	High overshoot	No or low overshoot

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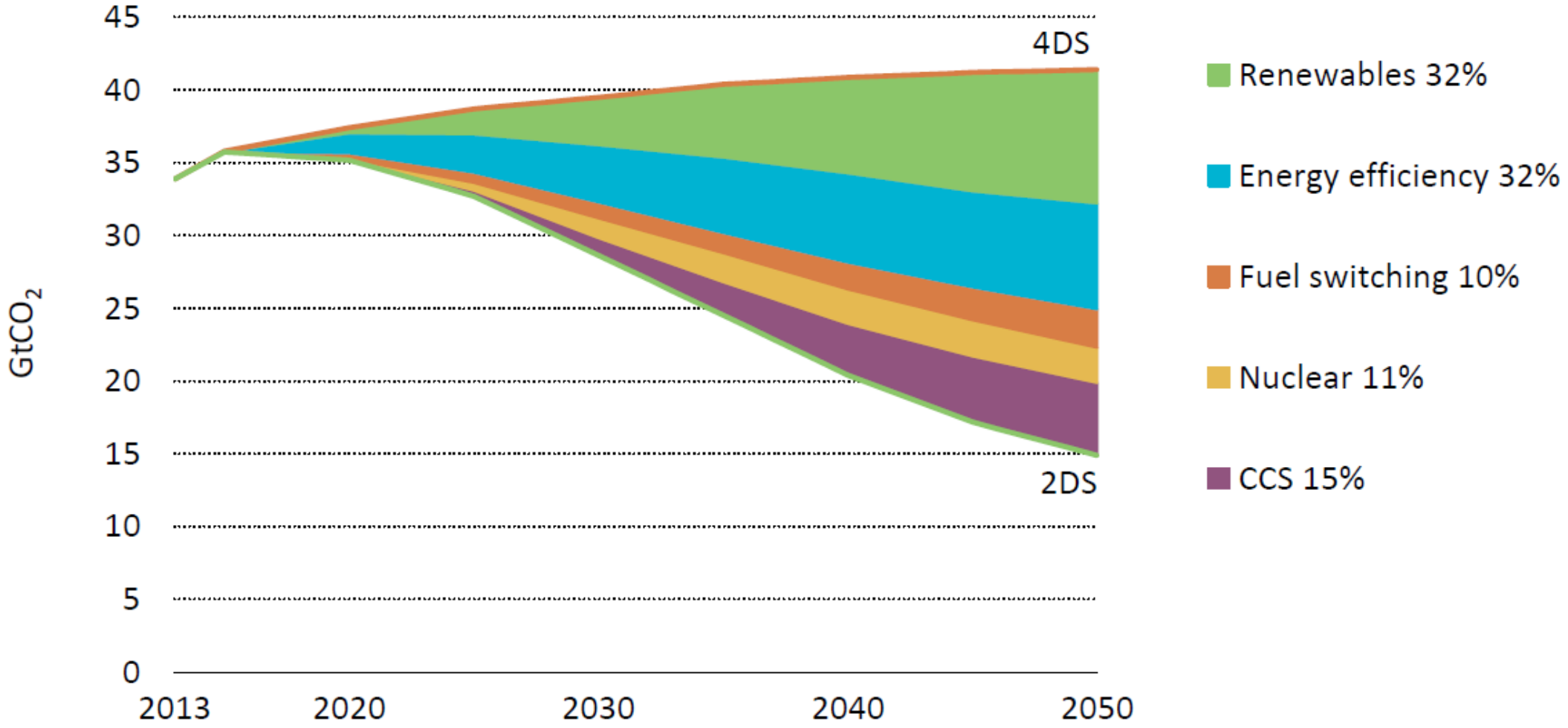
Pathway classification	No or low overshoot	No or low overshoot	No or low overshoot	High overshoot	No or low overshoot
CO_2 emission change in 2030 (% rel to 2010)	-58	-47	-41	4	(-59,-40)
↳ in 2050 (% rel to 2010)	-93	-95	-91	-97	(-104,-91)
Kyoto-GHG emissions in 2030 (% rel to 2010)*	-50	-49	-35	-2	(-55,-38)
↳ in 2050 (% rel to 2010)	-82	-89	-78	-80	(-93,-81)
*Final energy demand** in 2030 (% rel to 2010)*	-15	-5	17	39	(-12, 7)
↳ in 2050 (% rel to 2010)	-32	2	21	44	(-11, 22)
Renewable share in electricity in 2030 (%)	60	58	48	25	(47, 65)
↳ in 2050 (%)	77	81	63	70	(69, 87)
Primary energy from coal in 2030 (% rel to 2010)	-78	-61	-75	-59	(-78, -59)
↳ in 2050 (% rel to 2010)	-97	-77	-73	-97	(-95, -74)
from oil in 2030 (% rel to 2010)	-37	-13	-3	86	(-34,3)
↳ in 2050 (% rel to 2010)	-87	-50	-81	-32	(-78,-31)
from gas in 2030 (% rel to 2010)	-25	-20	33	37	(-26,21)
↳ in 2050 (% rel to 2010)	-74	-53	21	-48	(-56,6)
from nuclear in 2030 (% rel to 2010)	59	83	98	106	(44,102)
↳ in 2050 (% rel to 2010)	150	98	501	468	(91,190)
from biomass in 2030 (% rel to 2010)	-11	0	36	-1	(29,80)
↳ in 2050 (% rel to 2010)	-16	49	121	418	(123,261)
from non-biomass renewables in 2030 (% rel to 2010)	430	470	315	110	(243,438)
↳ in 2050 (% rel to 2010)	832	1327	878	1137	(575,1300)
Cumulative CCS until 2100 ($GtCO_2$)	0	348	687	1218	(550, 1017)
↳ of which BECCS ($GtCO_2$)	0	151	414	1191	(364, 662)
Land area of bioenergy crops in 2050 (million hectare)	22	93	283	724	(151, 320)
Agricultural CH_4 emissions in 2030 (% rel to 2010)	-24	-48	1	14	(-30,-11)

Contribution of technology area to global cumulative CO_2 reductions



IEA- 2015

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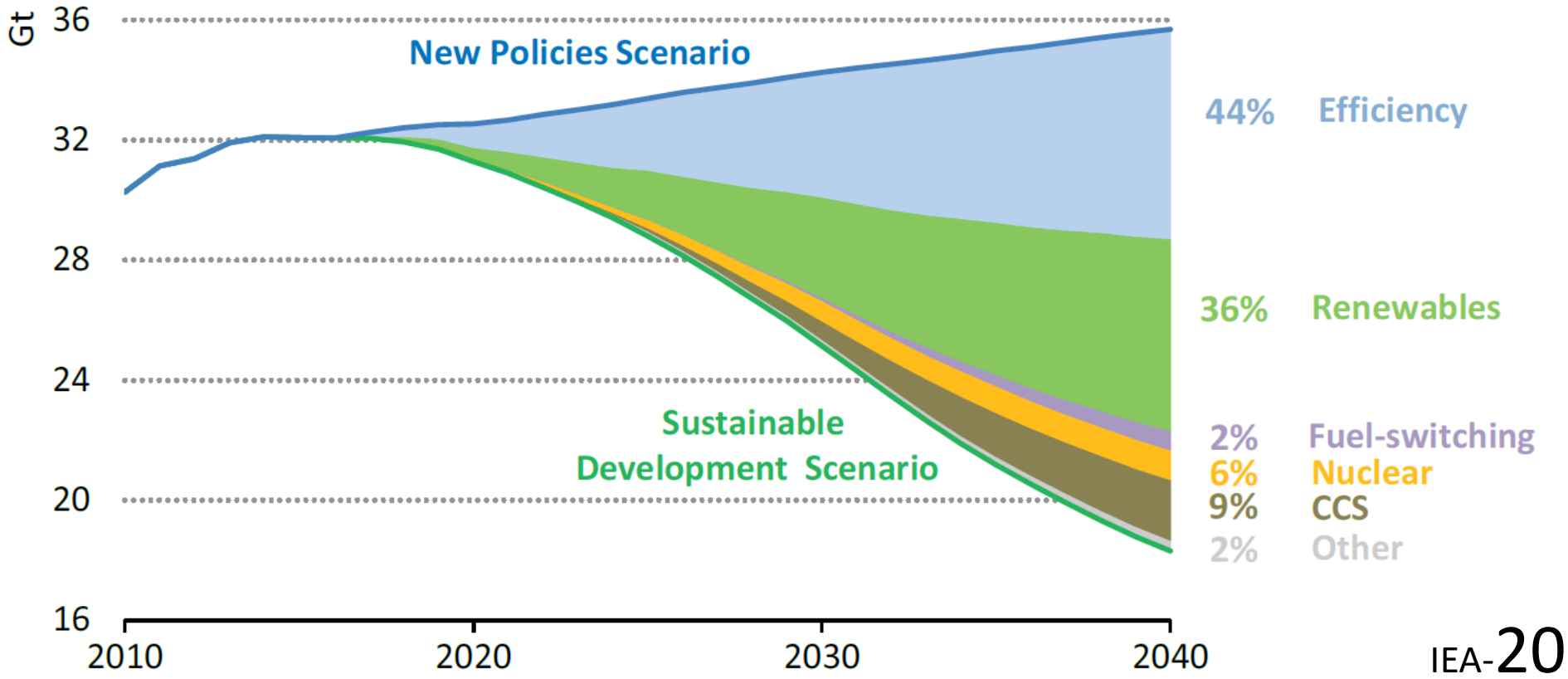
Efficiency, key enabler for climate neutrality

Figure 1.8 Global carbon dioxide (CO_2) emissions reductions in the WEO 2017 New Policies and Sustainable Development Scenarios



IEA-2018

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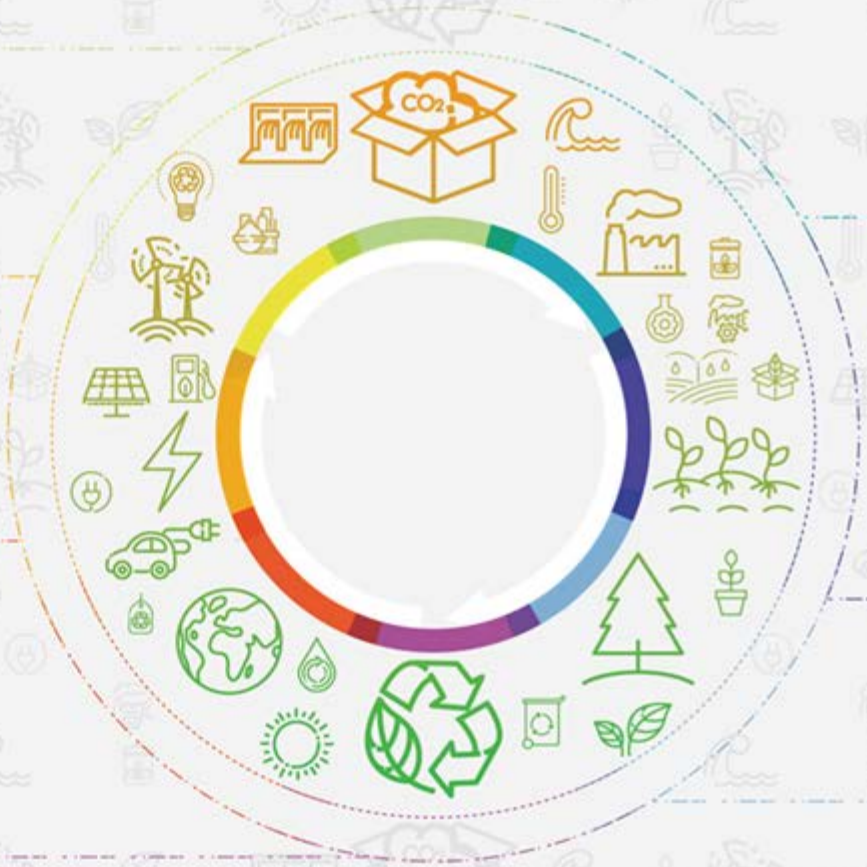
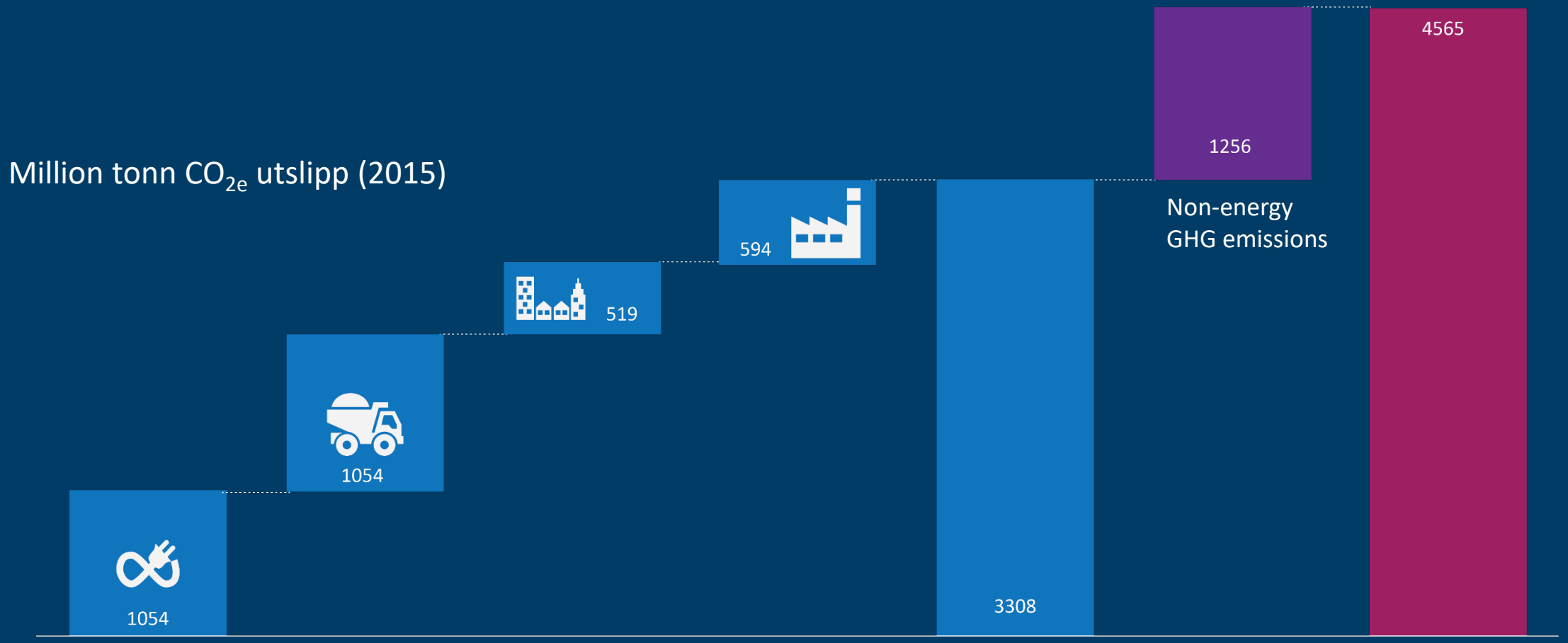
Reaching climate neutrality by 2050

A Clean Planet for all

A European strategic long term vision for a prosperous, modern, competitive and climate neutral economy



European emissions of GHG



Source: Eurelectric

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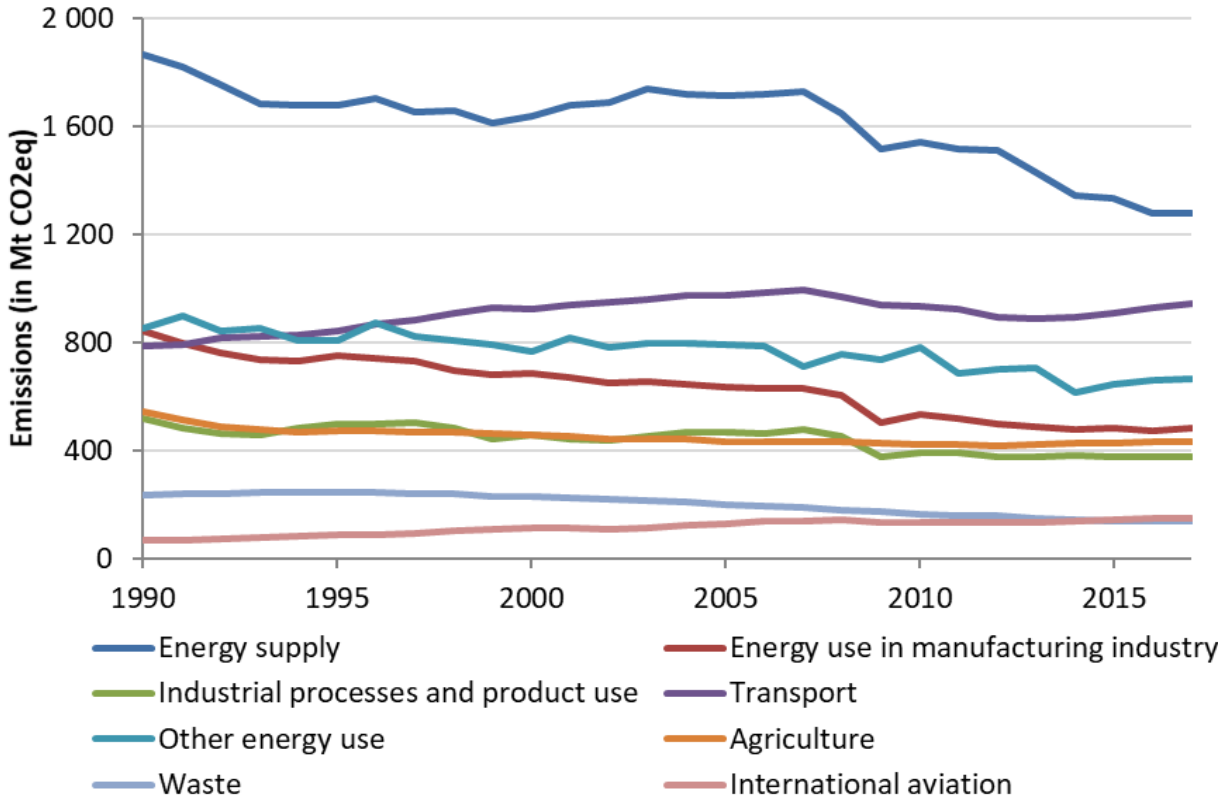
Europe Today

- GHG emissions -22% vs 1990
- Targets for 2030 (GHG, RES, EE) are agreed in EU law
- Full implementation implies around -45% GHG emissions in 2030 (vs. 1990)
- Without increasing ambition: -60% emissions in 2050



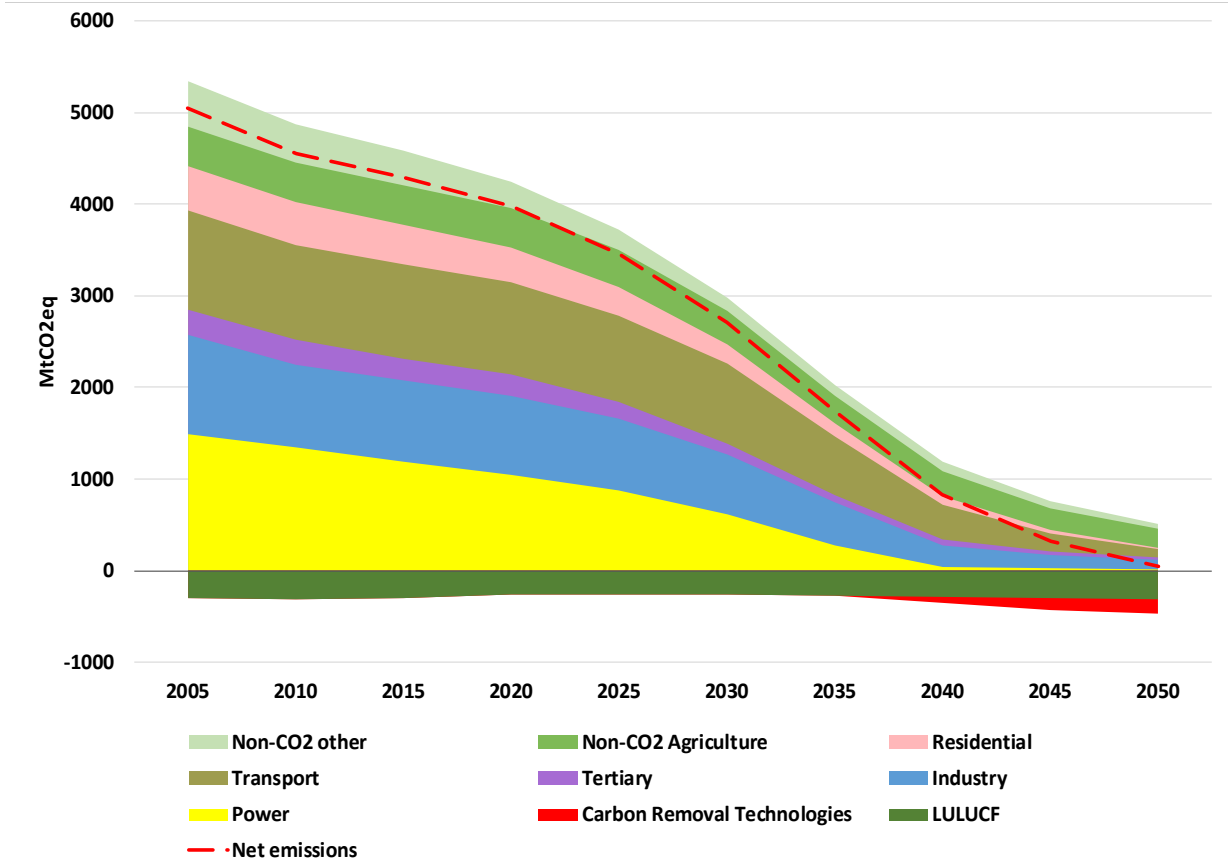
Analysed scenarios in line with Paris Agreement

Long Term Strategy Options

	Electrification (ELEC)	Hydrogen (H2)	Power-to-X (P2X)	Energy Efficiency (EE)	Circular Economy (CIRC)	Combination (COMBO)	1.5°C Technical (1.5TECH)	1.5°C Sustainable Lifestyles (1.5LIFE)
Main Drivers	Electrification in all sectors	Hydrogen in industry, transport and buildings	E-fuels in industry, transport and buildings	Pursuing deep energy efficiency in all sectors	Increased resource and material efficiency	Cost-efficient combination of options from 2°C scenarios	Based on COMBO with more BECCS, CCS	Based on COMBO and CIRC with lifestyle changes
GHG target in 2050	-80% GHG (excluding sinks) ["well below 2°C" ambition]					-90% GHG (incl. sinks)	-100% GHG (incl. sinks) ["1.5°C" ambition]	
Major Common Assumptions	• Higher energy efficiency post 2030 • Deployment of sustainable, advanced biofuels • Moderate circular economy measures • Digitilisation				• Market coordination for infrastructure deployment • BECCS present only post-2050 in 2°C scenarios • Significant learning by doing for low carbon technologies • Significant improvements in the efficiency of the transport system.			
Power sector	Power is nearly decarbonised by 2050. Strong penetration of RES facilitated by system optimization (demand-side response, storage, interconnections, role of prosumers). Nuclear still plays a role in the power sector and CCS deployment faces limitations.							
Industry	Electrification of processes	Use of H2 in targeted applications	Use of e-gas in targeted applications	Reducing energy demand via Energy Efficiency	Higher recycling rates, material substitution, circular measures	Combination of most Cost-efficient options from "well below 2°C" scenarios with targeted application (excluding CIRC)	COMBO but stronger	CIRC+COMBO but stronger
Buildings	Increased deployment of heat pumps	Deployment of H2 for heating	Deployment of e-gas for heating	Increased renovation rates and depth	Sustainable buildings			CIRC+COMBO but stronger
Transport sector	Faster electrification for all transport modes	H2 deployment for HDVs and some for LDVs	E-fuels deployment for all modes	• Increased modal shift • Electrification as in ELEC	Mobility as a service			• CIRC+COMBO but stronger • Alternatives to air travel
Other Drivers		H2 in gas distribution grid	E-gas in gas distribution grid				Limited enhancement natural sink	• Dietary changes • Enhancement natural sink

All sectors have to contribute

GHG emissions trajectory in a 1.5°C scenario



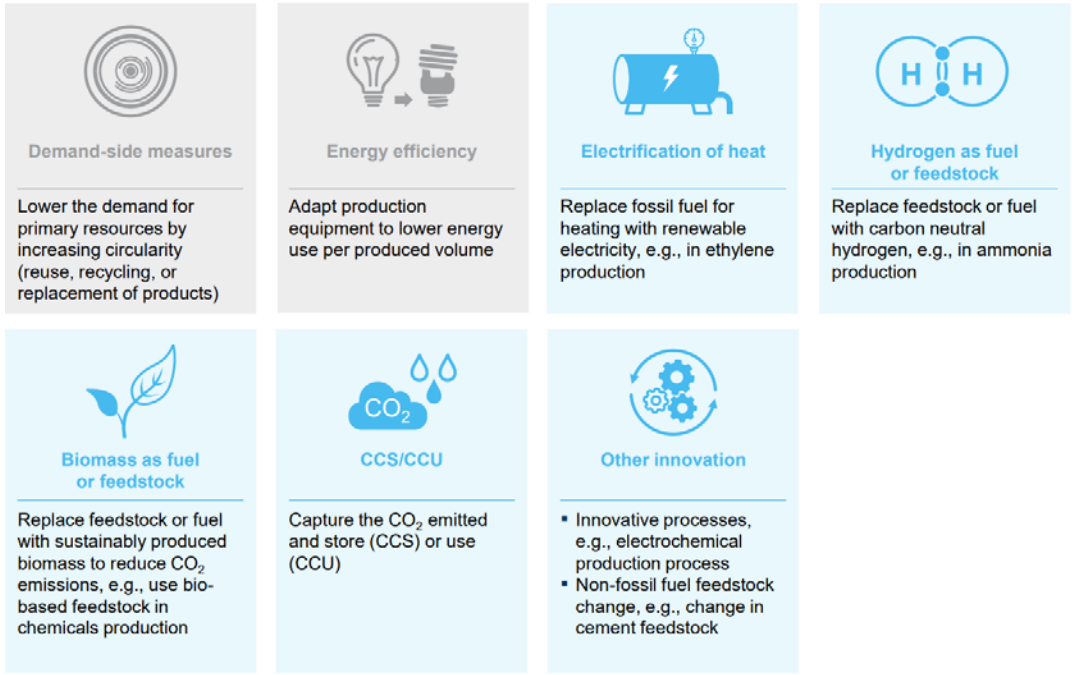
7 Building Blocks

1. Energy efficiency
2. Deployments of renewables
3. Clean, safe & connected mobility
4. Competitive industry and circular economy
5. Infrastructure and inter-connections
6. Bio-economy and natural carbon sinks
7. Tackle remaining emissions with carbon capture and storage

Changes in final energy consumption (2050 vs. 2005)

Achieving long term decarbonisation goals in industry

- The -80% ambition can be achieved even with currently existing technologies, which need to be further developed.
- Energy efficiency, electrification and use of sustainable biomass are technological ready options for this target.
- Other options include CCUS, hydrogen, clean fuels and circular economy. These require upscaling of technology readiness levels and changes in industrial value chains.



EU Implementation plan Energy Efficiency in Industry

Sector metrics – only for the purpose of prioritising (sources: [6] [7])	Final energy consumption	Economic[8] potential savings by 2030 (payback <=2 year)	Technical[9] potential savings by 2030	Energy[10] cost/ Value Added	No. of employed	Value added, gross
Sector	Mtoe/y	Mtoe/y	Mtoe/y		Million	€ billion
Pulp and paper	34.3	1.1	7.2	16%	1.43	79.0
Iron and steel	50.8	2.9	16.3	36%	0.63	39.7
Non-metallic mineral	34.2	1.2	7.1	23%	1.29	63.9
Chemical and pharma.	51.5	2.6	16.5	12%	1.72	229.8
Non-ferrous metal	9.4	0.5	1.9	23%	0.46	23.7
Petroleum refineries	44.7	1.7	10.6	44%	0.12	24.3
Food and beverage	28.4	1.4	6.8	10%	4.53	251.4
Machinery	19.3	1.0	5.3	3%	9.03	579.8
Total	**272.5**	**12.4**	**71.7**			

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Summary

- Energy efficiency is key in all studies to eventually reach climate neutrality
- The importance has grown over time- as have ambitions
- It's about reducing demand, using it wisely and recycle the embedded energy value in products- circular economy
- EU targets and scenarios rely on delivering efficiency gains in all sectors
- No lack of expectations for HighEFF!

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Technology for a better society