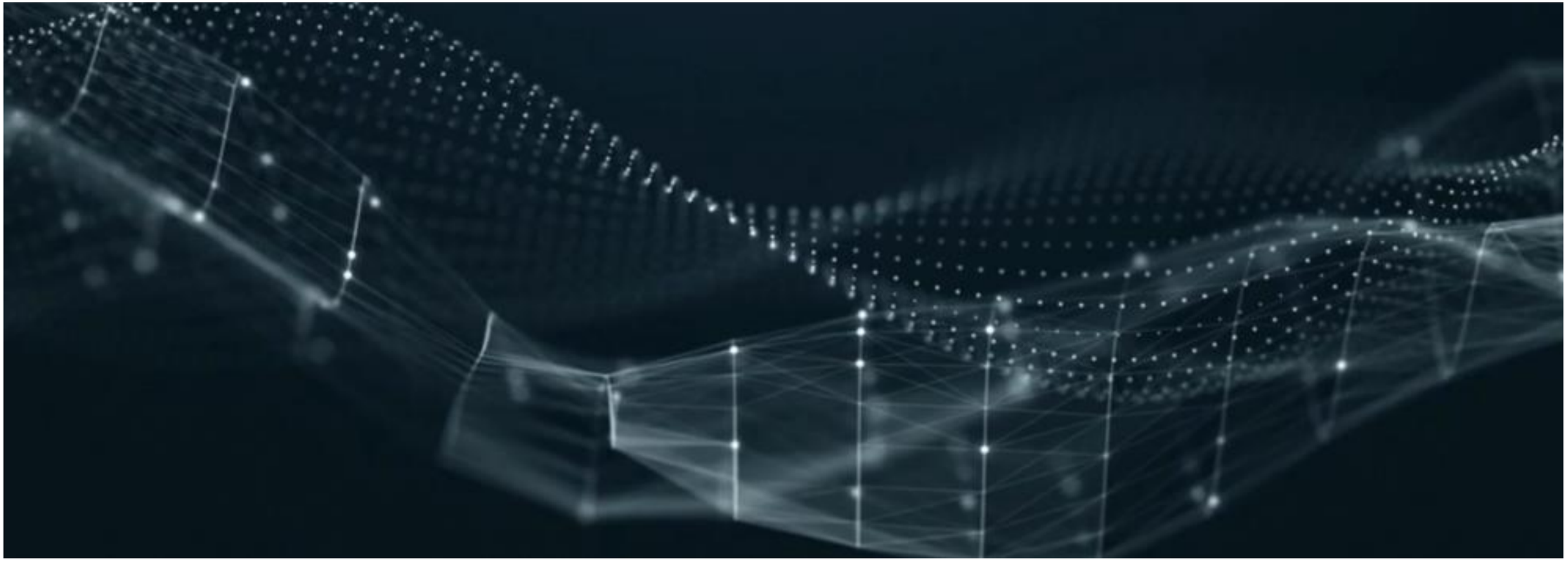
Emissions

Presentation | April 2023

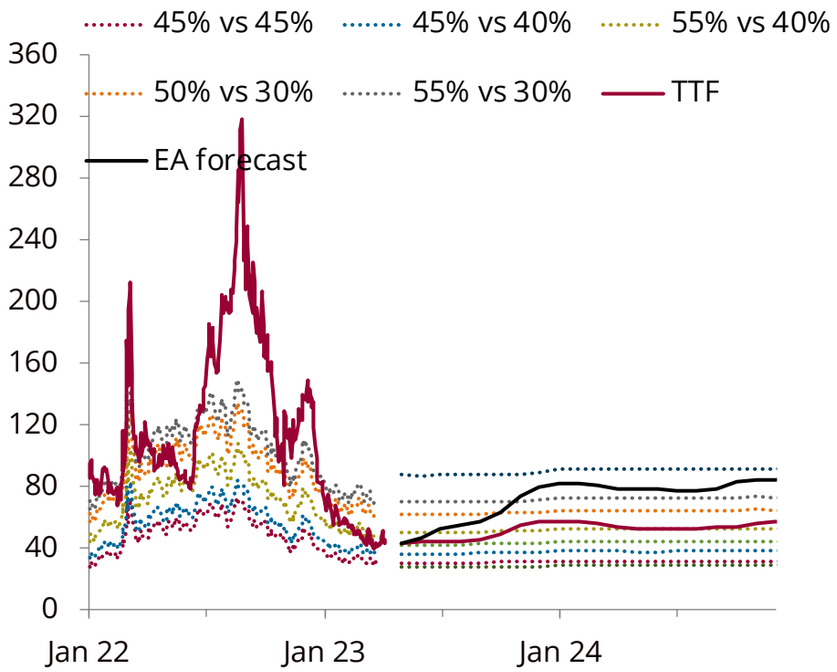
Can Europe wean itself off gas?



TTF still high but at more manageable levels on Russian supply loss

TTF prices

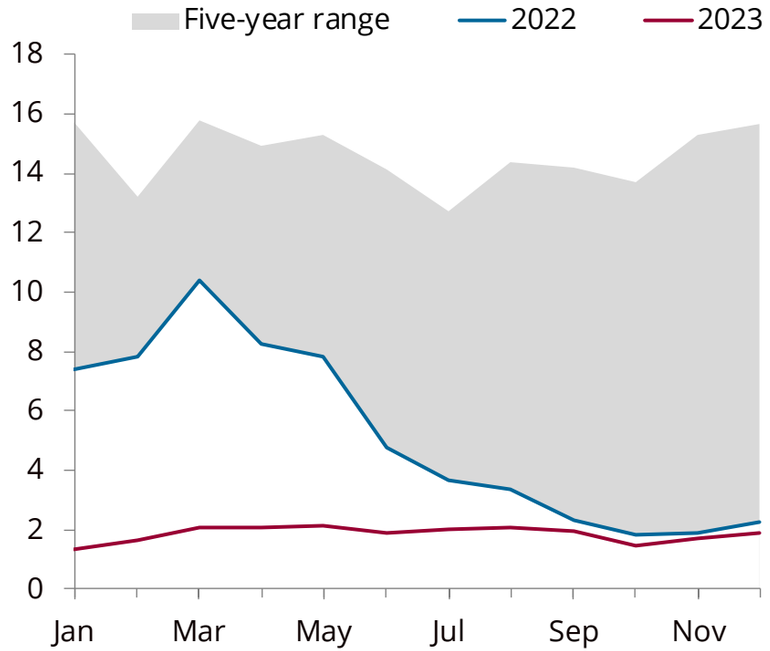
€/MWh



We are bullish against the TTF near curve on permanent loss of Russian gas supply.

Net Russian deliveries to Europe

bcm

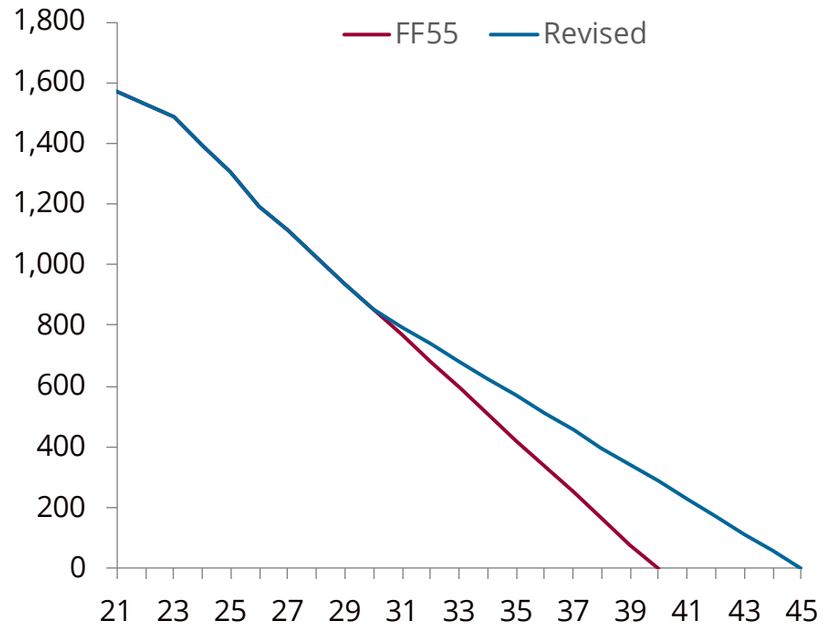


Gazprom's pipeline exports to Europe will be around 155 bcm below 2019 in 2023.

Source: CME, Argus Media Group, Bloomberg, ECB, system operators, Energy Aspects

Decarbonisation is an imperative and EU ETS sectors will be first

EU ETS cap under FF55, y/y



Europe's default policy is to completely decarbonise power and industry by the end of the next decade. Post-2030 LRF will be debated over this year.

REPowerEU: key points

Gt

Greater focus on rooftop solar

	FF55	REpowerEU	Budget (€ bn)	Spending
Solar (GW)	420	600	86	Renewable energy
Wind (GW)	480	480	29	Power grid
Others (GW)	167	156		
Total	**1,067**	**1,236**		
Biomethane (bcm)	17	35		
Heat pumps (mn)	30	10 by 2025	56	Heat pumps and energy efficiency
Renewable H2 (Mt)	5.6	20	27	

€225 billion REPEU budget. €20 billion will be funded by frontloading EUA sales from MSR.

European policy response to the energy (gas) crisis is REPEU, which looks to do FF55, but faster. Aimed at ending EU reliance on Russian gas by 2027.

Source: EU, Energy Aspects

Decarbonisation pathways replacing gas largely involve power or CCS

STEEL PRODUCTION

Existing technology

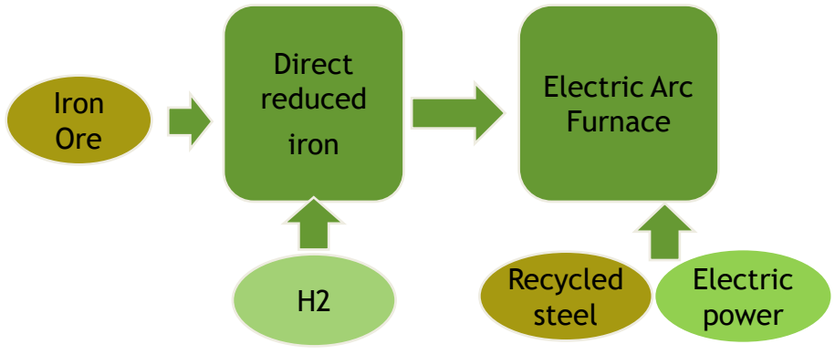
New technology

Blast furnaces
BOF

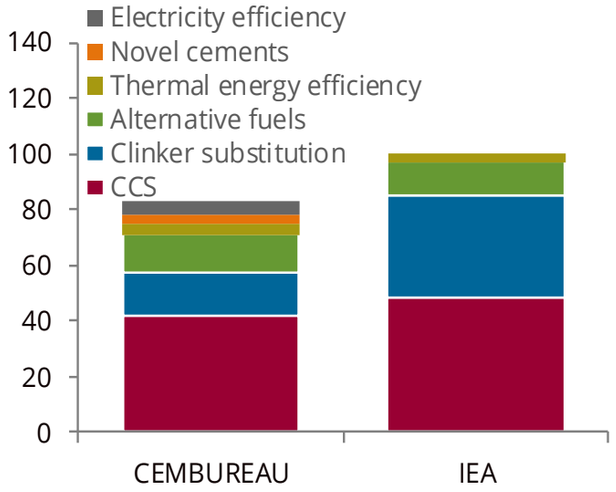
Electric Arc Furnace / DRI

Produces solid metallic iron

Produces molten steel



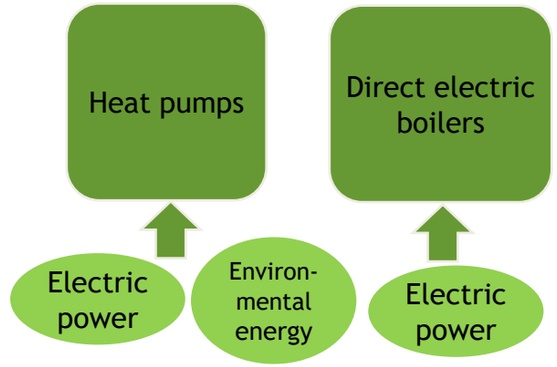
CEMENT PRODUCTION



Space heating

Natural gas combination boilers

Heat pumps / Direct electric heating

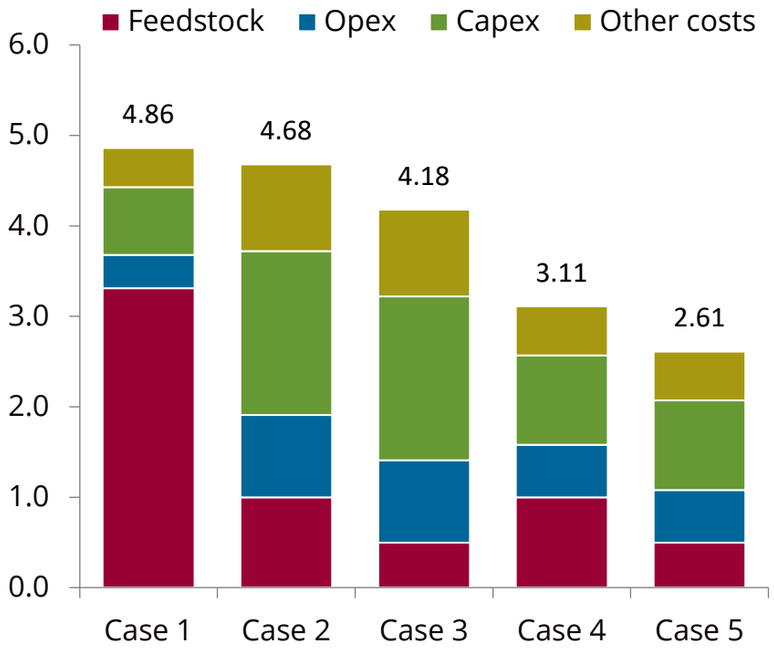


Source: CEMBUREAU, IEA, Energy Aspects

Electricity costs remain biggest barrier to reducing green hydrogen costs

LCOH of green hydrogen via PEM electrolysis

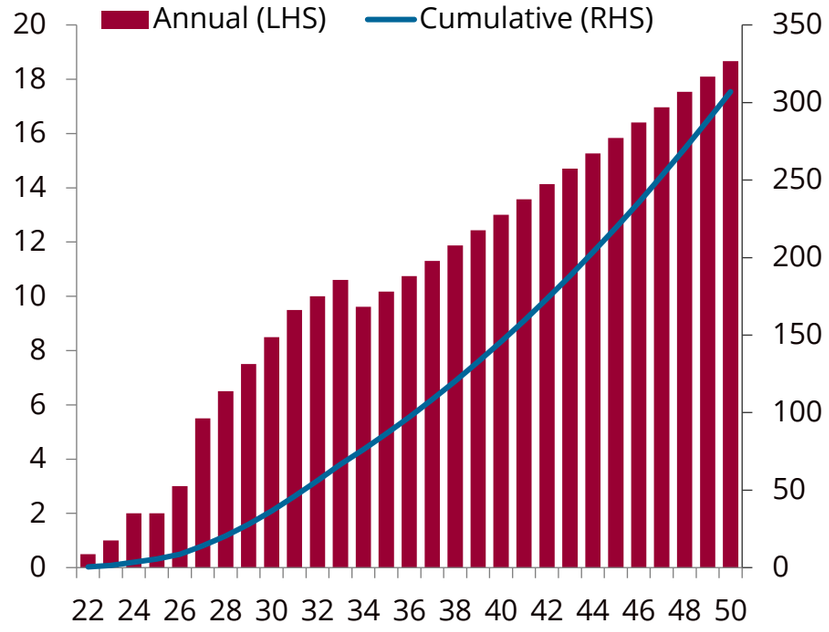
$/kg



		Case 1	Case 2	Case 3	Case 4	Case 5
Total installed cost	**$/kW**	841	841	841	462	462
Utilisation	**%**	97	40	40	40	40
Cost of electricity	**$/kWh**	0.066	0.02	0.01	0.02	0.01

Hydrogen electrolyser installed capacity

GW



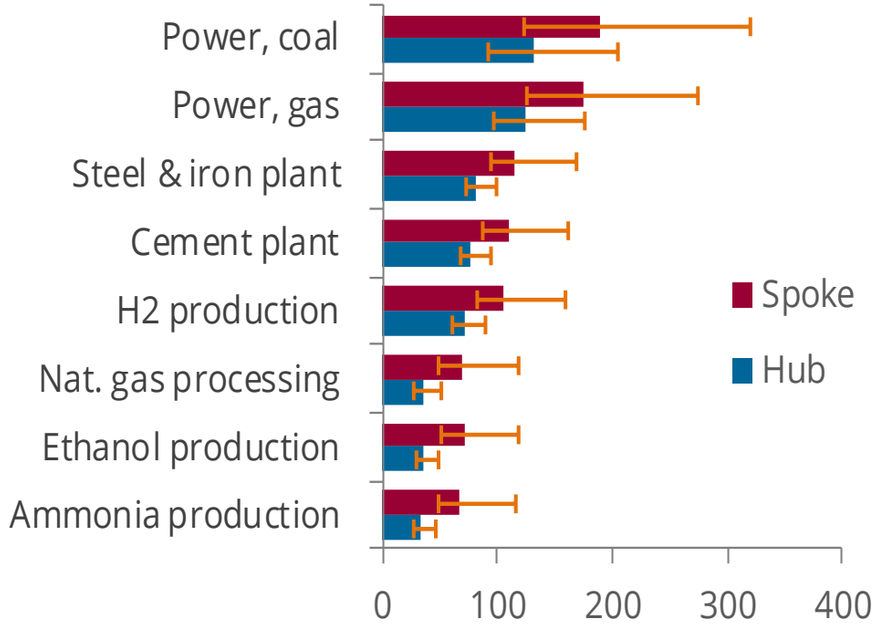
The EU aims to install 37 GW of electrolyser capacity by 2030, with an interim target of 6 GW by 2024. Efficiencies will improve and capital costs will decline by end-decade.

Source: Mayyas et al, NREL 2019–08, Energy Aspects

CCS will have some use in the EU

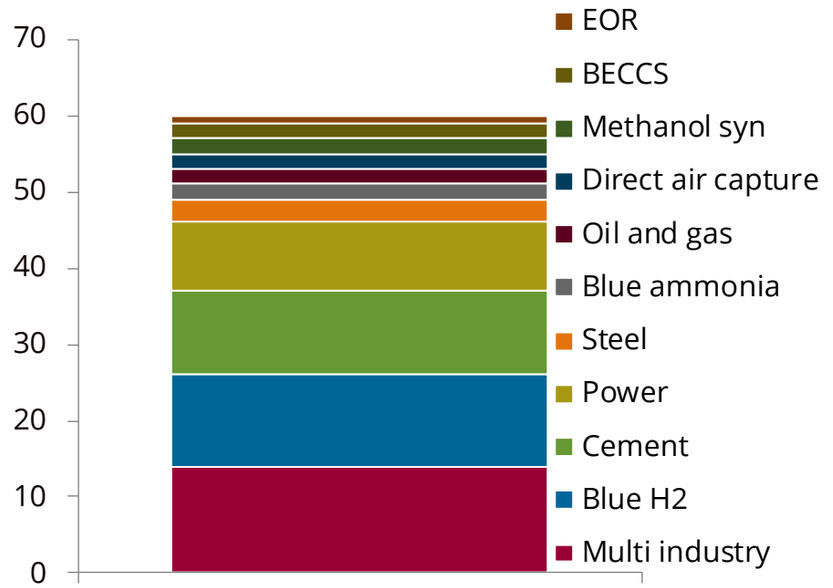
Carbon break even costs for CCS

$/t



Break-even prices rely on the concentration of the effluent stream, if infrastructure can be shared, type of storage.

CCUS projects announced in Europe



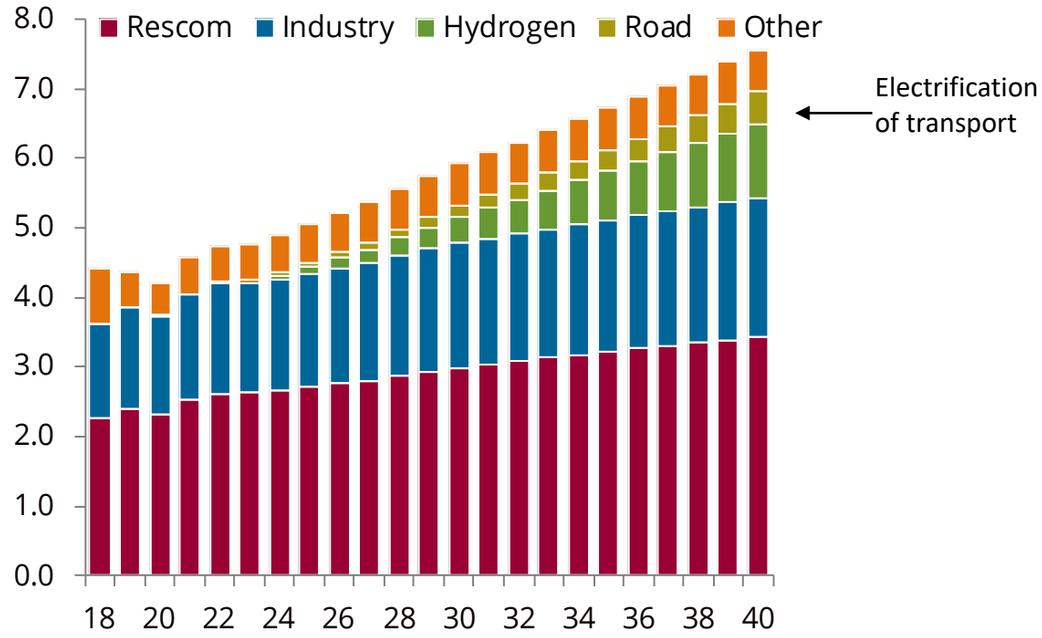
Some 72 CCUS projects (5 in Germany) in various stages of development that could deliver 80 Mtpa of emissions reductions by 2030. 7 are operational.

Source: IOGP Europe, Energy Aspects

Losing gas (and oil) means European power demand will increase

European power demand

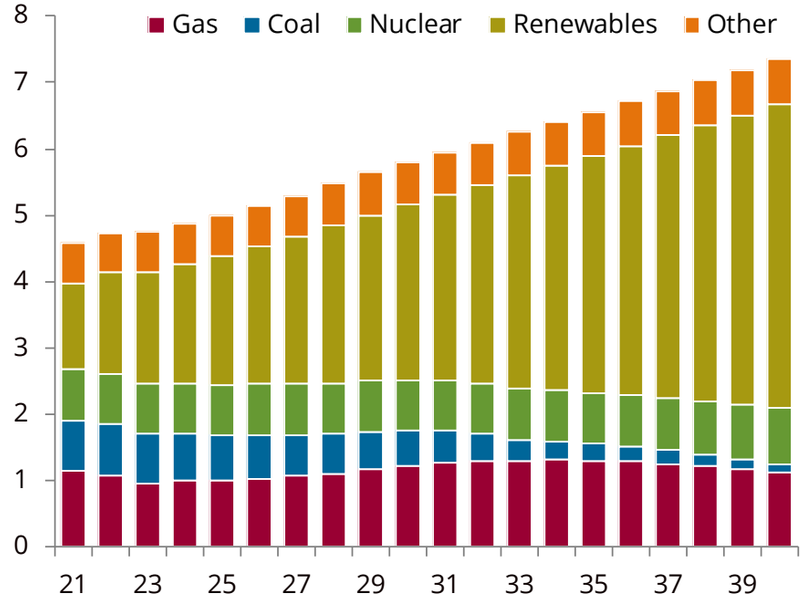
TWh



Transition means power demand is going to increase as decarbonisation pathways rely on decarbonisation

European power supply, y/y

TWh



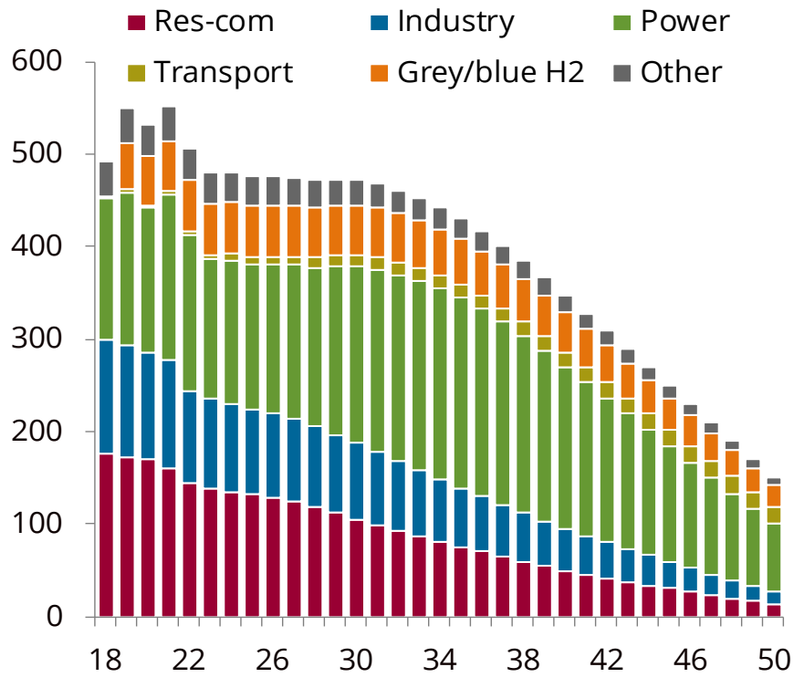
We assume average annual 70 GW of additional renewables between 2020 and 2030

Source: EU, Energy Aspects

European gas demand to fall but could still hang around in power

European gas demand

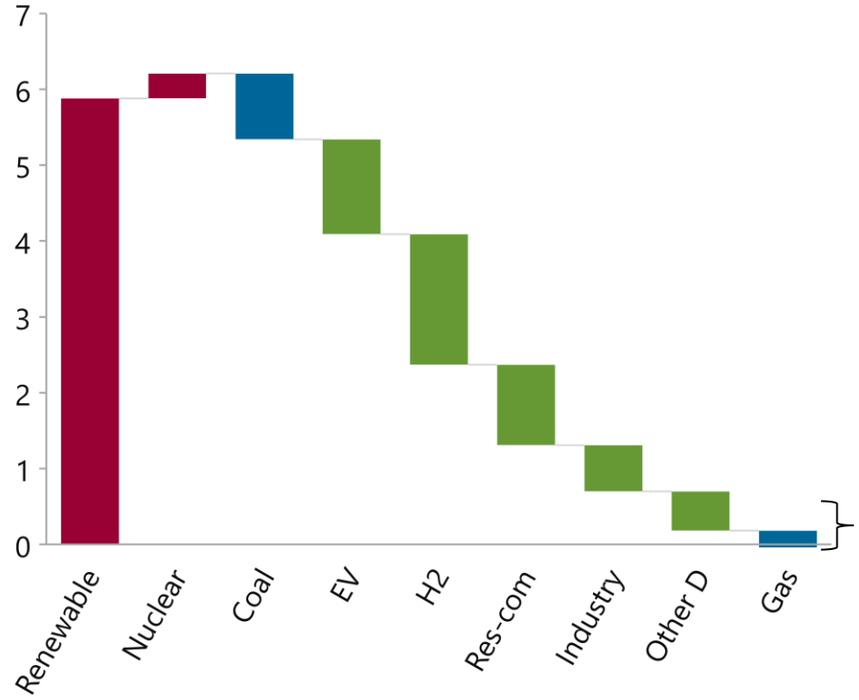
bcm



European gas demand will fall by 400 bcm (73%) by 2050.

2050 EU power balances compared to 2022

PWh



Increase in low-carbon generation to replace reductions in coal and added demand from EVs, hydrogen production and other electrification (industry and residential).

Source: Irena, various member states, Energy Aspects

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