

2023

Energy Perspectives

Global macroeconomic and energy market outlook

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A volatile and uncertain world

... with long-term repercussions, also for our ability to take collectively smart decisions

Geopolitics



Economics



Society



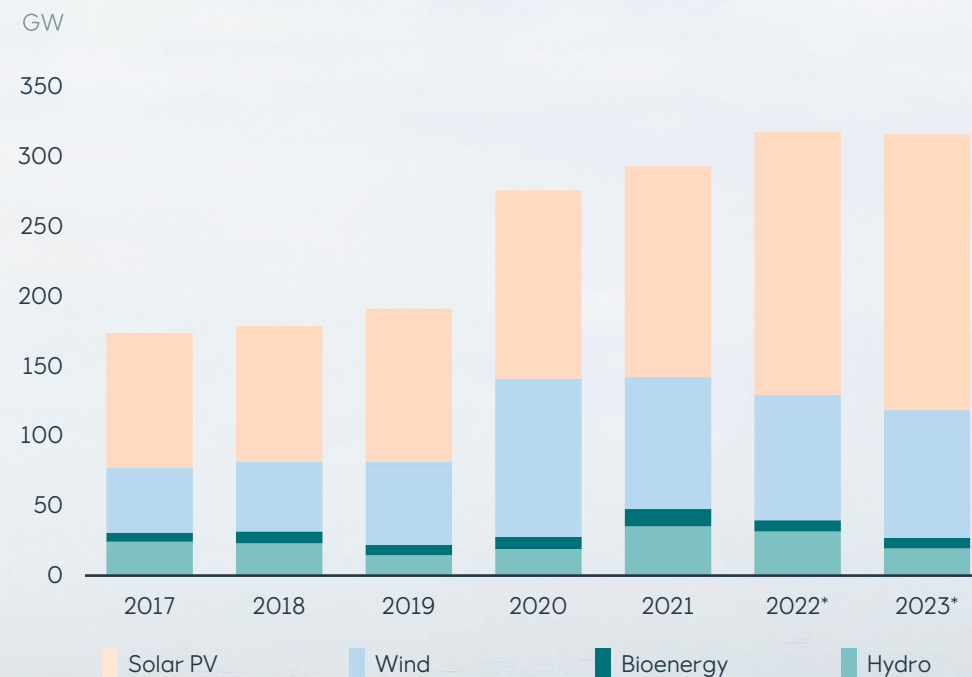
Climate



Policy and technology progress on energy transition

... driving long-term change – but development is too slow...

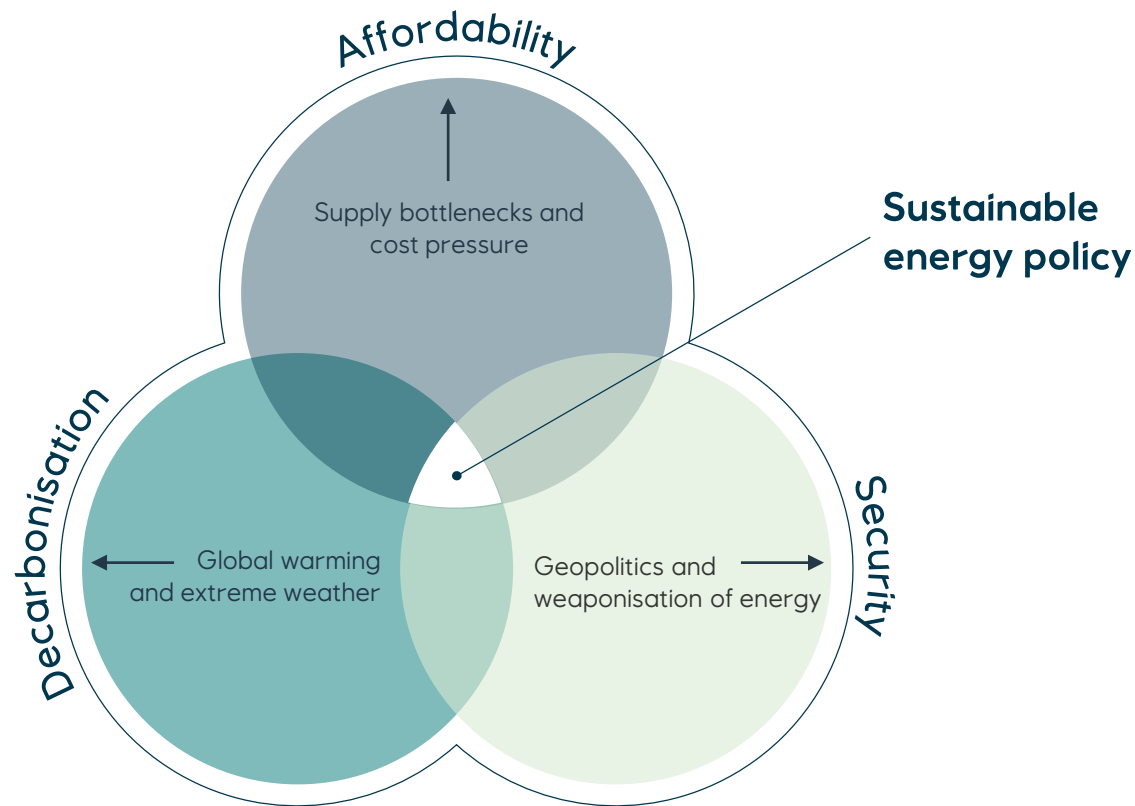
Net renewable capacity additions by technology



Source: IEA, 2019-2021 history, 2022*-2023* estimate

The energy trilemma is playing out and affected by events

Sustainability requires a balanced approach – but what about global inequalities and just transition?



Source: Equinor



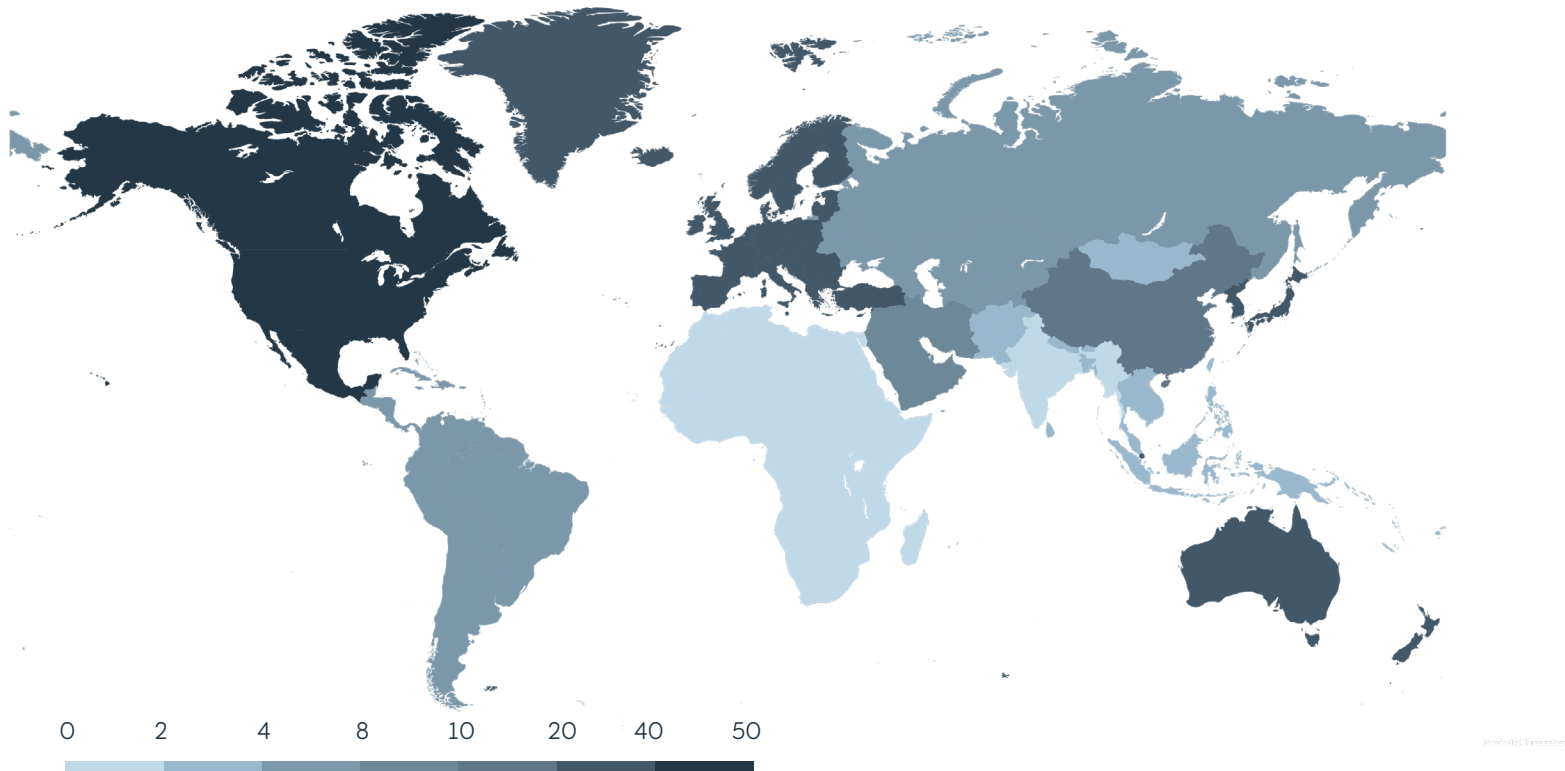
Source: United Nations

The ultimate dilemma – reducing income differences while reducing emissions

Emerging economies are less energy efficient than industrialised countries – transfer of wealth will increase energy use and emissions?

GDP per capita, 2020

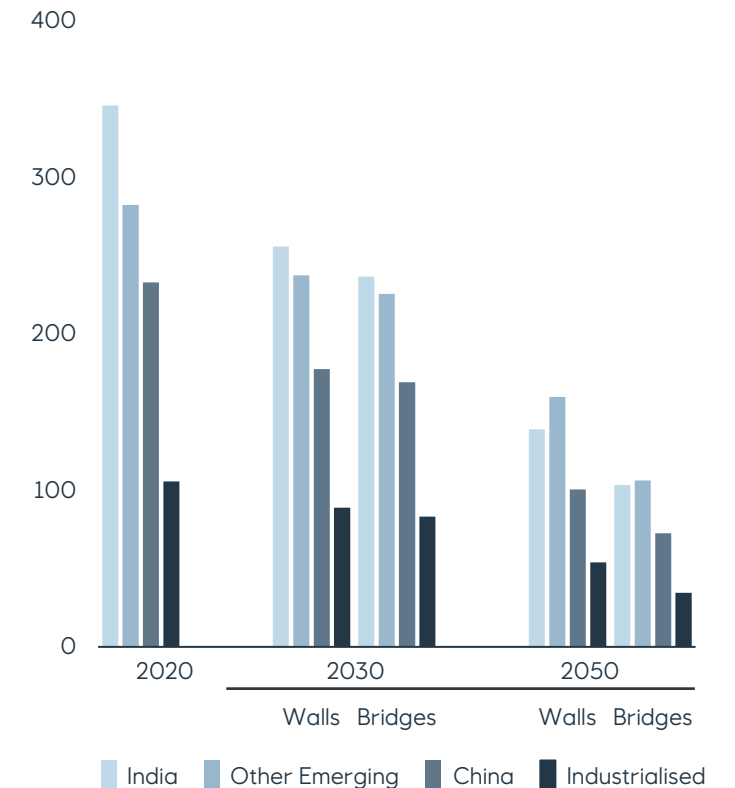
Real thousand USD at market exchange rate



Source: © Oxford Economics Limited 2023 (GDP), UN (population), MapChart

Energy intensity

toe/million USD



Uncertainties that can fundamentally change short- and long-term outlooks

... some are truly scary...



Armed conflict



Fusion breakthrough



Mass migration



Unregulated development of AI in a world of

- Geopolitical conflicts
- Democratic deficits
- Inequality and inequity
- Concentrated power in business

- Threatening millions of jobs
- Impact on the future of humanity?



Walls protect

but also divide

Walls

- Builds on current market trends, policy developments and policy signals
- Russia's invasion of Ukraine and geopolitical tensions give rise to obstacles for global cooperation
- Energy security is increasingly important in the short-to-medium term
- Regional differences in speed and scale of the energy transition

Bridges connect and enable

Bridges

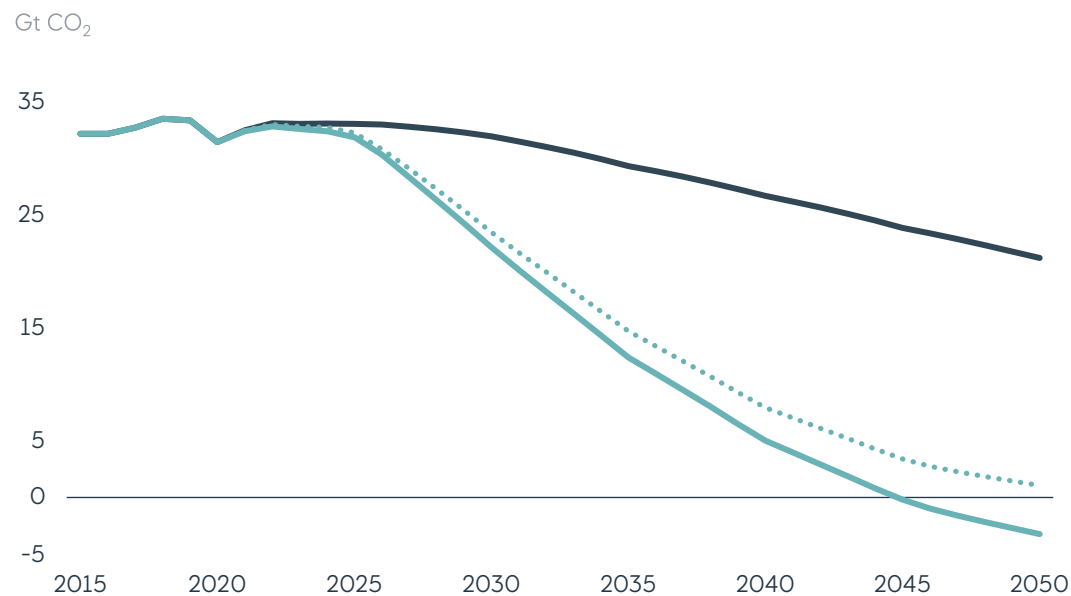
- A normative back-cast scenario
- Consistent with a 1.5°C temperature rise
- Immediate and coordinated international action needed
- Illustrates the kind of drastic measures needed to meet the goals of the Paris Agreement



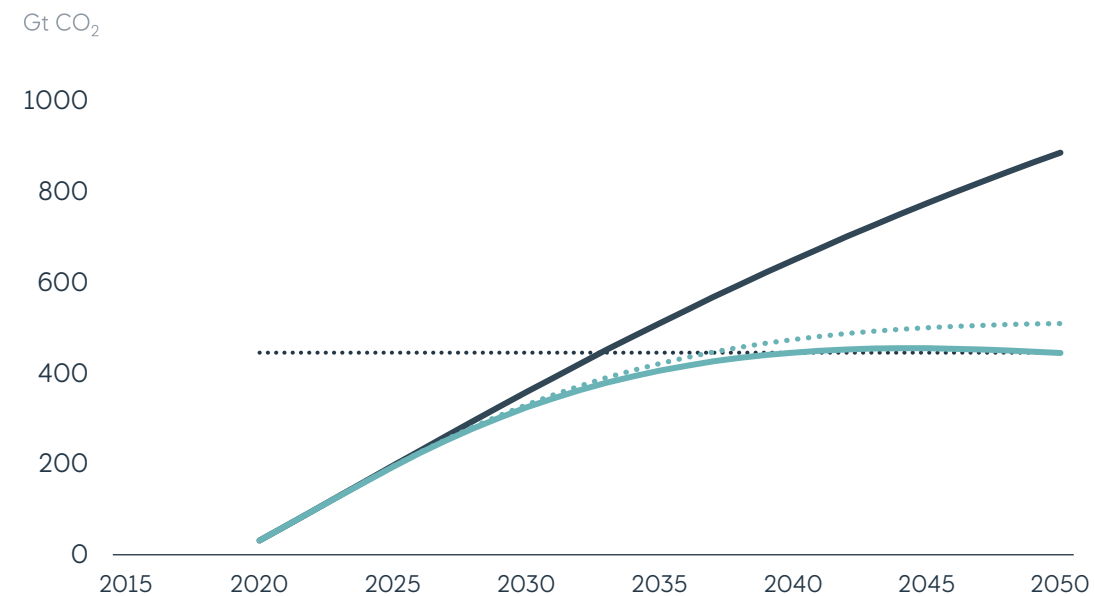
Emissions in Walls and Bridges decline, but at very different speeds

The challenge of staying within the 1.5°C carbon budget is formidable and requires carbon removal technologies

Annual energy-related emissions



Cumulative energy-related emissions



■ Walls ■ Bridges Bridges without carbon removal 1.5°C Budget

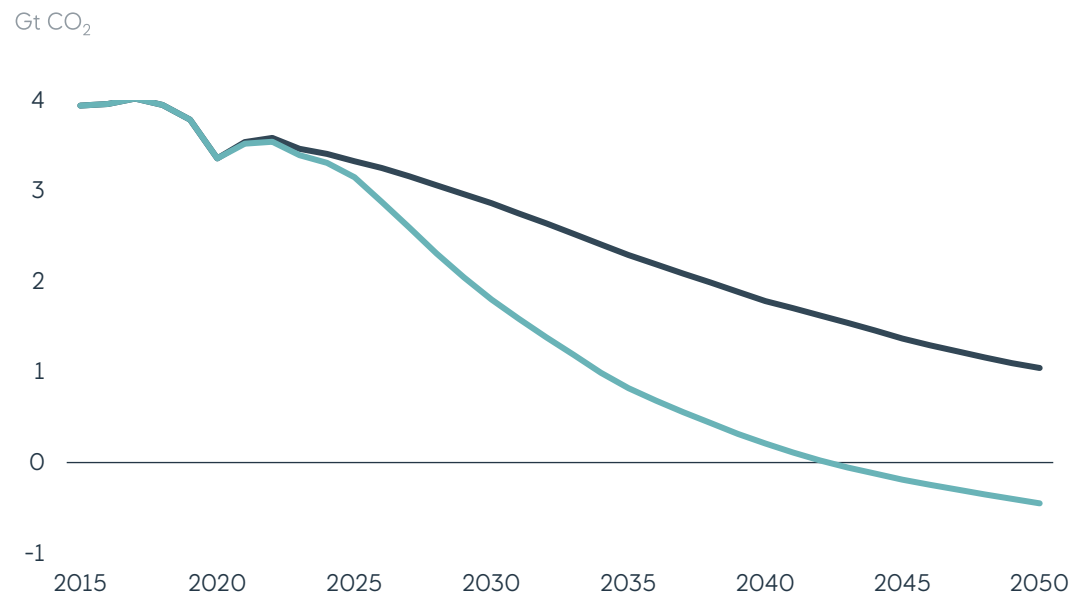
Source: IEA (history), Equinor (projections)

Source: Equinor (projections)

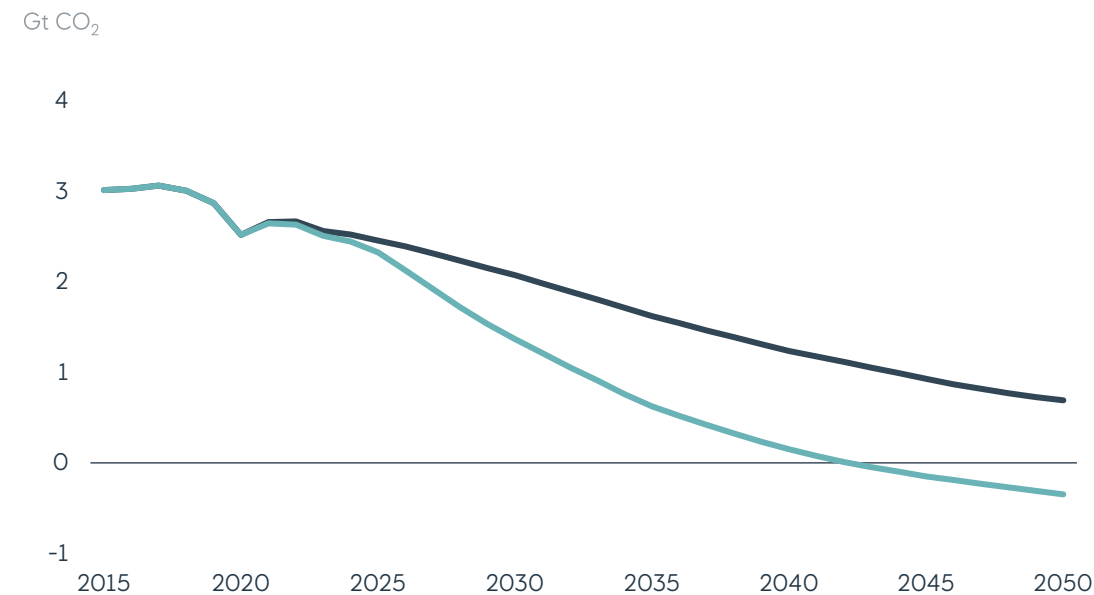
Emissions in Walls and Bridges for Europe

The challenge of staying within the 1.5°C carbon budget is formidable and requires carbon removal technologies

Annual energy-related emissions – Total Europe



Annual energy-related emissions – European Union



■ Walls ■ Bridges

Source: IEA (history), Equinor (projections)

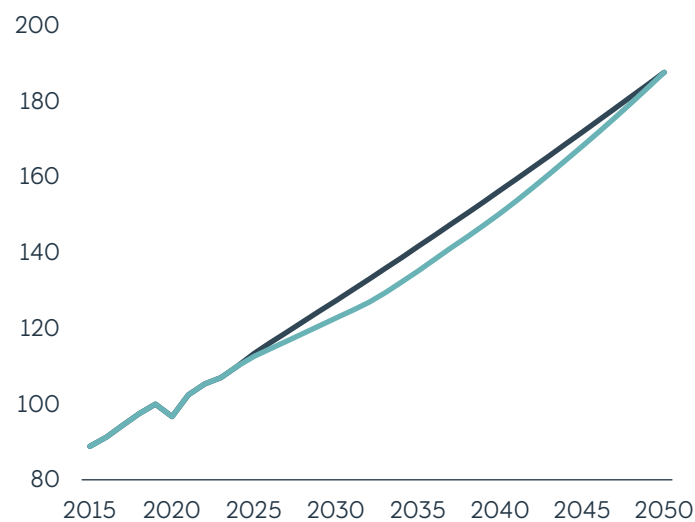
Source: Equinor (projections)

The global economy continues to grow and becomes more energy efficient

Reaching the 1.5°C target requires a reduction of 26% in total primary energy demand, GDP doubles, energy intensity must go down

Global GDP

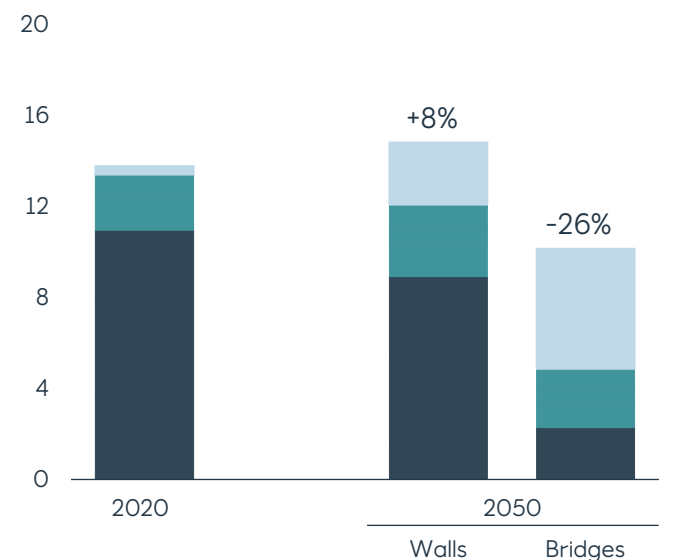
Indexed to 100 in 2020, constant USD



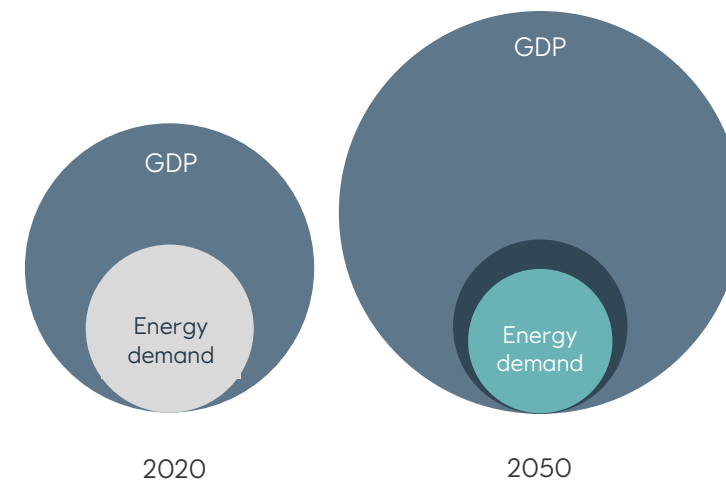
■ Walls ■ Bridges

Total primary energy demand

Gtoe



■ Fossil fuel ■ Other ■ New renewables



■ Walls ■ Bridges

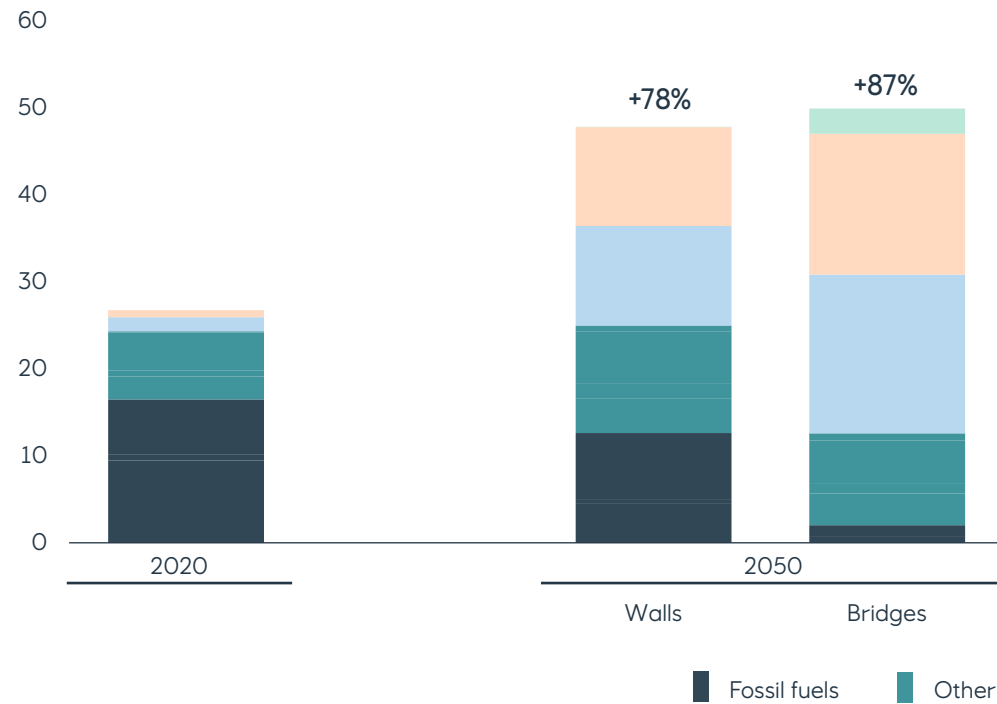
Source: IEA and © Oxford Economics Limited 2023 (history), Equinor (projections)

Electrification is the key enabler

Renewables continue to grow and replace fossil fuels

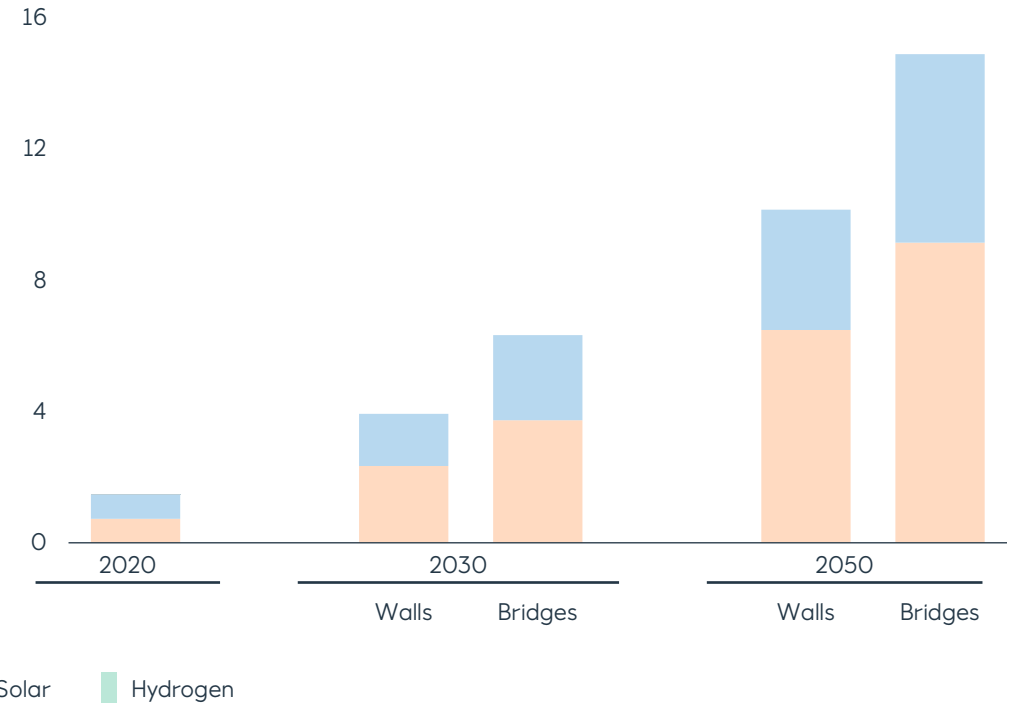
Electricity generation

Thousand TWh



Wind and solar PV capacity

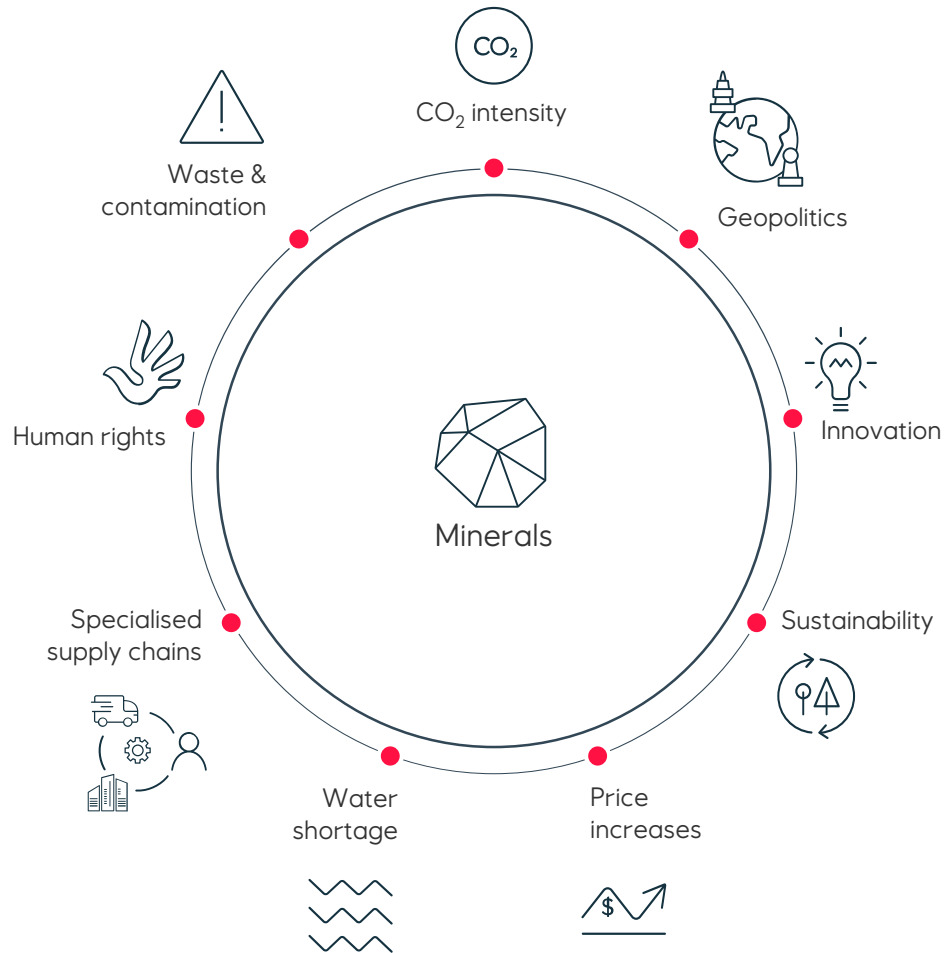
Thousand GW



Source: IEA (history), Equinor (projections)

Solar and wind expansion requires critical minerals

... raising a lot of issues...

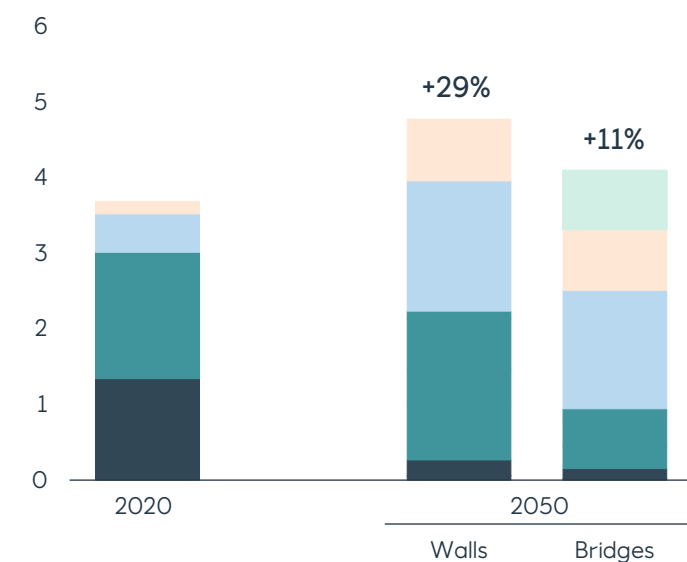


Massive changes in different parts of the European energy system

Electrification is the key element of the energy transition, and a major factor in efficiency improvements

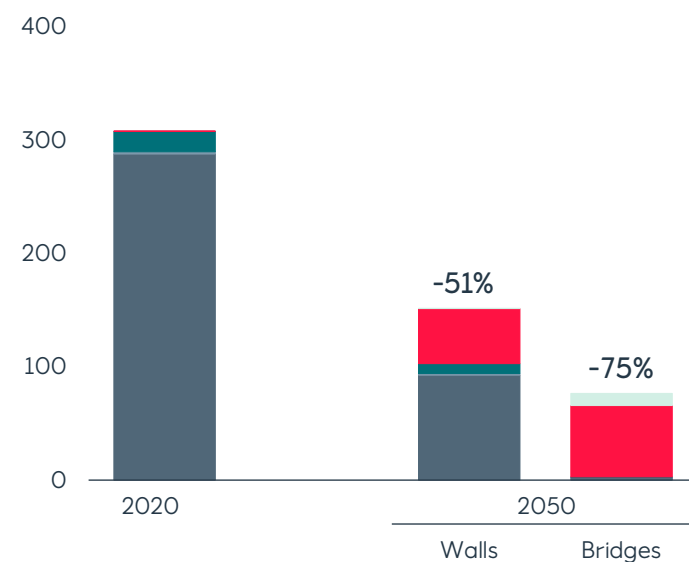
Electricity generation

Thousand TWh



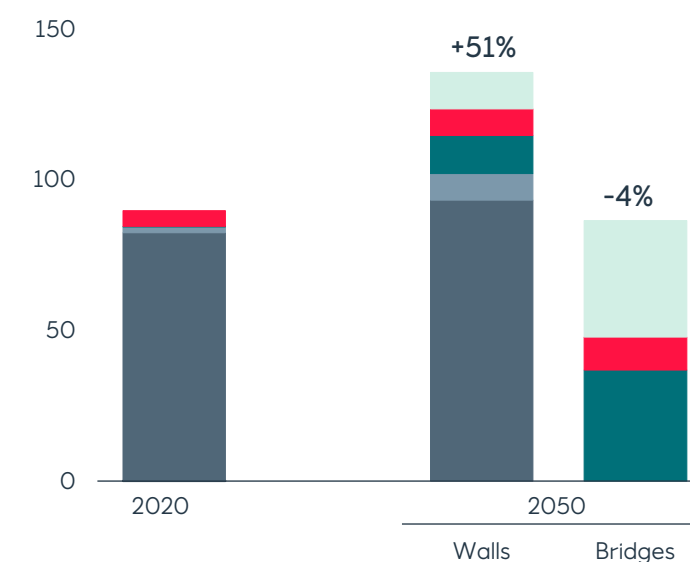
Road transport fuel demand

Million toe



Non-road transport fuel demand

Million toe



Fossil fuels
 Other
 Wind
 Solar
 Hydrogen

Oil
 Gas
 Biofuels
 Electricity
 Hydrogen

Oil
 Gas
 Biofuels
 Electricity
 Hydrogen

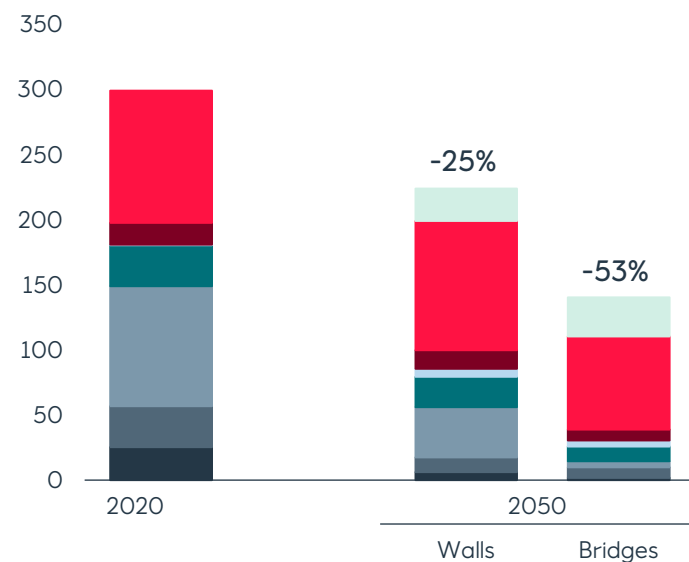
Source: IEA (history), Equinor (projections)

Electrification and efficiency improvements are keys in other sectors in Europe

Fossil fuels still needed as feedstock

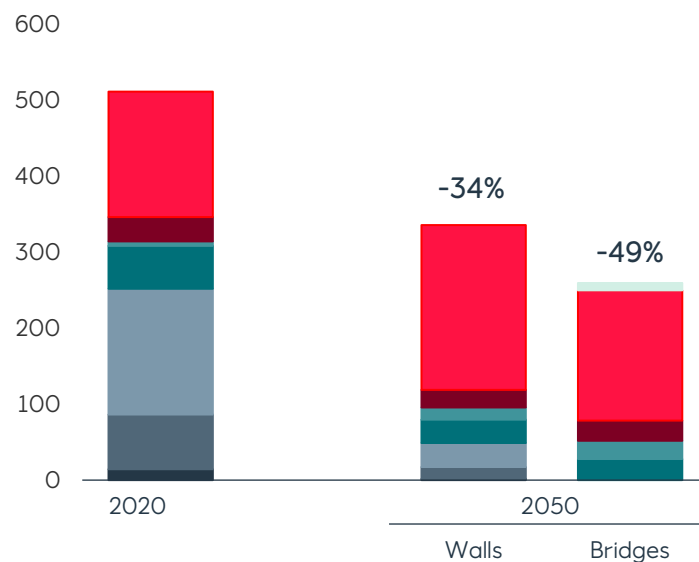
Industrial demand

Million toe



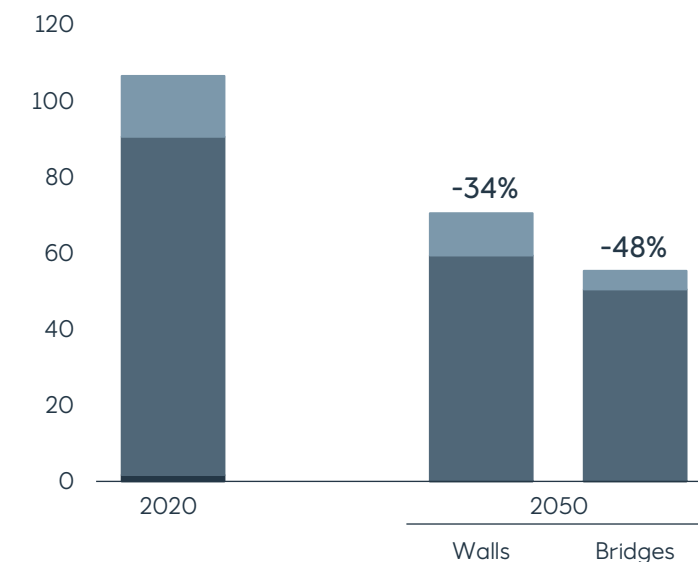
Buildings demand

Million toe



Non-Energy demand

Million toe



Coal
 Oil
 Gas
 Biomass
 New Renewables
 Heat
 Electricity
 Hydrogen

Source: IEA (history), Equinor (projections)

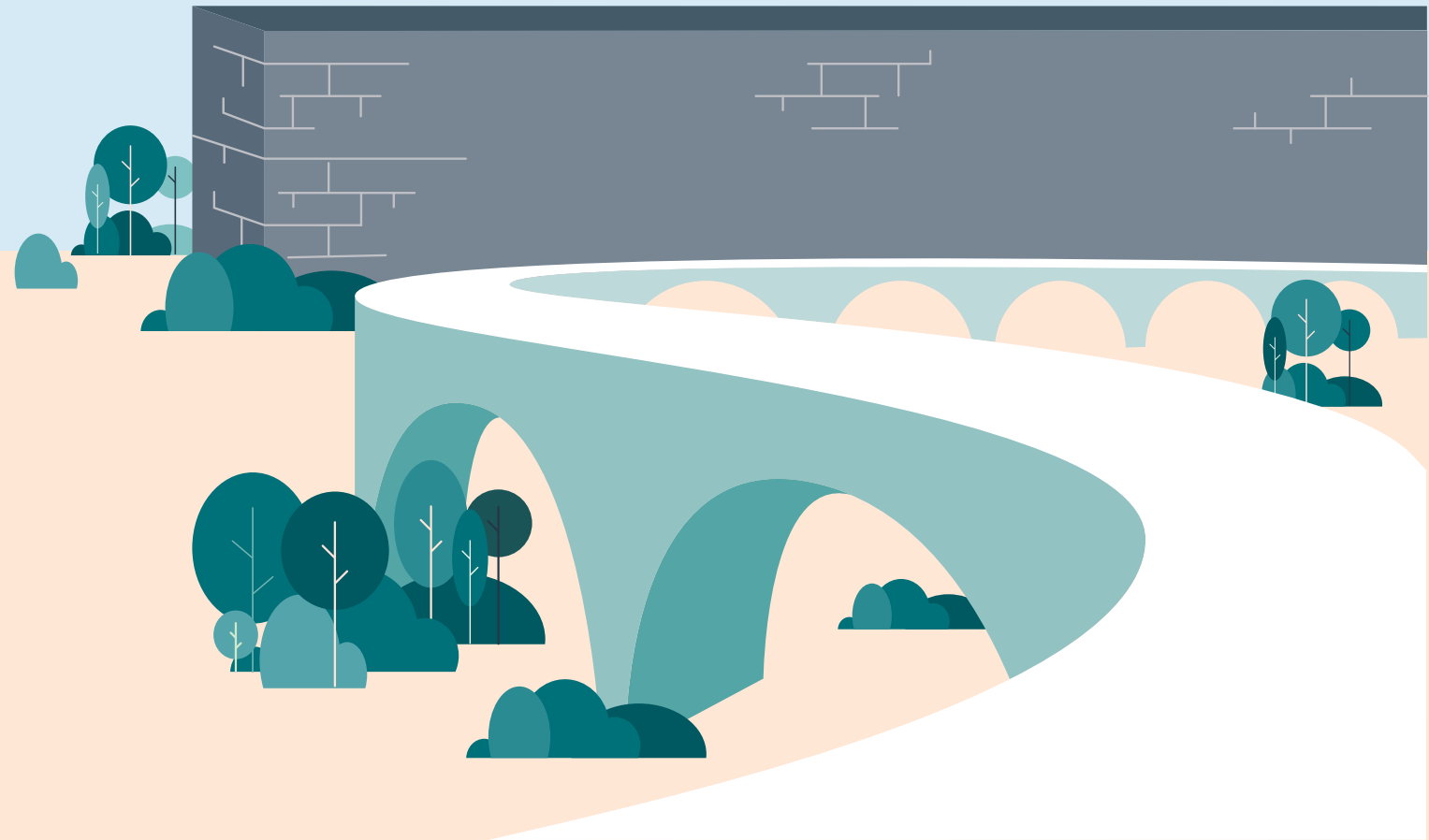
A change of pace and a revolution in transforming the energy system



	History 1990 - 2020	Walls 2020 - 2050	Bridges 2020 - 2050
Total primary energy demand CAGR %	1.6%	0.2%	-1.0%
Energy intensity CAGR %	-1.2%	-1.9%	-3.2%
Fossil fuel demand (Change in period - Gtoe)	3.9	-2.0	-8.7
Solar and wind in power generation (Change in period - Thousand TWh)	2	20	32
	History 2016 - 2020 (avg.)	Walls Peak 2050	Bridges Peak 2035
Mineral demand from solar and wind in power generation (Mt)	2.3	6.3	10.2

“We build
too many walls
and not enough
bridges.”

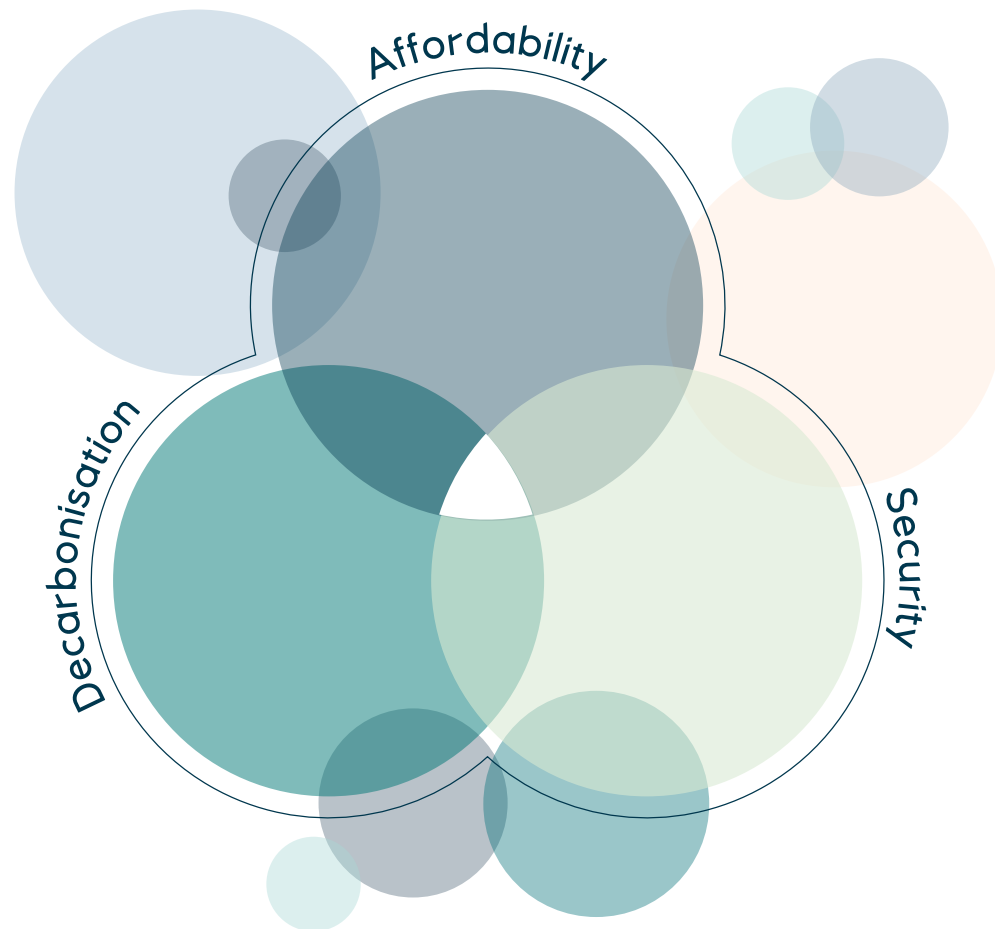
- *Attributed to Sir Isaac Newton*



Back-up slides

The energy trilemma is playing out and affected by events

Sustainability requires a balanced approach – but what about global inequalities and just transition?



Source: Equinor



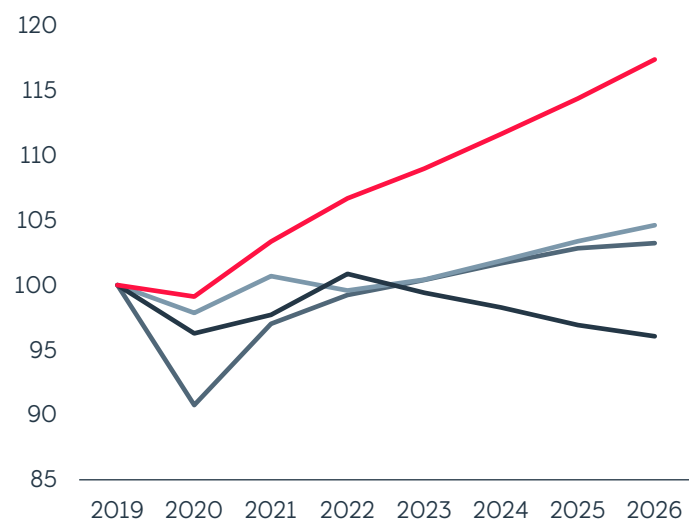
Source: United Nations

Our short-term outlook to 2026 – moderate growth and flat emissions

Out of Covid, handling the energy crisis and supply bottlenecks, food inflation and re-globalisation

Coal, oil, gas and electricity demand

Indexed, 2019 = 100



■ Coal ■ Oil ■ Gas
■ Electricity

Source: IEA (history), Equinor (projections)

GDP growth

% change y/y

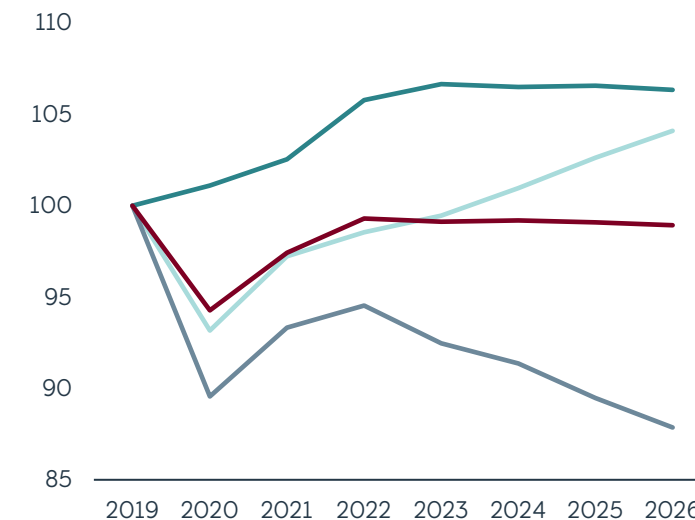


■ China ■ European Union ■ CIS
■ North America ■ World

Source: © Oxford Economics Limited 2023 (history), Equinor (forecast from April 2023)

Energy-related CO₂ emissions

Indexed, 2019 = 100



■ Industrialised ■ China ■ Emerging excl China
■ World

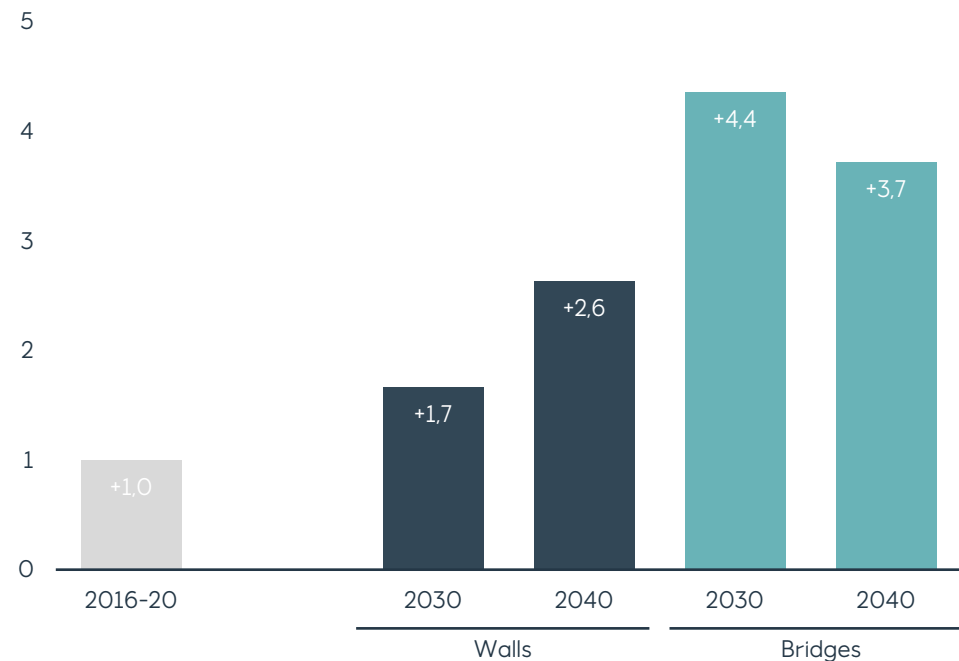
Source: IEA (history), Equinor (projections)

Mineral demand growth in renewable power will challenge production levels

Must be addressed by massive investments in mining, processing, refining and logistics across the globe, in a sustainable manner

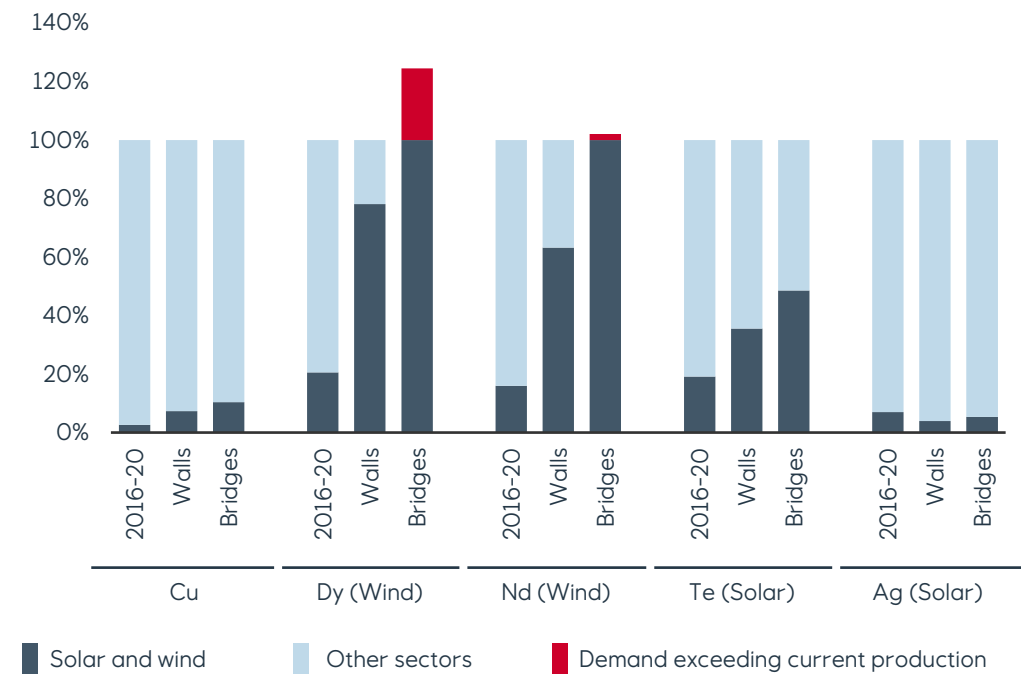
Mineral demand*

Indexed 2016-20 (average demand) = 1



Minerals demand in 2040 as share of 2022 production

2022 production = 100%



Source: Equinor, USGS, Wang et al. (2023) Future demand for electricity generation materials under different climate mitigation scenarios, Joule 7, 309-332. Elsevier Inc.

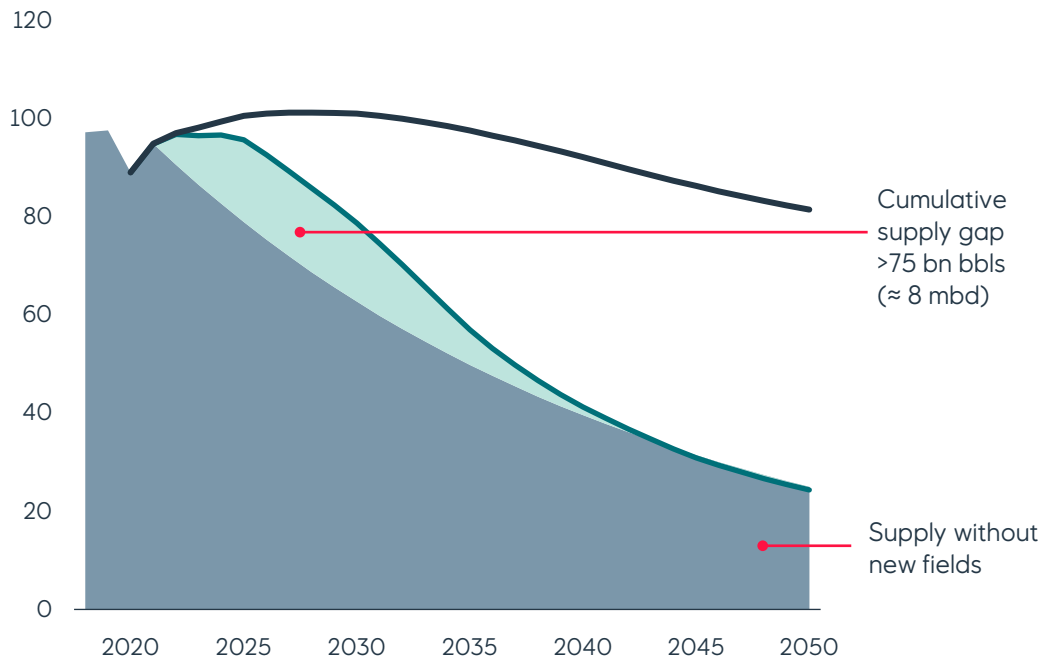
* Mineral demand needed to support annual solar PV and wind capacity additions in power generation.

Wide outcome space for oil and gas demand

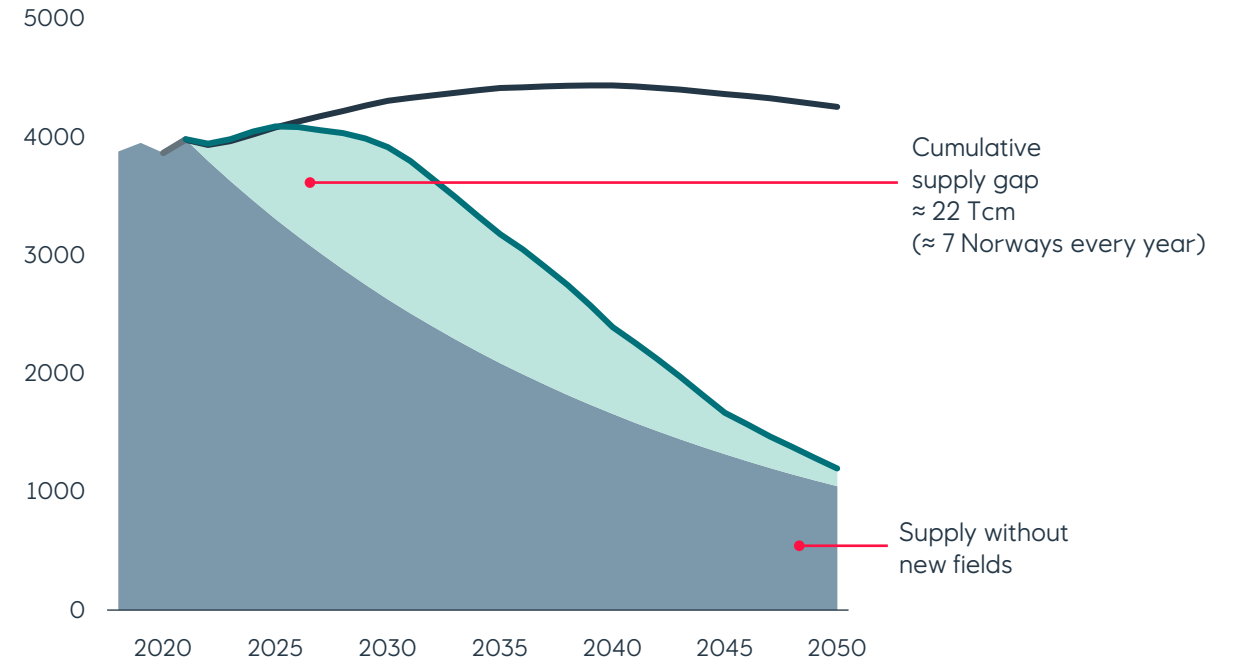
Large oil and gas investments in both scenarios, although significantly less in Bridges



Oil demand and supply from existing fields
mbd



Gas demand and supply from existing fields
Bcm



Walls

Bridges

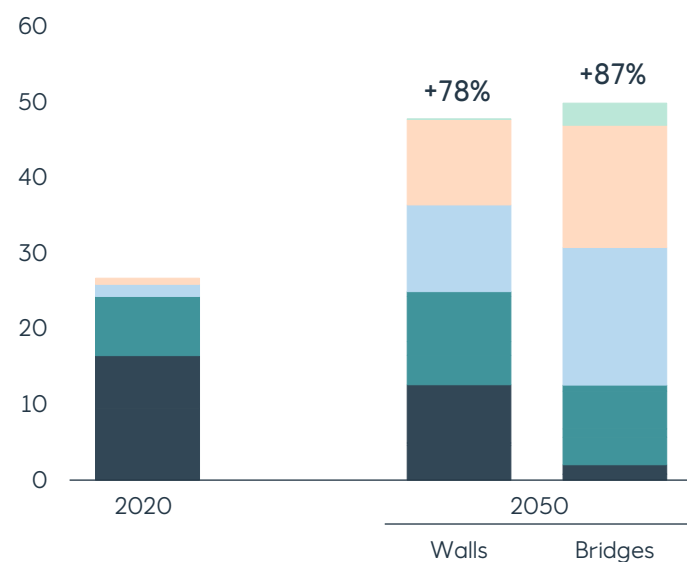
Source: IEA (history), Equinor (projections)

Massive changes in different parts of the energy system

Electrification is the key element of the energy transition, and a major factor in efficiency improvements

Electricity generation

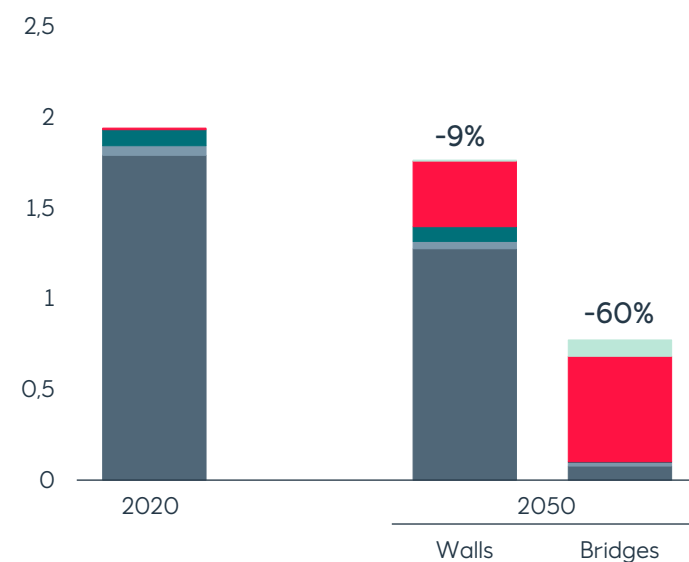
Thousand TWh



Fossil fuels
 Other
 Wind
 Solar
 Hydrogen

Road transport fuel demand

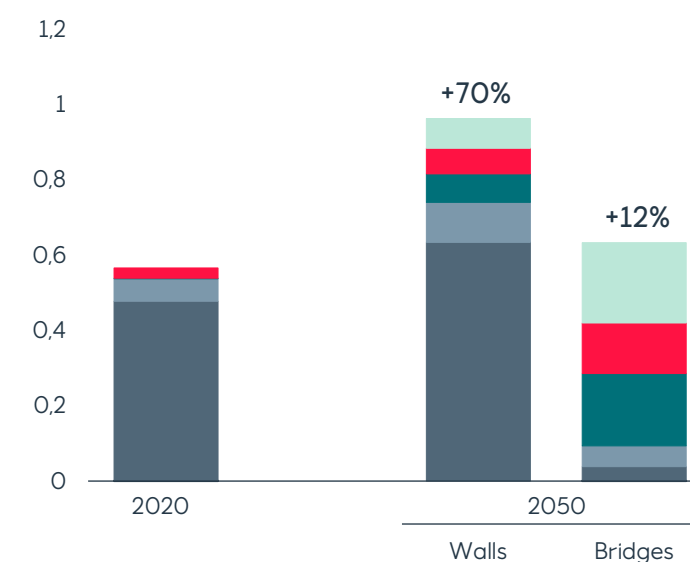
Gtoe



Oil
 Gas
 Biofuels
 Electricity
 Hydrogen

Non-road transport fuel demand

Gtoe



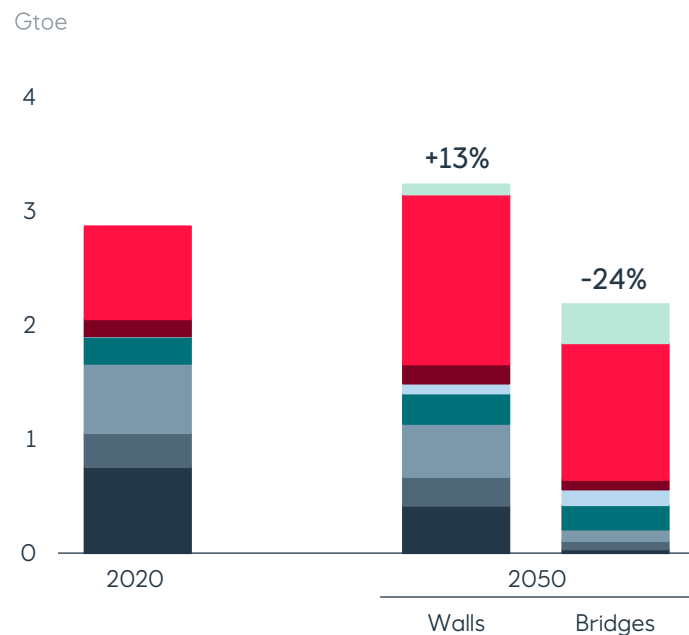
Oil
 Gas
 Biofuels
 Electricity
 Hydrogen

Source: IEA (history), Equinor (projections)

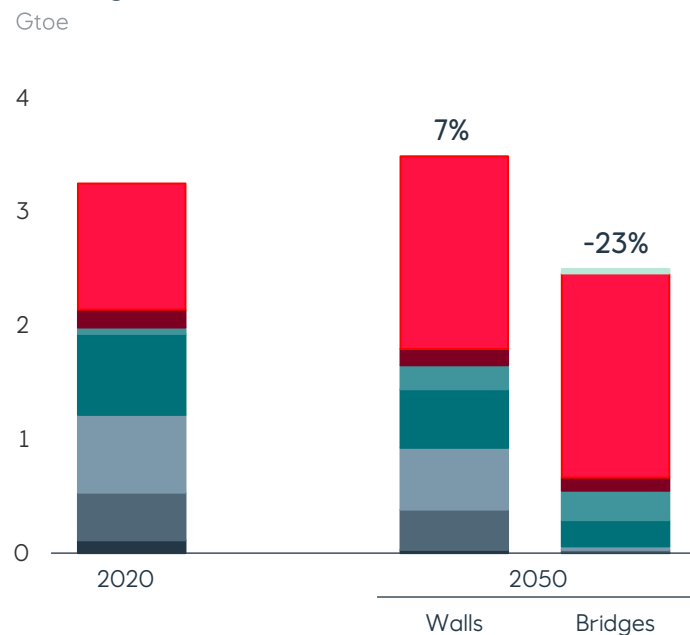
Electrification and efficiency improvements are keys in other sectors

Fossil fuels still needed as feedstock

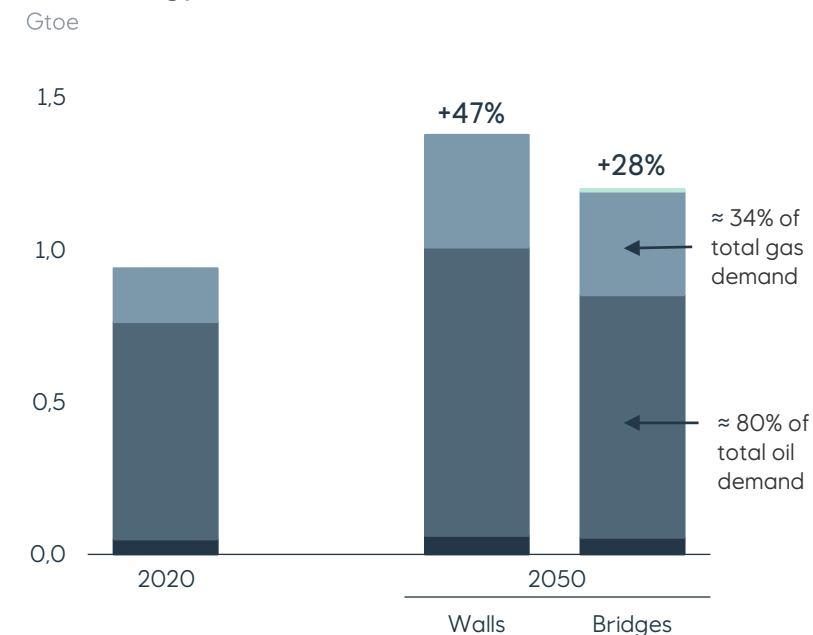
Industrial demand



Buildings demand



Non-Energy demand



Source: IEA (history), Equinor (projections)