

43rd IAEE International Conference

**Natural gas in the transition to low-carbon
transport systems:
focus on marine bunkering and NGVs**



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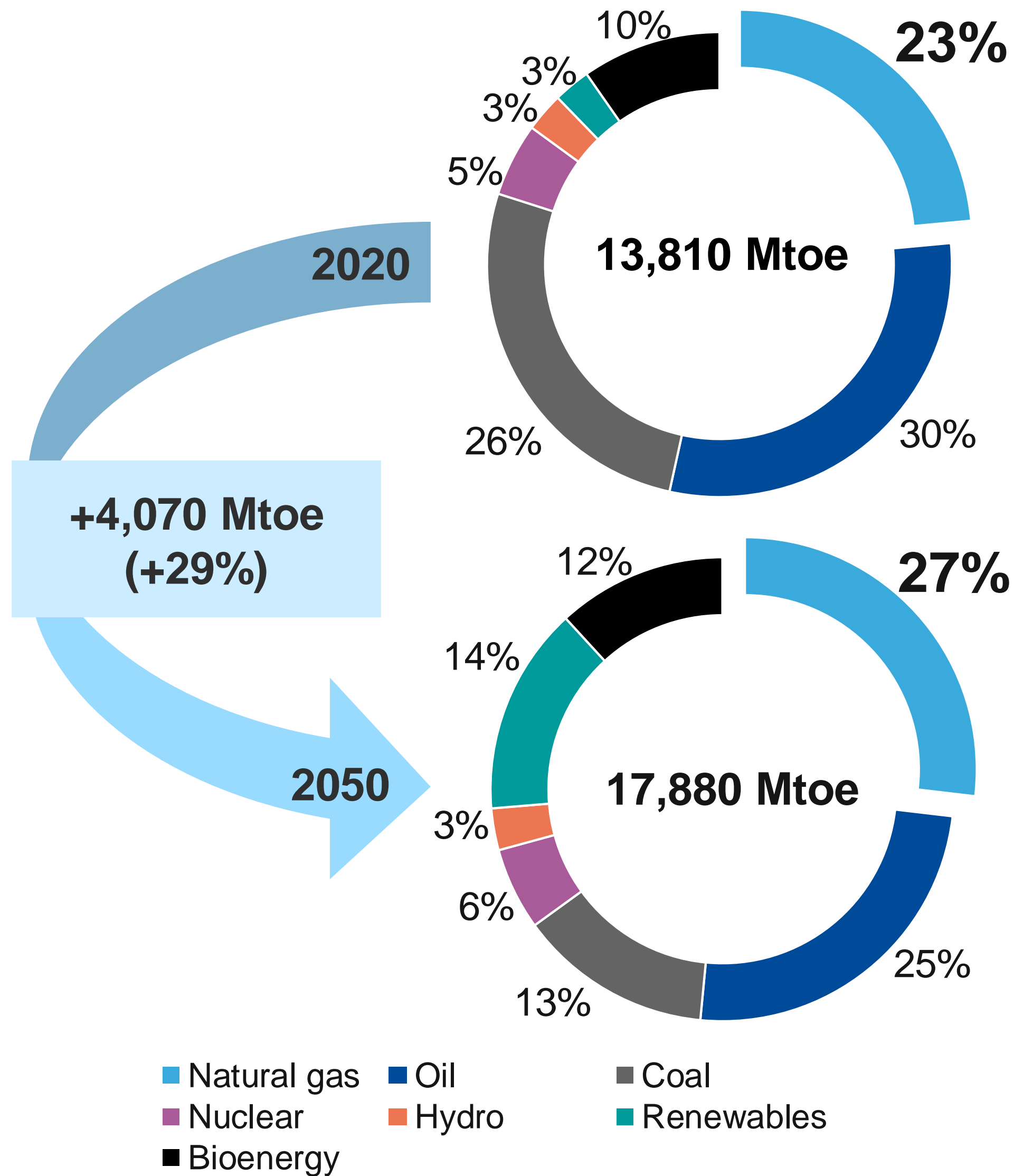
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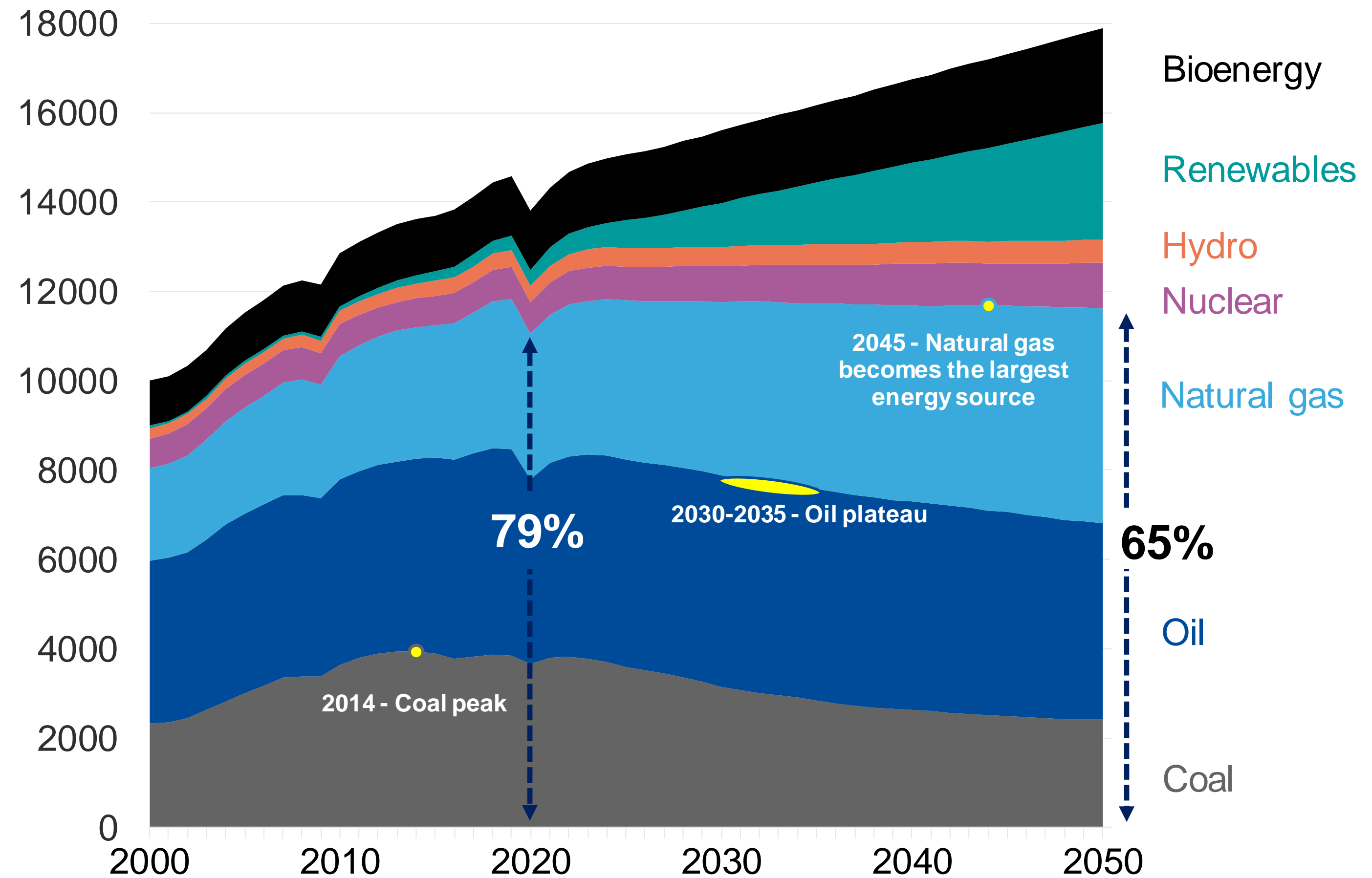
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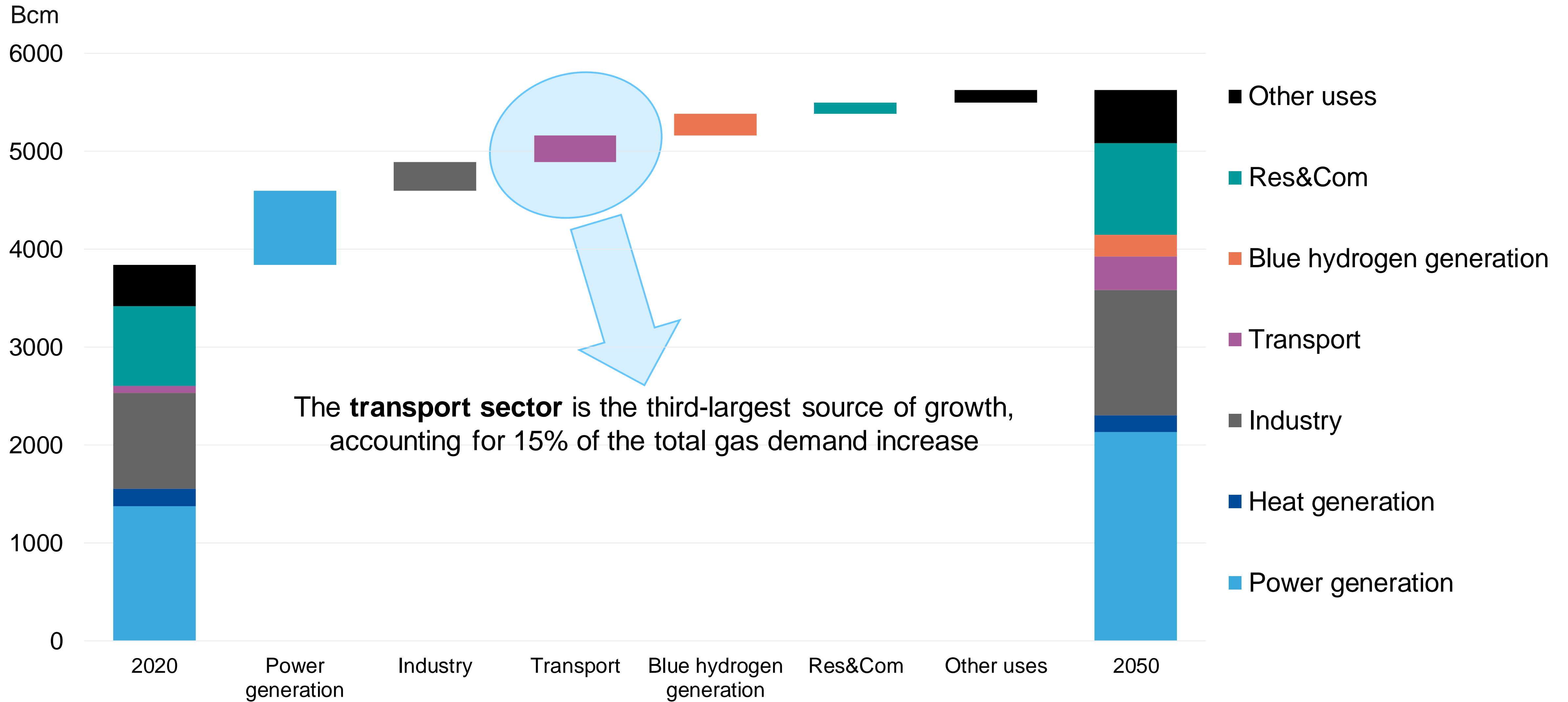
- Natural gas will increase its share in the global energy mix from 23% today to 27% in 2050.



Energy demand trends by fuel (Mtoe)



Note: Bioenergy includes traditional biomass and modern bioenergy

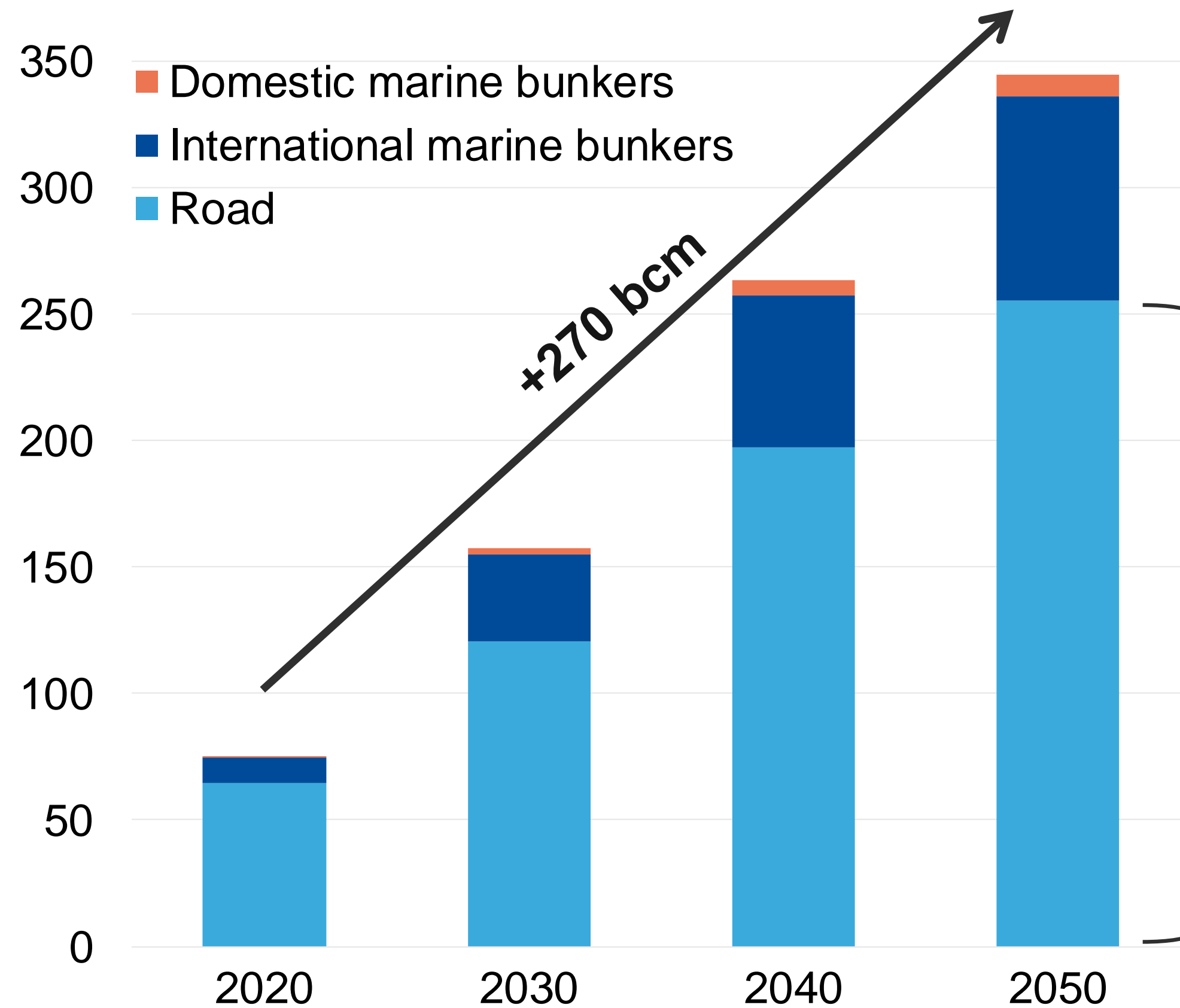


Note: 1) Industry includes gas used as an energy fuel and feedstock as well as for grey hydrogen generation and the production of liquid fuels;
 2) Transport includes road transport and marine bunkers;
 3) Other uses include gas demand for energy industry own use, for rail and pipeline transport

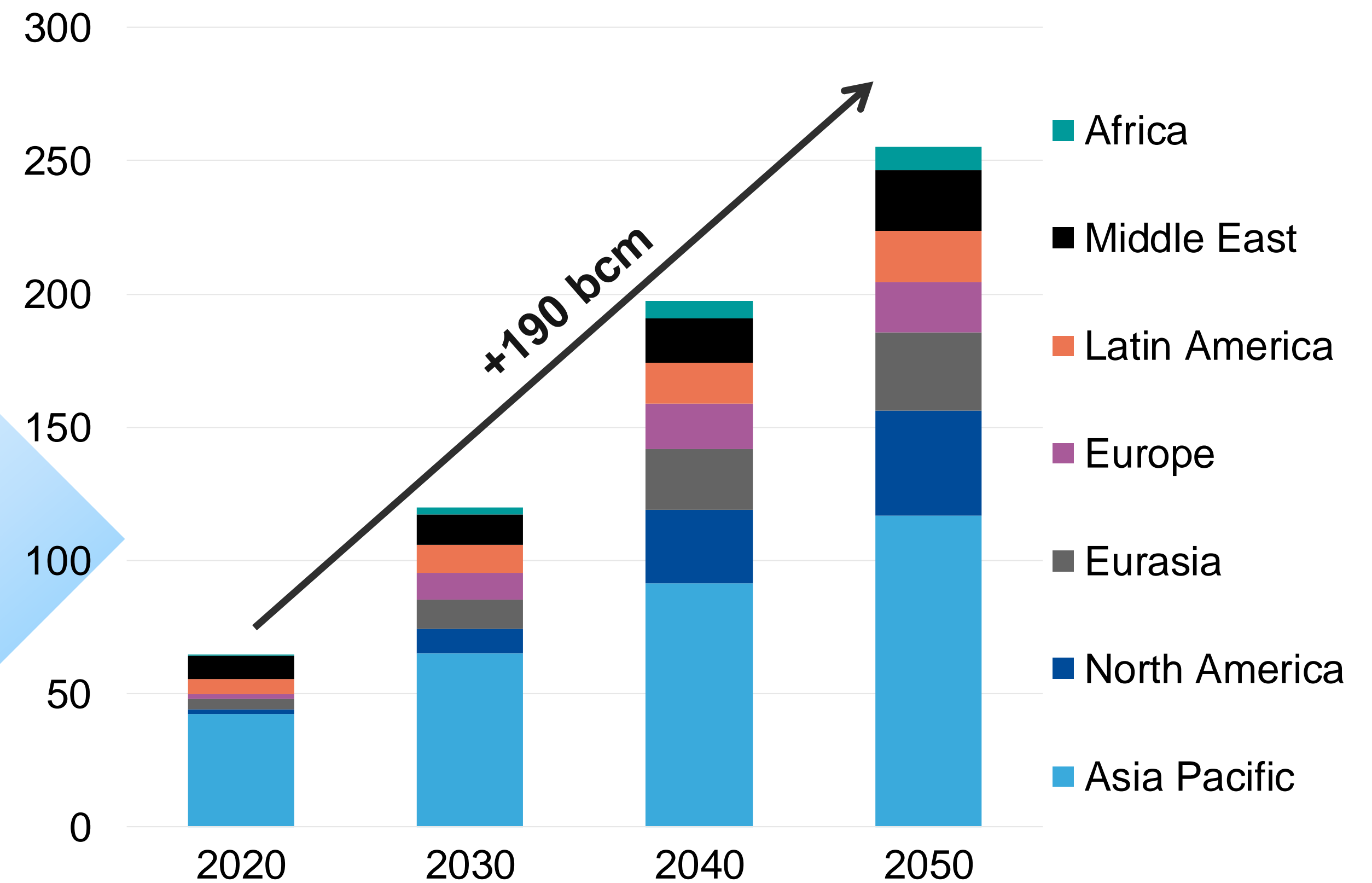
Natural gas is a promising alternative in road and marine transport

- The rise in demand will be robust, growing by 270 bcm (or by 360%) between 2020 and 2050.
- Increasing usage of LNG in heavy goods vehicles and as a bunker fuel.

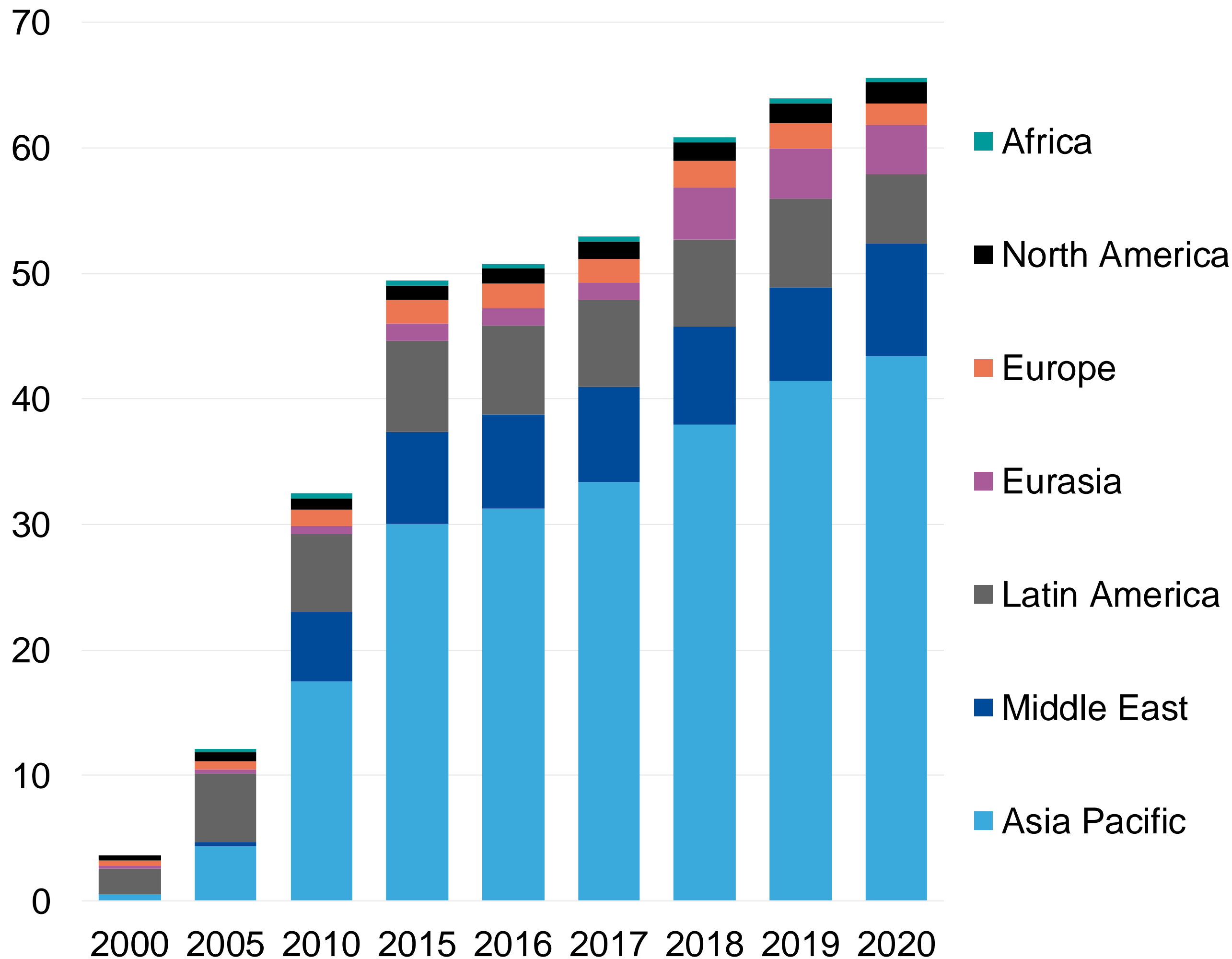
Global natural gas demand trends in road and marine transport (bcm)



Natural gas demand in road transport by region (bcm)



Natural gas demand in road transport by region, 2000-2020 (bcm)



- Growth in demand is impressive, however natural gas represents less than 3% share of the total energy consumed in the global road transport market.
- Total methane-driven fleet is accounted for more than 30 million vehicles. The majority of NGV population constitutes passenger cars, LCVs and buses.
- The penetration of NGVs varies significantly across the regions: Asia Pacific and the Middle East countries account for about 70% of the total NGV fleet.
- Major vehicle makers are entering mass production of NGVs, including powered by LNG.

NGVs are already well-prepared to take over the share of petrol and diesel

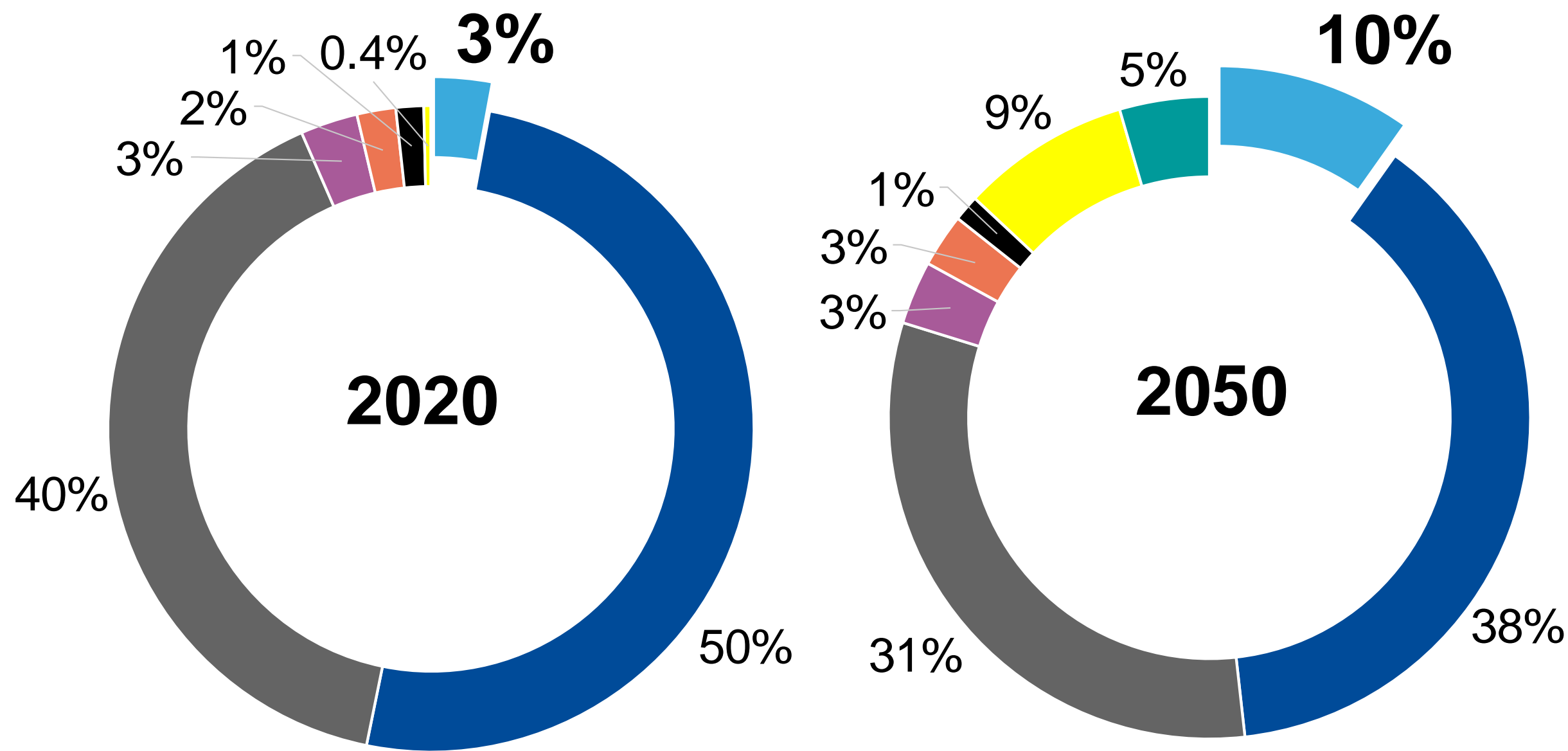
1. Compared to petrol and diesel vehicles:
 - no SOx emissions, 70% less NOx emissions, up to 95% less PM2.5;
 - clear reduction in GHG emissions - benefits amount up to 15-30%, taking a well-to-wheel approach; blending natural gas with biomethane increases environmental performance significantly.
2. Implementation of forward-looking national or regional sales bans on new diesel or petrol vehicles for 2025-2050 will implicitly support gas mobility.
3. Compared to electric vehicles:
 - affordable, ready for mass production, infrastructure is better developed;
 - for countries with a coal-intensive power system – much smaller carbon footprint;
 - the advantages of EVs over NGVs are not so obvious, given the energy intensity of the vehicle manufacturing process, dismantling and recycling of batteries.
4. Compared to hydrogen vehicles: there are no mass produced hydrogen vehicles expected before 2030.

Types of policy measures:

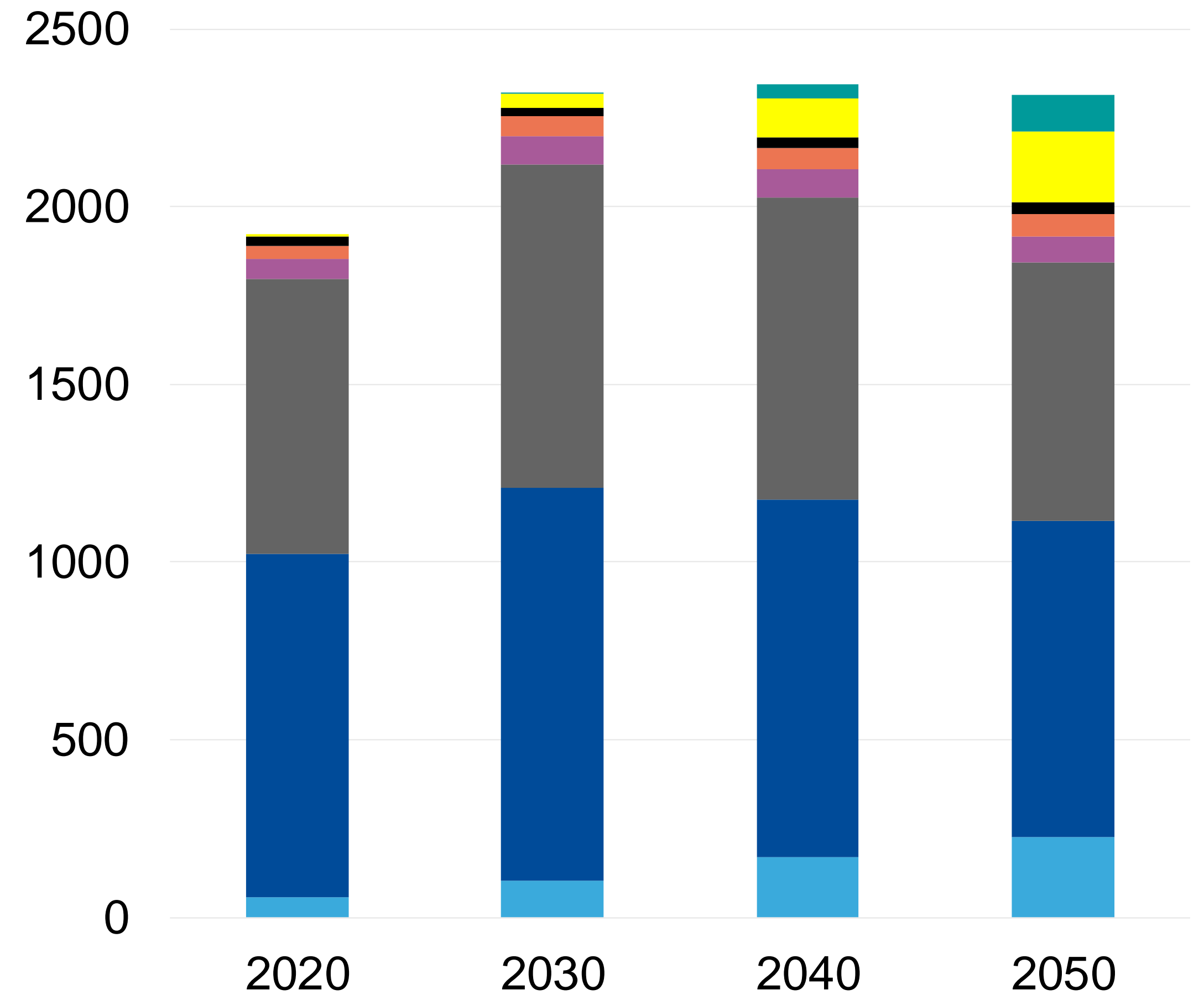
- 1. Fuel-related measures:** lower excise tax applied to methane, the taxation of oil-based fuels.
- 2. Measures encouraging the construction of gas infrastructure and refuelling stations:** direct involvement of government investments, granting of lands for the setting up of CNG/LNG outlets, easing the bureaucracy procedures; improved city gas networks.
- 3. Measures promoting NGV manufacture, supply and purchase:** inclusion of NGVs in OEM's range of models; fleet conversion programs; providing loans, price subsidies for the purchase of new NGVs; R&D programmes to promote innovations in gas-powered engines, refuelling and storage systems.
- 4. Incentives for NGV utilisation:** exemptions from driving restrictions in urban areas, reduced license fees, road tax, parking and congestion charges, priority lanes, waiving highway tolls etc.
- 5. Emissions standards:** establishing regulations to limit atmospheric pollution.

The share of natural gas in the global road transport market will rise from 3% in 2020 to 10% in 2050

Fuel shares (%)



Global road transport demand by energy carriers (Mtoe)



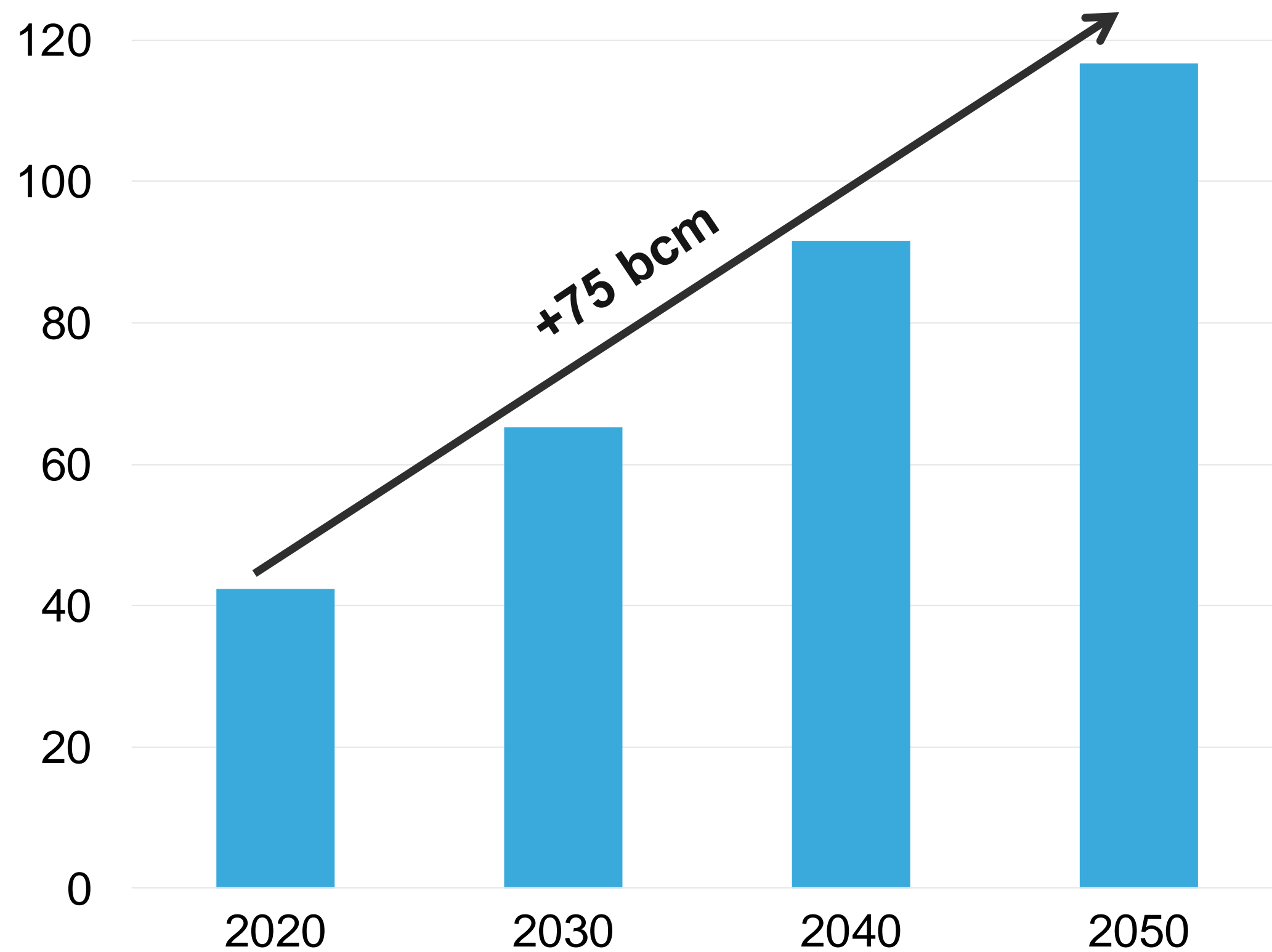
- The majority of gas demand growth will come from the HGV segment, predominantly in the form of LNG.
- The development of the NGV market could be slowed down as policy framework in major countries is explicitly favourable to electric and hydrogen vehicles instead of technological neutrality.

■ Natural gas ■ Petrol ■ Diesel ■ Biopetrol ■ Biodiesel ■ LPG ■ Electricity ■ Hydrogen

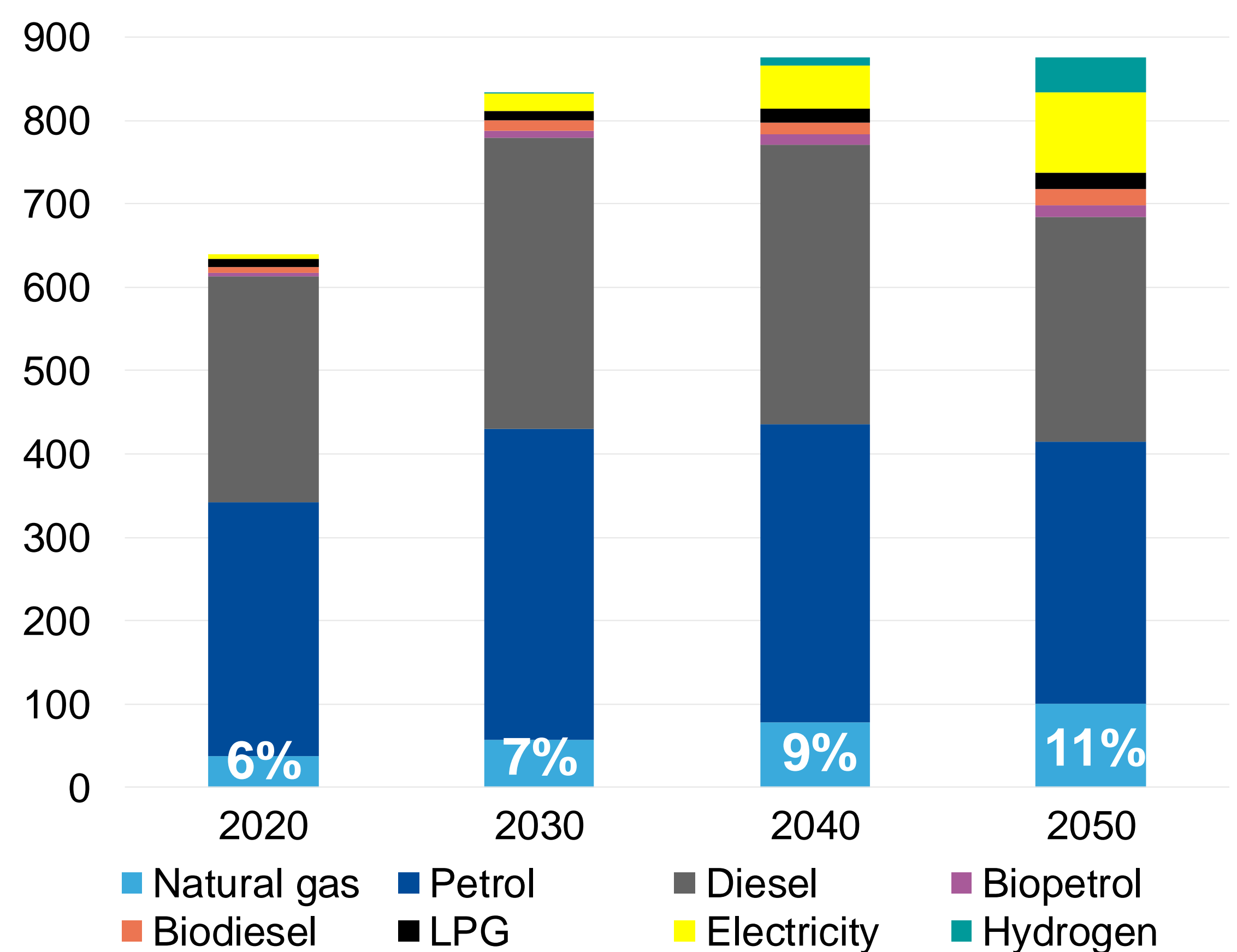
Asia Pacific will lead the growth in global demand for natural gas in road transport

- The rise in demand will be strong, growing by 75 bcm between 2020 and 2050 and driven by India and China
- The share of natural gas in the regional road transport market will rise from 6% to 11% over the outlook period

Natural gas demand in road transport in Asia Pacific (bcm)



Road transport demand by energy carriers in Asia Pacific (Mtoe)



■ Natural gas ■ Petrol ■ Diesel ■ Biopetrol
■ Biodiesel ■ LPG ■ Electricity ■ Hydrogen

1. The introduction of the IMO's global cap of 0.5% sulphur content in 2020.
2. Long-term driver – the IMO's decarbonisation strategy to halve international shipping GHG emissions by 2050, while reducing CO₂ emissions intensity by at least 40% by 2030 and by 70% by 2050, relative to a 2008 baseline.
3. Compared to oil-based marine fuels, LNG almost eliminates SO_x, PM and emits up to 95% less NO_x. On a full well-to-wake lifecycle basis, LNG use in shipping reduces GHG emissions by up to 23% (compared to very low sulphur fuel oil).
4. Many of alternatives fuels (hydrogen, ammonia, etc.) are in a nascent stage of development and have commercial and technical limitations.
5. LNG is in a good position to offer enhanced competitiveness thanks to the existing gas infrastructure and supply chains. Replacing conventional LNG with bio- or synthetic LNG offers an additional and practical way for shipping decarbonisation.

6. The fleet of LNG-powered vessels is growing:

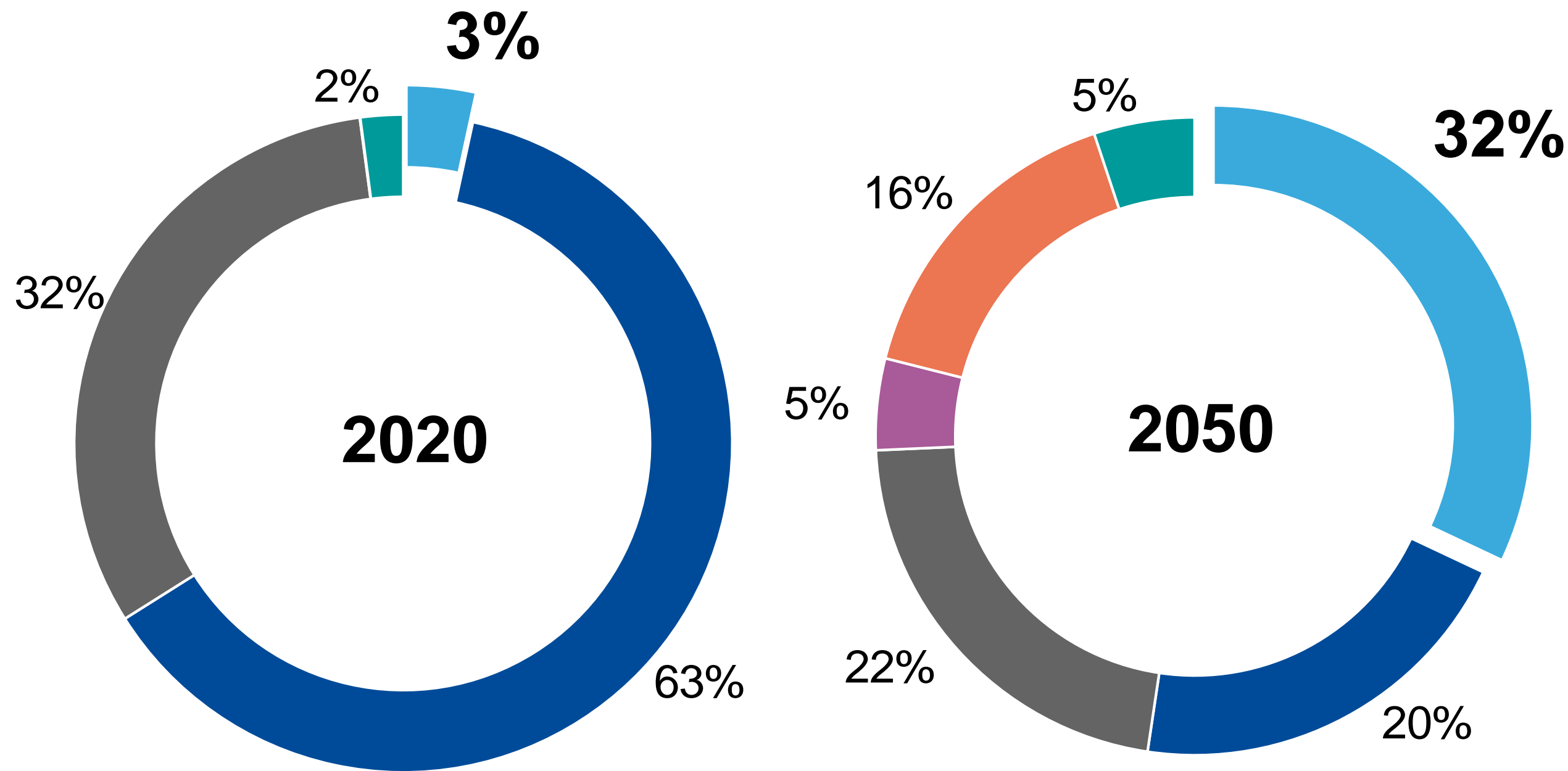
- there are over 300 vessels in service (excluding LNG carriers);
- based on orderbook, number of such vessels will exceed 800 by 2028;
- LNG-powered container ships, car carriers and crude oil tankers account for the majority of orders, resulting in substantial change in demand in the future;
- around 230 ships in the existing fleet and under construction are ‘LNG-ready’.

7. The bunkering infrastructure is responding dynamically and more than 130 ports worldwide offer LNG bunkering services. Ship-to-ship bunkering services are the most flexible and promising solution (38 bunkering vessels are active and 18 are under construction).

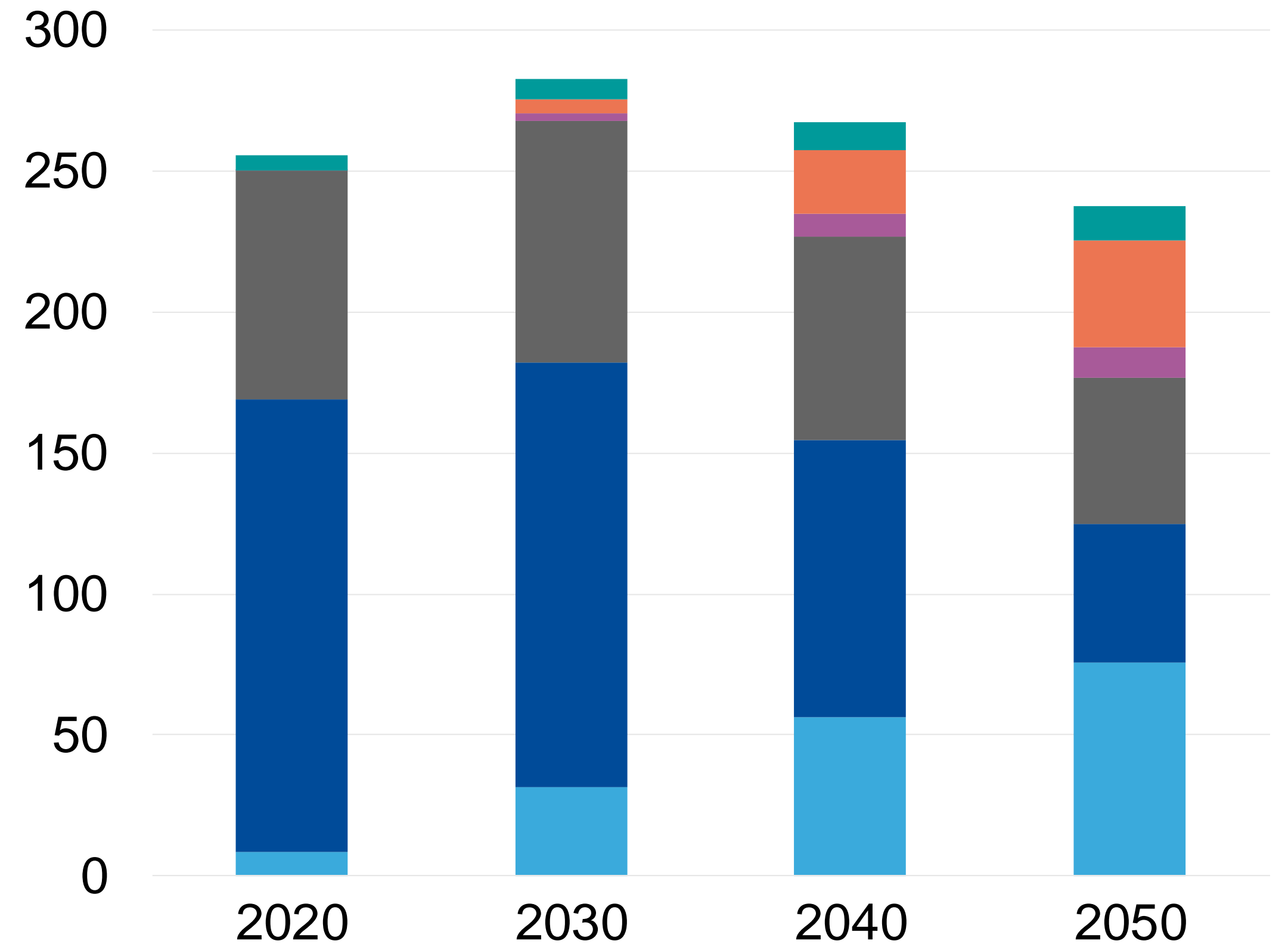
8. Regulations and government support will continue to be a fundamental driver behind the adoption of LNG: inclusion of shipping in the EU’s ETS; the establishment of a Mediterranean ECA; grants for the construction of LNG-powered vessels; waiving of entry fees to ports etc.

The share of LNG in the global bunker fuel market will rise from 3% in 2020 to 32% by 2050

Fuel shares (%)



Global marine demand by energy carriers (Mtoe)



■ Natural gas
 ■ Fuel oil
 ■ Diesel
 ■ Electricity
 ■ Hydrogen-based fuels
 ■ Other fuels

1. Natural gas in the road and marine transport is slated to take off, predominantly in the form of LNG as bunker fuel and in HGVs, driven by stricter environmental regulations and targets to curb air pollution.
2. LNG in marine transport has bright prospects, as it complies with future requirements for the major types of emissions and offers enhanced competitiveness thanks to existing gas infrastructure and supply chains.
3. In road transport, mature CNG and LNG technologies may represent a bridge to a sustainable and decarbonised mobility in the future. To capture the growth potential, it is important to support NGV penetration through sound solutions in the context of carbon mitigation (which surpasses EVs in coal-intensive power systems), air quality and affordability.
4. By maintaining a technological neutrality and a level-playing field between different alternative fuels, natural gas will play an important role in the transport sector. The GECF will support the expansion of natural gas usage in this sector with all tools available, including:
 - friendly policies promotion at major intergovernmental platforms, such as G20, UN (UNFCCC, UNESCO, UNECE) frameworks and activities;
 - research both for marketing purposes through GECF Global Gas Outlook, studies and working papers, and for technology at GECF Gas Research Institute.



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Thank You

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