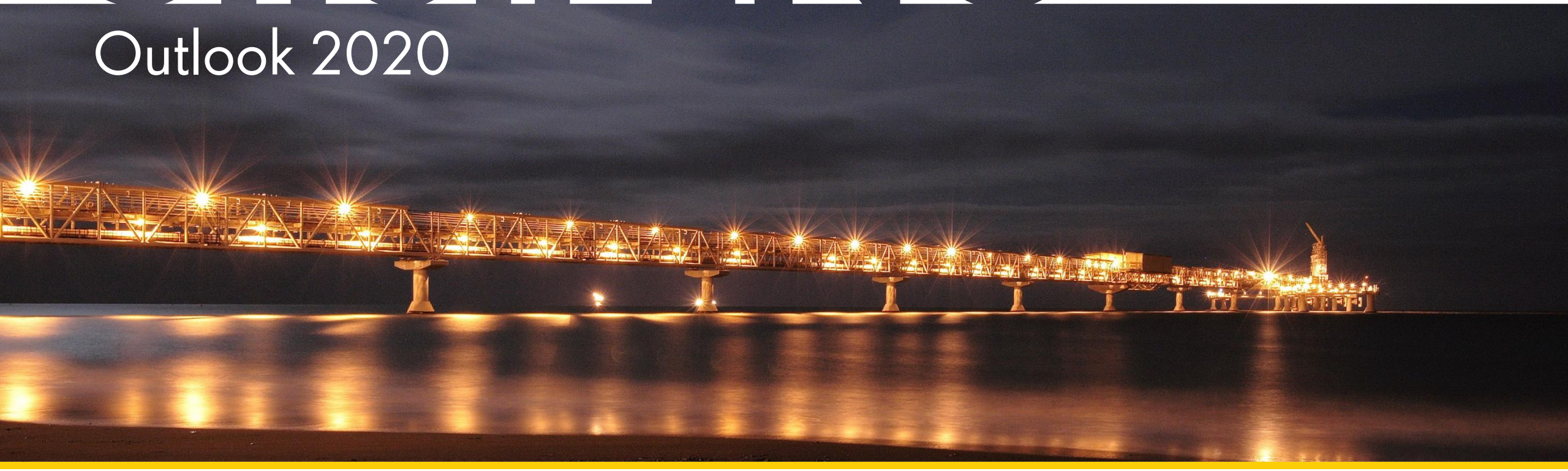
Shell LNG

Outlook 2020



Royal Dutch Shell

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Gas continues to provide more and cleaner energy solutions

The last decade has seen rapid growth in energy demand and corresponding greenhouse gas emissions which have created the need for more and cleaner energy options. A combination of new policy, favourable economics and partnership with renewables is driving the momentum for coal-to-gas switching.

2019 was a year of record LNG supply growth

2019 saw record LNG supply growth as the recent wave of new LNG liquefaction projects nears completion. Most of this growth was absorbed by Europe. Year-on-year growth in Asian imports slowed from highs of 2017 and 2018, but Asia still remains a growth region. Increased liquidity, new spot trading mechanisms and a wider variety of indices being used for long-term contracts point towards LNG becoming an increasingly flexible commodity.

Record supply investment due to confidence in long-term LNG demand growth

2019 was also a year of record final investment decisions (FIDs), with 71 million tonnes of new capacity being sanctioned, indicating belief in long-term LNG demand. Increasing uncontracted and flexible supply is set to offer more options for customers in the future.

Overview

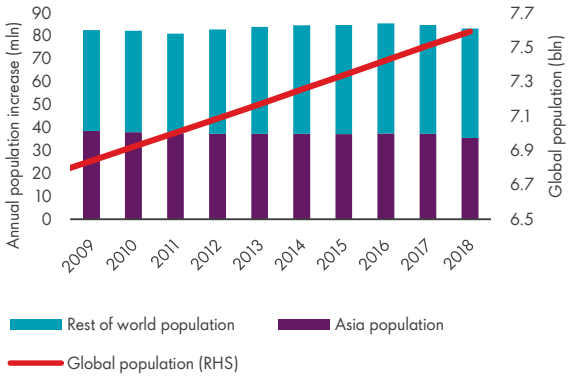
Queensland Curtis LNG

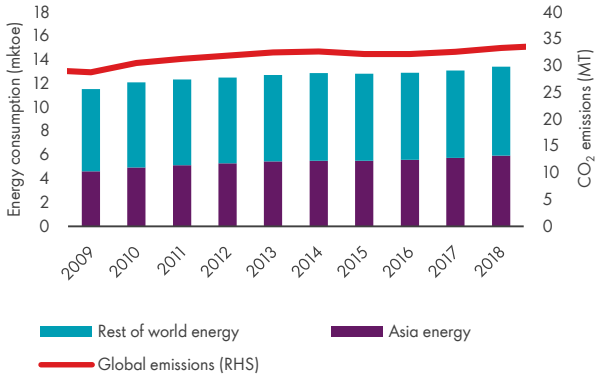
01

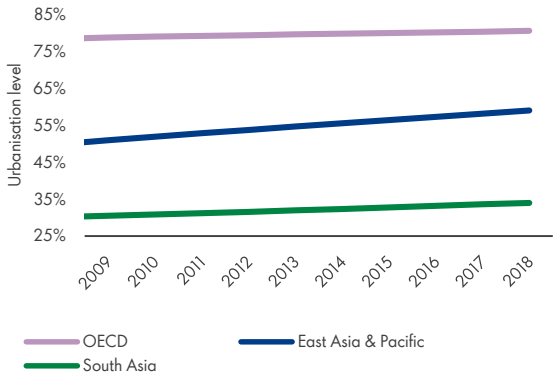
Gas continues to provide more and cleaner energy solutions

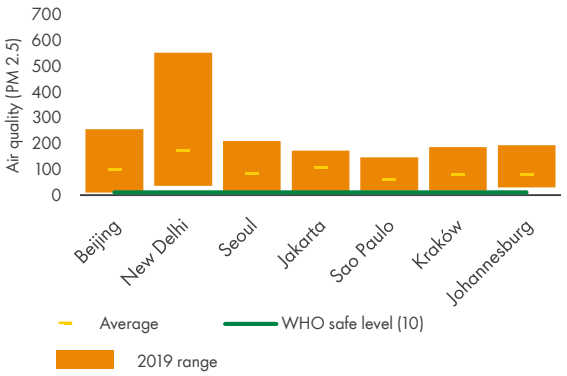
Growing population and rising living standards drive demand for energy with lower emissions

Shell LNG Outlook 2020





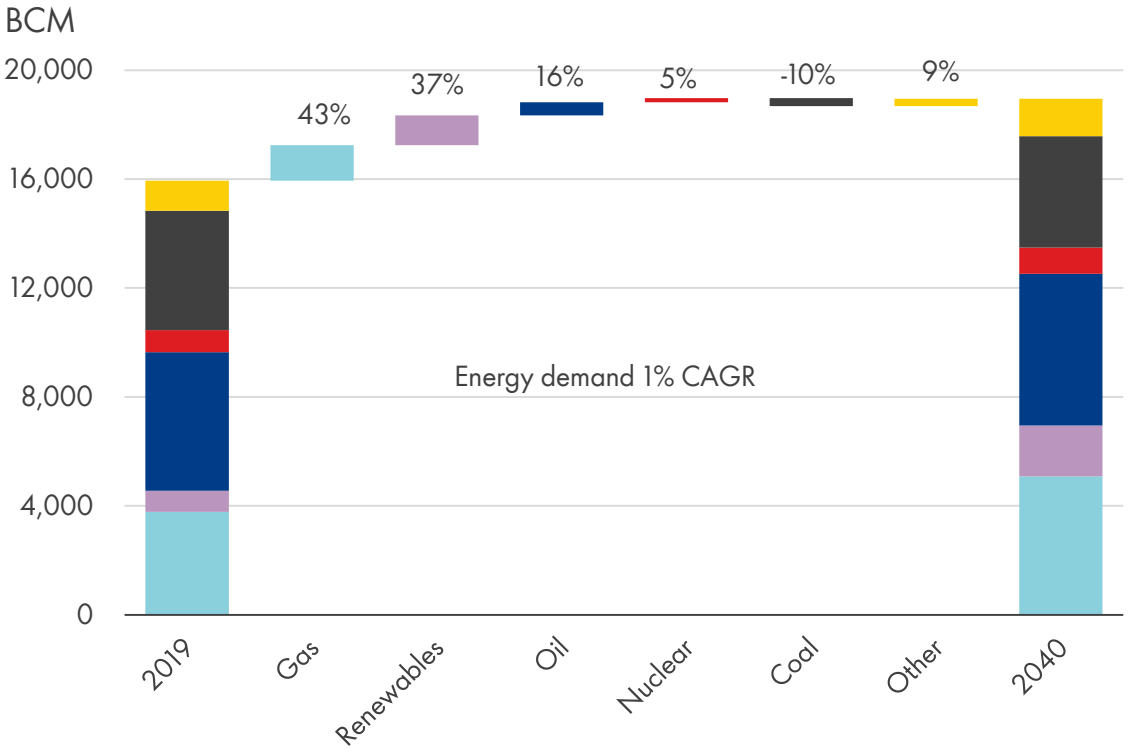




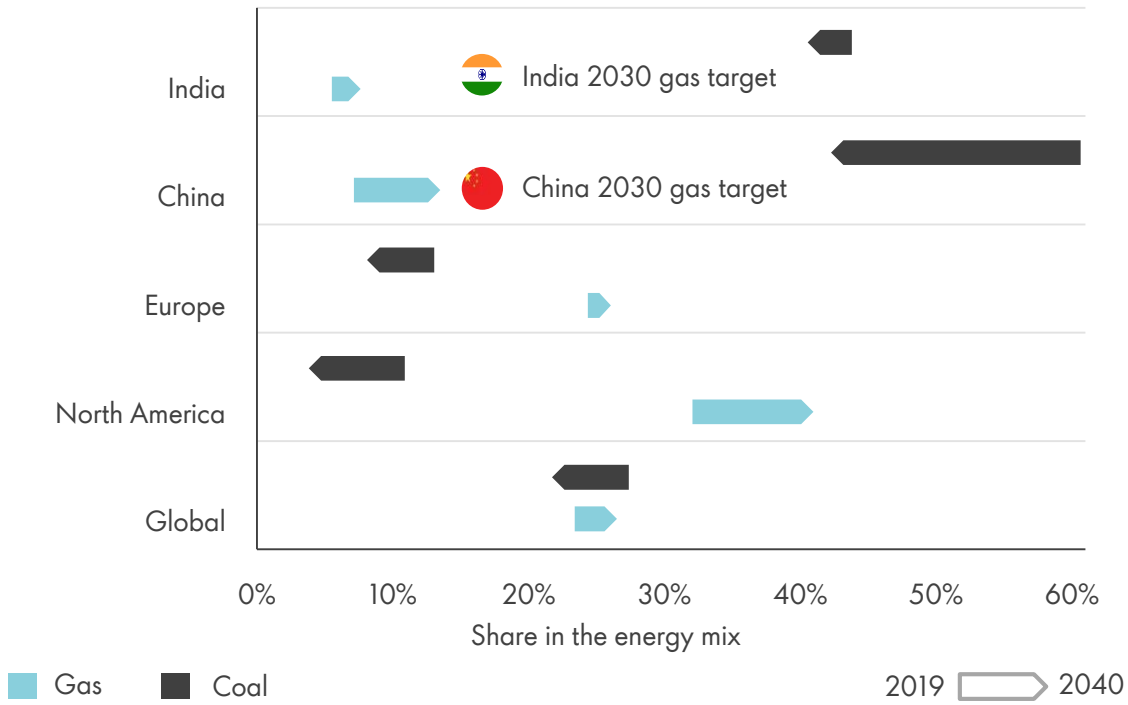
Source: Shell's interpretation of Wood Mackenzie H1, World Bank, The World Air Quality Index 2019 data

Renewables and gas expected to replace coal in the global energy mix

Global energy demand growth by fuel type



Gas and coal share in the energy mix 2019-2040



Source: Shell interpretation of Wood Mackenzie H1 2019 data

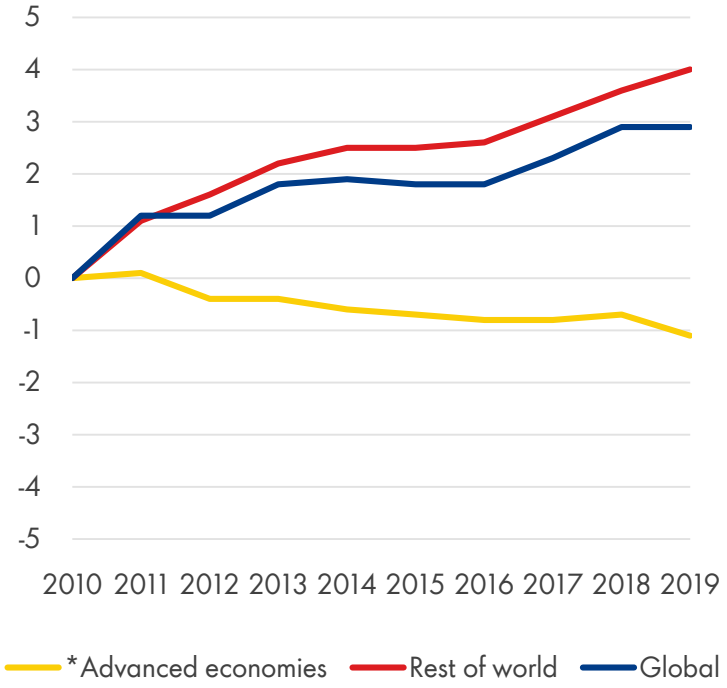
CAGR - Compound annual growth rate

Coal-to-gas switching helping level global CO_2 emissions

Shell LNG Outlook 2020

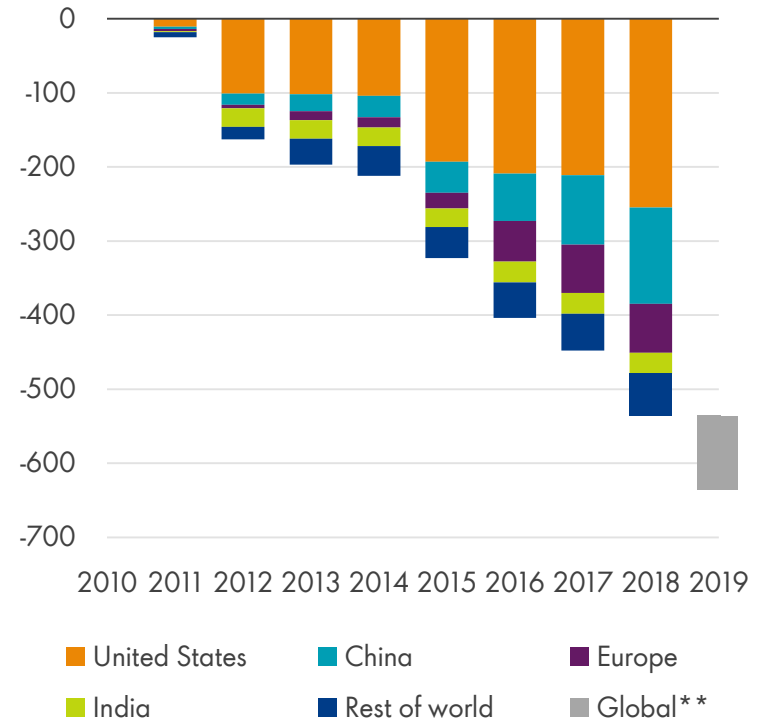
CO_2 change

CO_2 GT, 2010=0



Coal-to-gas switching CO_2 savings

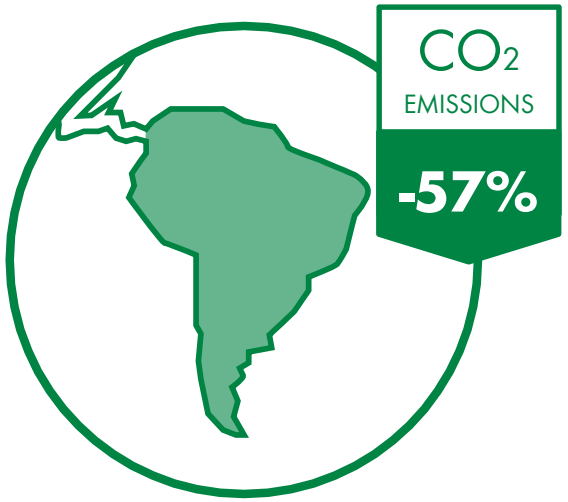
CO_2 MT, 2010=0



Equivalent to

over 50% of CO_2 emissions

from South America for a full year



Source: Shell interpretation of Wood Mackenzie, IEA World Energy Outlook, IEA Carbon Report 2019 data **Power sector coal-to-gas switching in Advanced economies only

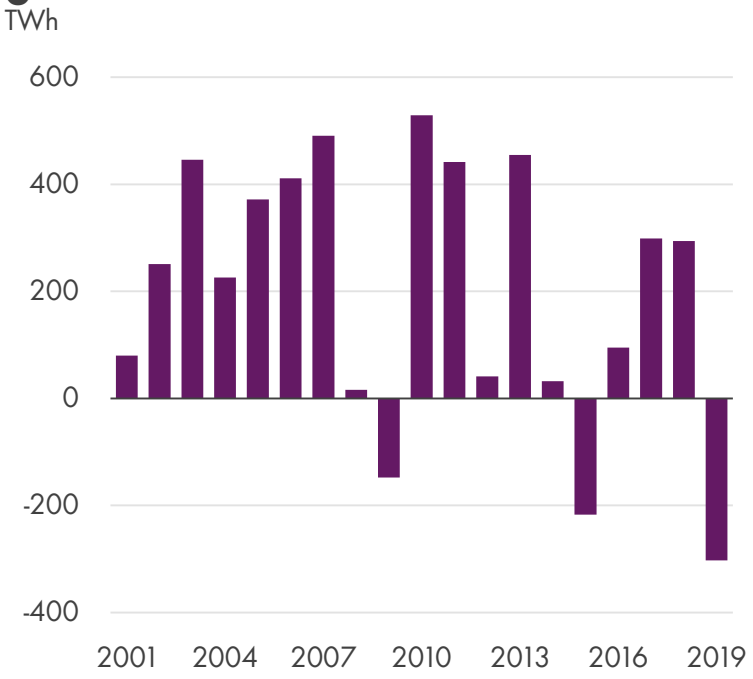
*Advanced economies include United States, European Union, Australia, Canada, Chile, Iceland, Israel, Japan, South Korea, Mexico, Norway, New Zealand, Switzerland & Turkey

Record coal phase-out and generation reduction in 2019

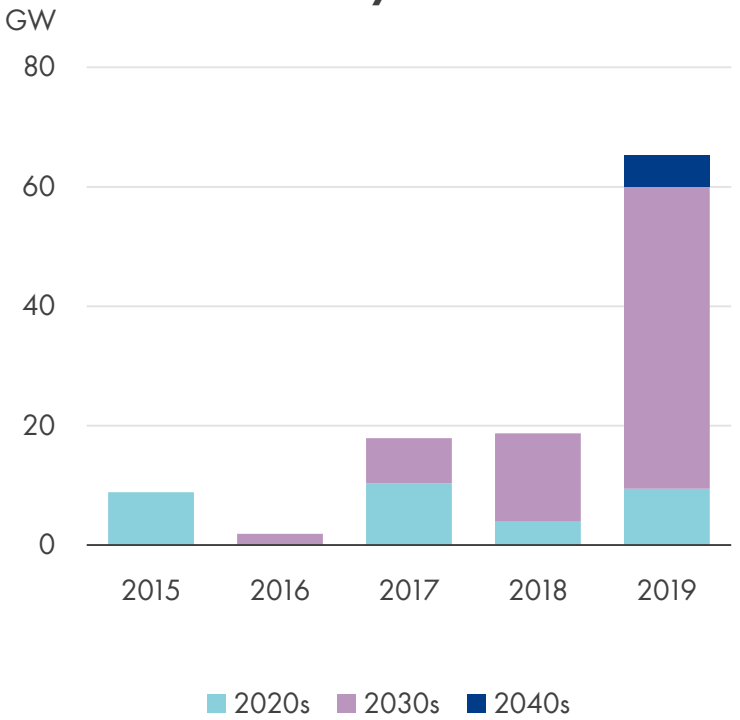
Opportunity for more displacement of coal in the power sector

Shell LNG Outlook 2020

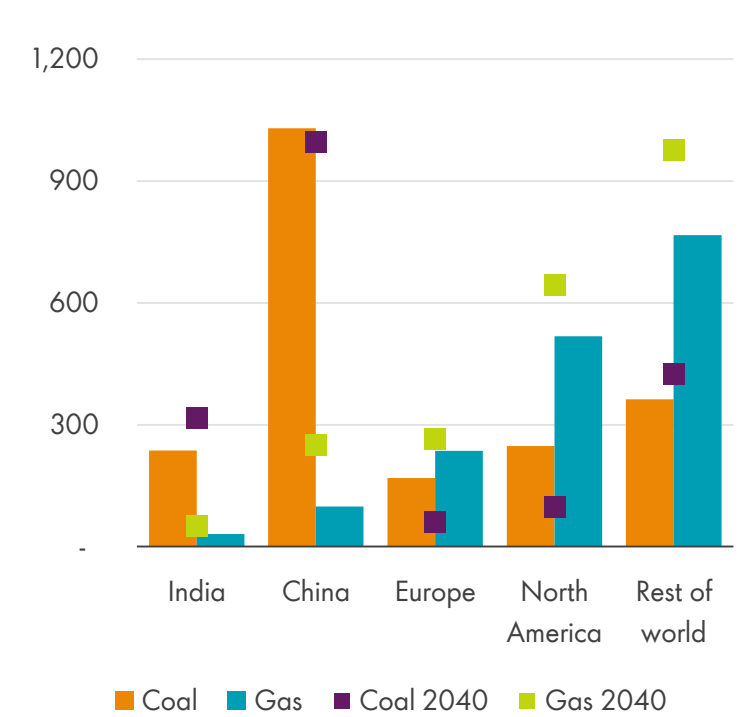
Net change in global coal generation



Global coal phase-out capacity announcements by date



Power capacity by fuel

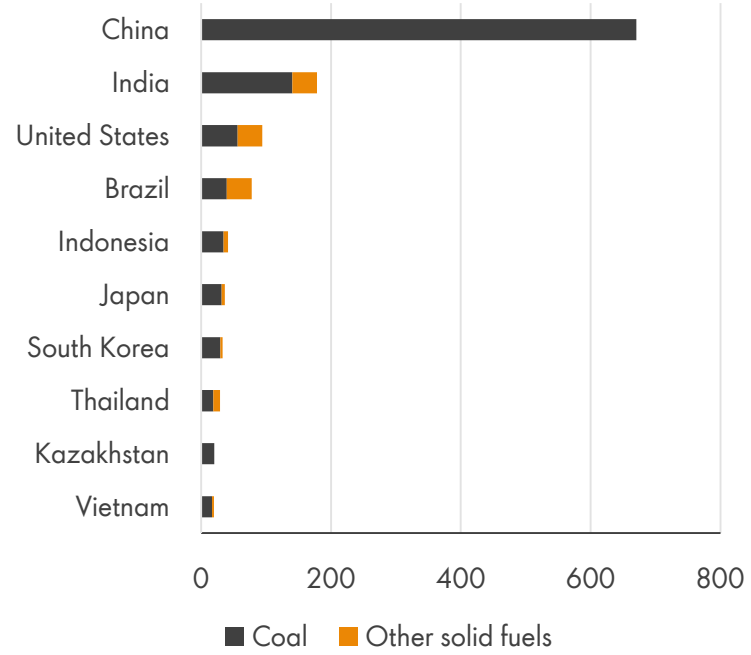


Source: Shell interpretation of national government policy announcements, Carbon Brief, Global Energy Monitor, GlobalData plc and Wood Mackenzie 2019 data

Use of coal and other solid fuels outside the power sector also impacts air quality

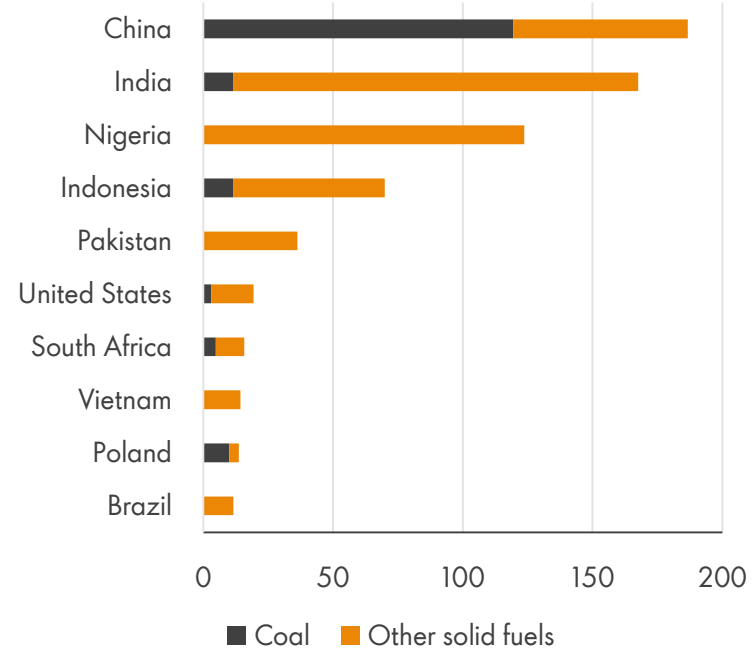
Coal and solid fuel use in the industrial sector

BCMe

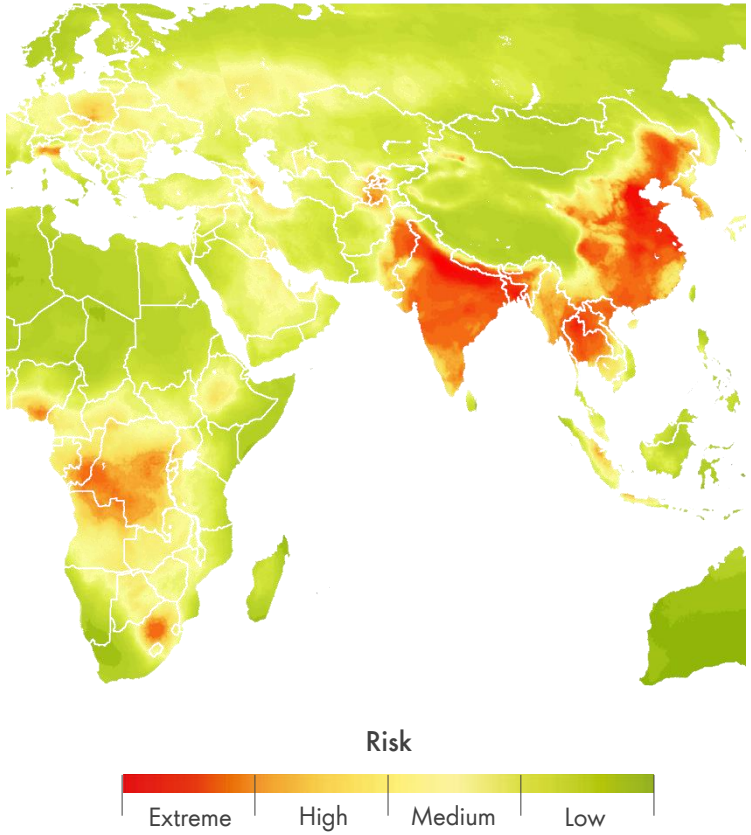


Coal and solid fuel use in res & comm* sector

BCMe



Air quality index 2018

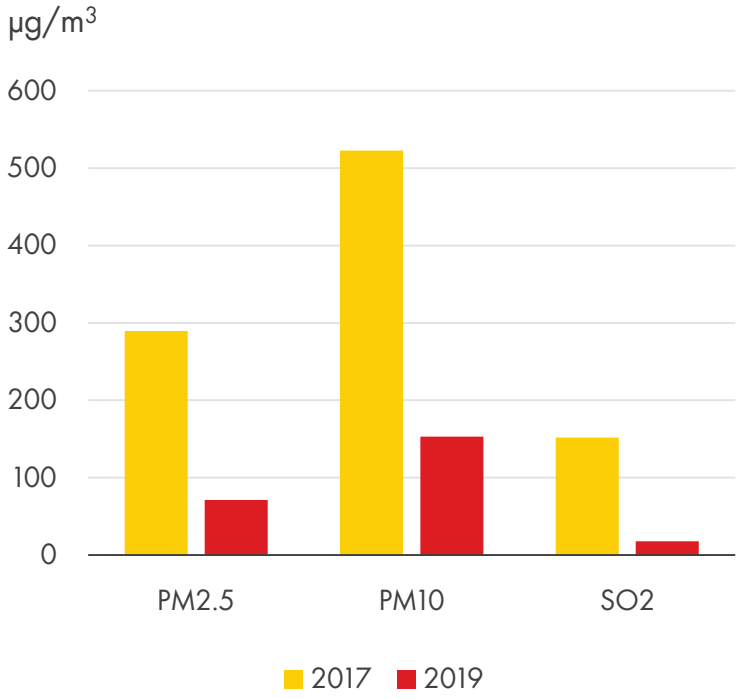


Source: Maplecroft 2018 and Shell interpretation of Wood Mackenzie data H1 2019

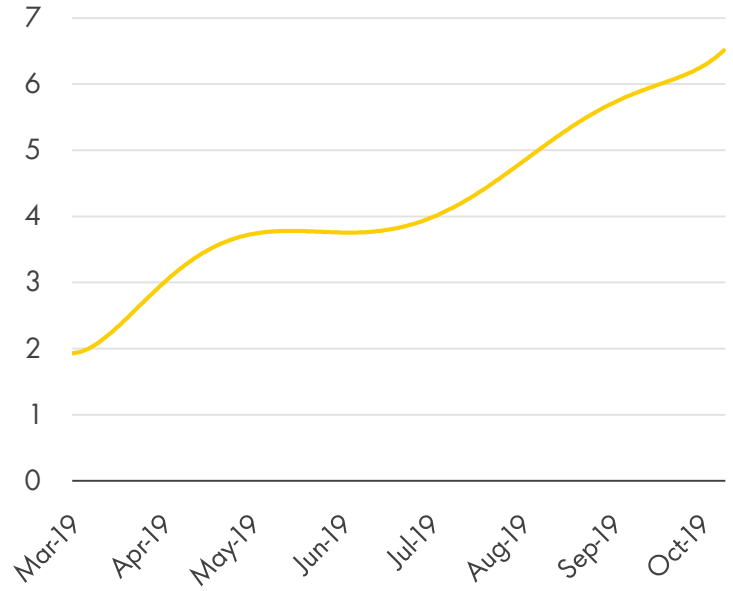
*Res & comm: residential and commercial sector and also includes use in cooking and heating BCMe – Billion Cubic Metres equivalent

Coal-to-gas switching in the industrial sector can improve air quality

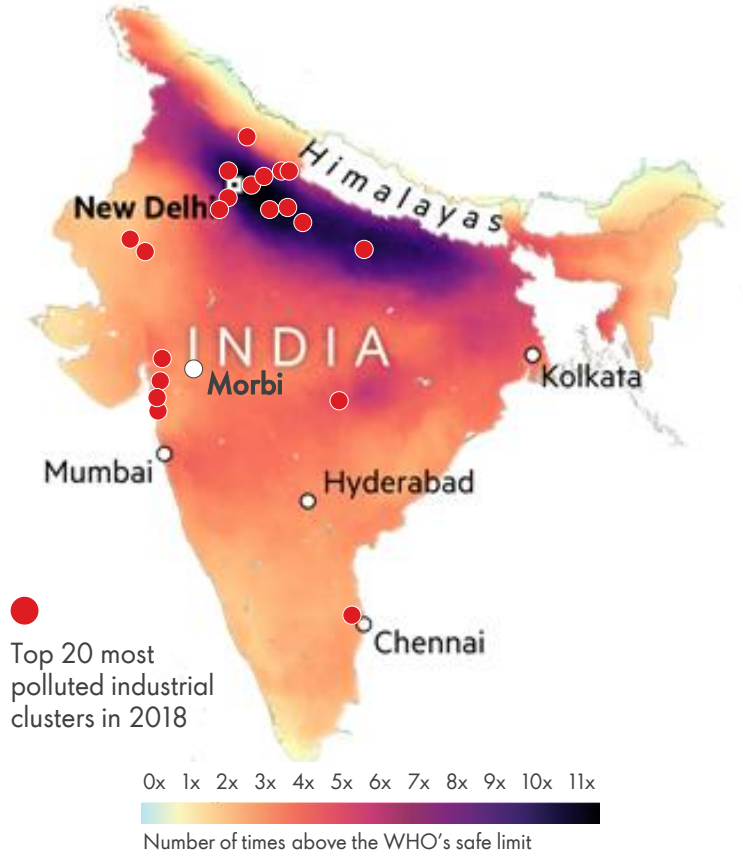
Air quality levels in Morbi, Gujarat



Gas demand post-ban on coal units in Morbi industrial sector in 2019



Air quality in India

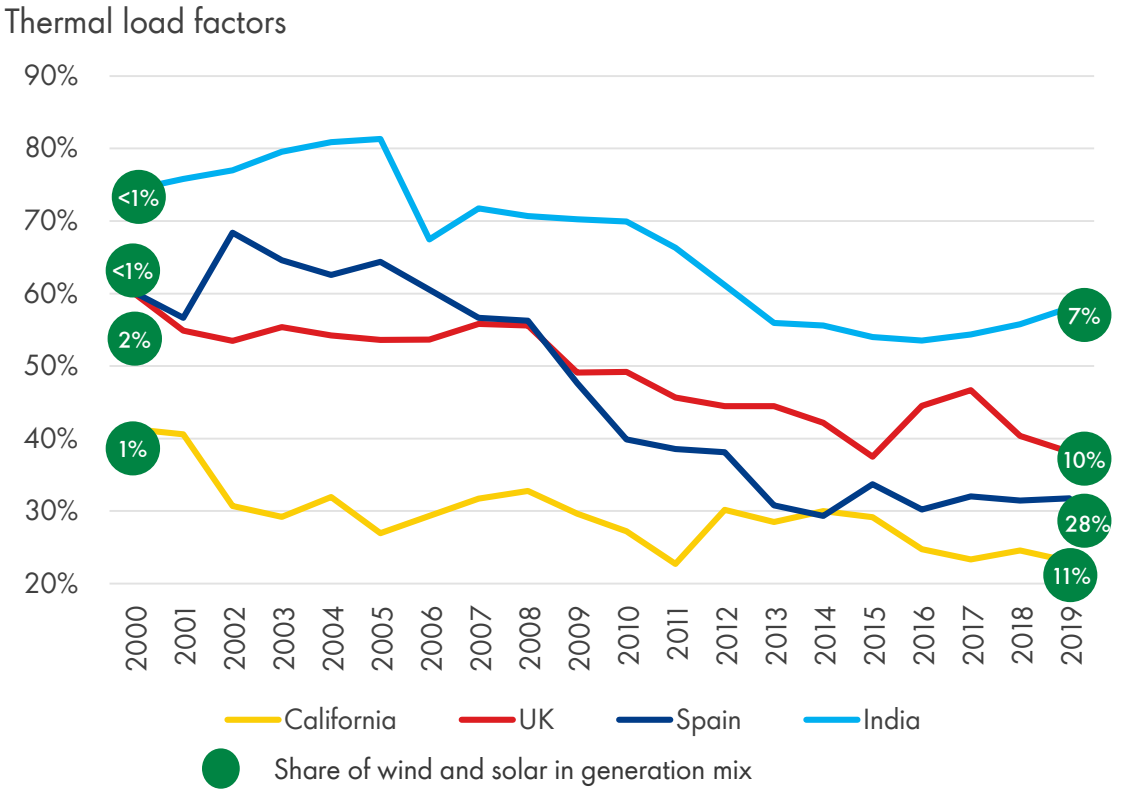


Source: Shell's interpretation of International Gas Union, Financial Times, Central Pollution Control Board (India) data 2018 and 2019

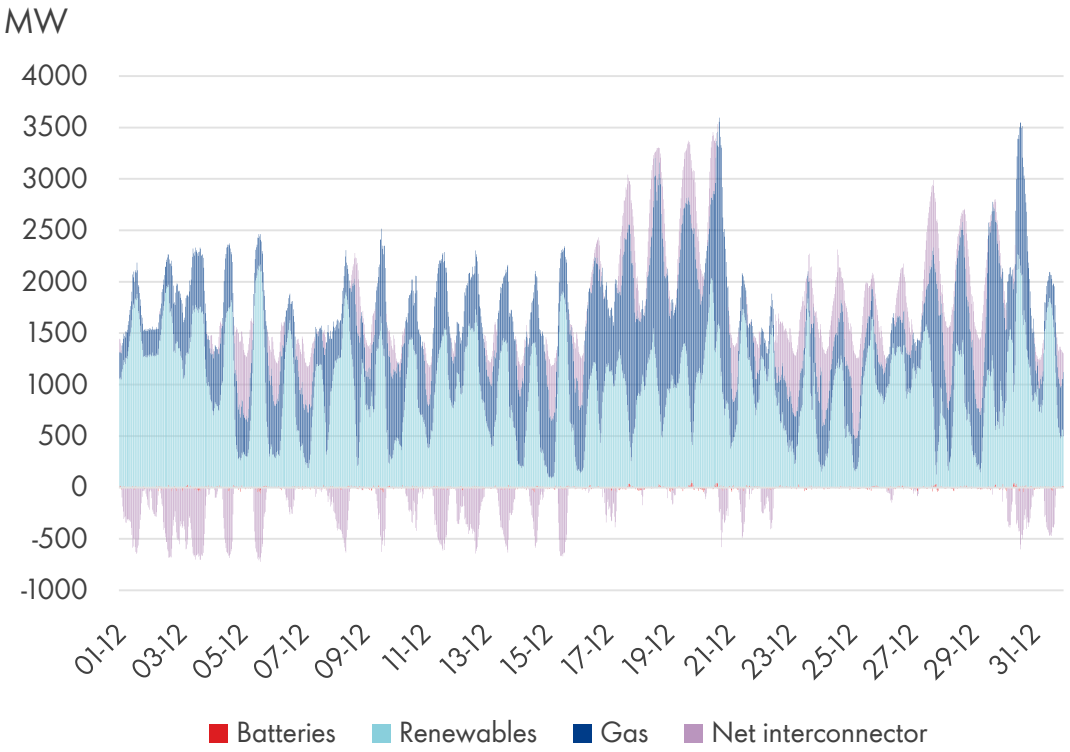
PM: particulate matter SO2: sulfur dioxide

Growth of renewables favours gas in the power mix

Average thermal load factors



South Australia electricity supply December 2019



Source: Shell interpretation of Wood Mackenzie H1, national data and OpenNEM 2019 data

Challenges to the role of gas in the energy transition

Industry to address

Methane emissions

Need for improved measurement and reporting and continual reduction in methane emissions

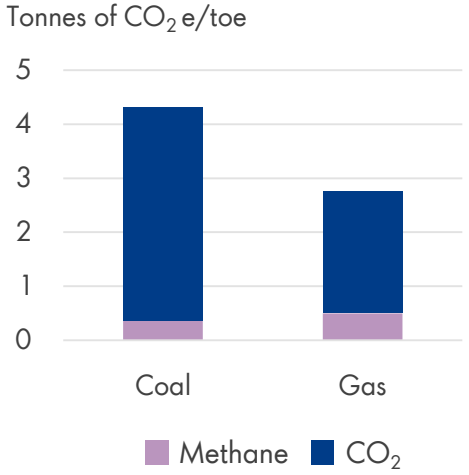
Future pathways

Credible routes to deploy clean gas at scale such as carbon capture and storage (CCS) and biogas are needed

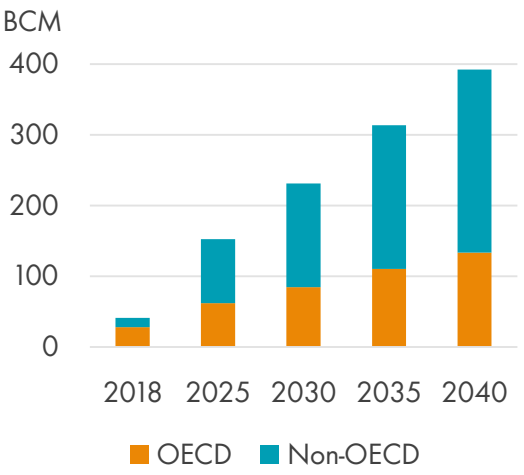
Cost control

Need to drive cost reductions to make natural gas more affordable for customers, ensuring it remains highly competitive compared to other energy sources

Emissions from coal and gas



Biogas production



Policies

To accelerate change, governments need to introduce long-term policies that enable development of lower-carbon and renewable sources of energy, supported by technologies like CCS. Also, carbon-pricing mechanisms can help reduce emissions and encourage the use of cleaner sources of energy.

Driven by influencers

Public perception

Gas faces a challenge from those arguing to remove all fossil fuels from the global energy mix. However, the supply of reliable energy cannot all be met by renewables– at least not yet.

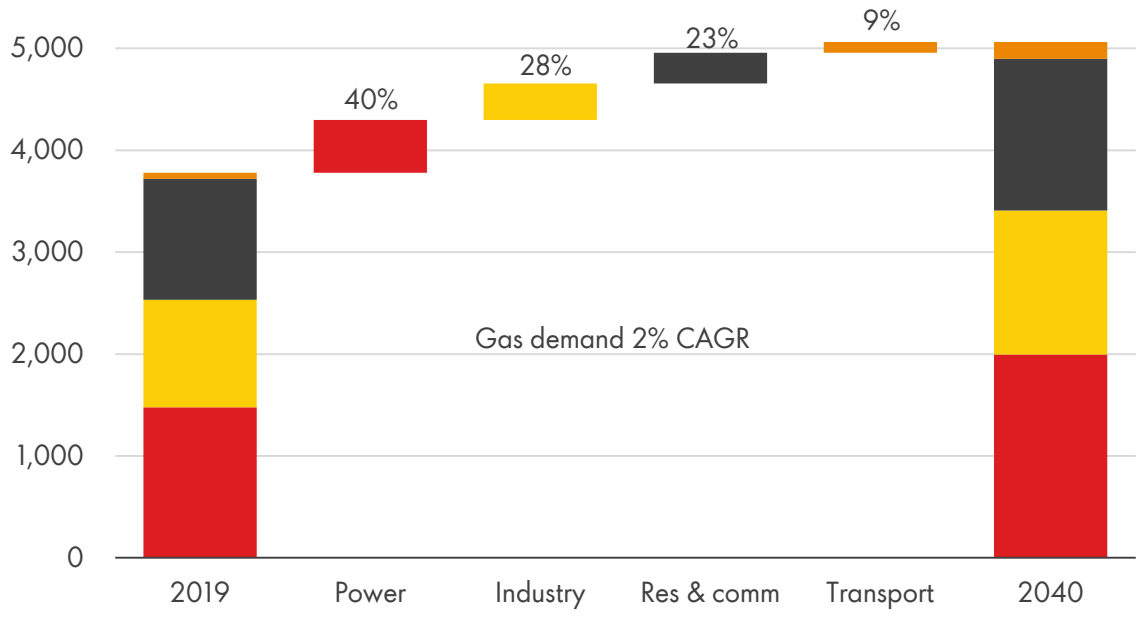
Gas is a fuel for today and tomorrow. It can act as a partner for renewable sources to offer reliable, flexible and cost-effective access to more and cleaner energy at scale, and all stakeholders must work harder to ensure public support for gas to play its full role.

Source: Shell interpretation of IPCC Emissions factors and IEA World Energy Outlook data 2019

Gas to play a key role in reducing emissions from hard-to-electrify sectors

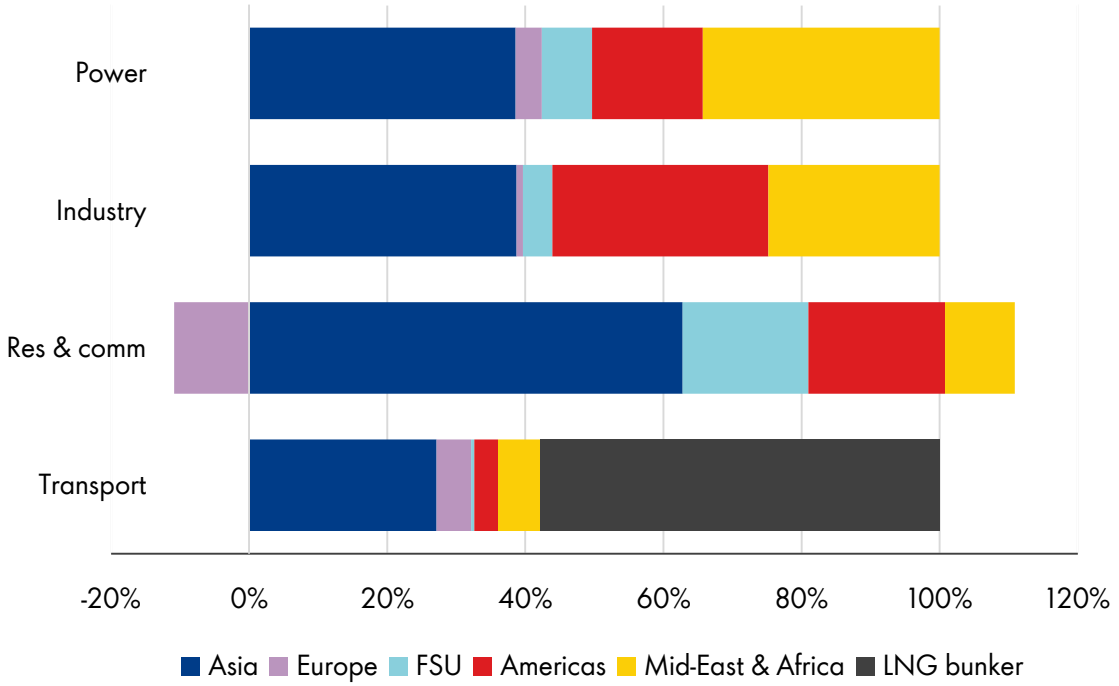
Global gas demand growth by sector

BCM



Share of gas demand growth by sector 2019-2040

Gas demand sectors



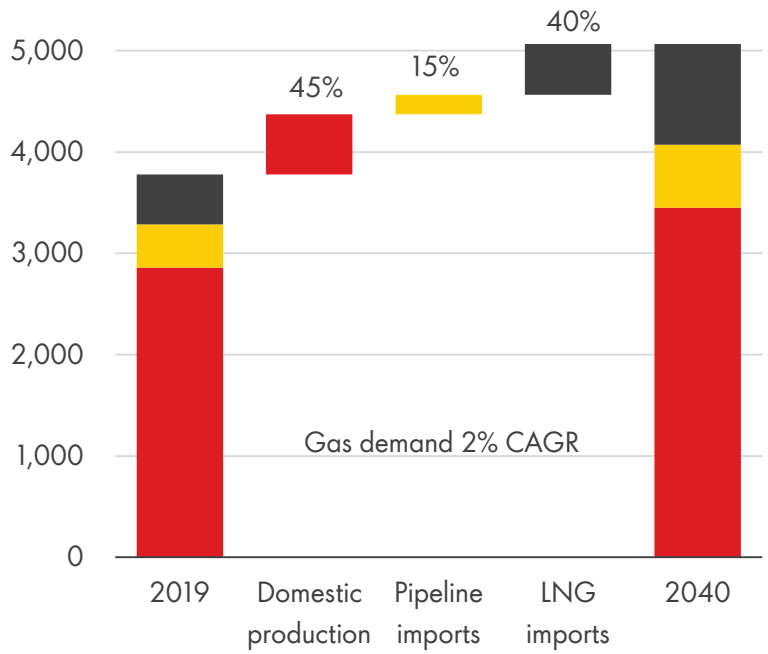
Source: Shell interpretation of Wood Mackenzie H1 2019 data

Asia set to be the key growth region for LNG

Shell LNG Outlook 2020

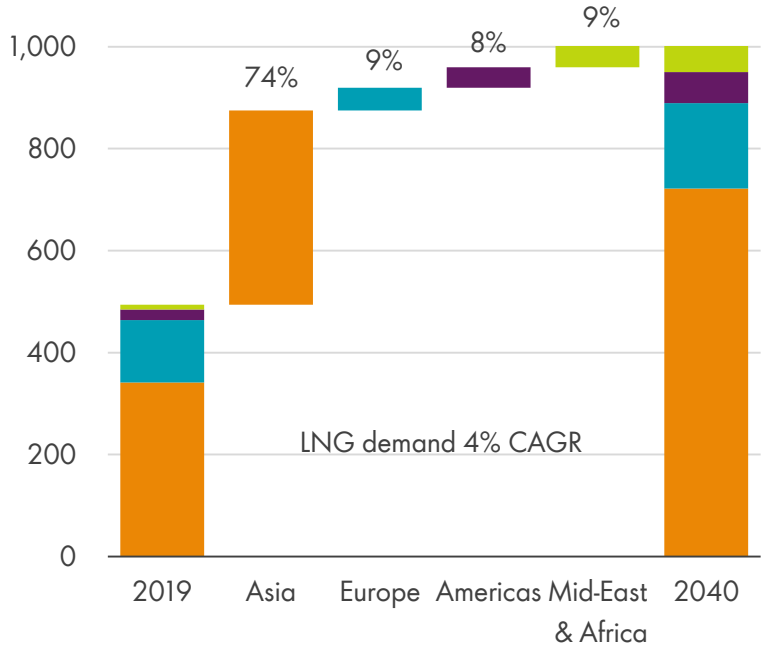
Global gas supply by source

BCM



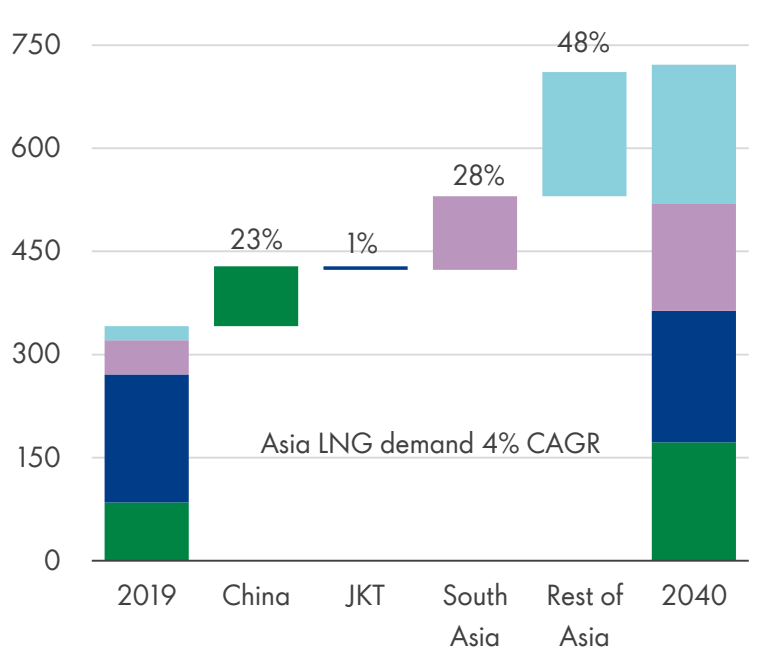
LNG imports by region

BCM



LNG imports into Asia

BCM



Source: Shell interpretation of Wood Mackenzie H1 2019 data

Gibraltar – small-scale LNG import terminal

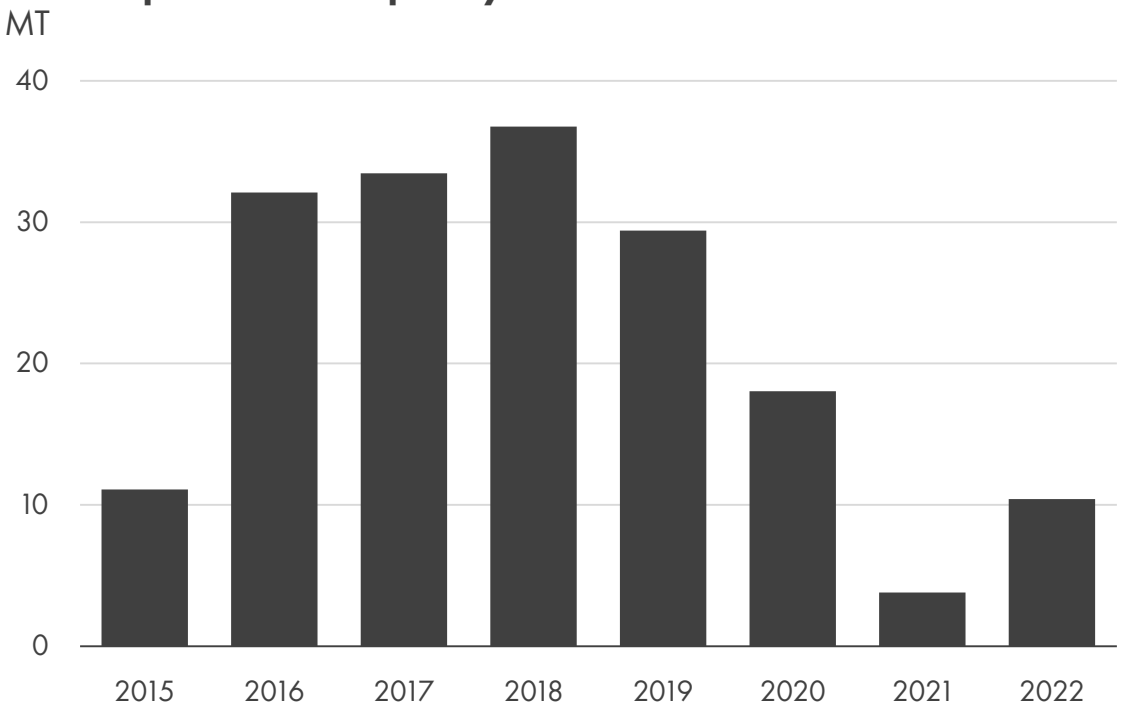
02

2019 was a year of record LNG supply growth

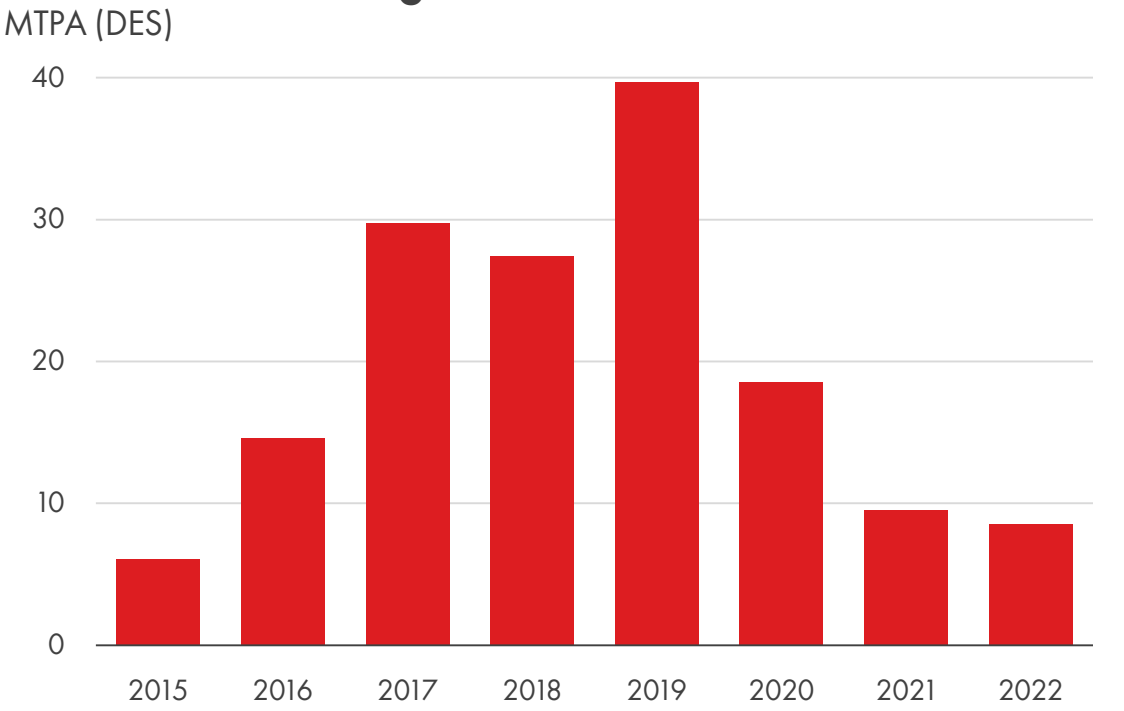
Current wave of LNG capacity additions coming to an end

85% now online

LNG liquefaction capacity additions



LNG trade volume growth



2019 LNG trade volume: 359 MTPA

Source: Shell interpretation of IHS Markit 2019 data

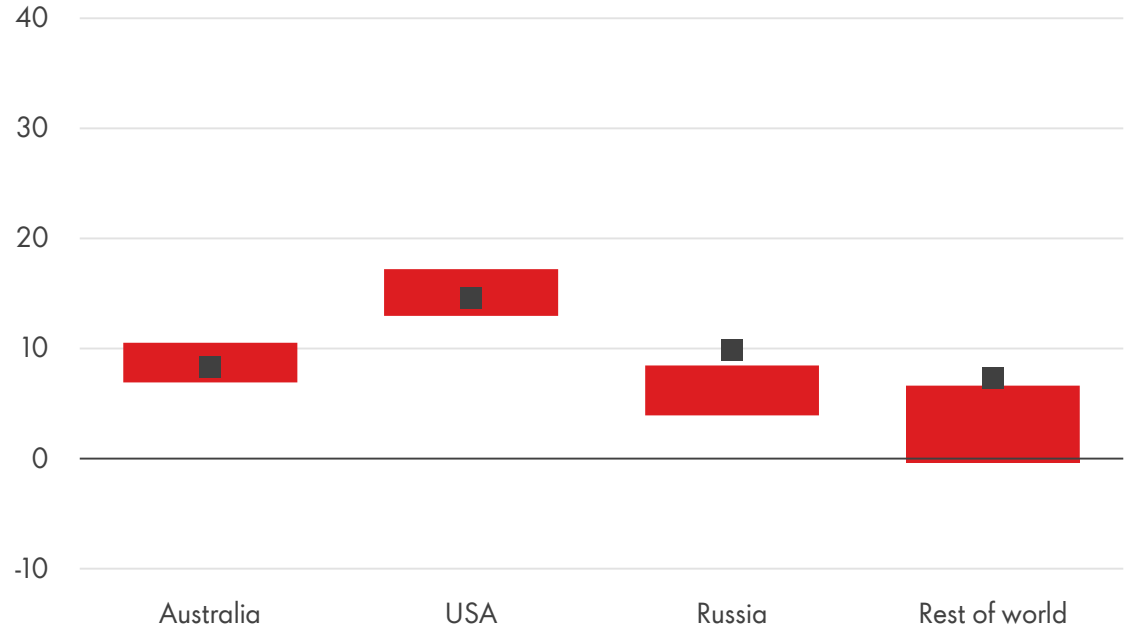
DES: delivered ex-ship

Record LNG supply growth absorbed mainly in Europe

Shell LNG Outlook 2020

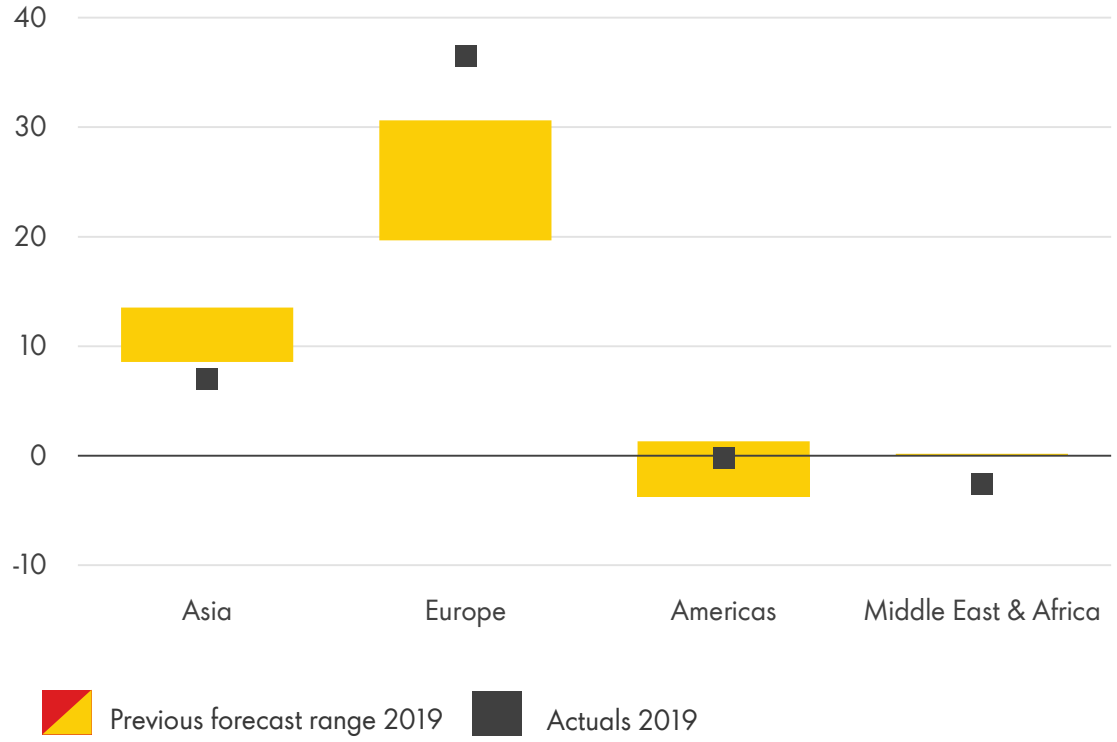
LNG supply growth range by country

MTPA



LNG demand growth range by region

MTPA



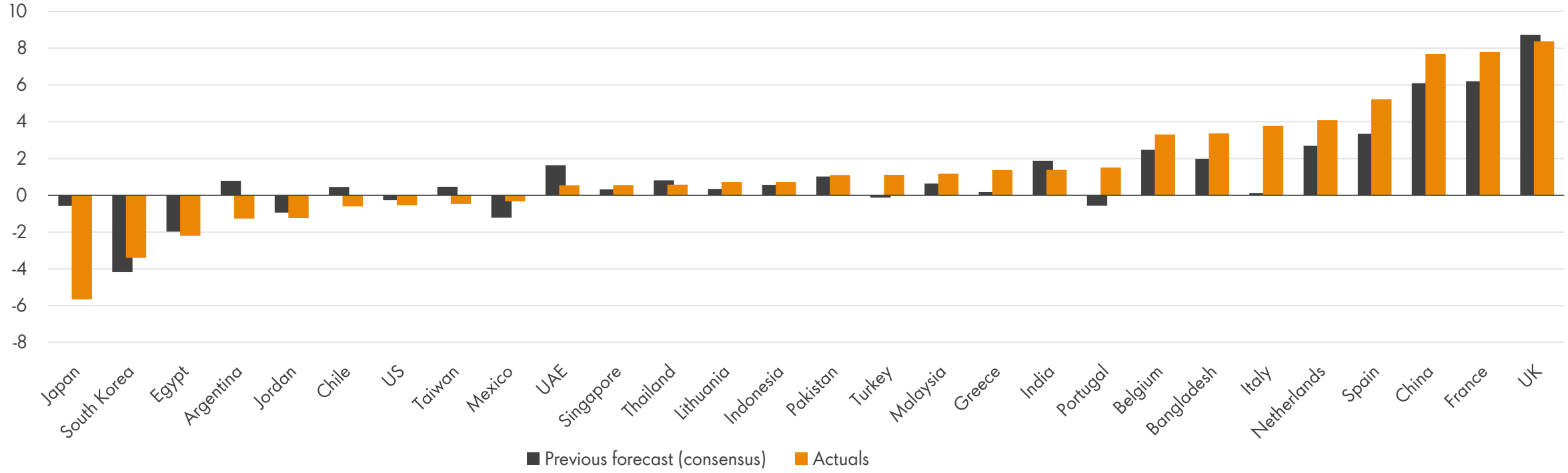
Source: Shell interpretation of IHS Markit, Wood Mackenzie, Poten & Partners Q4 2018 and 2019 data

LNG imports rise by 40 million tonnes in 2019

China continues to be among top three global LNG growth markets

Net imports: 2019 YoY

MTPA (DES)



Source: Shell interpretation of IHS Markit, Wood Mackenzie and Poten & Partners 2018 and 2019 data

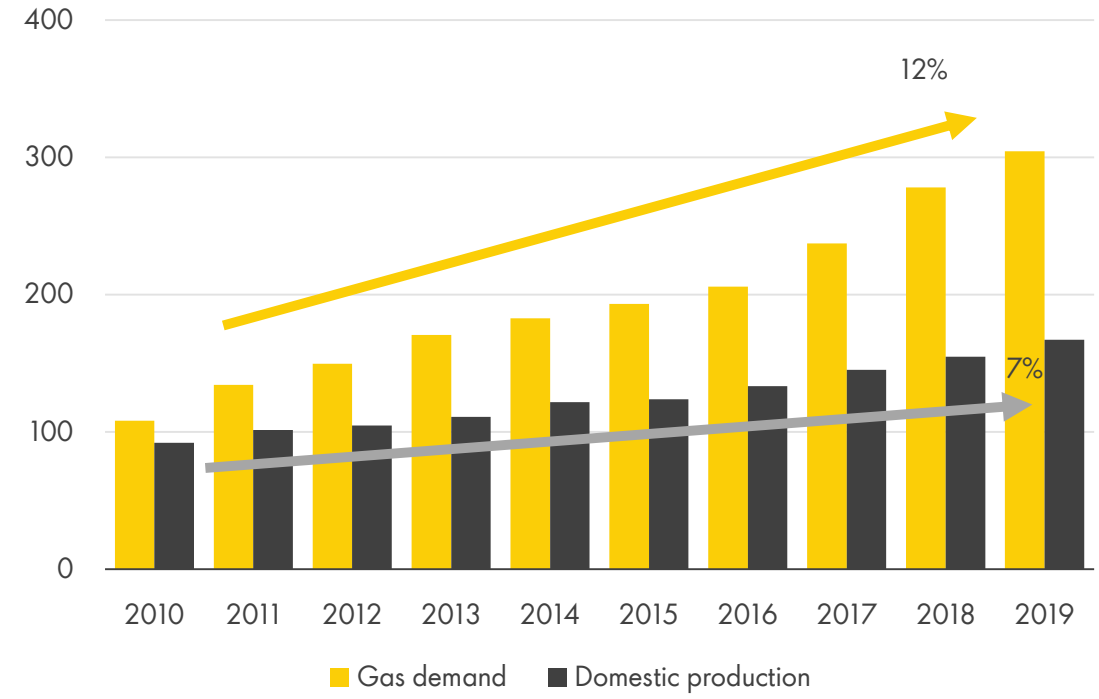
Note: Sweden, Canada, Colombia, Norway, Finland, Malta, Israel, Jamaica, Puerto Rico, Kuwait, Brazil, Panama, Poland and Dominican Republic are not included in the above chart as change is minimal

LNG imports continue to meet China's growing need for cleaner energy

Shell LNG Outlook 2020

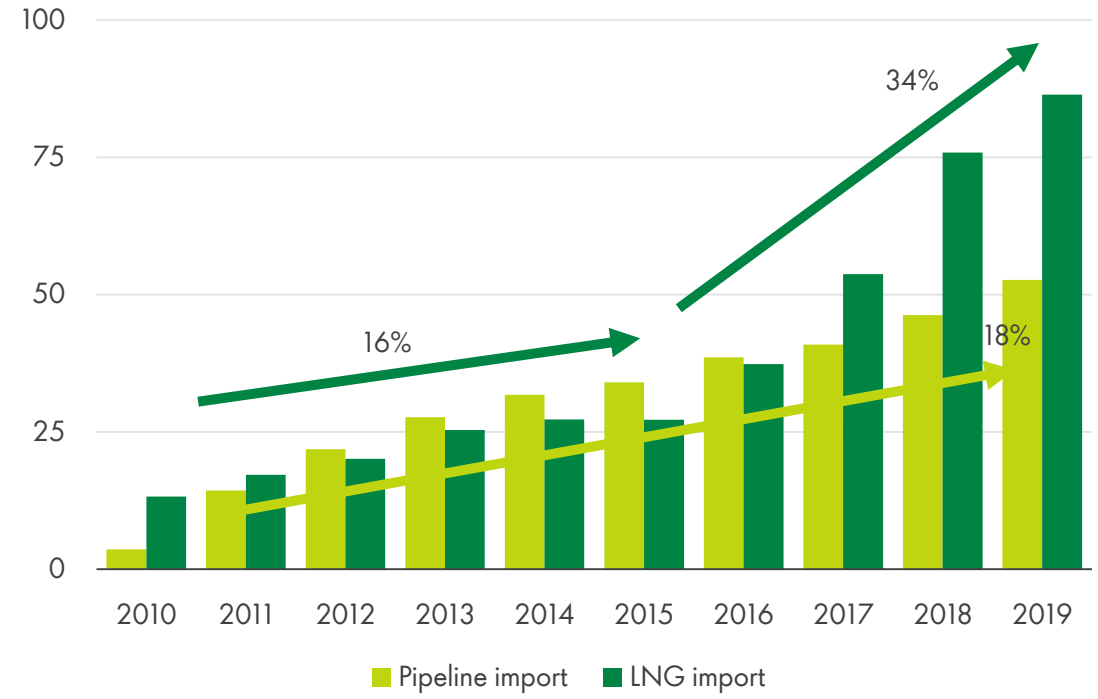
China gas demand vs domestic production

BCMA



China LNG and pipeline gas imports

BCMA

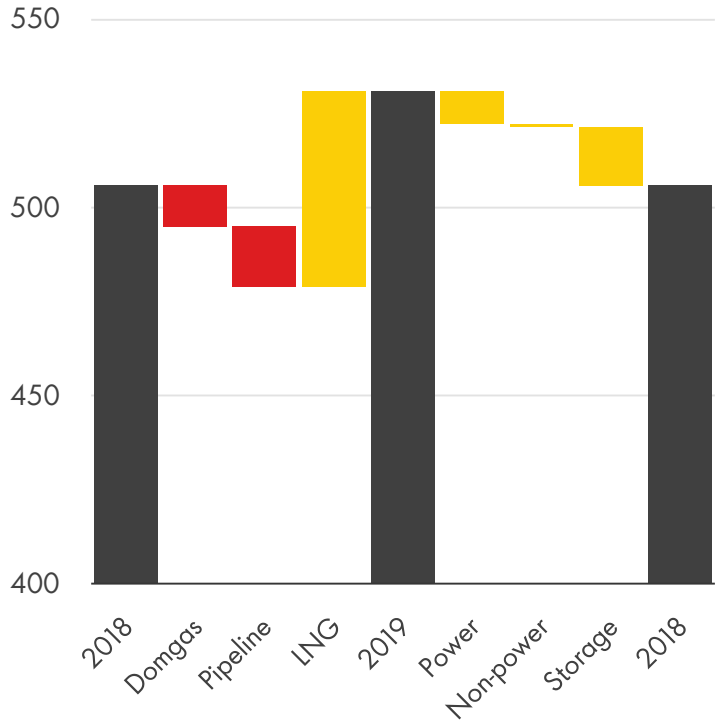


Source: Shell interpretation of NDRC 2019 data

European LNG imports increased by 74% in 2019 with declining domestic production and pipeline imports ...

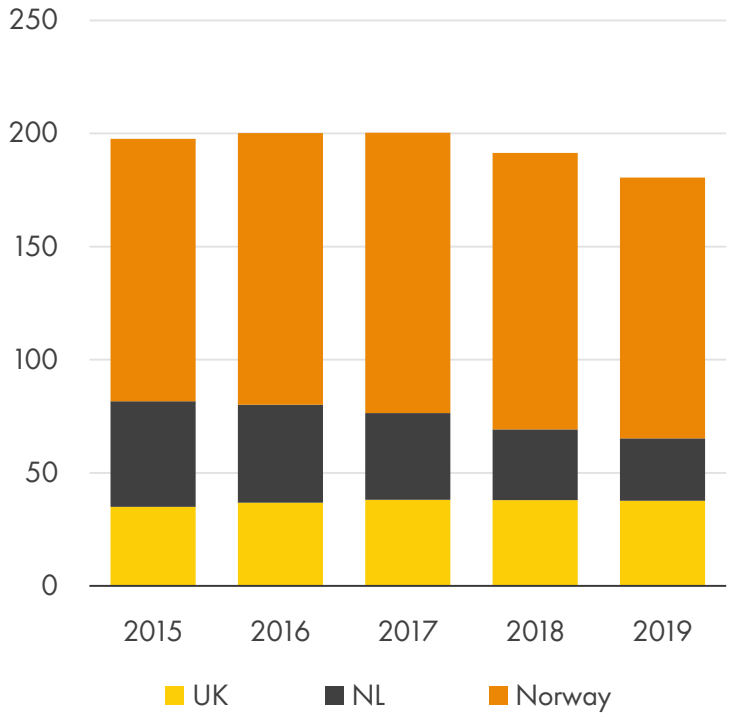
Gas balance

BCMA



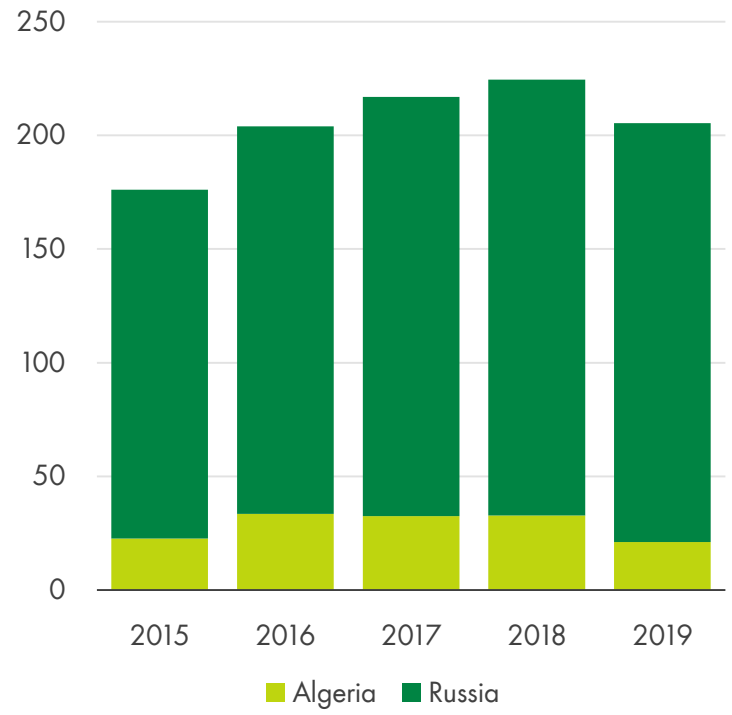
Domestic gas production

BCMA



Algerian and Russian pipeline sales

BCMA

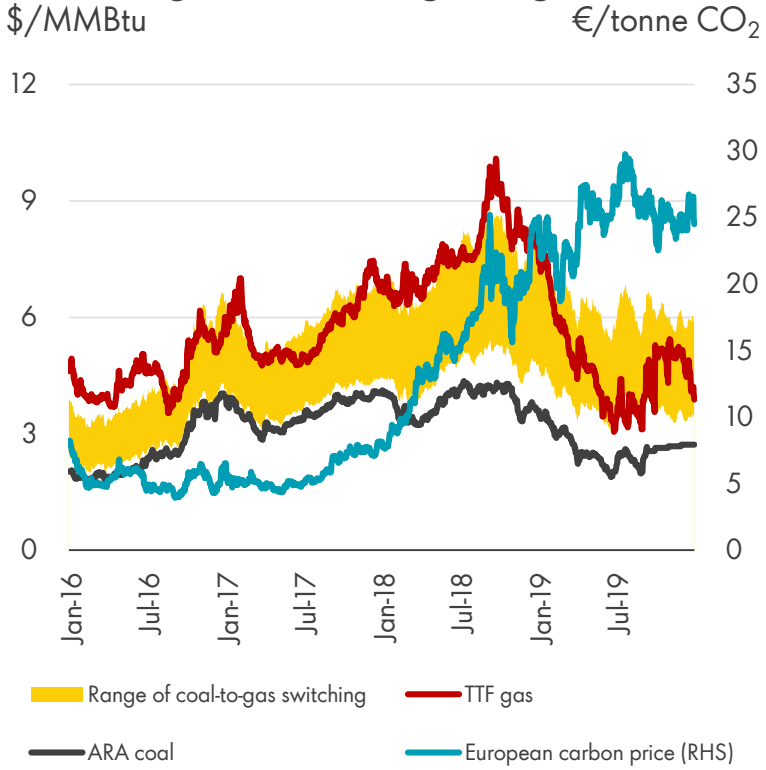


Source: Shell interpretation of Wood Mackenzie, S&P Global Platts and Gazprom Export LLC 2019 data

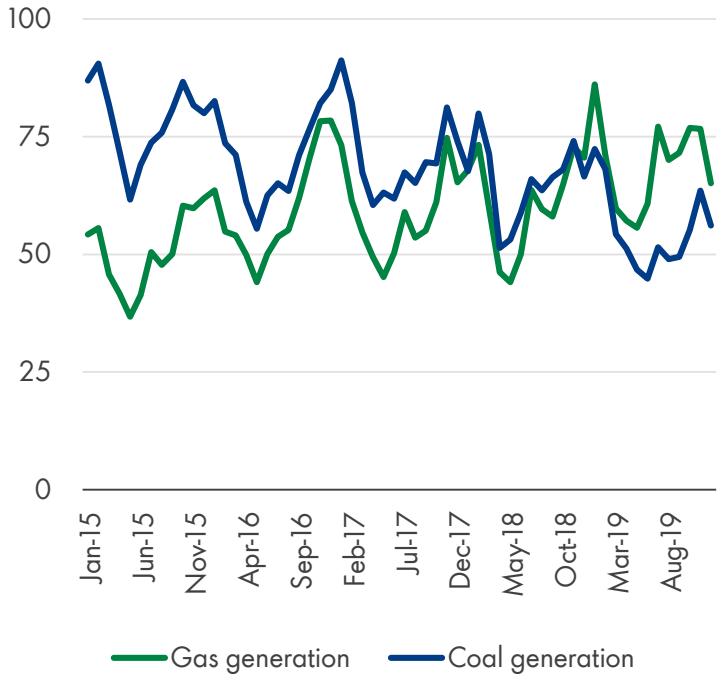
Russian sales volumes adjusted to reflect standard calorific value (40MJ/m^3 at 15°C)

… and increased coal-to-gas switching in the power sector and storage due to mild winter

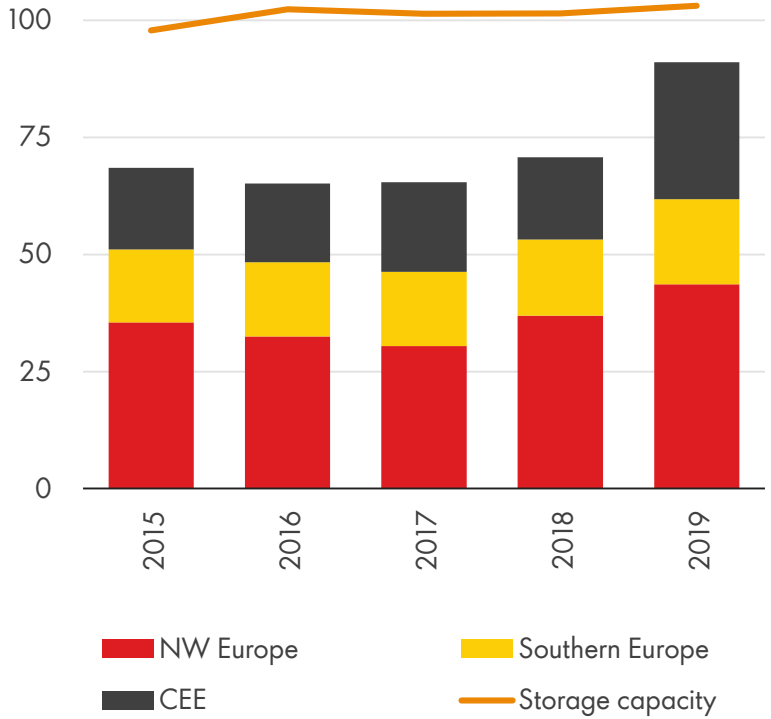
Coal-to-gas switching range



Coal generation vs gas generation



Year-end gas inventory

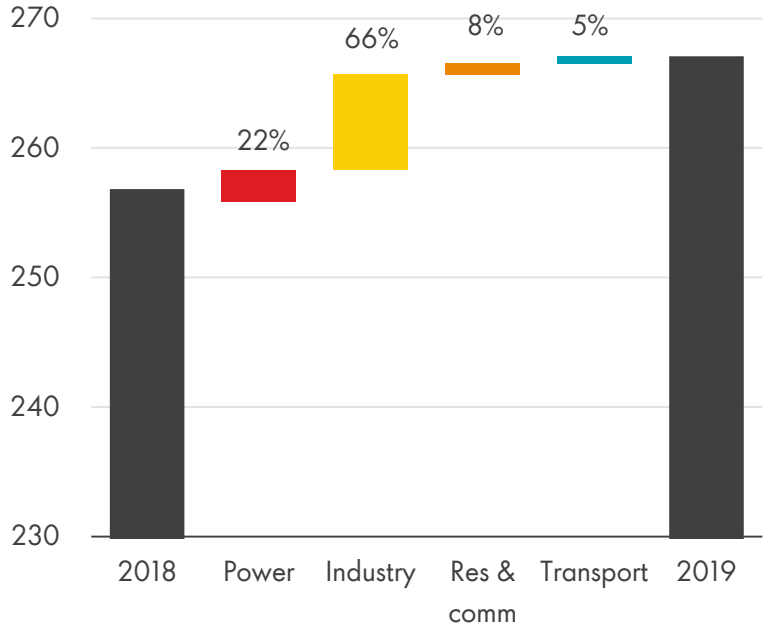


Source: Shell interpretation of IHS Markit, Wood Mackenzie and Gas Infrastructure Europe (Aggregated Gas Storage Inventory) 2019 data

Growing industrial gas demand and declining domestic gas spurs LNG demand in South and South-east Asia

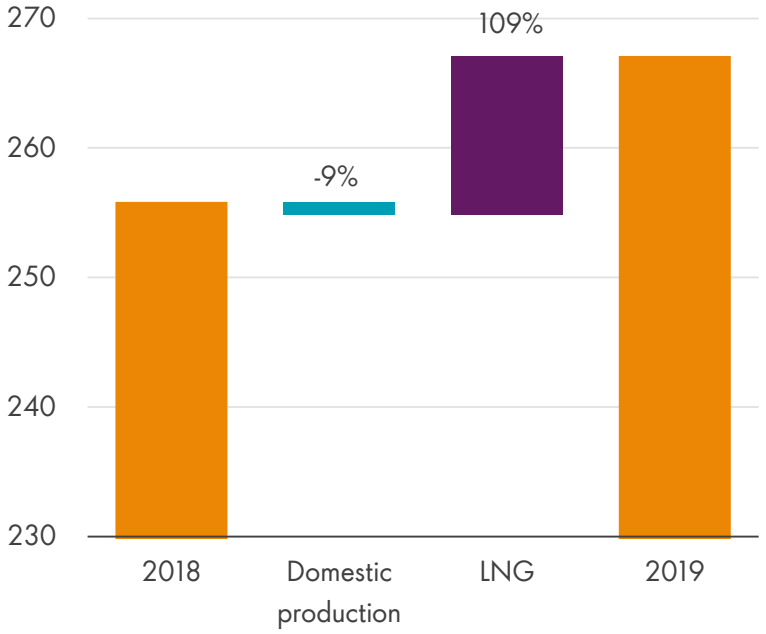
Gas demand growth by sector

BCMA



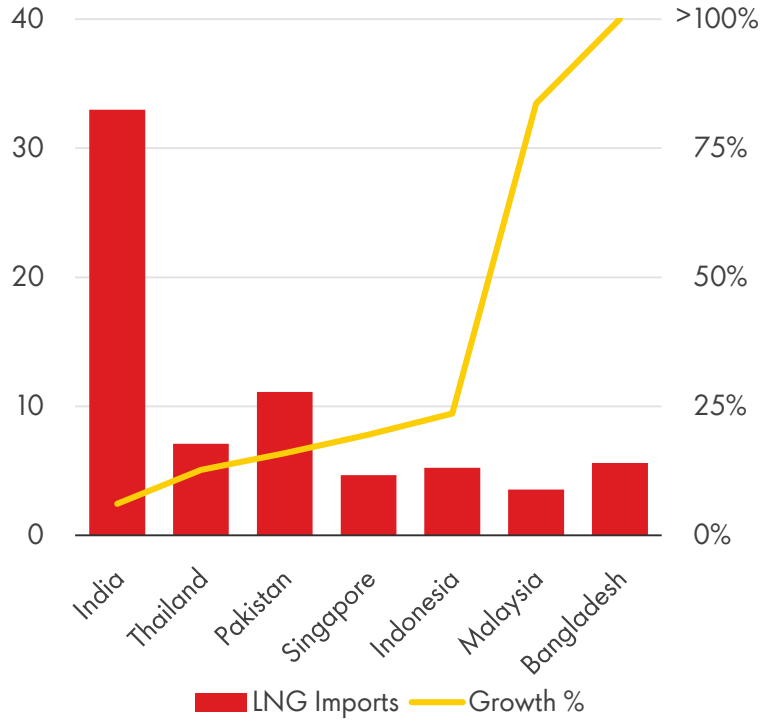
Gas supply growth by sector

BCMA



2019 LNG imports by country

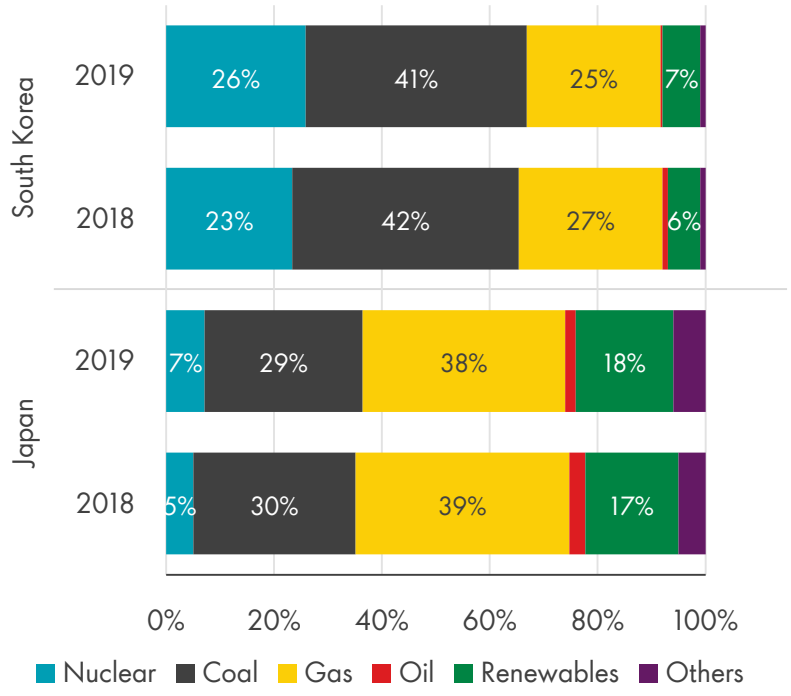
BCMA Growth



Source: Shell interpretation of Wood Mackenzie and IHS Markit 2019 data

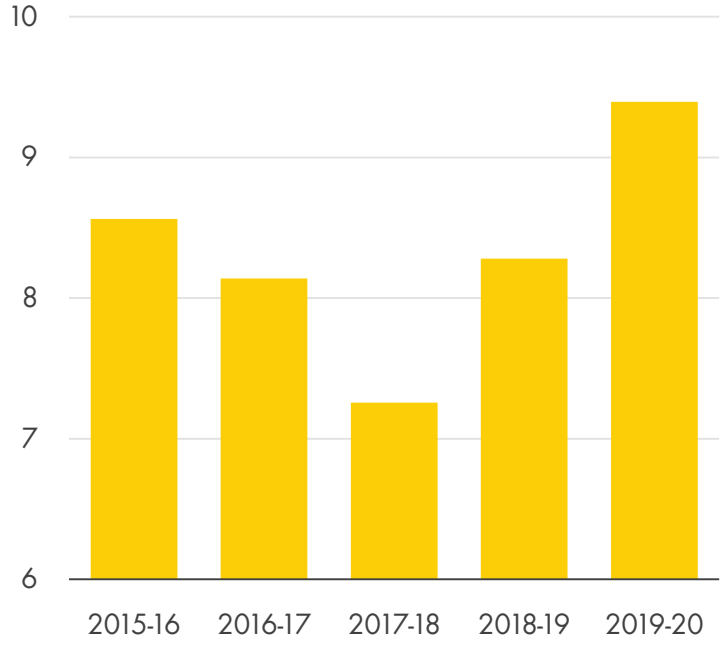
Higher nuclear availability and mild winters reduced imports into Japan and South Korea

Power generation mix



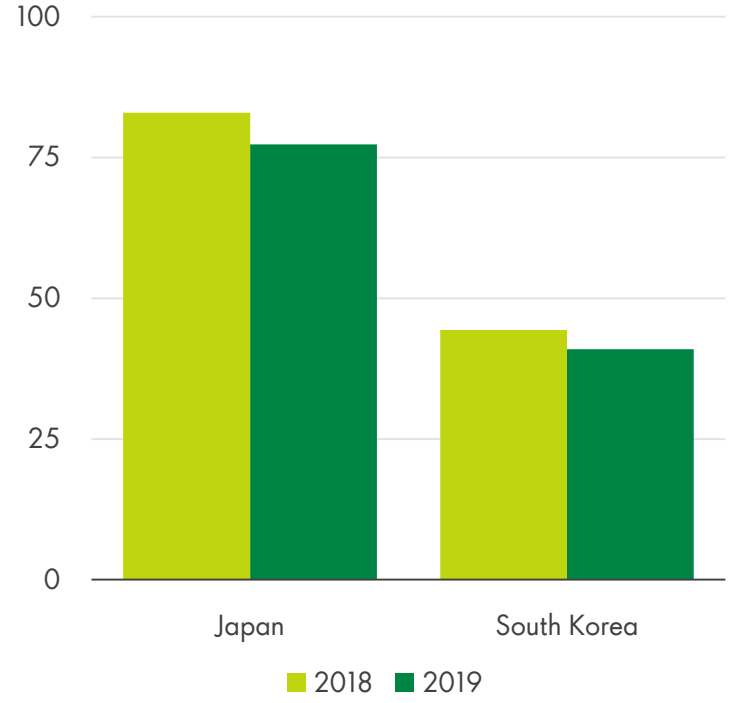
Winter* average temperature

Degree Celsius



LNG imports

MTPA

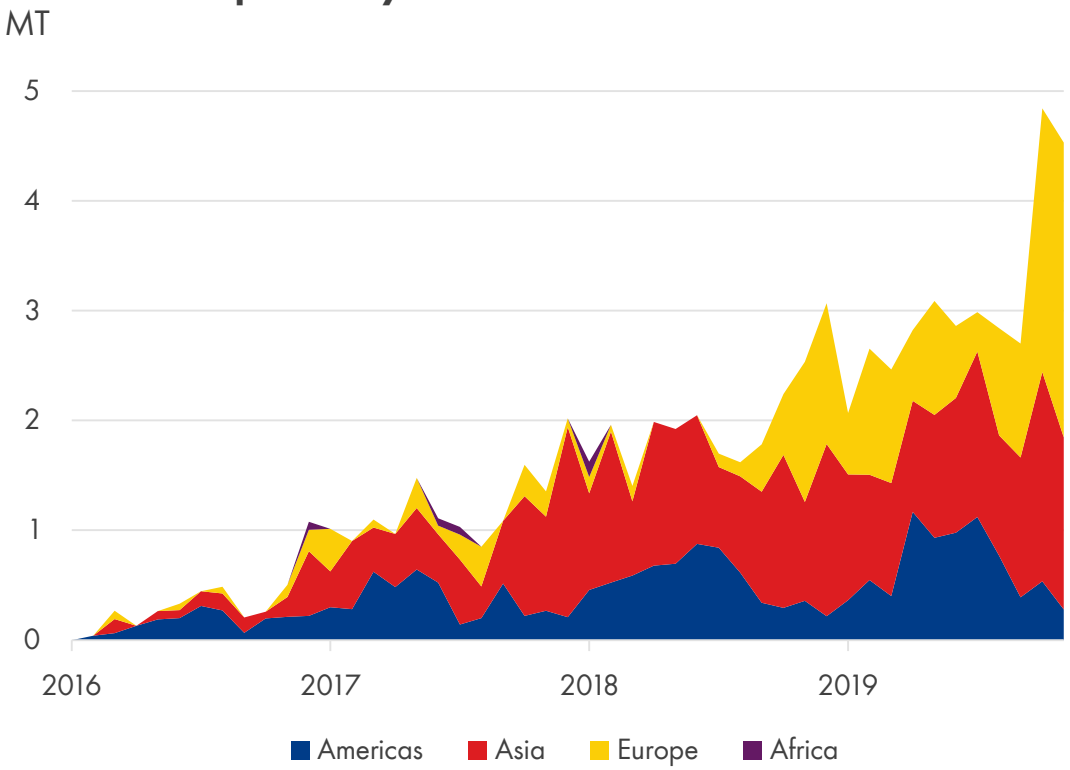


Source: Shell interpretation of IHS Markit, Japan Ministry of Economy, Trade and Industry, Korea Energy Economics Institute 2019 data

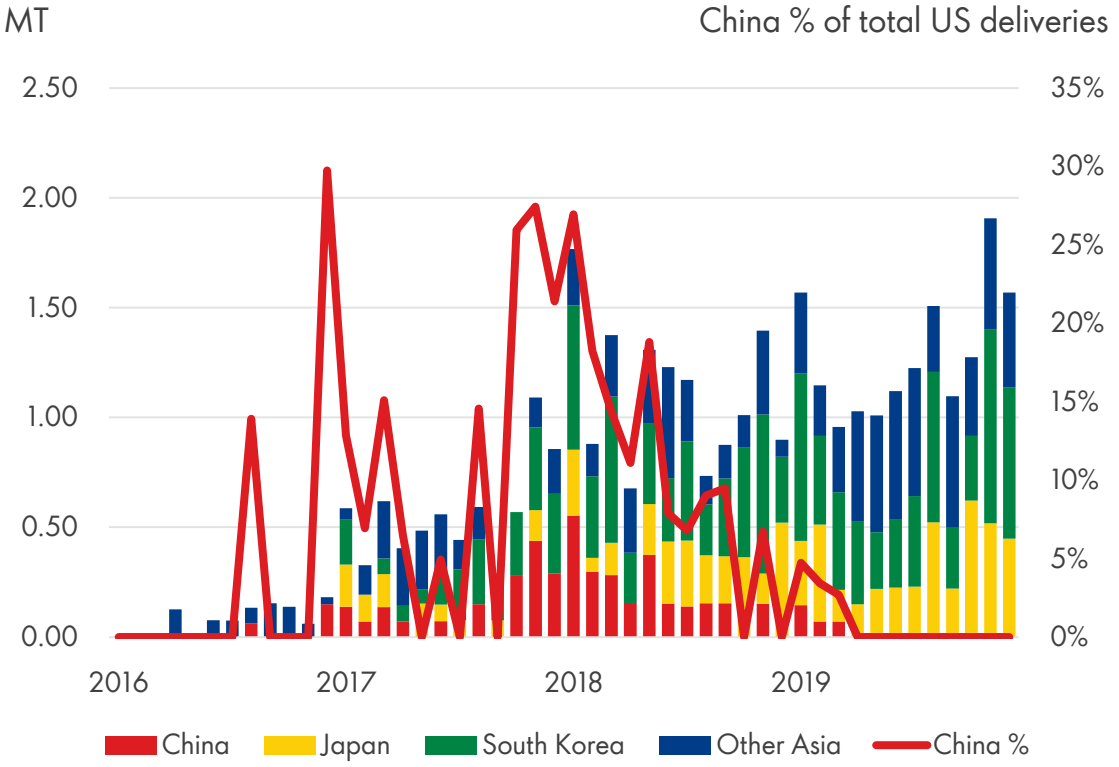
Power generation mix includes January through October data. *Winter months are from October through March.2020 includes YTD data

US supply adds volume and flexibility to the global LNG market

US LNG exports by destination



US LNG deliveries to Asia

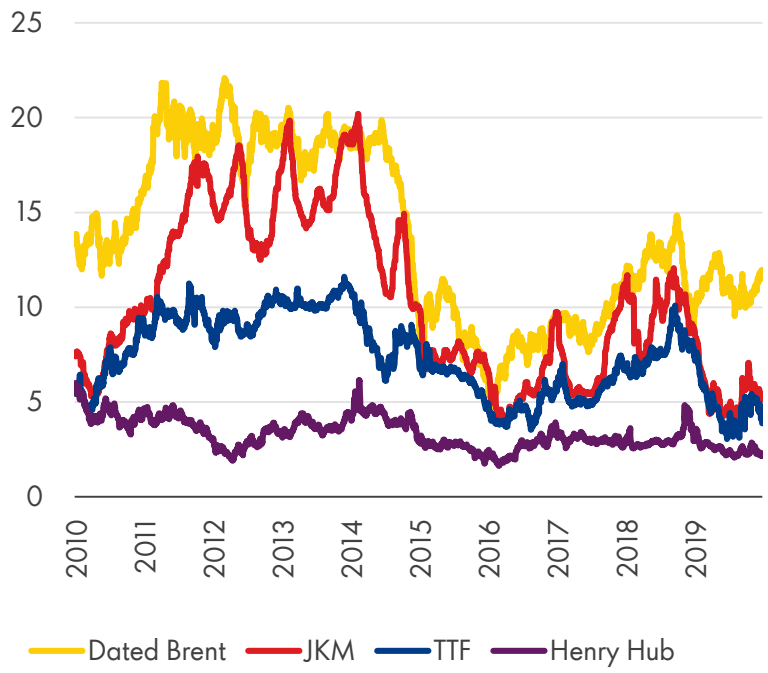


Source: Shell interpretation of IHS Markit, US Department of Energy 2019 data

Global gas prices softened in 2019

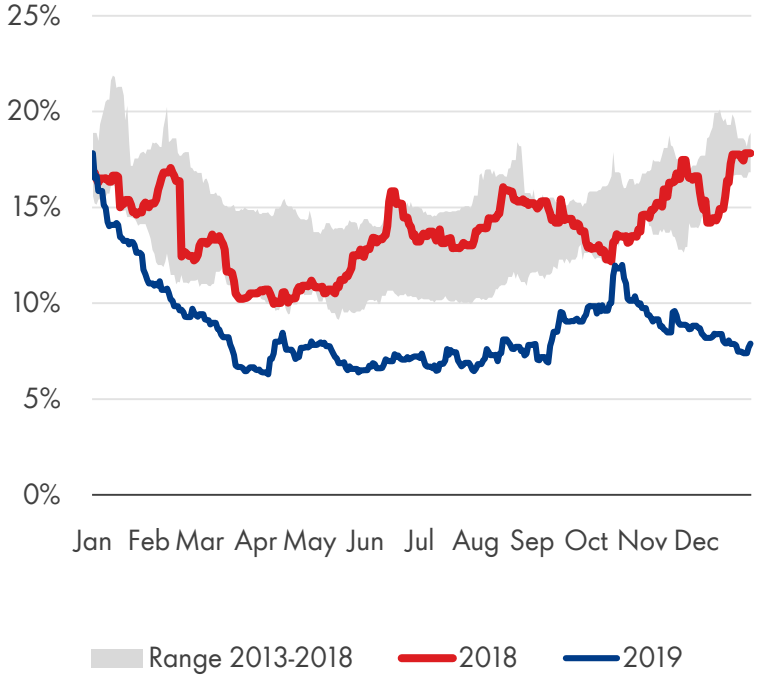
Global gas prices

$/MMBtu



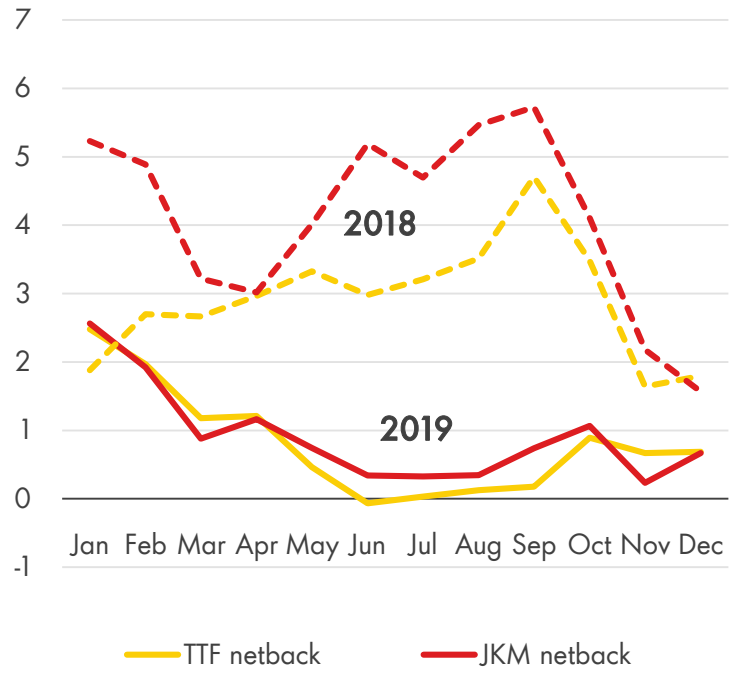
Asia spot price

JKM as % of Brent



US LNG export margins*

$/MMBtu

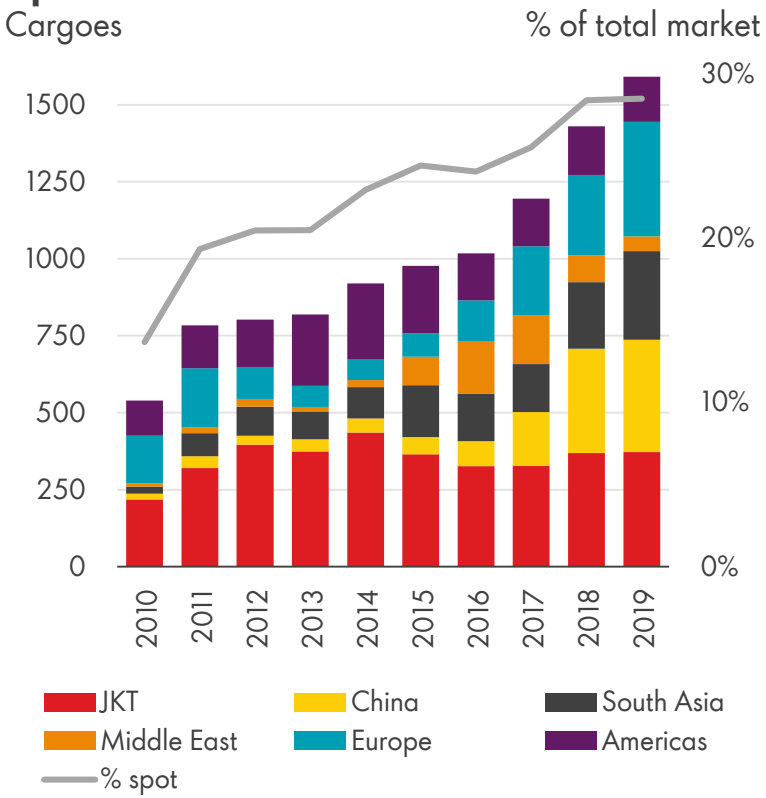


Source: Shell interpretation of ICE, CME, S&P Global Platts 2019 data

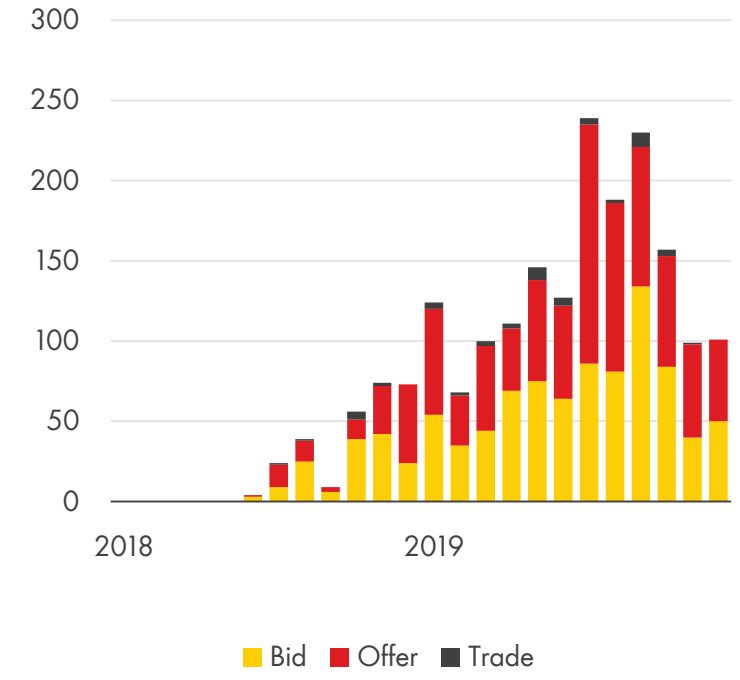
*Excludes liquefaction fee; netback calculated as: JKM and TTF minus regasification and transportation cost minus 115% Henry Hub

Increasingly liquid and transparent spot market

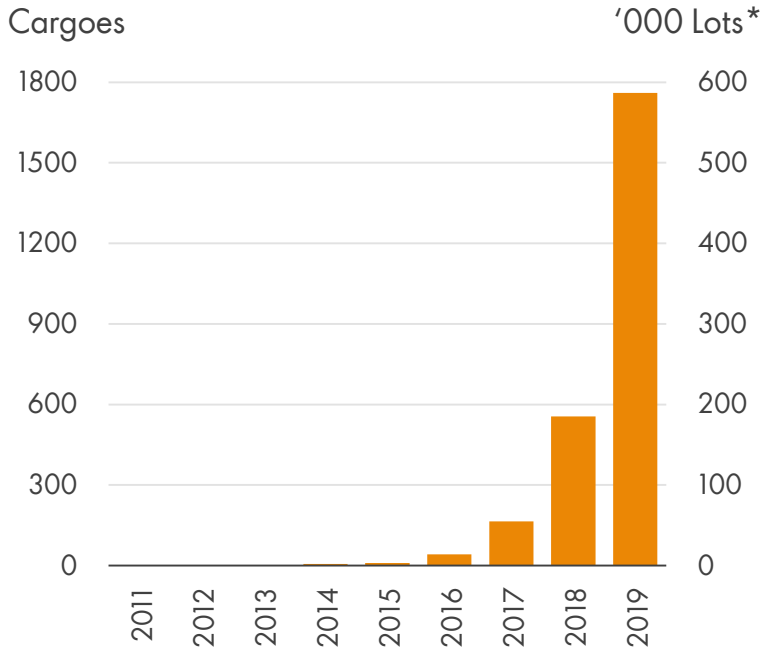
Spot LNG deliveries



JKM eWindow/Market on Close



ICE JKM LNG futures

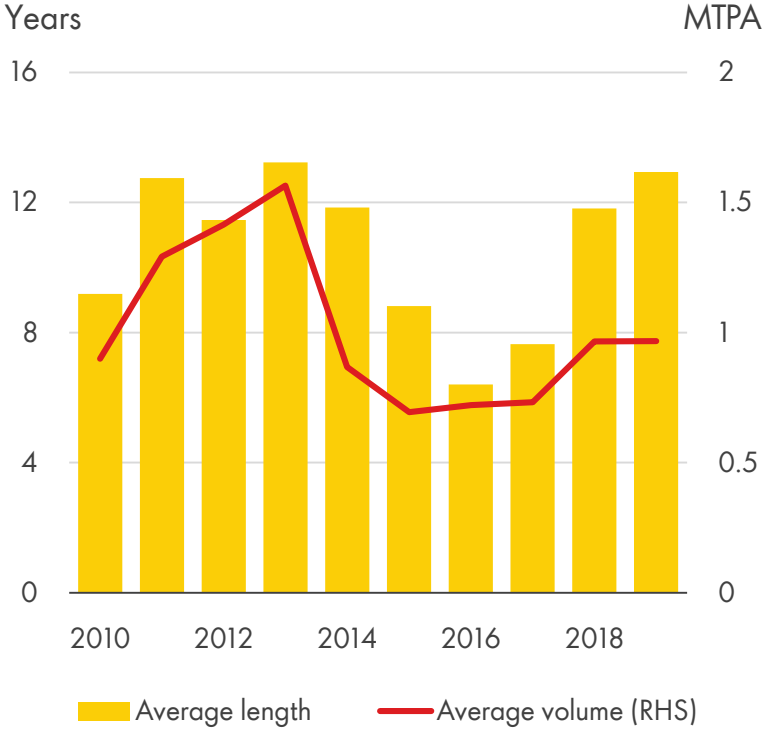


Source: Shell interpretation of IHS Markit, S&P Global Platts and ICE 2019 data

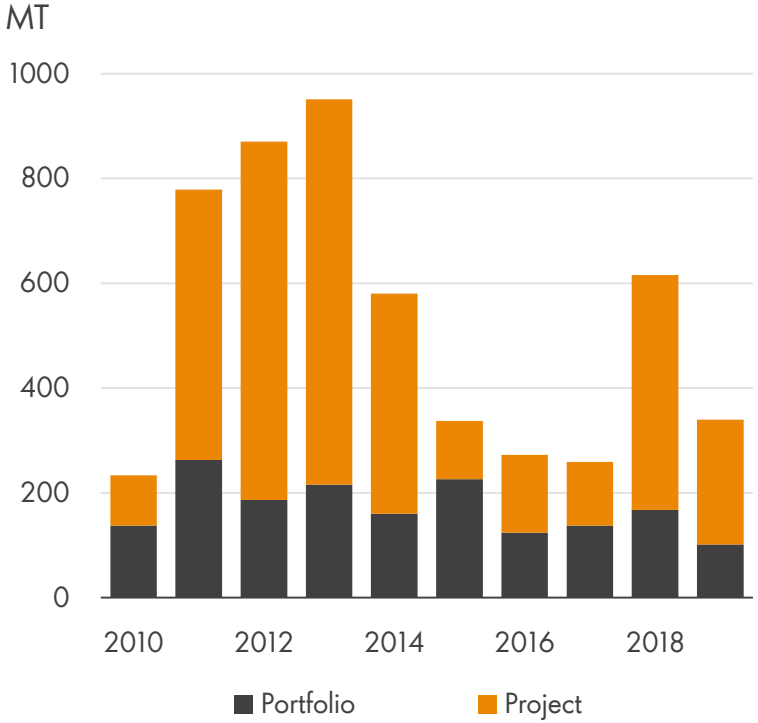
*About 300 lots is equal to 1 cargo

Evolving contracting structures

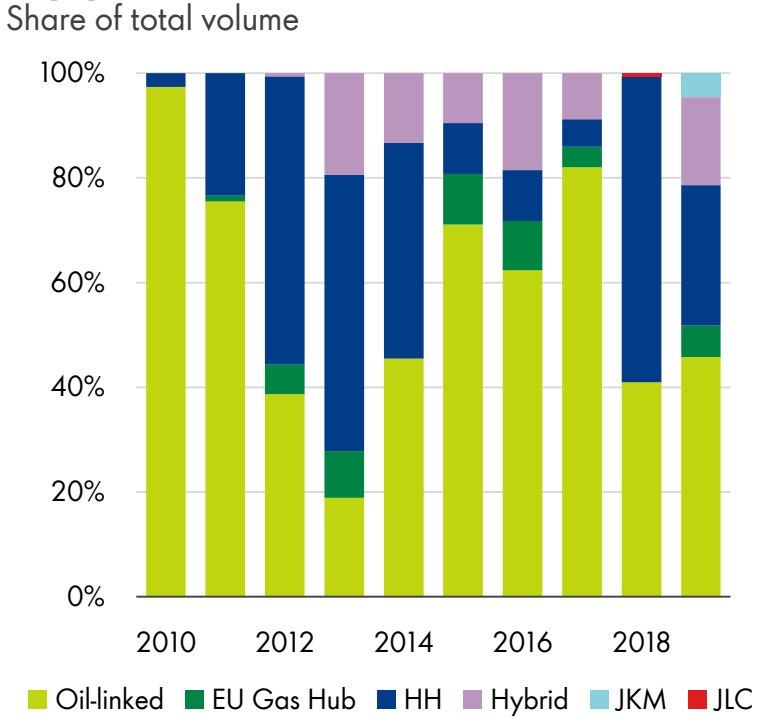
Average volume and length of new contracts



New LNG contract volumes (by seller type)



Share of new LNG contract volumes (by price indexation)

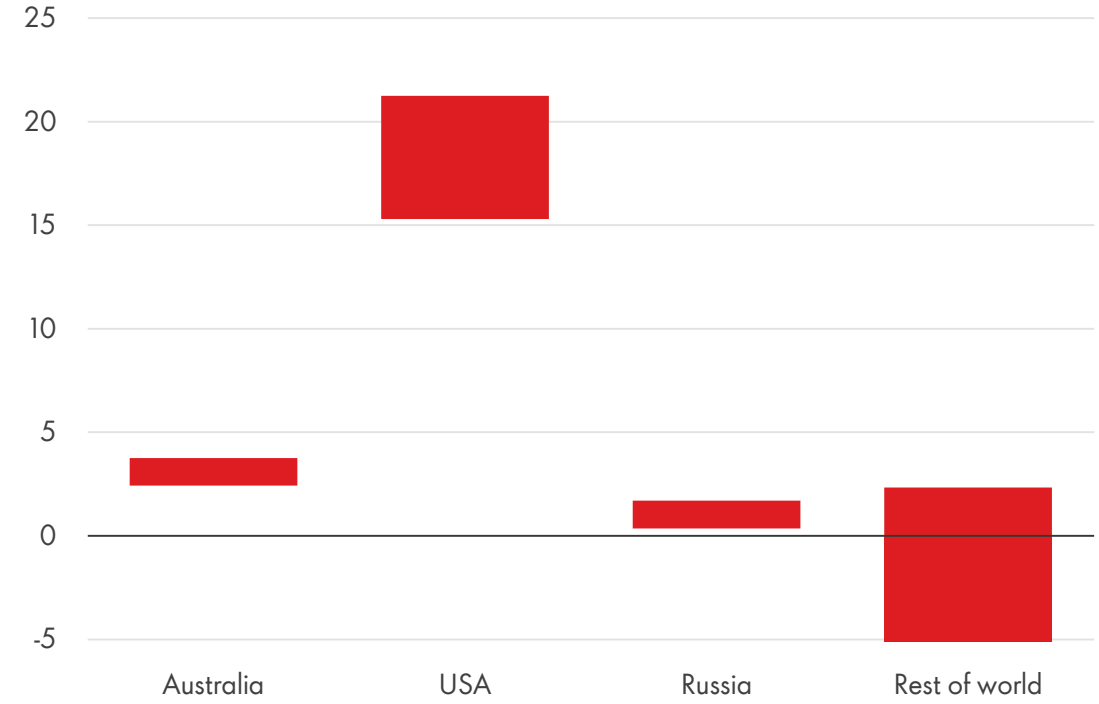


Source: Shell interpretation of Wood Mackenzie and IHS Markit 2019 data

End of the current supply wave in 2020

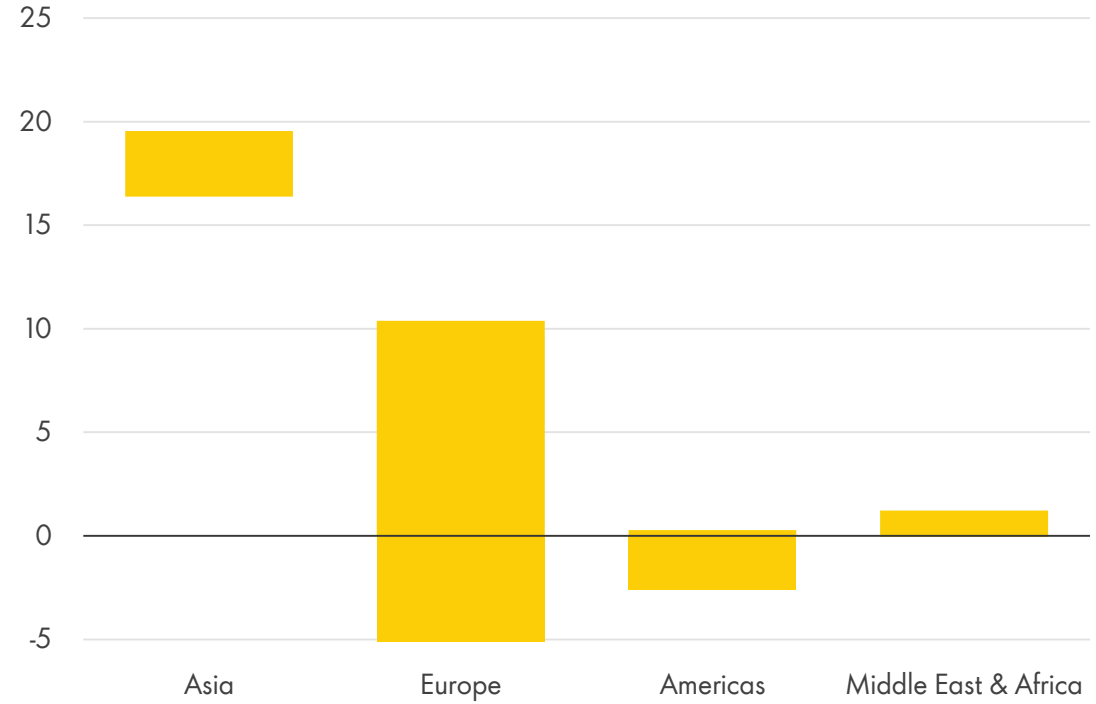
LNG supply growth range by country

MTPA



LNG demand growth range by region

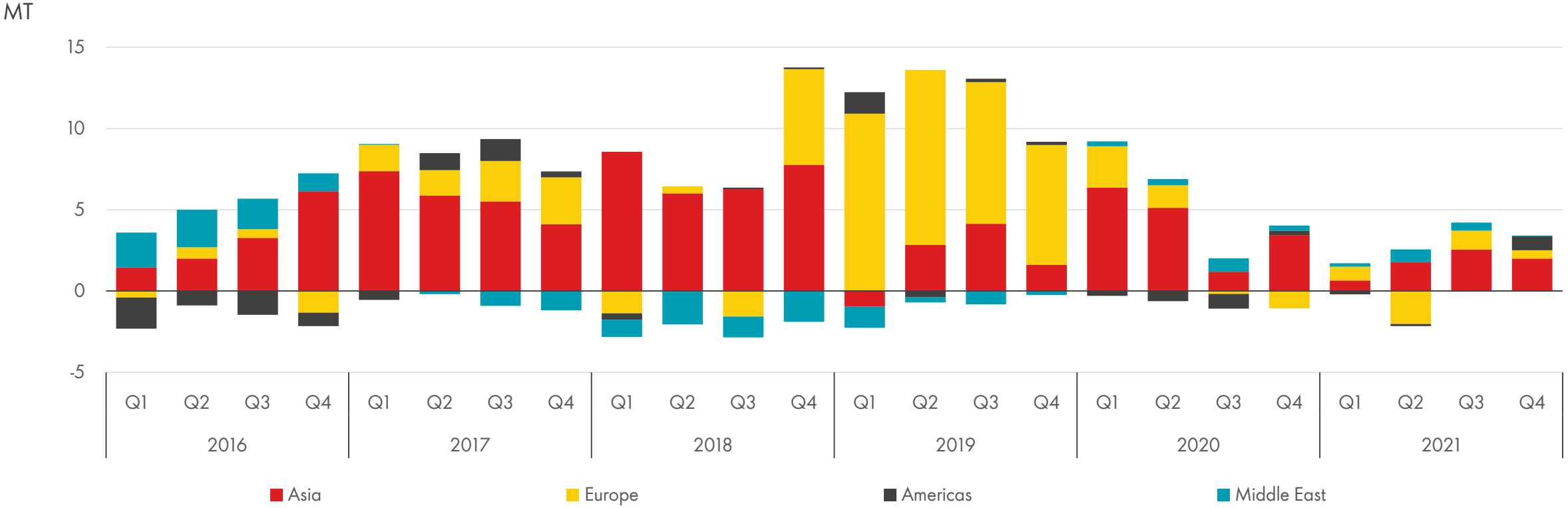
MTPA



Source: Shell interpretation of IHS Markit, Wood Mackenzie, Poten & Partners 2019 data

Global LNG market equilibrium expected to be restored

LNG import growth by region



Source: Shell interpretation of IHS Markit 2019 data

LNG London bunkers a containership in Rotterdam

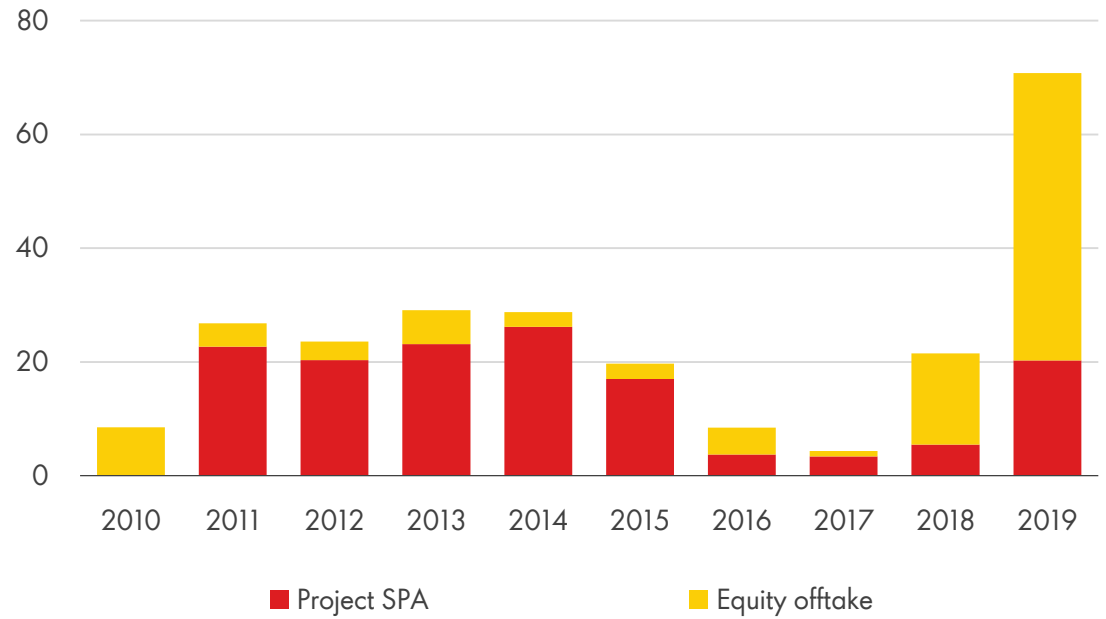
03

Record supply investment due to confidence in long-term LNG demand growth

Expected supply shortage in mid-2020s resulted in record FIDs

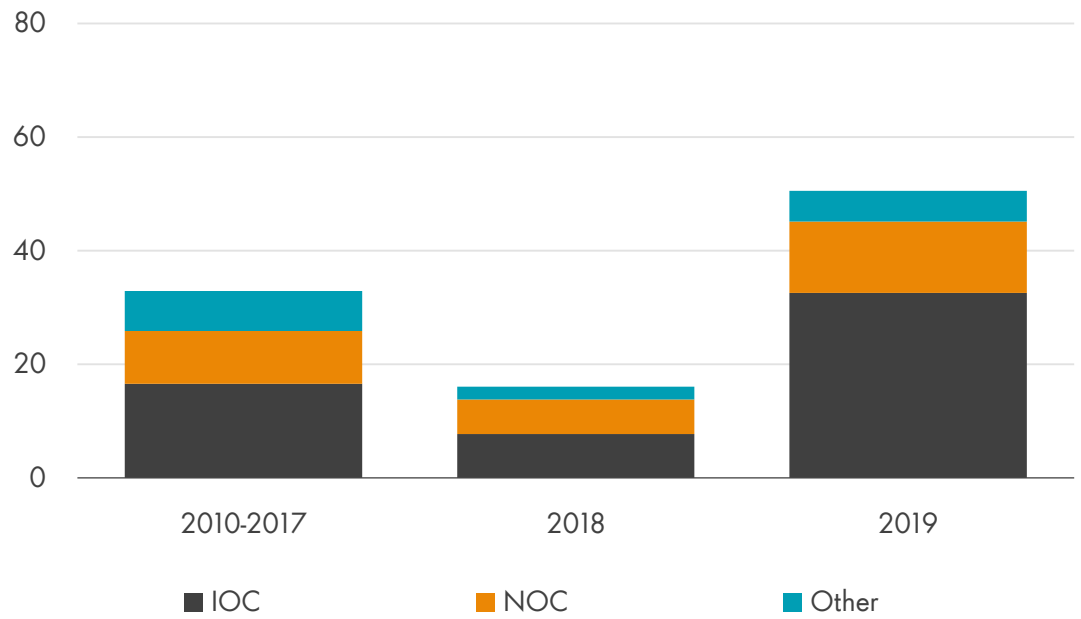
Investment in liquefaction capacity by contract type

MT



LNG equity offtake by buyer type

MT



Source: Shell interpretation of IHS Markit 2019 data

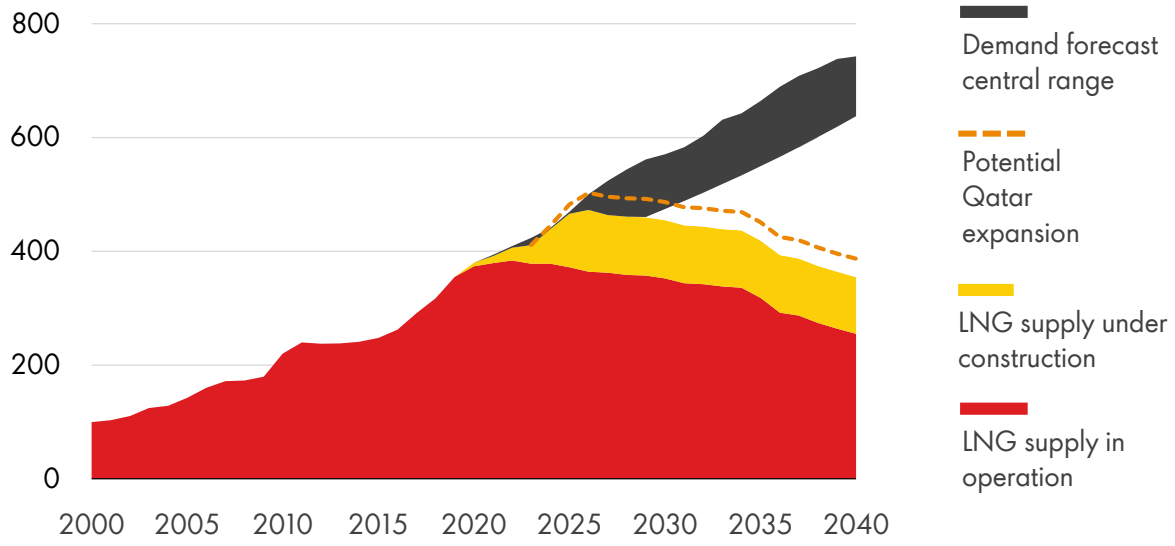
Record FIDs delay expected supply-demand gap

LNG demand estimated to double by 2040

Shell LNG Outlook 2020

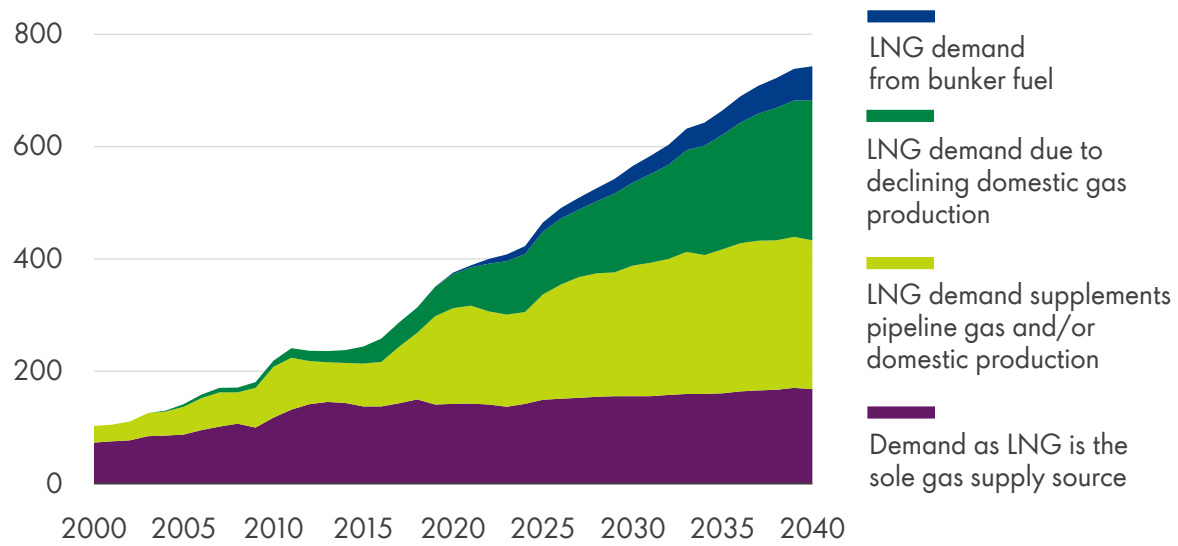
Emerging LNG supply-demand gap

MTPA



Demand drivers for LNG

MTPA

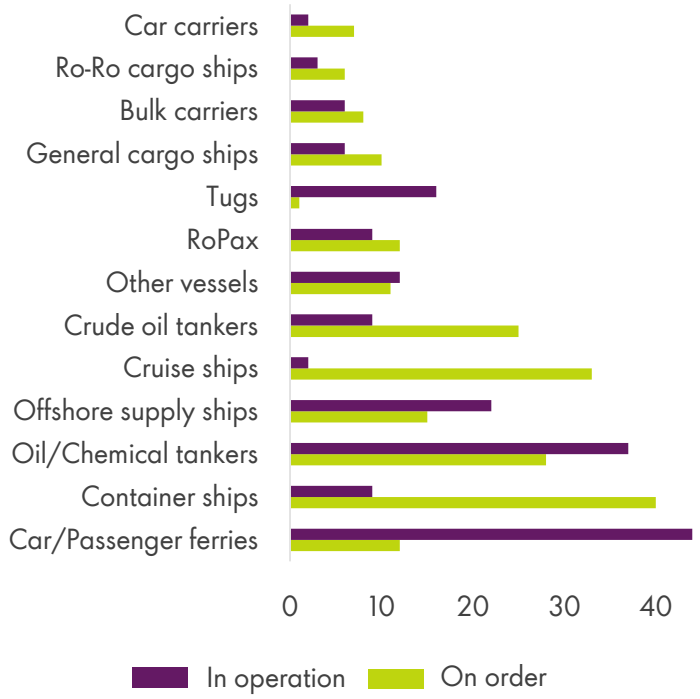


Source: Shell interpretation of IHS Markit, Wood Mackenzie, FGE and Poten & Partners Q4 2019 data

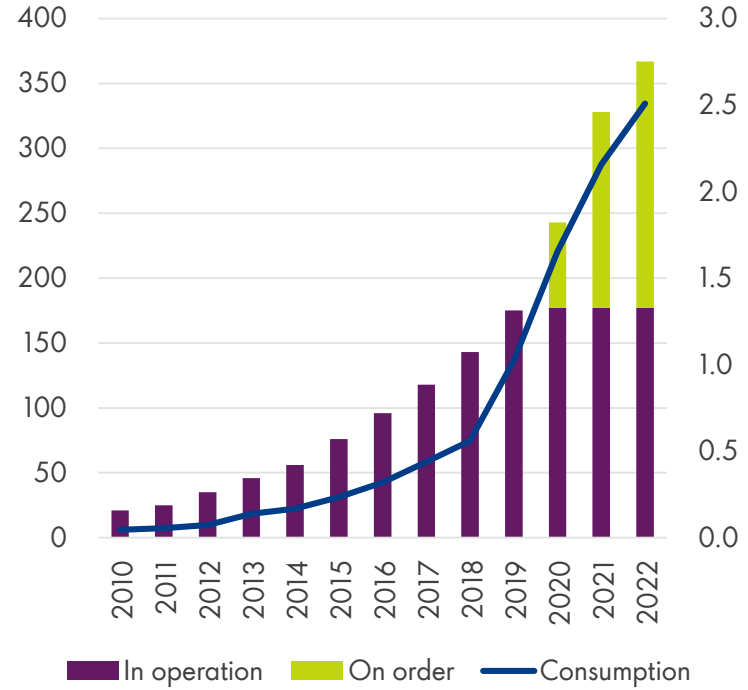
LNG bunkering demand accelerating

Shell LNG
Outlook 2020

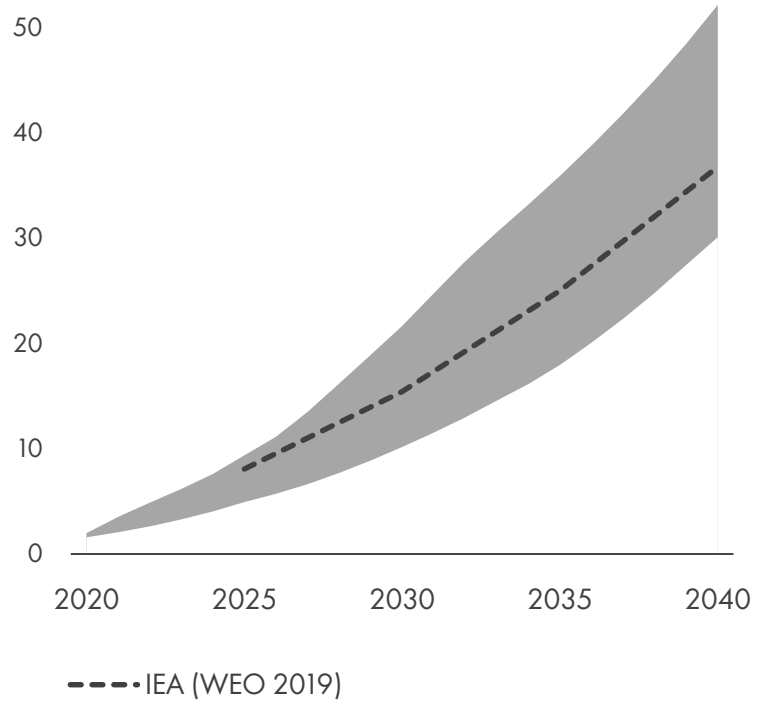
385 LNG ships currently in operation/on order*



Confirmed LNG demand



LNG bunker demand projection

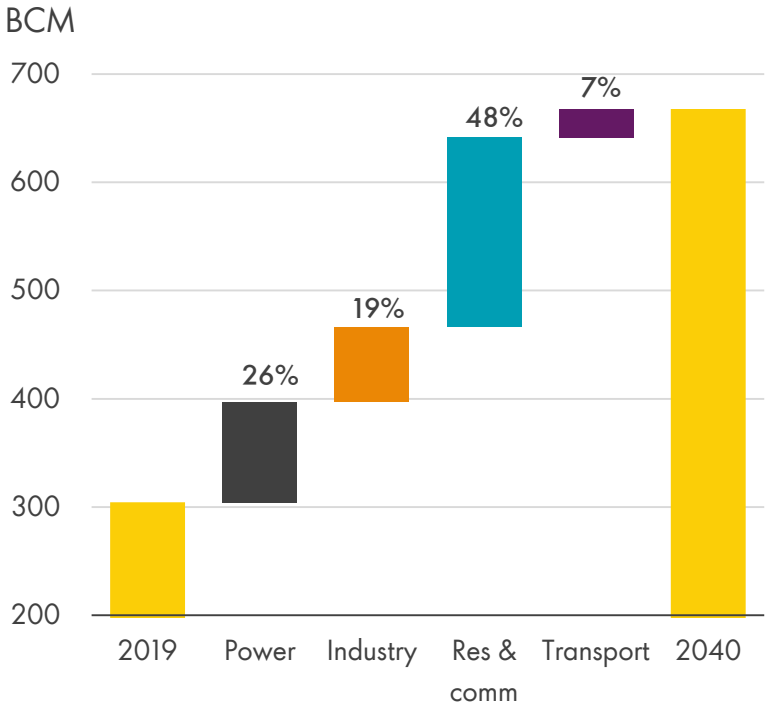


Source: Shell interpretation of DNV GL, Woodmac, IHS Markit & IEA 2018 and 2019 data

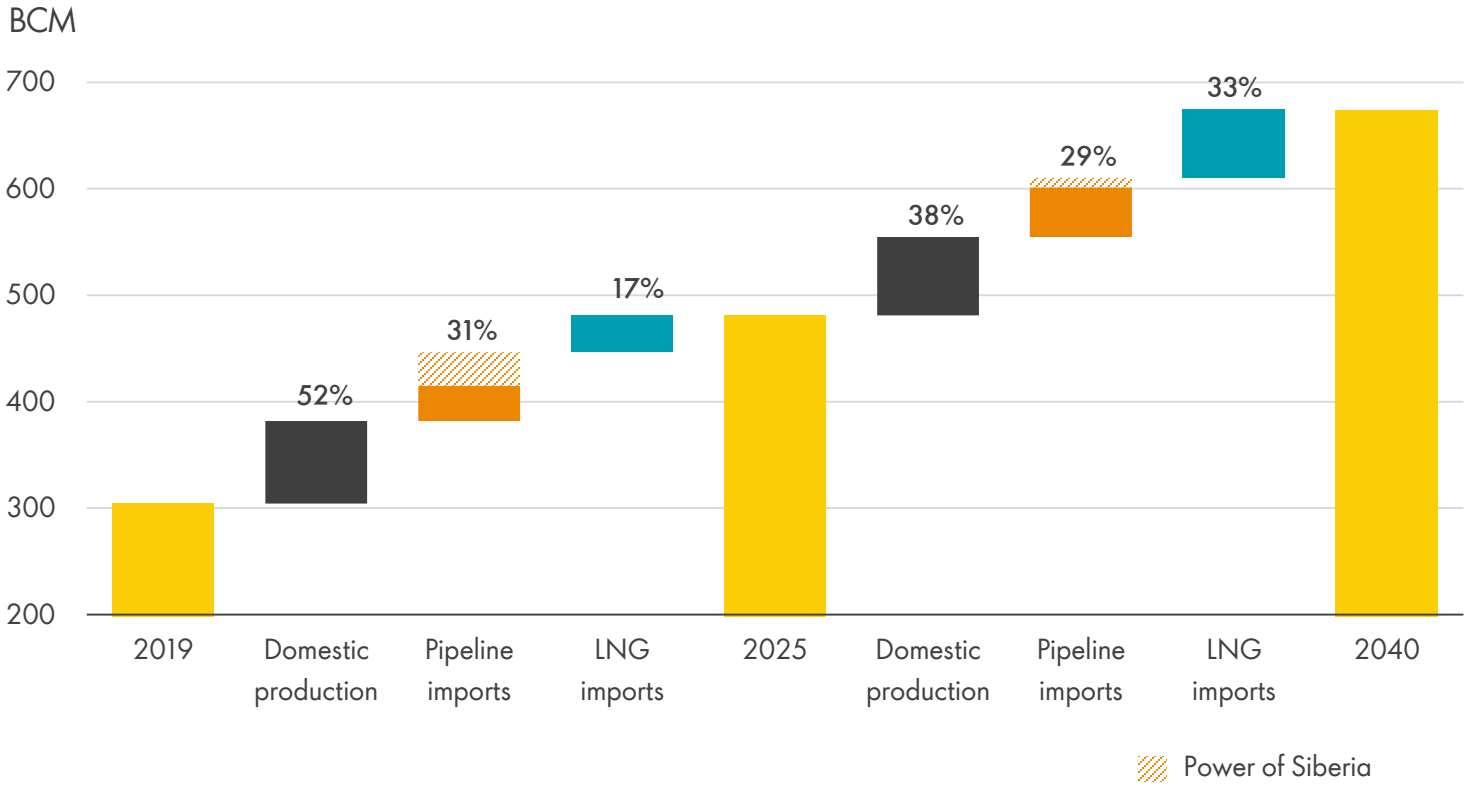
* Based on announcements with deliveries going out to 2027. Does not include 150 LNG-ready ships

China gas demand expected to double

China gas demand by sector



China supply by source



Source: Shell interpretation of Wood Mackenzie 2019 H1 data

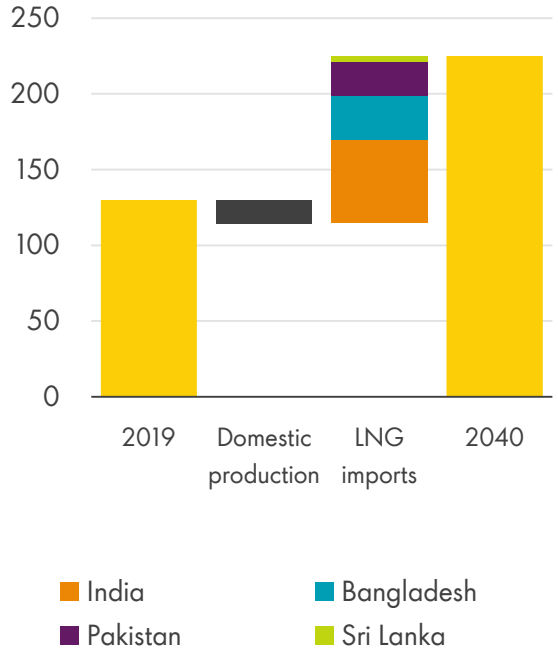
Growing gas demand expected in South and South-east Asia

More LNG infrastructure investment needed

Shell LNG Outlook 2020

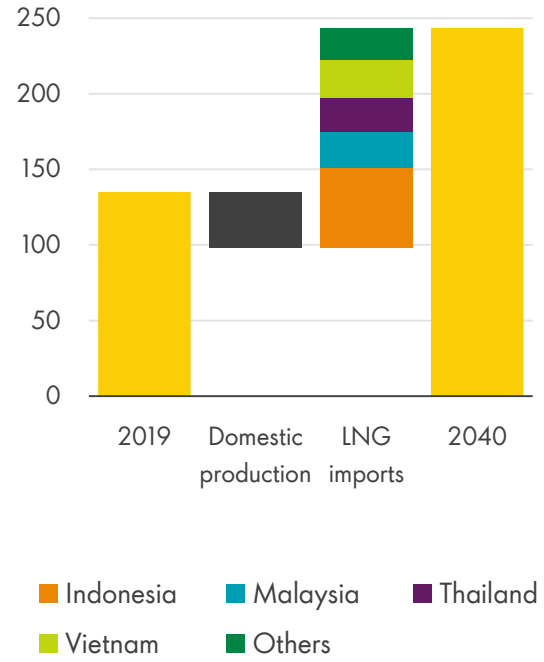
South Asia gas supply growth by source

BCM



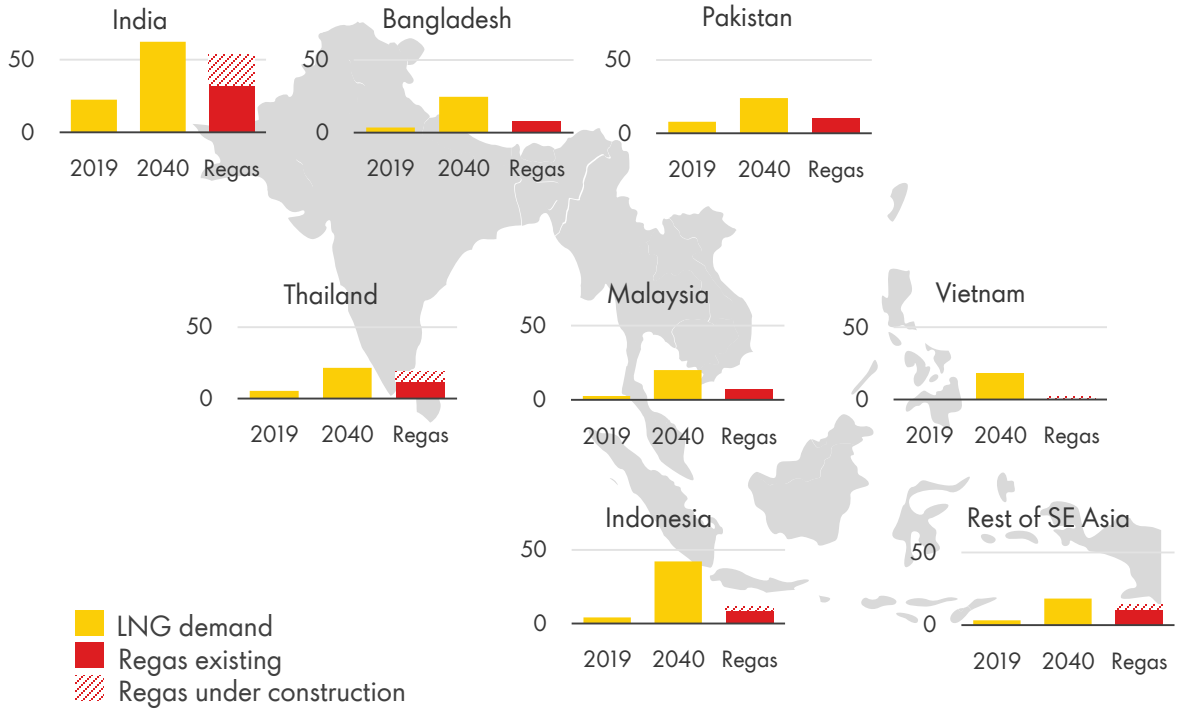
South-east Asia gas supply growth by source

BCM



LNG demand and regasification capacity

MT



Source: Shell interpretation of Wood Mackenzie and IHS Markit 2019 data

Gas continues to provide more and cleaner energy solutions

- 80% of energy demand growth expected to be met by renewables and gas
- Coal-to-gas switching helping level global CO_2 emissions
- Record coal phase-out and generation reduction in 2019

2019 was a year of record LNG supply growth

- European LNG imports increased by 74%
- Higher nuclear availability and mild winters reduced imports into Japan and South Korea
- End of the current supply wave in 2020
- Global LNG market equilibrium expected to be restored

Record supply investment due to confidence in long-term LNG demand growth

- Expected supply shortage in mid-2020s resulted in record FIDs
- Record FIDs delay expected supply demand gap
- LNG demand estimated to double by 2040

Summary