

World Energy Outlook 2014

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International Energy Agency
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Signs of stress in the global energy system

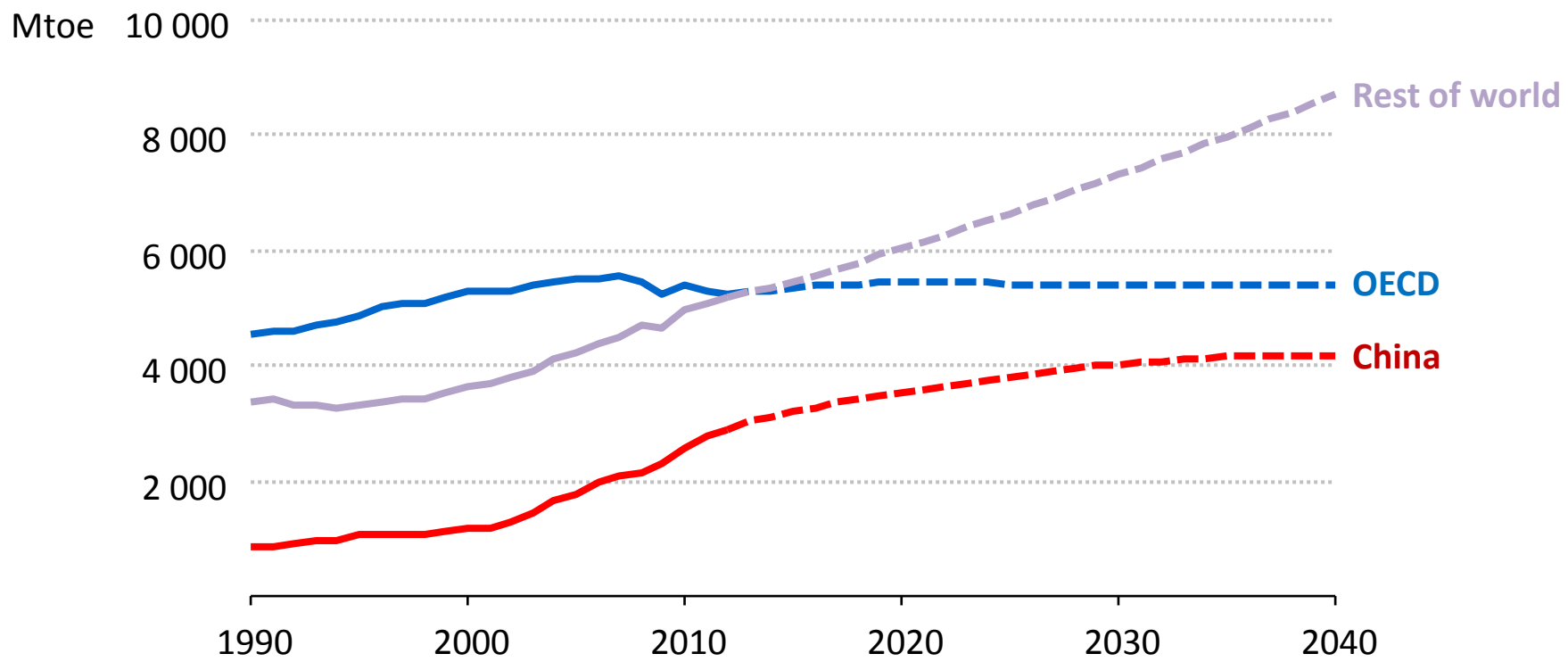
- **Current calm in markets should not disguise difficult road ahead**
 - *Turmoil in the Middle East raises doubts over future oil balance*
 - *Resurgent debate over the security of gas supply to Europe*

- **Mixed signals in run-up to crucial climate summit in Paris in 2015**
 - *Global CO₂ emissions still rising, with most emitters on an upward path*
 - *At \$550 billion, fossil fuel subsidies over four-times those to renewables*
 - *Increasing emphasis on energy efficiency starting to bring results*

- **Will change in global energy be led by policies, or driven by events?**

Changing dynamics of global demand

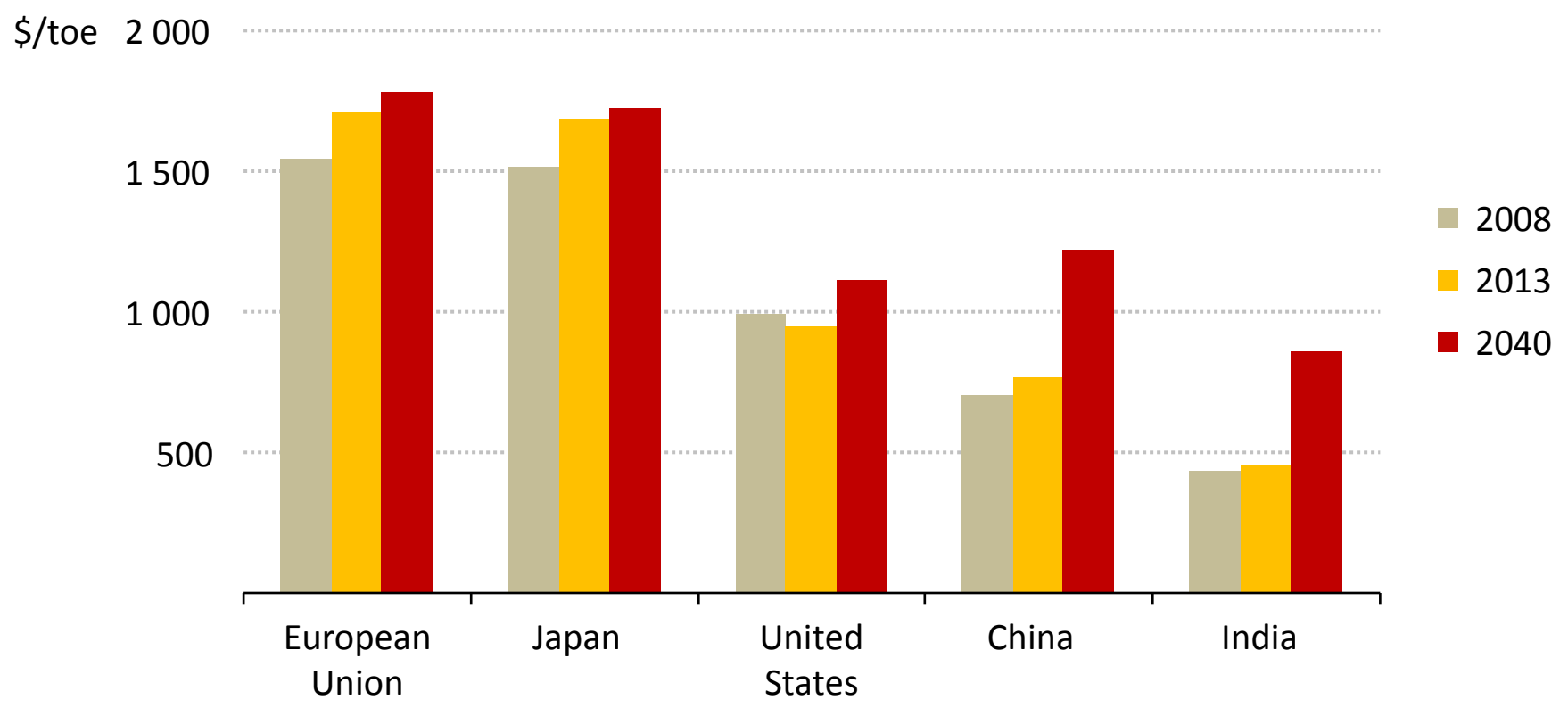
Energy demand by region



As China slows, then India, Southeast Asia, the Middle East and parts of Africa & Latin America take over as the engines of global energy demand growth.

United States holds a strong position on energy costs

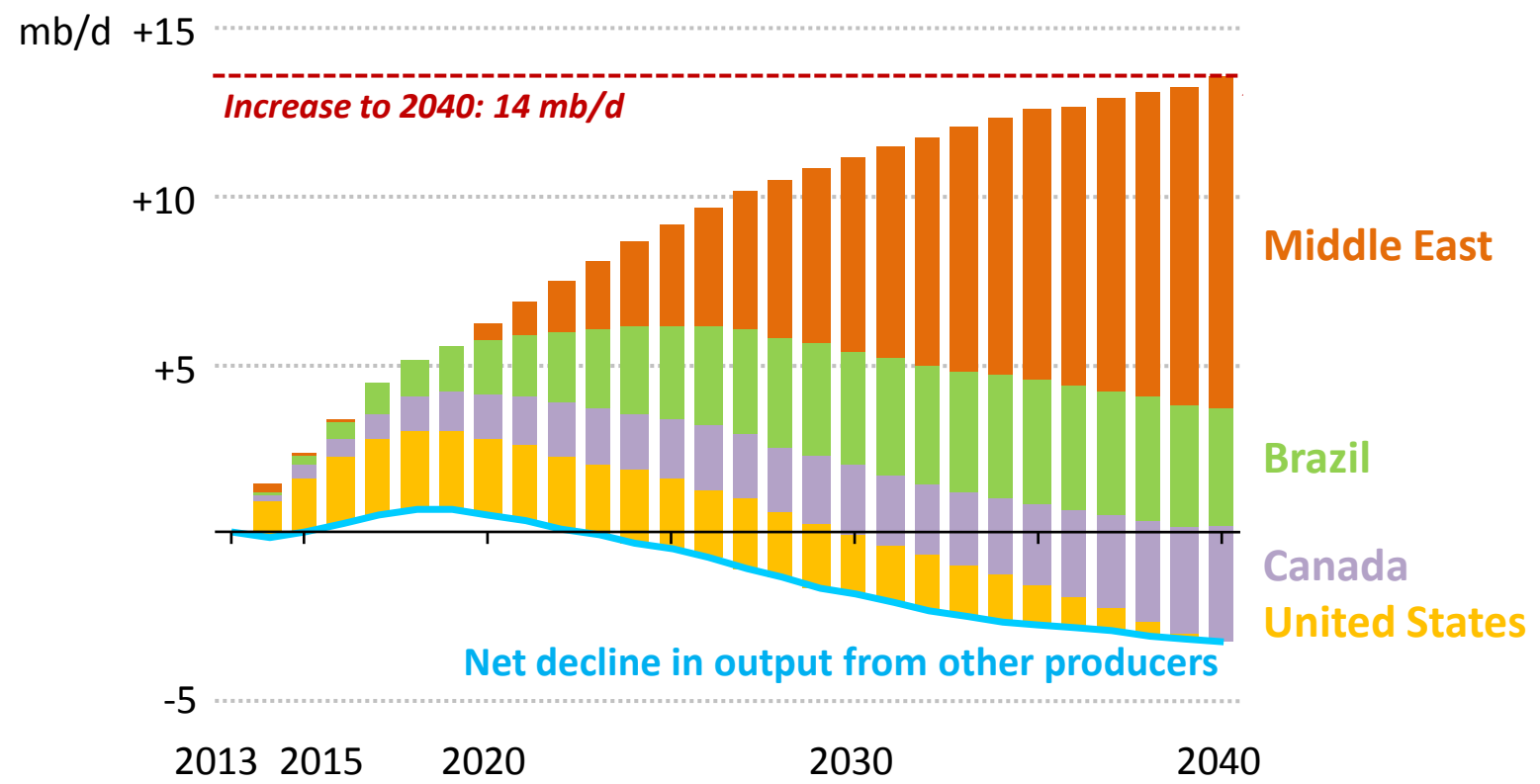
Weighted average cost of energy paid by consumers



Economies face higher costs, but the pace of change varies: China overtakes the US, costs double in India & remain high in the European Union & Japan

Instability in the Middle East a major risk to oil markets

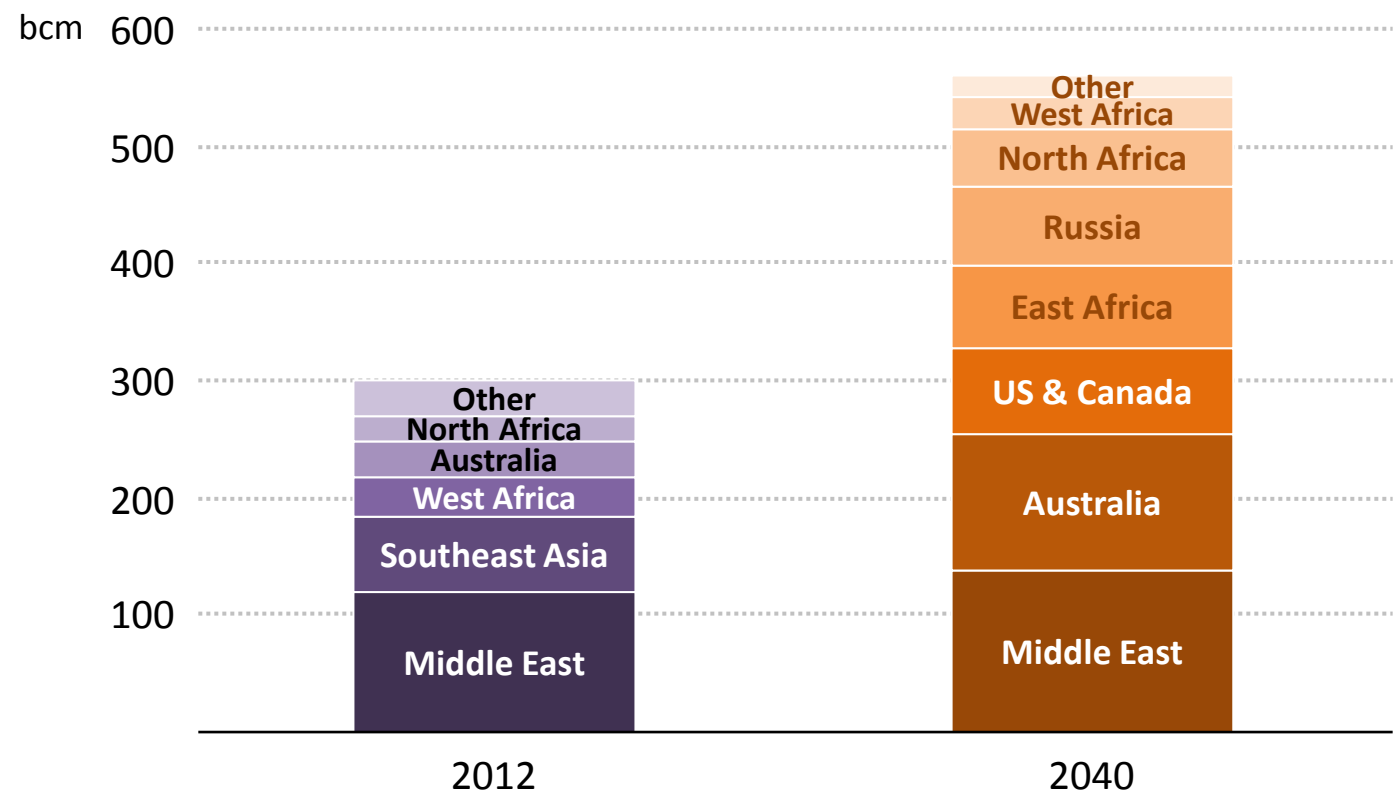
Oil production growth in United States, Canada, Brazil & the Middle East



The short-term picture of a well-supplied market should not obscure future risks as demand rises to 104 mb/d & reliance grows on Iraq & the rest of the Middle East

Gas on the way to become first fuel, with role of LNG on the rise

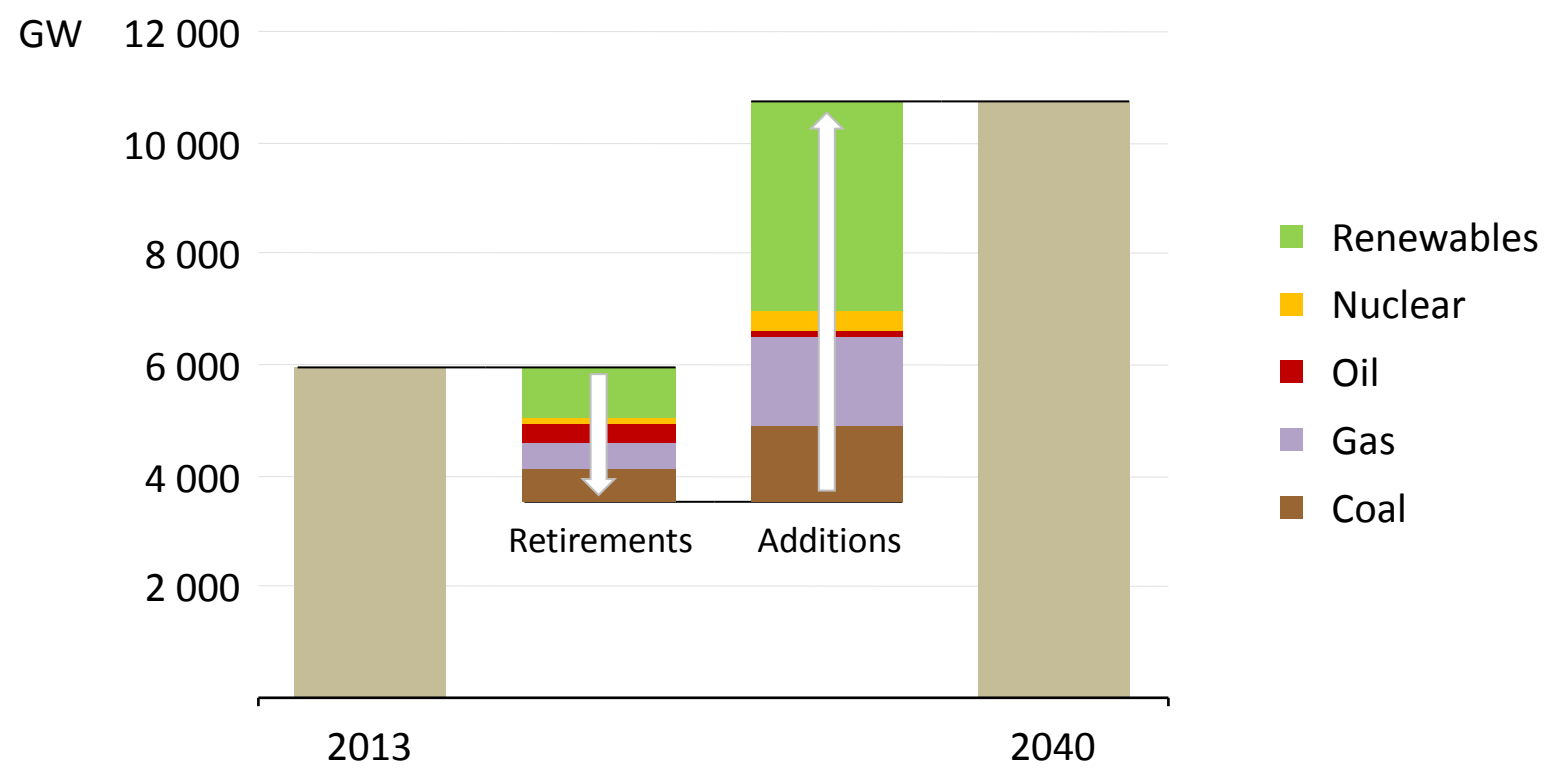
Main sources of regional LNG supply



Share of LNG rises in global gas trade, pushed by a near-tripling in liquefaction sites: LNG brings more integrated & secure gas markets, but only limited relief on prices

Retirements add to the investment challenge in the power sector

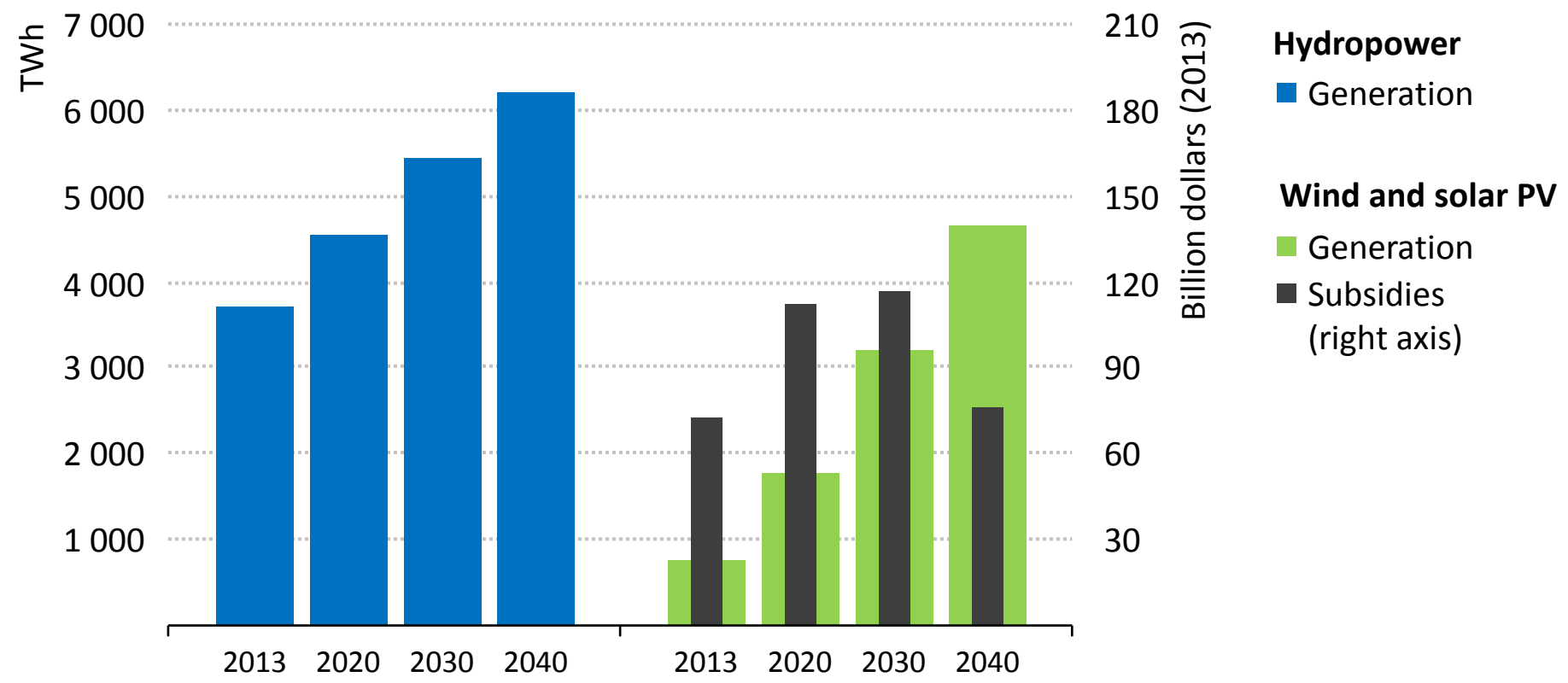
Power capacity by source, 2013-2040



Despite limited demand growth, OECD countries account for one-third of capacity additions – to compensate for retirements & to decarbonise

Renewables overtake coal to become the leading source of power

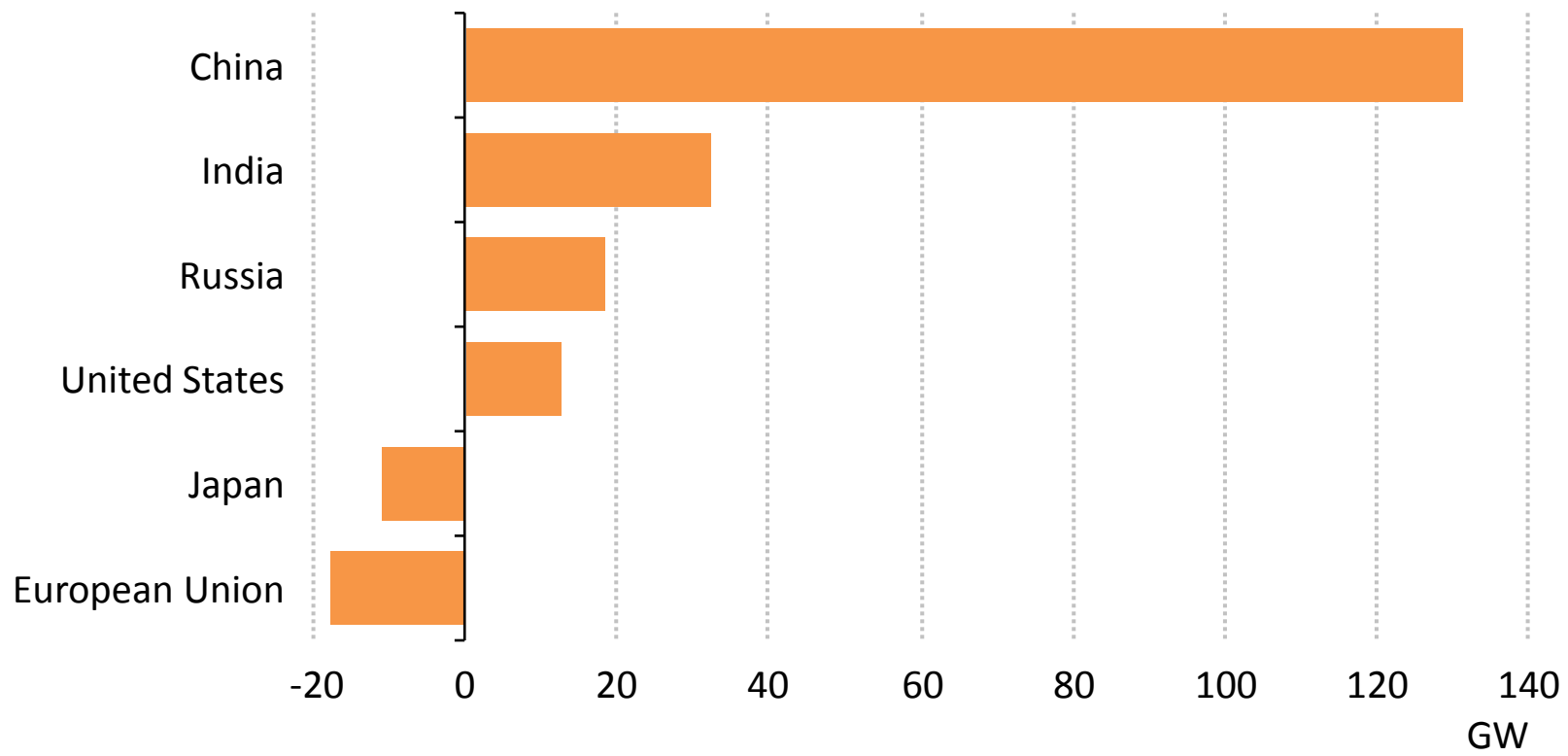
Renewables-based power generation and subsidies



Renewables supply half of the growth in global power demand; wind & solar PV subsidies decline from 2030 as costs fall & recent higher-cost commitments expire

Nuclear capacity grows by 60%, but no nuclear renaissance in sight

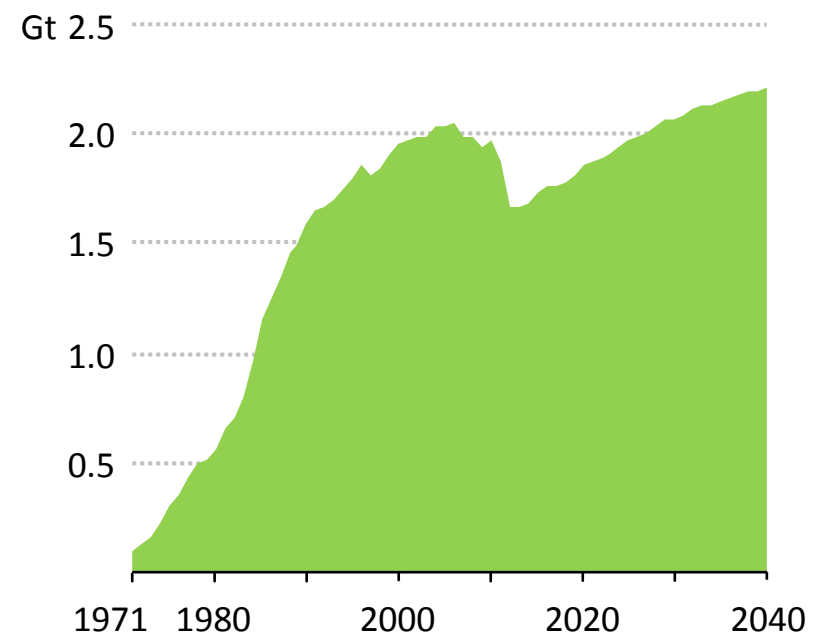
Net capacity change in key regions, 2013-2040



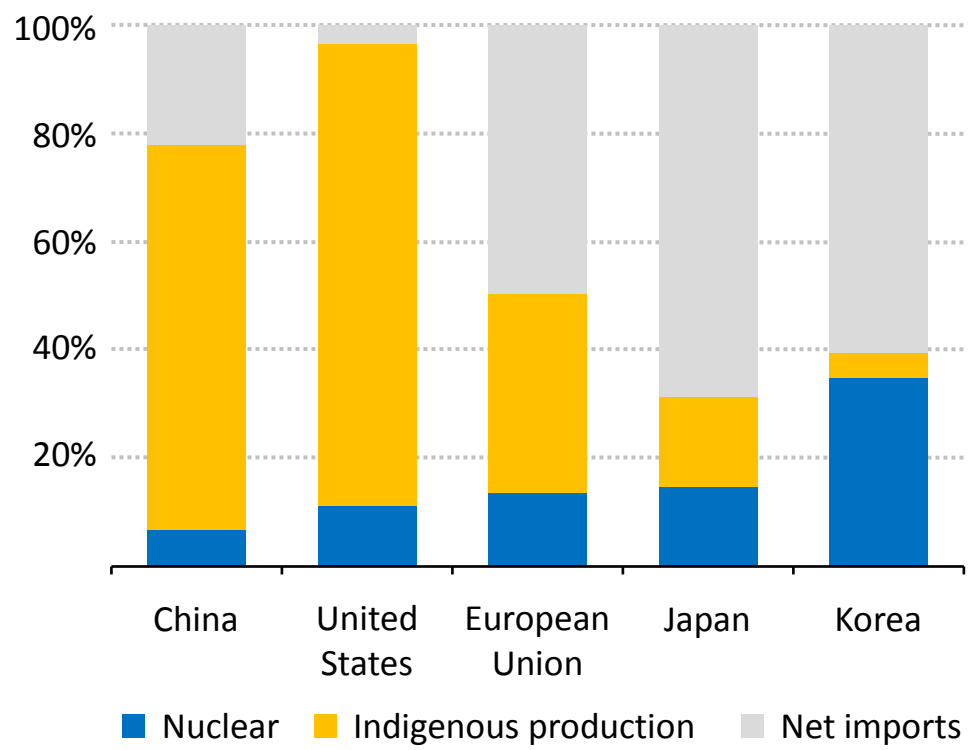
Capacity grows by 60% to 624 GW 2040, led by China, India, Korea & Russia; yet the share of nuclear in the global power mix remains well-below its historic peak

Nuclear power can play a role in CO₂ abatement & energy security

CO₂ emissions avoided annually by nuclear power 1971-2040



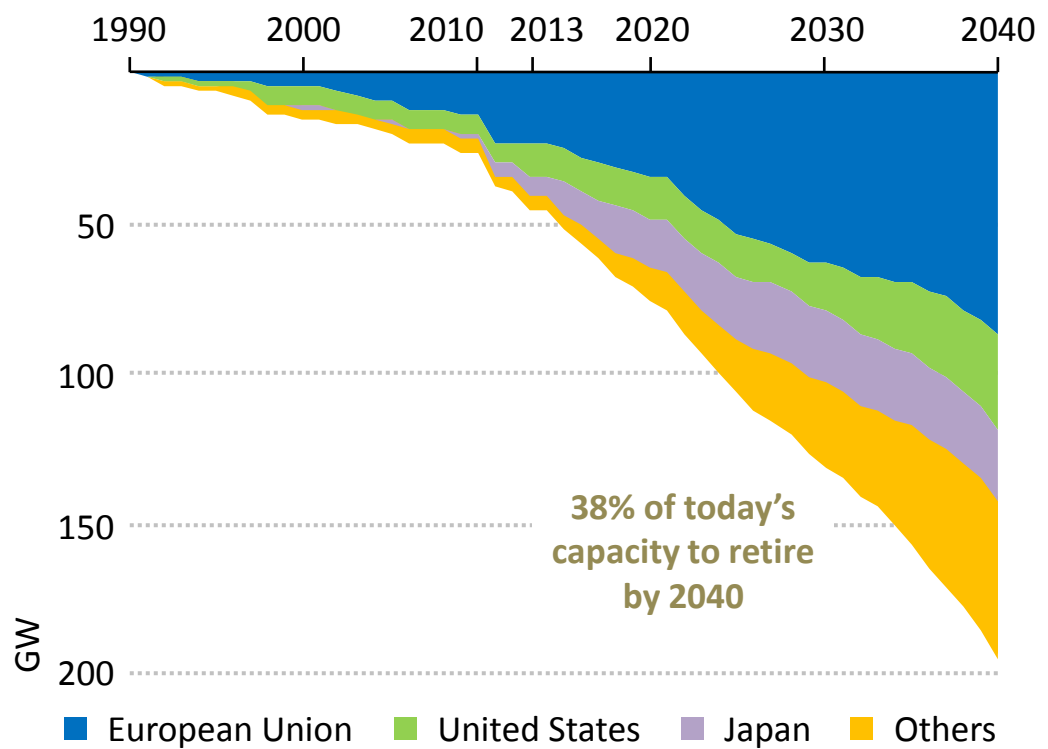
Share of energy demand met by domestic sources and nuclear power in 2040



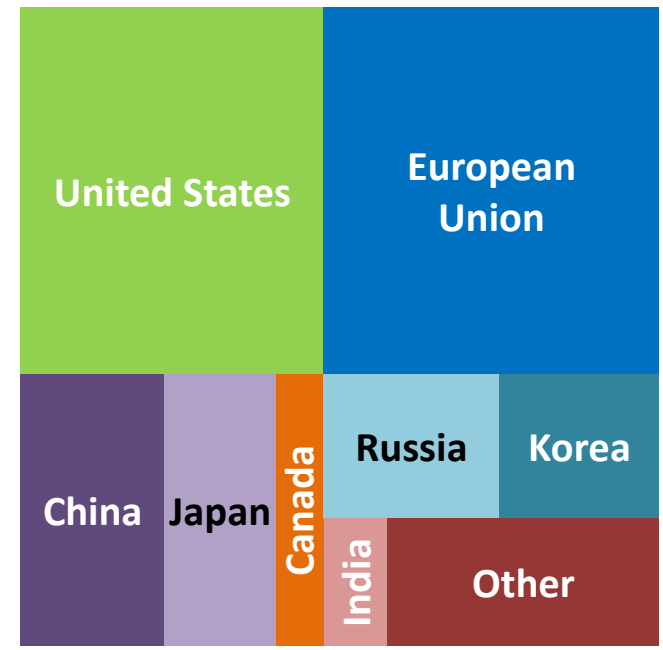
By 2040, an expanded nuclear fleet has saved almost 4 years of current CO₂ emissions & for some countries has improved energy security & balances of energy trade

Nuclear power: public concerns must be heard and addressed

Retirements of nuclear power capacity 1990-2040



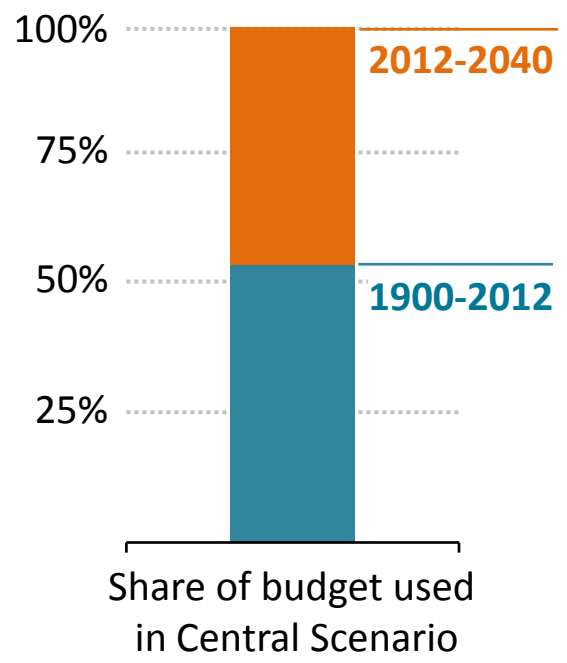
Spent nuclear fuel 1971-2040: 705 thousand tonnes



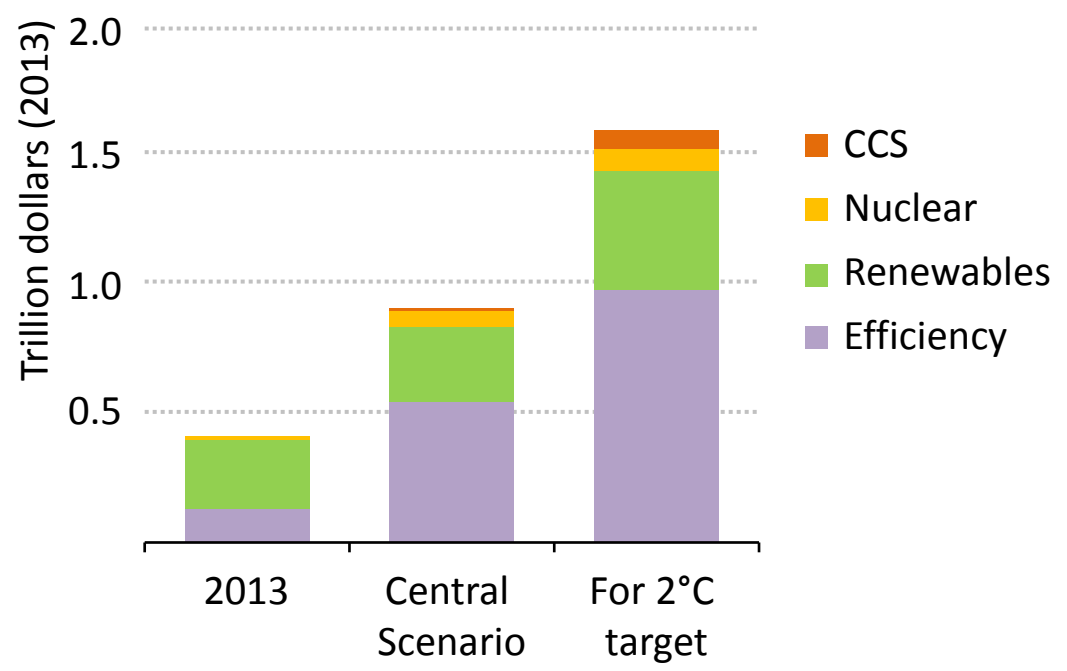
Key public concerns include plant operation, decommissioning & waste management; By 2040, almost 200 reactors are retired & the amount of spent fuel doubles

The 2 °C goal – last chance in Paris?

World CO₂ budget for 2 °C ~2300 Gt



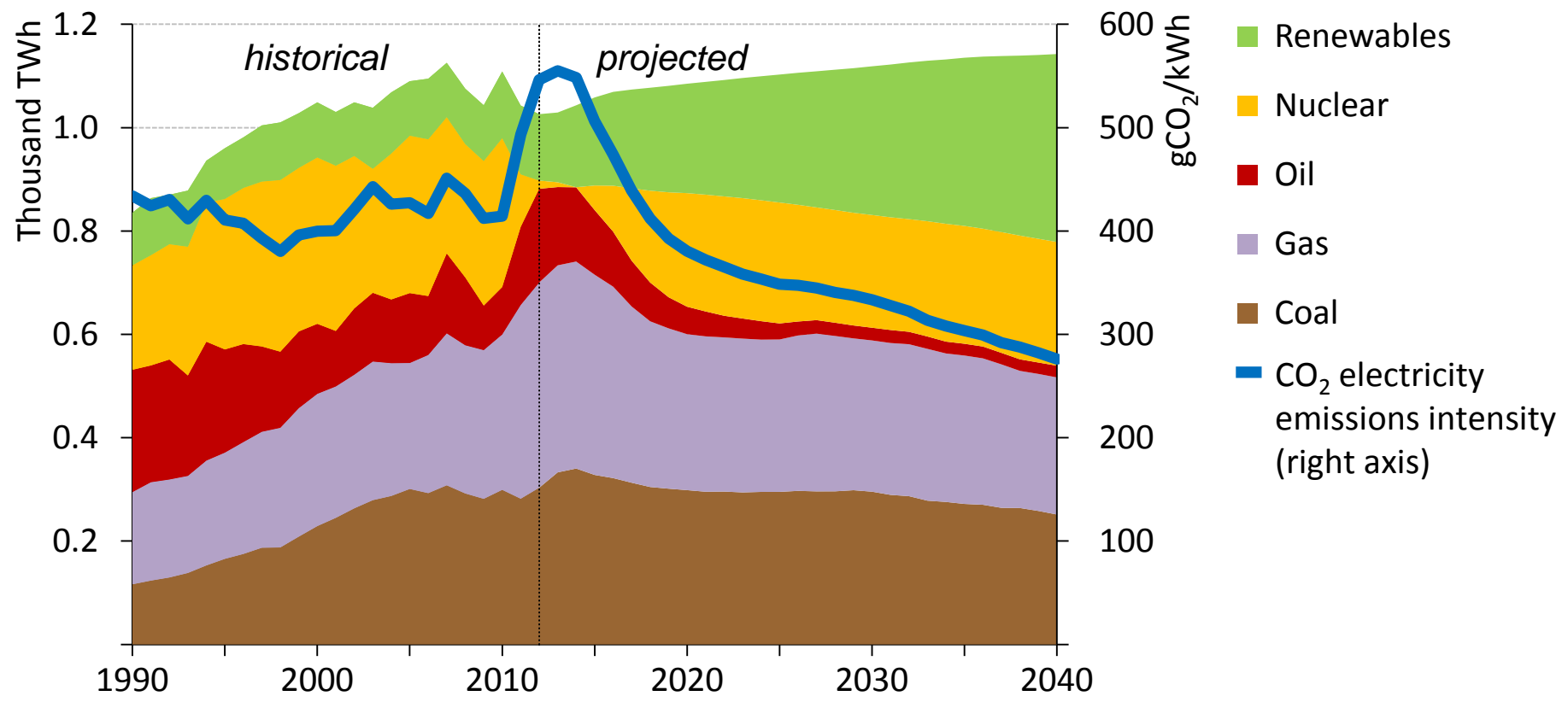
Average annual low-carbon investment, 2014-2040



The entire global CO₂ budget to 2100 is used up by 2040 – Paris must send a strong signal for increasing low-carbon investment four times beyond current levels

Japan's power system: moving to a more diverse & sustainable mix

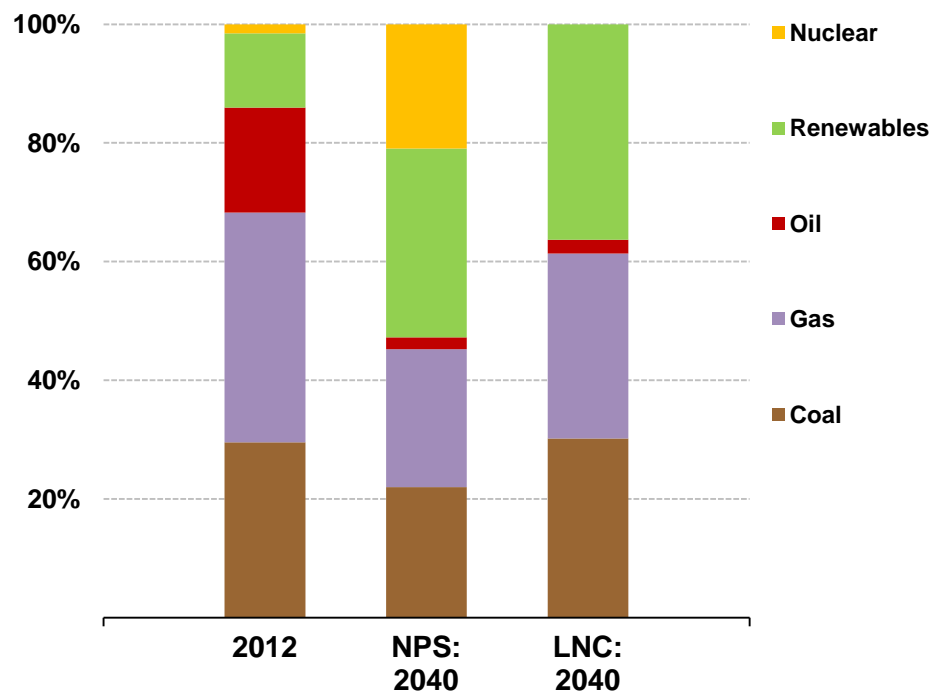
Japan electricity generation by source and CO2 intensity



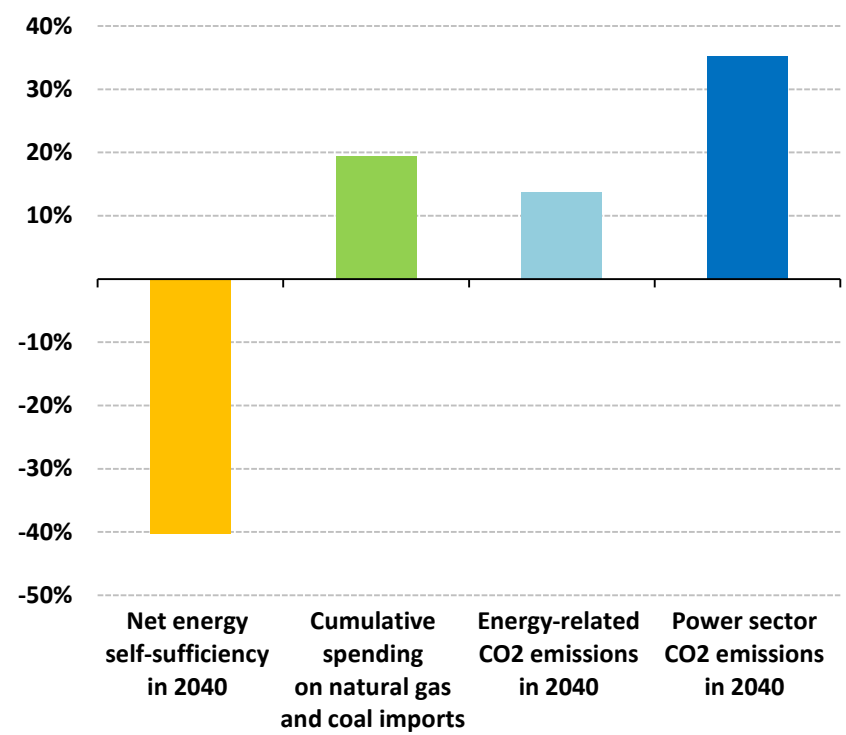
With nuclear plants expected to restart & increased use of renewables, Japan's electricity mix becomes much more diversified by 2040

The Low Nuclear Case (LNC): implications for Japan

Japan's power generation mix in the New Policy Scenario (NPS) and LNC



Change in Japan's energy indicators in LNC relative to NPS



In the Low Nuclear Case, Japan faces greater risks to its energy security, a \$450 billion increase in fuel import bills & a 14% rise in total CO₂ emissions

Navigating a stormy energy future: implications for Japan

- **Geopolitical & market uncertainties are set to propel energy security high up the global energy agenda**
- **Nuclear power grows, with the increase concentrated in a few countries – costs, financing & public concerns are the key barriers**
- **Without clear direction from Paris in 2015, the world is set for warming well beyond the 2 °C goal**
- **The rapid deployment of wind & solar requires careful attention to the design of electricity markets & support schemes**
- **Japan would face increased risks to energy security and it would be more difficult to meet climate & economic goals in the absence of nuclear power. A balanced energy mix needs to be pursued**