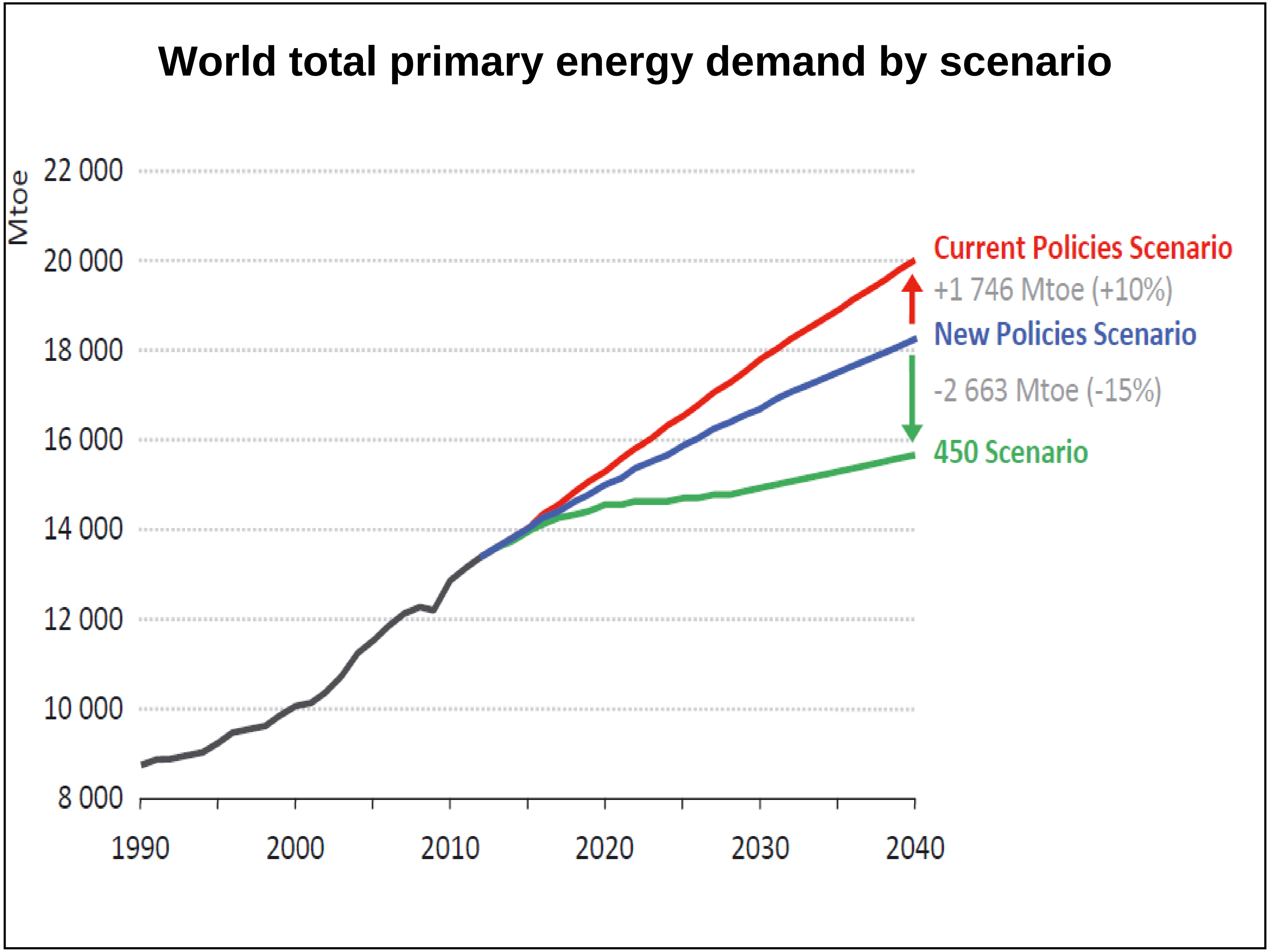
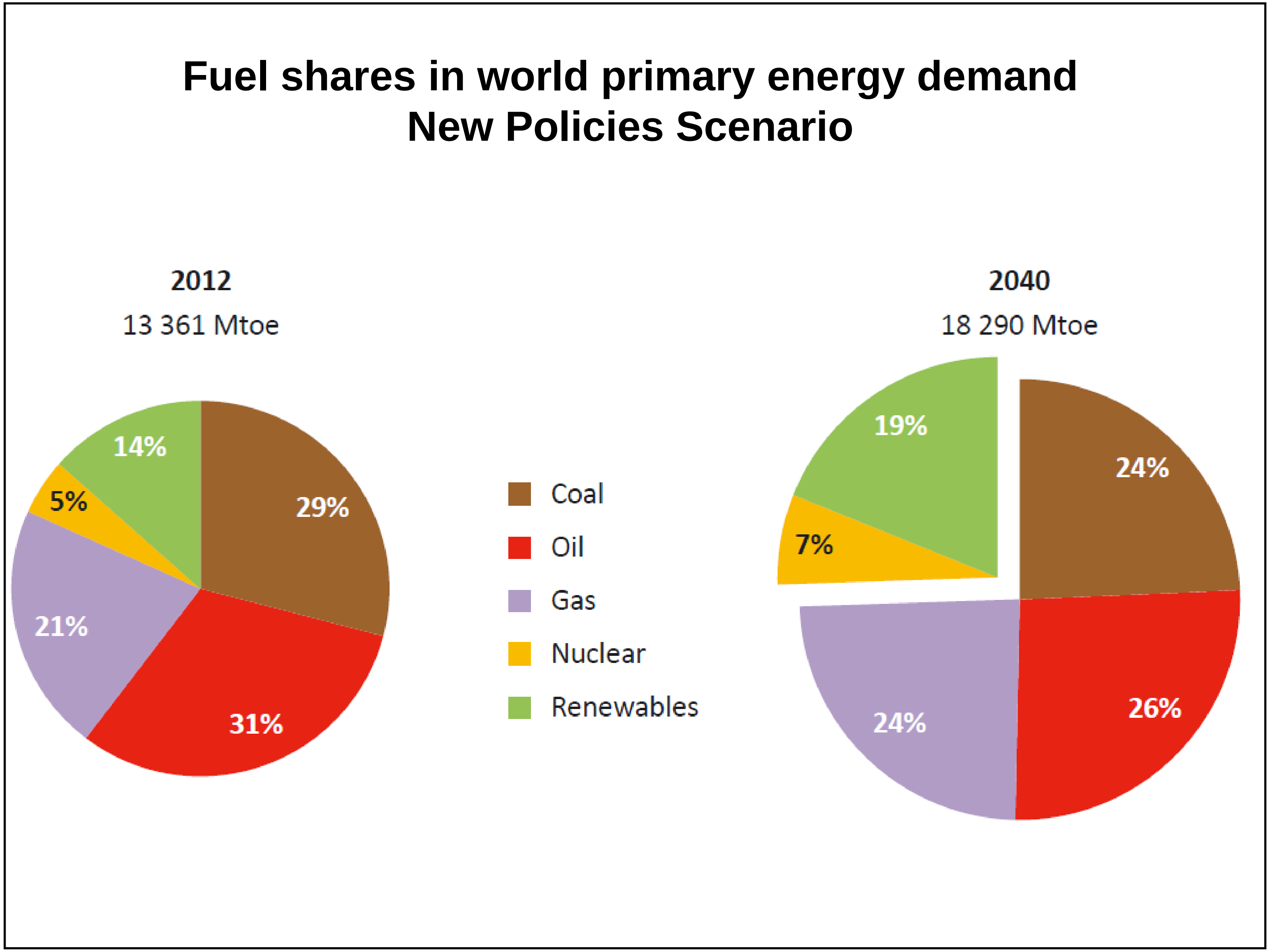

World
Energy
Outlook
2014

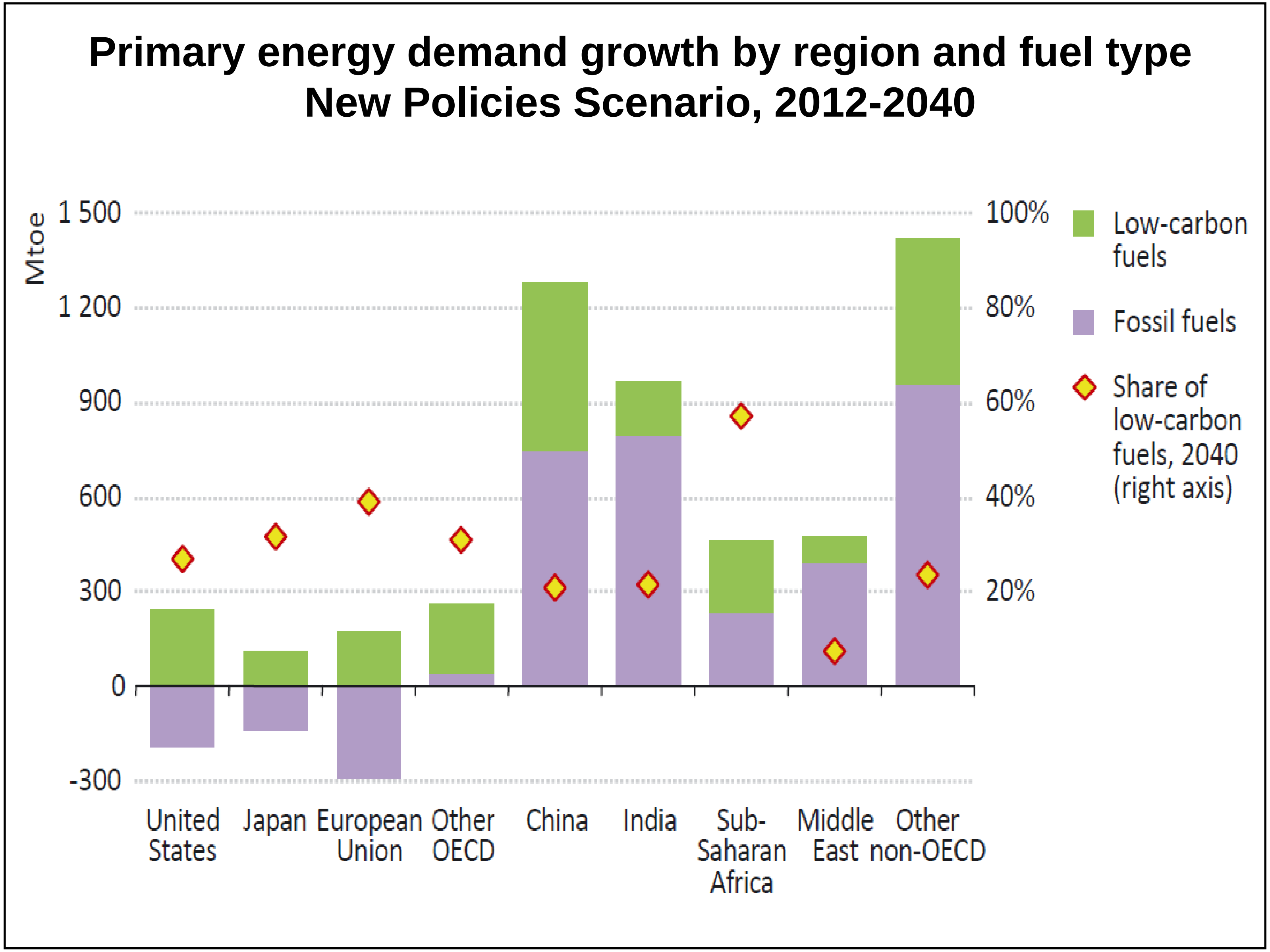
Signs of stress in the global energy system

- **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 CO_2 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?**

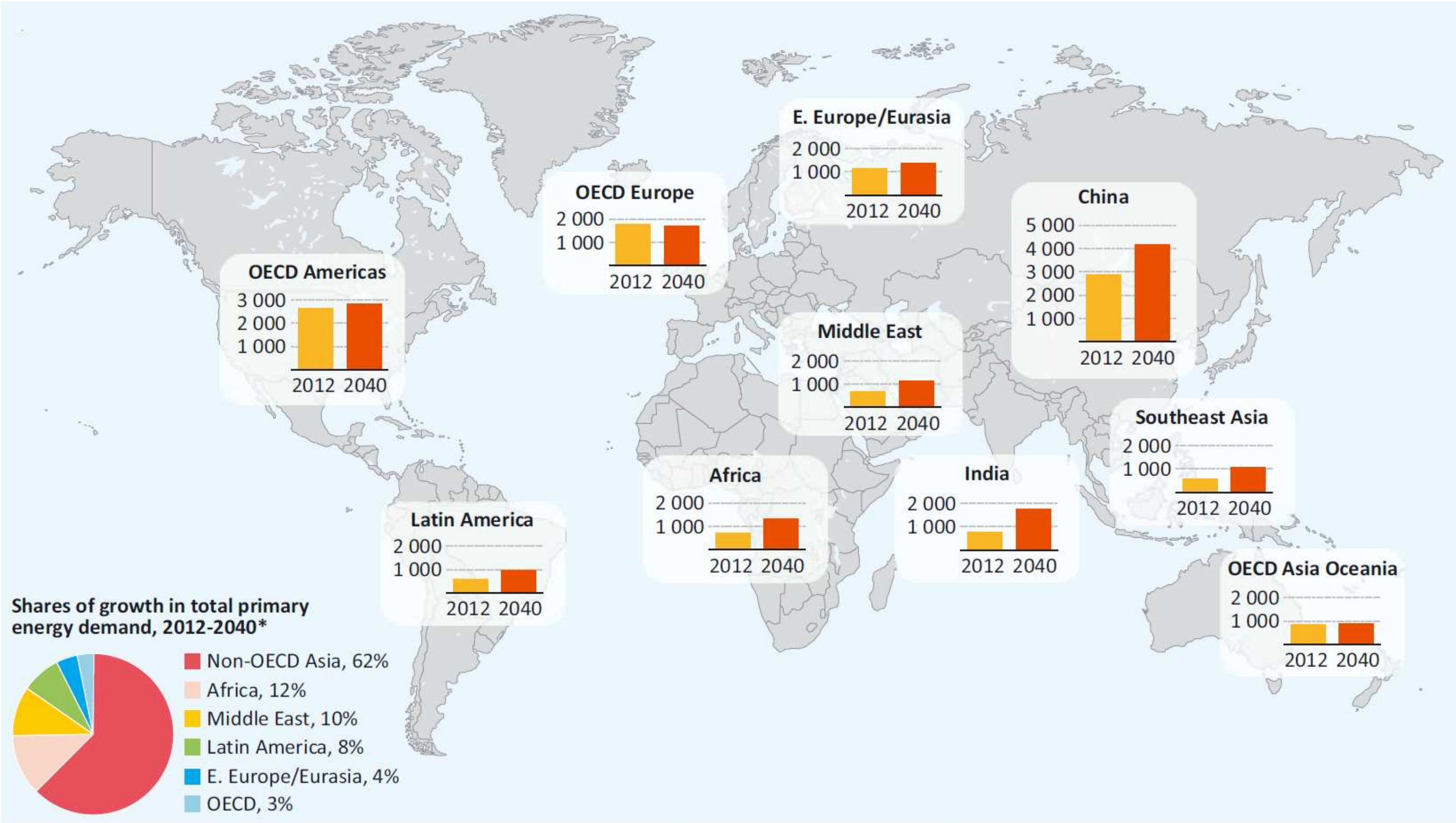


World total primary energy demand by scenario
Mtoe
22 000
20 000
18 000
16 000
14 000
12 000
10 000
8 000
1990
2000
2010
2020
2030
2040
Current Policies Scenario
+1 746 Mtoe (+10%)
New Policies Scenario
-2 663 Mtoe (-15%)
450 Scenario


Fuel shares in world primary energy demand
New Policies Scenario
2012
13 361 Mtoe
29%
31%
21%
5%
14%
Coal
Oil
Gas
Nuclear
Renewables
2040
18 290 Mtoe
24%
26%
24%
7%
19%


Primary energy demand growth by region and fuel type
New Policies Scenario, 2012-2040
Mtoe
1 500
1 200
900
600
300
0
-300
100%
80%
60%
40%
20%
Low-carbon fuels
Fossil fuels
Share of low-carbon fuels, 2040 (right axis)
United States
Japan
European Union
Other OECD
China
India
Sub-Saharan Africa
Middle East
Other non-OECD

Primary energy demand by region
New Policies Scenario (Mtoe)



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

*Growth in primary demand excludes bunkers. Note: Values in the pie chart do not sum to 100% due to rounding.

Changing dynamics of global demand

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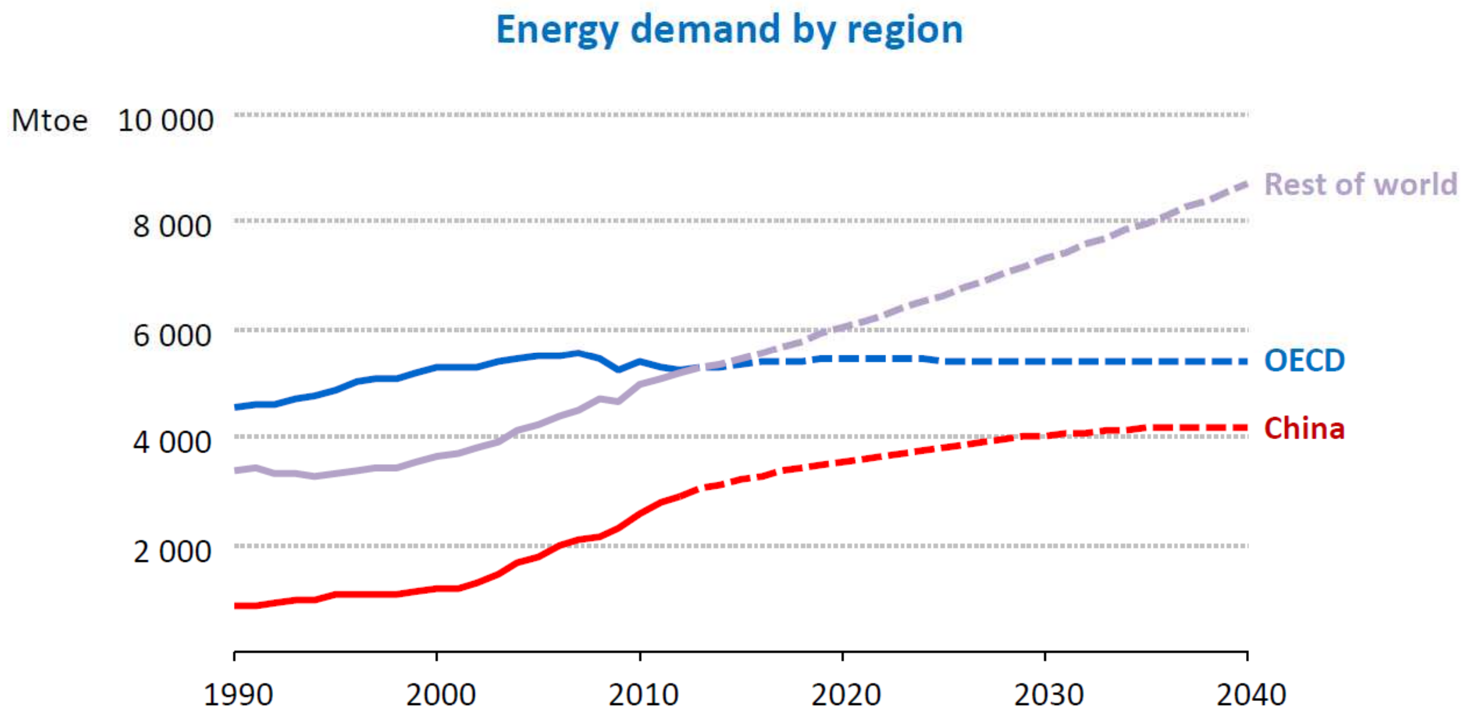

As China slows, then India, Southeast Asia, the Middle East and parts of Africa & Latin America take over as the engines of global energy demand growth.

United States holds a strong position on energy costs

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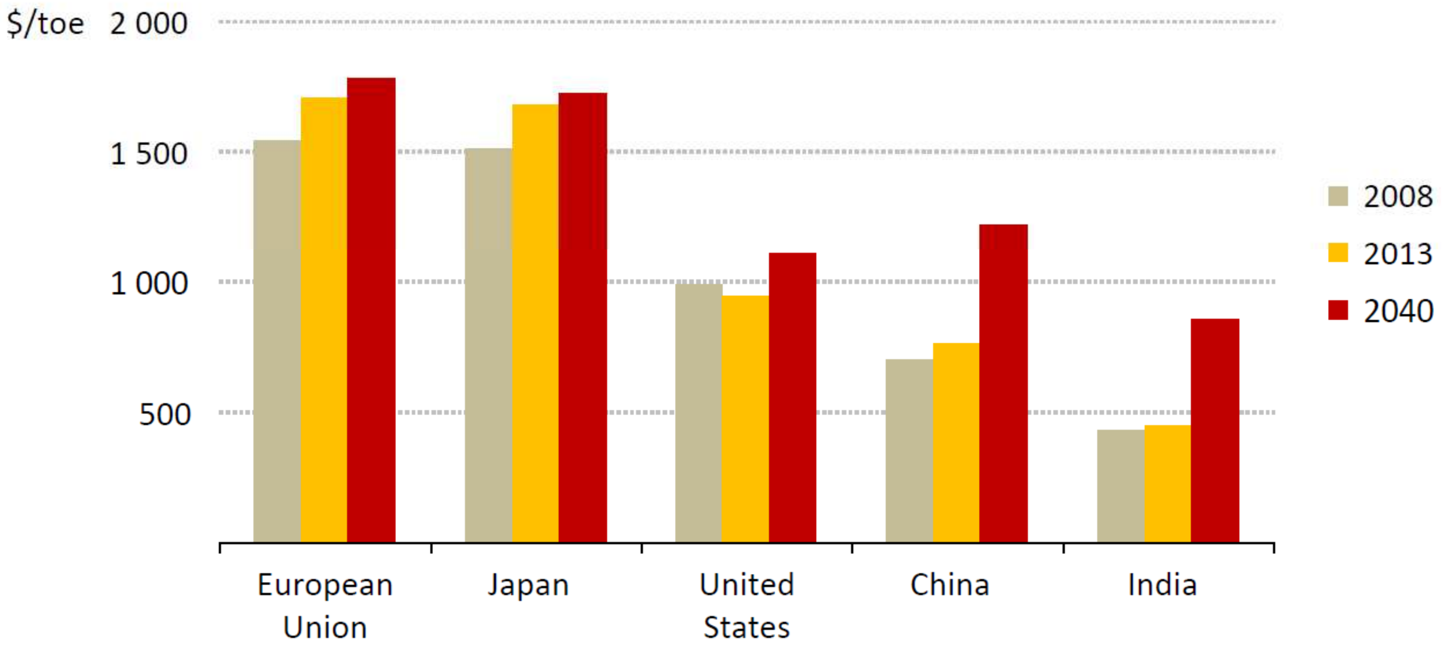
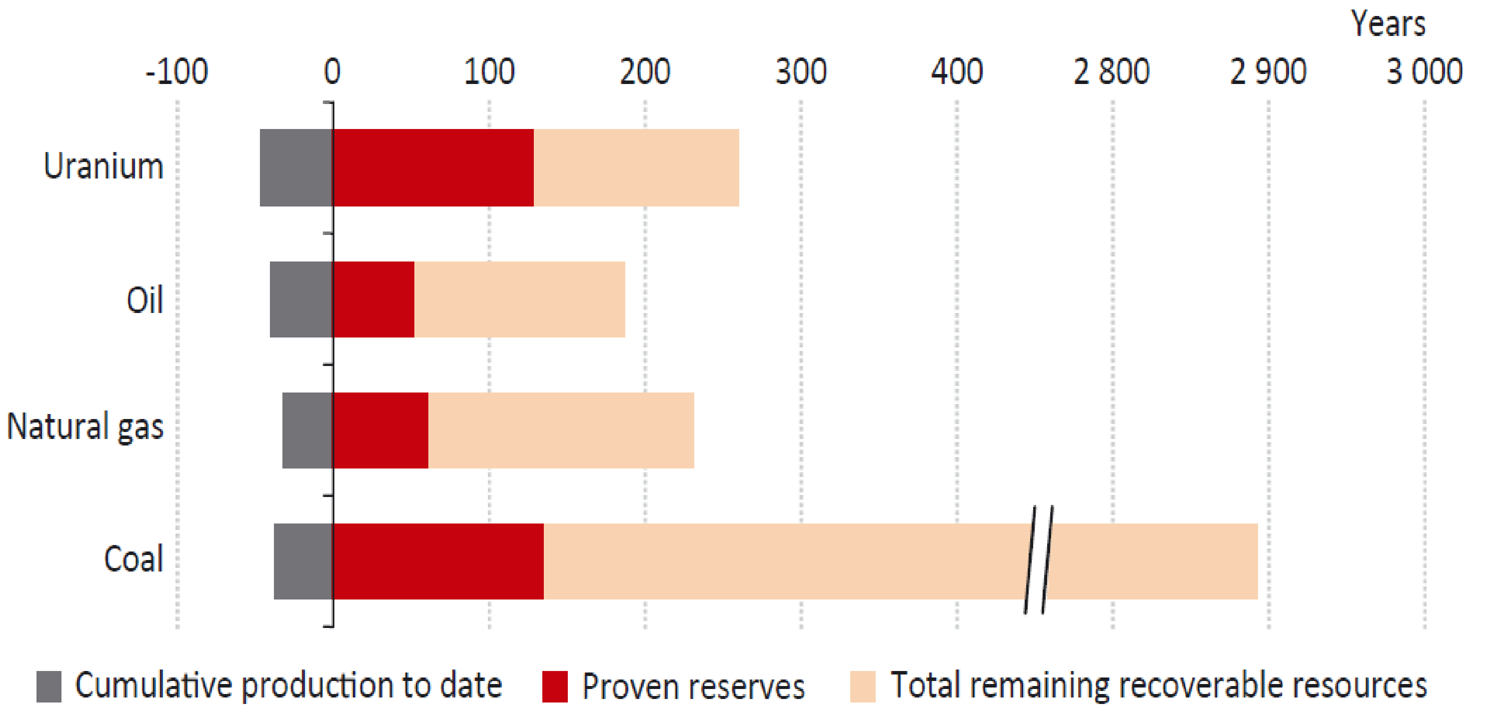
Weighted average cost of energy paid by consumers



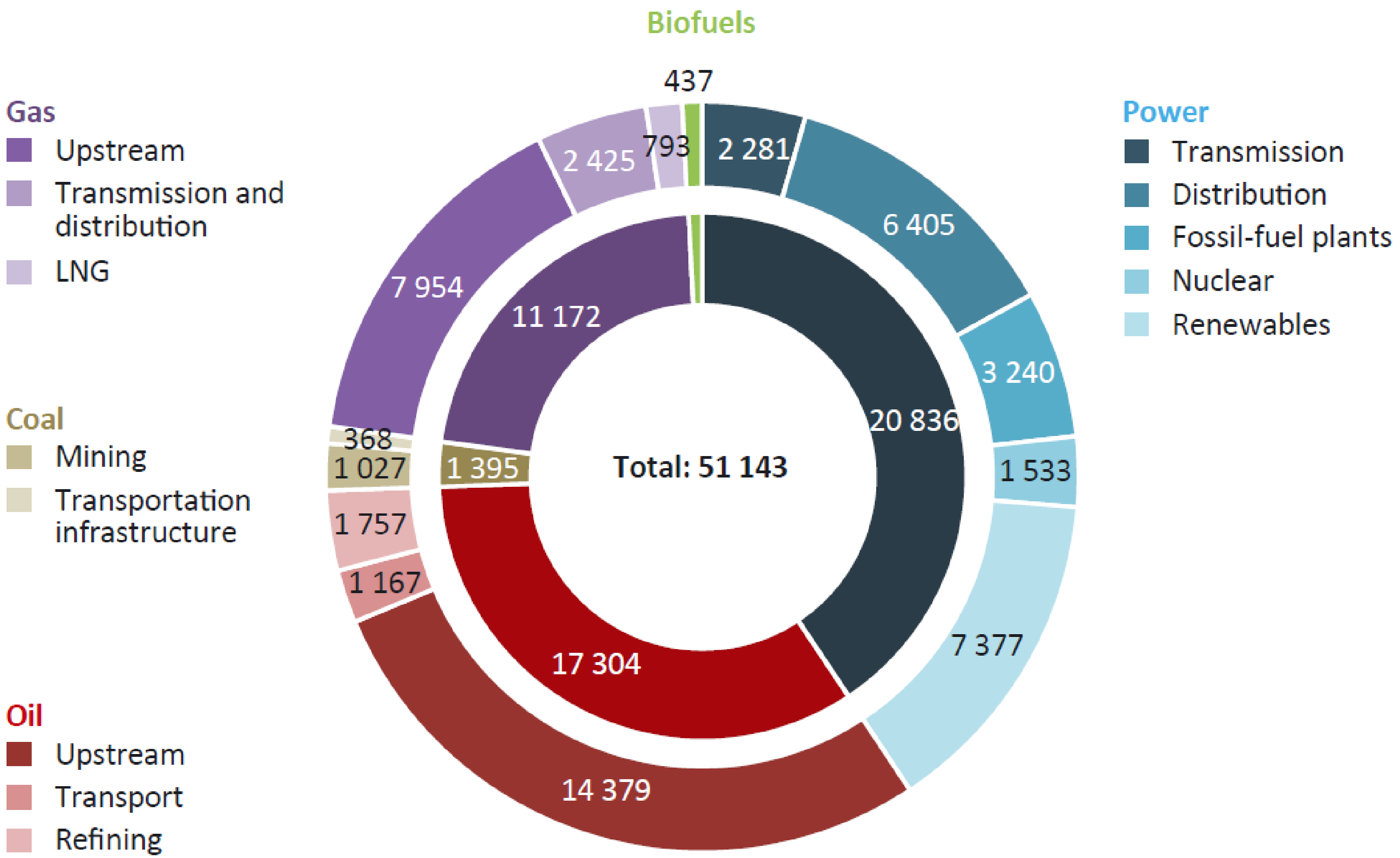
Economies face higher costs, but the pace of change varies: China overtakes the US, costs double in India & remain high in the European Union & Japan

Lifetimes of fossil-fuel and uranium resources*

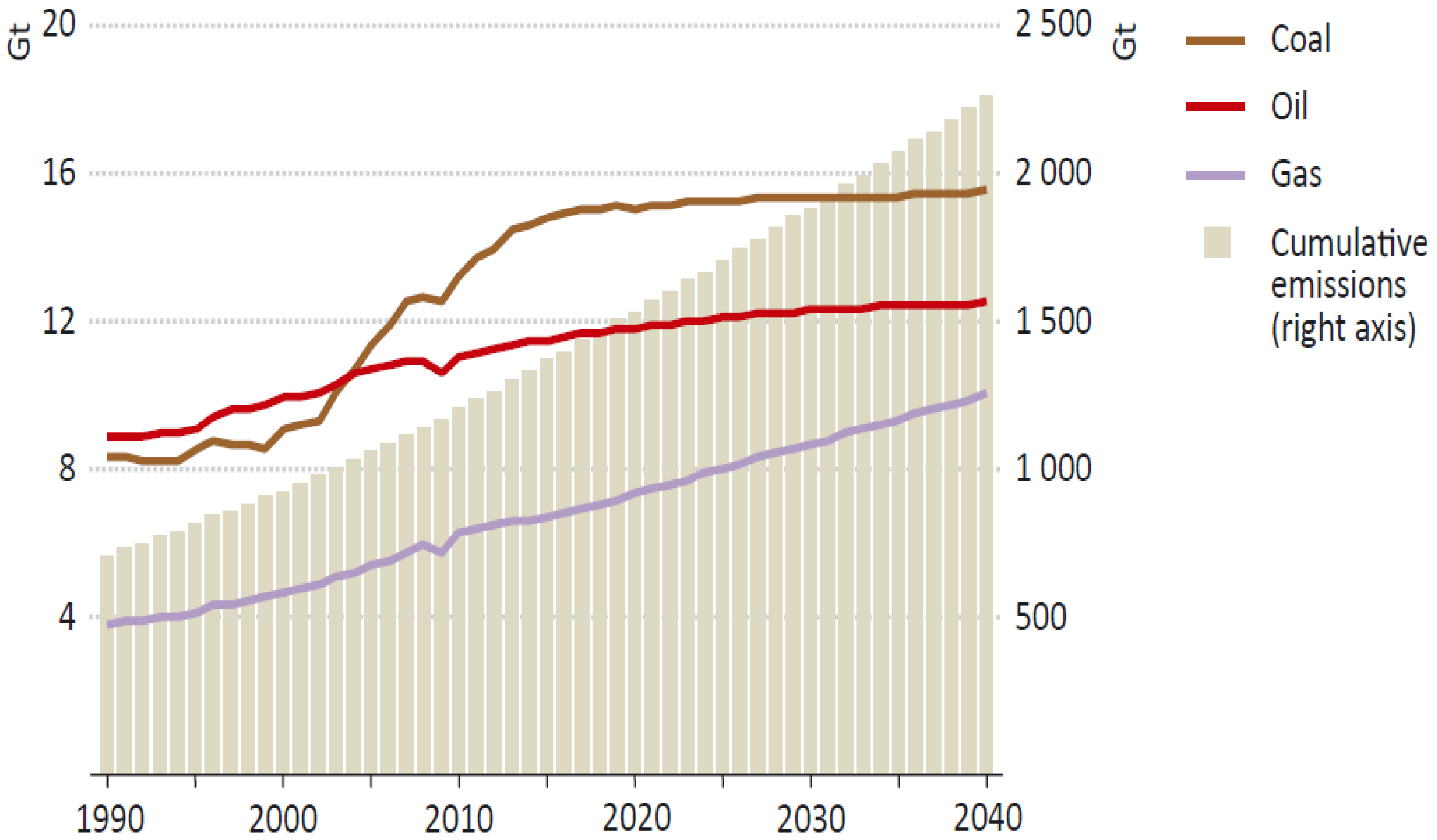


* Expressed as number of years of produced and remaining resources based on estimated production rates in 2013. For uranium, proven reserves include reasonably assured and inferred resources (see Chapter 11 for more details).
Sources: BGR (2013); O&GJ (2013); USGS (2012a); USGS (2012b); BP (2014); NEA/IAEA (2014); IEA estimates and analysis.

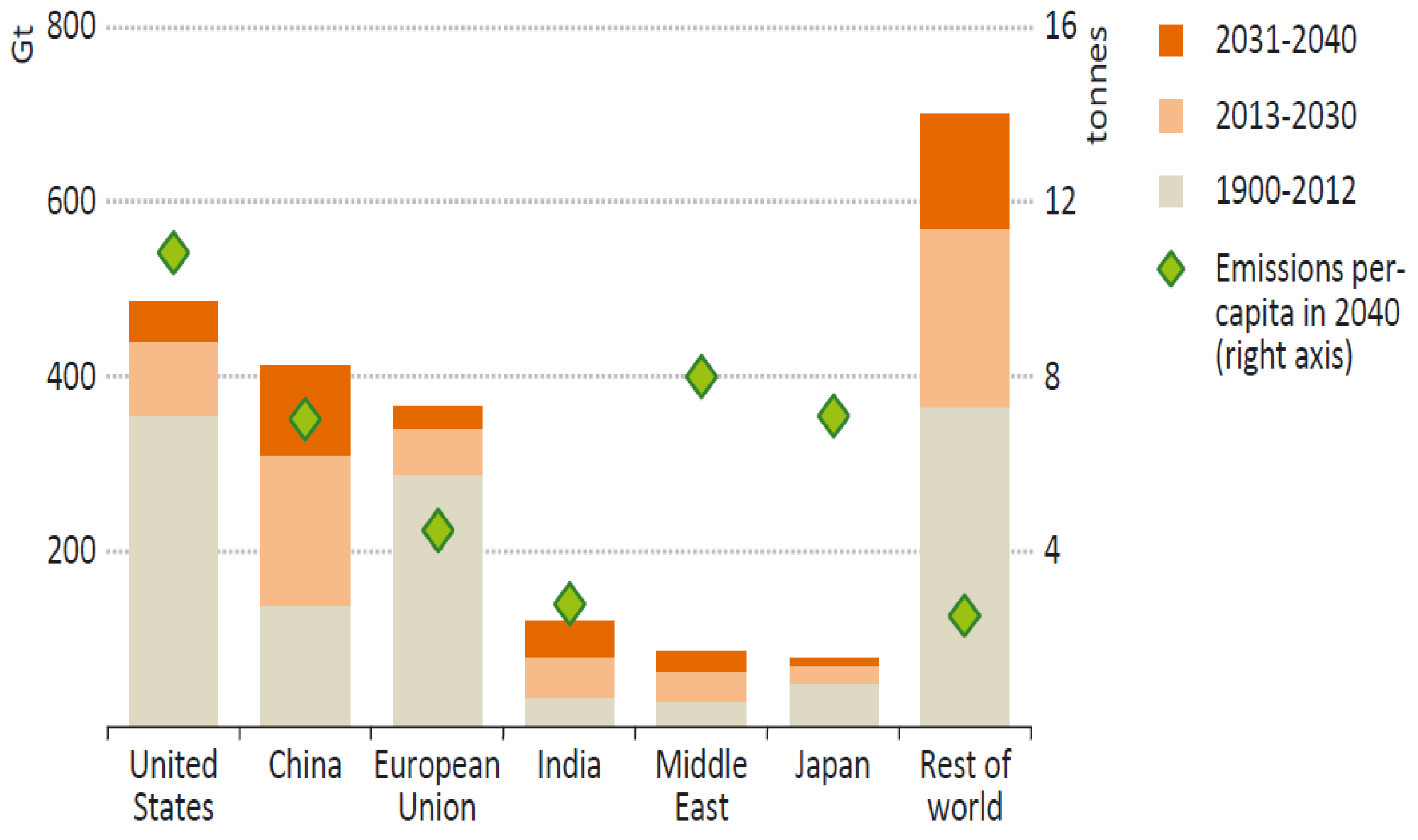
Cumulative global energy supply investment by fuel and type in the New Policies Scenario, 2014-2040 ($2013 billion)



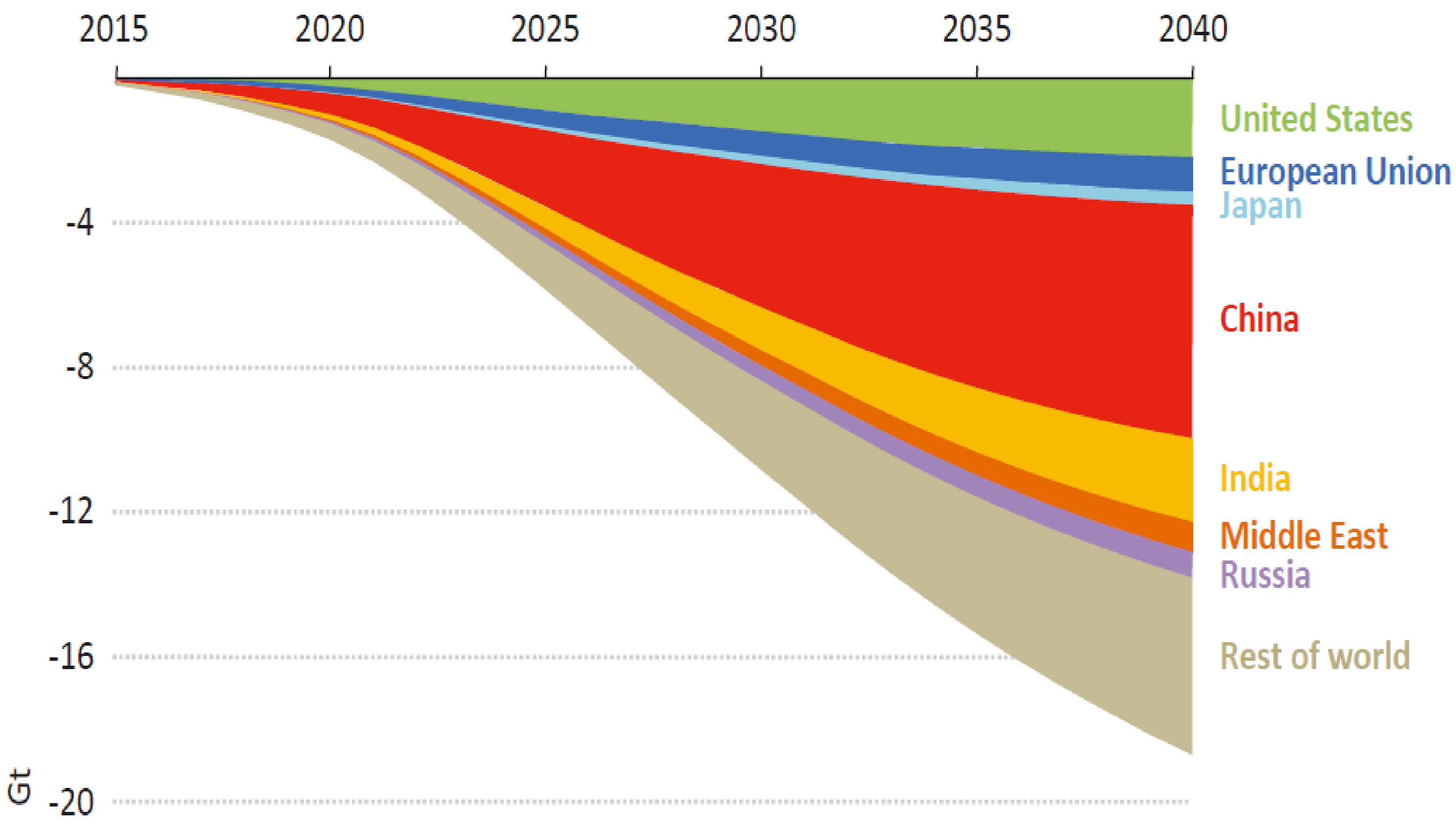
Global fossil-fuel energy-related CO_2 emissions and total cumulative CO_2 emissions in the New Policies Scenario



Cumulative energy-related CO_2 emissions by region
New Policies Scenario



Reduction in energy-related CO_2 emissions in 450 Scenario relative to the New Policies Scenario



The 2 °C goal – last chance in Paris?

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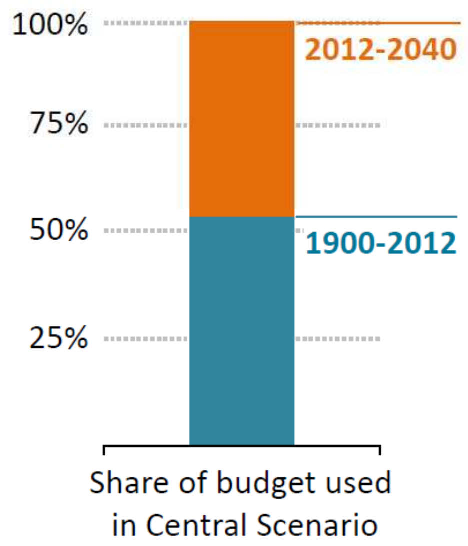
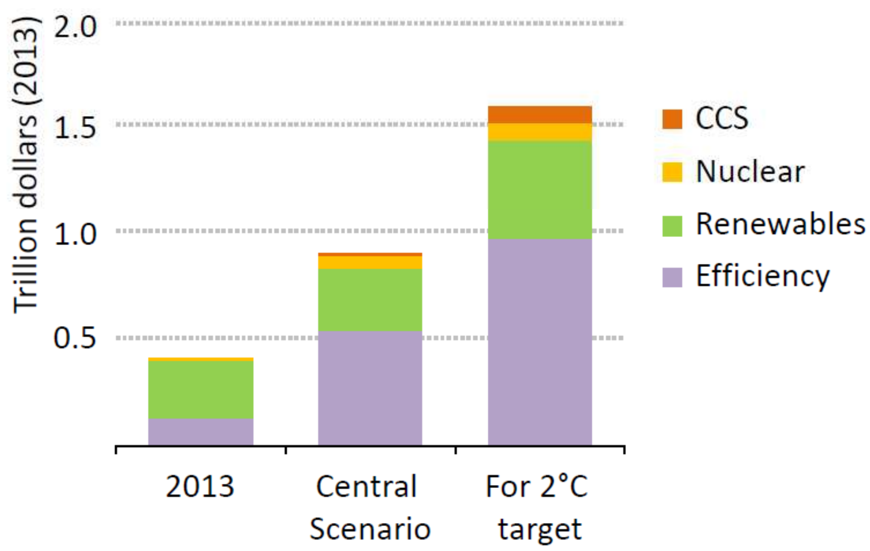
World CO_2 budget for 2 °C ~2300 Gt

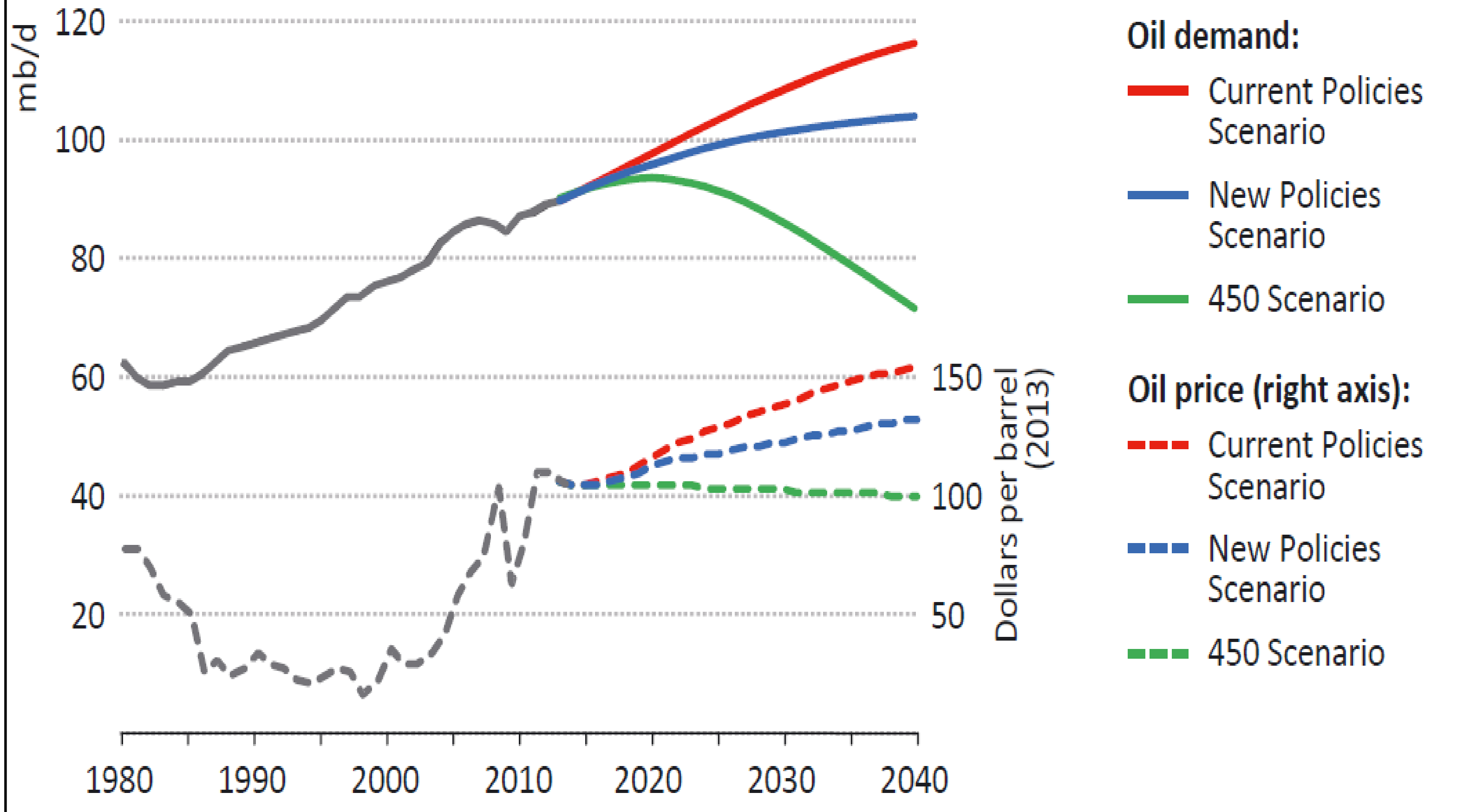


Average annual low-carbon investment, 2014-2040



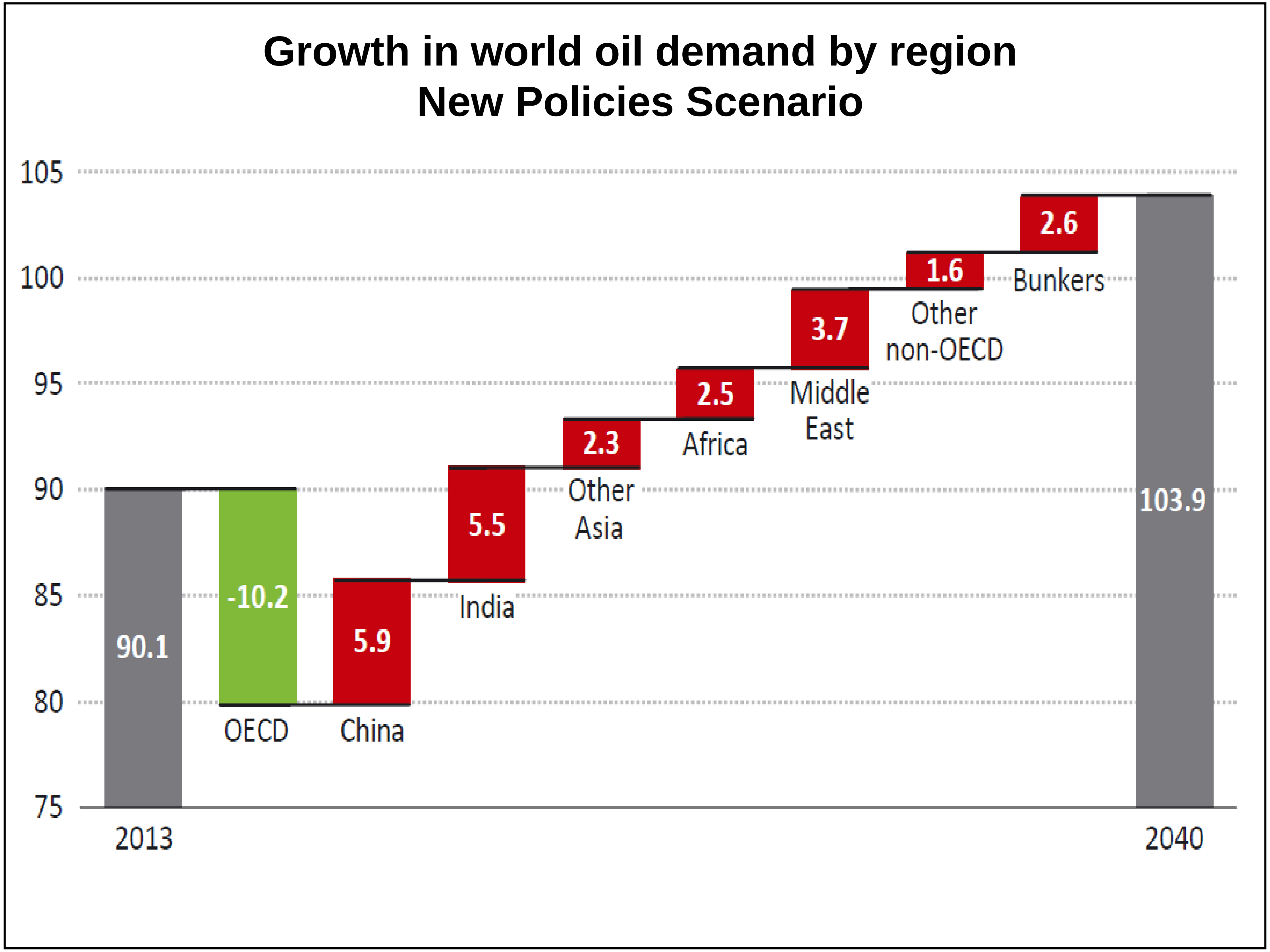
The entire global CO_2 budget to 2100 is used up by 2040 – Paris must send a strong signal for increasing low-carbon investment four times beyond current levels

World oil demand and oil price by scenario

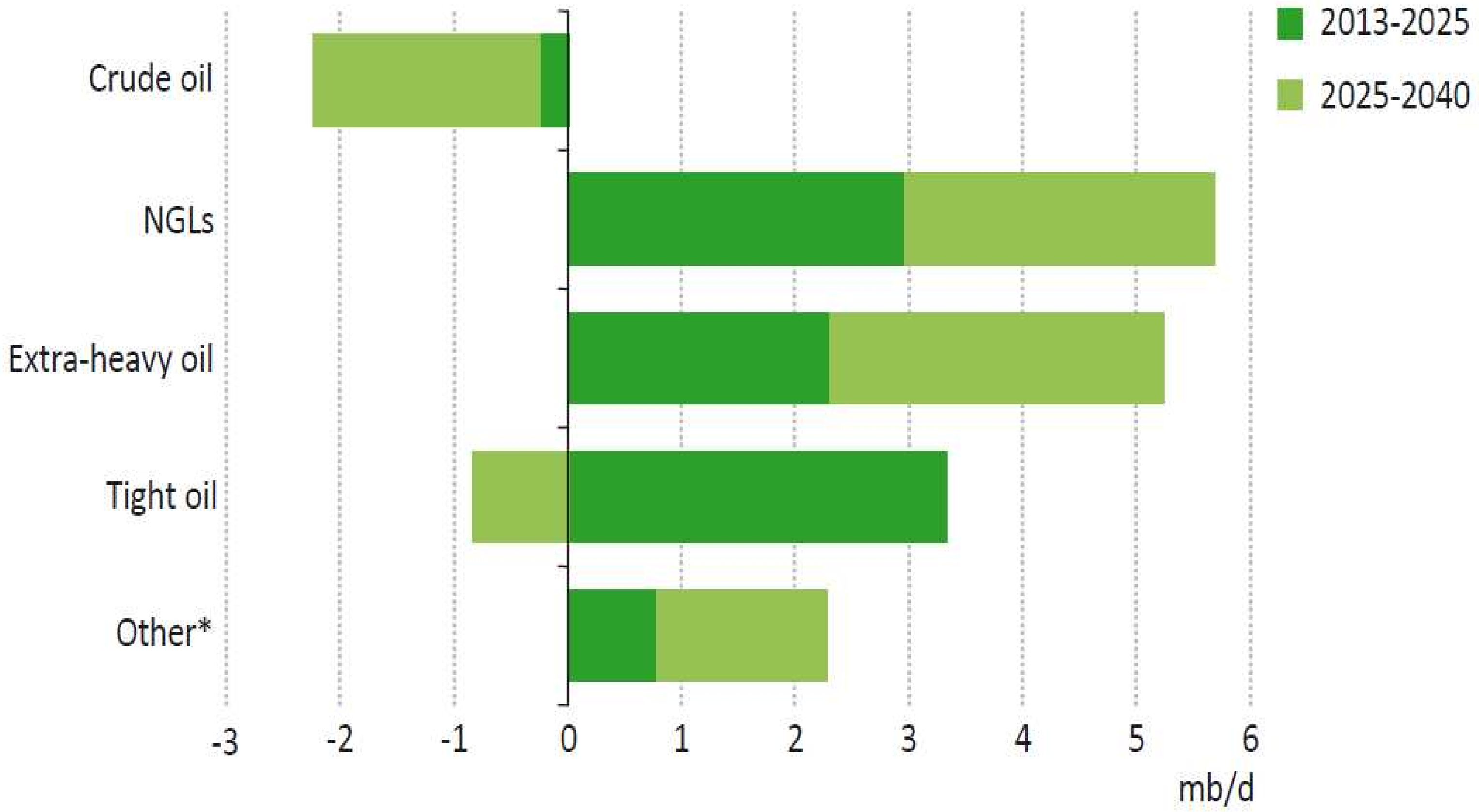


Looking ahead on the oil price

- Against a backdrop of weaker demand, buoyant supply in North America has brought prices down – but can it keep them down?
- Lower prices are starting to curtail upstream spending plans, with implications for future supply
- Over time, squeezed cash flow would constrain the capacity of North America & Brazil to act as engines of global supply growth
- Sustained $80/barrel oil could provide some breathing space to major oil importers, boosting demand & GDP
- It would also accelerate reliance on low-cost producers in the Middle East, some of which face major investment challenges

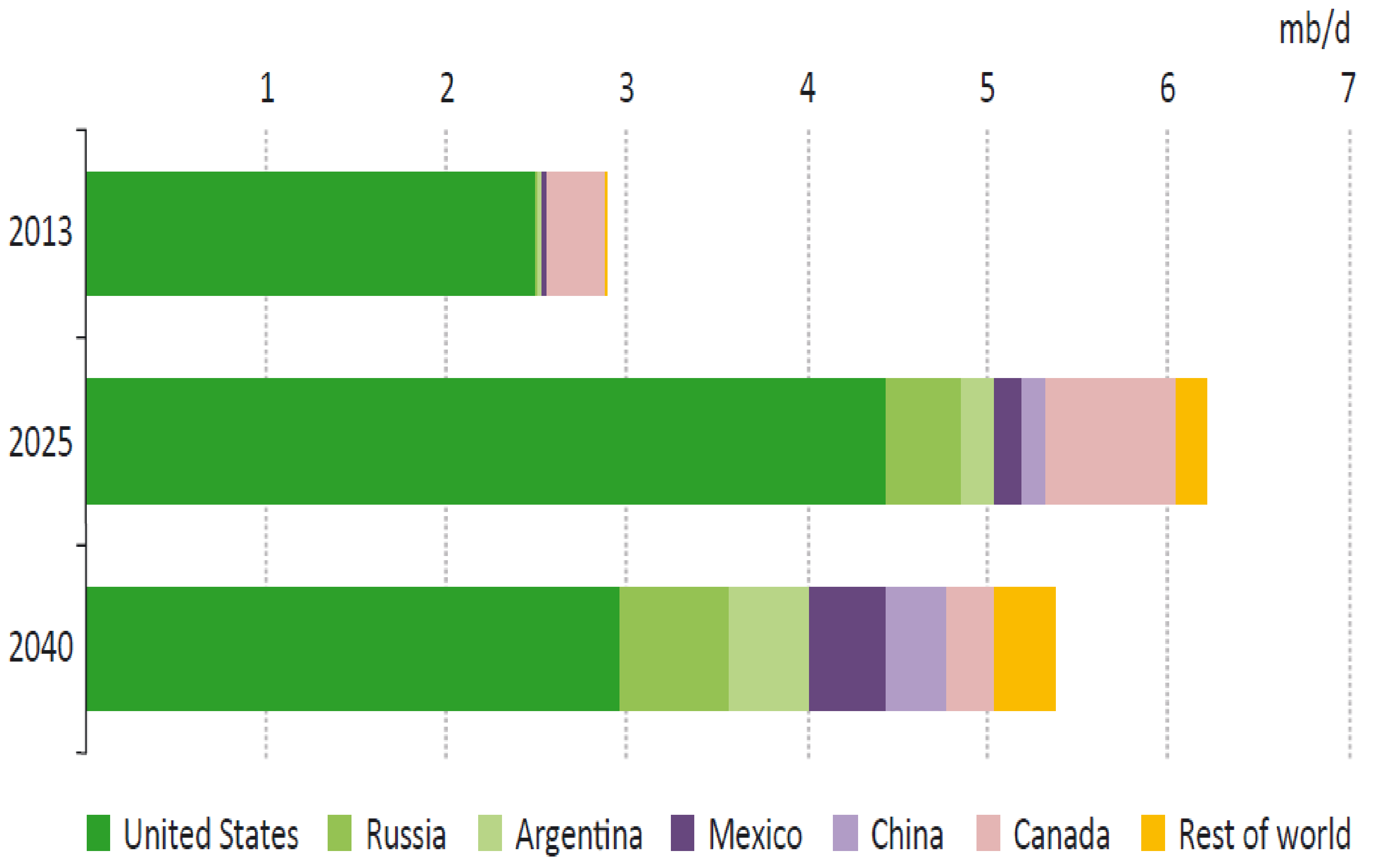

Growth in world oil demand by region
New Policies Scenario
105
100
95
90
85
80
75
90.1
-10.2
OECD
5.9
China
5.5
India
2.3
Other
Asia
2.5
Africa
3.7
Middle
East
1.6
Other
non-OECD
2.6
Bunkers
103.9
2013
2040

Change in world oil production by type
New Policies Scenario



* Includes coal-to-liquids and gas-to-liquids projects, production of additives and of kerogen oil.

Tight oil production by country
New Policies Scenario



Instability in the Middle East a major risk to oil markets

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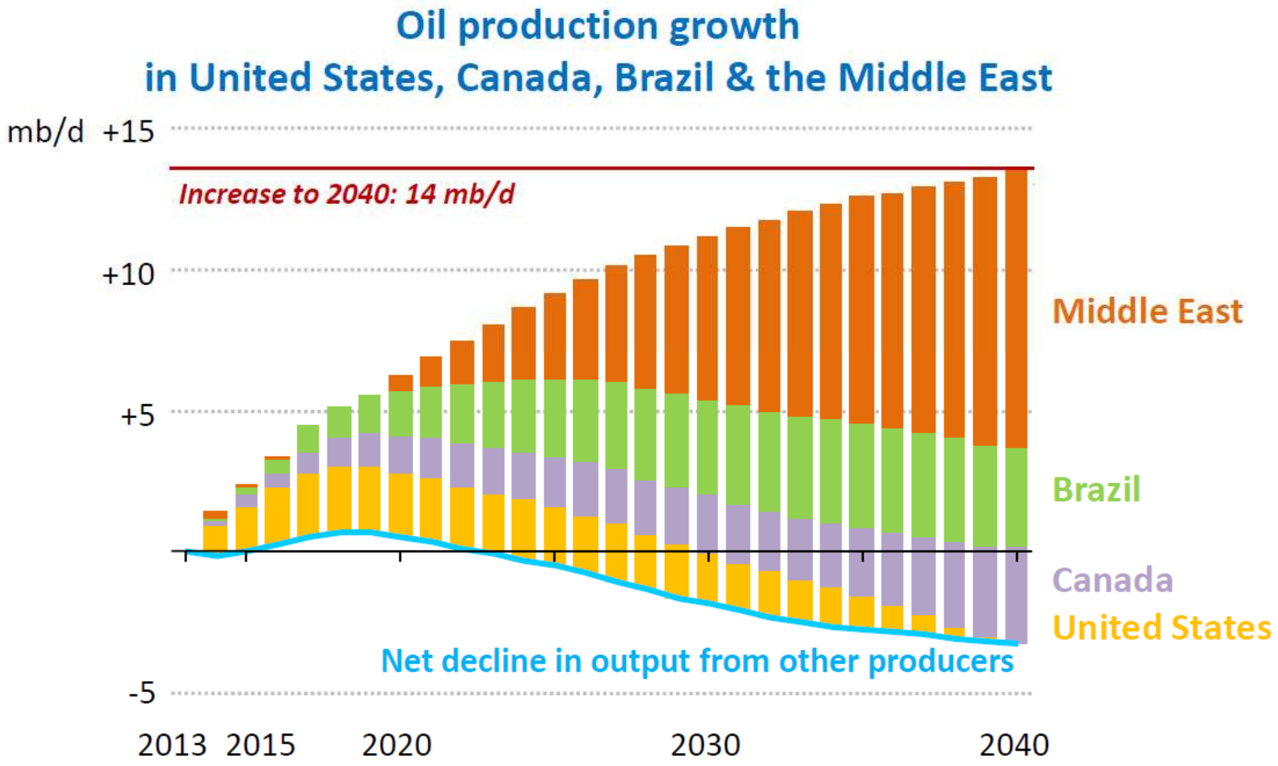
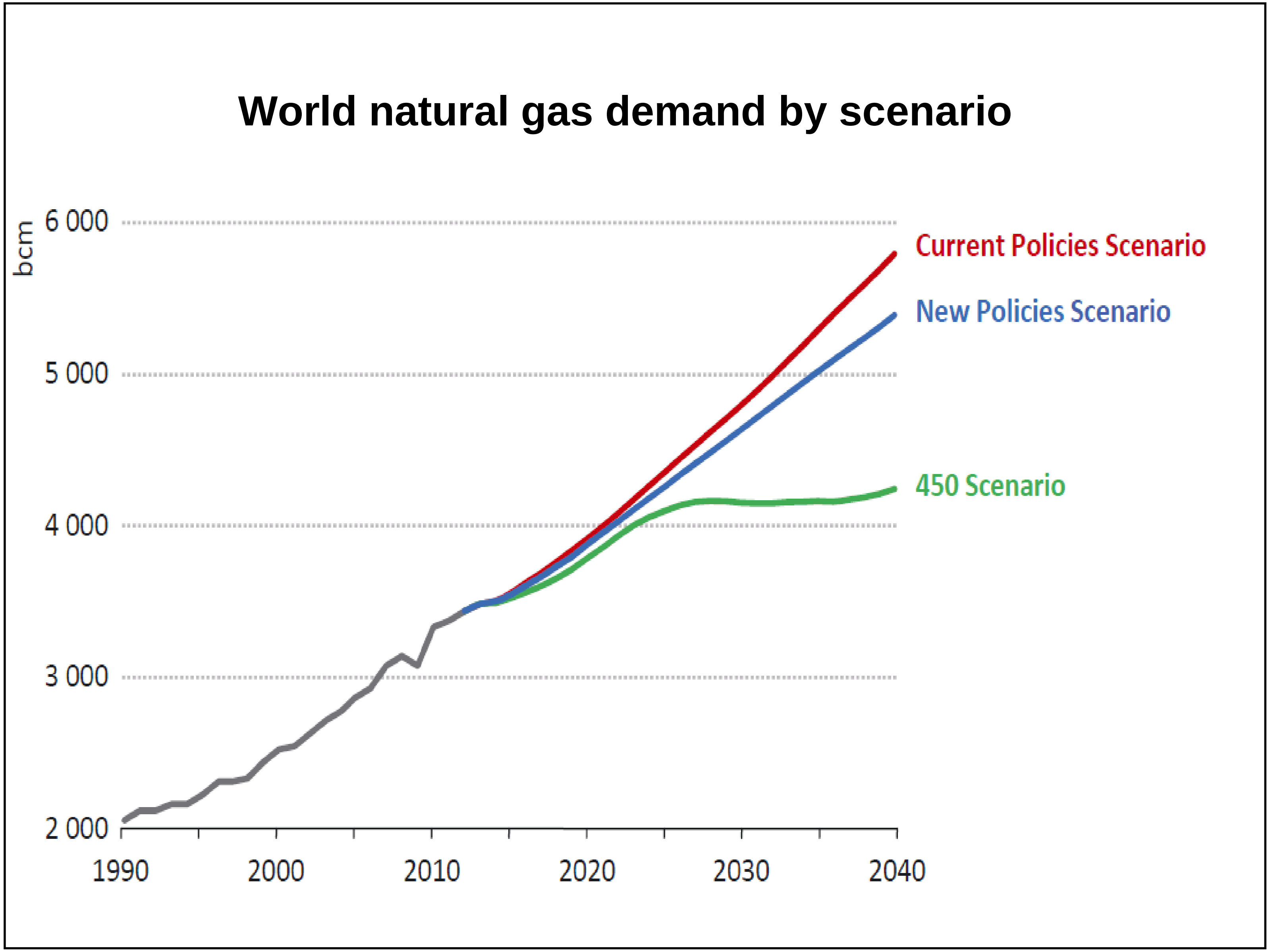
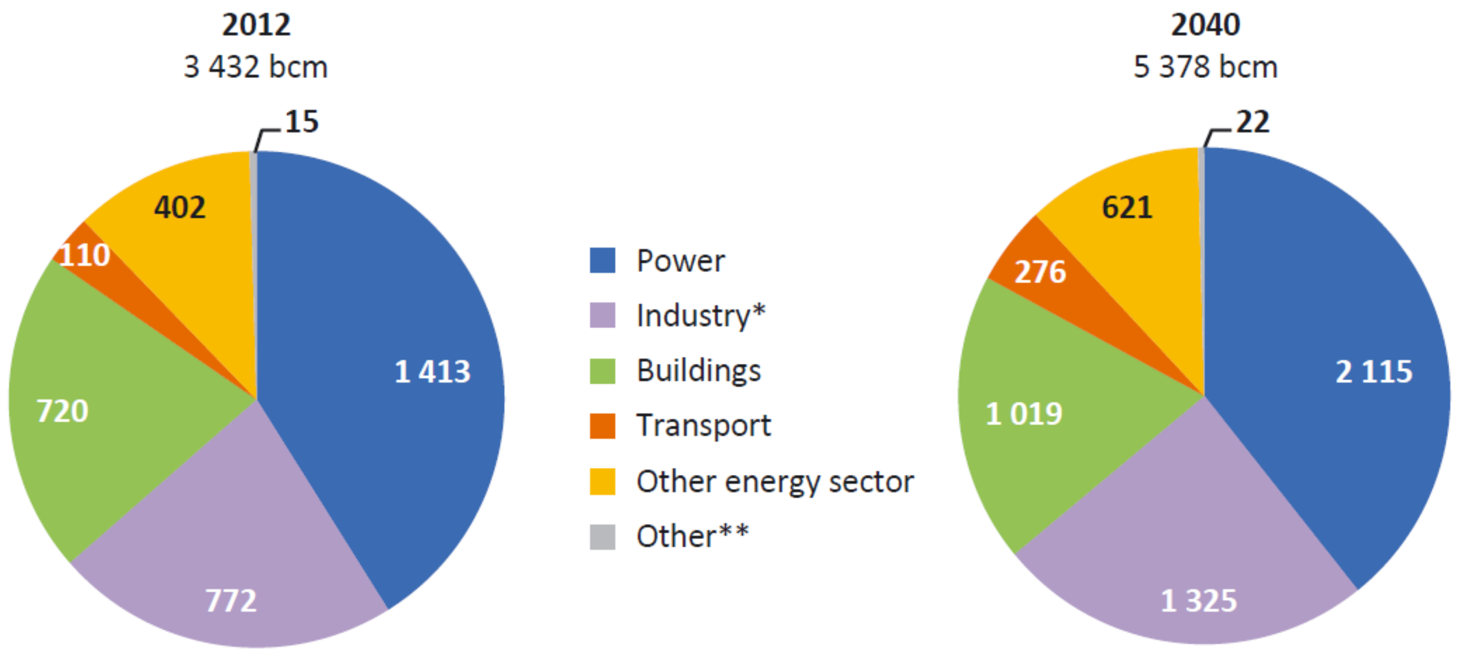


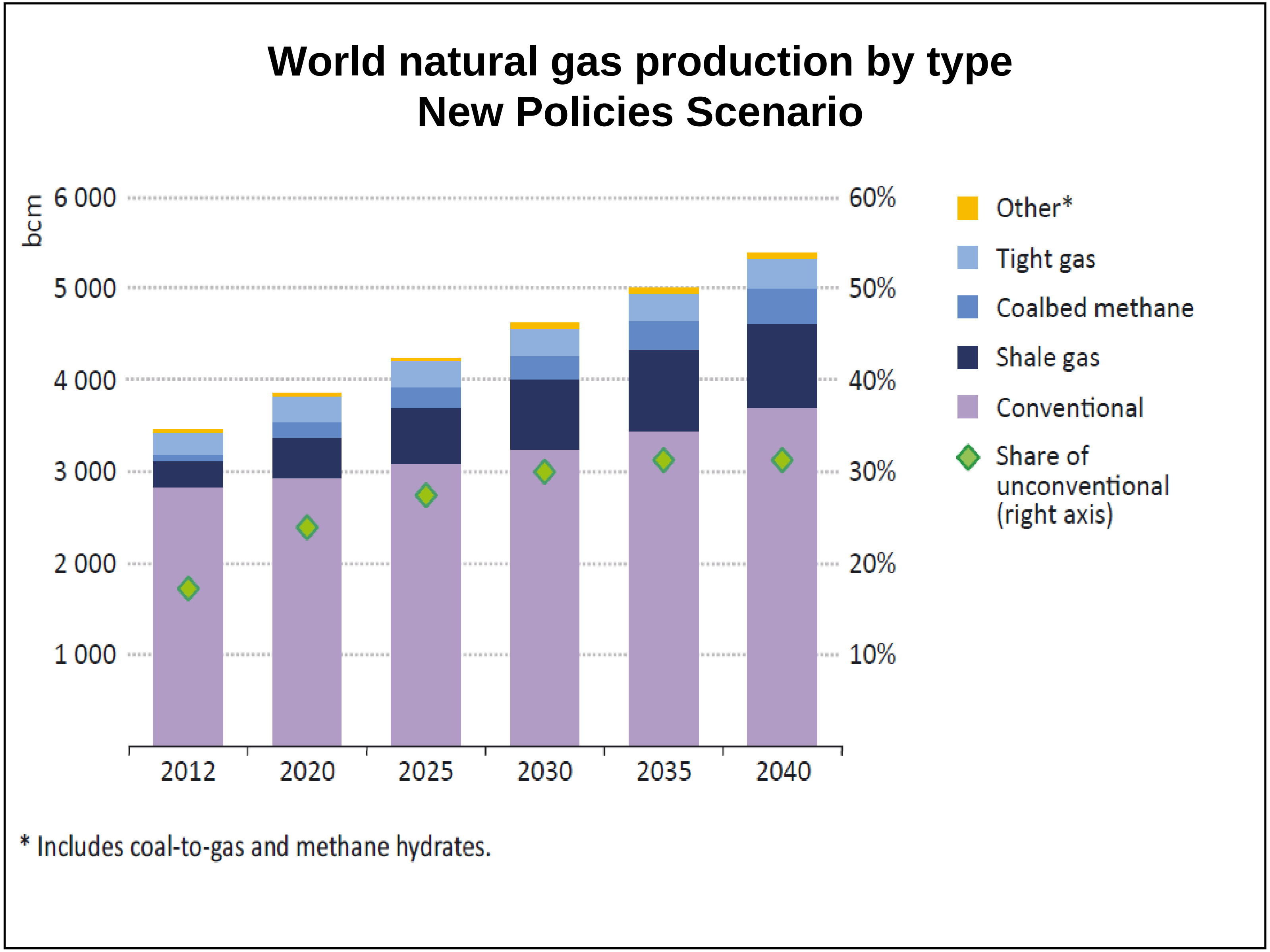
The short-term picture of a well-supplied market should not obscure future risks as demand rises to 104 mb/d & reliance grows on Iraq & the rest of the Middle East


World natural gas demand by scenario
bcm
6 000
5 000
4 000
3 000
2 000
1990
2000
2010
2020
2030
2040
Current Policies Scenario
New Policies Scenario
450 Scenario

World natural gas demand by sector
New Policies Scenario



*Industry includes gas used as petrochemical feedstocks and energy consumption in coke ovens and blast furnaces.
**Other includes agriculture and any other non-energy use.


World natural gas production by type
New Policies Scenario
bcm
6 000
5 000
4 000
3 000
2 000
1 000
60%
50%
40%
30%
20%
10%
2012
2020
2025
2030
2035
2040
Other*
Tight gas
Coalbed methane
Shale gas
Conventional
Share of unconventional (right axis)
* Includes coal-to-gas and methane hydrates.

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

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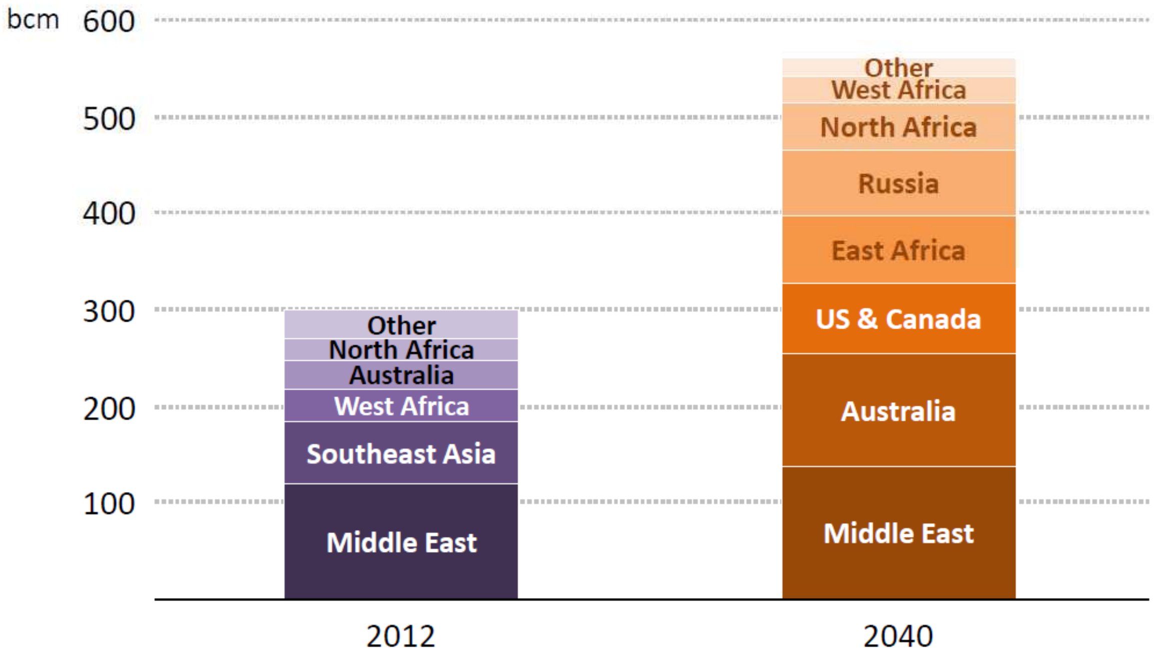
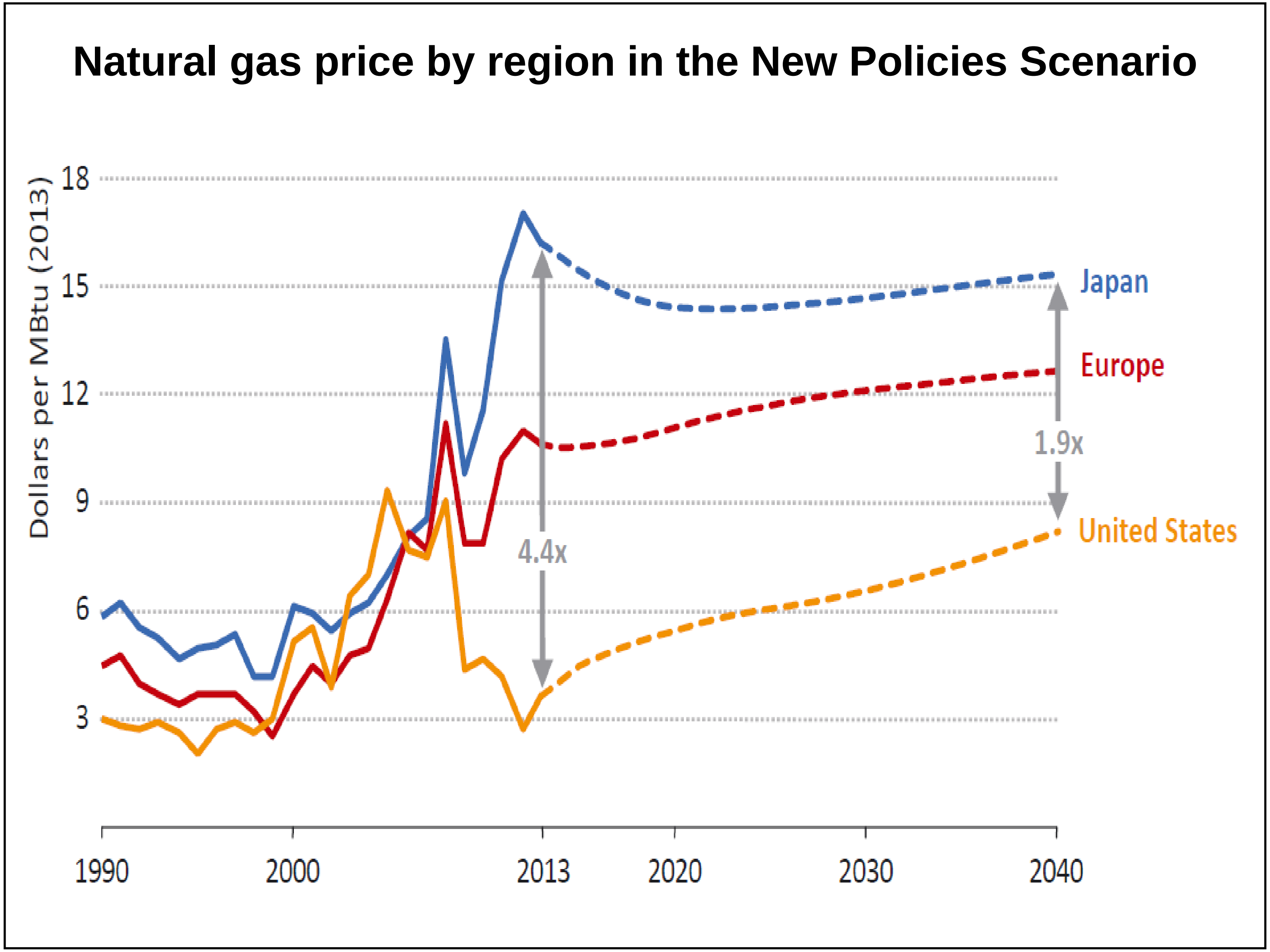
Main sources of regional LNG supply



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


Natural gas price by region in the New Policies Scenario
Dollars per MBtu (2013)
18
15
12
9
6
3
1990
2000
2013
2020
2030
2040
Japan
Europe
United States
4.4x
1.9x

Global coal demand leveling off

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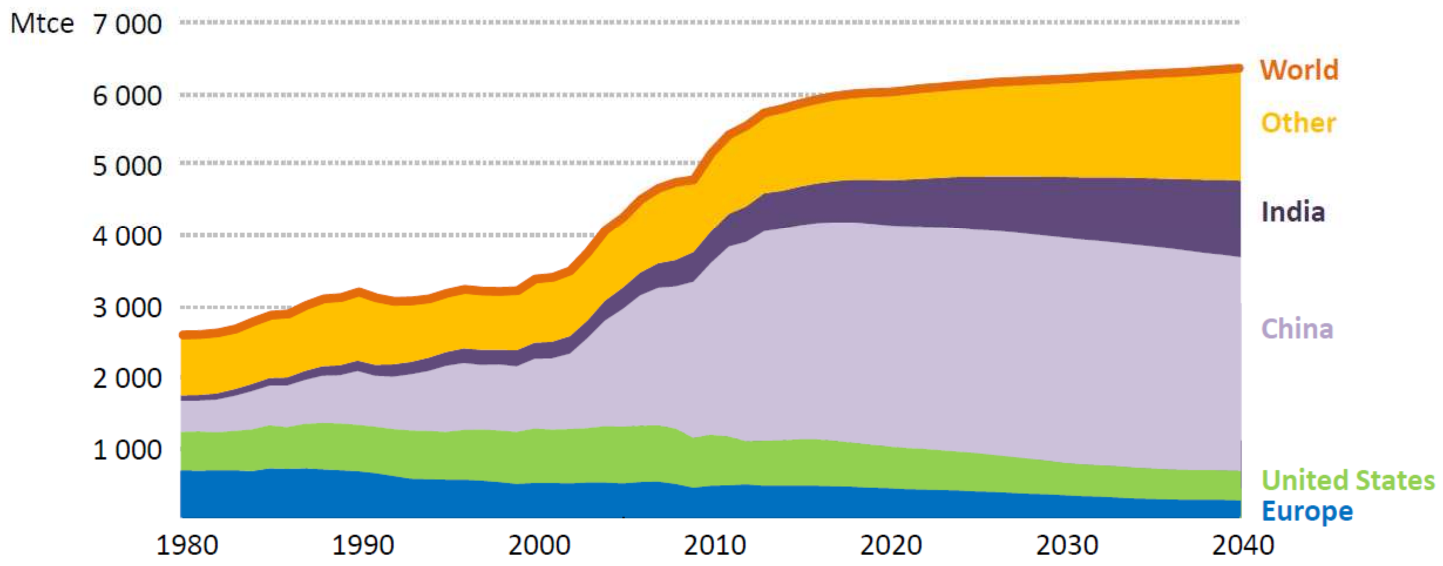
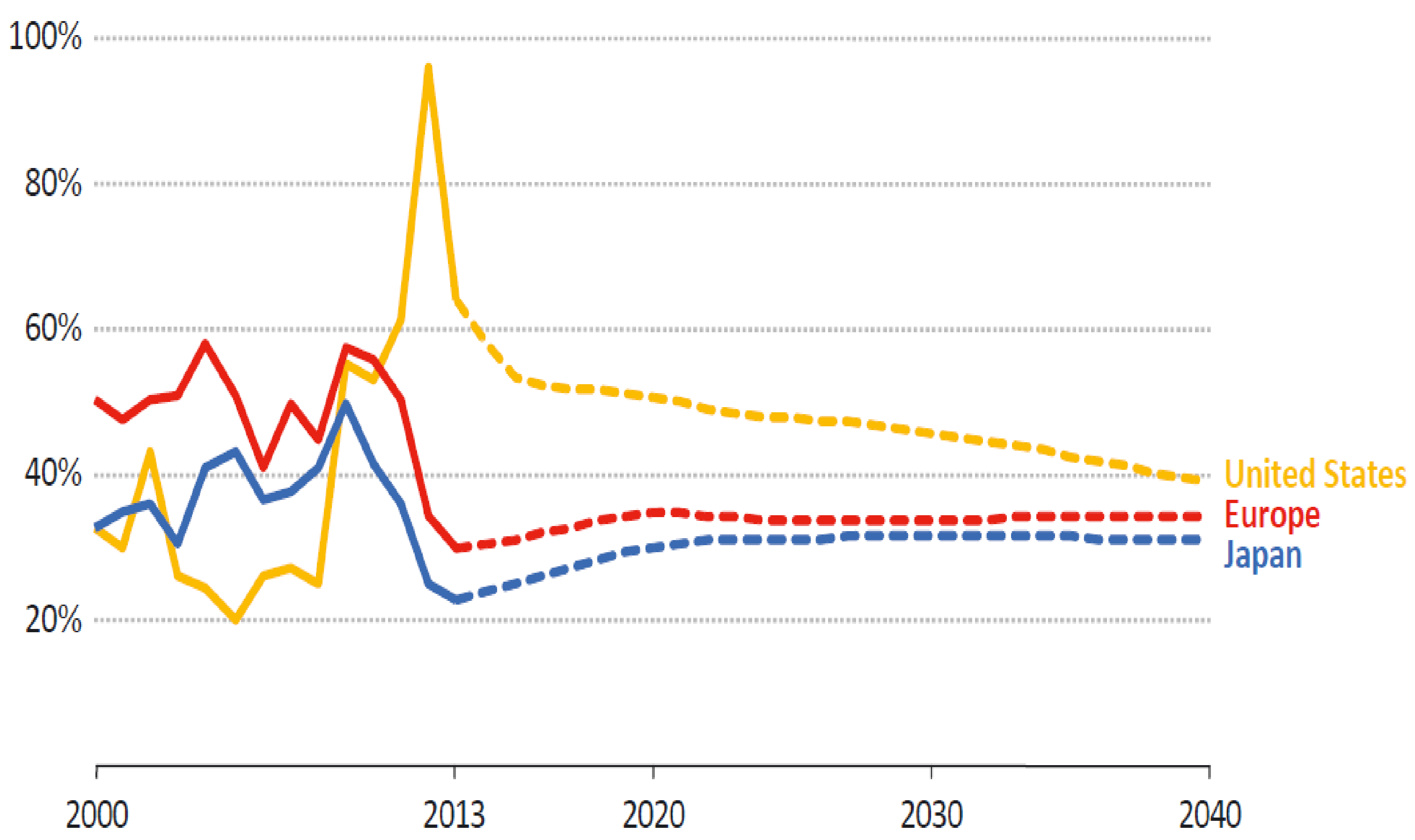
Global coal demand by key region

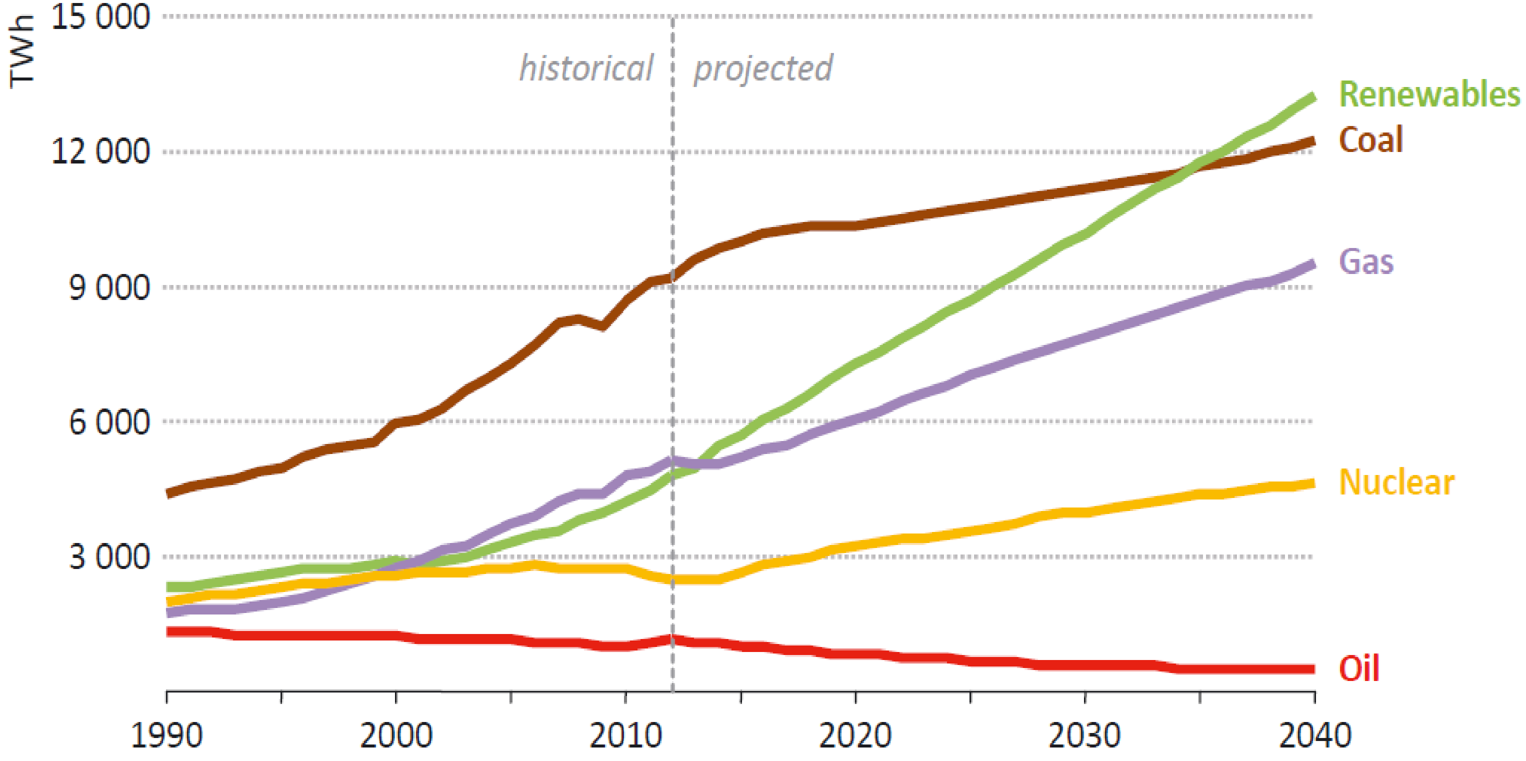


Global coal demand growth slows rapidly due to more stringent environmental policies, underlining the importance of high-efficiency plant & CCS to coal's future

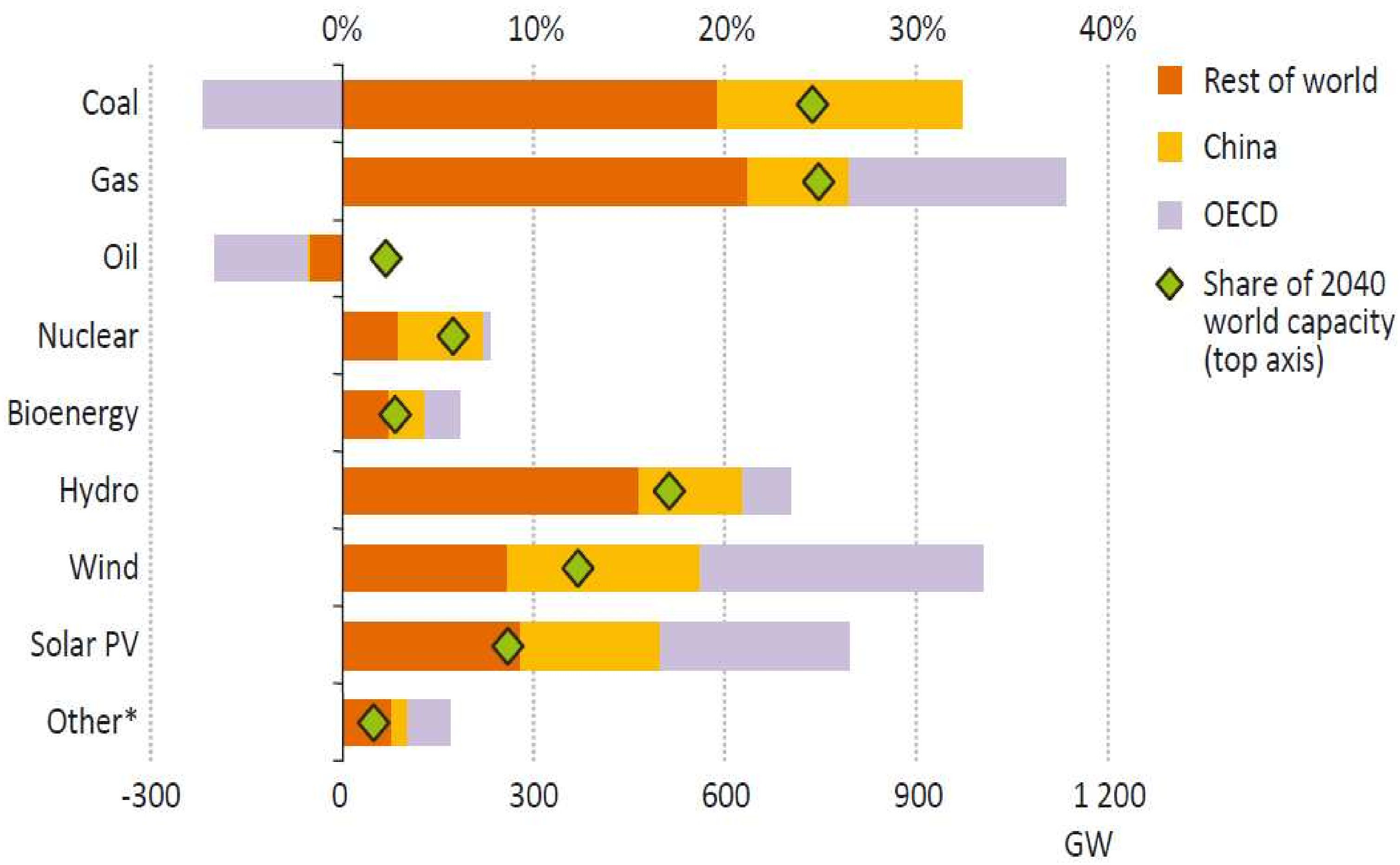
Coal price relative to gas price by region in the New Policies Scenario (in energy equivalent terms)



World electricity generation by source
New Policies Scenario



Net change in world power generation capacity by fuel type and region in the New Policies Scenario, 2013-2040



Renewables overtake coal to become the leading source of power

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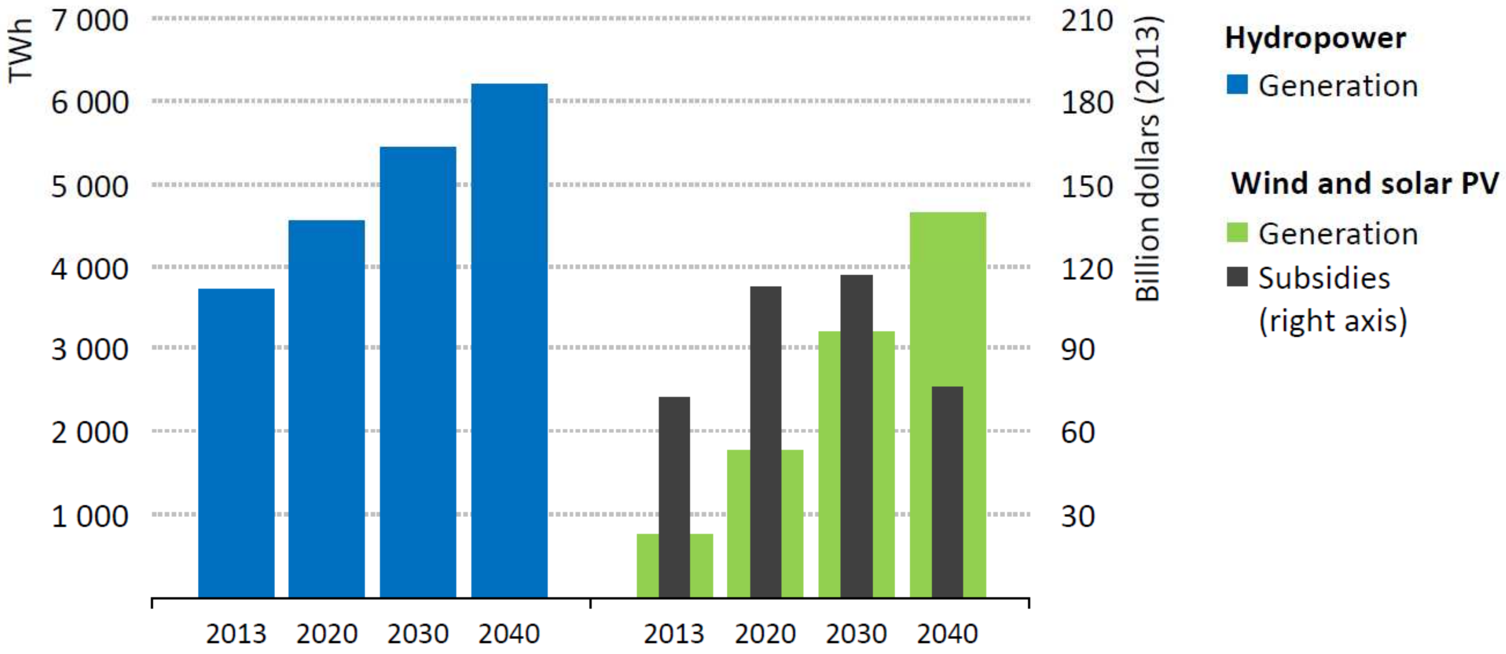
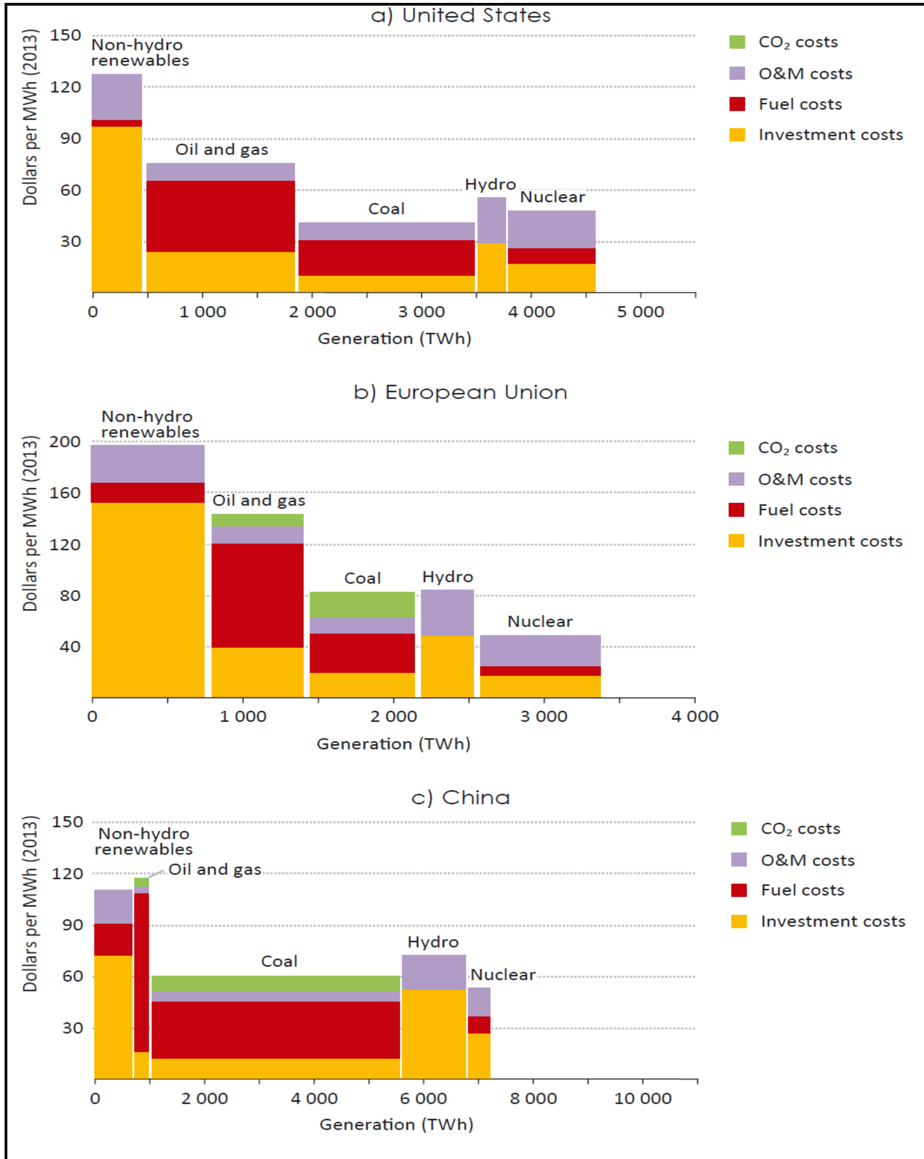
Renewables-based power generation and subsidies



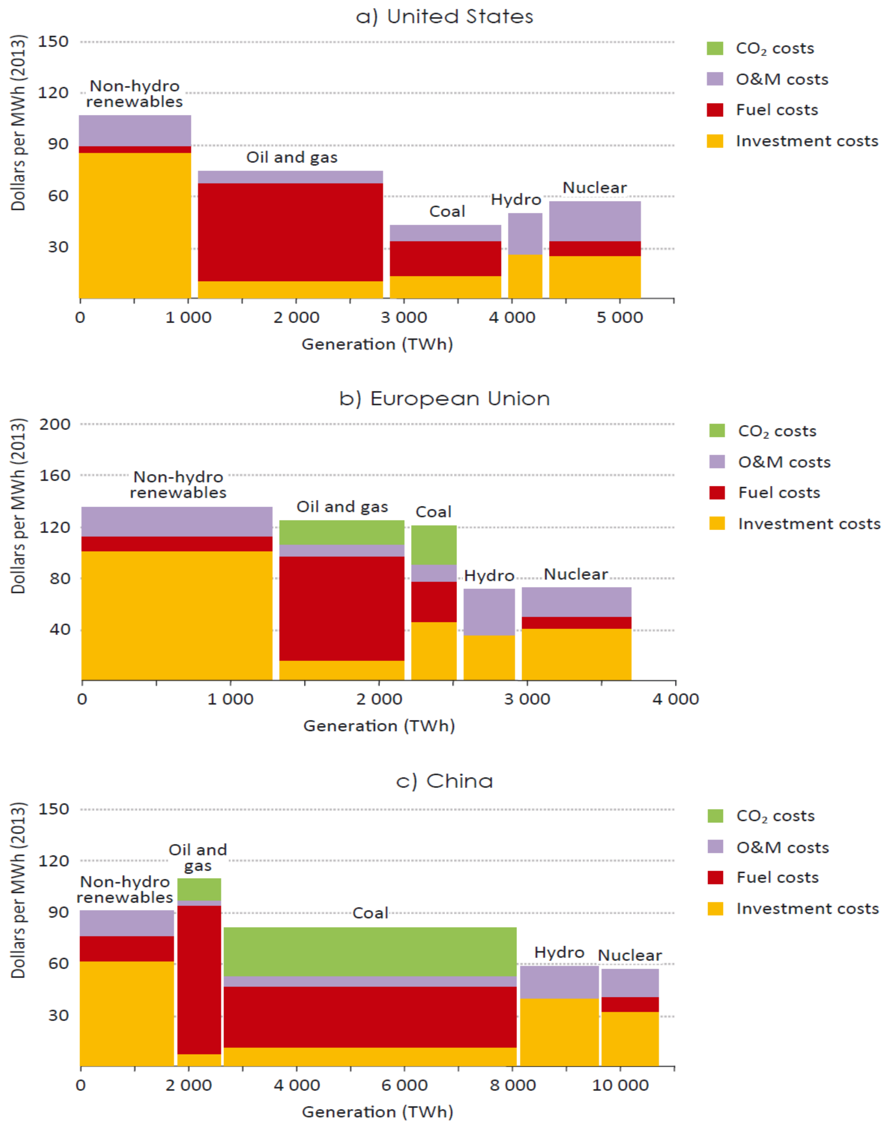
Renewables supply half of the growth in global power demand; wind & solar PV subsidies decline from 2030 as costs fall & recent higher-cost commitments expire

Total power generation costs by selected region New Policies Scenario, 2020



Note: Investment costs are calculated as the annuity payments required to recover past capital investments.

Total power generation costs by selected region New Policies Scenario, 2040



Note: Investment costs are calculated as the annuity payments required to recover past capital investments.

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

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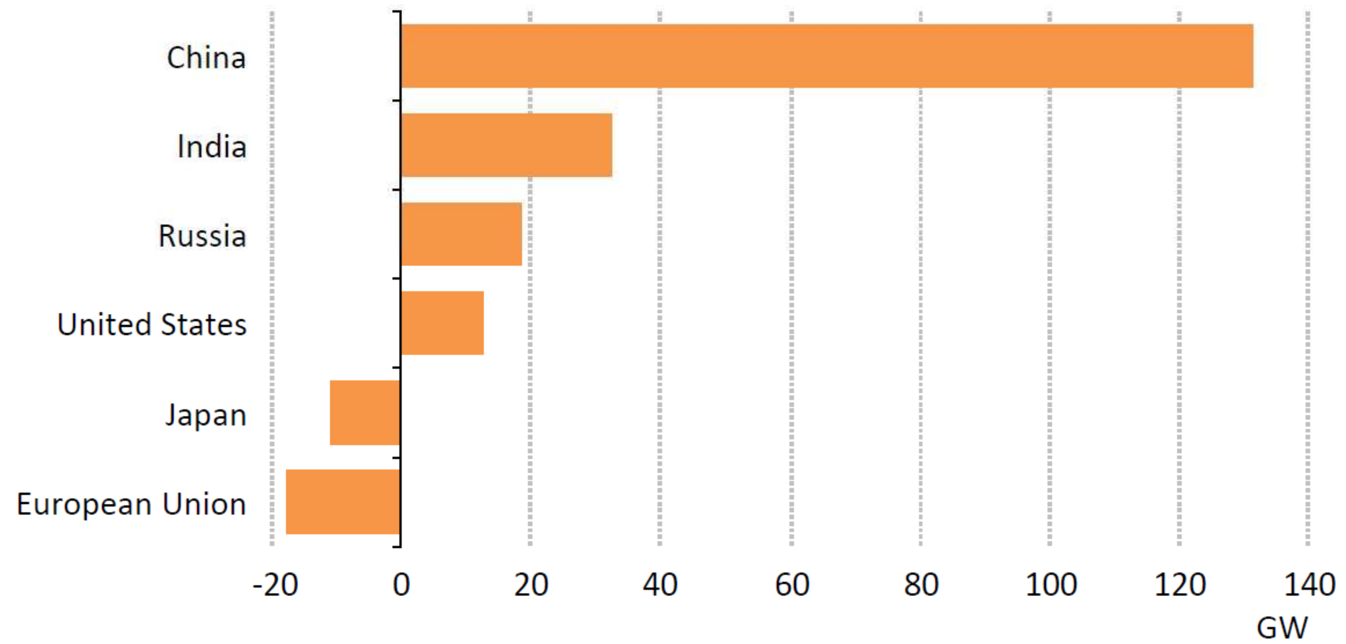
Net capacity change in key regions, 2013-2040



By 2040, an expanded nuclear fleet has saved almost 4 years of current CO_2 emissions & for some countries has improved energy security & balances of energy trade

Nuclear power: public concerns must be heard and addressed

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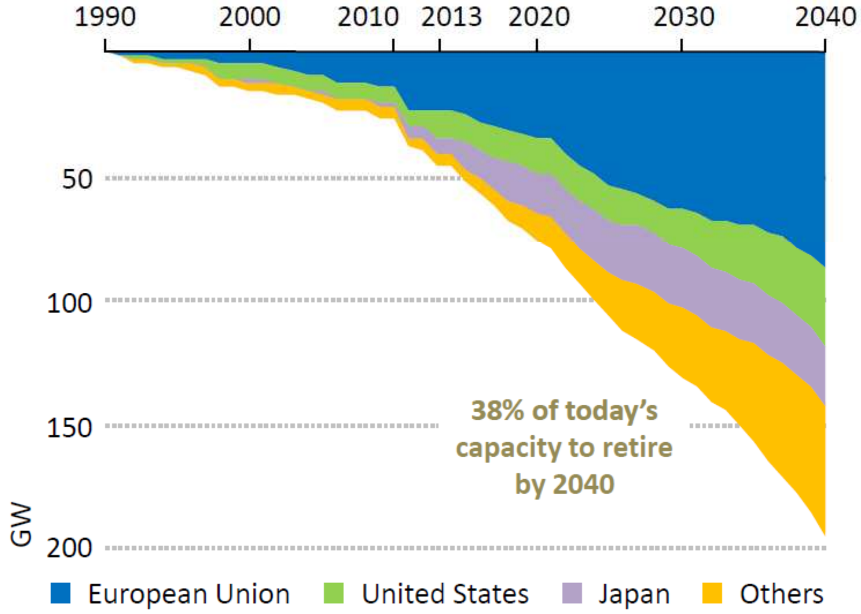
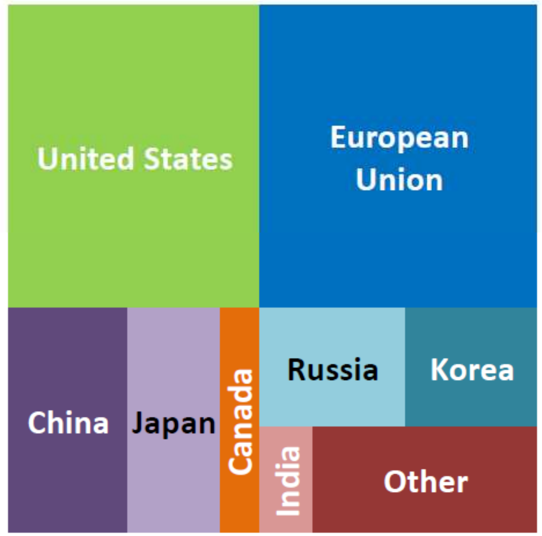
Retirements of nuclear power capacity 1990-2040



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

Navigating a stormy energy future

- Geopolitical & market uncertainties are set to propel energy security high up the global energy agenda
- Volatility in the Middle East raises short-term doubts on investment & spells trouble for future oil supply
- Nuclear power can play a role in energy security & carbon abatement – but financing & public concerns are key issues
- Without clear direction from Paris in 2015, the world is set for warming well beyond the 2 °C goal
- Far-sighted government policies are essential to steer the global energy system on to a safer course