

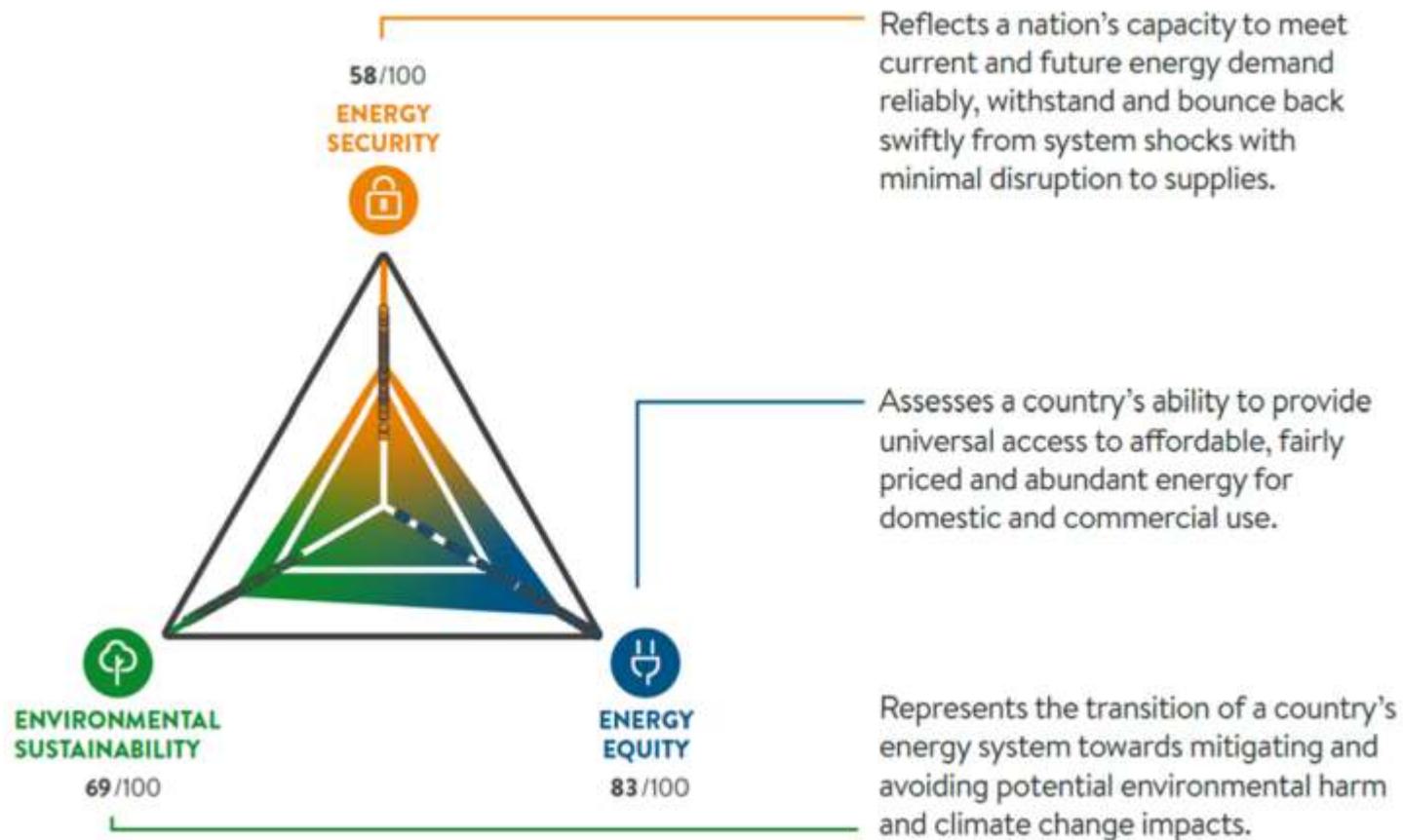


Meeting the Energy Trilemma: Reliability, Affordability, and Sustainability

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DIHAD 2023

The Energy Trilemma

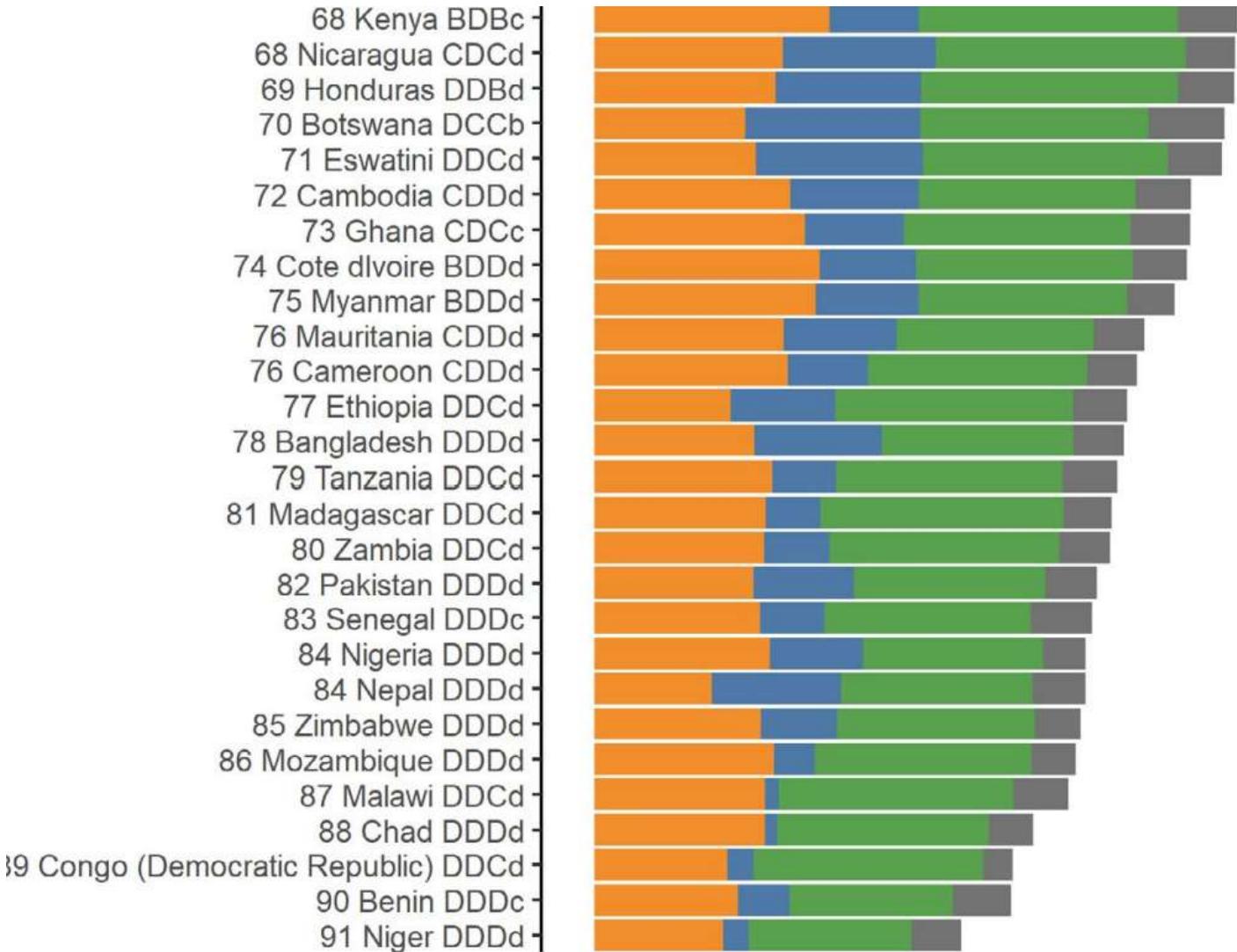


- Energy leaders need to manage the **competing** demands of the energy trilemma (*WEC*)
- The energy trilemma is about addressing three often **conflicting** challenges: ensuring energy security, providing energy equity -- access to affordable, clean energy -- and achieving environmental sustainability (*Mitsubishi*)

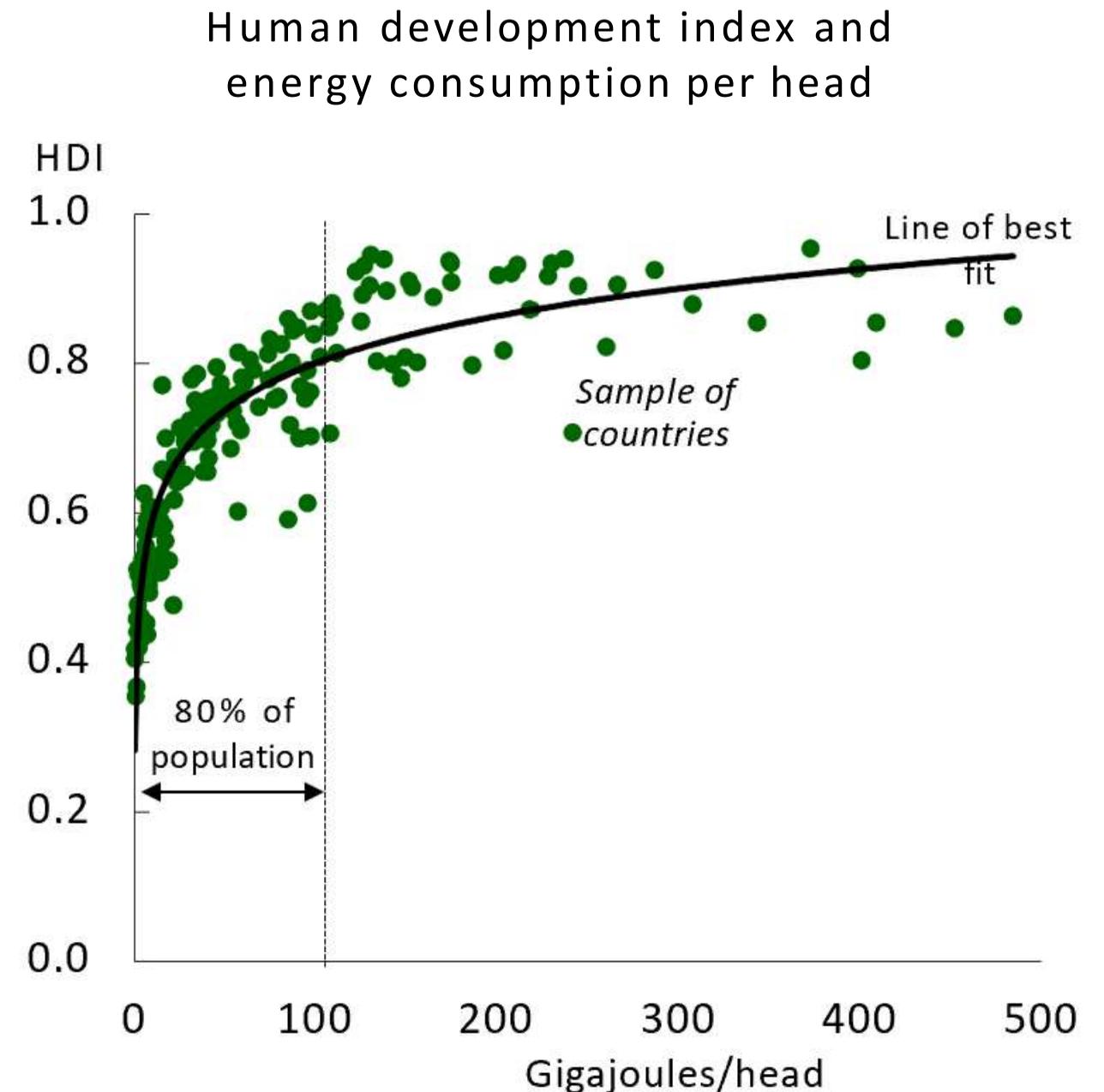
Top performers

Rank	Country	Grade	Score
1	Sweden	AAAa	84.3
2	Switzerland	AAAa	83.4
2	Denmark	AAAa	83.3
3	Finland	AAAa	82.7
4	United Kingdom	AAAa	82.4
4	Canada	AAAa	82.3
5	Austria	AAAa	82.2
6	France	AAAa	81.1
6	Norway	BAAa	81.0
7	Germany	AAAa	80.6
8	New Zealand	AAAa	80.3
9	Slovenia	ABAa	78.8
9	Estonia	ABAa	78.7
10	United States	AACa	78.5

Worst performers



- More than 600 million people in Africa (43% of the continent's population) still lack access to electricity on the continent.
 - The biggest barrier in front of African economic development is lack of energy access (IEA)
- 45% of world population do not have access to reliable electricity
 - Limits the expansion of EVs
 - **'Resource colonialism' vs. 'Just Energy Transition'**

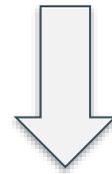


- Income inequality in many parts of the world (rich & poor) so strained that slight changes in fuel prices can trigger unforeseen reactions
- Energy constitutes a relatively large share of the expenditures of low-income households

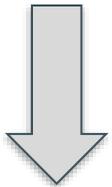


In three years: a crisis soufflé with no clear end in sight

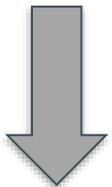
- Covid-19 pandemic: 'A crisis like no other'



- War in Ukraine: the largest security and humanitarian crisis in Europe since World War II



- 'Could soon cause a global food crisis that may last for years' (UN)



- A 'very painful' outlook for global economy. 2023 to be the darkest hour' (IMF)

- May 2021: IEA recommended halting investments in oil and gas to achieve net zero (p. 21 in the Net Zero 2050 Report):
 - ***"There is no need for investment in new fossil fuel supply in our net zero pathway. Beyond projects already committed as of 2021, there are no new oil and gas fields approved for development in our pathway, and no new coal mines or mine extensions are required."***
- October 2021:
 - IEA concerned that the world isn't investing enough in oil and gas (p. 278, World Energy Outlook 2021):
 - ***"If demand remains at higher levels, reduced investment would result in a **shortfall in supply in the years ahead, and this would lead to higher and more volatile prices.**"***
 - IEA repeated its warning about lack of investment in oil and gas (Oil Market Report, October 2021)
 - ***"Shrinking global spare capacity underscores **the need for increased investments** to meet demand further down the road."***

- **May 2022:**



...

Shout and scream all you like, but I'm not going to put Britain's energy security at risk by shutting off domestic oil and gas production.

We will need oil and gas for decades to come. Either we source more of what we need from the North Sea, or import more from abroad.

REPowerEU Plan, 18 May 2022

'In the new reality... some of the existing **coal** capacities might also be used longer than initially expected, with a role for nuclear power and domestic **gas** resources too.'

- **May 2022:**
- Norwegian Petroleum and Energy minister: 'If Europe commits to buying, Norway can replace more Russian gas'.

- **June 2022:**
- The EU and Norway announced 'strengthening energy cooperation' between them.
- 'Recognising that Norway has significant remaining oil and gas resources and can, through continued exploration, new discoveries and field developments, continue to be a large supplier to Europe also **in the longer term beyond 2030**. The EU supports Norway's **continued exploration and investments** to bring oil and gas to the European market.'

1 minute read · March 13, 2023 11:09 PM GMT+4 · Last Updated a day ago

Germany forms alliance against phase-out of internal combustion engines by 2035

Reuters

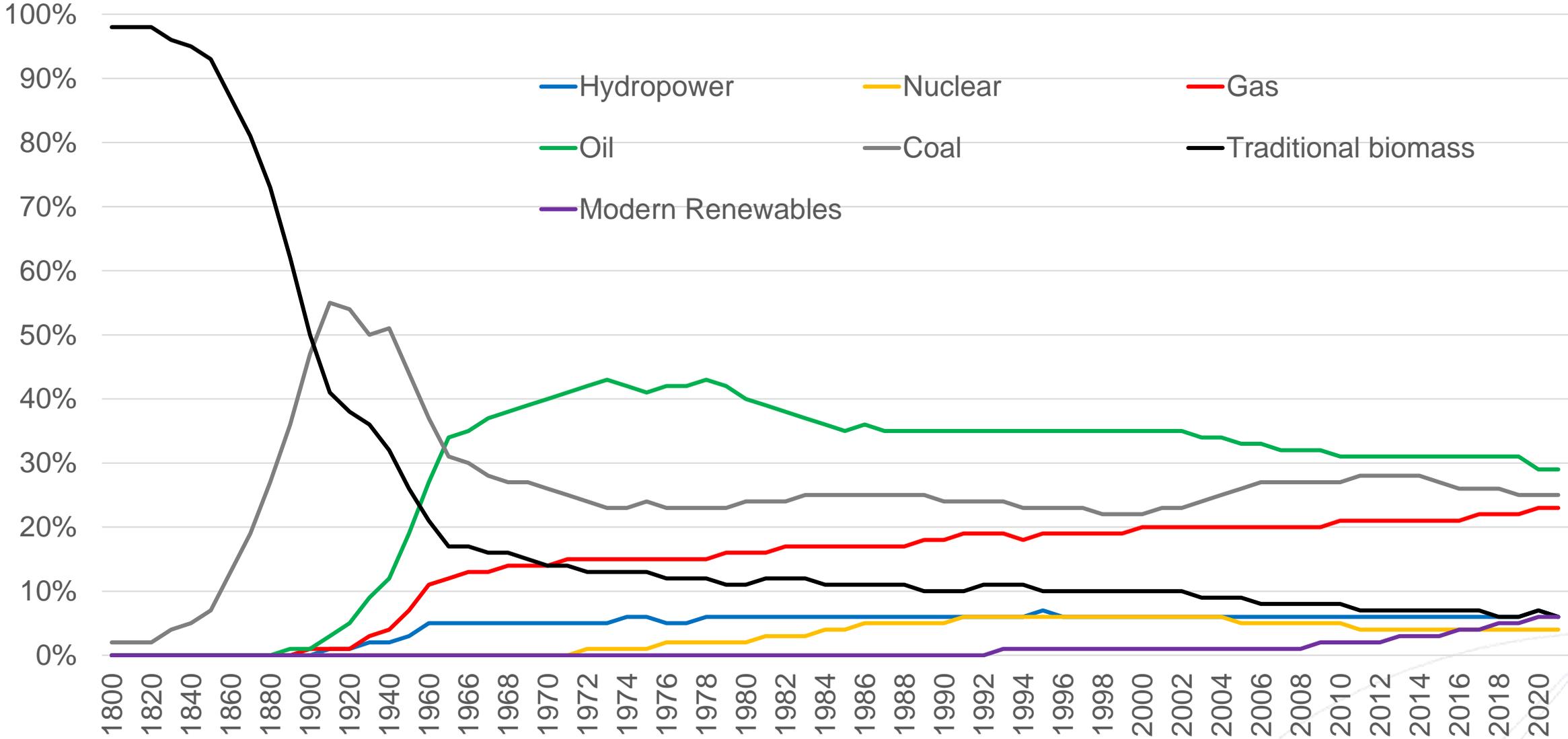
WORLD NEWS DEC. 5, 2022 / 7:07 AM

Von der Leyen warns of unfair advantage created by U.S.'s Inflation Reduction Act

Energy mix dominated by fossil fuels



Evolution of the world's primary energy mix

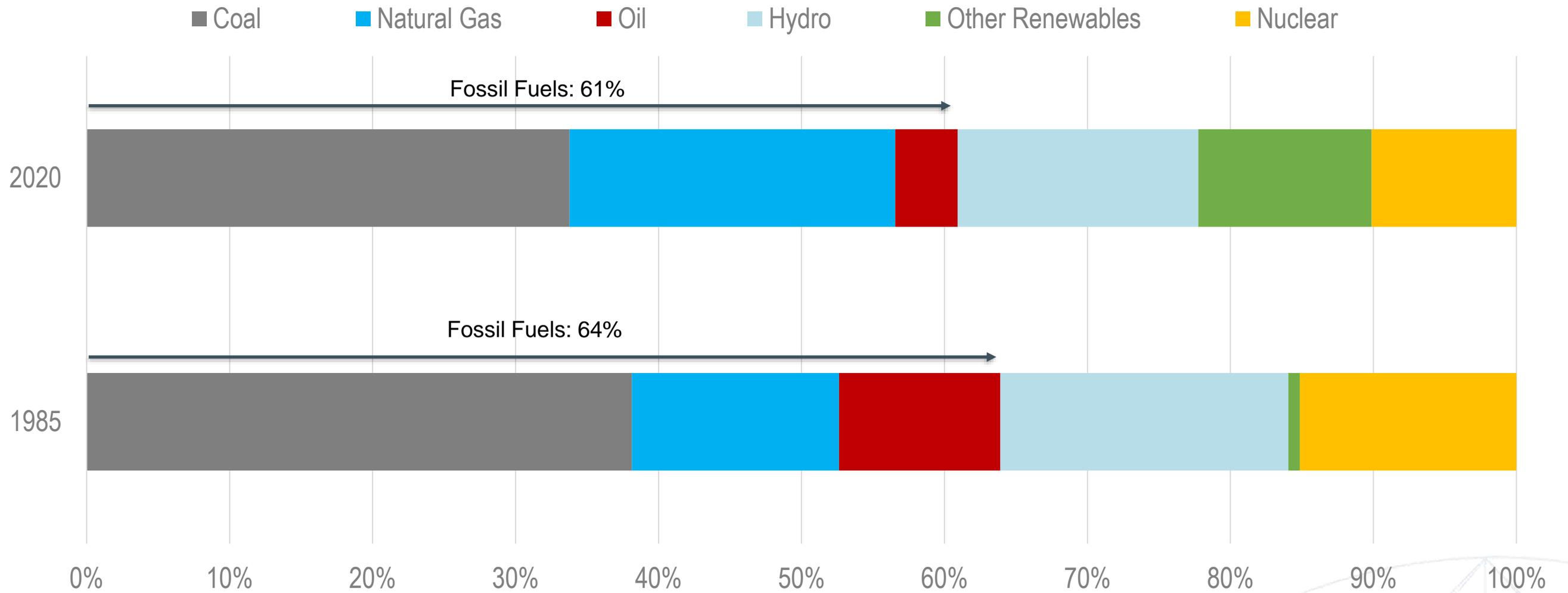


Source: Our World in Data

Limited progress in more than 35 years



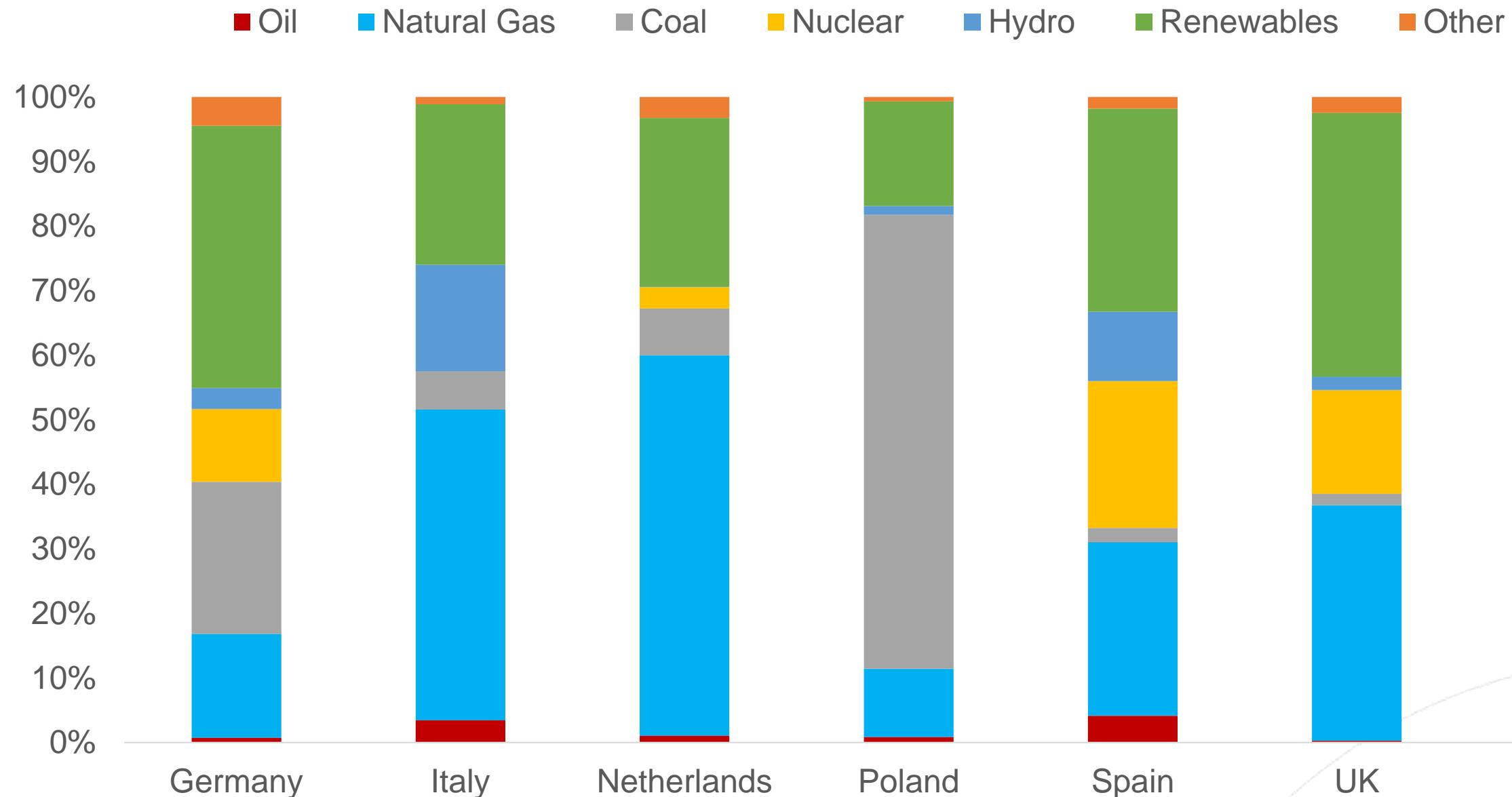
Global Electricity Mix



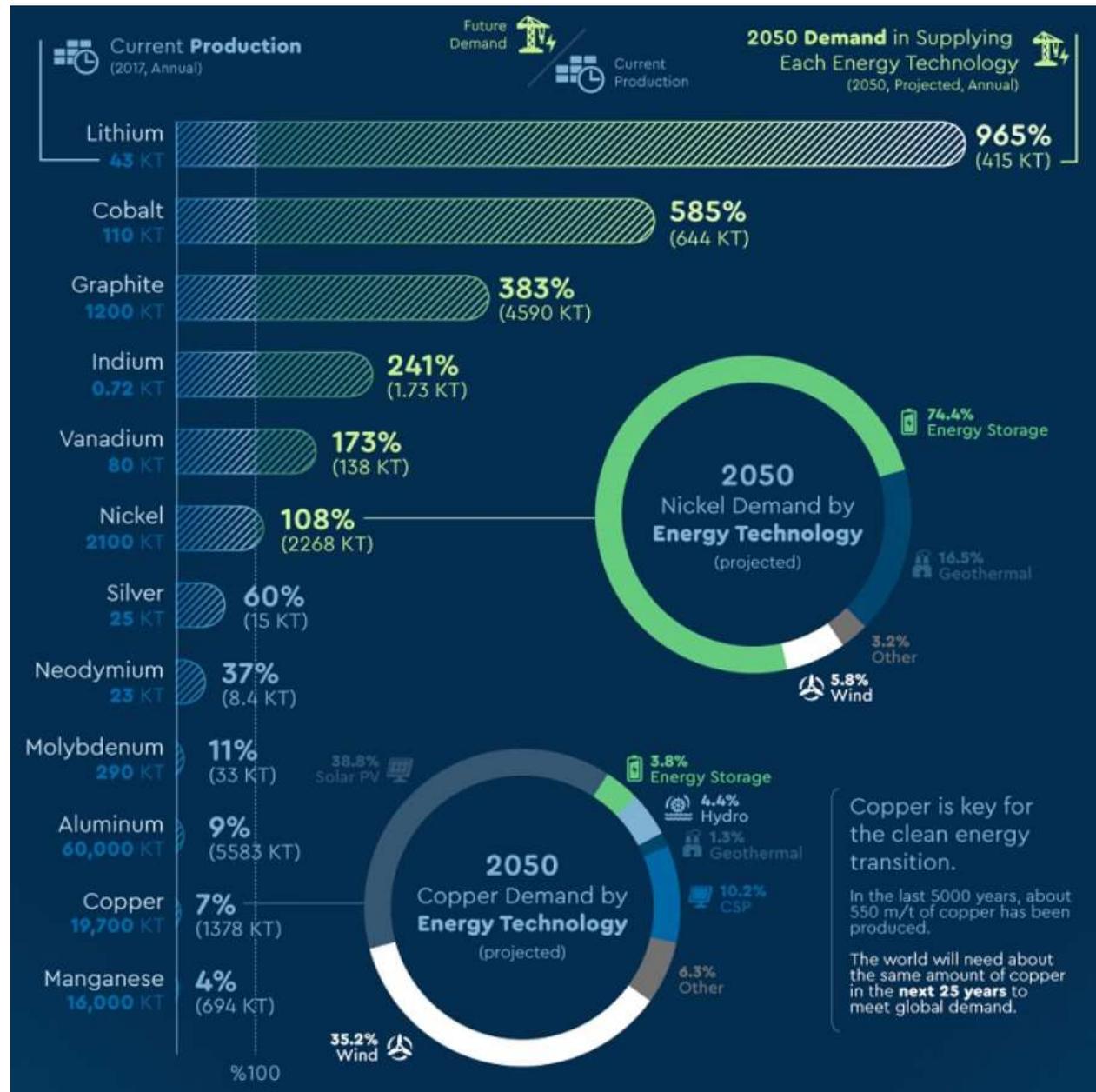
Source: BP, 2020

Europe: underneath the trend, a multispeed energy region

Electricity Generation by Fuel, 2020



Is a 'green world' secure? Affordable? Sustainable?



- China and Russia hold 57% of global reserves of rare earth elements, while the largest remaining country, Australia, holds 2.4% of global reserves
- China is the world's largest producer of 31 different commodities
- DR Congo provides more than half the world's cobalt
- Mining environmental (and social) footprint

A degree of realism is urgently needed

- Policy continuity, predictability and long term commitment
 - Many governments come and go
- Price, cheapness and reliability will be the deciders of the world energy mix
- Provide a truly motivating worldwide story which the prophecies of disaster some decades ahead lack the persuasive power to turn into action
 - A much more compelling story has to be devised and much more powerful motives and incentives have to come into play
- Harnessing the causes – of energy security, affordability and climate security – in tandem to create a grand unity of purpose which the world so conspicuously lacks at present.
 - **Complementarity not substitution; collaboration not divisions; openness not protectionism**



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The Grand Alliance: Reliability, Affordability, and Sustainability

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Thank you!

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