Economic challenges to the global energy transition

WESTMINSTER ENERGY FORUM: GLOBAL ENERGY TRENDS

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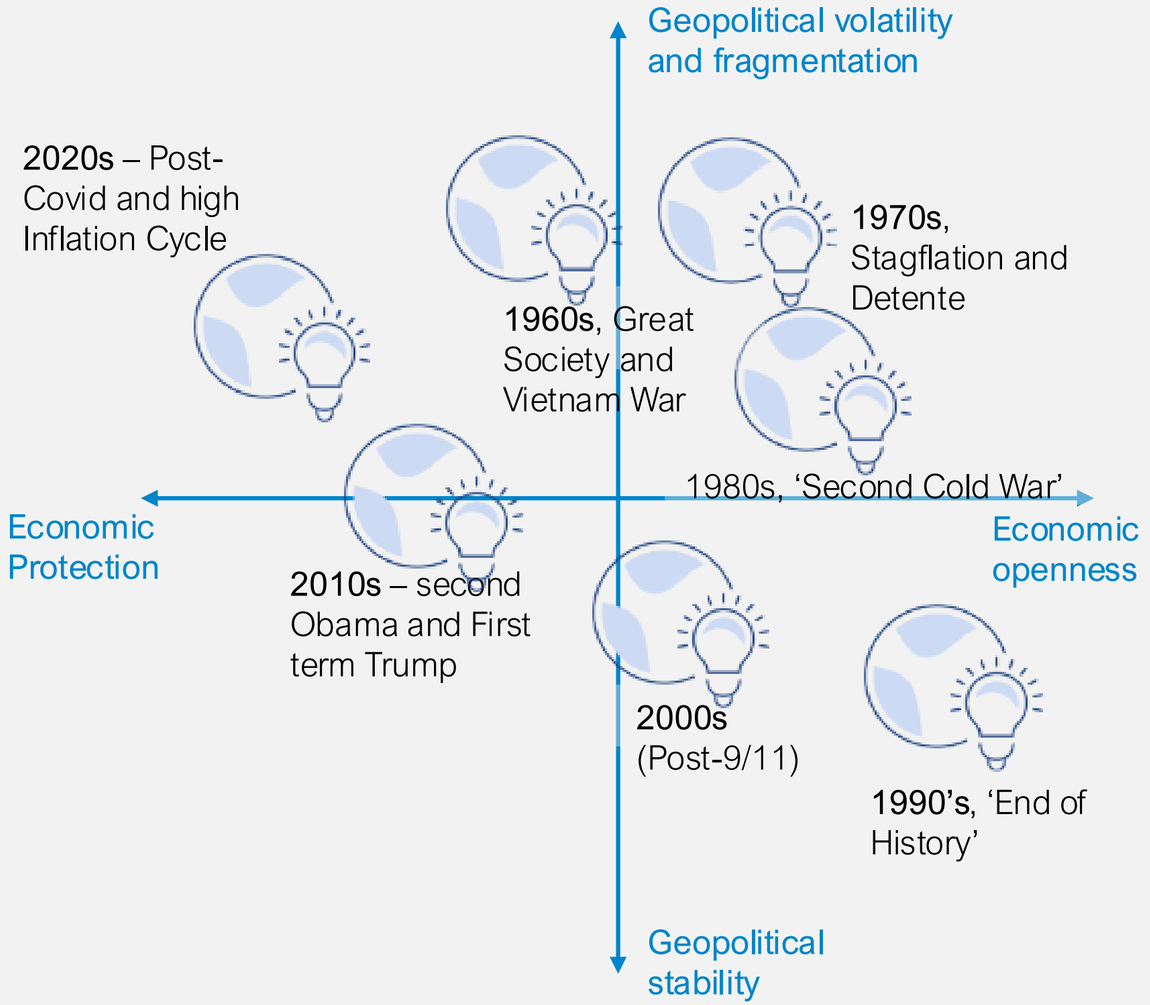
Current economic cycle driven by fragmentation and protectionism

Long term trends / forces impacting country economies – with cycles tending to last between 8 to 12 years.

- **There are a number of long term trends / forces that affect the absolute and relative economic and geopolitical landscape and position of each countries**.
- These forces move at different speeds. Some operate in a cyclical / structural way. Examples of these forces are:
  - Geopolitical tensions,
  - Economic openness and the role of government
  - Demographics,
  - Technological discoveries and productivity; and
  - Energy systems.
- We have moved from more a volatile but relatively 'opening' international environment in the 1970s and 1980s to open and stable in the globalization era of the 'Great Moderation' [1990-2007].
- After the Financial Crisis (of 2008) we have progressively moved towards more protectionism, more government intervention, and a more political and geopolitically volatile world. **This is naturally a more inflationary and uncertain environment.**



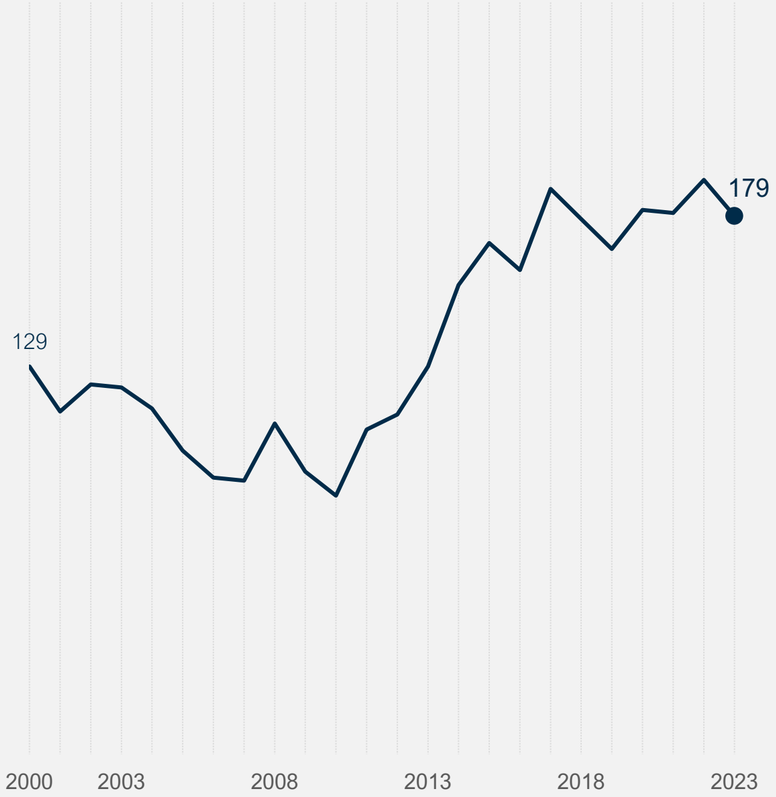
Geopolitics and politics are shaping global economic policies, including those by central banks.

KEY MACROTRENDS

Role of politics and geopolitics | Macroeconomic and volatility | Role of transition

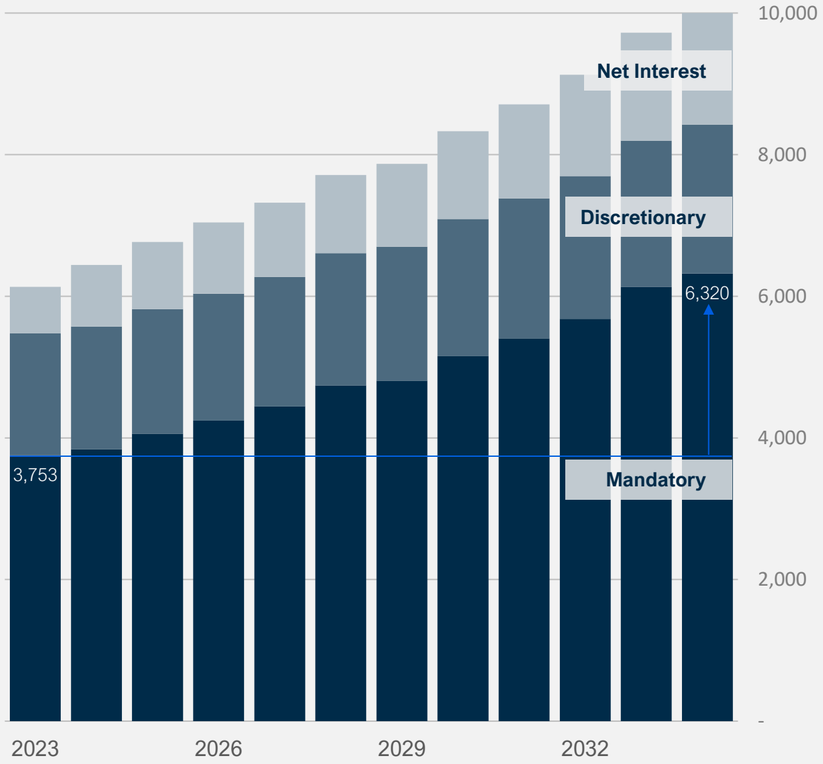
Security risk is high due to conflict in multiple regions

No. Armed Conflicts (World), 2000 – 2023 [1]



Projected rise in US fiscal spending is driven by mandatory budget items

US projected budget outlays (USD, Billions), 2000 – 2023 [2]



The simultaneous deterioration of security climates in multiple regions (the Middle East, Europe and the Indo-Pacific) is unprecedented within the last 30–40 years.

Given this re-emphasis of hard power over soft power, there are also growing concerns about the strategic implications of closer ties between China, Iran, North Korea and Russia as the four countries appear increasingly aligned: we define this as ‘correlation risk’.

A rise in government debt, and role in the economy:

- **Fiscal risk is deepening** across the US and EU, which will manifest in a higher term premium in bond markets.
- **Domestic political shocks, such as expansionary fiscal policies, can have discontinuous effects on market confidence and spark debt crises.** Central banks’ ability to manage inflation through monetary policy tools may also become less effective.

Source: [1] Our World in Data, [2] CBO - based on current policy (as of February 2024). Note, 2023 data is actual.

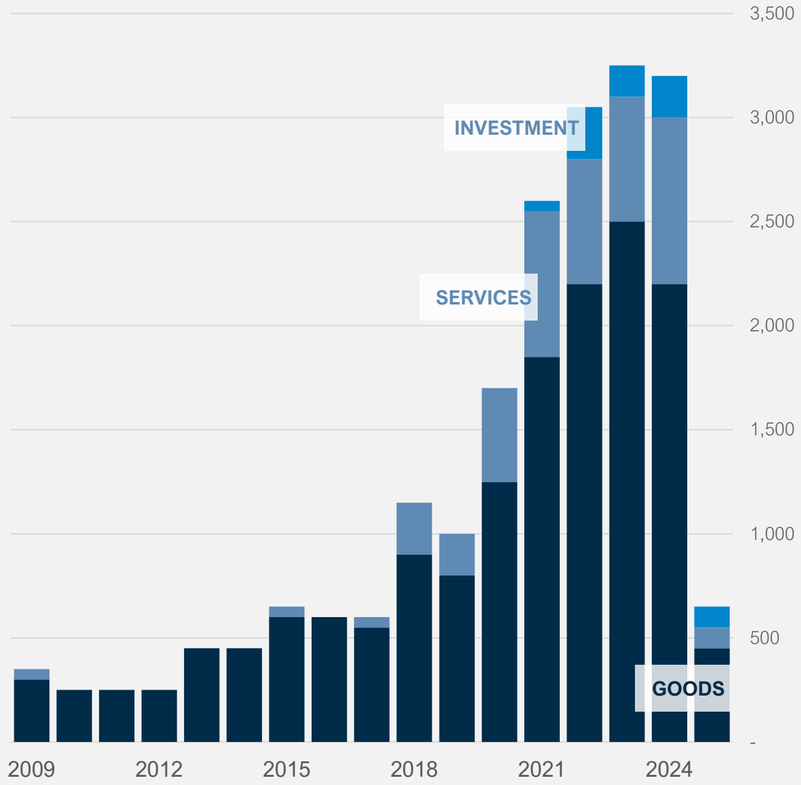
‘Economic Rewiring’ will drive a more investment intensive and inflationary global growth path

KEY MACROTRENDS

Role of politics and geopolitics | **Macroeconomic and volatility** | Role of transition

Geopolitical tensions & restrictive trade policies indicate trade fragmentation

Trade restrictive measures (# of), 2009 to 2025 [1]



The global economy will see a rewiring of trade routes, supply chains and financial flows through 2040 as the nexus between economy policy and geopolitics tightens.

The revival of industrial policy, shifting supply chains and the energy transition will reinforce a more investment intensive global growth path, though with persistently tighter financing conditions.

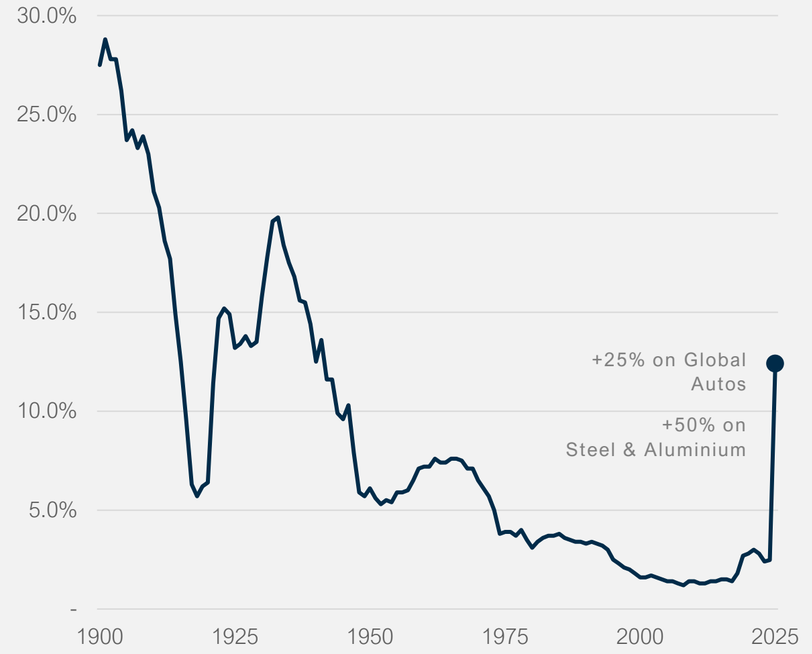
Key features:

Shifting flows driven by government policy

- **Trade rewiring**. Businesses’ investment decisions will increasingly be influenced by policy.
- **Financial rewiring**. Non- aligned countries and China fear payments infrastructure may be weaponised against them.
- **The energy transition** will require c. $100 trillion of additional global capital expenditure to 2050.
- **Industrial policy.** The IRA and the EU Green Deal Industrial Plan mark the return of government activism.

Average tariff rate on all US imports after US Court of International Trade decision

Percent, 1900 to 2025 [2]



Estimates for **the affective average rates varies** and is still uncertain **but will be around 13% to 18%**. It will change by sector and by country significantly

Source: [1] GTA, [2] Taxfoundation.org

The energy transition is driving structural shifts in supply chains, industrial policy and capital re-allocation.

KEY MACROTRENDS

Role of politics and geopolitics | Macroeconomic and volatility | **Role of transition**

The transition is driving competition and market fragmentation across new lines as countries increasingly interlink economic and national security goals. Prioritising energy security and green industrial policy, countries will increasingly prioritise domestic energy production and regional cooperation. Note: Clean tech is also capital-intensive and suffers in a high-interest-rate environment.

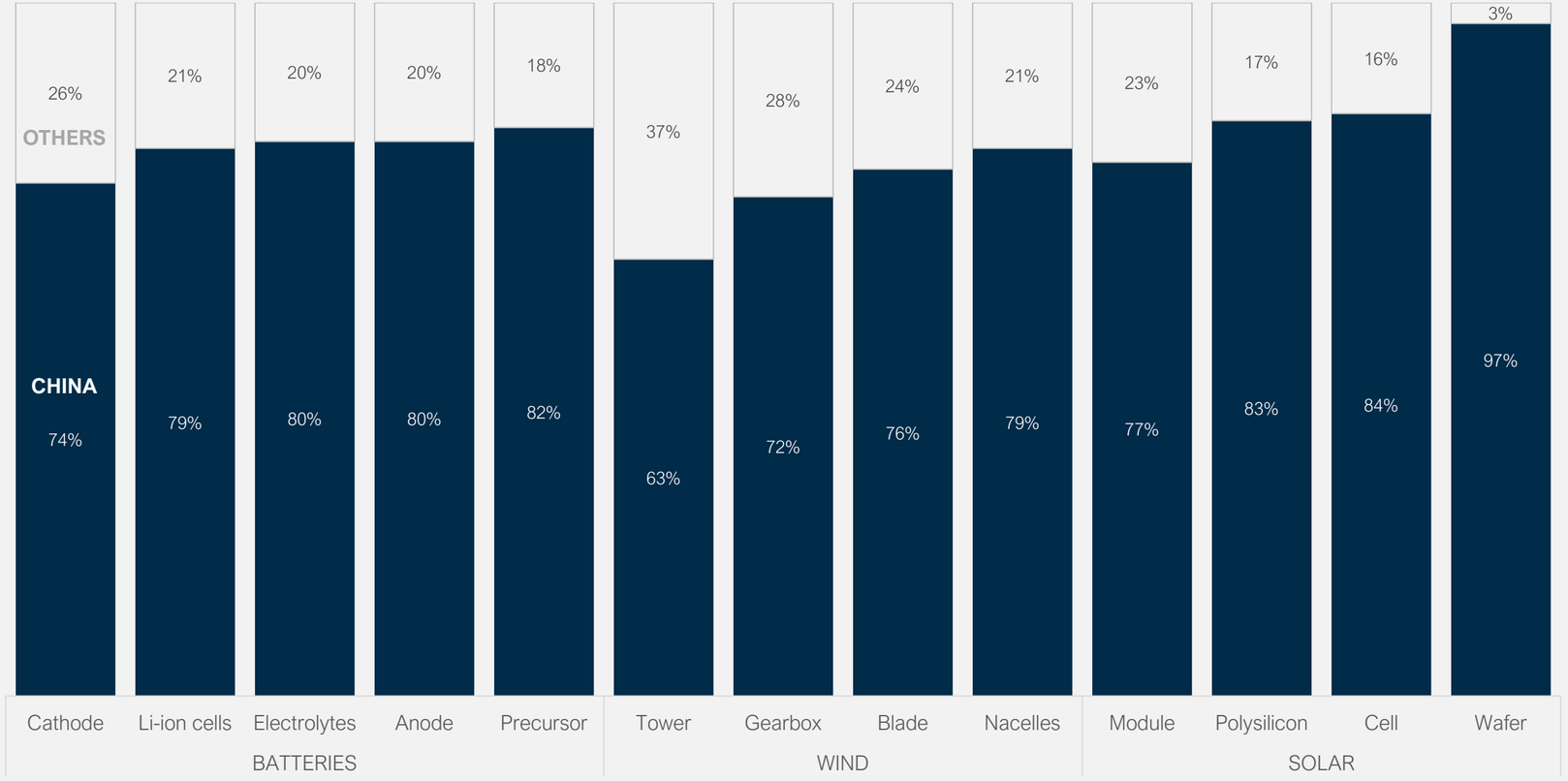
Key features:

An unstable and non-linear transition

- **Energy blocs may emerge**, like US-EU cooperation on supply chains & CBAMs and China's outreach to resource-rich countries
- **Powerful major oil exporters**. Expedited peak oil demand to the 2030s may grant major suppliers more geopolitical clout.
- **Critical minerals chokepoints**. China may weaponise its dominance in critical minerals against the West.
- **Increased market intervention**. Energy supply shocks will lead to a greater government role in energy markets.

China has a strong grip on CleanTech

% share across CleanTech value chains (China vs Others), 2023 [1]



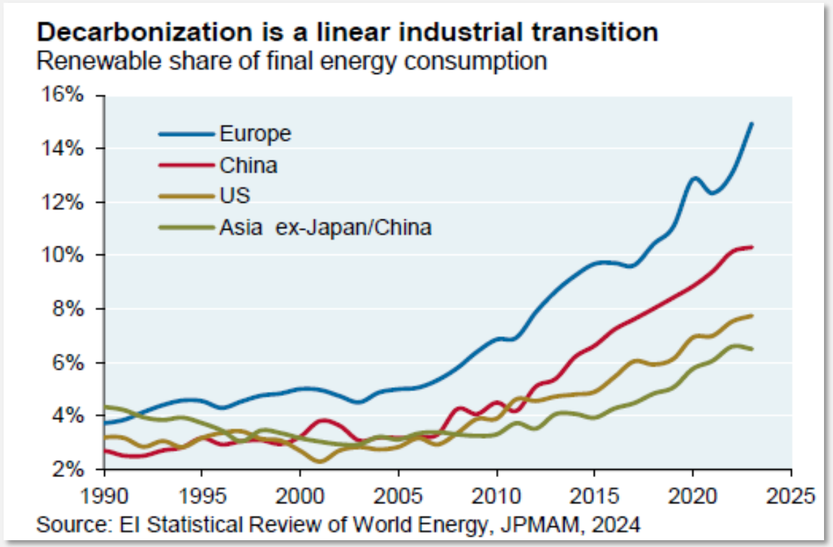
Source: [1] Wood Mackenzie, IEA

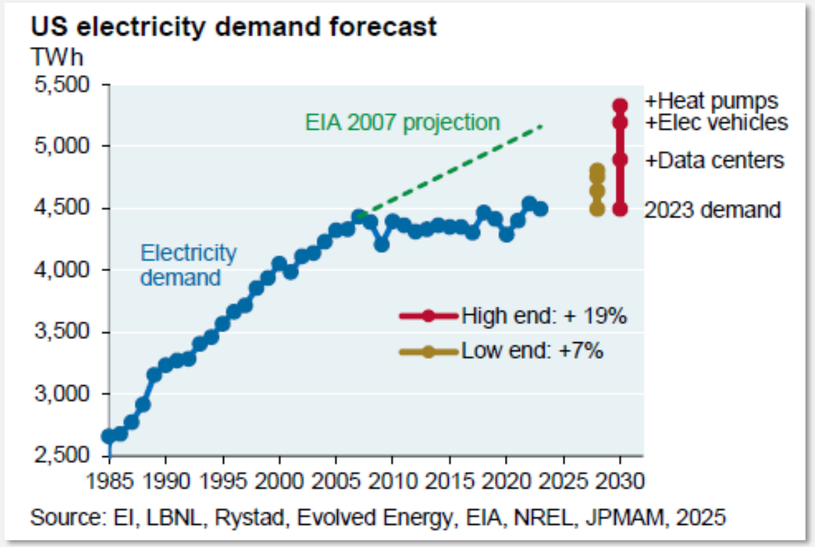
We foresee the continued rise in renewables investment, and future energy demand. However, investment is yet to translate to lower prices for homeowners.

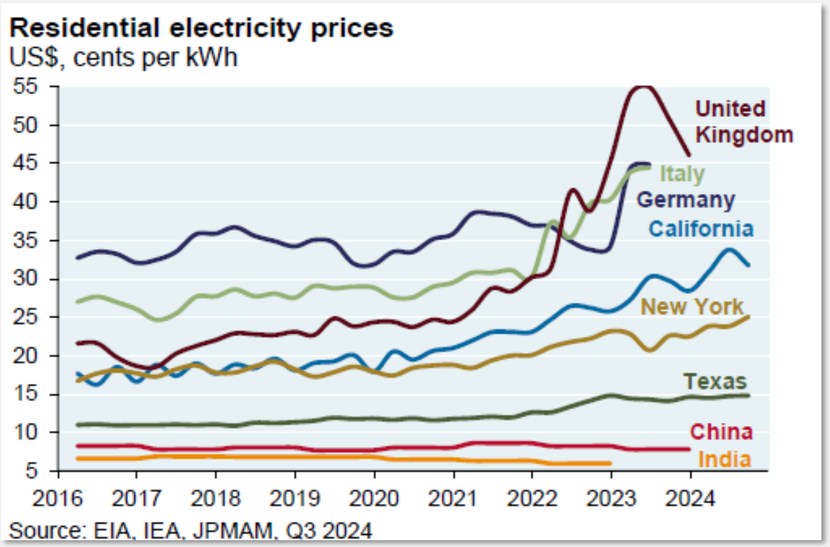
Renewables investment is rising – leading to an increasing share of final energy consumption across: Europe, China, US, and Asia.

Electrification and data centers will add to future energy demand – ranging between +7% to +19% of today's levels by 2030.

But the energy transition comes at a cost – residential energy prices are rising as investors seek a return on their investment in 'clean' energy.



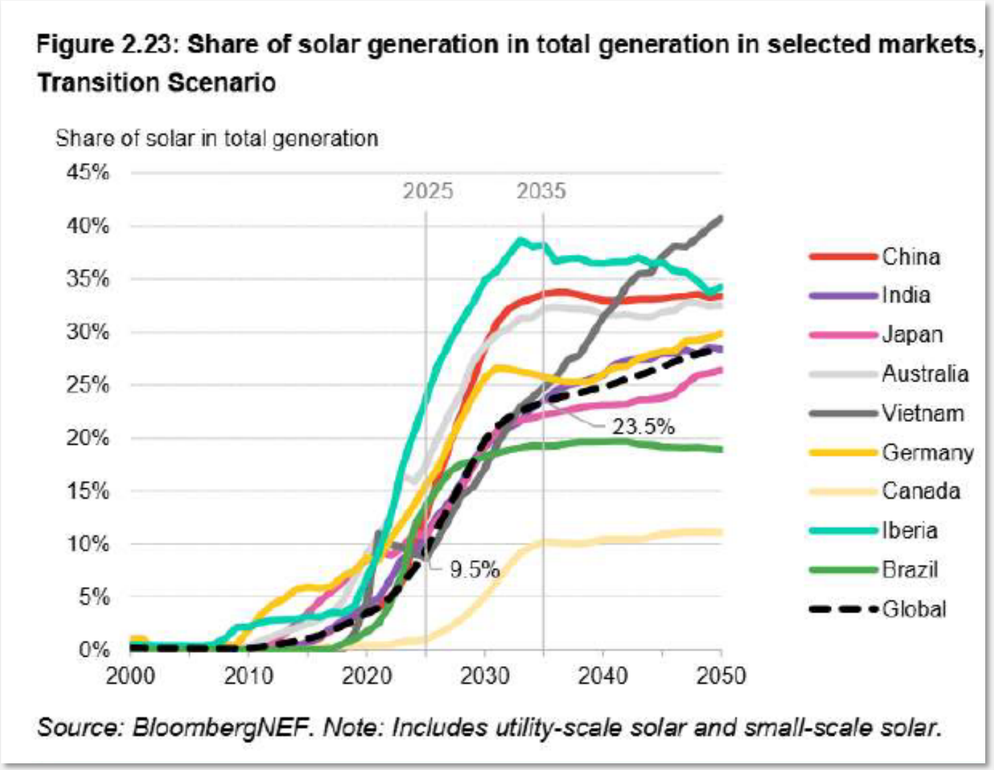


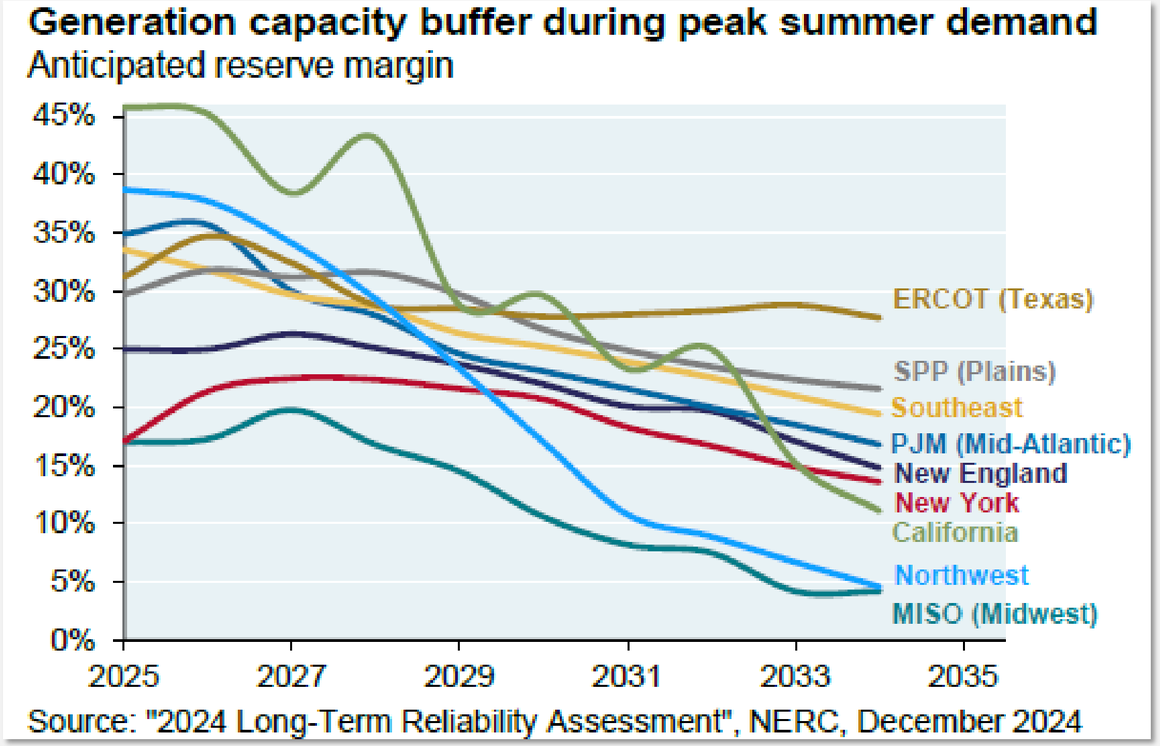


Flexibility and network investment will dominate the investment landscape to accommodate increasing demand and intermittent power

Solar PV and batteries are expanding. An increasing share of solar (out of total) energy generation is expected globally – driven by APAC countries.

However, flexibility will be key to harness the new energy supplied and there is less investment in the grid now that we need it most. Reserve margins are falling in most countries. Episodes - as what happened in Spain - could become more frequent [1].

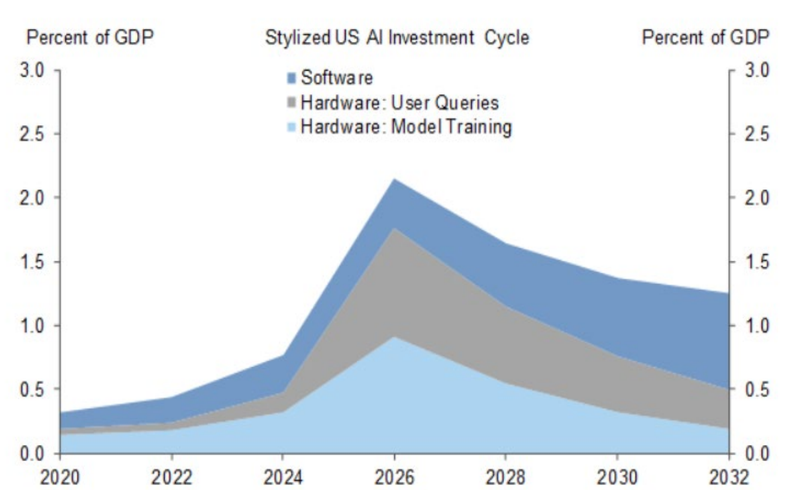




Note: [1] Even if renewables was not at fault, the system is becoming more complex and with less room for error.

Our increasing demand for data, its storage, and accessibility is leading to increasing power usage from data centres.

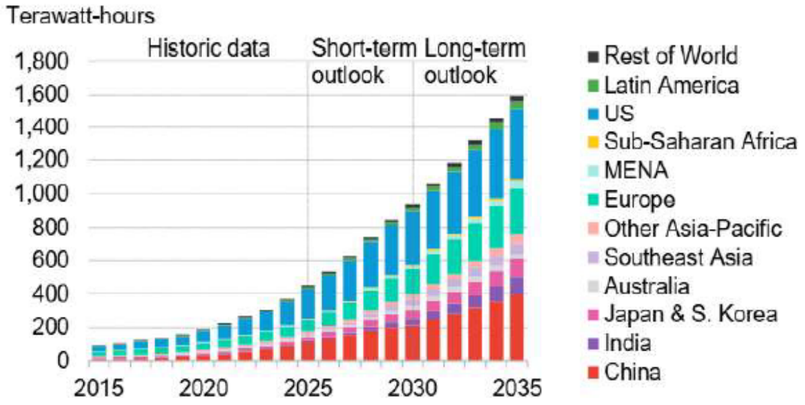
Hardware investment necessary to train AI models **initially surges** but then fades as compute costs decline while **AI software investment increases steadily** over time as end-user adoption increases



Source: Goldman Sachs Global Investment Research

Data centers and AI will drive demand for power, especially in China and US

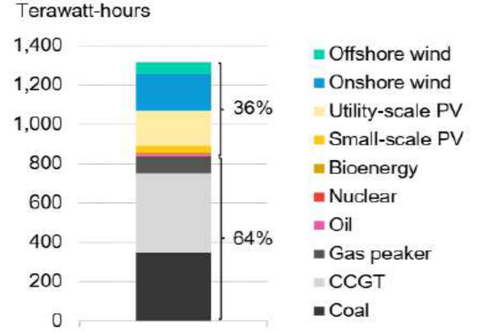
Figure 2.5: Global data-center power demand outlook by market, 2015-2035, Economic Transition Scenario



Source: BloombergNEF. Note: See New Energy Outlook 2025: Data Viewer (web | terminal) for full regional break-down and data to 2050.

But most will not come from low carbon sources

Figure 1.2: Incremental generation needed to meet data-center demand, by technology, 2035

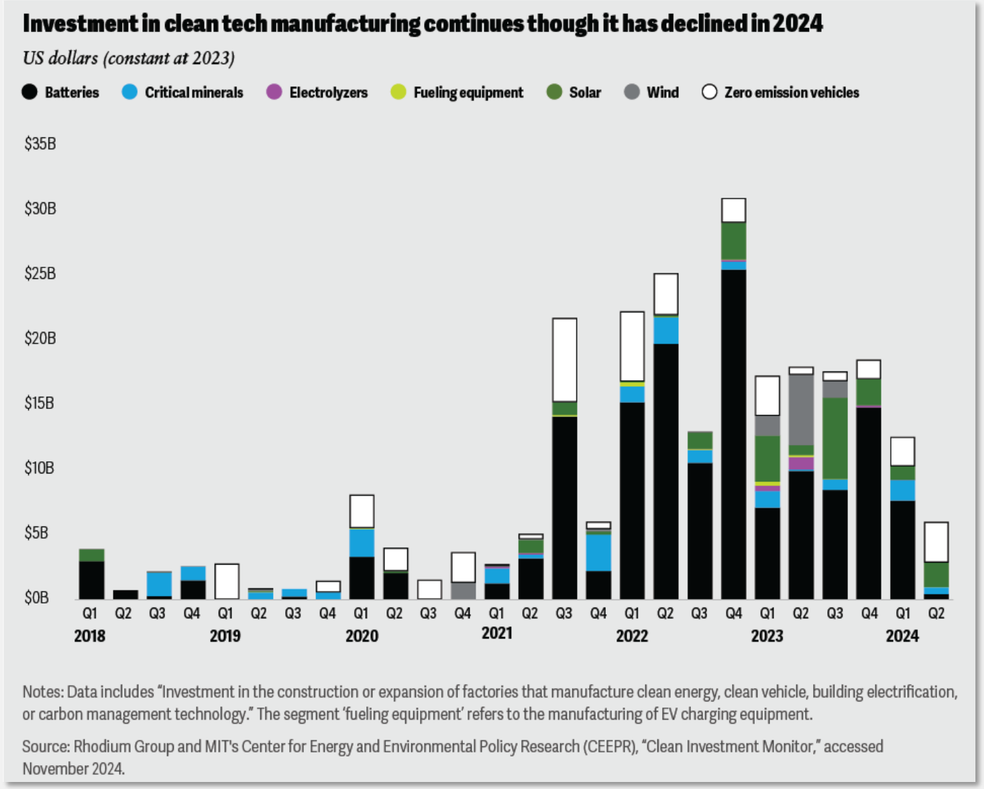


Source: BloombergNEF. Note: This analysis measures the marginal impact of data centers on capacity. Once grid-connected, our modeling assumes that data centers consume the same power mix as other electricity consumers.

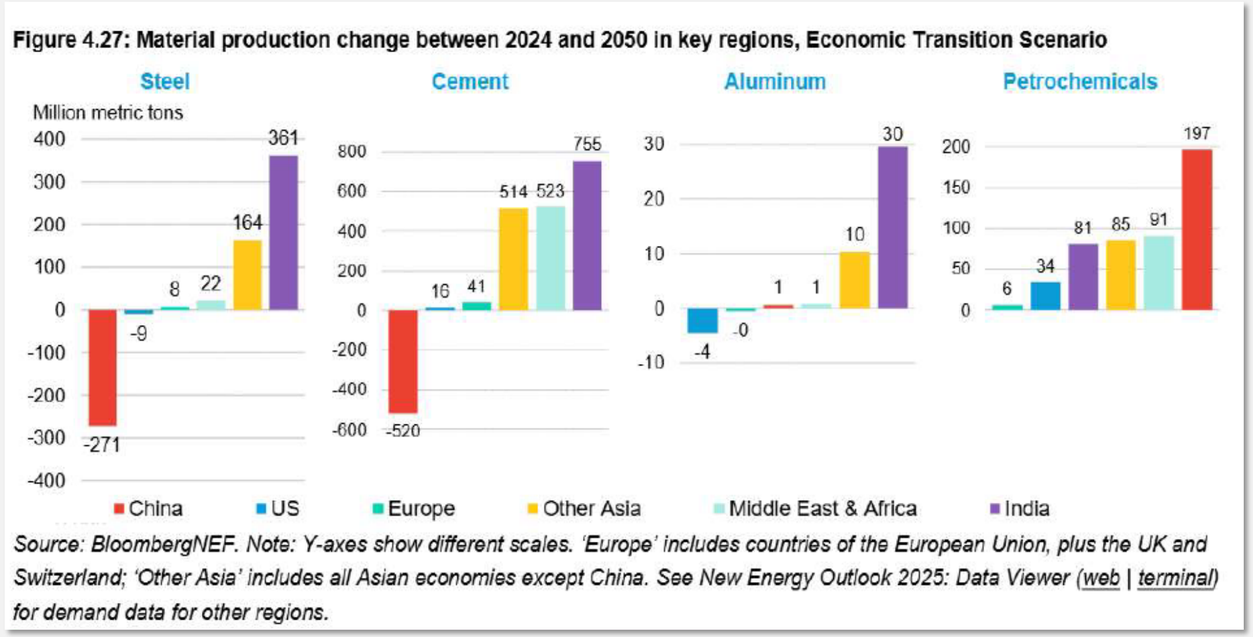
Source: BloombergNEF

Minerals and materials are key commodities for supporting the Energy Transition. Their accessibility will influence CleanTech manufacturing and facilities investment.

IRA and EU fit for 55 drive the clean tech boom, though it ran out of steam in late 2024. as government money runs out, will investors and funds pick up the slack? Is the demand sufficient? Is the supply chain there?



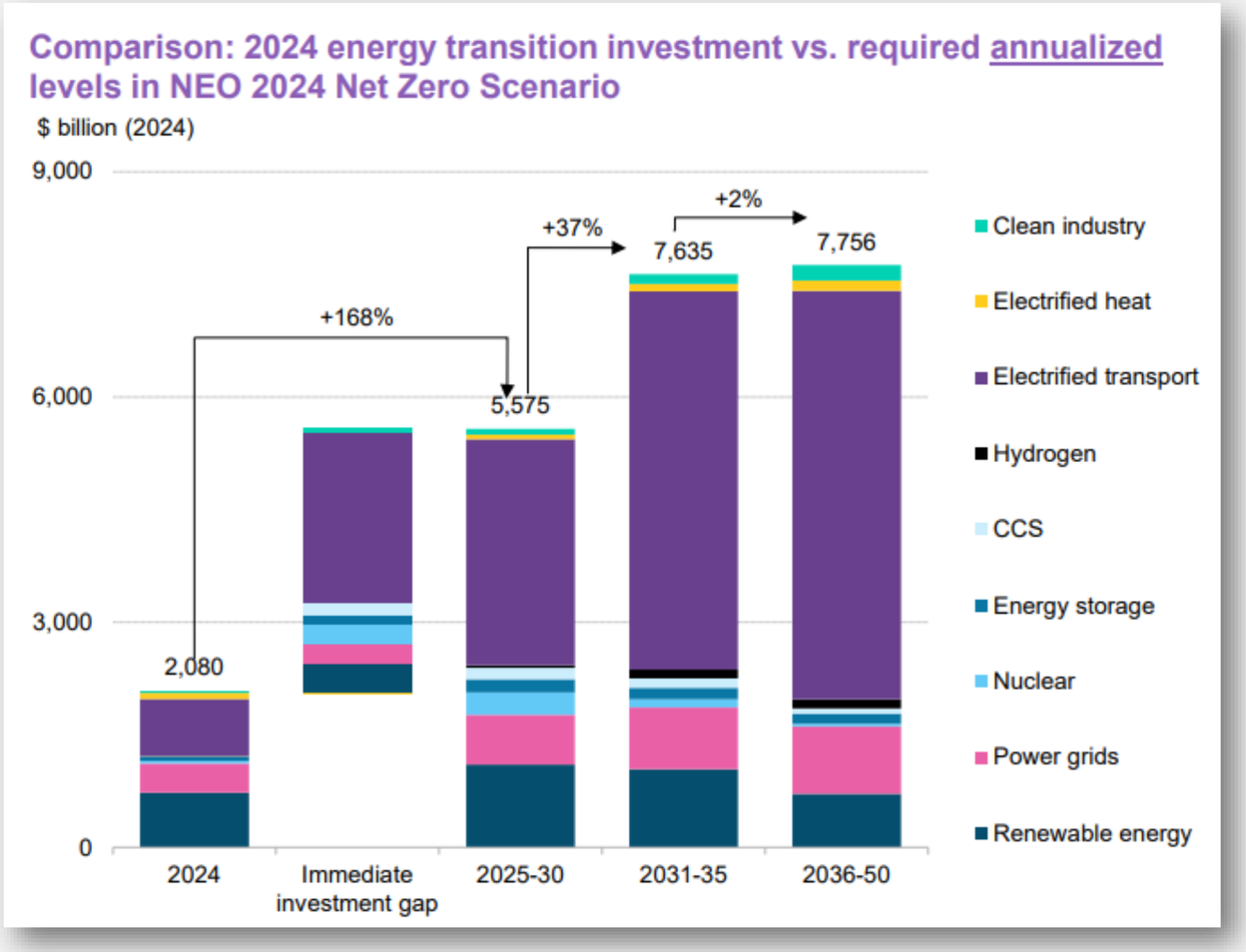
Minerals and materials will be the new 'oil'.
The energy transition is built on mining as much as on energy efficiency and renewables



Source: Deloitte, BloombergNEF

Outlook: Emerging Investment Trends

- It is likely that historic **macro investment trends will continue** after having seen USD$ 2.1 trillion invested into renewable energy in 2024.
- The **electrification of transport** and renewable energy generation, will remain key drivers of investment as governments continue to implement supportive policies.
- **Grid expansion** continues to attract accelerating investments to ensure sufficient capacity to meet the growing demand from data centers
- **Energy storage & flexibility markets** will likely gain some traction to address renewables oversupply and curtailment.
- New technologies aspiration – CCUS, Hydrogen – will re-dimension but may return to localized grow at a time of increased government backing.
- **Nuclear investment** on the back of AI demand and technological innovation.



Source: Bloomberg

Outlook: Implications for Investors & Policymakers

- In 2026, the focus will be on energy security and decarbonisation through pragmatic investments, lower risk tolerance, and a return of ‘robust’ commercial models.
- As macro economic forecasts start to see a slowdown in GDP and inflation remaining sticky, investors will need to prepare for a higher-cost capital environment: less financial engineering and more ‘operational/capital engineering’.
- The market has already witnessed the UK and Europe enact more interventionist supply-side responses to stimulate the transition.
- Blended finance options as well as public-private partnership models will supplement traditional investments.

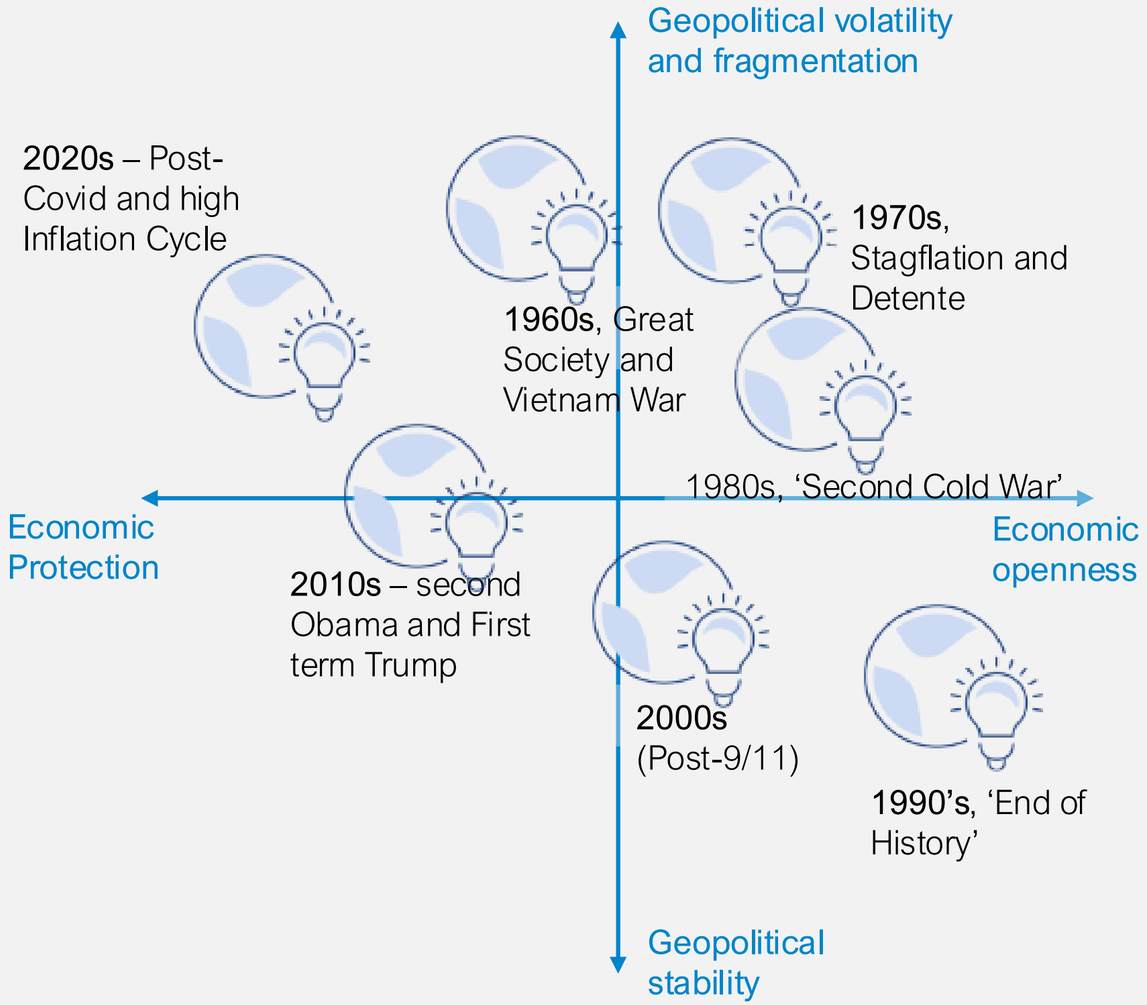
- **China** will remain the dominant player in renewable energy investment – in the shorter term expanding the share of exports, but provoking a global though uncoordinated response.
- **United States:** we have seen two different approaches to incentivize domestic energy investment, with mixed success. Policy stability and regulatory clarity would be the best way to attract investment.
- **Europe:** Strong policy ambition but historic economic stagnation has limited investment appetite. In the future more of the same may not be a viable option.
- **Asia-Pacific:** Employes a dual strategy—rapid renewables scale-up + continued coal and LNG build-out for reliability.
- **Middle East:** Generational shift backed by state capital; rapid supply chain integration.

Source: IEA

Outlook – the next cycle is about ‘pragmatism’

Long term trends / forces impacting country economies – with cycles tending to last between 8 to 12 years.

- Equity returns expected slightly below the historical mean but higher than last cycle.
- Policy ‘protection’ appears on the rise, returns to infrastructure investments will shift away from policy to fundamentals.
- Some investment ‘bets’ will turn sour.
- Reality will slowly kick in – public debt will force discipline and will need private capital.
- Diversification from US – Europe has an opportunity whilst Asia could be above historical trends.
- Defense and security are an investment class
- AI may be in a bubble but could still change everything.

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