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Begegnung - Impuls - Diskurs

Für Männer

27.08.26

Zukunft der Energie

- Reports der Internationalen Energieagentur IEA -

International Energy Agency

Alte Eisdiele

RAUM
für kleine Freuden
und große Themen

Aktuelle Reports der Internationalen Energieagentur IEA

- Globaler Energiebedarf – Ausblick bis 2050 (Report 2025)
- Energiekrise 2026
- Energiebedarf durch KI und Klimaerwärmung (Report 2026)
- Investitionen in den Energiesektor (Report 2026)

Entwicklung des Energiebedarfs bis 2035/2050

Primärenergiequellen

Strombedarf bis 2050

Rohstoffe & Investitionen der Energiewirtschaft

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Globaler Energiebedarf bis 2050

2 Szenarien :

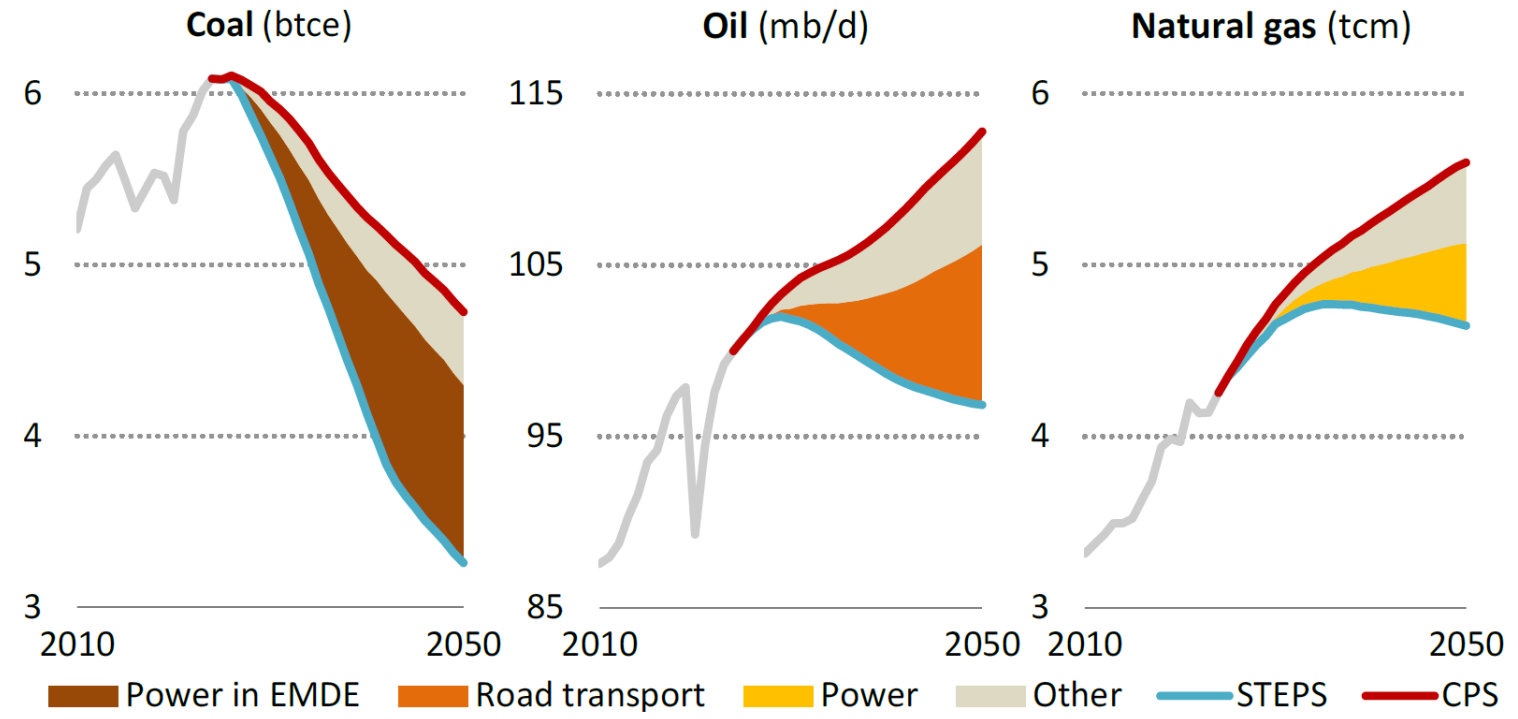
CPS = aktuelle Energiepolitik der Staaten (Fortsetzung des „Status Quo“)

STEPS = „versprochene“ Energiepolitik in den diversen internationalen Konferenzen

CPS und STEPS unterscheiden sich signifikant in der Nutzung von Öl und Gas

Alle Reports und Fortschreibungen von 2026 deuten eher darauf hin, dass das CPS Szenario realistischer ist

Figure 1.2 ▷ **Demand for coal, oil and gas by major driver and scenario, 2010-2050**



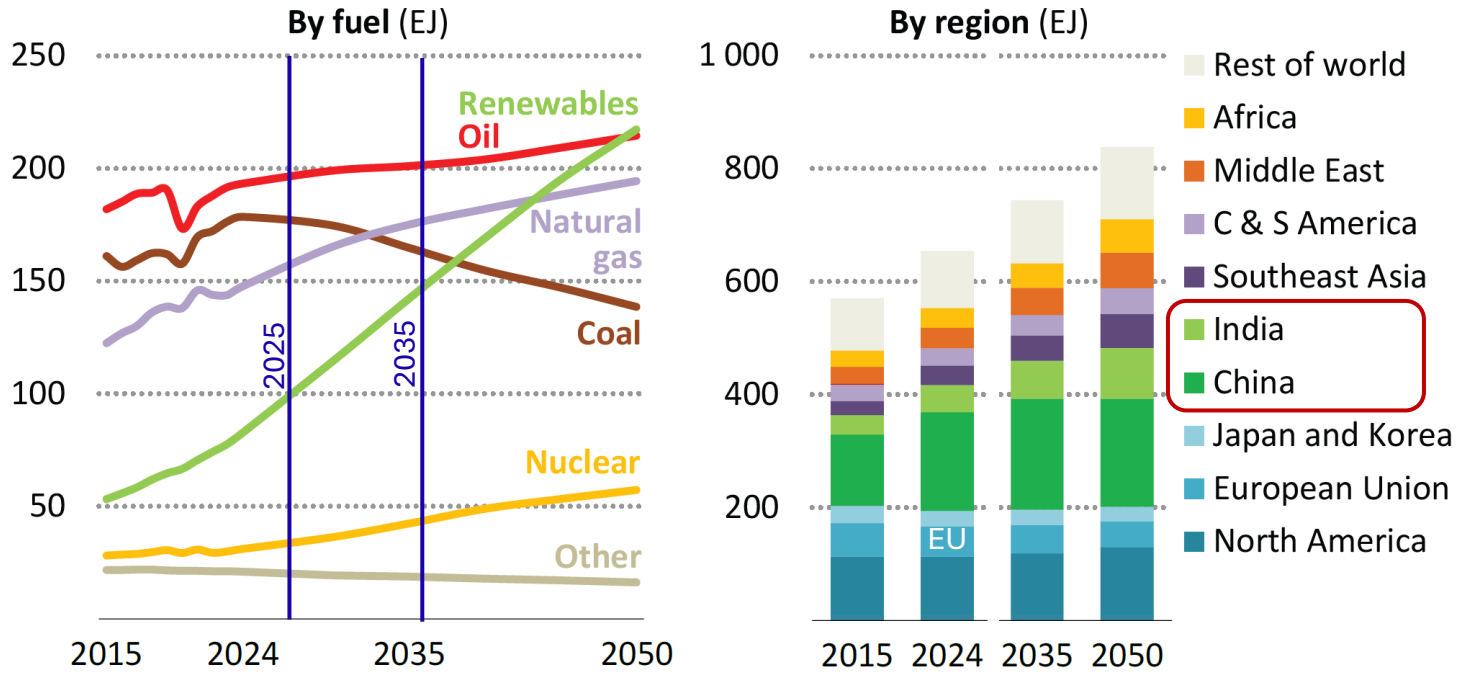
Coal and oil demand peak by 2030 in the STEPS; growth is higher in the CPS due to slower uptake of technologies such as renewables and EVs

Note: btce = billion tonnes of coal equivalent; mb/d = million barrels per day; tcm = trillion cubic metres. EMDE = emerging market and developing economies; CPS = Current Policies Scenario; STEPS = Stated Policies Scenario.

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Globaler Energiebedarf bis 2050

Figure 3.1 ▷ Total energy demand by fuel and region in the CPS to 2050



IEA. CC BY 4.0.

Around 90% of global energy demand growth comes from emerging market and developing economies, and global oil and natural gas use rises through to 2050

Notes: EJ = exajoule; C & S = Central and South America. Other includes traditional use of biomass and non-renewable waste.

In den nächsten 10 Jahren

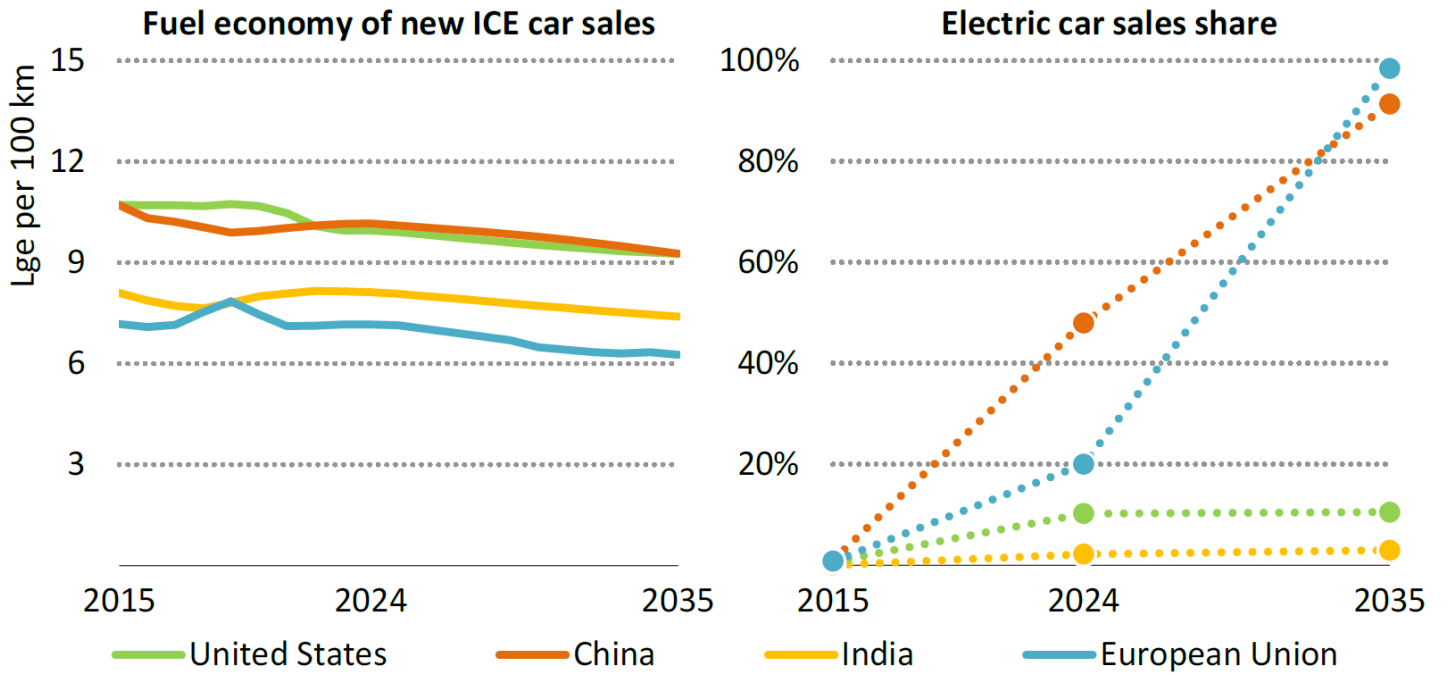
- Steigt der globale Energiebedarf um 15%
- Erneuerbare Energien wachsen ~ 50%
- Kohle geht etwas zurück
- Öl stagniert
- Gas und Kernkraft nehmen zu
- Wachstum vor allem in China und Indien

Europa hat ca. 7% des globalen Energiebedarfs, der anteilig zurückgeht

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Mobilität – Verbrenner vs. Elektrisch

Figure 3.6 ▷ Fuel economy of new conventional cars and electric car sales by selected region/country in the CPS to 2035



Fuel economy of ICE cars slowly improves; electric car sales rise in China and the European Union, but are muted in other major car markets

Note: ICE = internal combustion engine; Lge = litre of gasoline equivalent.

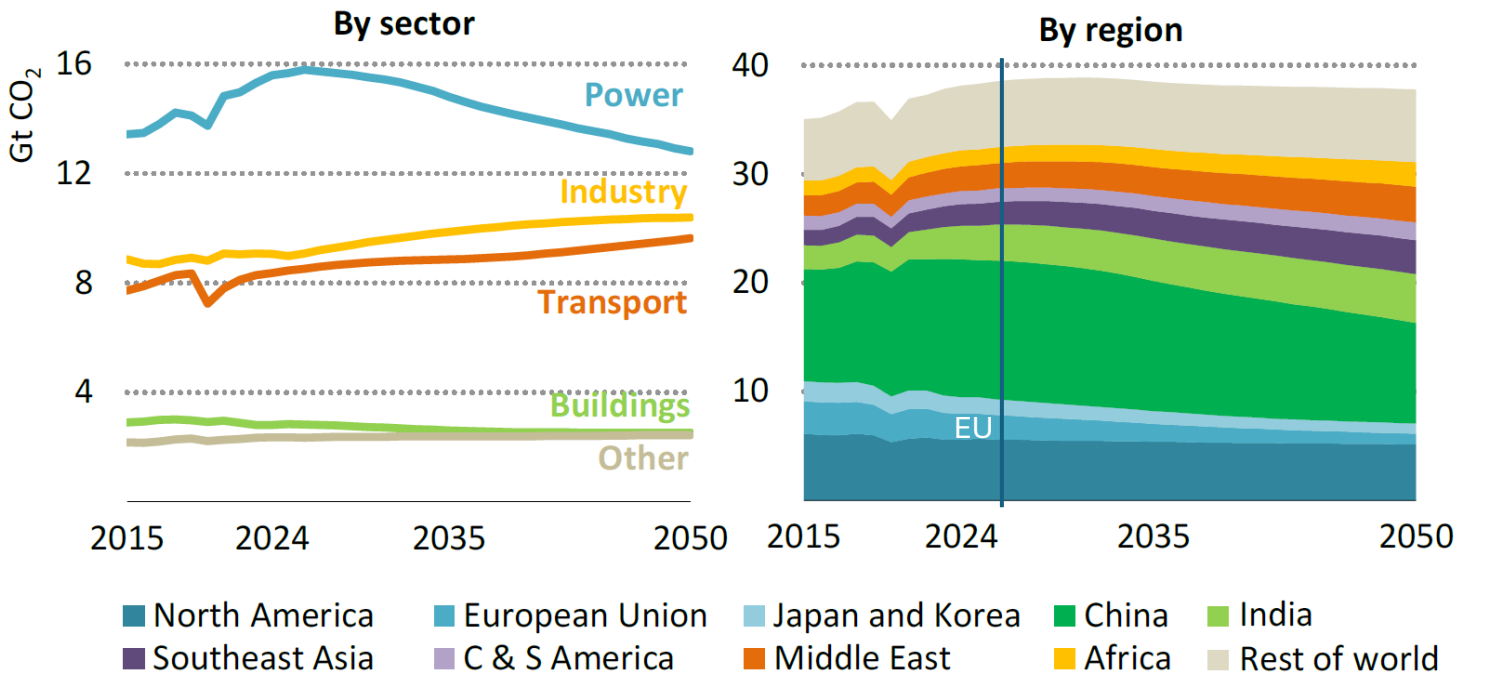
Sources: Historical numbers for electric car sales are based on ACEA (2025); EV Volumes (2025); European Commission (2025); Marklines (2025).

- EU Verbrenner-Autos sind 40% effizienter als US/CN Verbrenner-Autos
- Elektroautos setzen sich nur in EU und CN durch

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

CO2 Emissionen bis 2050

Figure 3.3 ▷ CO_2 emissions by sector and region in the CPS, 2015-2050



CO_2 emissions increase in industry and transport but decline in power, leading to a broad plateau in emissions through to 2050

Note: Gt CO_2 = gigatonnes of carbon dioxide; C & S America = Central and South America.

CO2 Emissionen werden verursacht

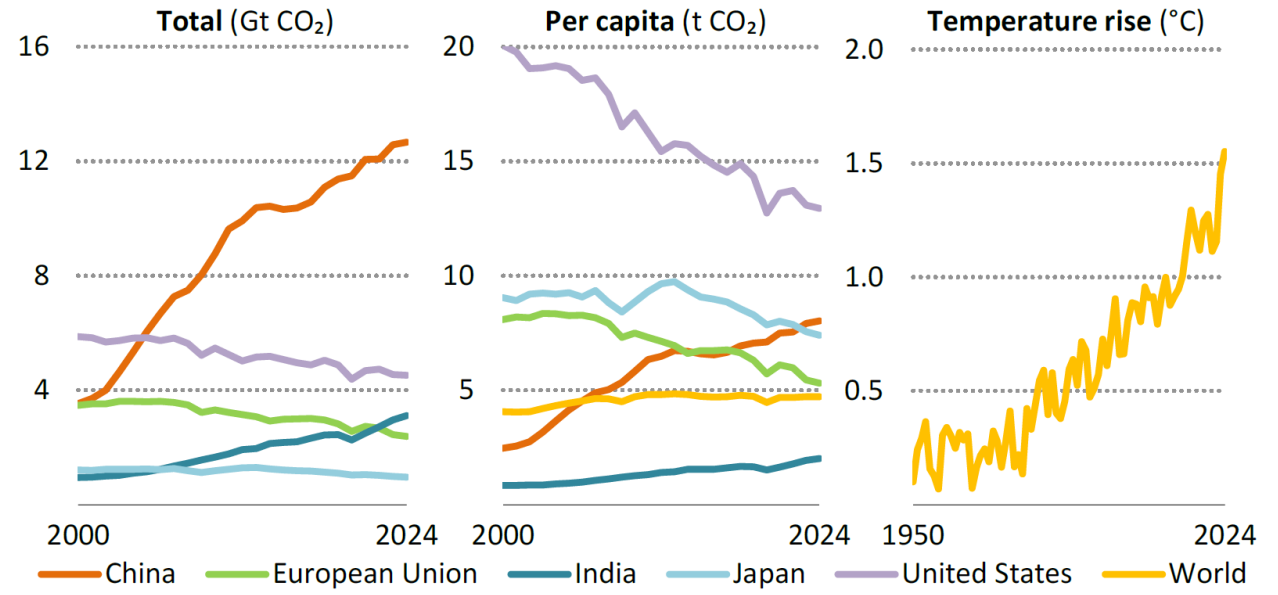
- ~ 40% durch Stromerzeugung
- ~ 20 % Transport
- ~ 20 % Industrie
- ~ 10 Gebäude

Europa verursacht ca. 6 % der globalen CO2 Emissionen (bei 7% Energiebedrf)

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

CO2 Emissionen

Figure 2.6 ▷ **Energy-related CO_2 emissions by selected country/region and per capita, 2000-2024, and global average annual temperature rise above pre-industrial levels, 1950-2024**



Energy-related emissions reached another all-time high in 2024, which was the hottest year ever recorded, with temperatures of over 1.5 °C above pre-industrial levels

Notes: Gt CO_2 = gigatonnes of carbon dioxide; t CO_2 = tonnes of carbon dioxide; °C = degree Celsius. Temperature rise is the average of HadCRUT5, Berkeley Earth, NOAA GlobalTemp v6, GISTEMP, ERA5, and JRA-3Q datasets adjusted by the World Meteorological Organisation so that each dataset is relative to the period 1850-1900.

Sources: IEA analysis and WMO (2025).

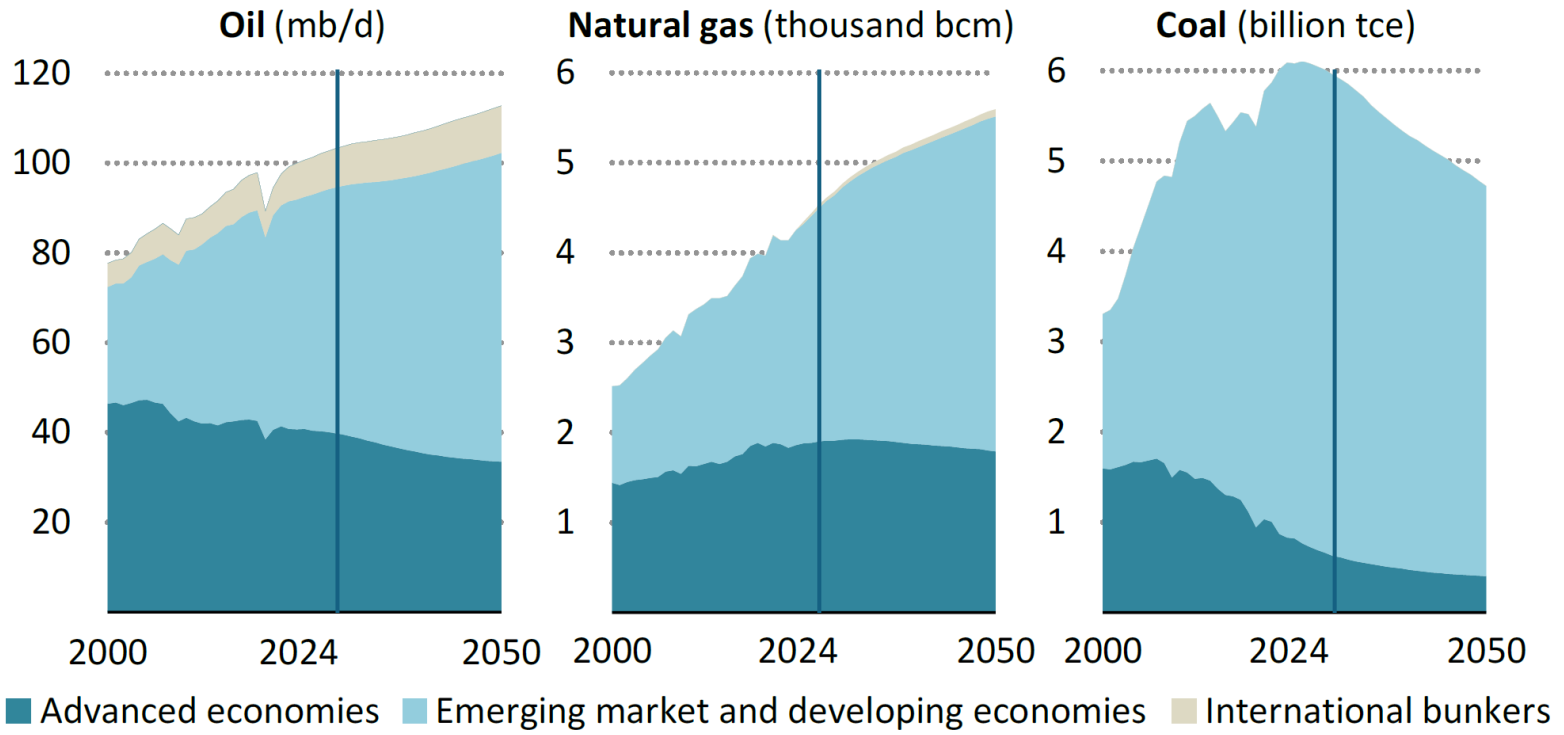
CO2 Emissionen 2000 - 2024

- ~ 40% durch China
- US haben höchste pro Kopf Emissionen
- Rückgang in EU um ca. 25% in letzten 20 a

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Globaler Energiebedarf bis 2050

Figure 3.28 ▷ Fossil fuel demand in the CPS to 2050



Oil and natural gas demand continue to rise to 2050; coal use falls, mainly as a result of reductions in the power sector in China and advanced economies

Note: mb/d = million barrels per day; bcm = billion cubic metres; tce = tonne of coal equivalent.

2025 erwartete man dass

- Kohle in CN ab 2026 reduziert wird
- Kohleausstieg in EU fortgesetzt wird
- Öl / Gas deutlich steigen

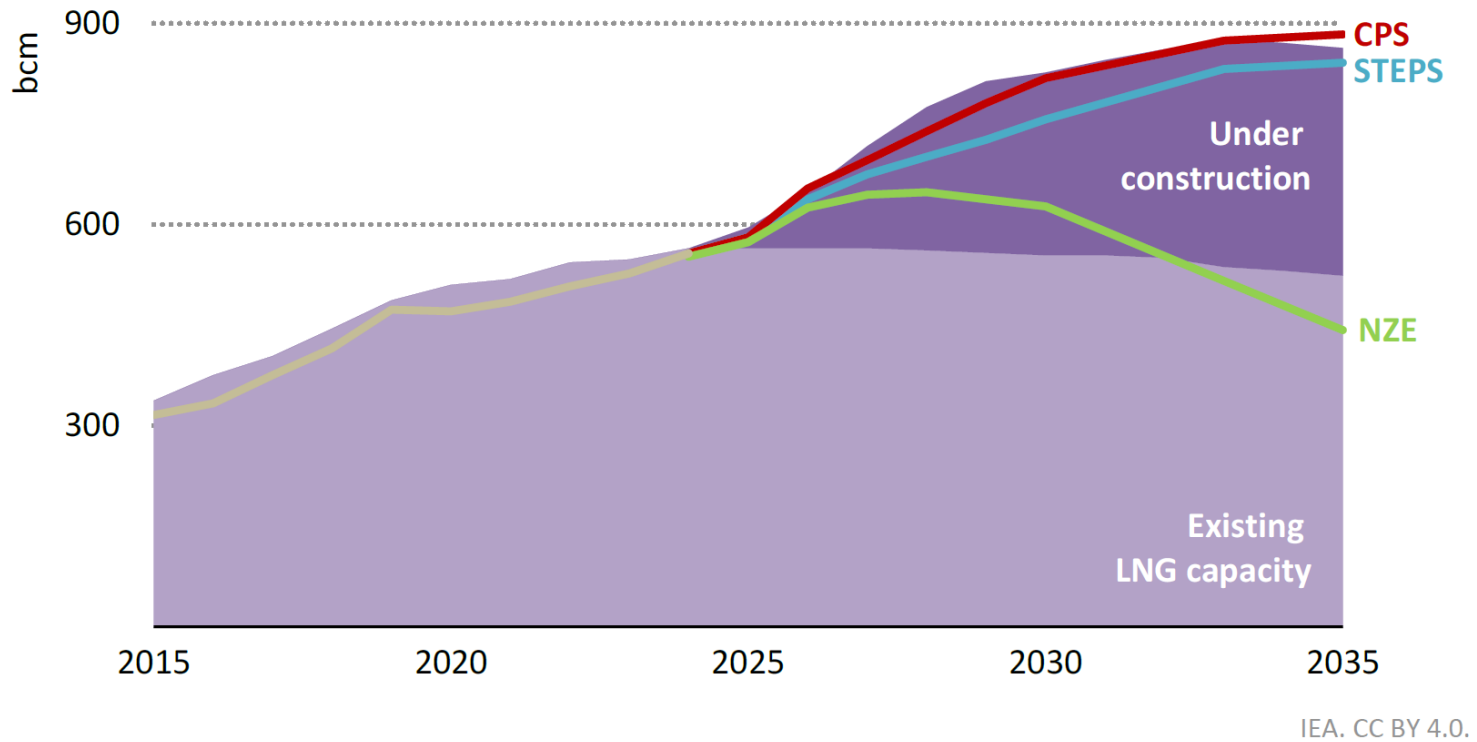
2026

- Kohle wächst wieder in CN
- Gas in Asien leicht reduziert → PV

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Flüssiggas

Figure 1.28 ▷ Existing and under construction available LNG export capacity and LNG trade by scenario to 2035



The large upcoming wave of additional LNG export capacity is fully absorbed in the CPS but results in well-supplied global gas markets in the STEPS through to 2035

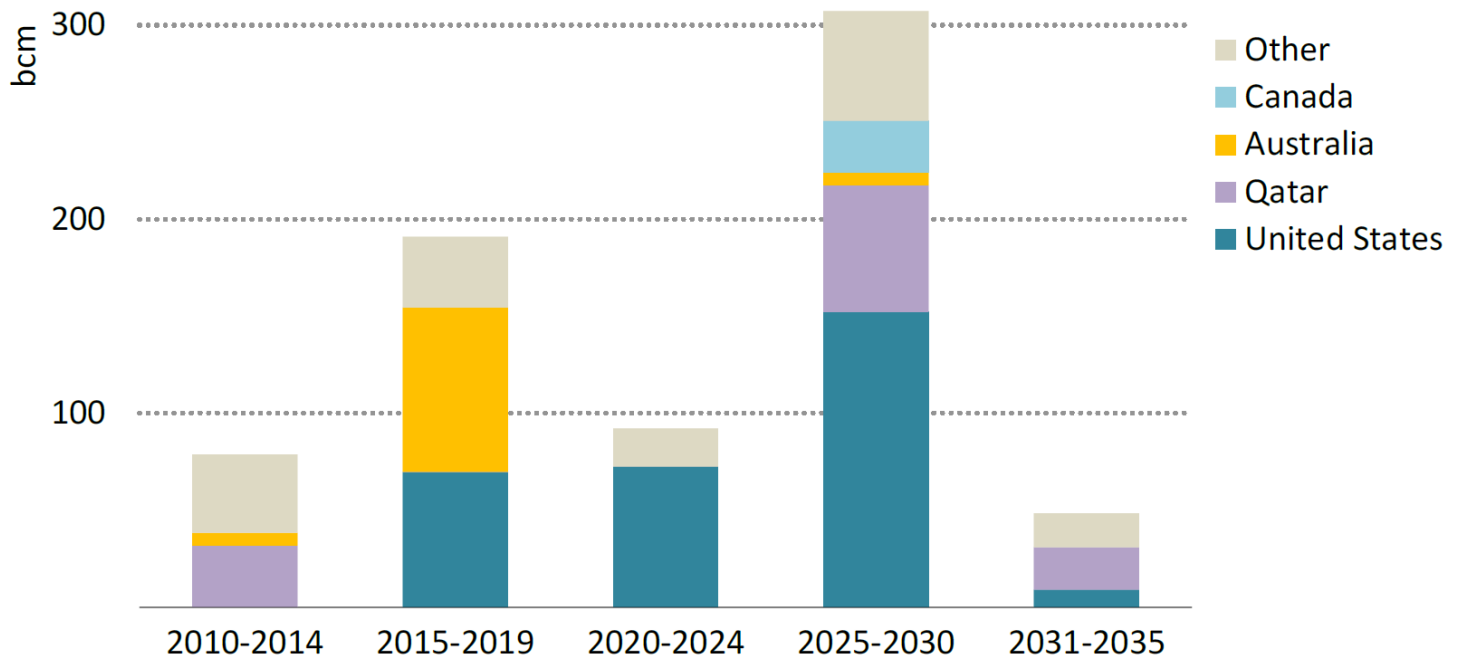
Note: CPS = Current Policies Scenario; STEPS = Stated Policies Scenario; NZE = Net Zero Emissions by 2050 Scenario.

In den nächsten 5 Jahren erhöhen sich die Flüssiggas Versorgungskapazitäten um 50%

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Flüssiggas

Figure 1.27 ▻ LNG capacity under development by supplying country, 2010-2035



United States has driven global liquefaction capacity growth for the past decade and it is set to expand its capacity by a further 160 bcm to 2035

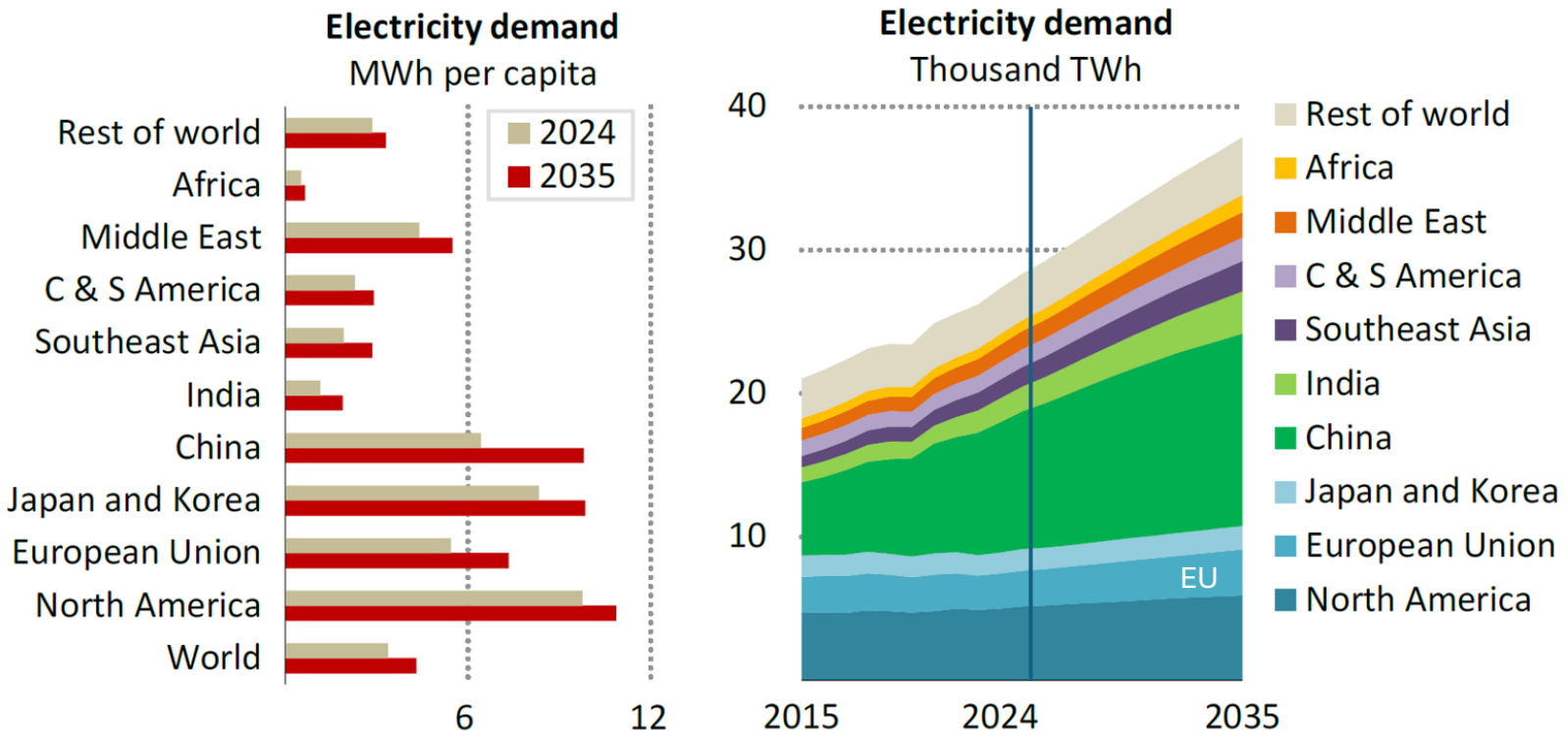
Note: bcm = billion cubic metres.

Massive Investitionen in neue Flüssiggas – Kapazitäten vor allem in USA und Katar, aber auch neuen Förderländern (Argentinien)

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Globaler Strombedarf bis 2050

Figure 3.15 ▷ Electricity demand by region/country in the CPS to 2035



Electricity demand per capita rises to 2035 in all regions, and global electricity demand increases rapidly, predominately in emerging market and developing economies

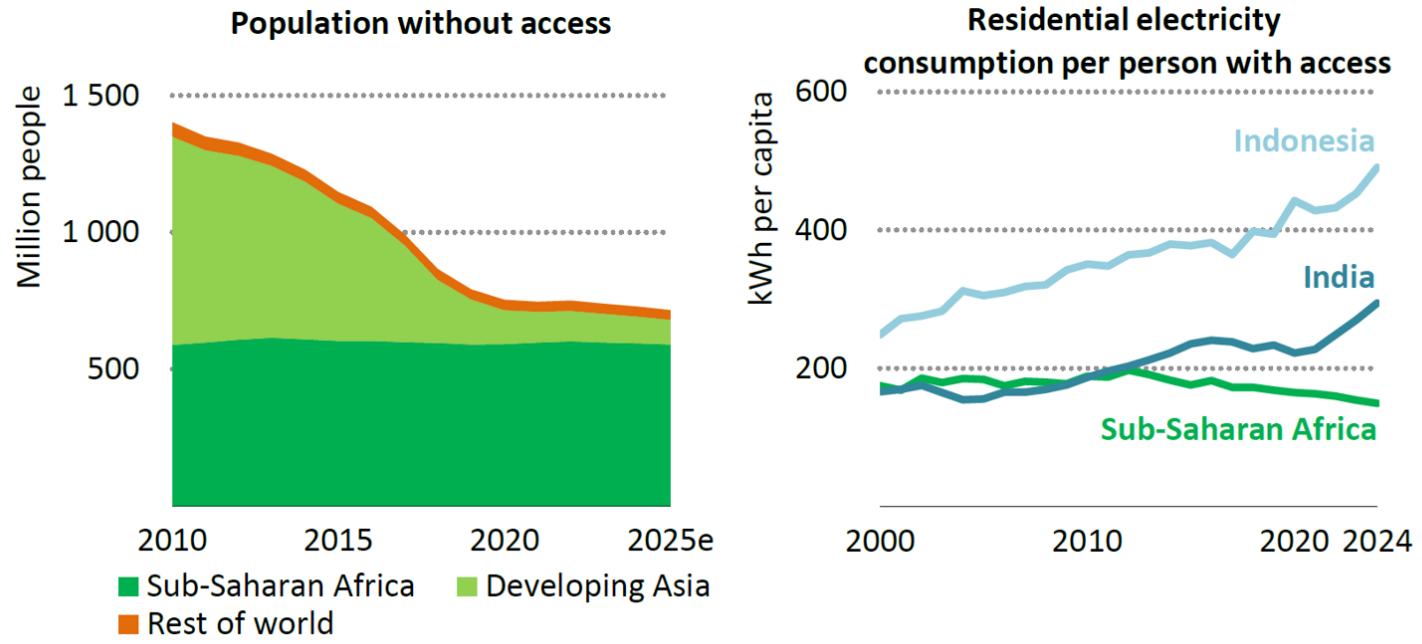
Note: MWh = megawatt-hour; TWh = terawatt-hour; C & S America = Central and South America.

- Strombedarf nimmt bis 2035 um 30% zu
- EU hat ~ 8 % des globalen Strombedarfs, steigt auf 9% bis 2035
- Stärkstes Wachstum in CN, Indien und Asien

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Zugang zu Stromversorgung

Figure 1.21 ▻ Population without electricity access, 2010-2025e, and average residential electricity consumption per capita with access, 2000-2024



Developing Asia is approaching universal electricity access and electricity use is rising, while progress in sub-Saharan Africa is stagnating and household consumption is falling

Note: 2025e = estimated values for 2025.

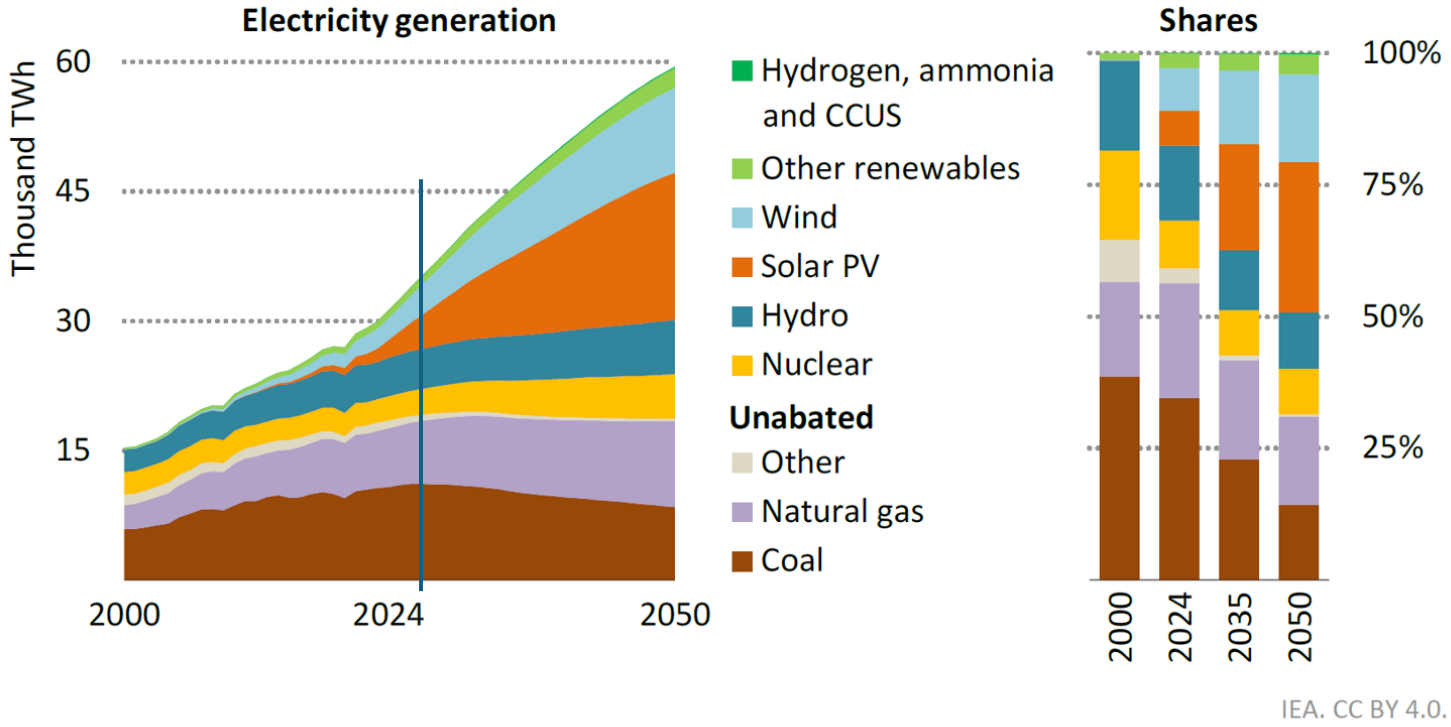
Steigender Strombedarf vor allem in Süd-Ost Asien und Indien

bedingt durch
- KI
- Umstieg von Flüssiggas auf Strom beim Kochen
- Klimageräte

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Stromerzeugung

Figure 3.18 ▷ Global electricity generation by source in the CPS to 2050



Coal and natural gas continue as the bedrock of global electricity supply into the 2030s, complemented by a nuclear comeback and fast deployment of renewables

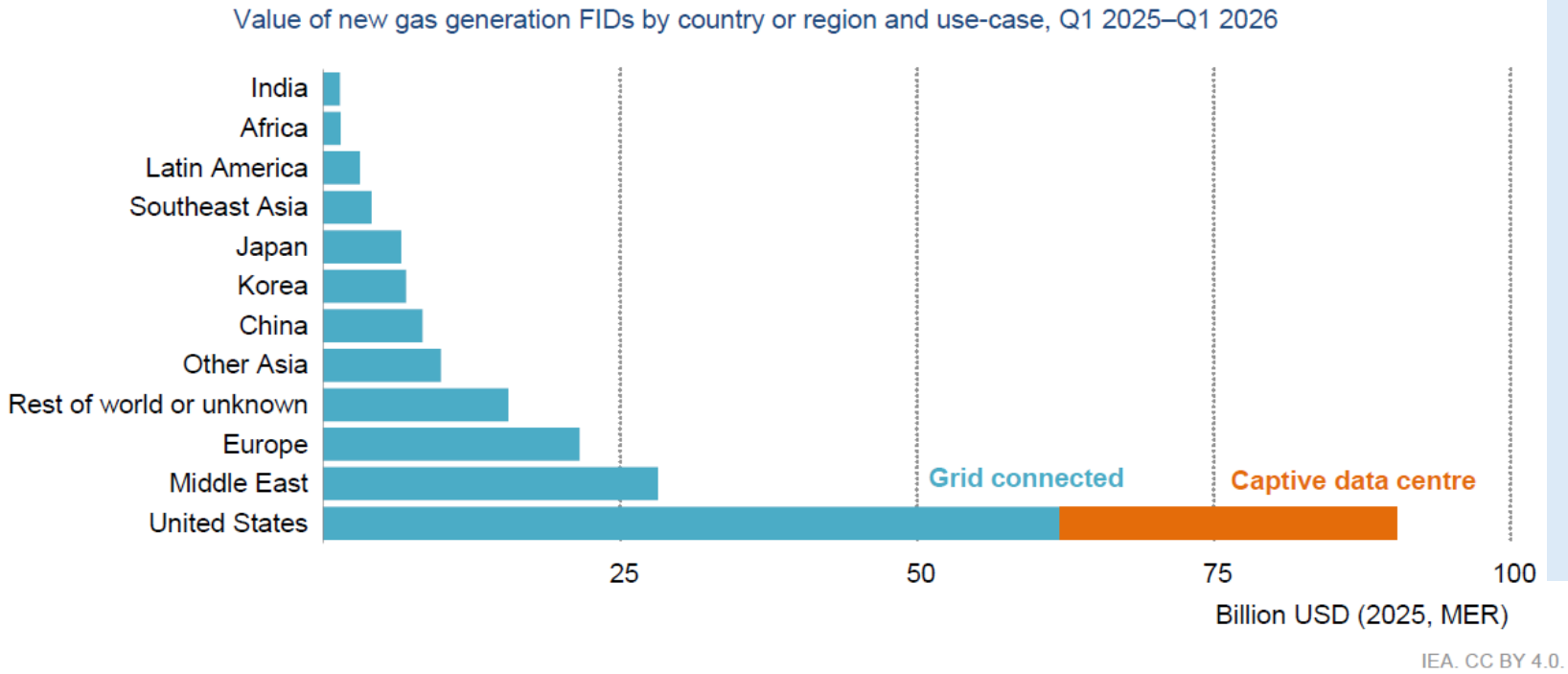
Notes: TWh = terawatt-hour; CCUS = carbon capture, utilisation and storage. Other renewables include bioenergy and renewable waste, concentrating solar power, geothermal and marine. Other includes oil, non-renewable waste and other sources.

- Hauptquelle für Strom ist aktuell Kohle
- Kohle wird durch Gas abgelöst werden
- Solar wird weiter stark steigen
- Wind und Kernkraft werden weiter ausgebaut

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Globale Energie Investitionen 2026

Securing electricity supply for artificial intelligence is driving investments for new gas generation to a 25 year high



Since Q1 2025, the value of new gas-turbine orders intended to supply captive power for US-based data centres is greater than total orders in any other country.

Notes: MER = market exchange rate. FID = final investment decision. Values indicate the total project investment in the year or quarter the turbines are ordered.
Source: IEA analysis based on McCoy (2026), Gas Turbine and Steam Turbine Order data.

- Gaskraftwerke für Stromerzeugung werden in USA vor allem für KI Rechenzentren gebaut

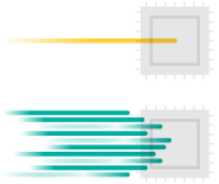
Quelle : https://www.iea.org/reports/world-energy-investment-2026

Strombedarf durch KI

Conventional versus AI data centres

Power density

höhere Energiedichte



In the next few years, AI data centres are set to concentrate a peak power demand equivalent to 65 households in a space equal to a household refrigerator.

Load variability

stärkere Schwankung

AI data centres see repeated swings of server load of more than 50% of rated capacity within a second.

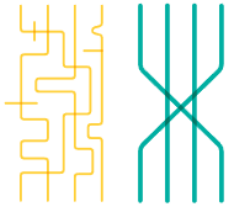
Energy storage

Energiespeicher benötigt

To manage load swings, storage technologies, including lithium-ion batteries, are becoming critical for AI data centres, potentially making them more flexible, grid-friendly assets.

Power distribution

Kleine Netze



AI data centres are shifting towards high voltage, direct current power distribution, building on technologies pioneered in EVs and renewables.

Heat density

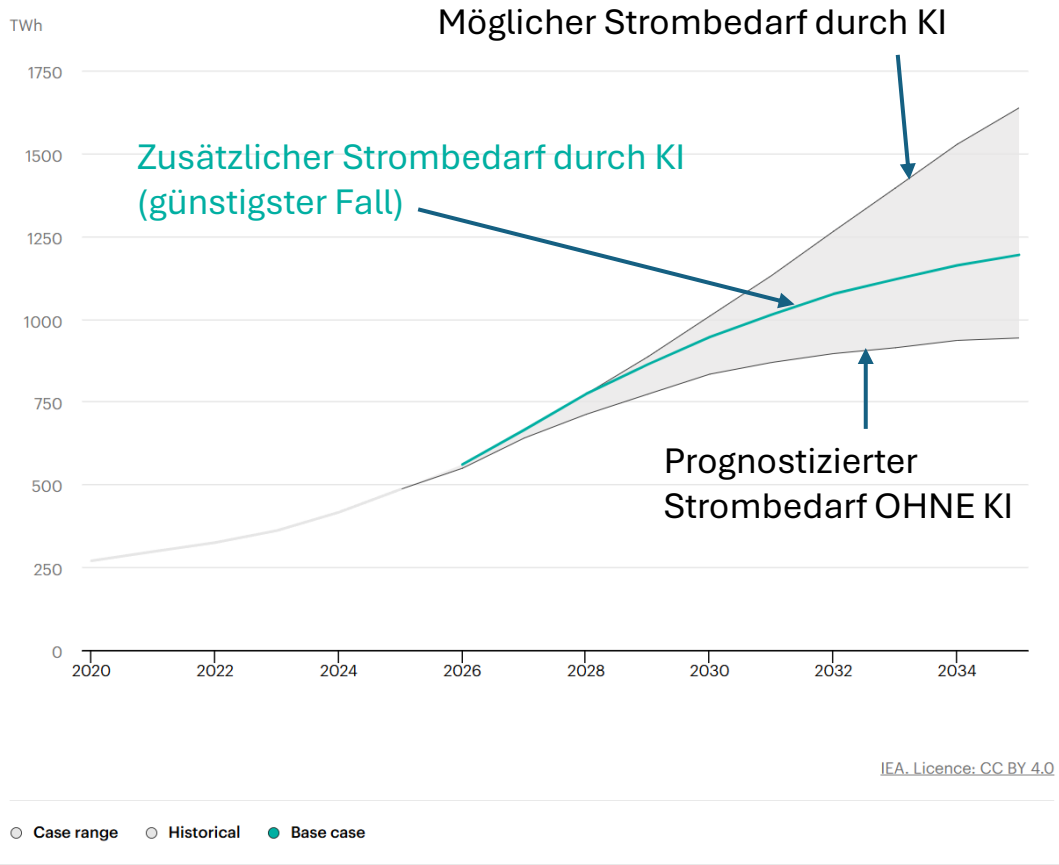
Hohe Wärmeentwicklung

AI data centres need to evacuate the heat equivalent to 30 natural gas boilers per server rack.

Weight

Hohes Gewicht

In an AI data centre, a single server rack the size of a refrigerator can weigh more than a pick-up truck.



Im „max case szenario“ verdoppelt sich der globale Strombedarf durch KI bis 2035

Quelle: https://www.iea.org/reports/energy-and-ai

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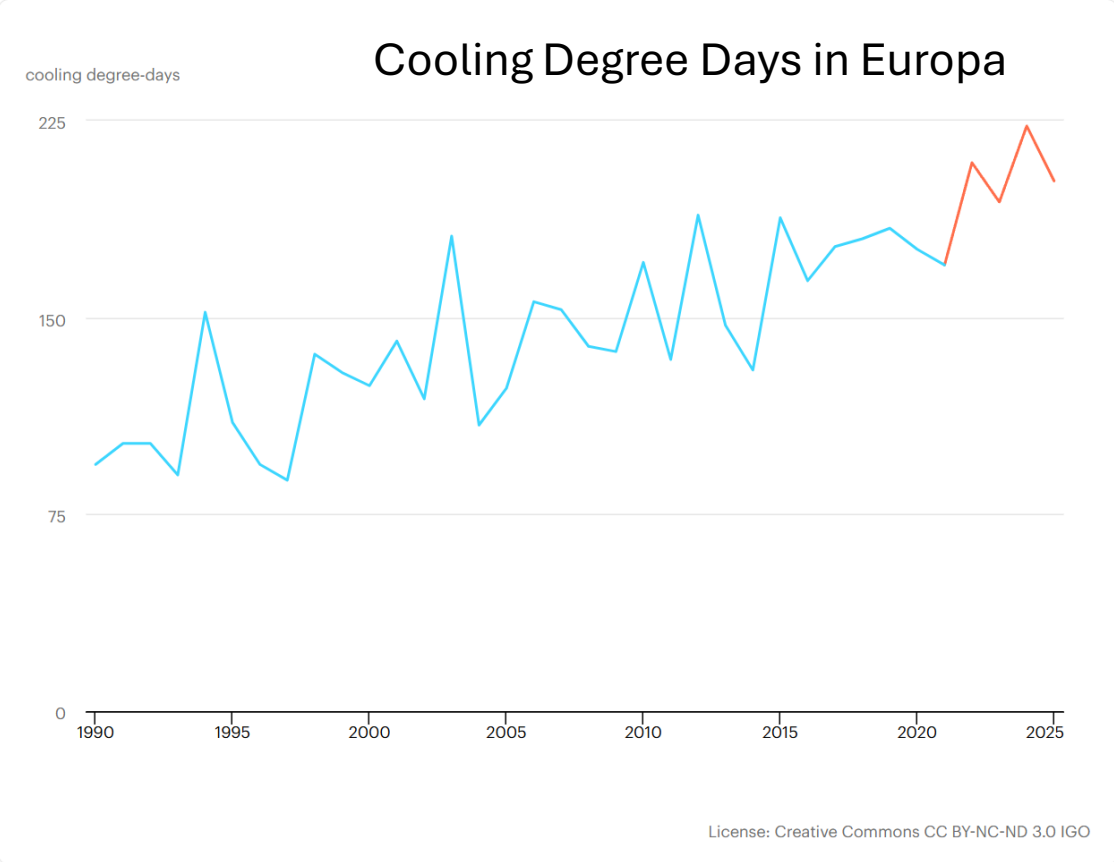
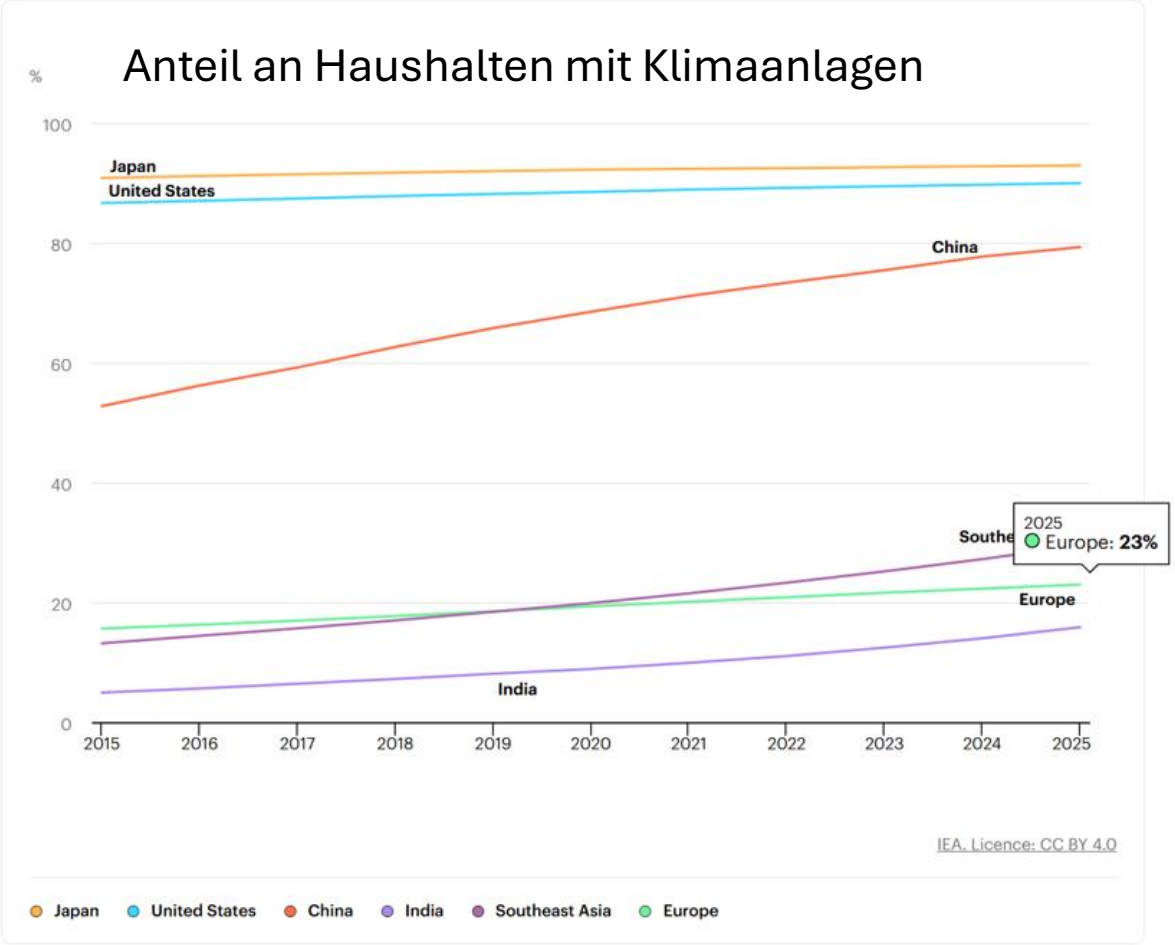
Erderwärmung und Klimanlagen





Cooling Degree Days (CDD) = Kennzahl der IEA um Energiebedarf für Kühlung zu monitoren

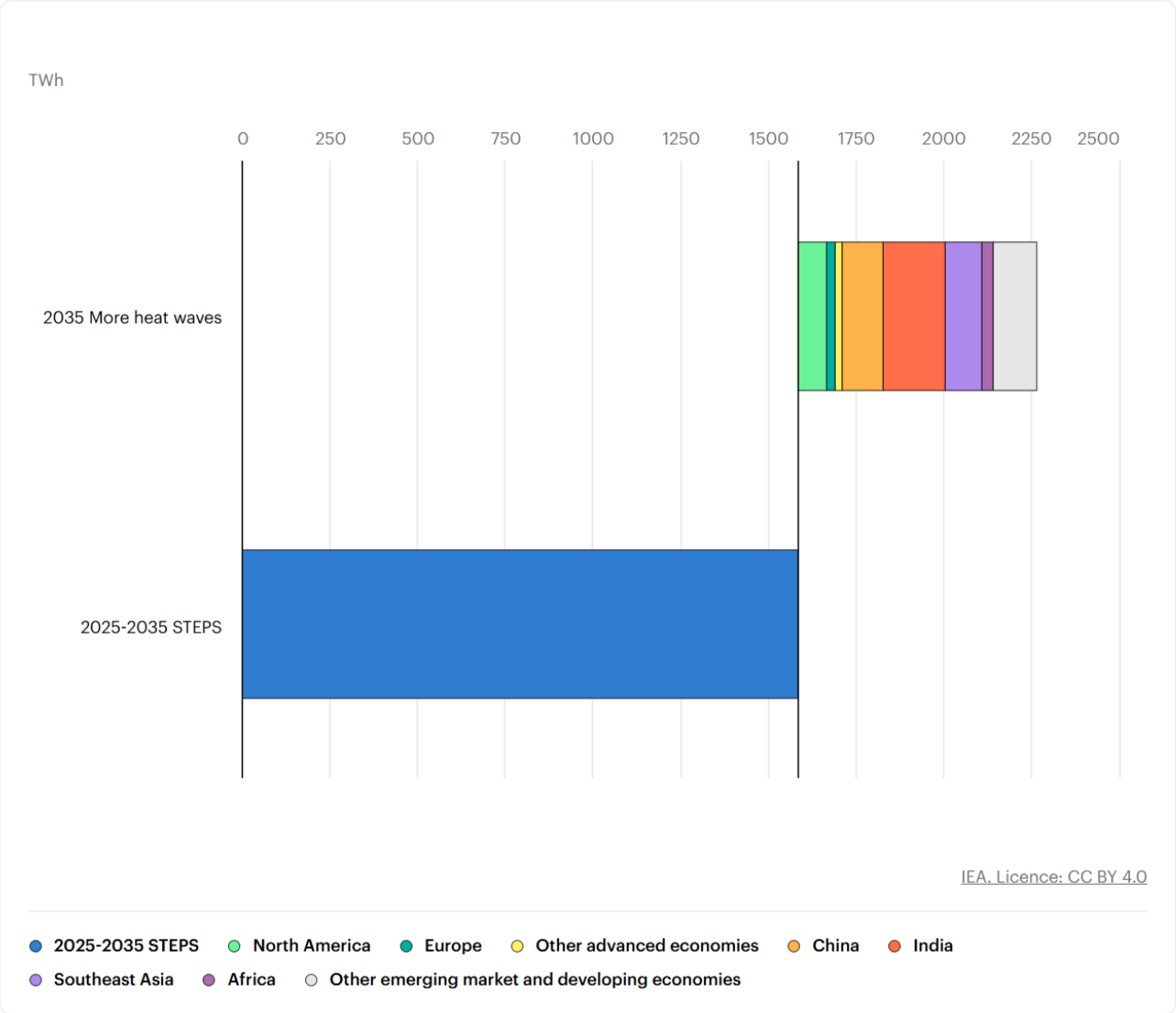
CDD = (Tagesmitteltemperatur in °C – 21) * Anzahl der Tage > 21°C)

z.B. Tagesmitteltemperatur 25°C , 5 Tage lang = CDD = (25-21)*5 = 20

- Anzahl heißer Tage nimmt zu
- Vor allem in CN ist der Anteil an Klimaanlagen stark gestiegen
- EU und Indien/SEA haben einen relativ niedrigen Anteil

Quelle: https://www.iea.org/commentaries/cooling-a-hotter-world-el-nino-meets-strong-growth-in-global-electricity-demand

Zusätzlicher Strombedarf durch Klimageräte



Neue Schätzung 2026

Bedingt durch Klimaerwärmung wird der Anteil der Klimaanlagen steigen und dadurch auch der Strombedarf

Schätzungen der IEA gehen von einem 40% höheren Strombedarf bis 2035 aus, vor allen in Asien

Quelle: https://www.iea.org/commentaries/cooling-a-hotter-world-el-nino-meets-strong-growth-in-global-electricity-demand

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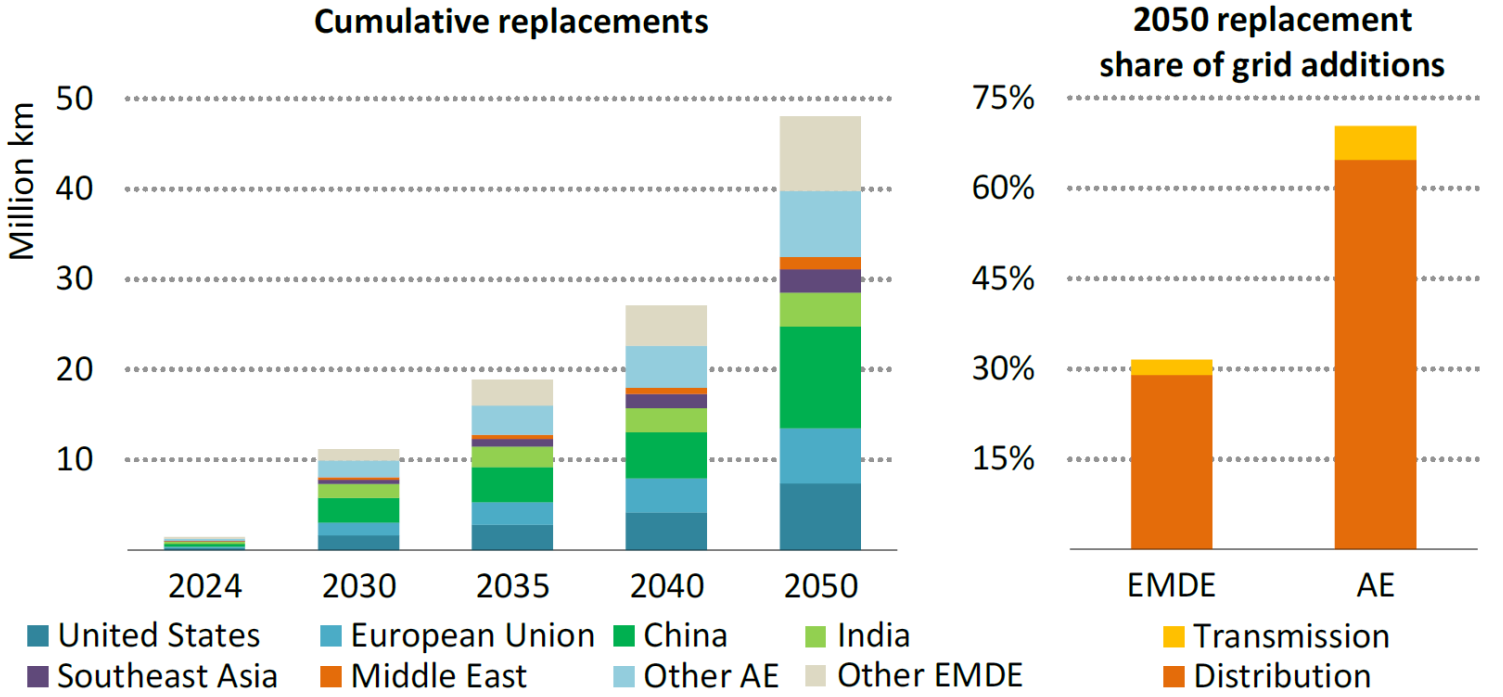
Begegnung - Impuls - Diskurs

Infrastruktur

Figure 3.26 ▻ Grid line replacement by selected region/country and replacement share of grid additions in the CPS, 2024-2050



More than 45 million km of grid line are replaced by 2050, accounting for 40% of all cumulative grid additions, of which more than two-thirds are in advanced economies

Note: AE = advanced economies; EMDE = emerging market and developing economies.

Durch den erhöhten Strombedarf muss die Infrastruktur

- Leitungen
- Transformatoren

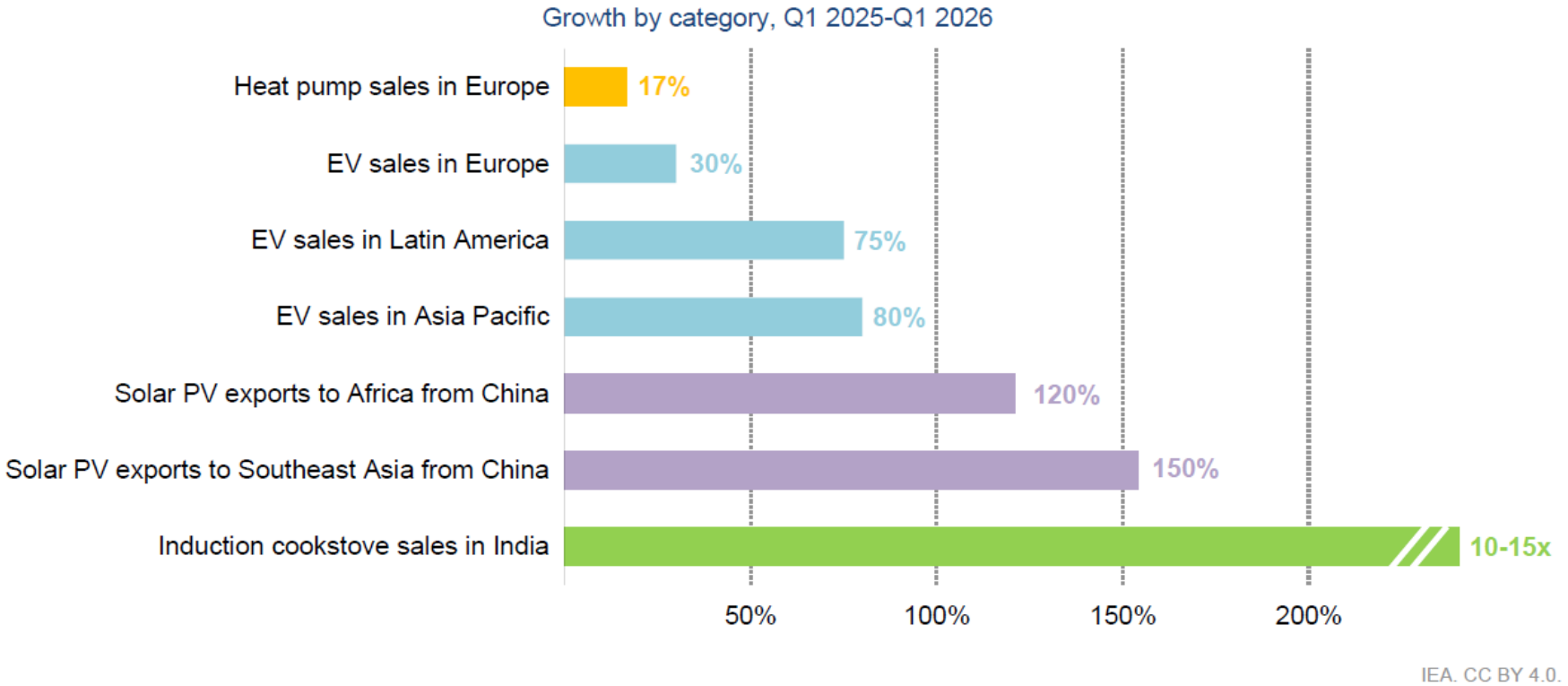
ausgebaut und erneuert werden

In den „entwickelten“ Ländern müssen 70% der Verteilnetze erneuert werden

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Globale Energie Investitionen 2026

There are early signs consumers are turning to electrification in response to supply disruptions



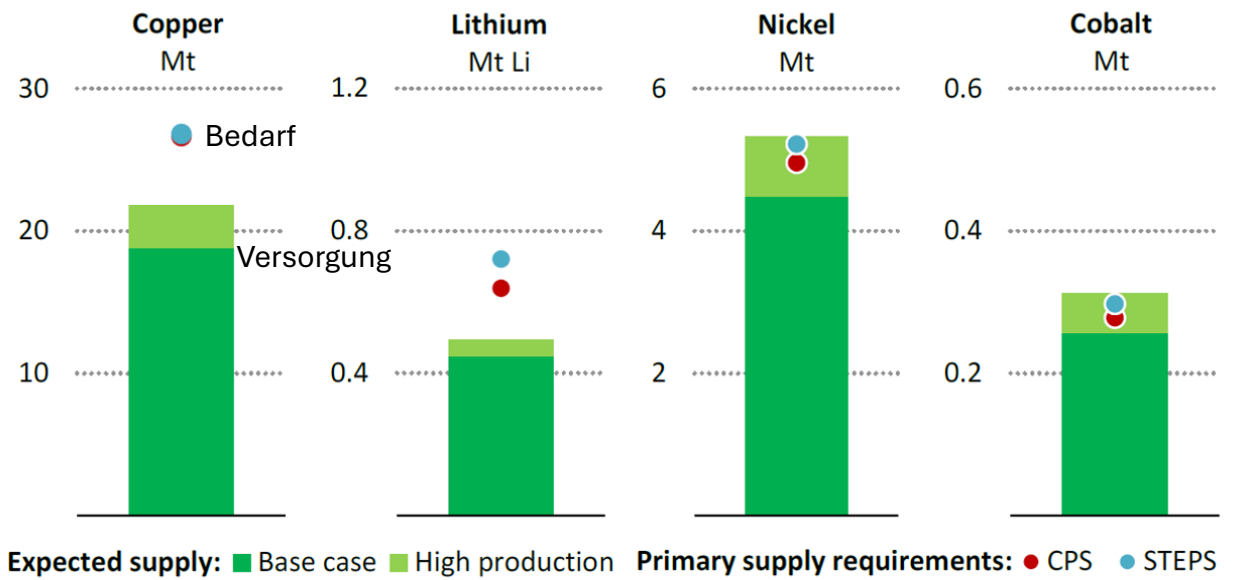
There has been strong growth in Q1 2026 spending on key categories including heat pumps, EV sales and solar PV in some regions. In India, LPG supply disruptions led to a surge in induction cookstove sales.

Die aktuelle Krise am Persischen Golf beschleunigt die Transformation hin zu strombasierten Lösungen

Quelle : https://www.iea.org/reports/world-energy-investment-2026

Kritische Rohstoffe

Figure 5.16 ▷ Primary supply requirements for critical minerals and expected supply from existing and announced projects by scenario, 2035



IEA. CC BY 4.0.

Supply-demand balances through to 2035 are improving compared to a few years ago, but major concerns remain, especially for copper

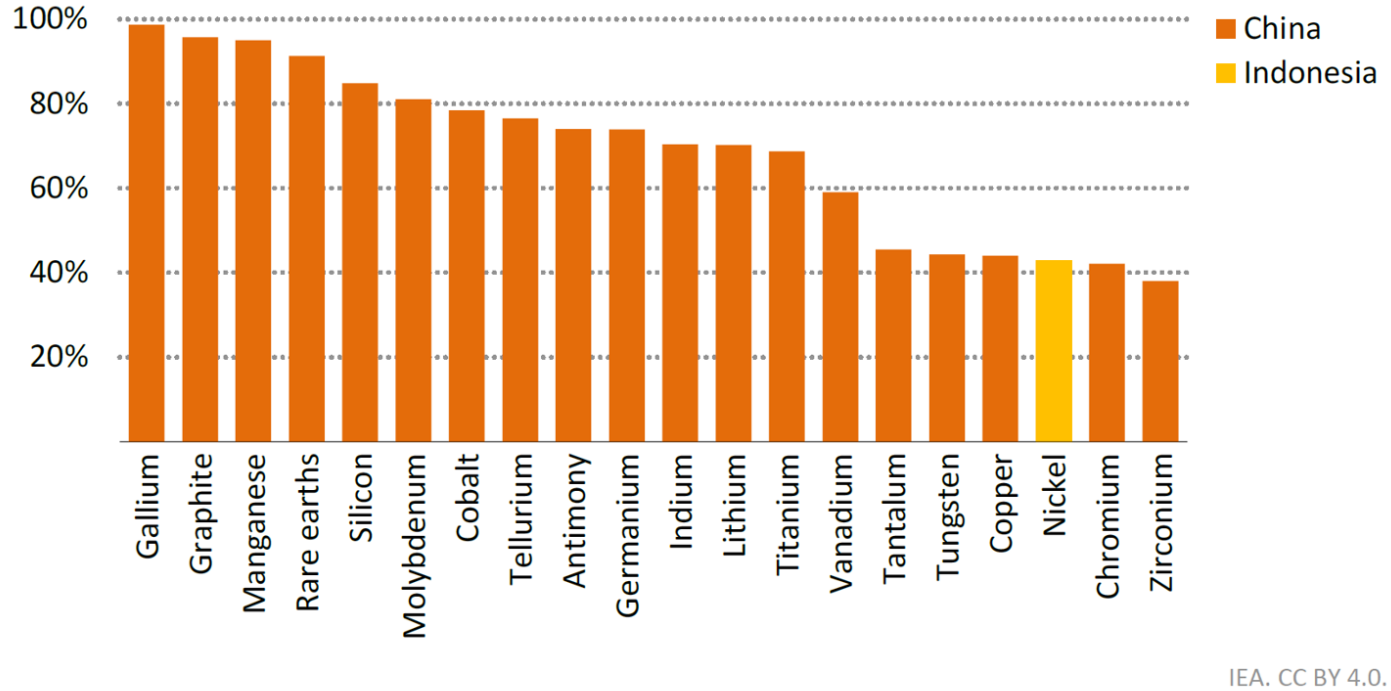
Notes: Mt = million tonnes; Mt Li = million tonnes of lithium metal content; CPS = Current Policies Scenario; STEPS = Stated Policies Scenario. Primary supply requirements are calculated as total demand net of secondary supply, and accounting for losses during refining operations. The base case includes production from existing and under construction assets, and projects with a high chance of moving forward. The high production case includes less certain projects at a reasonably advanced stage of development, including projects seeking financing or permits.

Einige kritische Rohstoffe (Cu, Li) für die Stromversorgung sind knapp

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Kritische Rohstoffe

Figure 1.23 ▷ Top refiner share of selected energy-related strategic minerals by country



China is the leading producer for nearly all of the 20 energy-related strategic minerals analysed, with an average market share of around 70%

Note: Values refer primarily to 2024, or to the latest year for which data are available in certain cases.

Source: IEA (2025c).

Bei fast allen Rohstoffen, die in der Stromversorgung benötigt werden, ist China in der Herstellung (Refiner) führend

Quelle : https://www.iea.org/reports/world-energy-outlook-2025

Zusammenfassung

- Europa spielt mit 7% des Energiebedarfs und 6% der CO2 Emissionen global eine untergeordnete Rolle
- Anstieg des globalen Energiebedarfs um 30% in den nächsten 25 Jahren, getrieben durch
  - Strombedarf für KI,
  - Klimawandel (Kühlung) und
  - Transport
- Die aktuelle Krise am Persischen Golf verstärkt den globalen Bedarf nach strombasierten Lösungen (Kochen, Auto, Heizen)
- Deckung des Strombedarfs durch Gas, PV und Kernkraft
- Erhebliche Investitionen in Verteilernetze und Infrastruktur erforderlich
- Die dafür benötigten kritischen Rohstoffe liegen in der Hand von China