Urban Mining Forum

IRENA's Insights on Critical Materials for the Energy Transition

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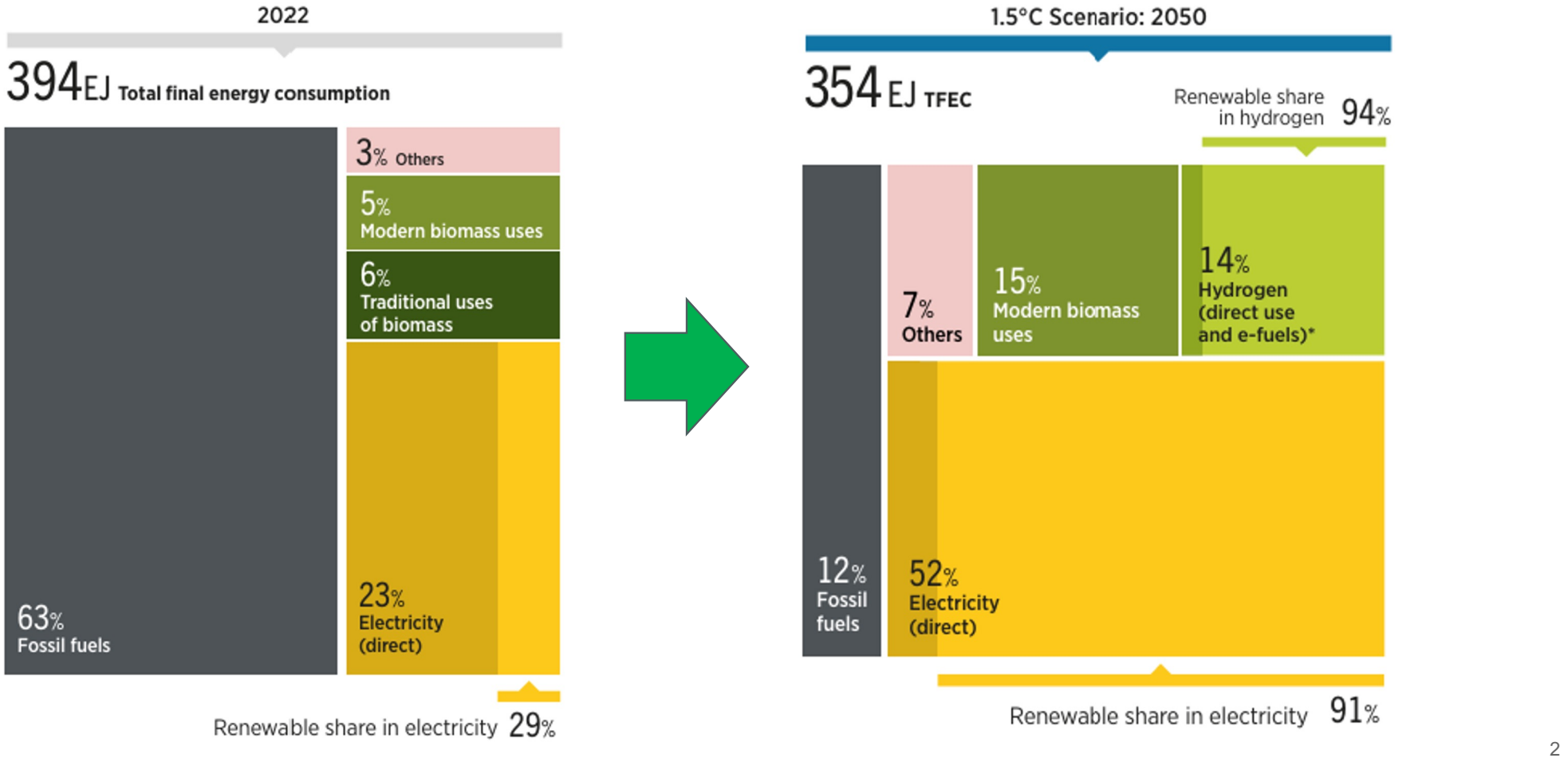
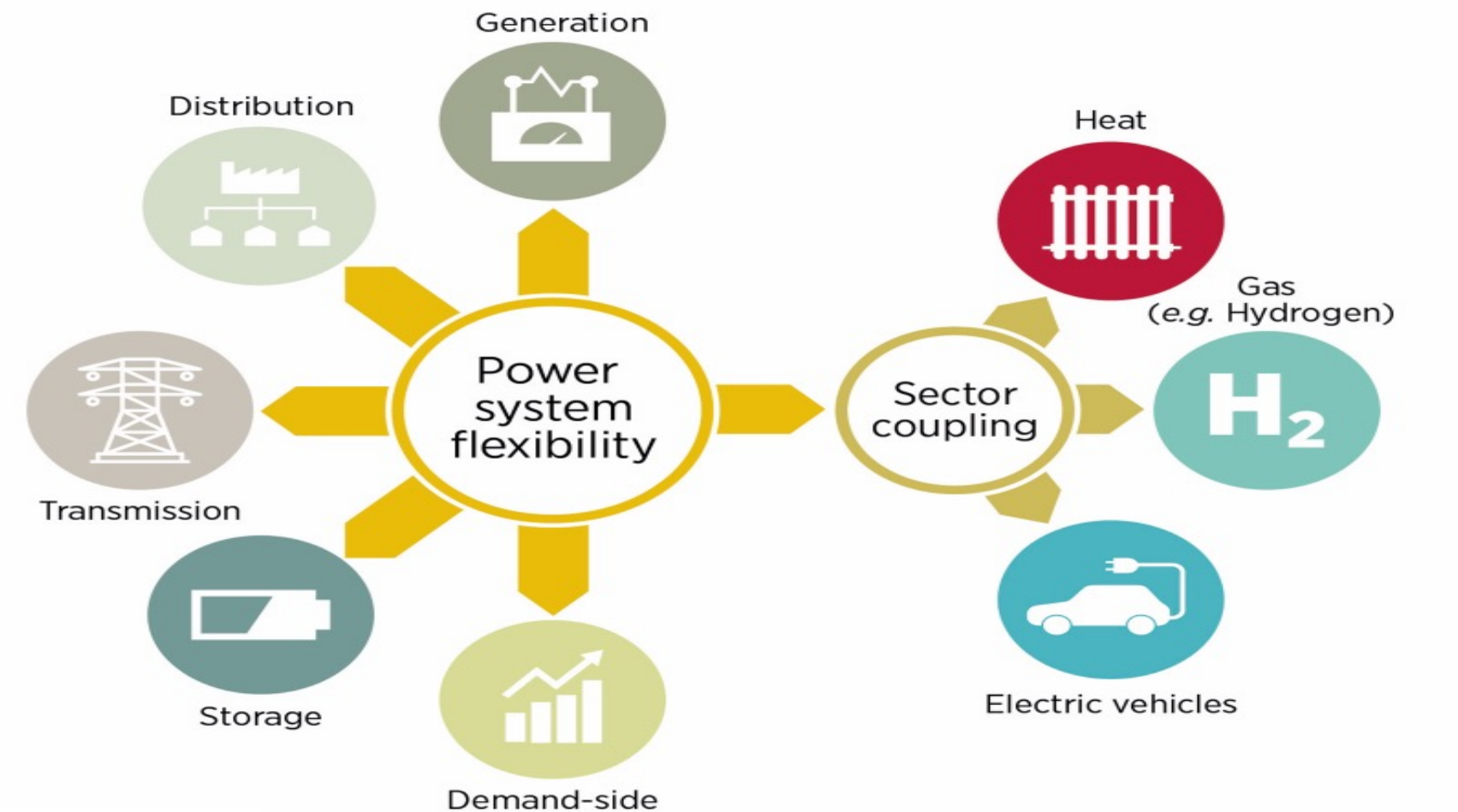
27 February 2025

Rapid Electrification via renewables is necessary for rapid decarbonisation



Source: (IRENA, 2024)

Enablers of power system flexibility in the energy sector



Source: (IRENA, 2018a).

Unprecedented growth in renewable power additions in 2023

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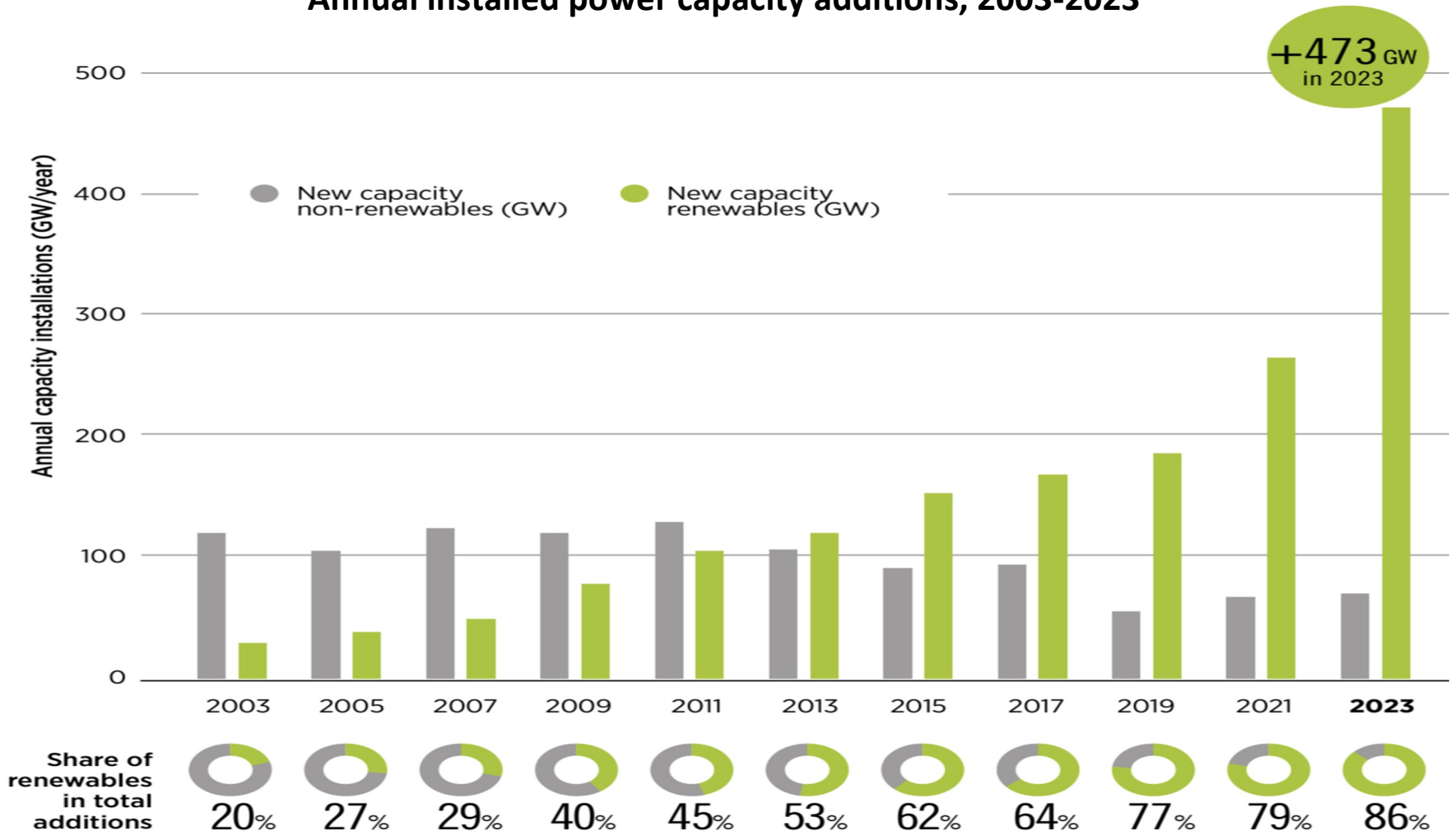
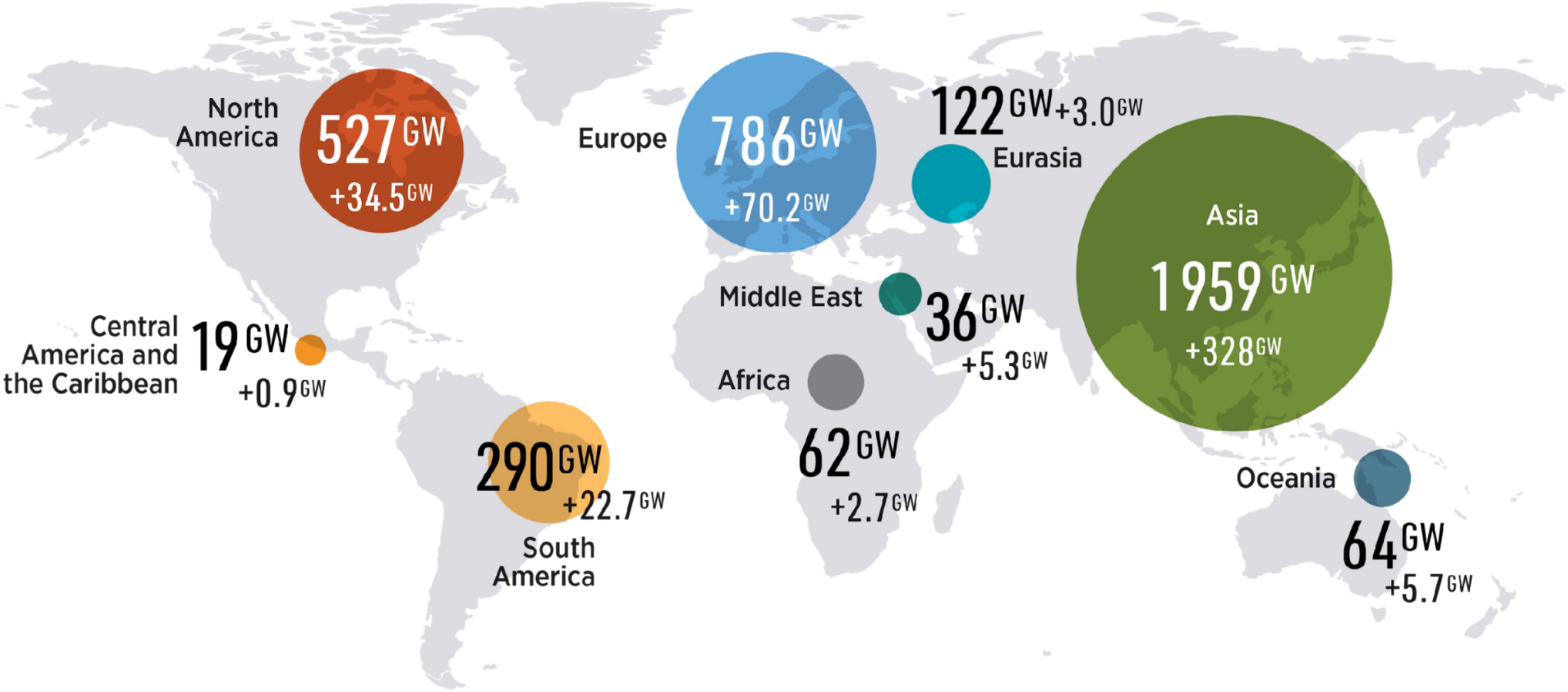
Annual installed power capacity additions, 2003-2023



Renewable power capacity by region and additions in 2023



Critical Minerals mining and refining supply forecasts in 2030

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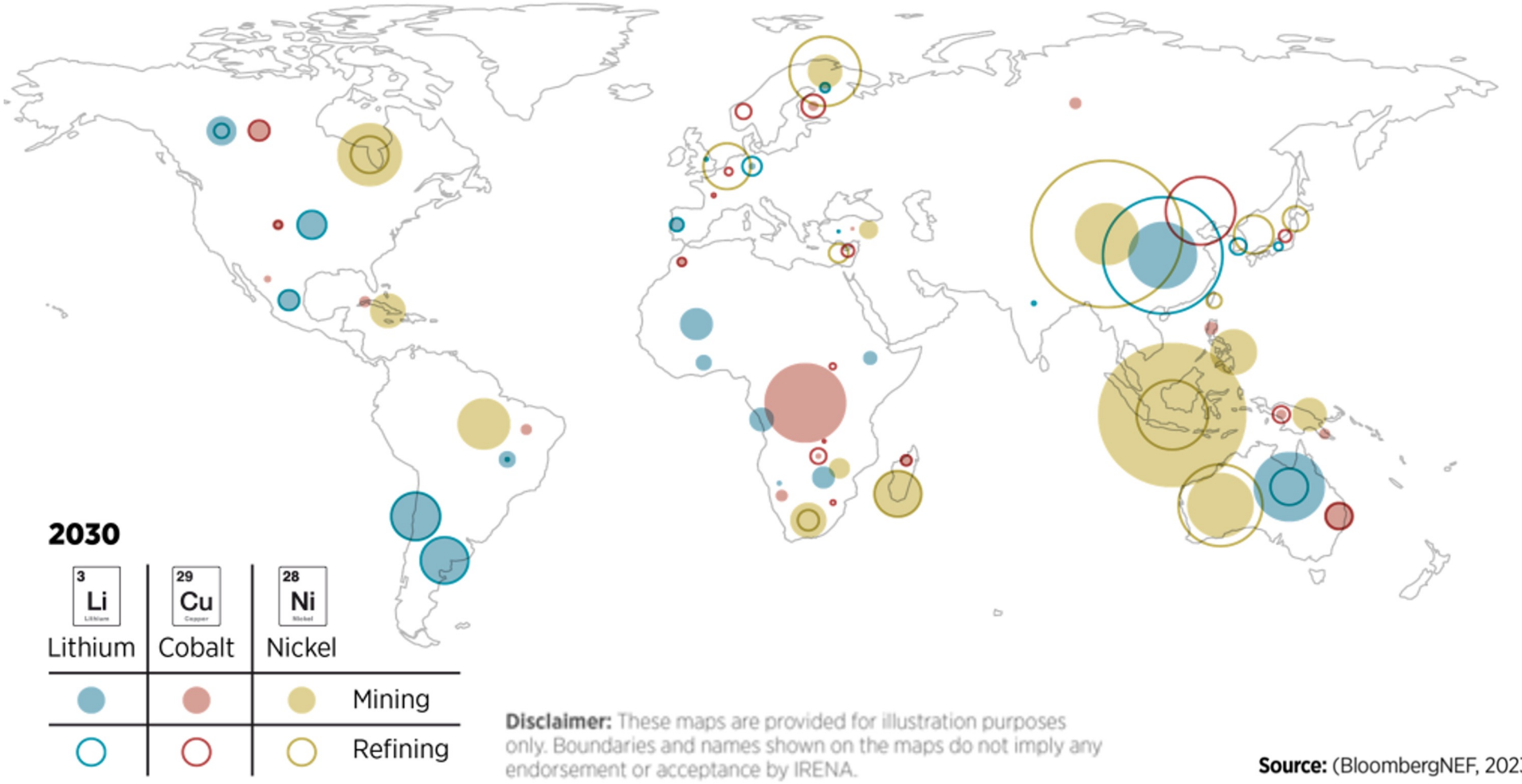

Disclaimer: These maps are provided for illustration purposes only. Boundaries and names shown on the maps do not imply any endorsement or acceptance by IRENA.

Source: (BloombergNEF, 2023).

In the long-term, the availability of resources in not a constraint for the energy transition

Comparison of the estimated 2030 demand for selected critical materials with the estimated identified resources

Material	Estimated annual demand in 2030 (Mt/year)	Estimated Resources (Mt)	Resource-to-Annual Demand Ratio
Lithium	1.7 – 2.3	560	240 - 330
Cobalt	0.24 – 0.39	25	65 – 105
Graphite	6.5 – 7.4	800	1110 – 1200
Nickel	3.9 – 4.7	350	75 – 90
Copper	31.3 – 38.1	2,100	55 - 70
Phosphorous	28.2 – 29.2	30,000	1,030 – 1,060
Manganese	22.5 – 26.0	17,000	660 - 760

Source: Estimated resources based on (HAIM`an, 2023; USGS, 2024).

However, **efforts are needed** to mitigate **supply risks,** and to timely and effectively **scale up production** to meet growing demand in the **short-to-medium term.**

Key geopolitical risks to the supply of materials

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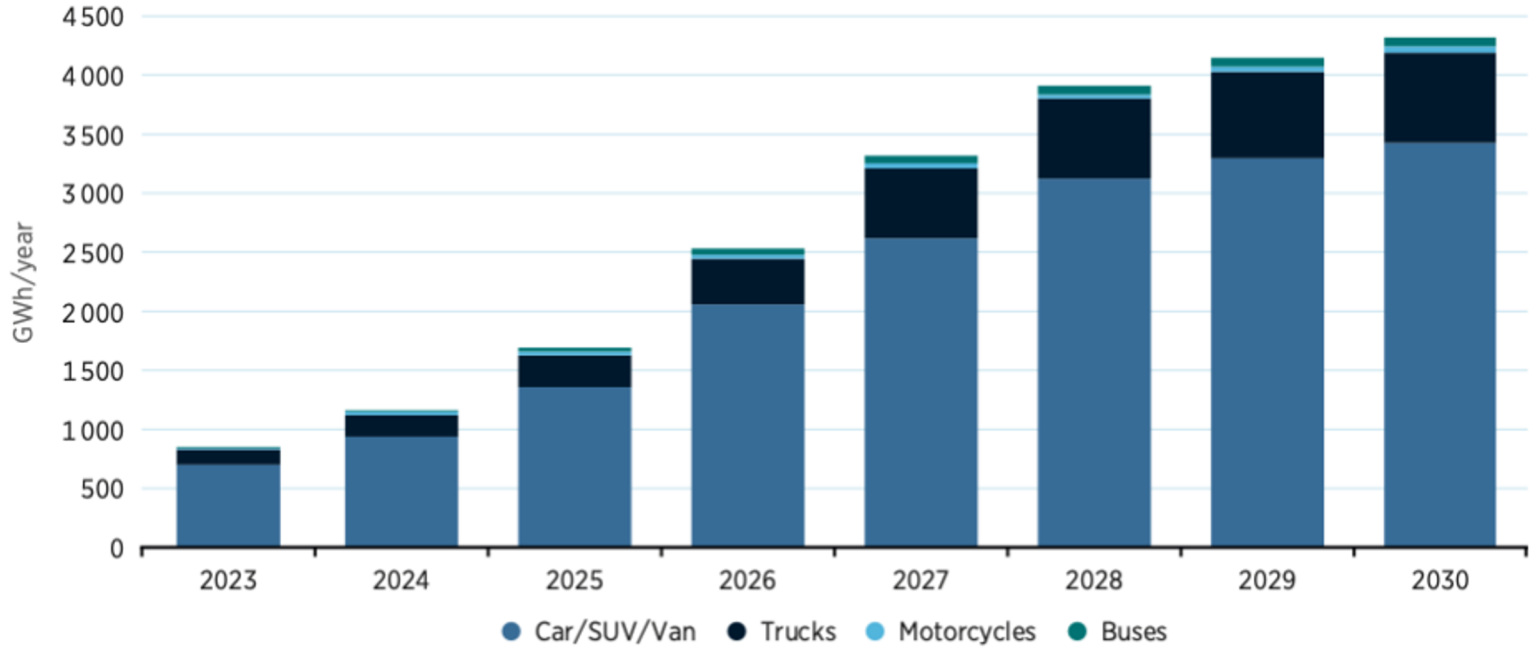
EV battery production needs to grow five-fold by 2030



Notes: Includes battery EVs and plug-in hybrid EVs. GWh = gigawatt hour; SUV = sports utility vehicle.

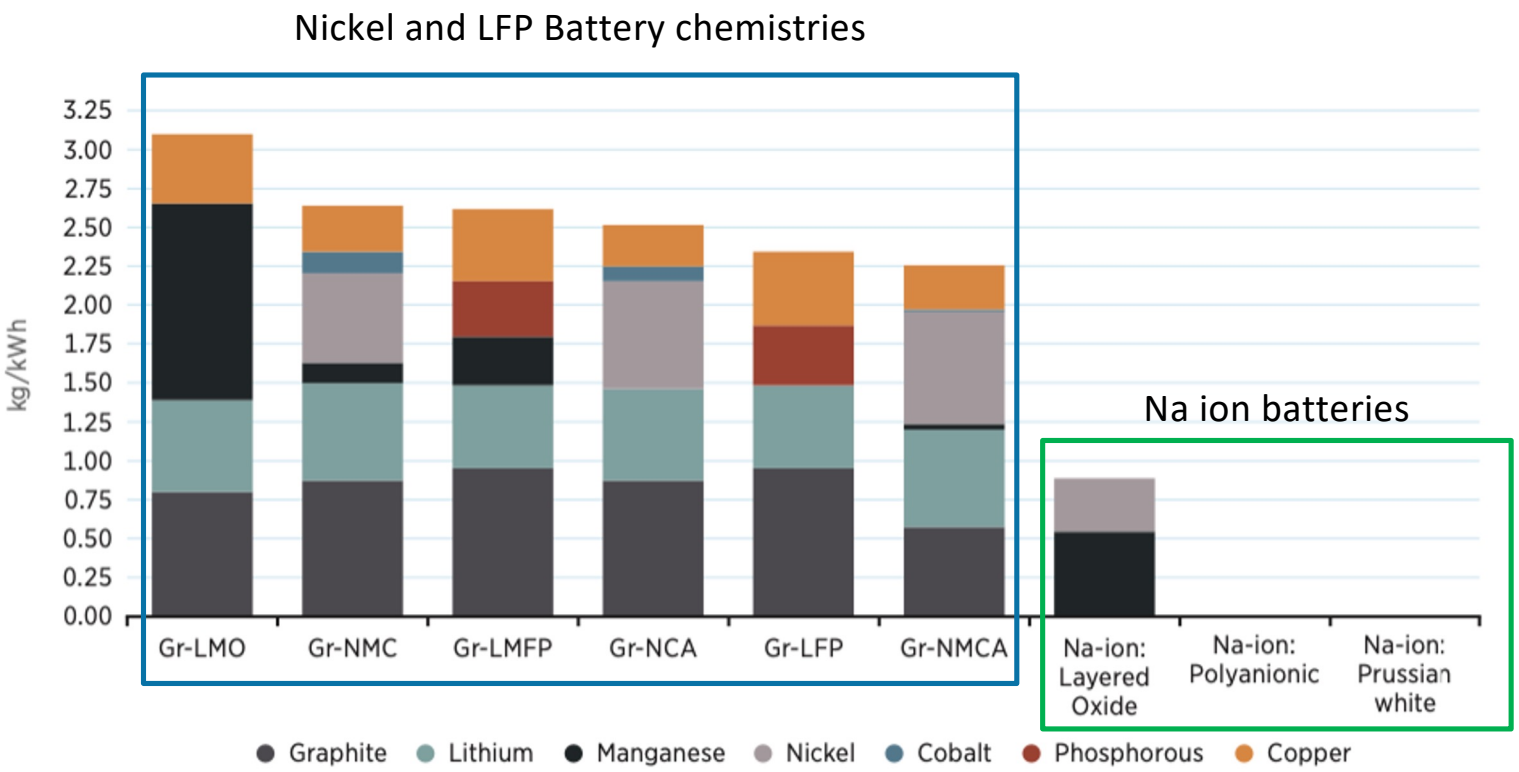
EV battery demand In IRENA's 1.5°C Scenario:

4,300 GWh per year by **2030**.

Staying aligned with **IRENA's 1.5°C Scenario** would require global EV sales to continue growing to about **60 million** passenger vehicles per year by 2030.

Source: (IRENA, 2024)

Innovation reduces the need for critical materials



- Lithium iron phosphate type batteries (LFP) which are becoming dominant can be produced without nickel or cobalt.
- Sodium-ion batteries could be adopted in the near future for some market segments and can be produced with minimal to no use of critical materials

Based on: Argonne National Laboratory (2022, 2024), Bernstein (2021) and Maisel *et al.* (2023).

Source: (IRENA, 2024)

Securing inclusive supply of critical materials

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Source: (IRENA, 2024)

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Thank you for your attention!