

Energy Transition or Reset ?



Mark P. Mills

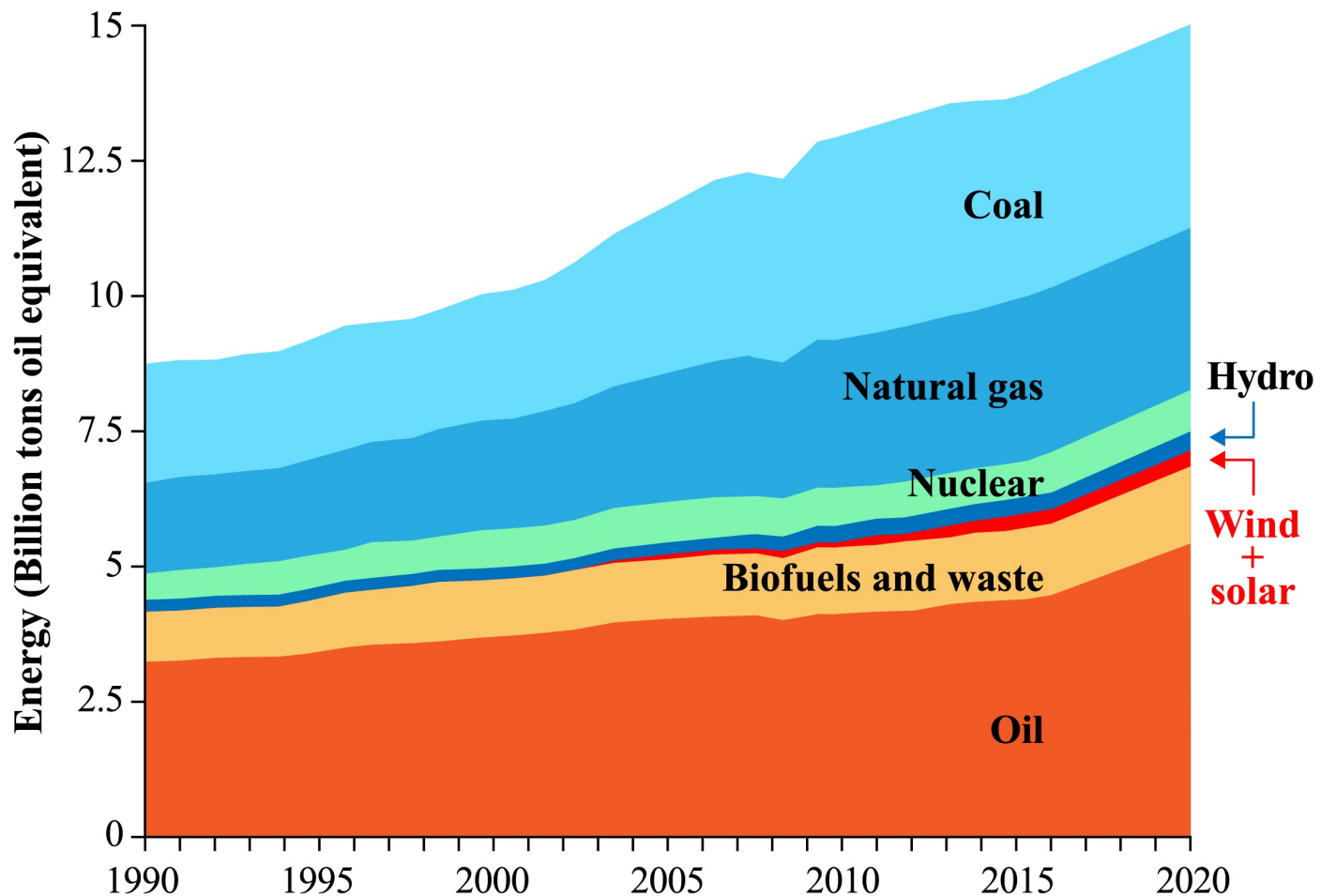
Senior Fellow, Manhattan Institute for Policy Research

Partner, Montrose Lane Ventures

Faculty Fellow, Northwestern University McCormick School of Engineering

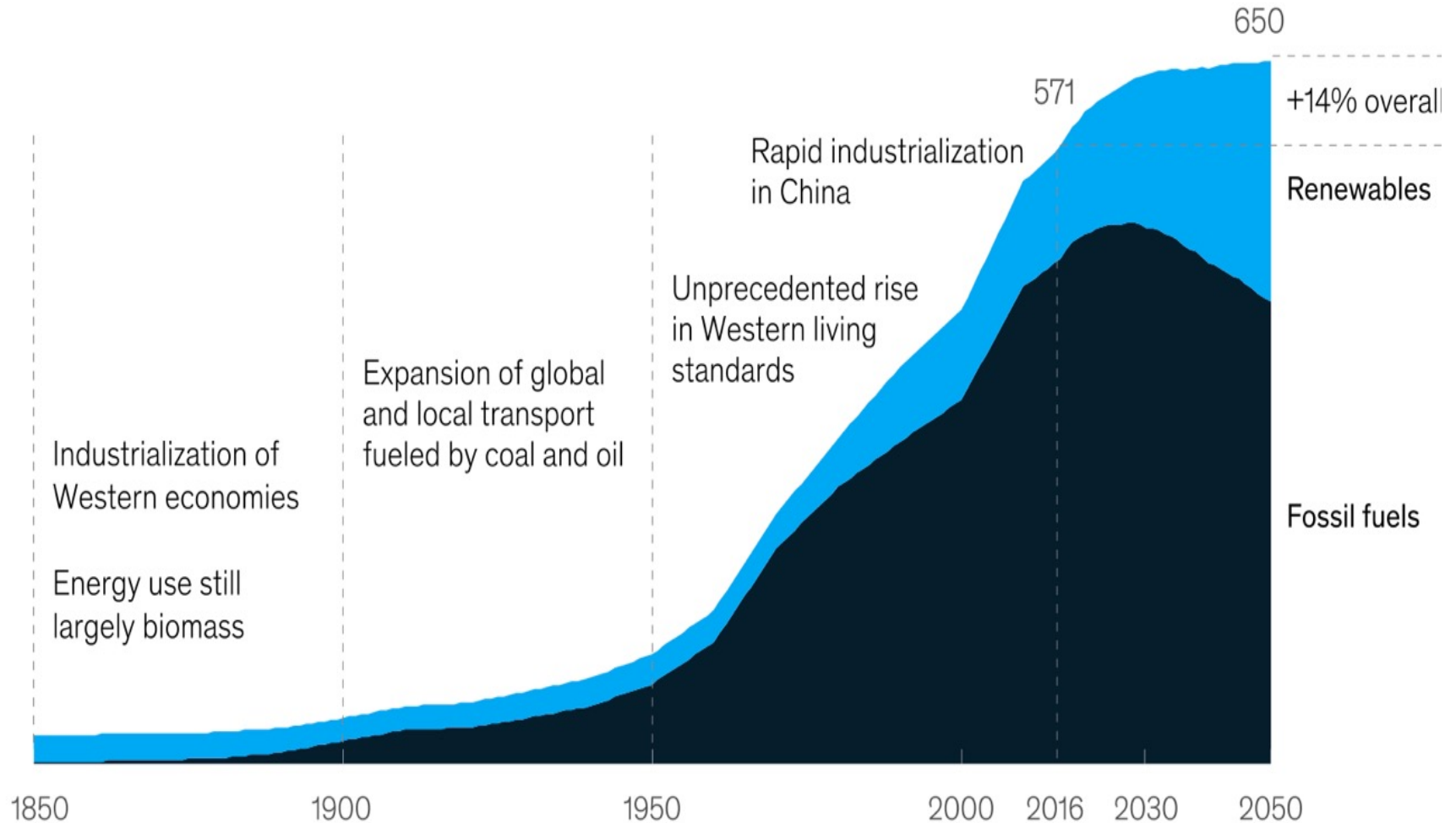
Reality Check: Transition Are Very Slow

2022:	World	U.S.
Wind + Solar	3%	4%
Wood	10%	2%



Reality Check: Transition Aspirations

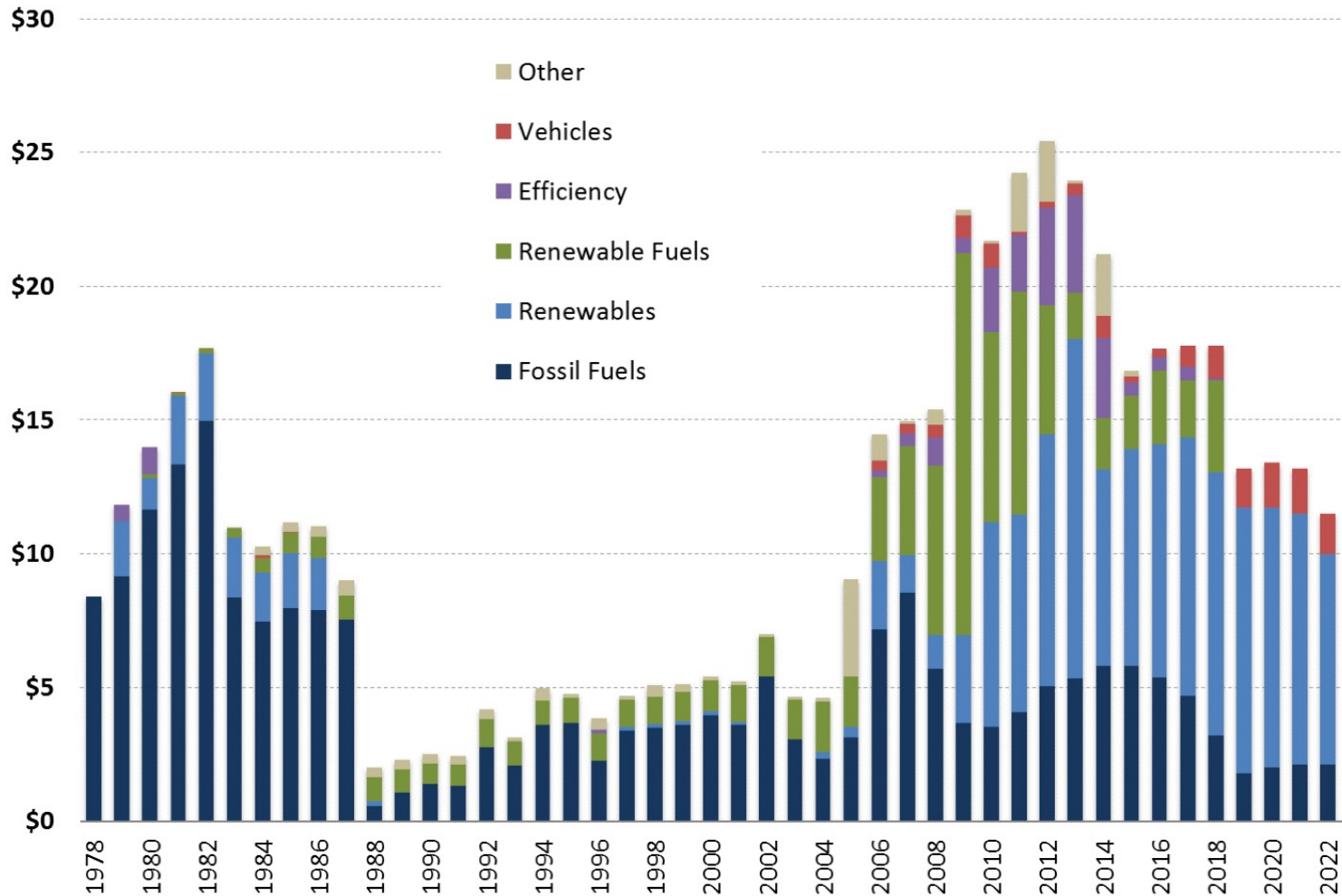
Who supplies the 66%?



IRA: “Christmas For Climate Tech”

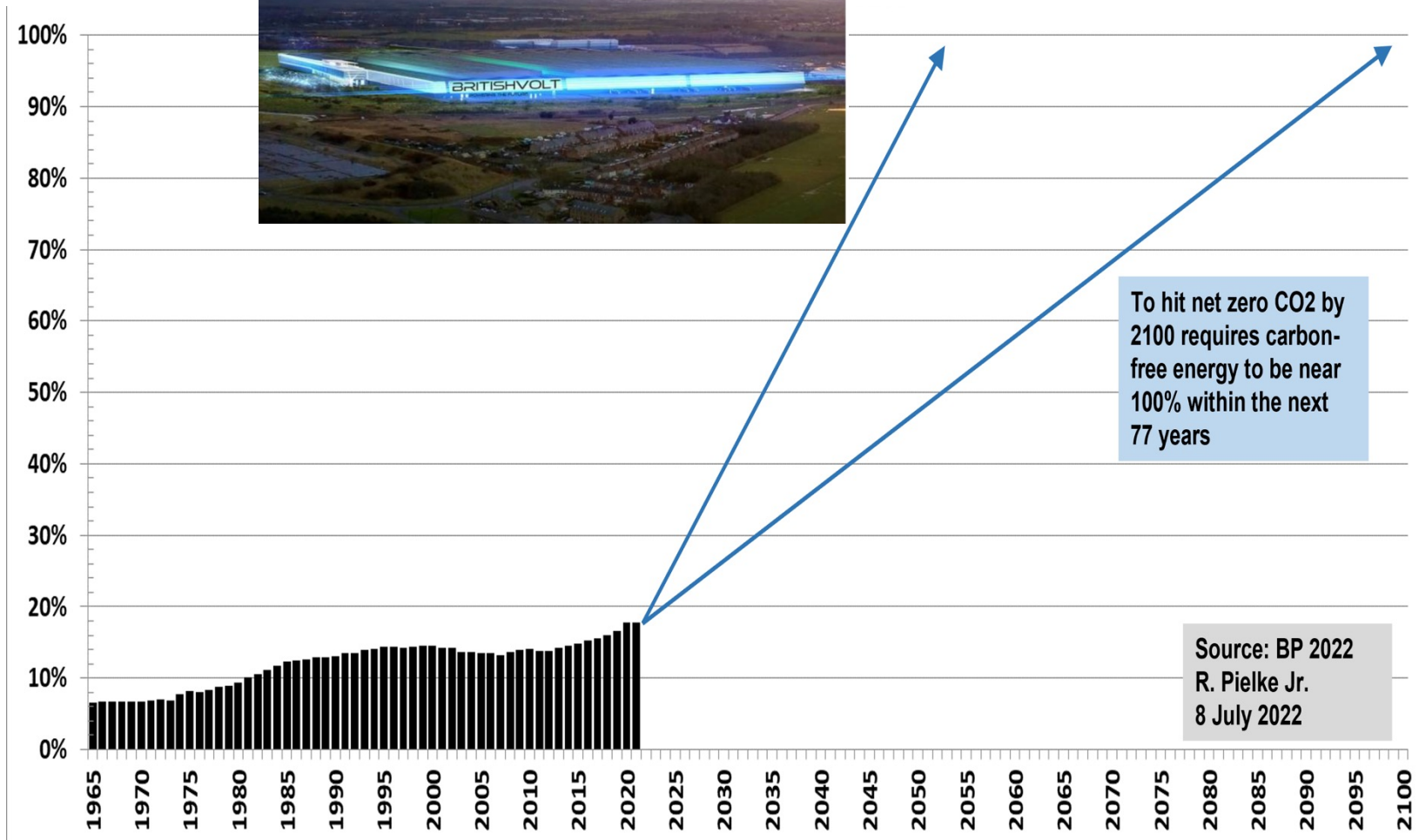
IRA → 300%/yr jump in green spending

Billions of 2018 Dollars



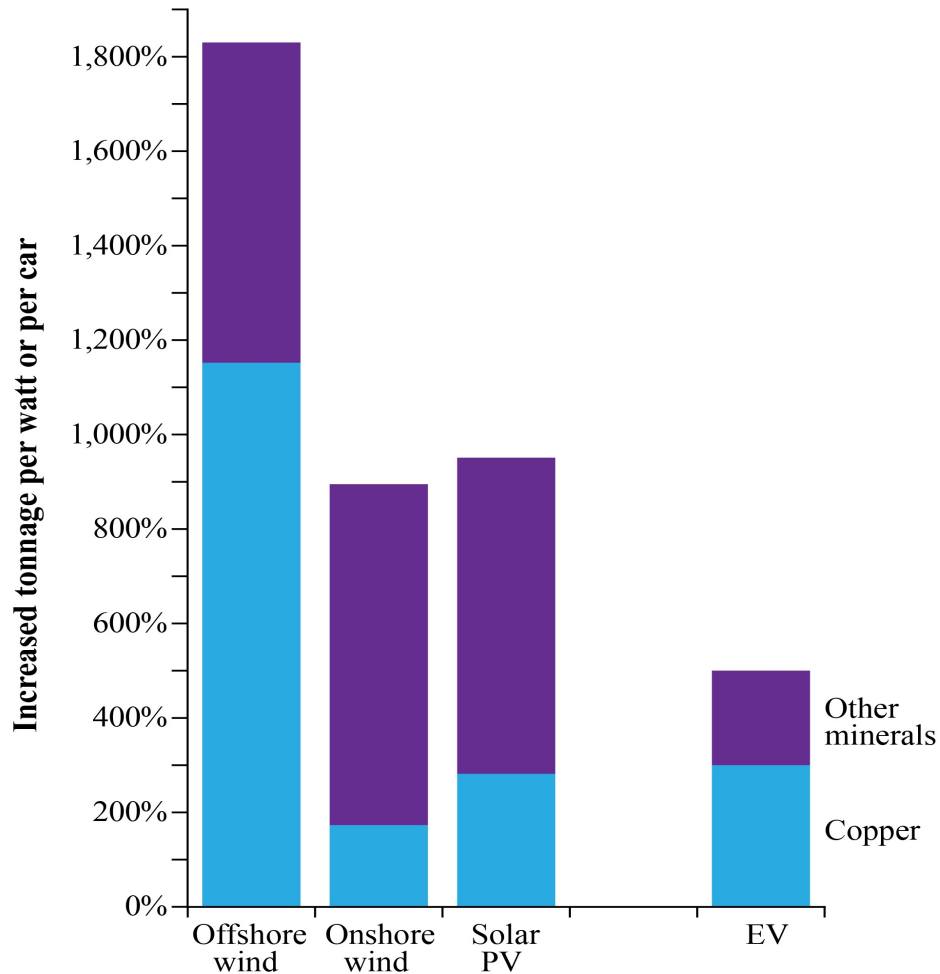
Transition: Velocity Problem

Share global energy carbon free

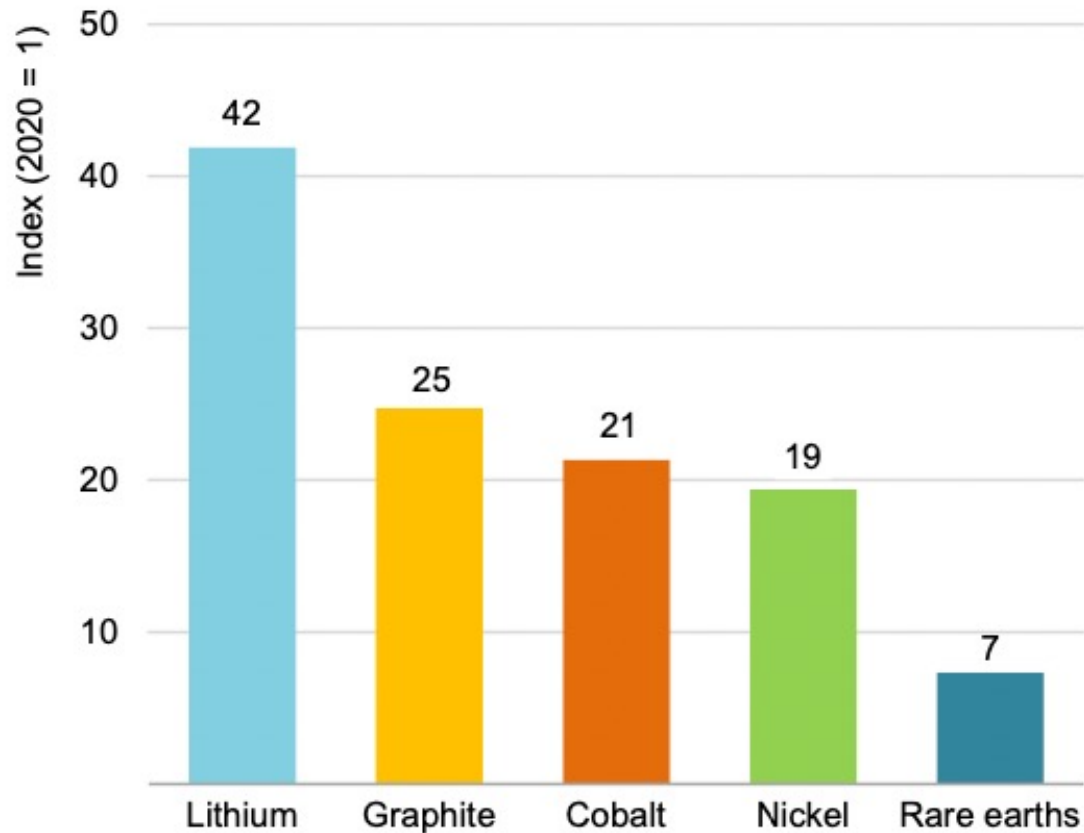


Minerals: Unprecedented Shift to Mining

➤ 1,000% minerals & metals
1 car battery @ 1000 lbs → 500,000 lbs materials mined

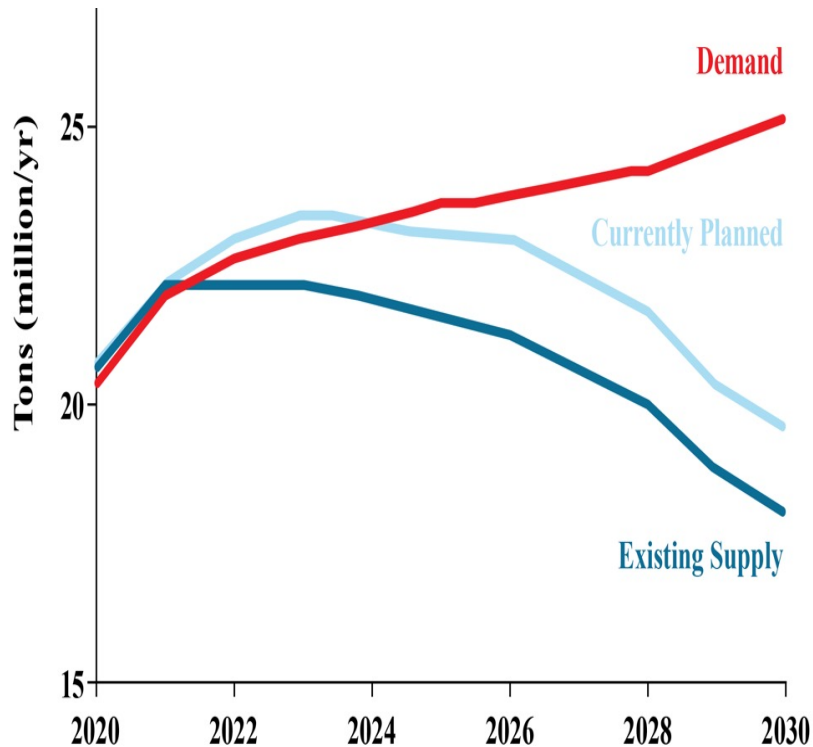


Transition Minerals: Demands by 2040



IEA: 100s of New Mines Needed

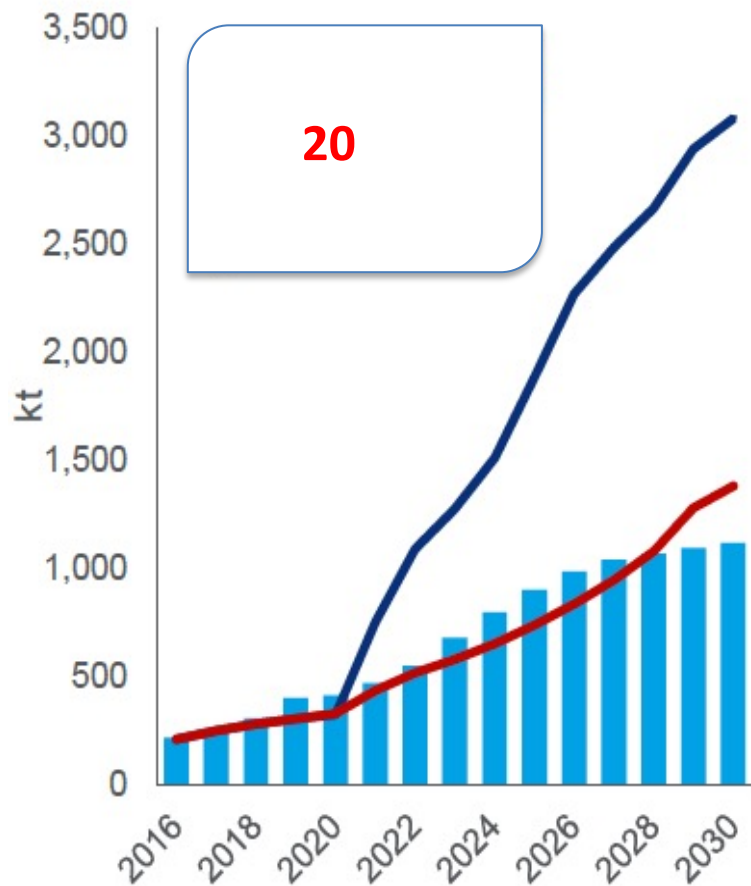
16 years avg. to open new mine
Coal mining capex >> all minerals combined



World's biggest **copper** mine
Escondida, Chile



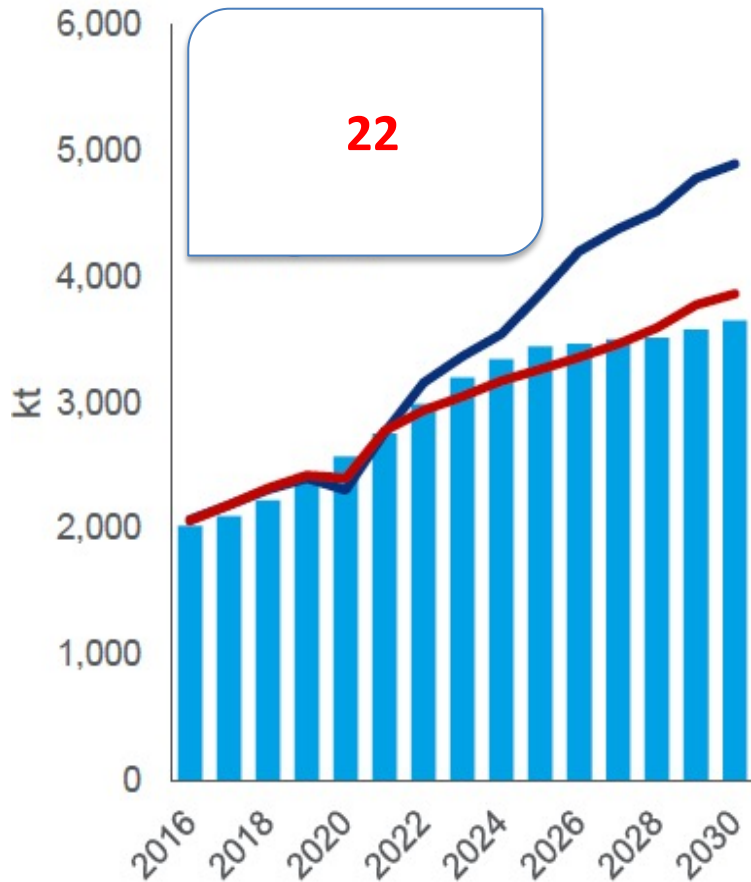
Lithium at OPEC Scale



**World's biggest mine
Greenbushes, Busselton, West Australia**



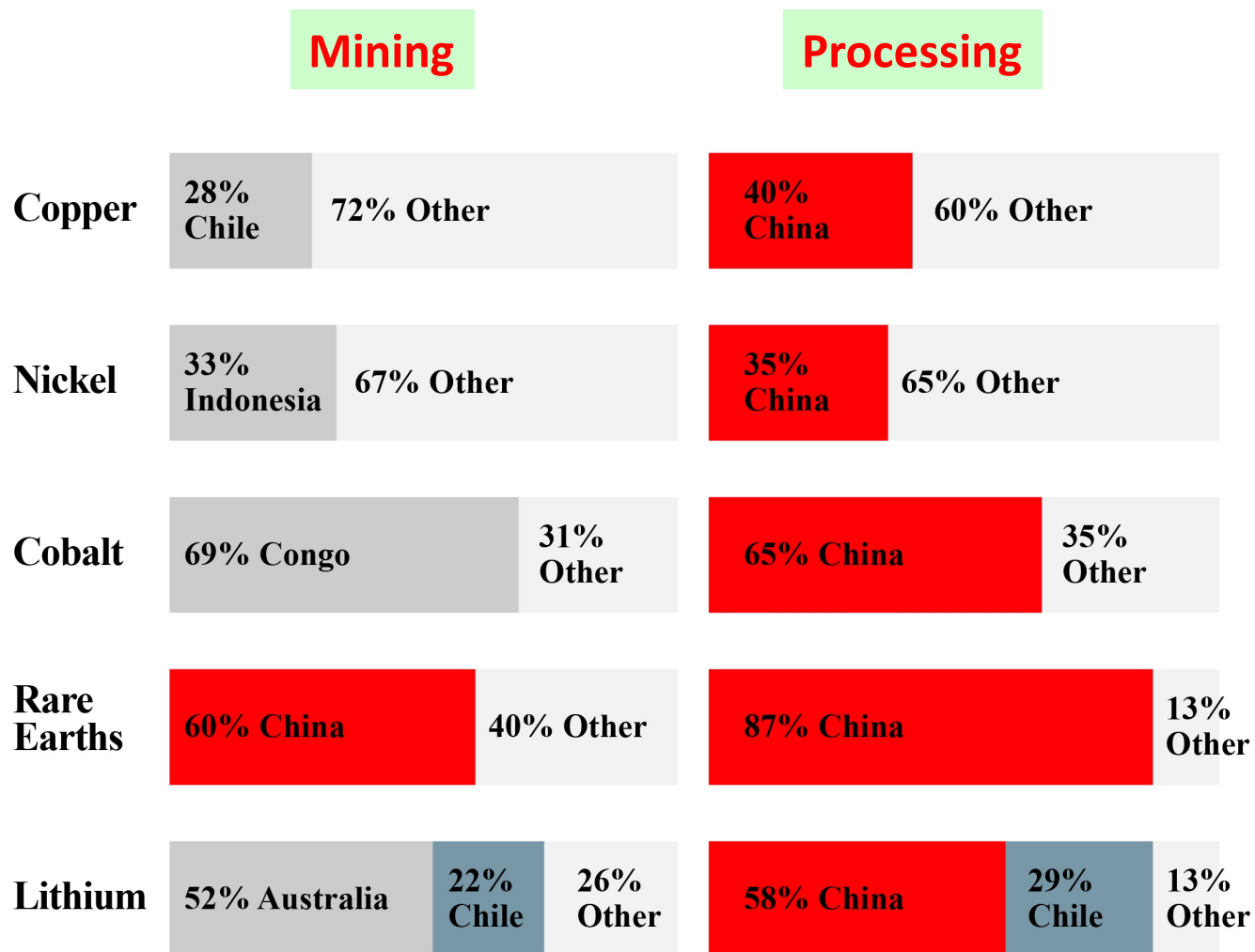
Nickel at OPEC Scale



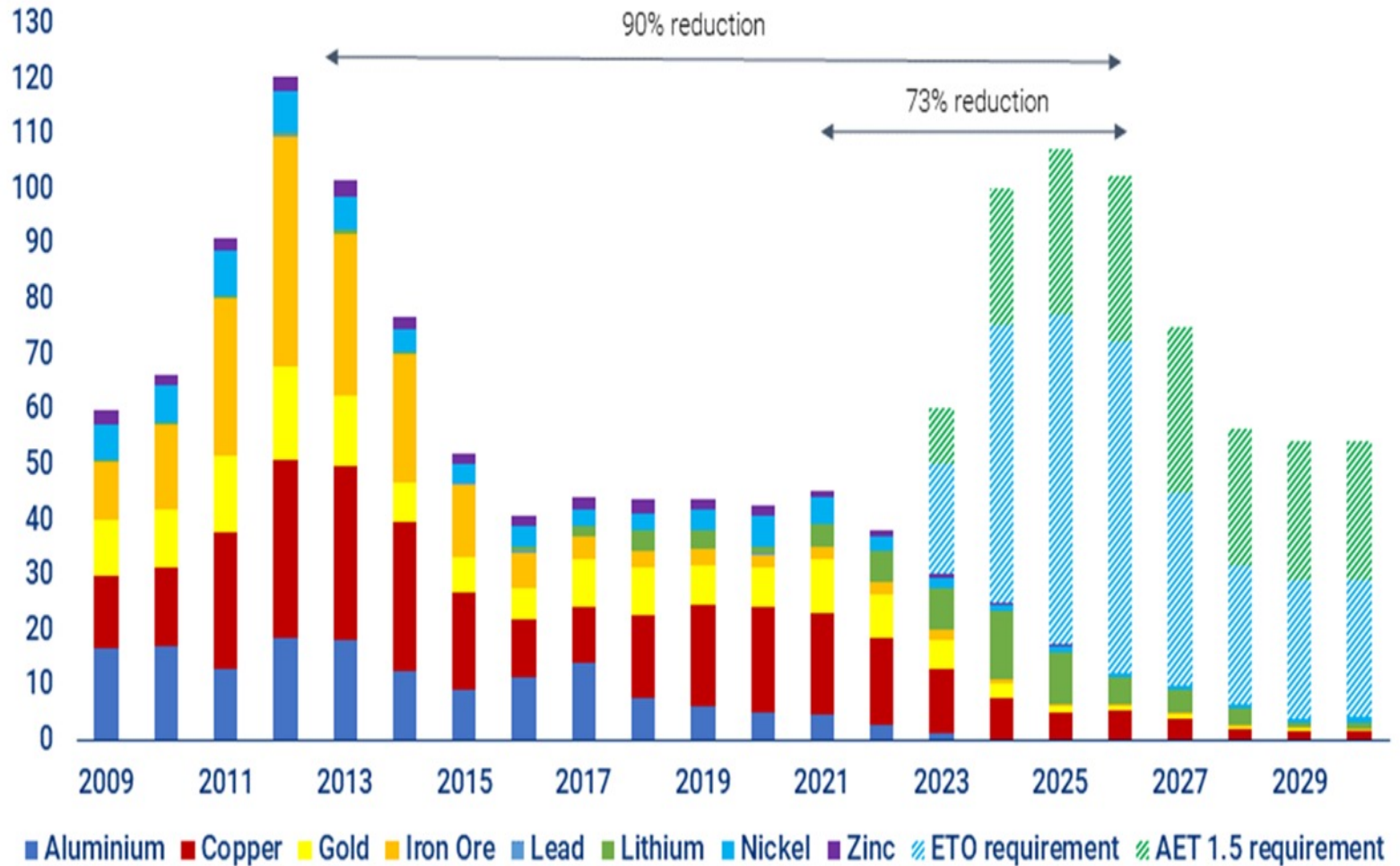
World's biggest mine
Sorowako, South Sulawesi, Indonesia



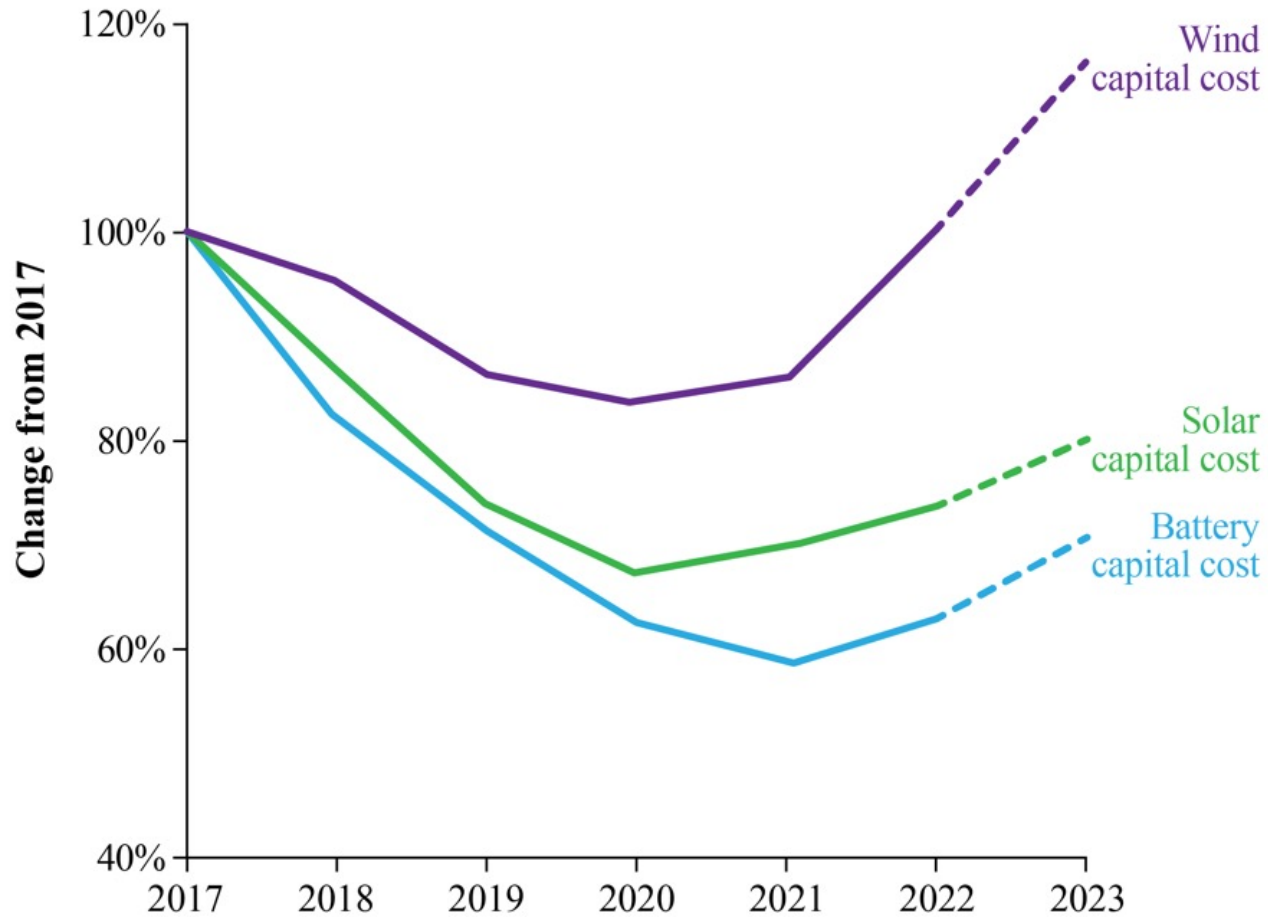
Supply Chain: China, OPEC of Energy Minerals



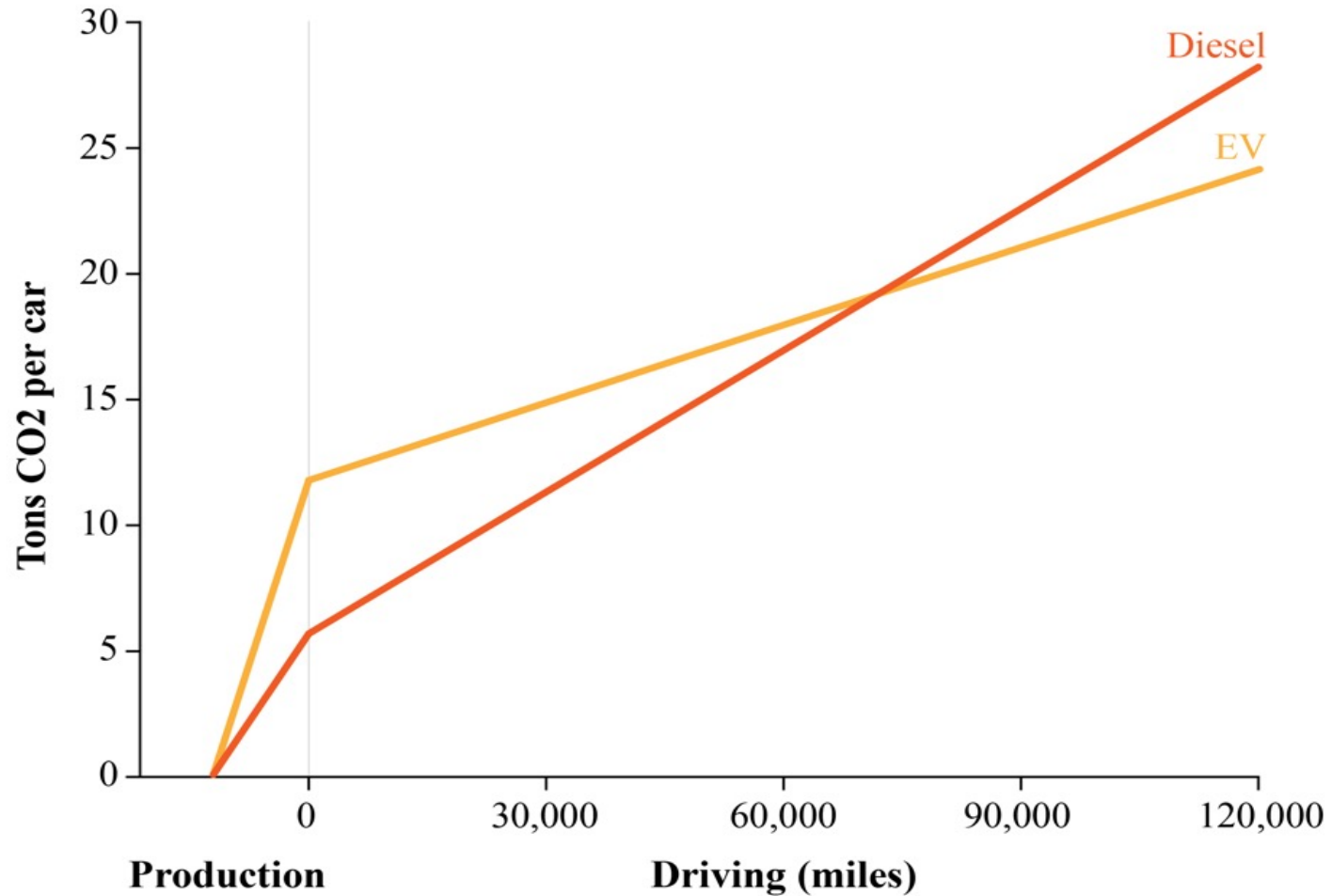
Global Mining CapEx: Planned & Needed



Green Machines Costs *Rising*

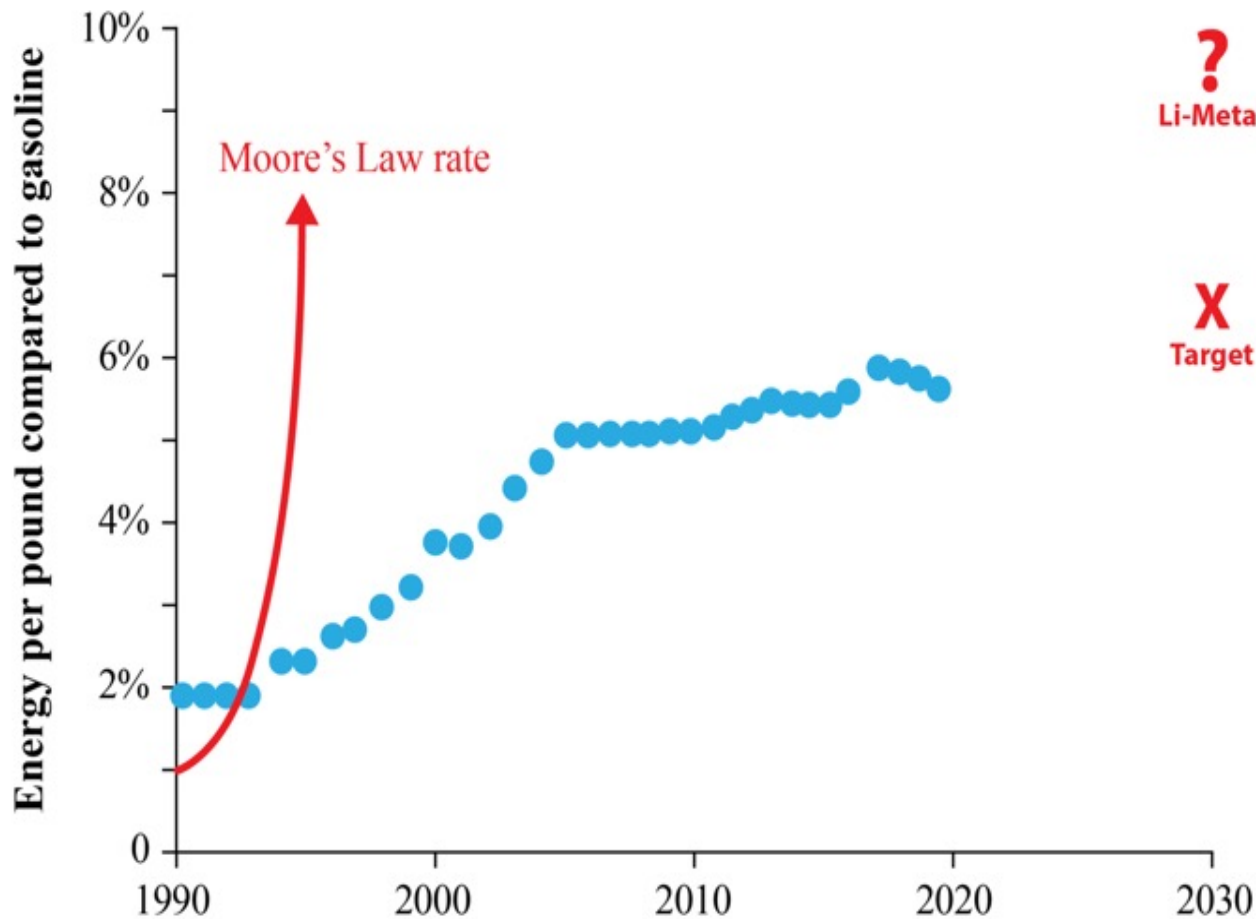


Reality Check: Carbon Intensive Batteries



Future Battery Tech: Hyperbole vs Physics

“[Clean-tech] 10x exponential process ...will wipe fossil fuels off the market in about a decade.” *Tony Seba, Stanford*



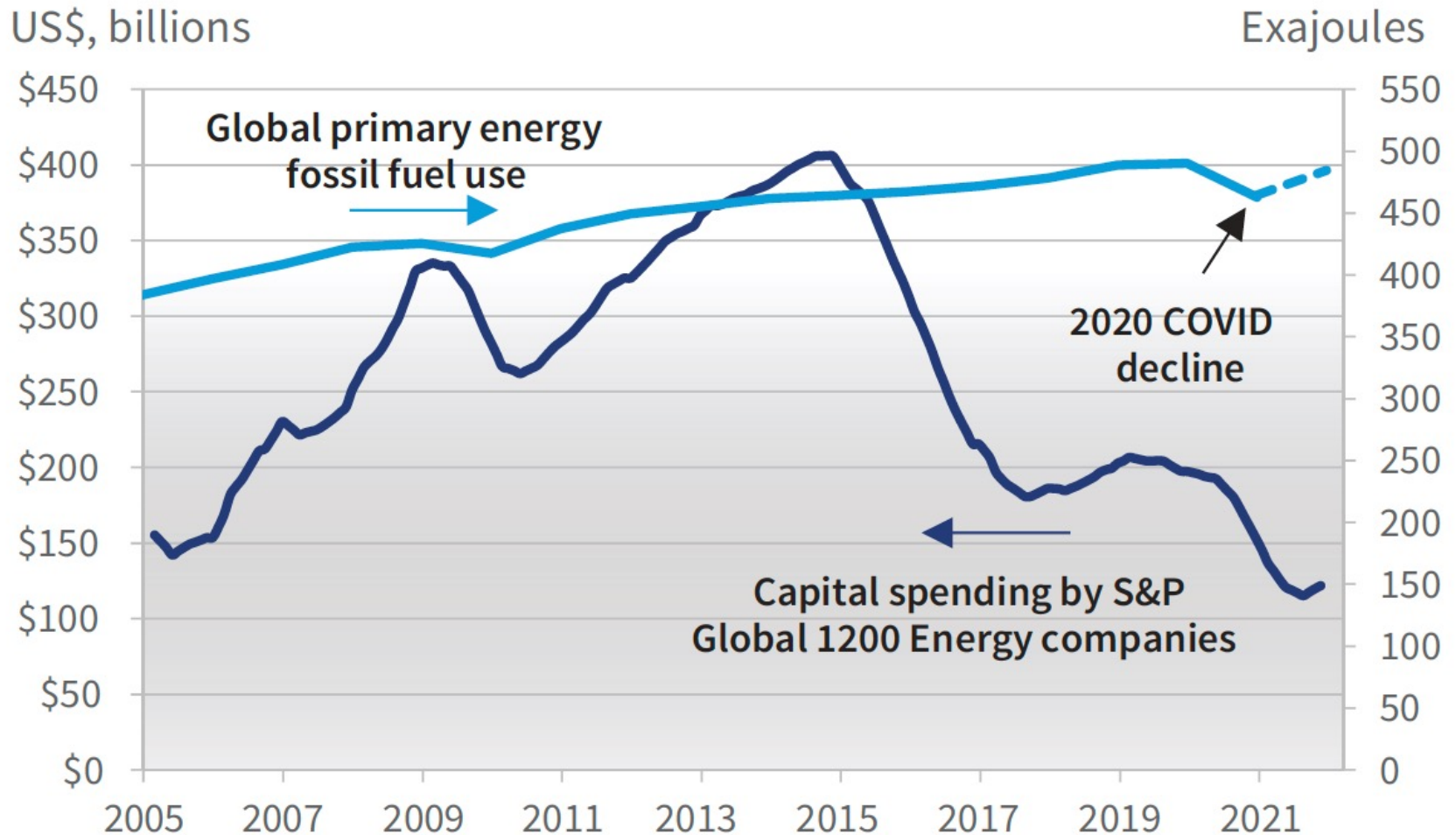
Reality Check: Russia X-Rays Supply Chains

Russia: Natural gas **17%** & oil **12%**
1 LNG ship = 4 million Teslas



Lost Velocity: Global Oil & Gas CapEx

Hydrocarbons Still **84%** global energy

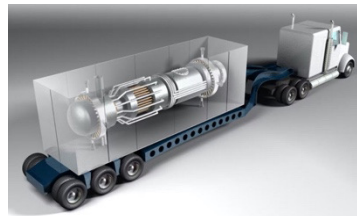


What's Really New ?

Silicon Carbide & Hybrids



Digital Oilfields Fast Offshore & Small Nukes



Robo-labor

