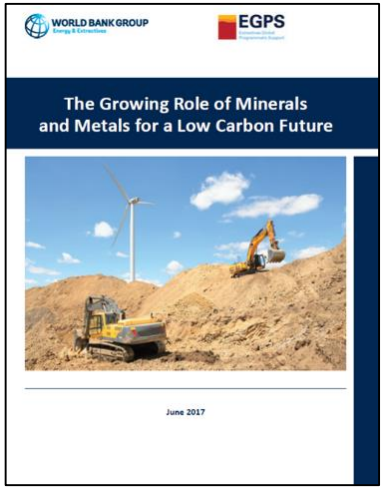
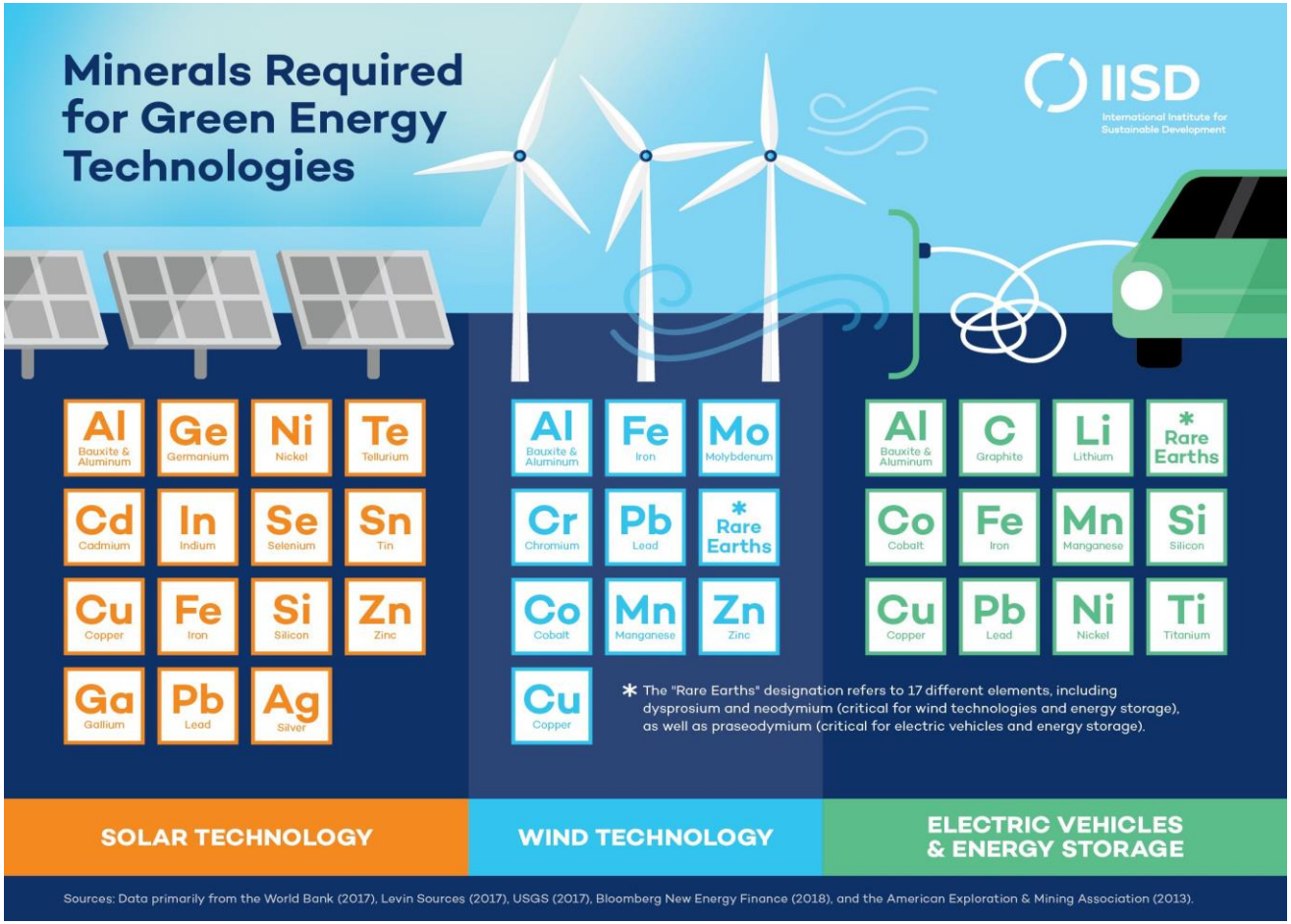
INTRODUCING ‘CLIMATE-SMART MINING’

WHERE WE STARTED: THE GROWING ROLE OF MINERALS AND METALS FOR A LOW-CARBON FUTURE (2017)

In June 2017, the World Bank released the report '*The Growing Role Minerals and Metals for a Low Carbon Future*' and concluded that a **low-carbon future would be very *mineral intensive***.

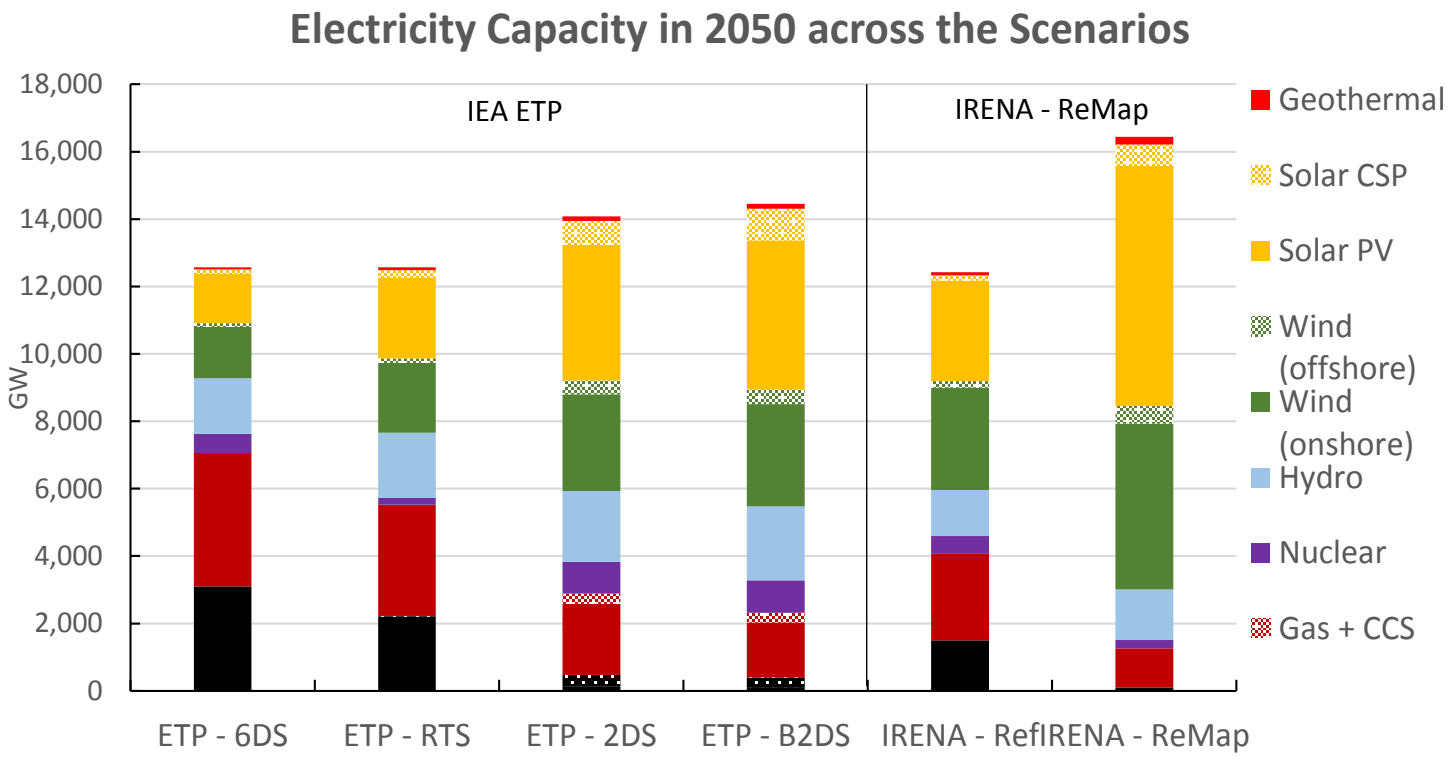




WITHOUT MINERALS, A LOW-CARBON FUTURE WOULD SIMPLY NOT BE POSSIBLE...

Reaching the Paris Agreement will require increased electrical capacity from low-carbon technologies

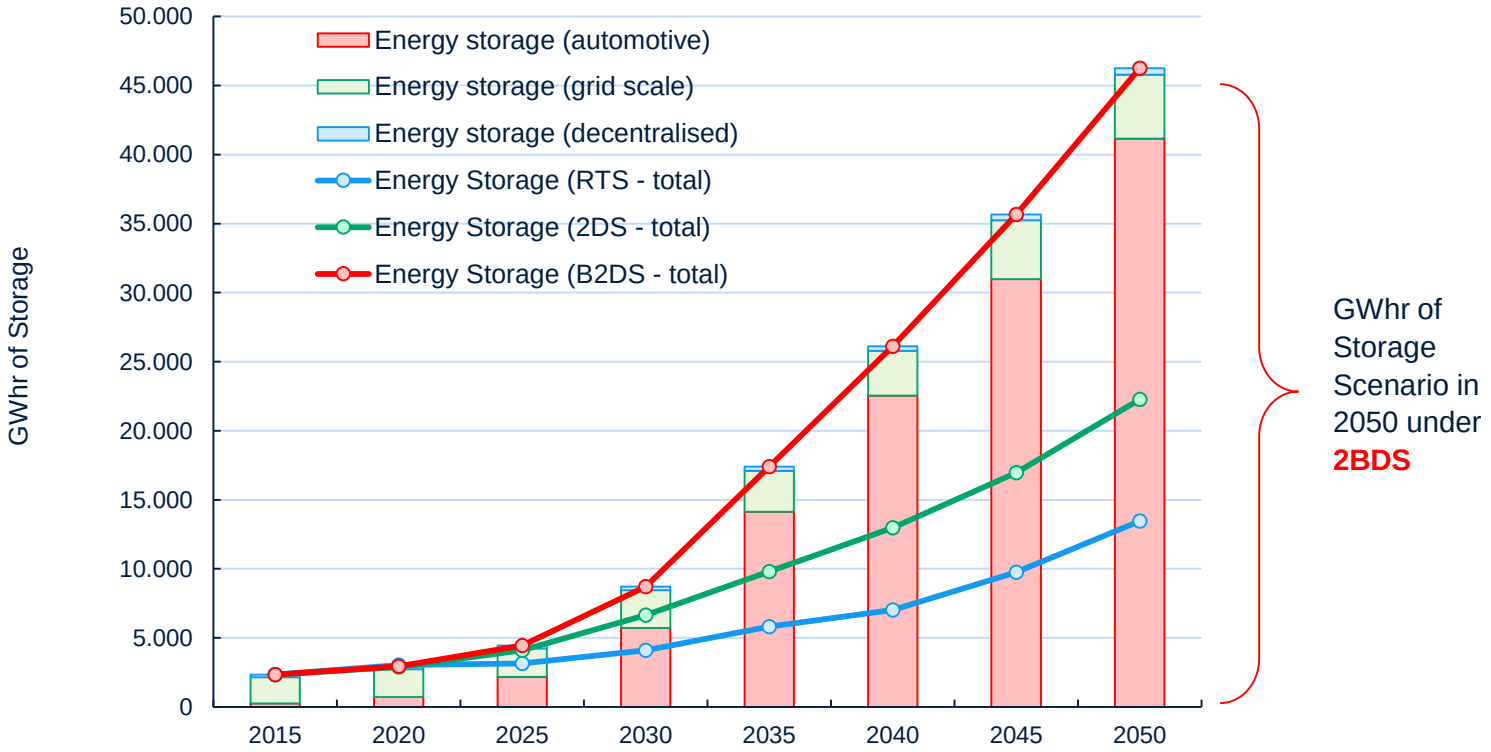
The International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA) have different scenarios on electricity capacity in 2050.



MINERALS ESSENTIAL FOR A LOW-CARBON FUTURE

Reaching the **Paris Agreement**'s long-term goal of 1.5 – 2°C will require rapidly growing energy storage capacity

Energy Storage Scenarios by Application to 2050

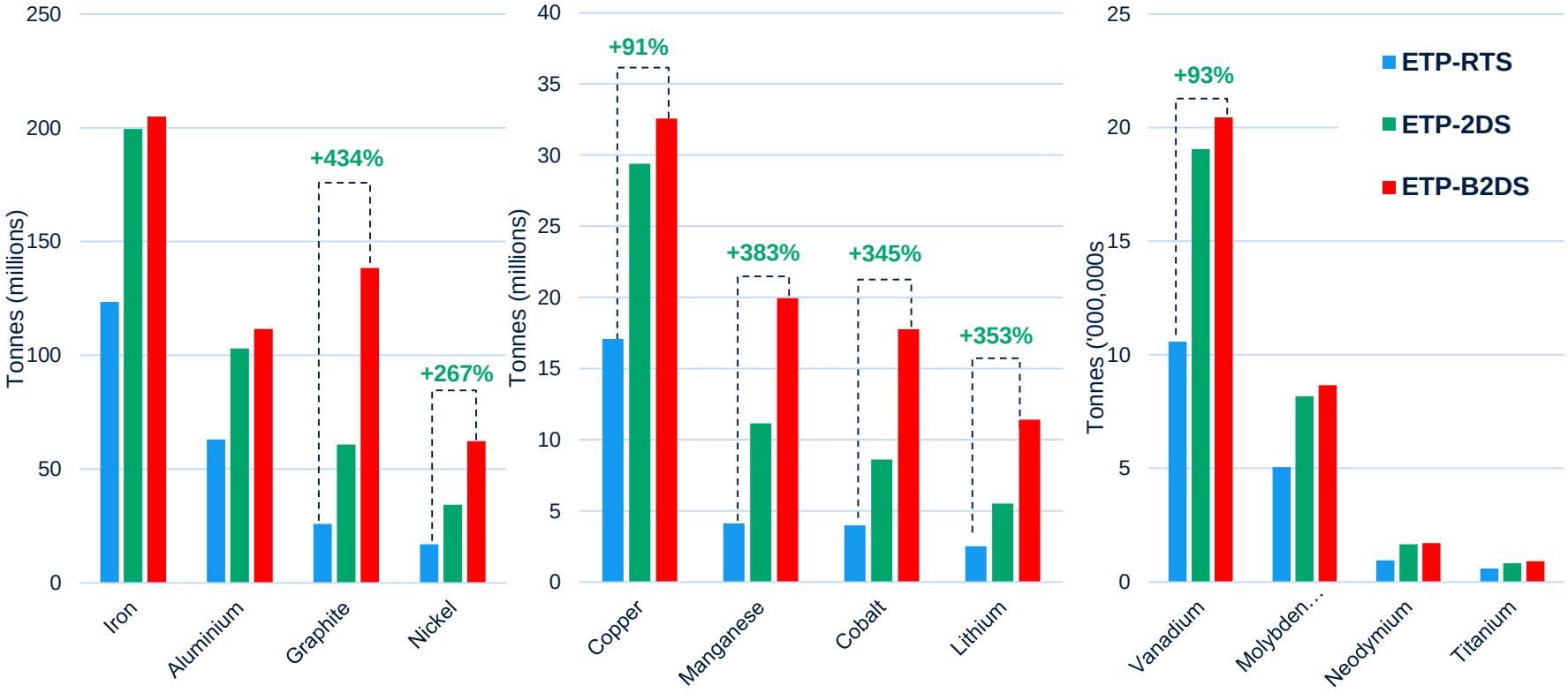


- ETP-RTS: Scenario based on existing Paris Agreement Commitments (2.6°C – 3.1°C)
- ETP-2DS: Scenario where there is at least a 50% chance of limiting the avg. global temperature increase to 2°C by 2100
- ETP-B2DS: Scenario where there is at least a 50% chance of limiting avg. future temperature increases to 1.75°C

New research (2018): Minerals Still Essential for a Low-Carbon Future

Greater ambition in **Greenhouse Gas (GHG) reductions** leads to **greater demand** for a wide range of **minerals and metals**.

Total Mineral Demand from Power Generation Tech & Energy Storage to 2050 *(only)*



Source: International Energy Agency, Energy Technology Perspective (ETP) 2017, World Bank Analysis (preliminary results from Sep. 2018)

- ETP-RTS: Scenario based on existing Paris Agreement Commitments (2.6°C – 3.1°C)
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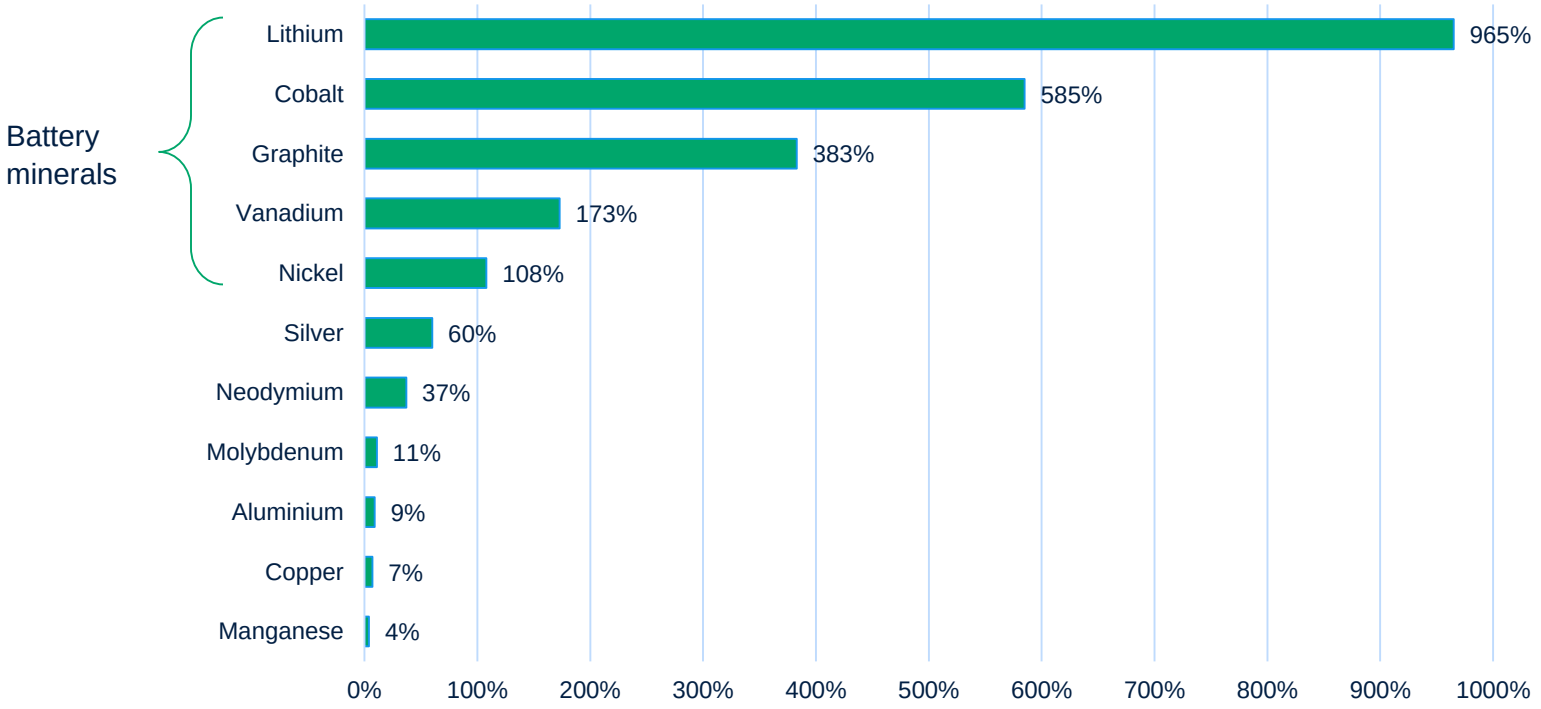
NEW RESEARCH (2018): MINERALS STILL ESSENTIAL FOR A LOW-CARBON FUTURE (II)

Under a **2-degree scenario (2DS)**, the **overall mineral demand** from energy technologies is expected to be significant for **certain minerals and metals in 2050**, particularly minerals used in battery technology.

Projected Annual Demand from Energy Technologies in 2050 (2DS)

(Percentage of 2017 Annual Production)

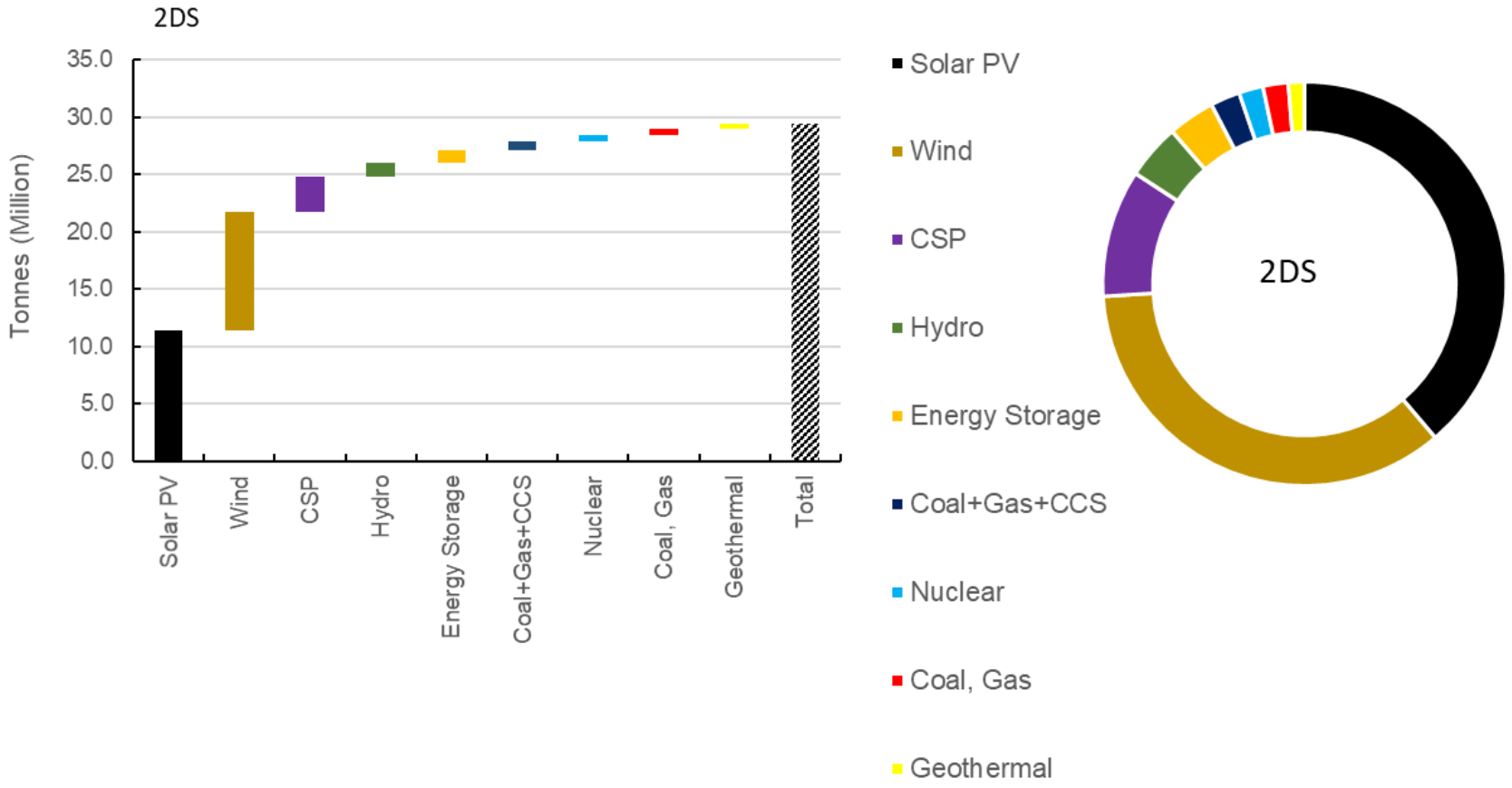


Source: International Energy Agency, Energy Technology Perspective (ETP) 2017, Deetman et all (2018), World Bank Analysis (2018)

- ETP-2DS: Scenario where there is at least a 50% chance of limiting the avg. global temperature increase to 2°C by 2100

EXAMPLE: COPPER DEMAND BY ENERGY TECHNOLOGY (IEA 2DS)

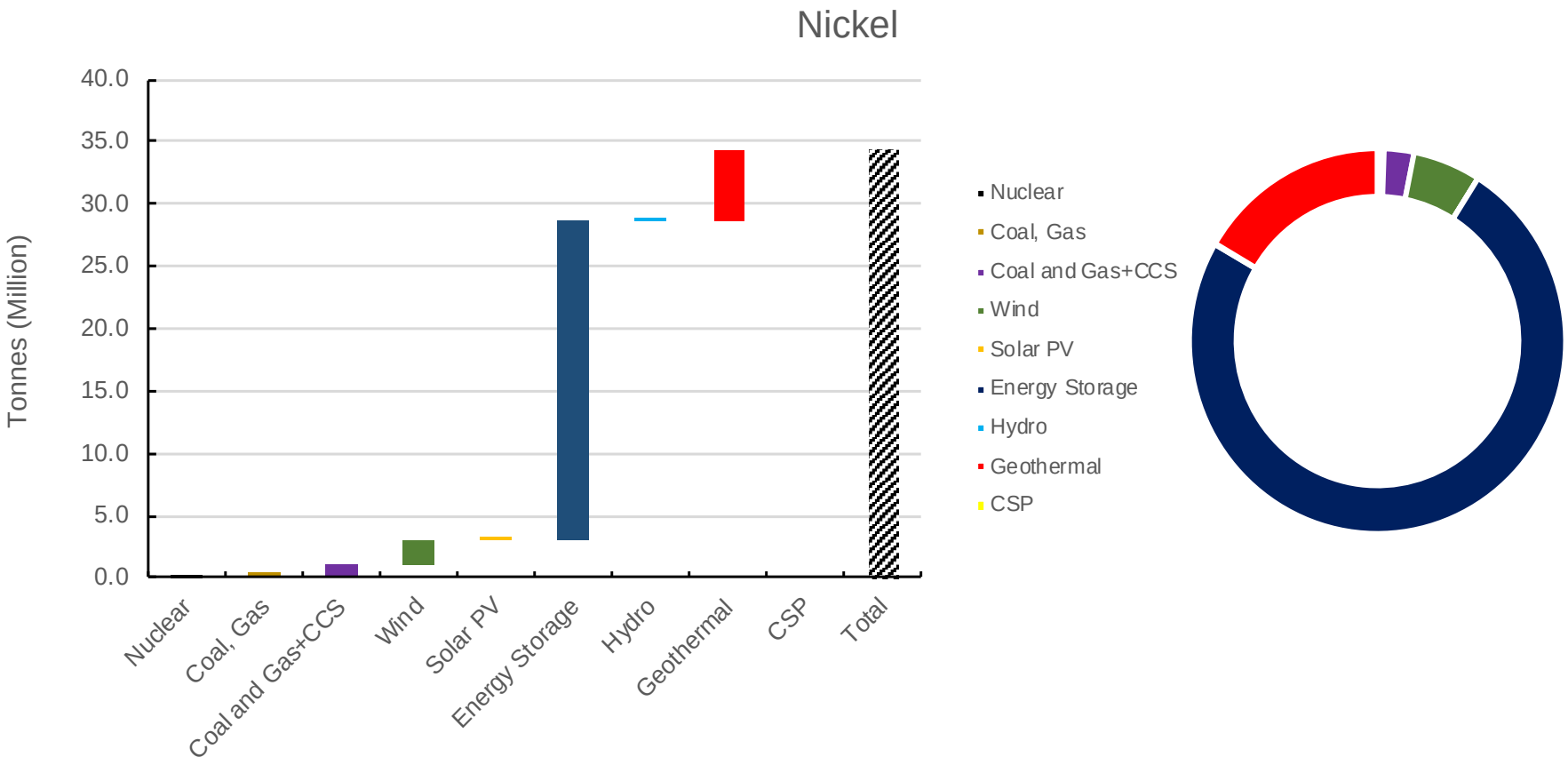
The **choice of pathway** to a low-carbon economy can dramatically impact which minerals and metals experience the greatest increase in demand.



Source: International Energy Agency, Energy Technology Perspective (ETP) 2017 (2DS), World Bank Analysis (2018)

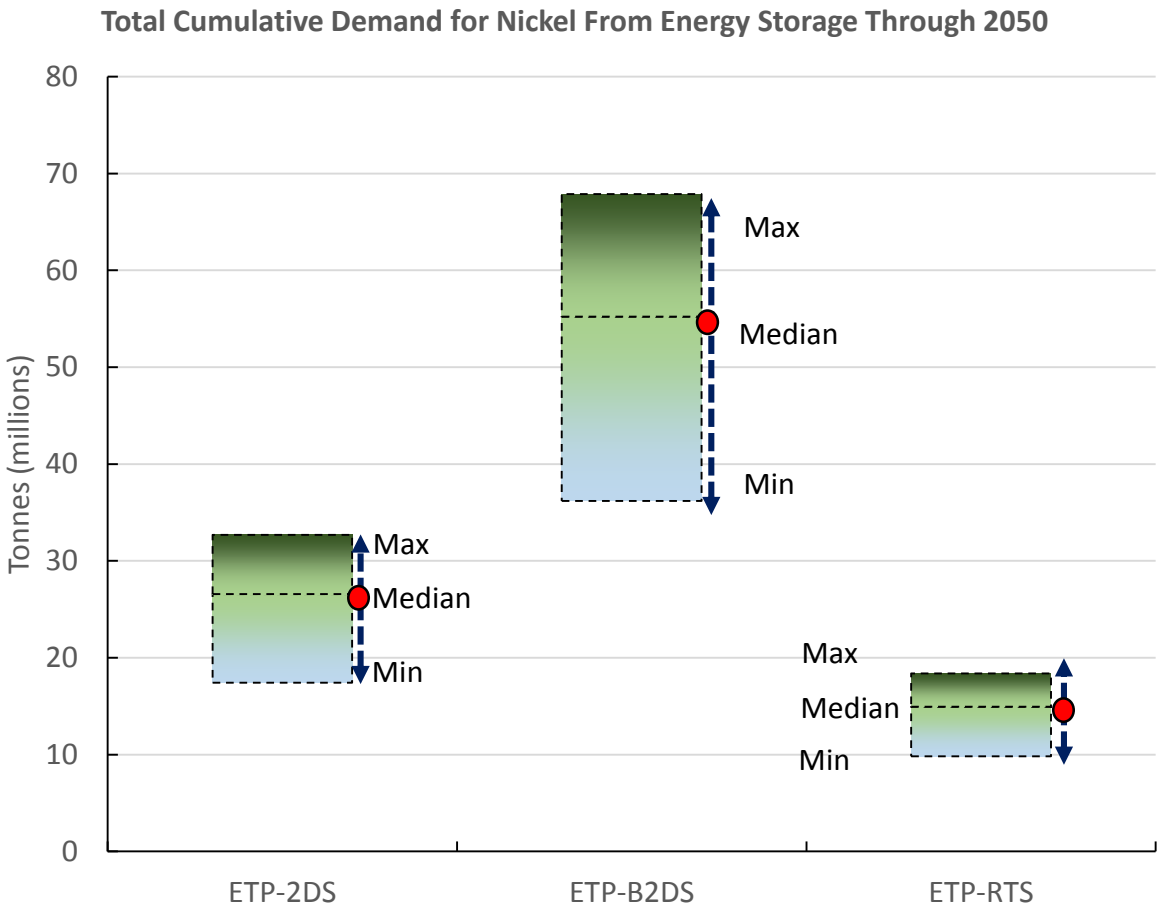
EXAMPLE: NICKEL DEMAND BY ENERGY TECHNOLOGY (IEA 2DS)

Some minerals will be required for a wide range of clean energy technologies, while others are only **required for one specific (sub) technology**.



Source: International Energy Agency, Energy Technology Perspective (ETP) 2017 (2DS), World Bank Analysis (2018)

UNCERTAINTY RANGES ARE SIGNIFICANT



Max – The maximum value is from Nickel Manganese Cobalt 111 batteries (NMC 111 – equal parts Nickel, Manganese and Cobalt).

Median – The median value comes from Nickel Manganese Cobalt 622 batteries (NMC622 – 6 parts Nickel, 2 parts manganese and 2 parts Cobalt) batteries.

Min – All Lithium ion batteries are Lithium Iron Phosphate (No Cobalt)

GLOBAL WARMING POTENTIAL (GWP)

The technology transition to a low-carbon economy, while materially intensive, is of a magnitude **smaller in GHG emissions when compared to continued combustion of coal and gas** (Nuss and Eckleman – 2014).

GWP of Strategic Minerals (Extraction & Processing)

Scenario	Generation	Storage	Total (Mt $C0^2$ eq)
IEA – RTS	15,533	657	16,191
IEA – 2DS	25,095	1,450	26,545
IEA – B2DS	26,575	3,011	29,587
IEA – 6DS	3,026	N/A	

Cumulative Emissions of Coal and (Combustion)

Scenario	Coal	Gas	Coal & Gas (CO^2 Mt eq)
IEA – RTS	421,130	140,815	561,945
IEA – 2DS	151,426	94,517	245,944
IEA – B2DS	123,351	91,887	215,238
IEA – 6DS	535,743	134,209	669,952

WHERE WILL ALL THESE MINERALS COME FROM?

Many of these minerals will come from **resource-rich developing countries** and **emerging economies**.

WHAT IS 'CLIMATE-SMART MINING'?

Climate **Smart** Mining

'Climate Smart Mining' supports the sustainable extraction and processing of minerals and metals to secure supply for clean energy technologies while *minimizing* the climate and material footprint throughout the value chain of those materials by scaling up technical assistance and investments in mineral rich developing countries.

CSMF: OBJECTIVES

The Facility will be a *multi-year program* providing both **technical assistance** and opportunities for **leveraging financing** to support resource-rich client countries in developing their strategic mineral reserves while adopting CSM practices.

Climate Smart Mining FACILITY

Objectives

Support the **research** and **adoption of innovative practices** in the extraction, processing, recycling and transportation of critical raw materials to 'green' the clean technology value chain from extraction to the end-consumer product

✓Leverage resources to **finance greenfield** and **brownfield mining projects** for strategic low carbon minerals with a **climate smart mining innovative approach**, allowing client countries to contribute to the clean energy and tech supply chain

✓**De-risk investments for low carbon minerals** by creating an enabling environment for private sector investments in mineral-rich developing countries

✓Assess opportunities for **mineral recycling operations** in developing countries

BUILDING BLOCKS OF 'CLIMATE SMART MINING'

Strong Governance and Adequate Regulatory Framework

Climate Change Mitigation	Climate Change Adaptation	Reducing Material Impacts	Creating Market Opportunities
Integration of **Renewable Energy** in the Mining Sector	**Forest Smart Mining** within Landscape Management	Adoption of a **'Circular Economy'** for Strategic Minerals	**De-risking Investments** for Strategic Minerals
Innovation in Extractive Practices	**Resource Efficiency** in Mineral Value Chain (e.g. water use)	**Recycling** of Strategic Minerals	Enabling **Carbon Markets**
Energy Efficiency in Mineral Value Chain	**Innovative Tailings** Solutions	**Strategic Mineral Supply Chain** Management	Robust **Geological Data Management**

World Bank Support to Decarbonize and Reduce Material Footprint of Mining Sector

Climate Smart Mining

QUESTIONS?

Please contact the World Bank's Program Managers for 'Climate-Smart Mining'

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