CENTER OF EXCELLENCE IN TRANSPORTATION ELECTRIFICATION AND ENERGY STORAGE OF HYDRO-QUÉBEC

Perspectives on emerging battery technologies towards a sustainable energy transition

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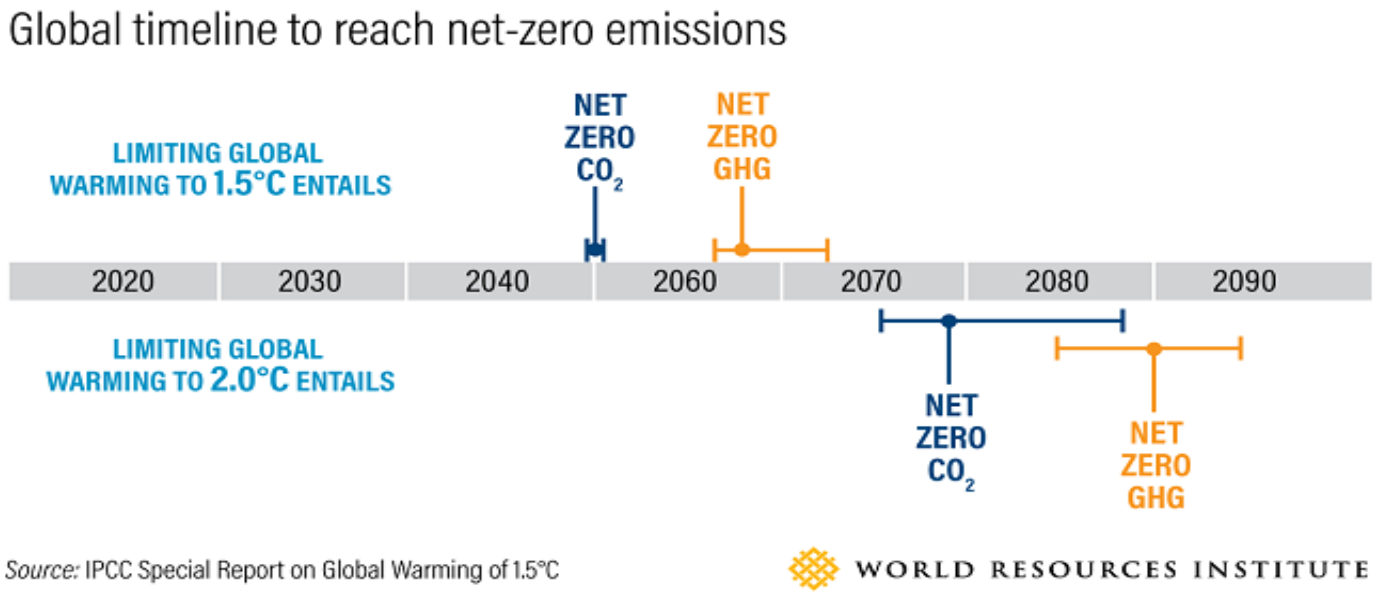
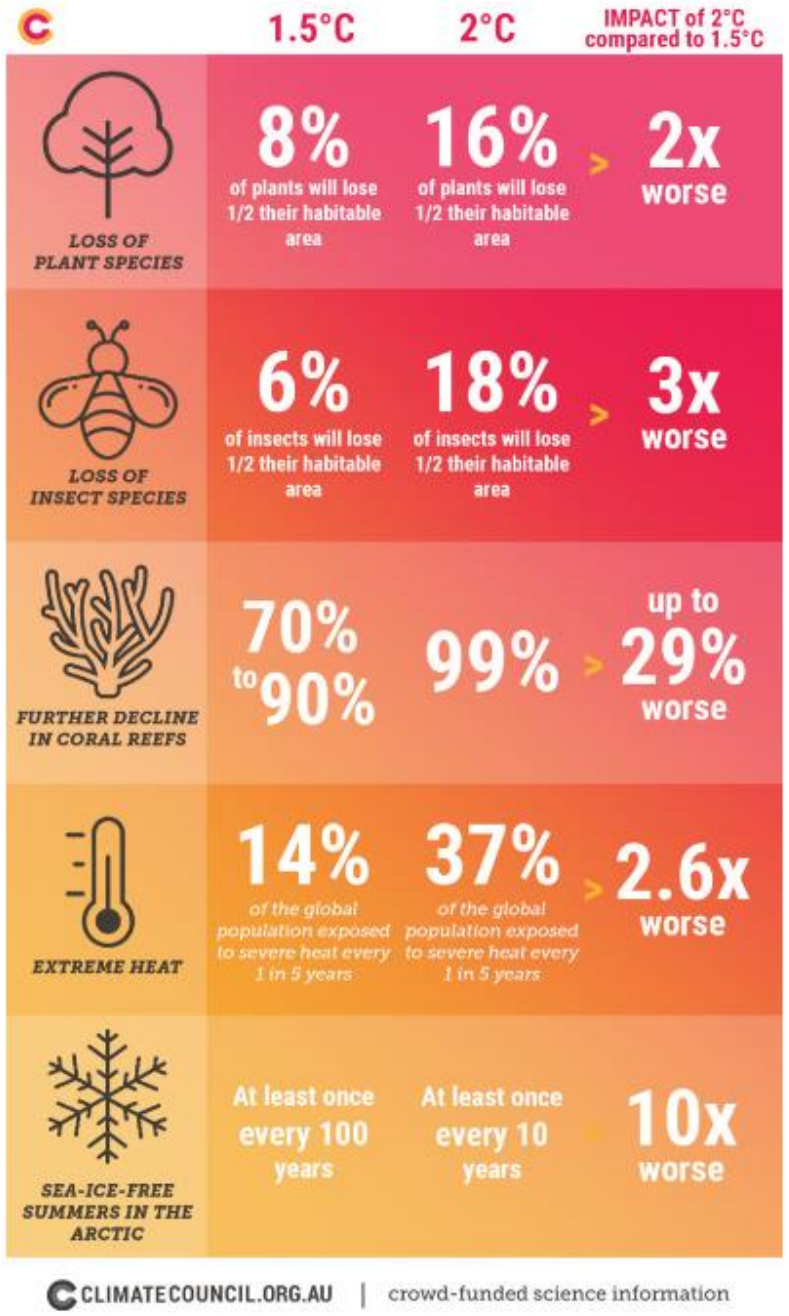
Net Zero Scenarios



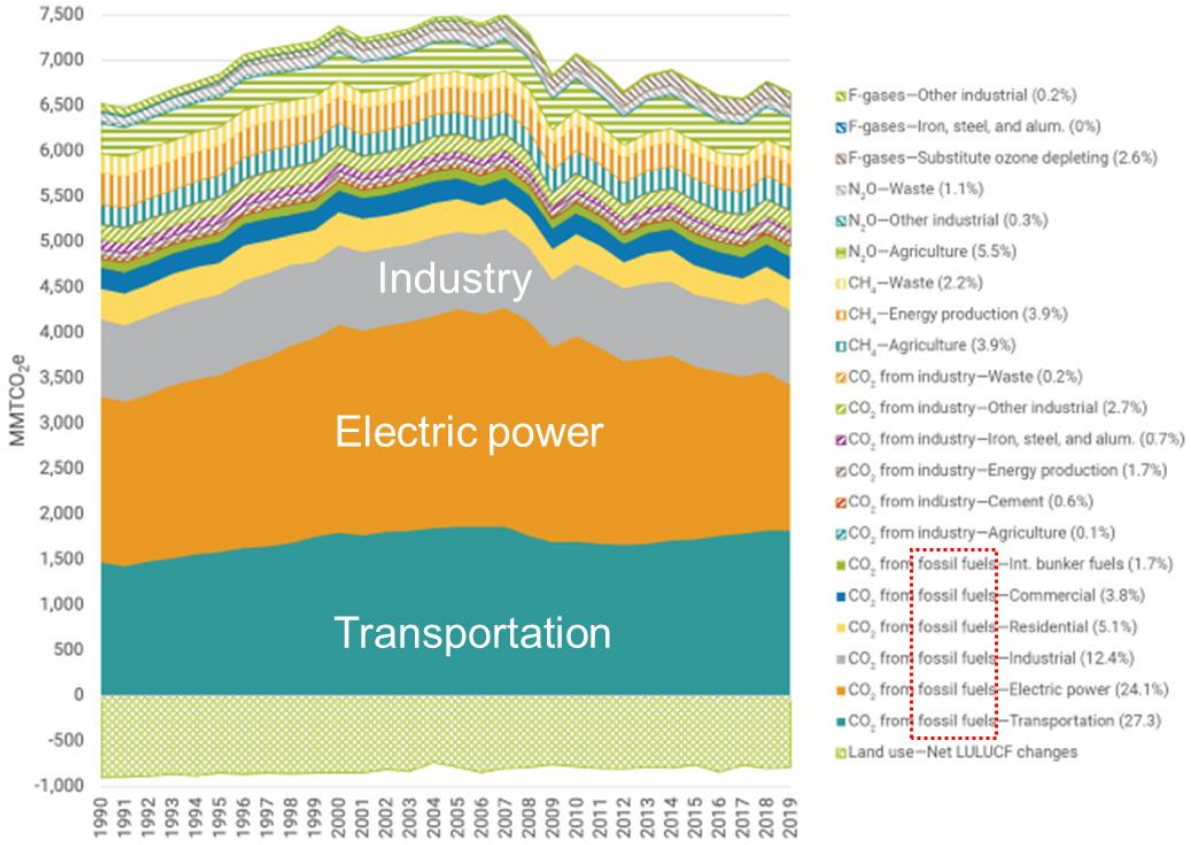


Sources of GHG Emissions

"Energy Transition"

- 74.4% of CHG originate from the fossil fuels
- **Clean electrification** will be the primary route to decarbonization

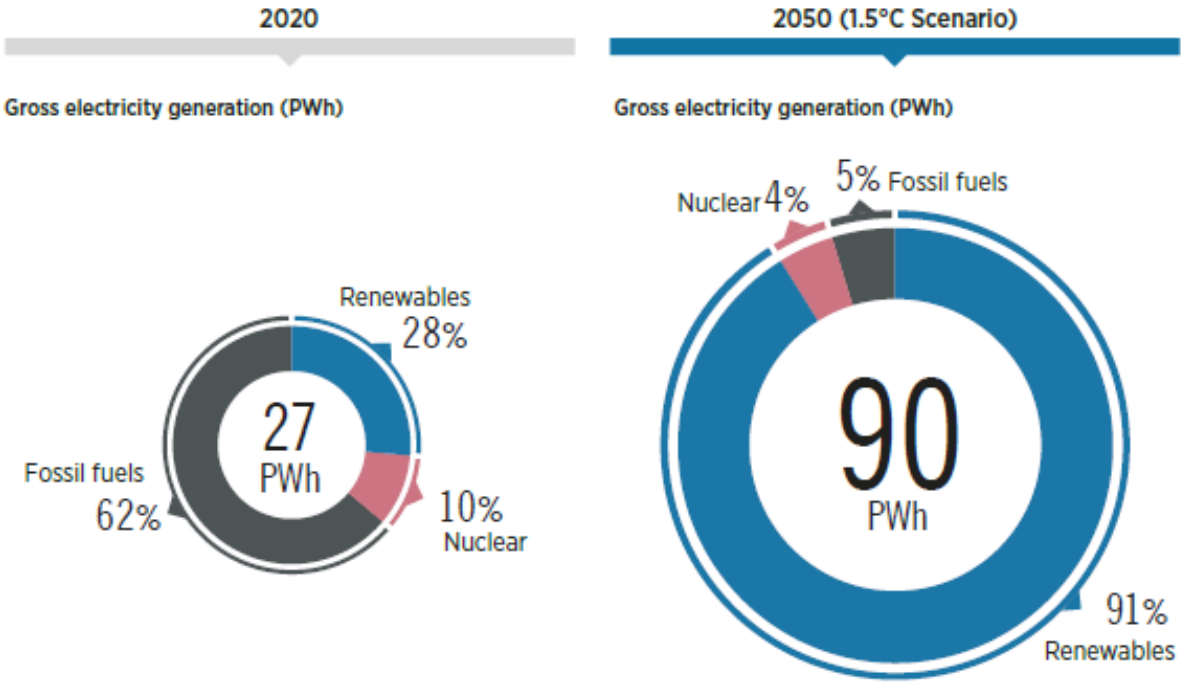
Figure 2. Historical US GHG emissions by gas and source



Source: EPA (2022).

Renewable Energy : The Pathway to Net-Zero

FIGURE 1.1 Power generation needs to more than triple by 2050 in the 1.5°C Scenario

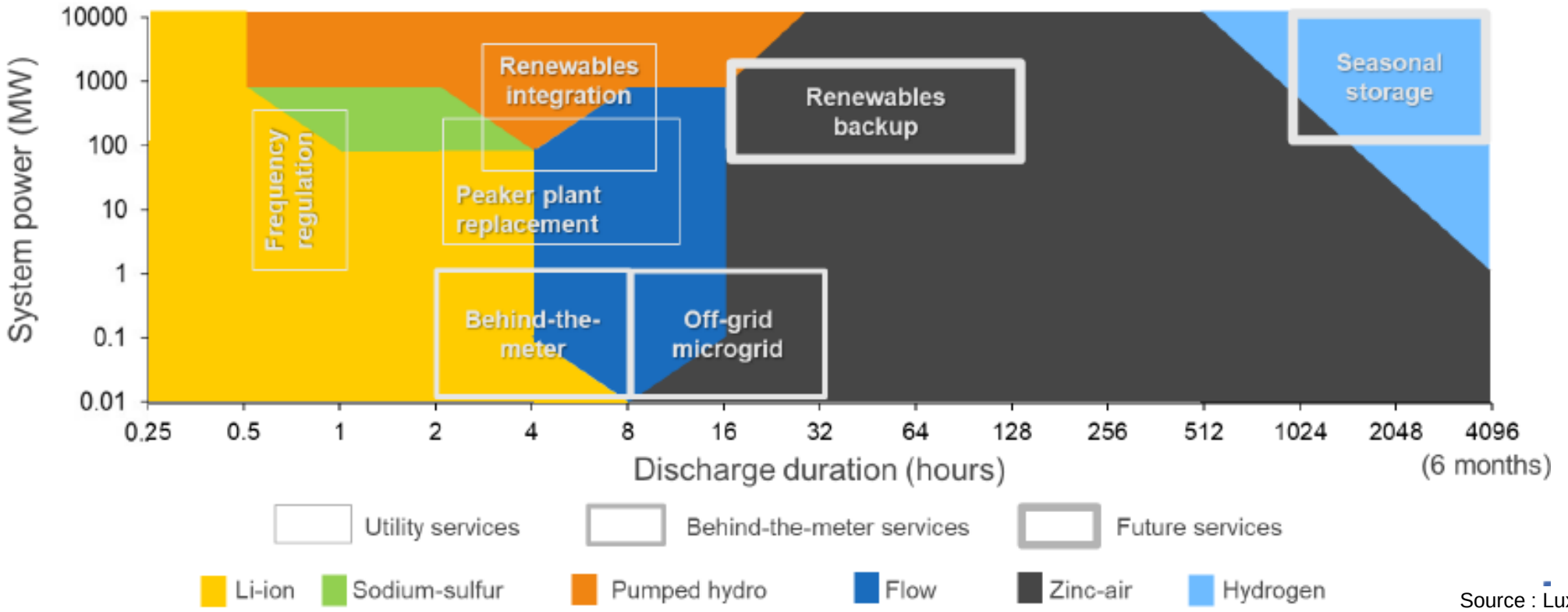


Note: PWh = petawatt hours.

Source: IRENA report 2023

- Need a **tripling of global installed renewable power** capacity by 2030 and then a further doubling by 2040.

Energy Storage Systems for Renewable Power



Source : Lux Research

LIBs play a key role in the short- to mid-duration ESS market for applications requiring less than 8 hours of storage.

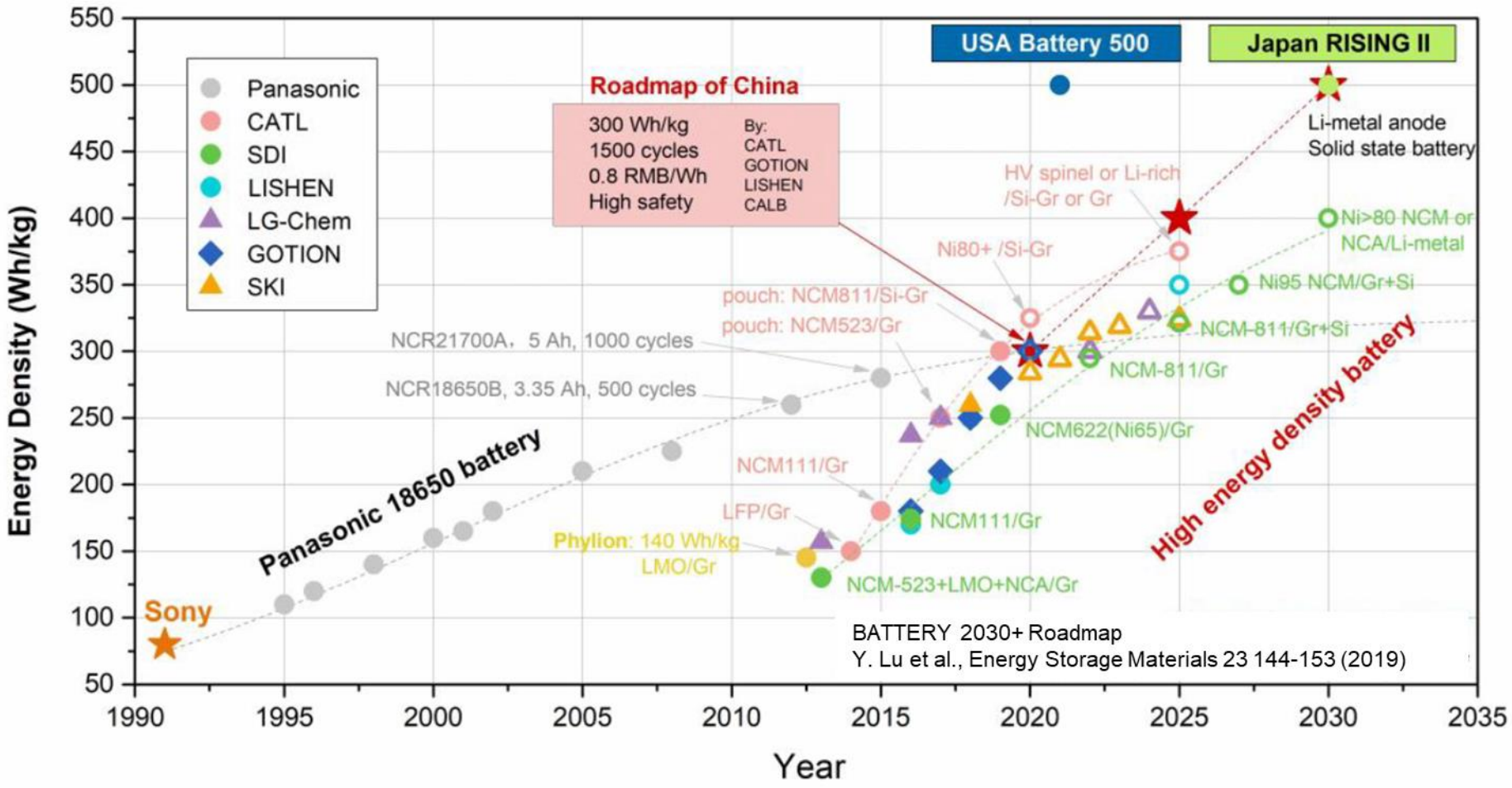
Emerging Technologies – New Materials

Cathode Active Materials

- LCO
- LNO
- LMO
- NCM
- LFP, LMP
- *LMX*
- *LMR*
- *DRX*

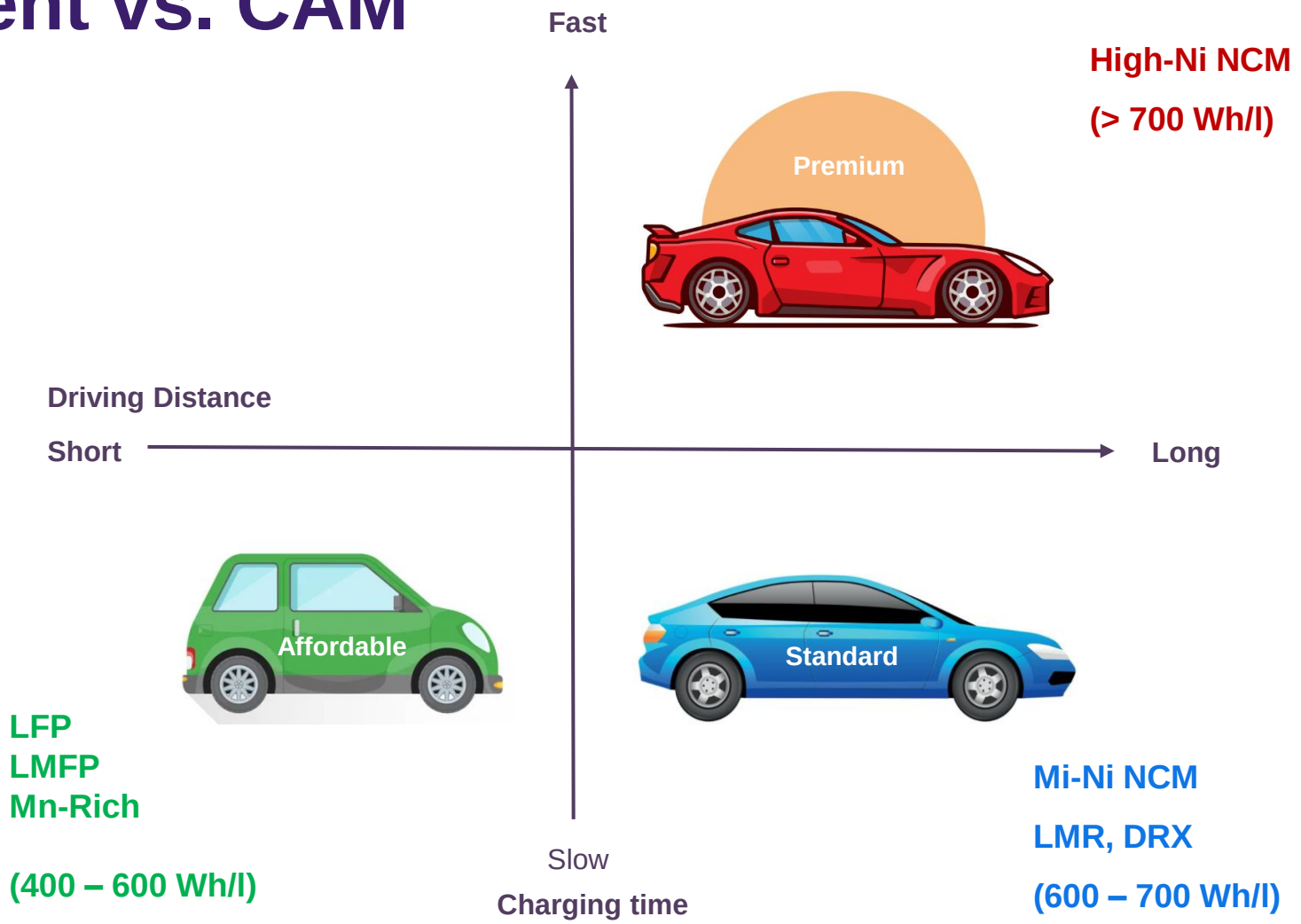
Anode Active Materials

- Graphite
- Si, Si-C, SiO_X
- LTO, LNTO
- *Li metal*



EV Market Segment vs. CAM

Different active materials with balanced **cost** and **performance** characteristics can be selected based on the specific requirements of various **market segments**.



Take Aways

- **Electrochemical energy storage** systems, particularly secondary batteries, play a vital role in the **energy transition toward net-zero emissions**

- **Enhancing upstream sustainability** of LIB production is essential to ensure both supply chain resilience and a reduced carbon footprint.

- A **diversity of battery chemistries** should be pursued to meet the specific needs of various applications and market segments, including the development of **'Co/Ni-free**' and **'Beyond Li**' active materials.

Thank You!

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