

Where is battery technology heading— Vehicle Batteries

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China is building the future, EV's that beat ICE!! 1,000 km range EV's with sub-10 minute recharge time and an affordable price



Zeekr begins deliveries of its 001 EV with world leading 1000km range

MAY 19, 2023 · NO COMMENTS · 2 MINUTE READ · DANIEL BLEAKLEY



IM L6 presales begin. With “solid-state battery” and 1,000 km range, starting at 31,800 USD

Reading Time: 4 minutes · Adrian Leung | April 9, 2024 | 15

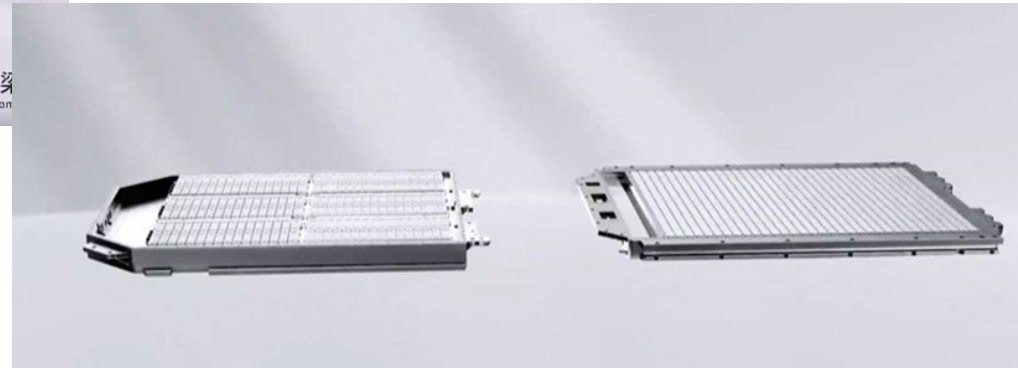
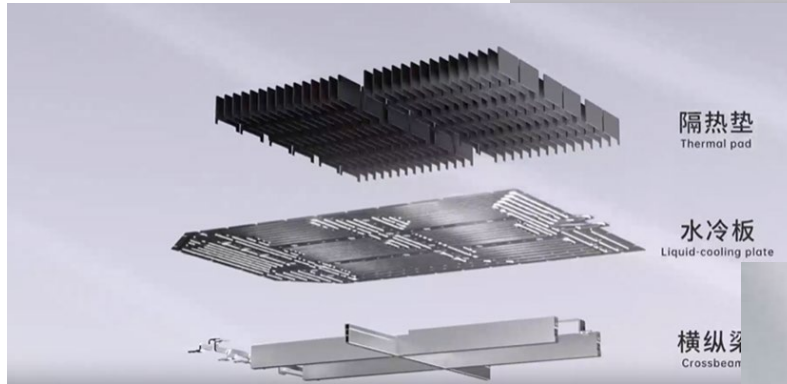


- 1. NIO ET7 – 649 miles
- 2. IM Motor L6 – 620 miles
- 3. NIO ES6 – 577 miles
- 4. ZEEKR 009 – 511 miles
- 5. HiPhi Y – 503 miles
- 6. ZEEKR 001 – 466 miles
- 7. XPeng P7 – 441 miles

Vehicle batteries can see many advancements

- **What is the problem my battery is solving?**
 1. **Batteries need to tackle range, recharge times, cold weather, safety issues**
 2. **What is the cost to performance tradeoff?**
 3. **Does my value chain exist if geopolitics emerge?**
 4. **What is my long-term price point (\$20 per KWh is a good target)**
 5. **Who am I competing with and can I compete vs the best in class?**
 6. **Who is willing to be my secured customer?**

CATL's 255 Wh/kg pack design is best in class...others in China looking to top



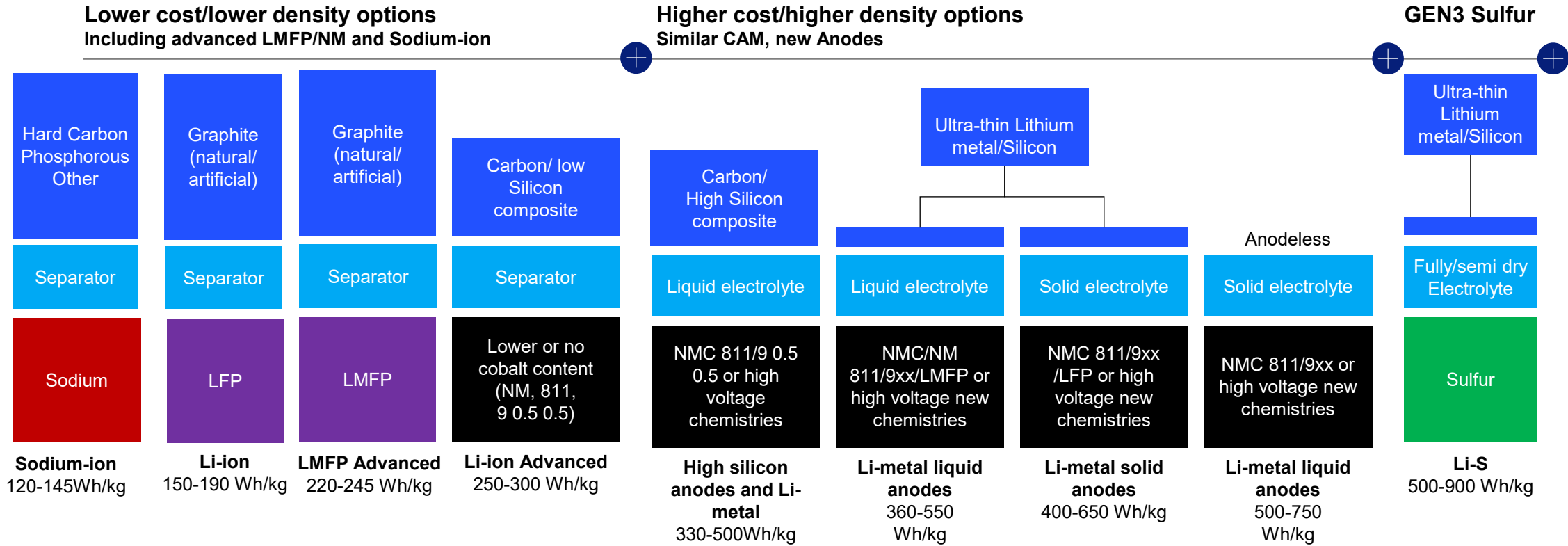
The first thing western companies should target is near 80% Volume utilization efficiency. Current western brands are below 65%, with some even below 55%.

Using innovative pack designs increases pack density to as high as 255 Wh/kg, up from the 160 Wh/kg in the West, this move allows for lower cost cathode materials while increasing range of vehicles to the magical 1,000 km, plus helps reduce charging times to under 15 minutes (4C)

We see battery chemistry evolving rapidly and not in a straight line, OEM's focus on density, charging speed, costs, and durability

Understand cathode AND anode material qualities and implications

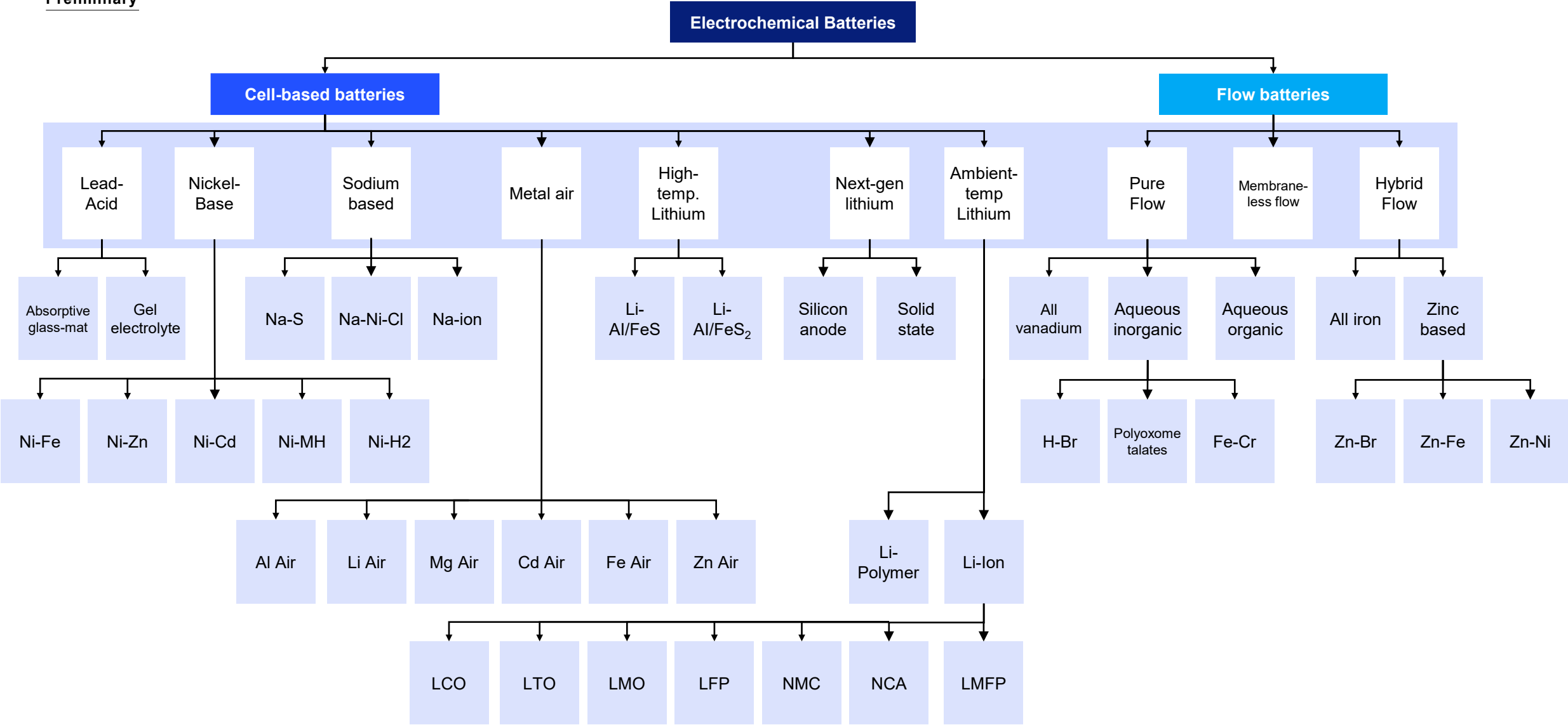
■ Anode ■ Separator/Electrolyte ■ Cathode



1. Very early stage reflexion
2. Based on 7-year contracts in average, last known supply order signed with Volkswagen in March 2021

Cell Technology is very diverse--The type of potential solutions to the world's battery needs is vast and changing every day

Preliminary



What are some interesting ideas for next-gen batteries

The first order of business is improving the pack design to attain the 140-150 KWh designs of China

Finding ways to produce lithium metal/anodeless batteries that use sub 10 micron lithium, or a pre-lithinated state

Finding the right low cost CAM, be it LFP, LMFP, iron vanadium, among others to drive the cost down, whilst improving overall performance

Producing lithium metal cells that use no, or low pressure means so as to keep densities through to the pack

Starting small with new applications and using efficient means to produce at smaller scale before the major ramp up needed by mass produced vehicles

Inventing condition specific batteries, ie those that can maintain charge as well as be charged in very cold climates.