



Aiming to become a leading solutions provider to the fast-growing battery industry

DNB Battery Conference  
Stian Madshus  
11 May 2021

# Aiming to become a leading solutions provider to the fast-growing battery industry

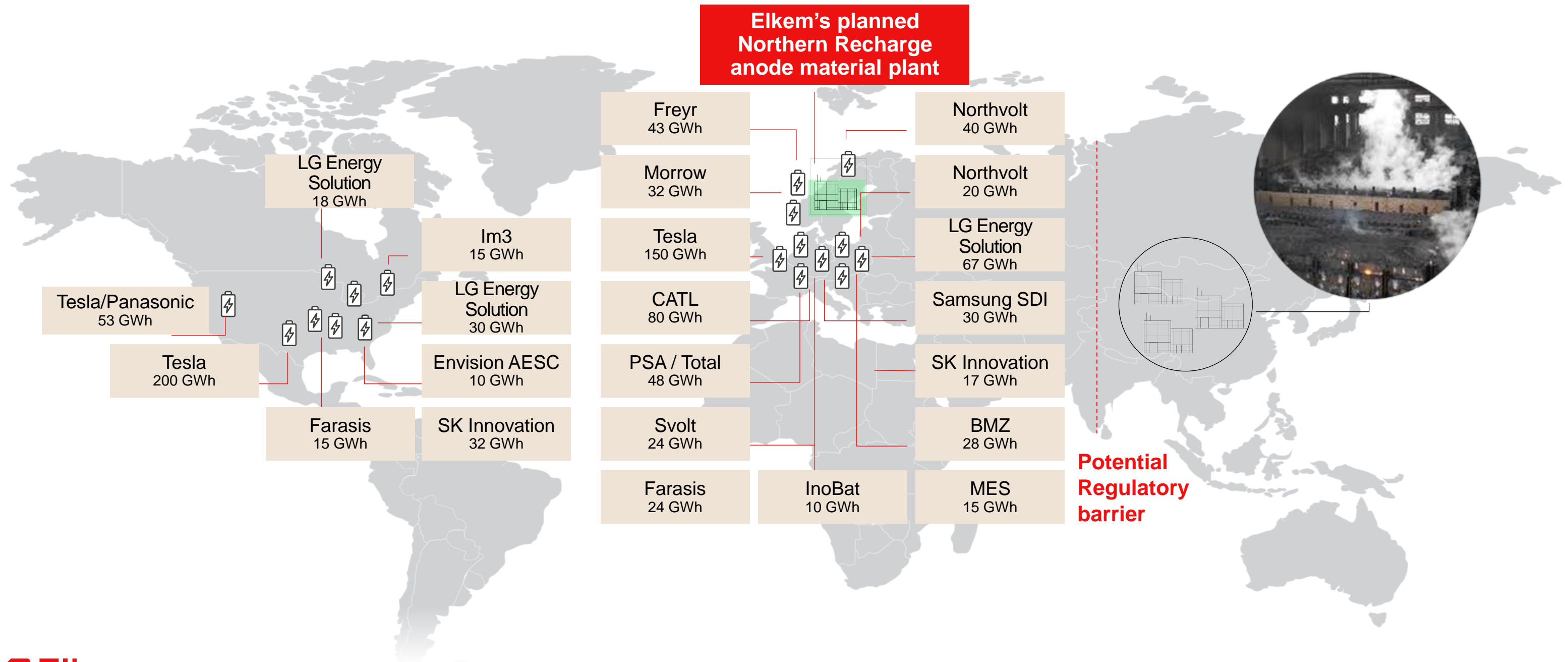
1. **A green transport revolution requires a green battery revolution**
2. **Elkem is uniquely positioned to supply specialised battery materials with a green footprint**
3. **Going from pilot to industrial production and aiming to become a leading solutions provider to the battery industry**



# High number of cell manufacturing projects in Europe and North America

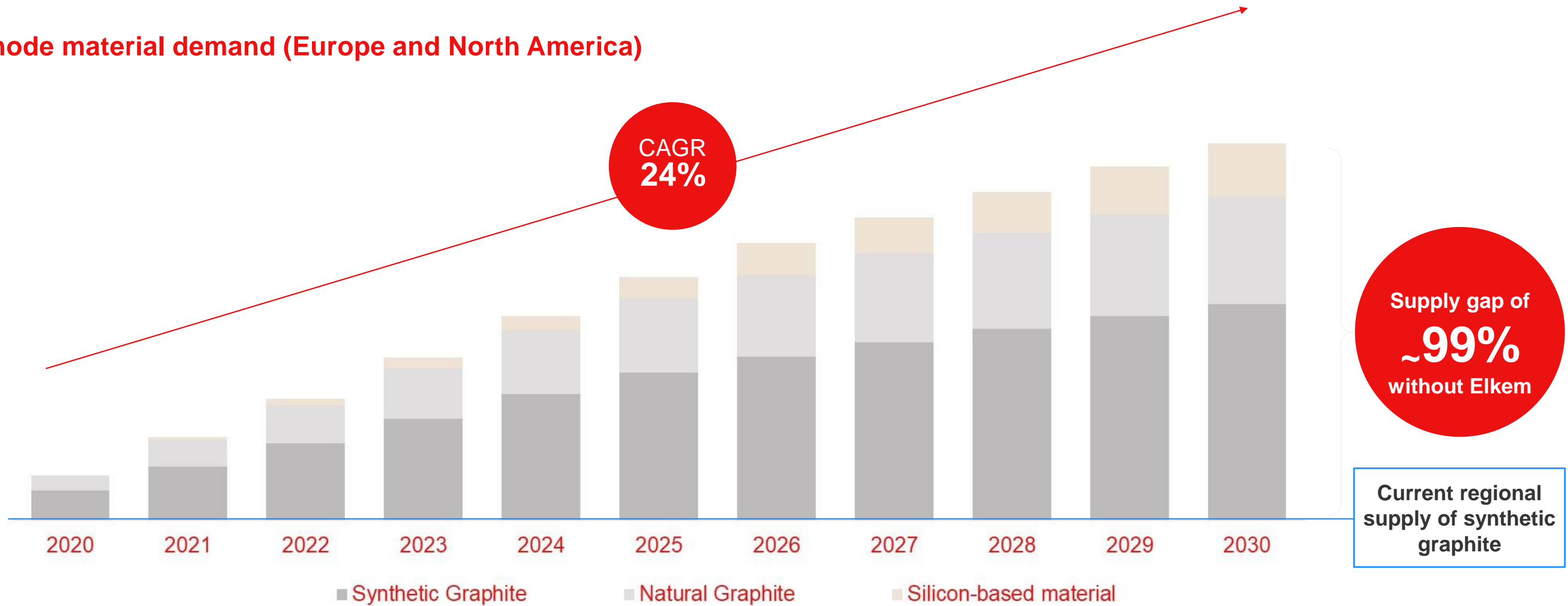
...but production of critical anode materials is currently dominated by Asian players

**Gigafactory capacity (2030)**  
 Europe ~ 610 GWh  
 North America ~ 383 GWh  
**TOTAL ~ 1,000 GWh**



# This implies an increasing need for battery anode materials from reliable and sustainable suppliers

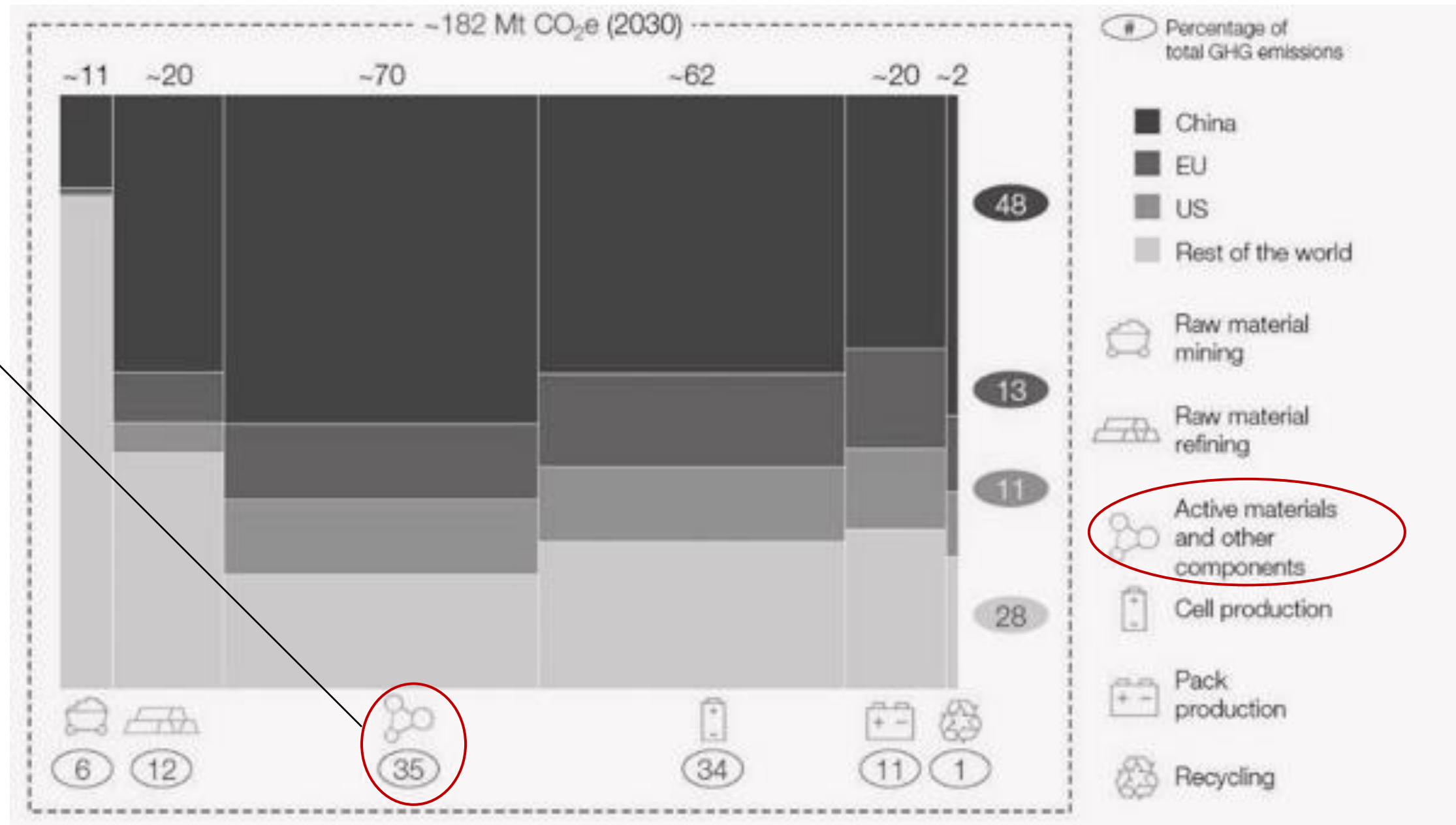
Anode material demand (Europe and North America)



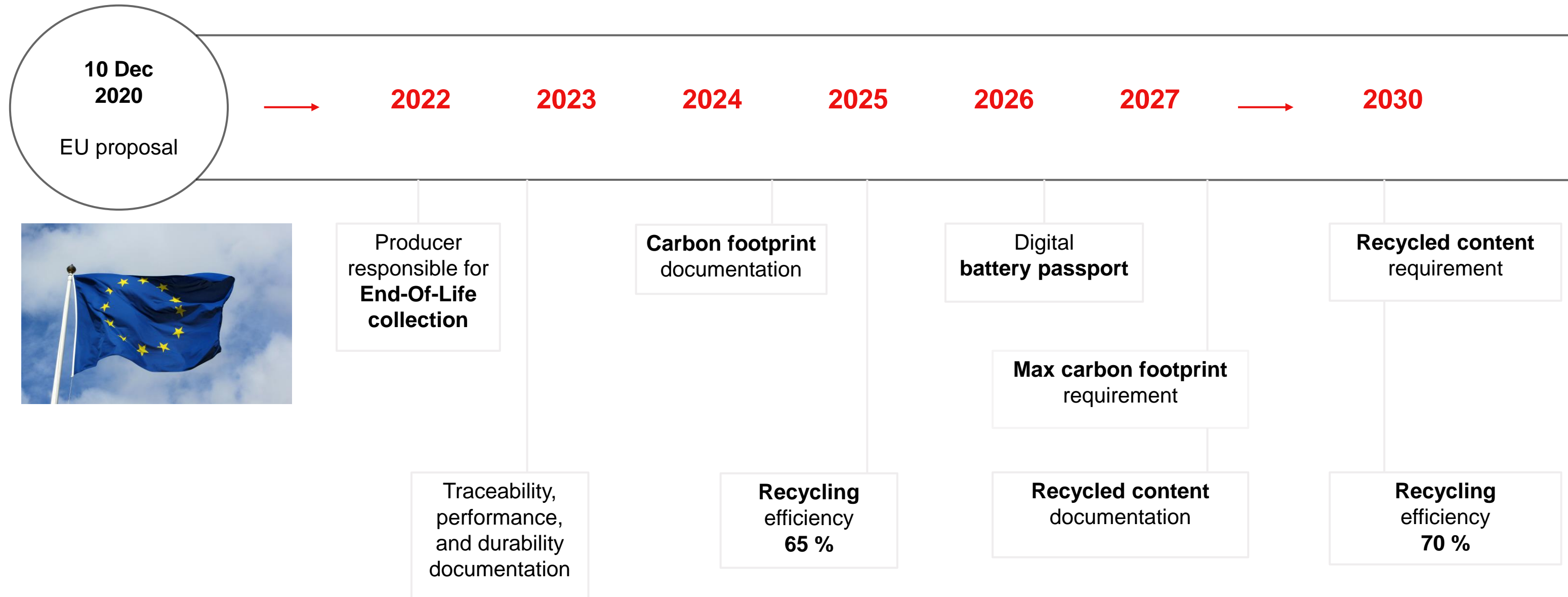
# Today's battery production comes with a significant CO<sub>2</sub> footprint – active materials being a major contributor

Greenhouse gas emissions by value chain step, Mt CO<sub>2</sub>e per annum (2030)

Active materials and components  
~ 35%  
of battery  
GHG  
emissions



# EU proposed regulations on sustainable batteries: Clear push for increased traceability, lower CO<sub>2</sub> footprint, more recycling



# Automakers also increasingly focused on securing a more sustainable value chain

**“We don’t want to compensate, we want to avoid. We don’t want to buy CO2 certificates from other companies, we don’t want to cause any emissions ourselves. Wherever energy cannot be saved, we use electricity from renewable sources”**

*Oliver Blume, chairman of the executive board of Porsche AG*



COAL | ELECTRIC POWER | METALS — 11 Sep 2020 | 13:18 UTC — New York

## VW aims to increase battery supply chain transparency

**Swedish battery manufacturer Northvolt receives a \$14 billion order from VW**

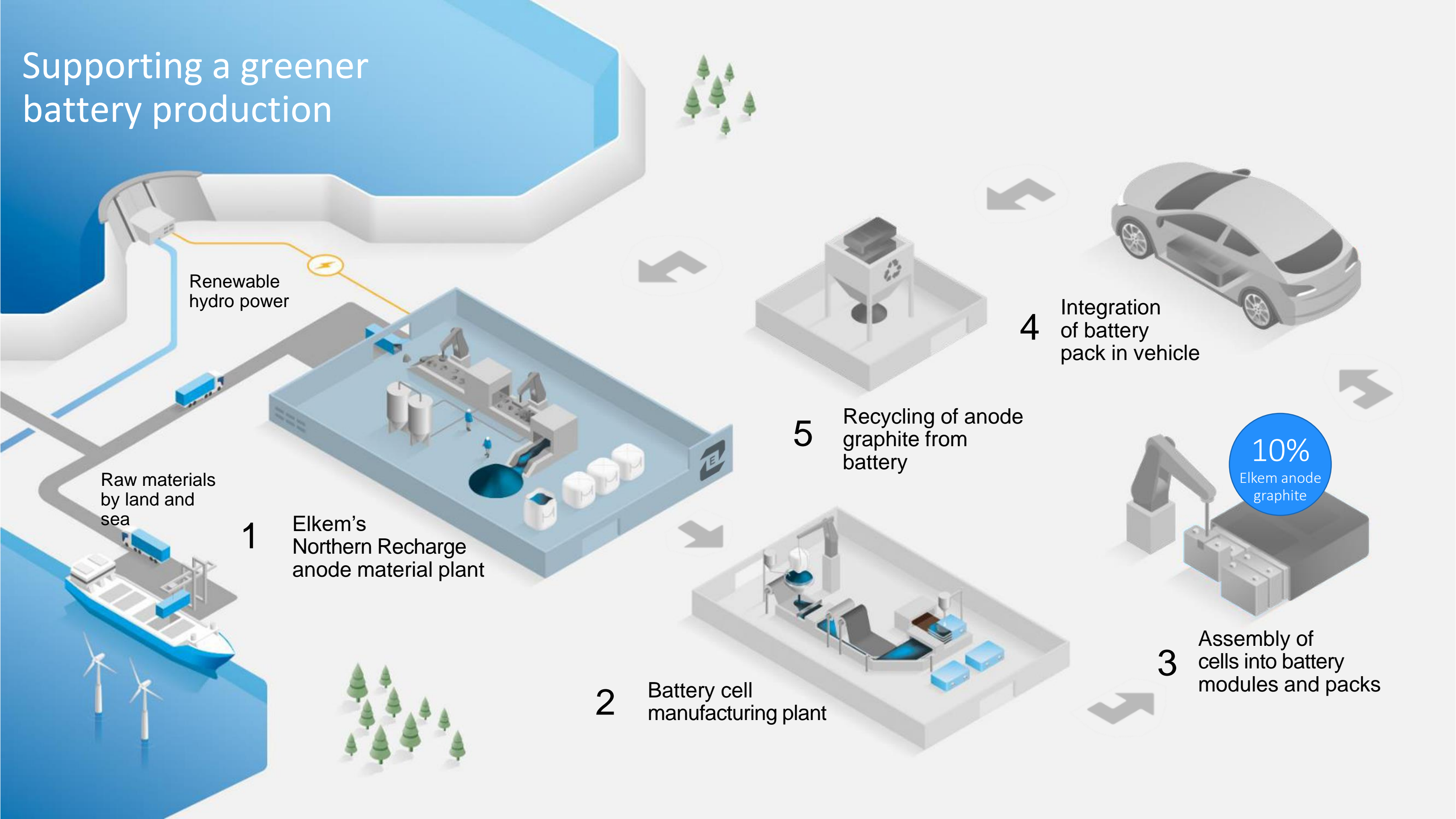
Jonathan Shieber @jshieber / 1:30 PM GMT+1 • March 15, 2021

Tesla takes part in deal to take over controversial nickel mine in New Caledonia

Fred Lambert - Mar. 5th 2021 6:11 am ET @FredLambert



# Supporting a greener battery production

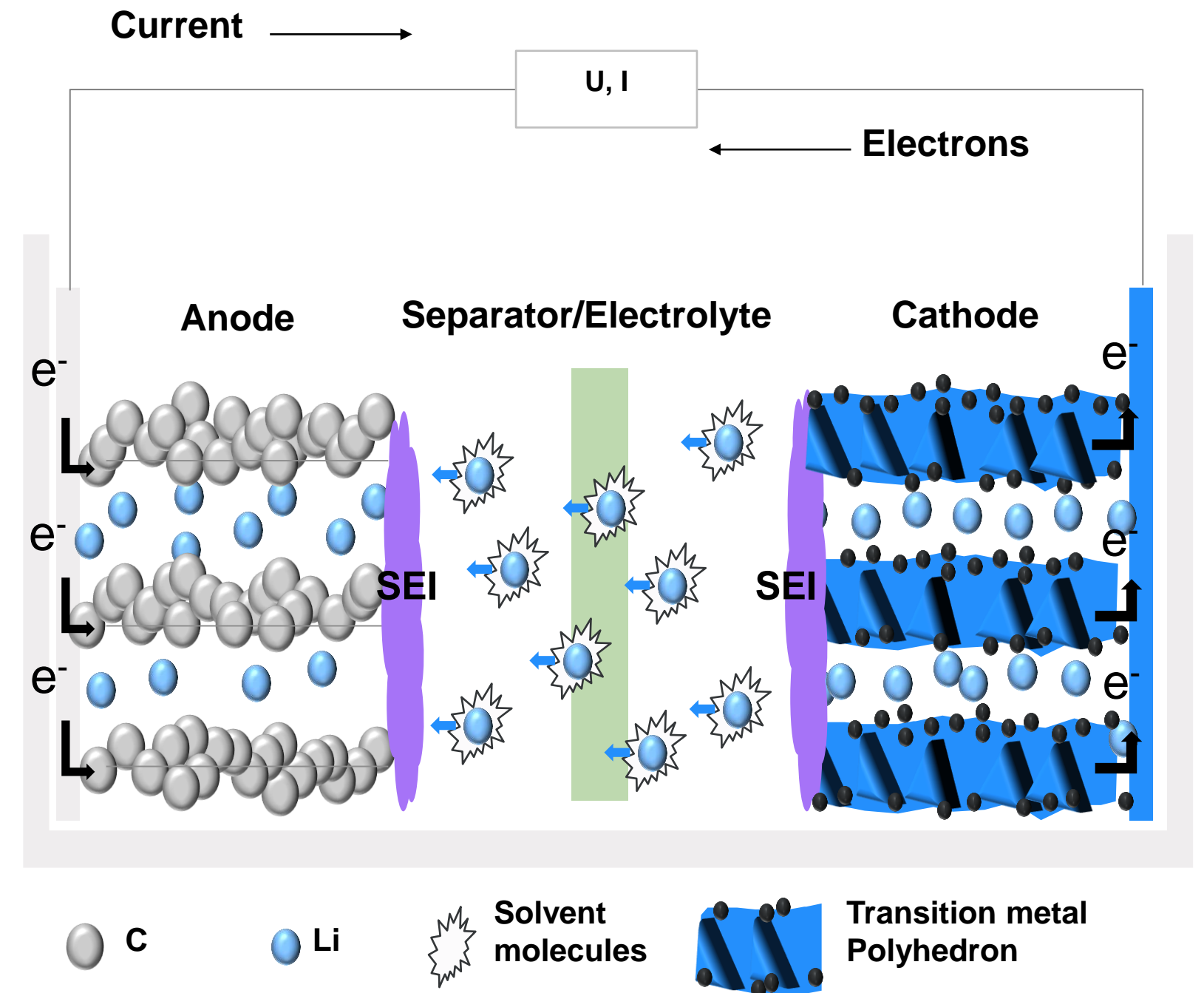




# Anode graphite is a critical, advanced and highly engineered material

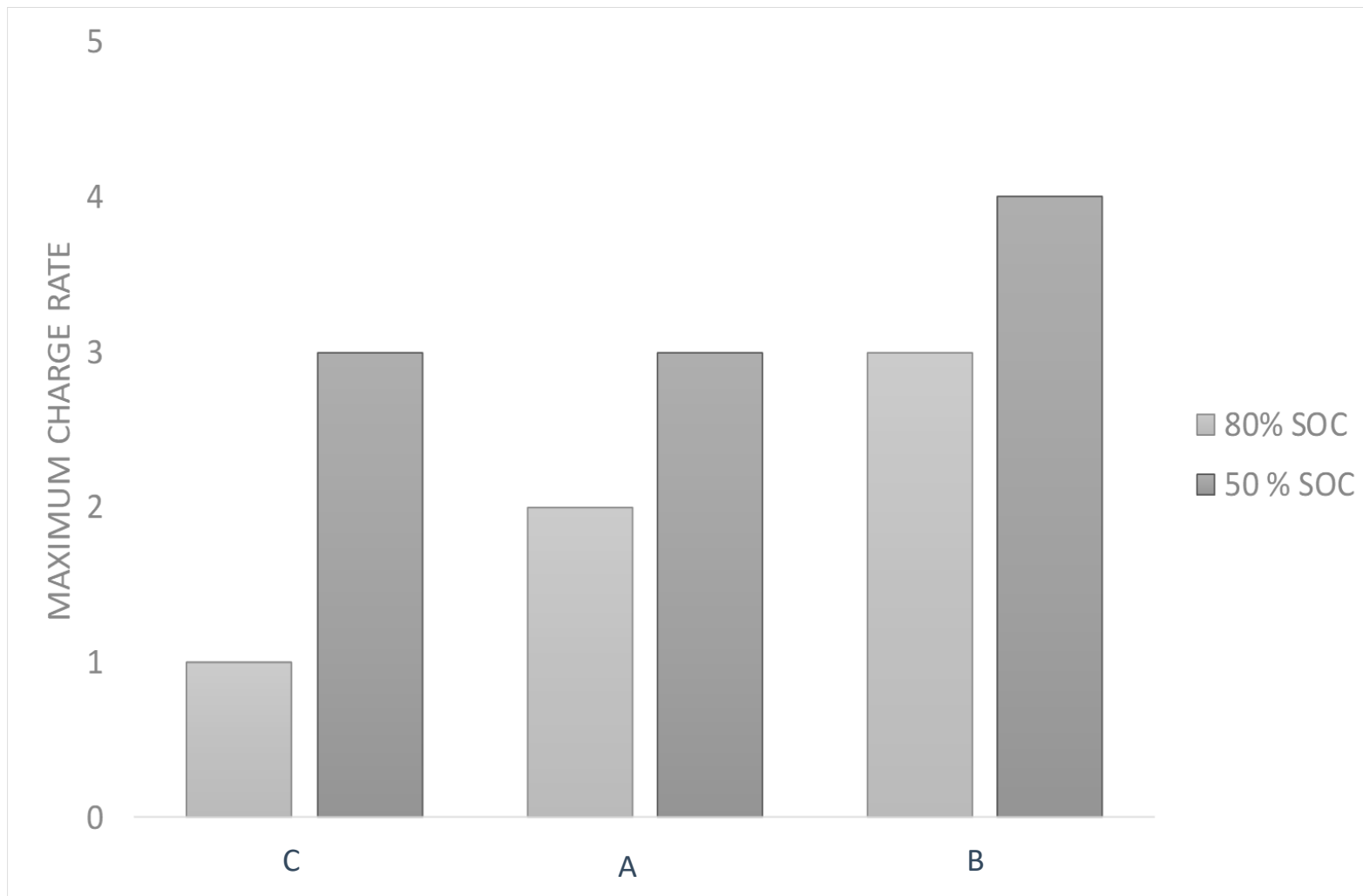
*“Our cells should be called nickel-graphite, because primarily the cathode is nickel and the anode side is graphite”  
Elon Musk, CEO of Tesla*

- **High energy density**
  - Graphite structure
  - Powder density
- **High charge speed**
  - Short diffusion path for Li-ions
  - Particle size and structure
  - Surface properties
- **Long lifetime/many cycles**
  - Graphite is an intercalation material (fundamentally different from silicon anodes) - this gives mechanical integrity
  - Surface forms stable Solid Electrolyte Interface (SEI)
- **Safety**
  - Controlled and limited degradation mechanisms
  - Limited swelling

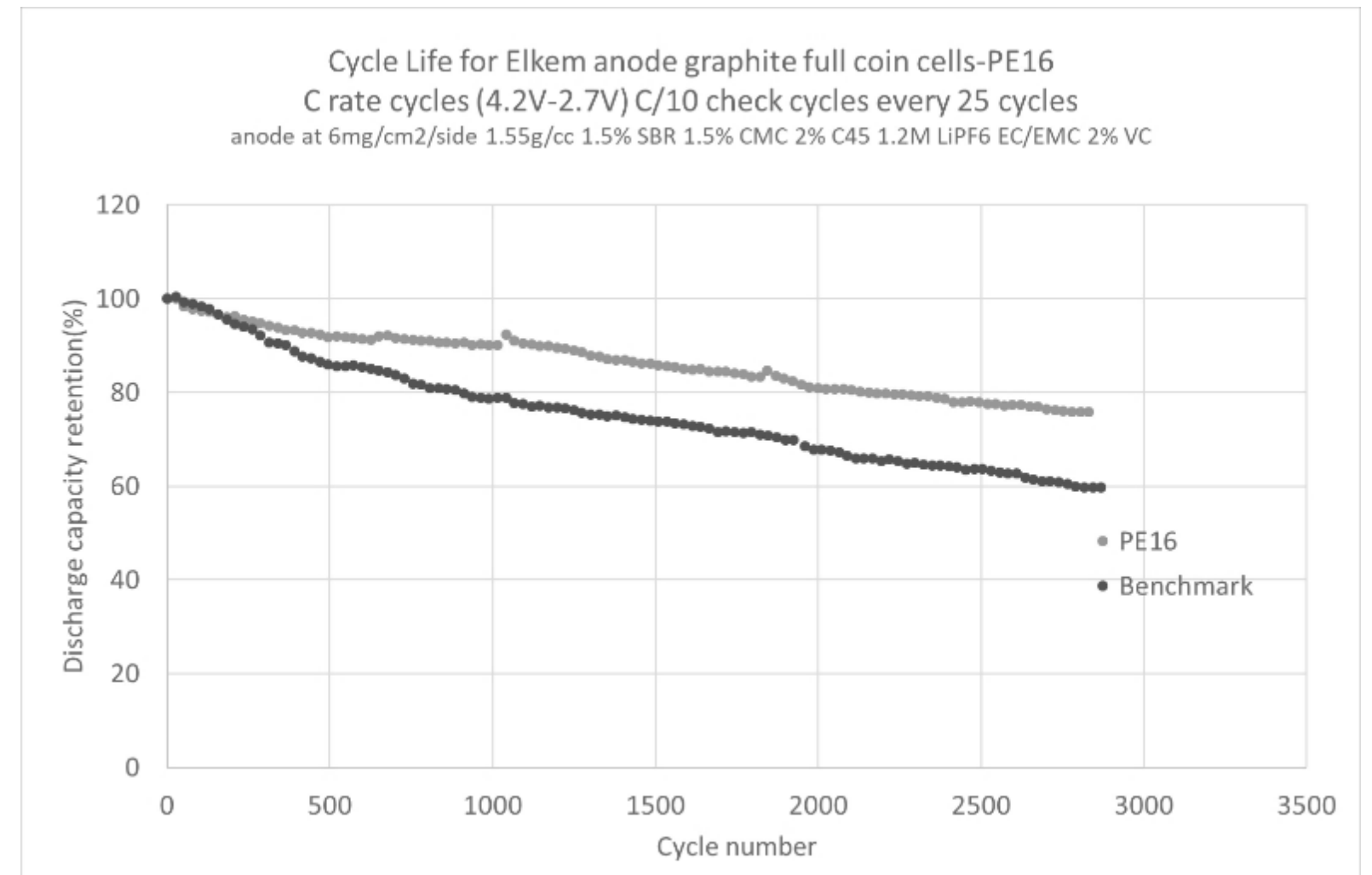


# Elkem's active anode materials enable fast charging with high energy density and long cycle life

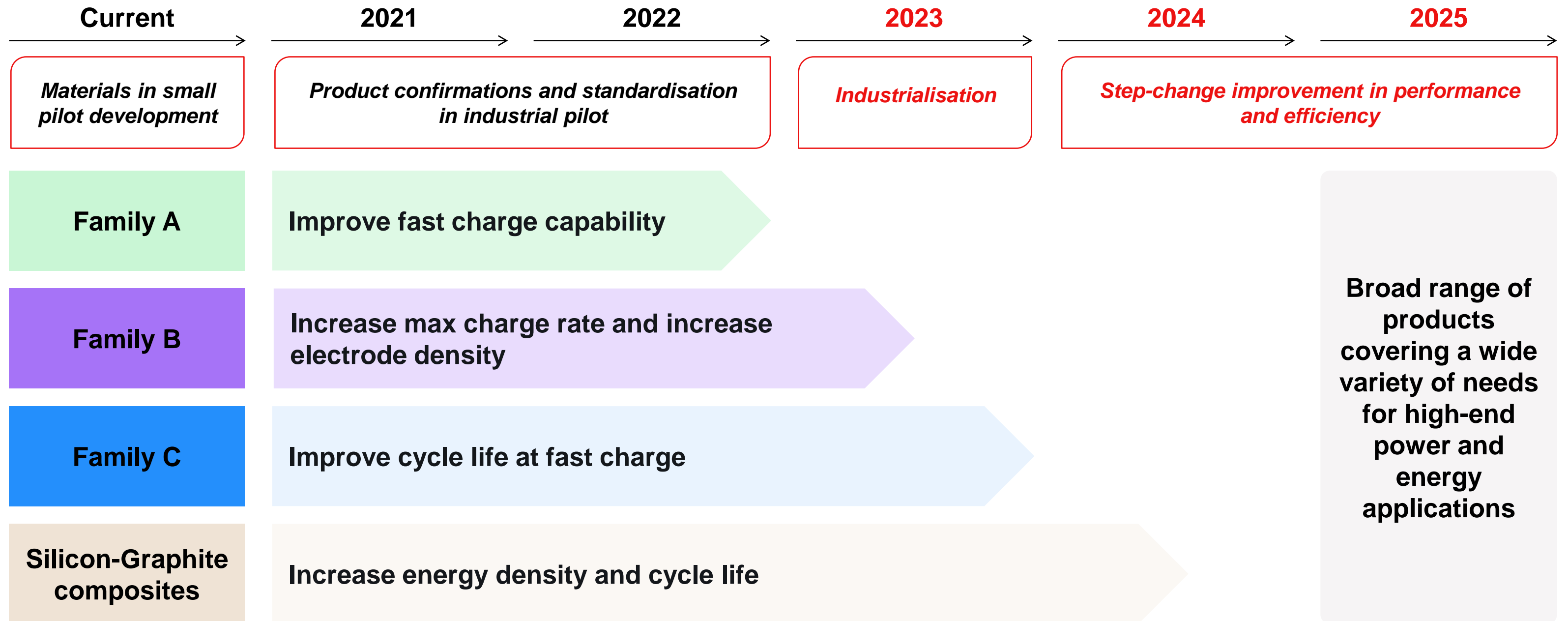
## STRONG FAST-CHARGING CAPABILITIES



## LONG CYCLE LIFE

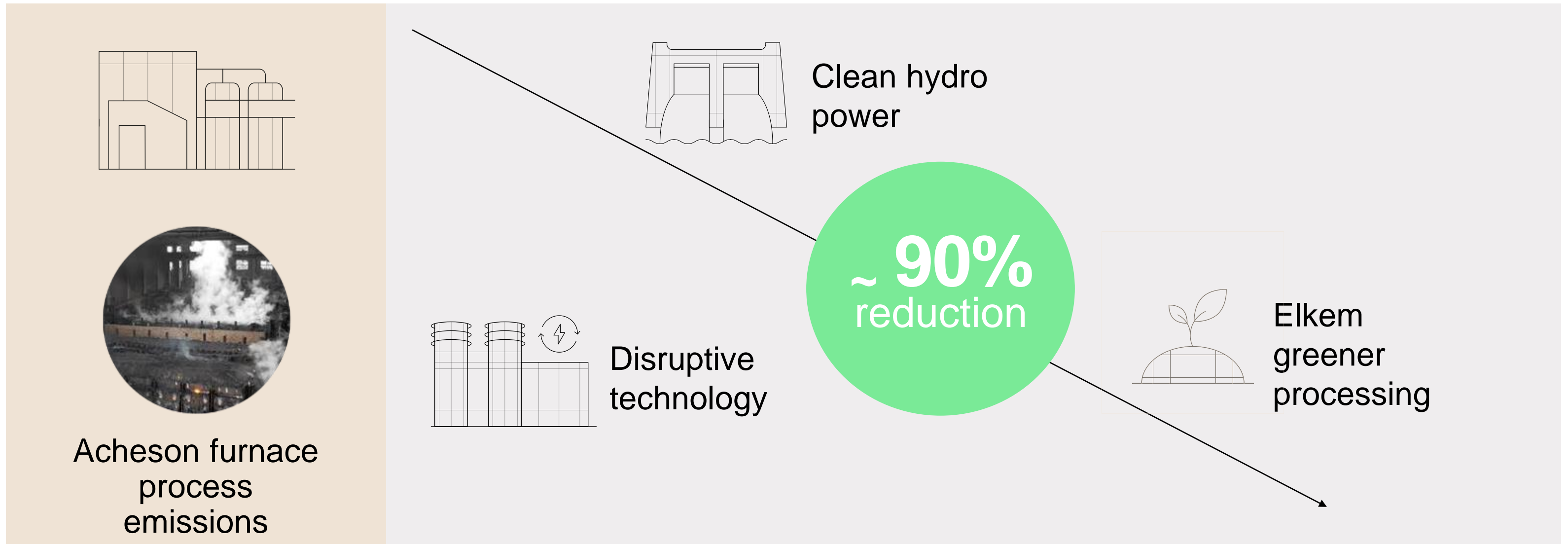


# A clear roadmap for product families covering a wide variety of needs for high-end power and energy applications



# Elkem's disruptive technology and access to clean hydropower enable **close to zero emissions**

Emission reductions vs market standard production process <sup>1</sup>



# We are preparing to go from **pilot** to **industrial production**

	Pilot	Industrial pilot*	Industrial plant no. 1
<b>Capacity</b>	5 tons per year	200 tons per year	50,000 tons per year
<b>Status</b>	In full operation	In commissioning and start-up, In full operation from Q2 2021	In planning**. Phase 1 SOP: 2023 Phase 2 SOP: To be decided
<b>Description</b>	All process steps. Small size industrial equipment.	All process steps. Industrial scale equipment.	Modular design for rapid expansion
<b>Location</b>	Kristiansand, Norway	Kristiansand, Norway	Herøya Industrial Park, Norway



# Vianode

an Elkem company



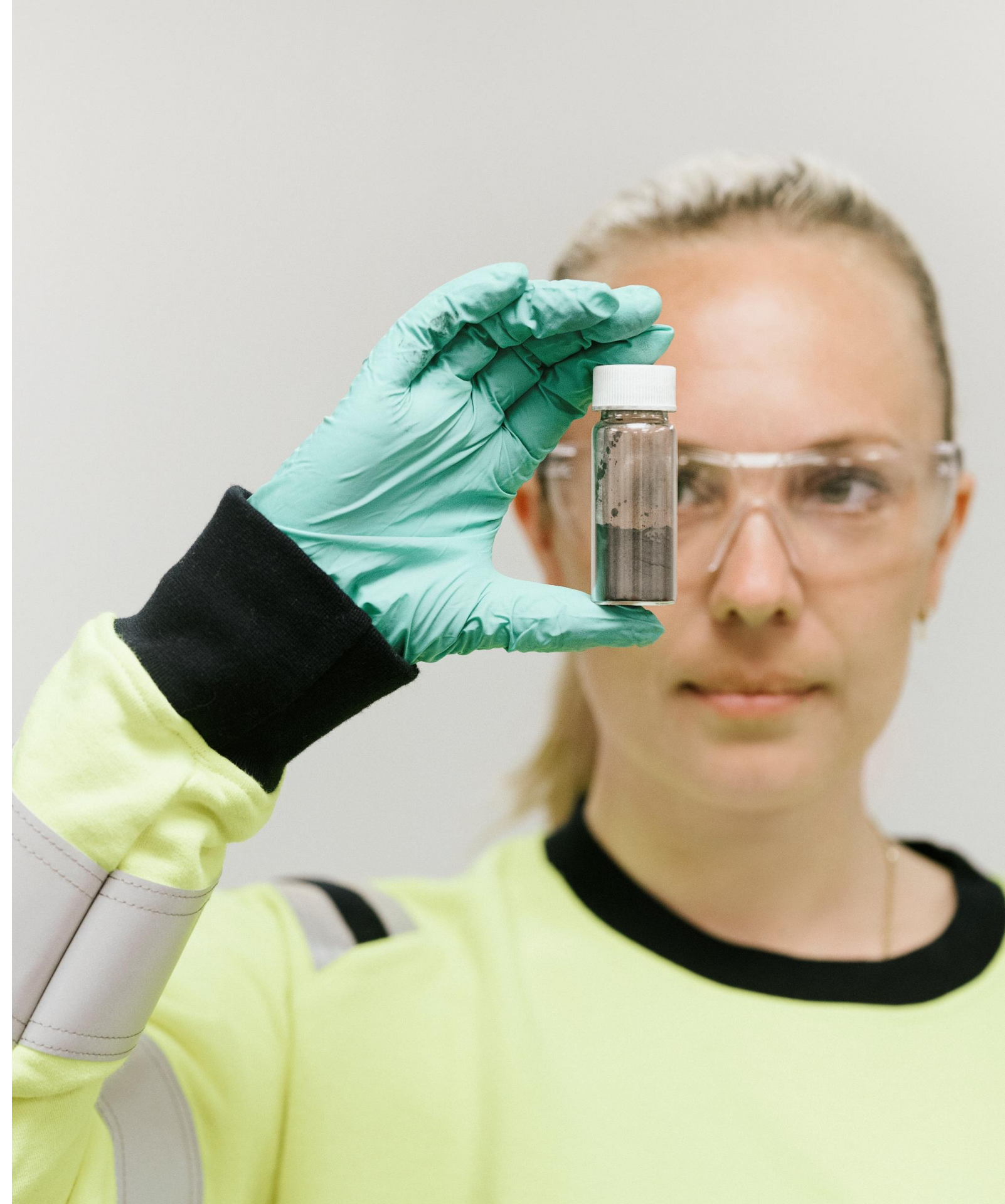
# Vianode's battery materials plant, Herøya Industrial Park



# Aiming to become a leading solutions provider to the fast-growing battery industry

- Positioning to become a leading supplier of advanced materials in a multi-billion USD market
- Leveraging our 100+ years of experience in large-scale high-temperature processes
- Offering a full range of materials and services with a dedicated and world-class team

**Vianode aims to be a solutions provider to the battery industry, meeting today's challenges and tomorrow's opportunities**







Delivering your potential