



# La produzione di celle dall'Europa all'Italia....

## Sfide, Bisogni, Proposte

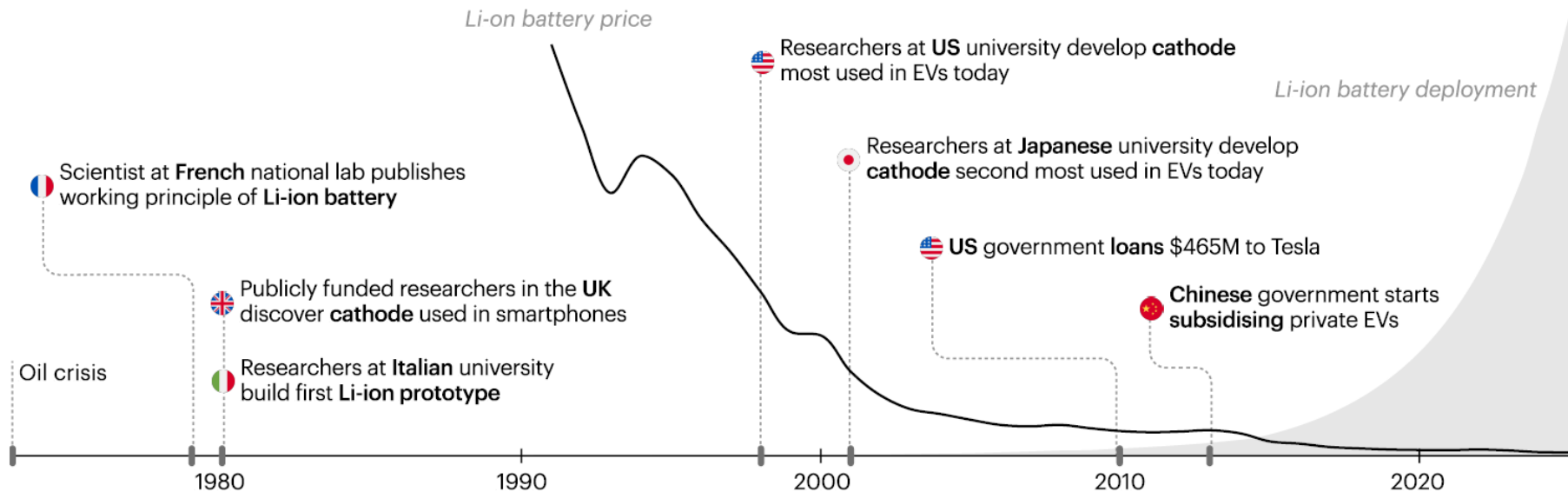
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**Electrochemistry Group**  
Department of Applied Science and  
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Politecnico di Torino, Italy

# Public R&D is behind recent steps forward for energy technologies

Global deployment, price and key publicly-funded milestones for lithium-ion batteries, 1973-2025



L'invenzione degli ioni di litio fu sostenuta da finanziamenti pubblici e seguita da numerosi successi di ricerca nei laboratori pubblici. Il suo mercato annuale ha superato i 150 miliardi di dollari nel 2025.

# More than 70% of the cells are produced in China

## BATTERY MANUFACTURING CAPACITY BY COUNTRY

Global lithium-ion battery production capacity is projected to increase eightfold by 2027.

Here's a look at the top countries for battery manufacturing in 2022 and 2027, based on BloombergNEF's lithium-ion supply chain rankings.

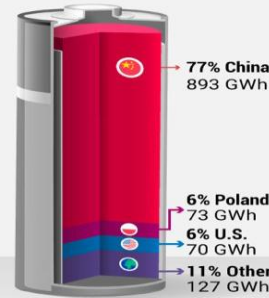


Six of the top 10 battery manufacturing companies are headquartered in China.



U.S. battery production capacity is projected to grow over 10x by 2027.

**2022**



**Total Capacity**  
1,163 GWh  
(GIGAWATT-HOURS)

**2027P**

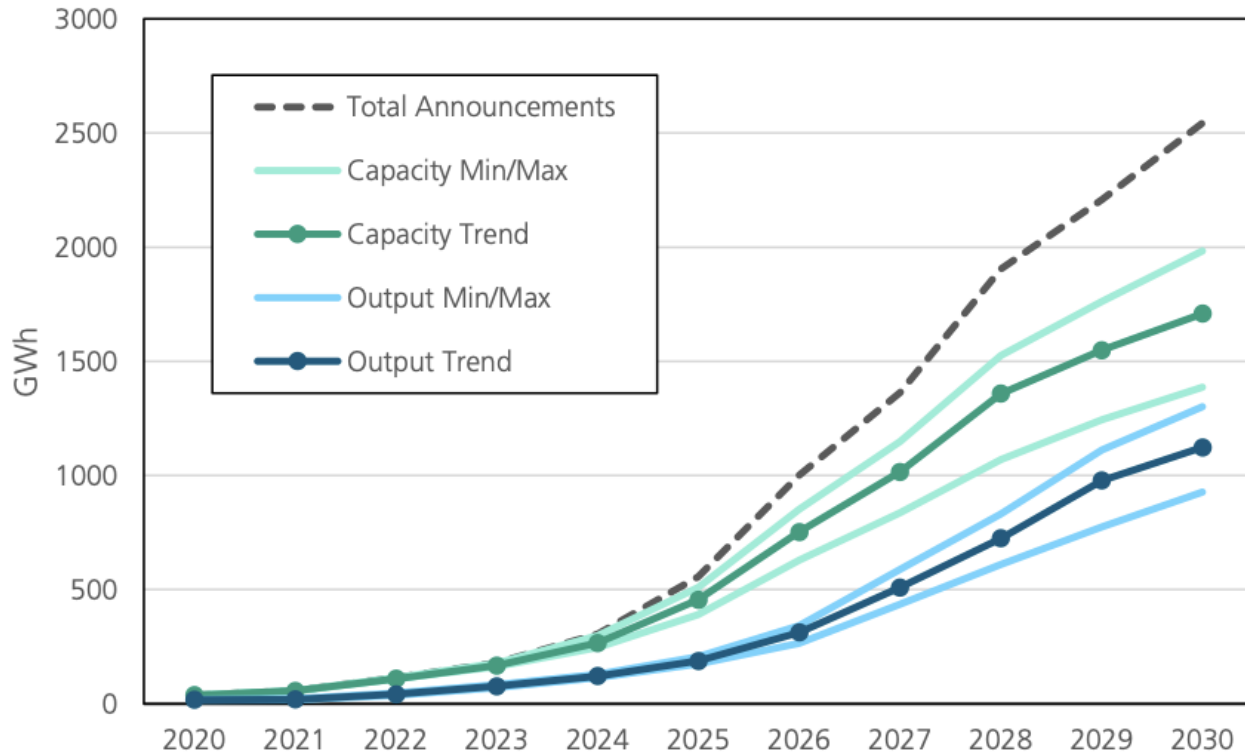


**Total Capacity**  
8,945 GWh  
(GIGAWATT-HOURS)

A photograph of a factory worker in a white uniform and blue gloves working on a battery assembly line. The worker is focused on a component on a conveyor belt. The background shows other workers and the industrial setting of a battery production plant.

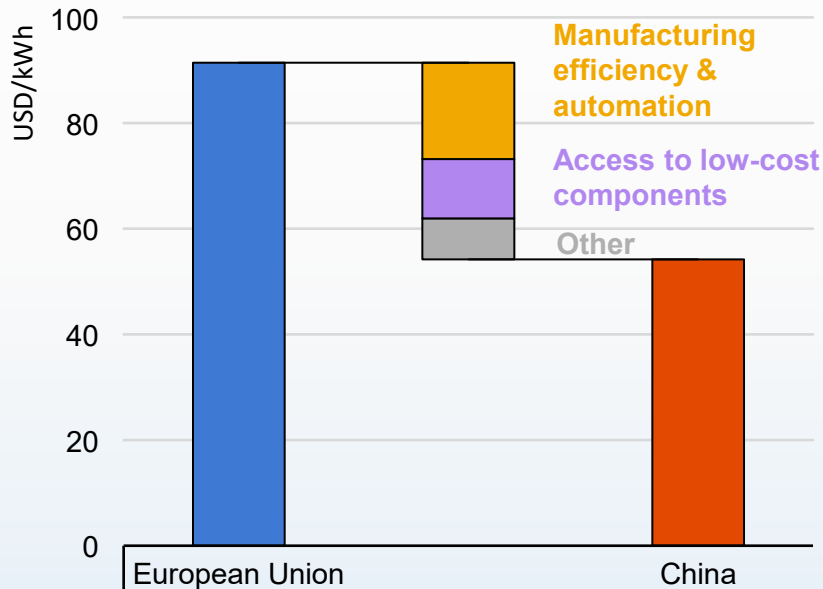
# Batteries production ... and Europe?

# Eppure lentamente, ma ancora vivo.....



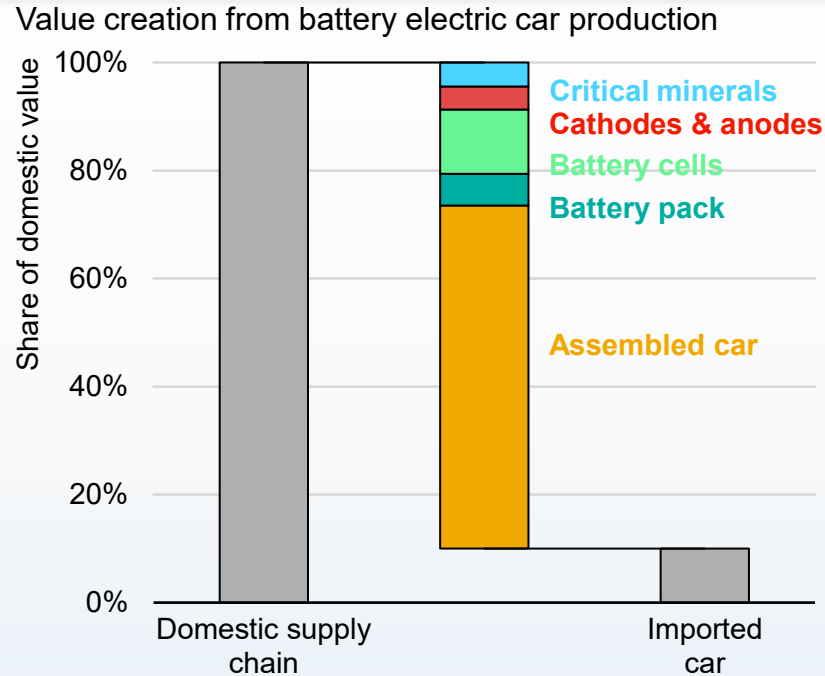
# Il divario con la Cina è grande, ma la maggior parte può essere colmata

Domestic lithium-ion battery production cost by region



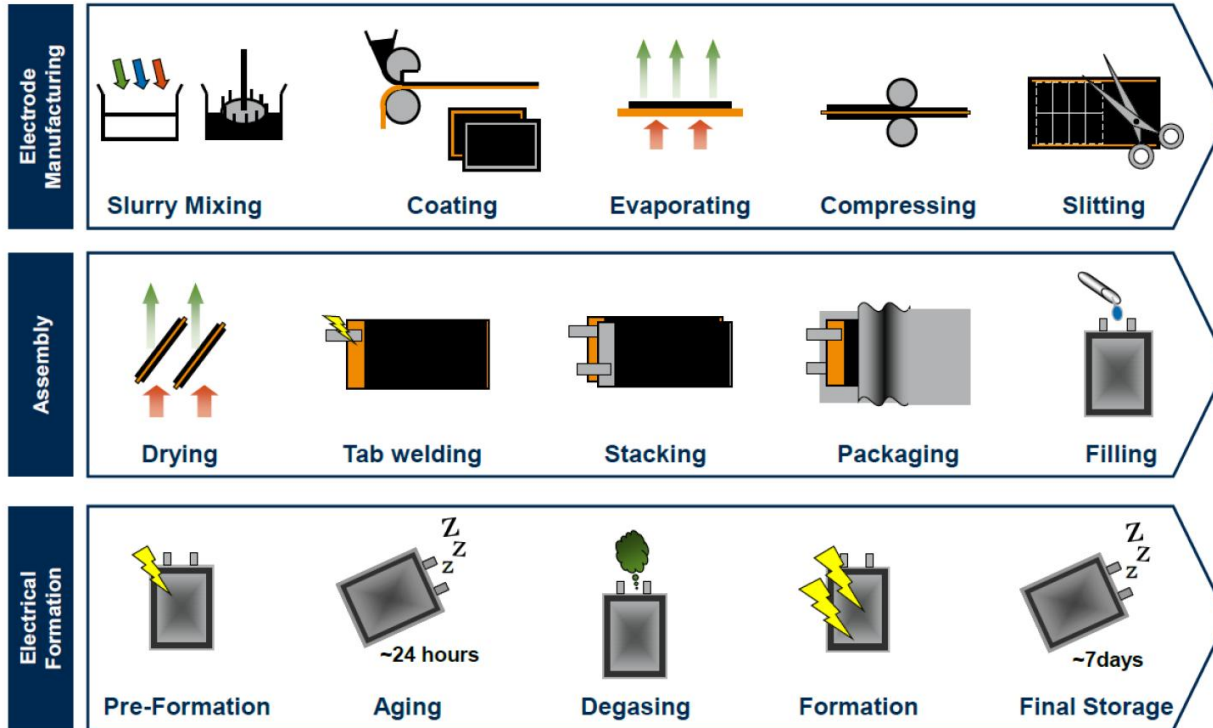
I costi di produzione delle celle a batteria nell'Unione Europea sono superiori del 50% rispetto alla Cina, ma oltre il 40% di questo divario può essere colmato raggiungendo lo stesso livello di efficienza produttiva e automazione.

**il problema non è tecnologico,  
è industriale**

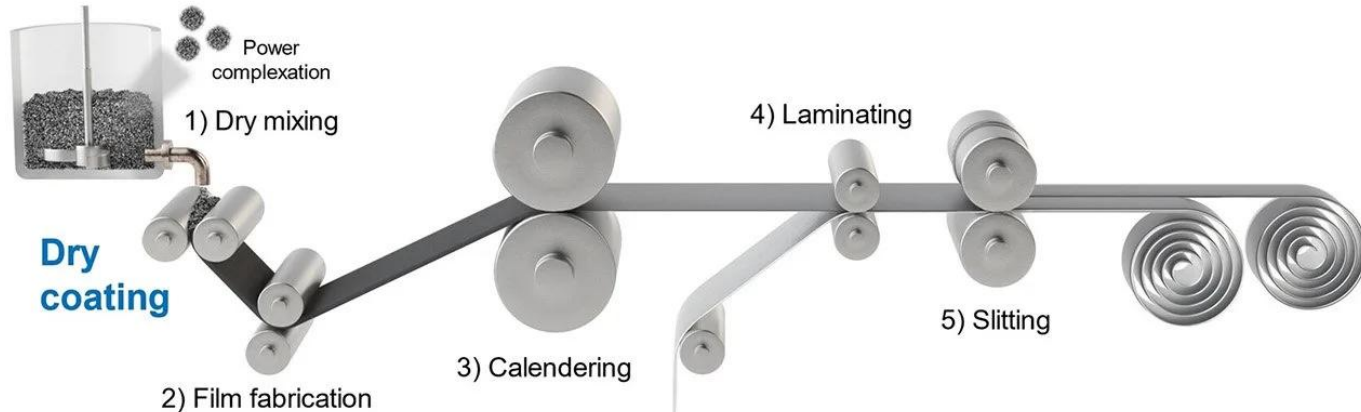
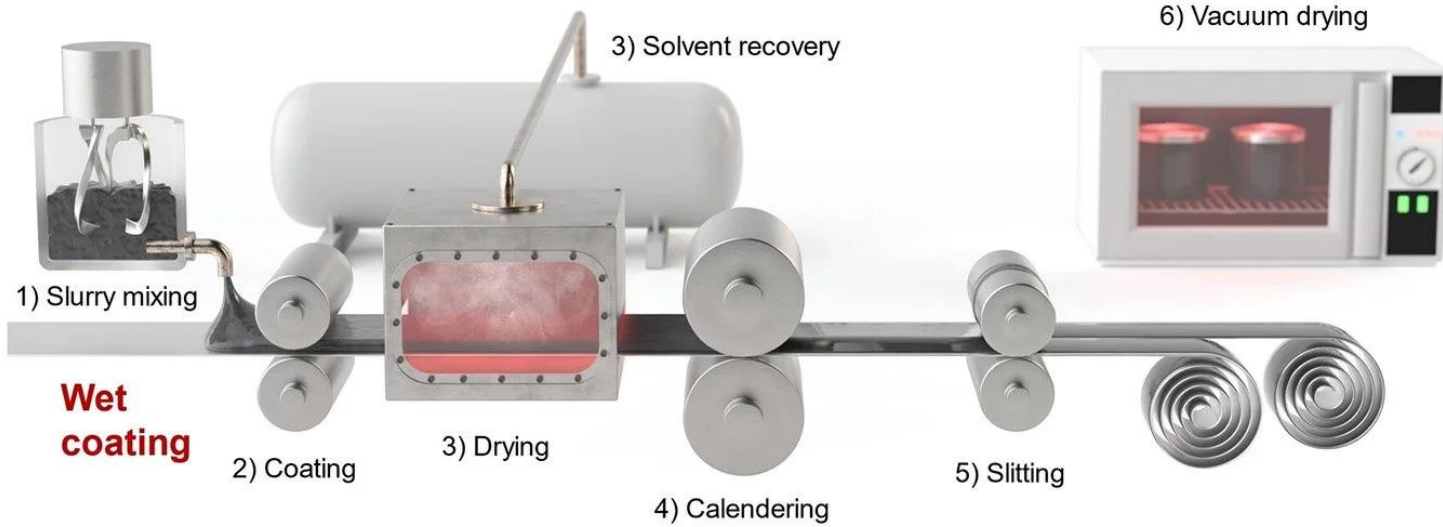


**Dare priorità alla produzione di veicoli elettrici ora può aumentare il valore interno e la domanda di batterie, mentre le catene di approvvigionamento si rafforzano nel tempo, sia a livello locale che con partner strategici.**

# Produzione di celle



Fuente: M+W Group 2013



# Cell Manufacturing

## GIGAGREEN Design to Manufacture Giga-Factory concept

### SAFER

- NMP-free
- SOPs for safety handling and automation

### CHEAPER

- Reduced energy and material consumption, economy of scale
- Cell manufacturing cost reduced by 20%

### GREENER

- Reduced energy and material consumption
- Energy consumption of cell manufacturing reduced by 25%

### FLEXIBLE

- Digitalisation processes allowing to quicker specification change
- Affordable scalable process

### BETTER

- High performance LNMO/SiC
- Data-driven process and product quality control

## Overarching approach



Industry actors from all value chain



Pathway 1 – wet (NMP-free) processing



Open Access ensured



Pathway 2 – dry processing



LNMO/Si-C chemistry



Time to impact: immediate

## DESIGN

Material research and optimization

LMNO – Si rich



Selection of suitable binders



Research and optimization of sustainable and ultra safe electrolyte



# Roadmap

## DESIGN

## OPTIMIZATION

Material research and optimization

LMNO – Si rich



Selection of suitable binders



Research and optimization of sustainable and ultra safe electrolyte



Evaluation of properties of interest for electrode manufacturing (i.e. rheology, EC stability...)



Manufacturing  
Wet process in pilot line  
Dry process



laser - texturing of electrodes



# Roadmap

## DESIGN

## OPTIMIZATION

## VALIDATION

Material research and optimization

LMNO – Si rich



Selection of suitable binders



Research and optimization of sustainable and ultra safe electrolyte



Evaluation of properties of interest for electrode manufacturing (i.e. rheology, EC stability...)



Manufacturing  
Wet process in pilot line  
Dry process



Formulation, testing and scale-up assessment for industrial production

Gen1 monolayer cells



Scale up to 10 Ah cell



laser - texturing of electrodes

Digital Twin platform

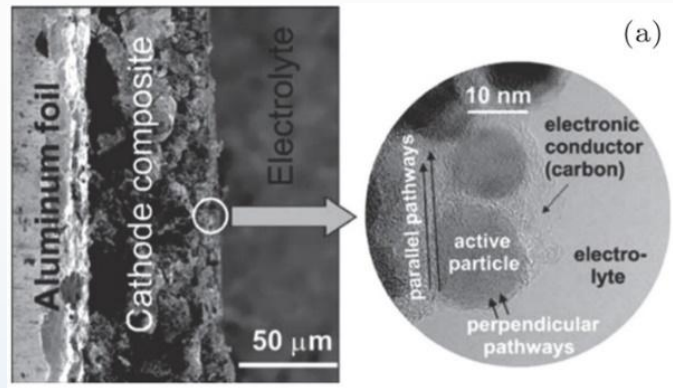
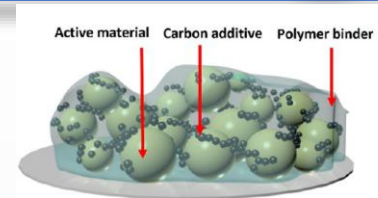
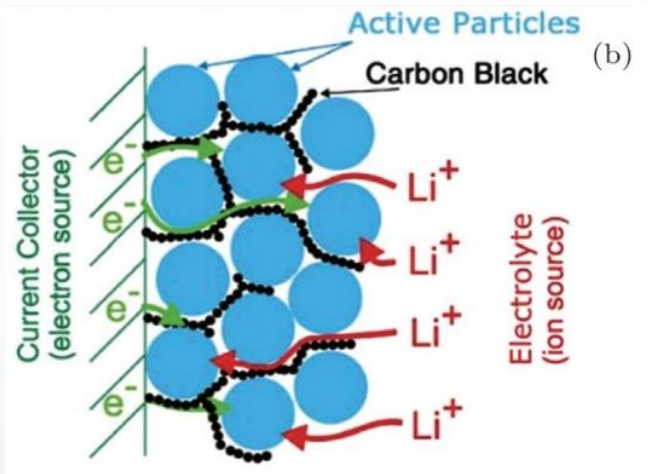


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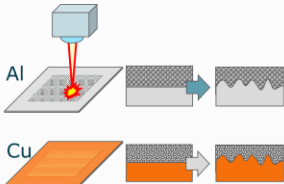
# Additivo conduttivo e legante



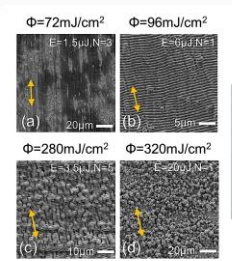
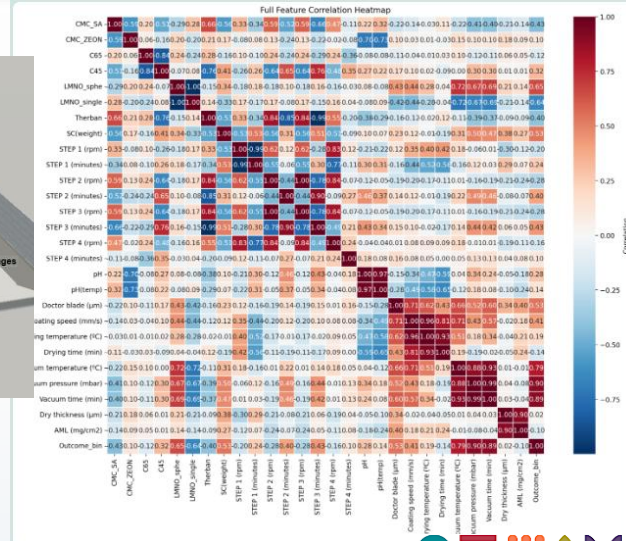
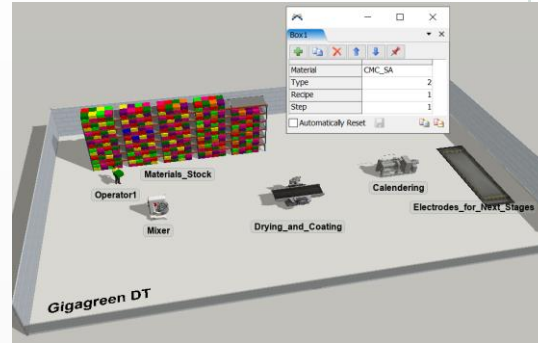
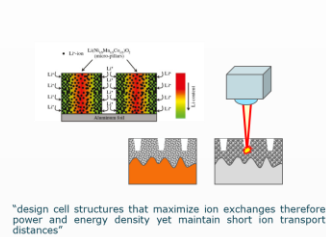
Energy Environ. Sci., 2018,11, 3096-3127

□ Laser Texturing of charge collectors both Cu and Al

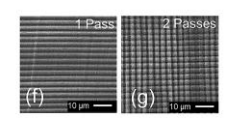
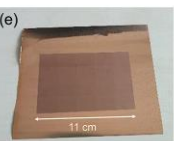
improve the electro-mechanical bonding between the charge collectors and the active part of the electrode



□ Extend to Gen3b the concept of 3D-battery



SELF REMODELING



DLIP

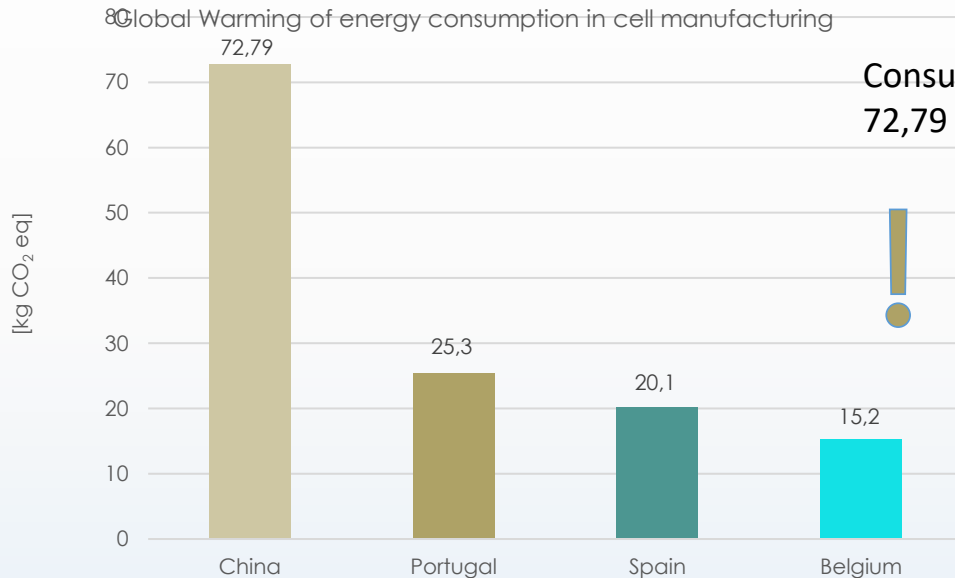
Journal of Energy Storage 2017, 12(12), 1212-1220  
 Journal of Energy Storage  
 Research Paper  
 Ultra-short pulsed laser texturing of current collector for Si/C-Li-ion anodes: Characterization of electrochemical performance and evolution of interface morphology  
 Elsa Bernini\*, Giorgio Montanari\*, Giuseppe Milonzi\*, Marco Negarzi\*, Daniele Venuti\*, University of Genoa, \*Alfano F.A., Laiter\*, Federico Belli\*, Silvia Barbucci\*



Obiettivo: Ricreazione dell'impianto pilota  
 Rappresentazione 3D della pianta e della logica di processo  
 Algoritmo di IA per prevedere le specifiche degli elettrodi  
 Simulazione di vari scenari per ottimizzare il processo produttivo (inclusi consumo energetico, tassi di produzione, ecc.)



# Ma ha senso investire in Europa?



Consumo energetico durante la produzione delle celle (Cina):  
72,79 kWh

**Se cambiassimo il paese in cui la cella viene prodotta, l'impatto ambientale associato al consumo energetico si ridurrebbe.**

La variazione di questi impatti è legata al mix energetico dei diversi paesi. La Cina è un attore potente nel mercato globale dei combustibili fossili. Pertanto, la transizione verso fonti di energia più pulite e rinnovabili può ridurre le emissioni di gas serra



Funded by the European Union under grant agreement N° 101069707. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA) Neither the European Union nor CINEA can be held responsible for them.

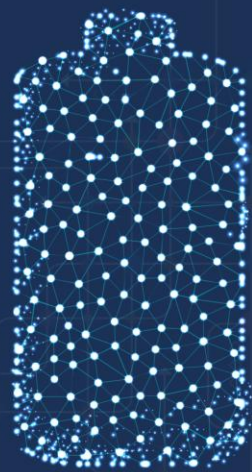


# BATTERY 2030+ ANNUAL CONFERENCE

7-8 May 2026  
Turin, Italy



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant number No.101104022



BATTERY  
2030+







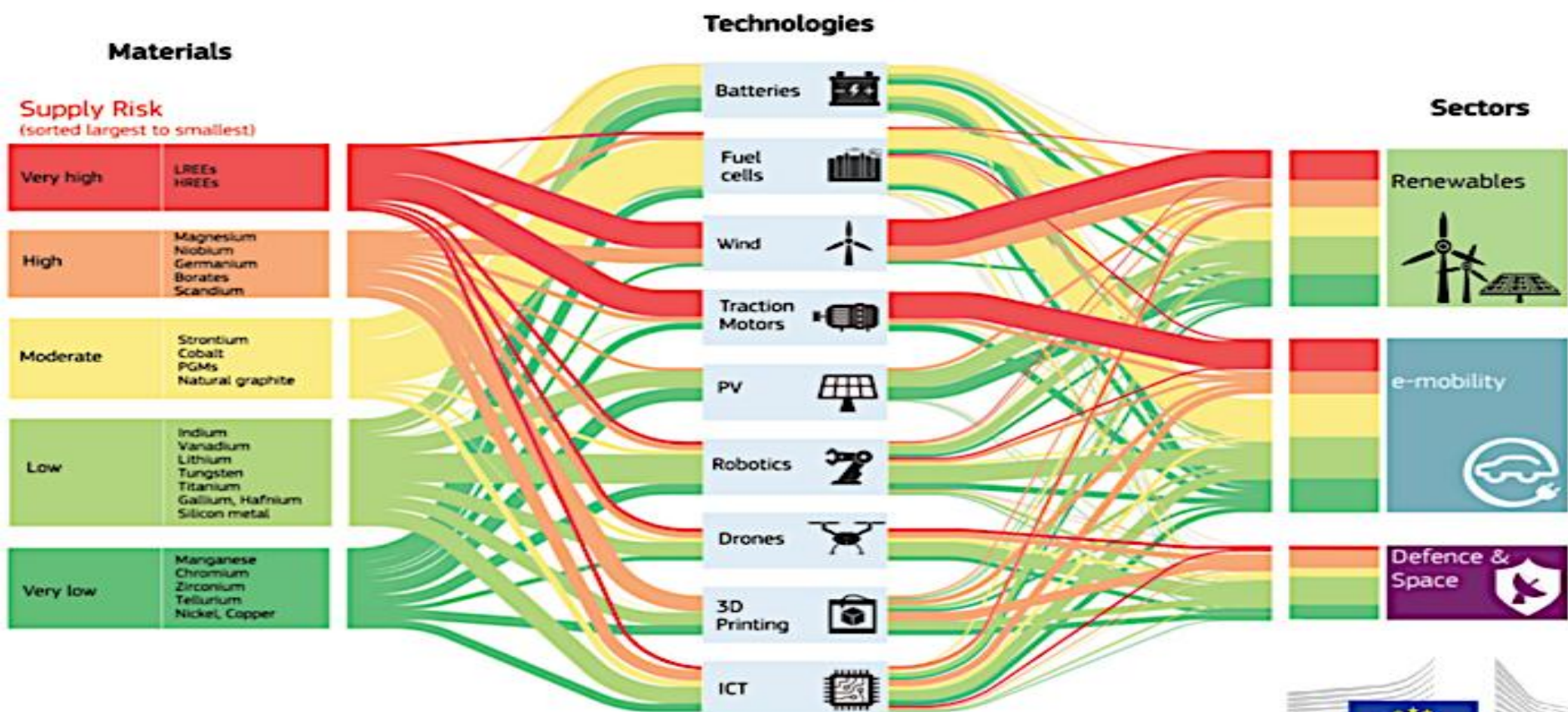
**Sfide:** quali sono i principali ostacoli nella produzione (celle, moduli, pacchi)?

**Needs:** di cosa ha bisogno la filiera per crescere (competenze, infrastrutture, normative)?

**Proposte:** quali azioni concrete si possono suggerire?

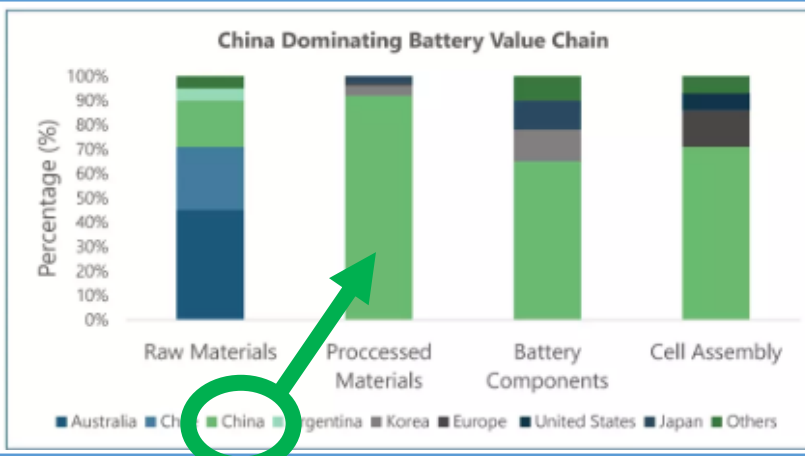


# Critical raw materials and their supply risk



# Raw Material Supply Chain Disruptions

Challenges in Raw Material Supply Chain Hindering the Outlook for Smooth Energy Transition



## Causes of Supply Chain Disruptions



Rate of EV production vs rate of mining of raw materials.



Biggest Market of EV i.e., Europe dependent on other regions for raw material sourcing/Raw material sourcing by European EV manufacturers



Ukraine-Russia crisis



Covid-19 Pandemic Effect

# E già in Italia non abbiamo materiali critici.....



## I materiali critici in Italia

Le tre aree dove si ricercano le materie prime  
utili alla transizione energetica

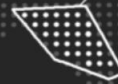
PIEMONTE

Valli di Lanzo



TOSCANA - LAZIO

da Monte Amiata  
ai Campi Flegrei



SARDEGNA

Buddusò



Cobalto

Litio

Terre rare