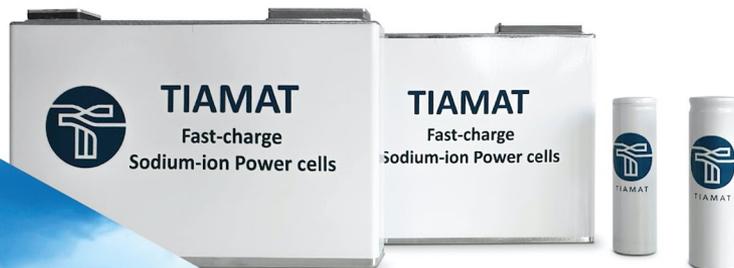




# TIAMAT **Sodium-ion** Technology



WORLD  
**MATERIALS**  
FORUM



July, 2023

# Why Sodium?

**2022**  
400 GWh



**2025**  
1 500 GWh



**2030**  
4 500 GWh

**By 2030...**

## Nickel

Nickel Class 1 extraction capacity will be **46% below demand\***

## Lithium

Lithium carbonate & hydroxide capacity will be **52% below demand\***

## Cobalt

Cobalt extraction capacity will be **10% below demand\***

**Nickel, Lithium and Cobalt are the main materials for Mainstream technology Li-ion based batteries**



**TIAMAT Sodium-ion technology is a Lithium and Cobalt-free product**

# Our story : from french research to global market



Prof. JM Tarascon



Dr. M Morcrette – Prof. C Masquelier – Prof. P Simon – Dr L Croguennec



2012

Launch of the sodium-ion research task force (CEA, CNRS, Collège de France).



Sodium-ion patents



2016

First 18650 Na-ion Gen<sup>1</sup>cell, resulting from the work of the scientists of the RS2E network.



2017

Birth of Tiamat



2018

1<sup>st</sup> capital increase of 1.6 M€



2019-20

First real-life use cases



2020

1<sup>st</sup> development contract signed with French automotive Tier 1 for automotive 48V battery pack



2021

2<sup>nd</sup> capital increase of 3.5 M€



2022

First 18650 Na-ion Gen<sup>2</sup> cell



2023

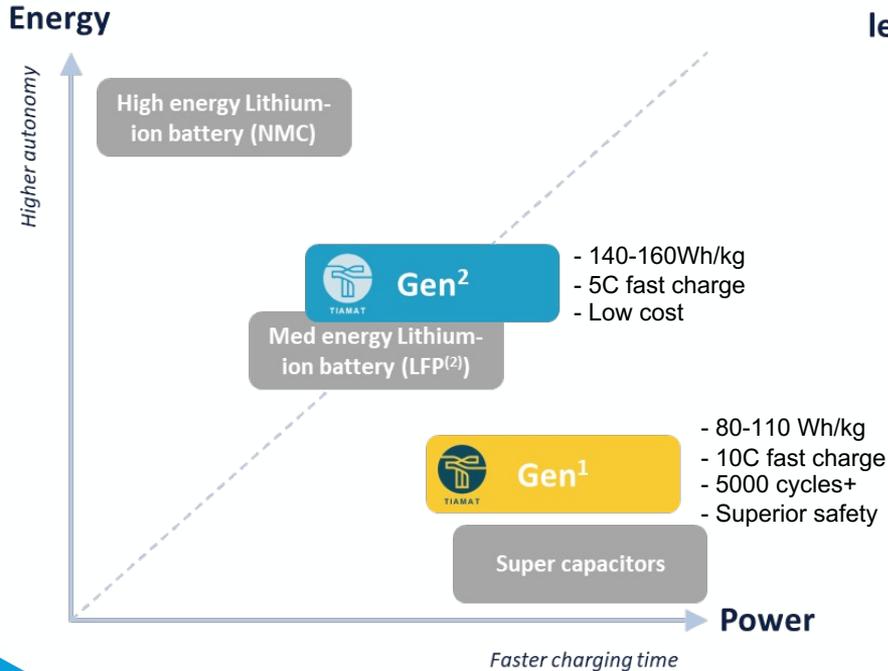
3<sup>rd</sup> capital increase



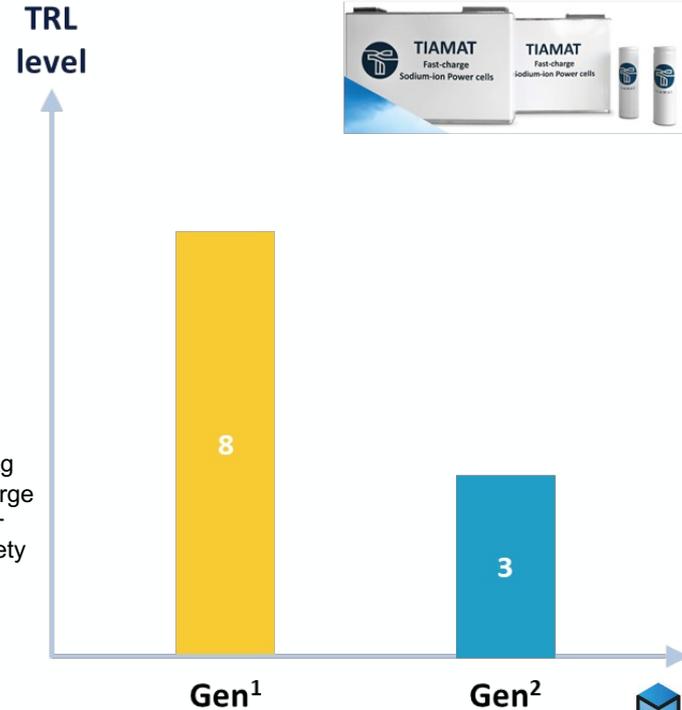
# Products positioning

Tiamat's historical Gen<sup>1</sup> Sodium-ion battery cell has recently been complemented with Gen<sup>2</sup> to widen its market opportunities

Tiamat's products position in terms of Energy and Power



Tiamat's Gen<sup>1</sup> & Gen<sup>2</sup> TRL<sup>(1)</sup>



# Markets and competition

\*P3 consulting



140 GWh in 2030\*  
40 GWh in 2030  
5 GWh in 2030



740 GWh in 2030\*  
210 GWh in 2030  
>20 GWh after 2030

## HYBRID AND H<sub>2</sub> VEHICLES



Hybrid & hydrogen light vehicles    Hybrid & hydrogen trains    Hybrid aircrafts    Hybrid & hydrogen heavy vehicles

Battery that assists main energy source in order to limit energy consumption and emissions

## ELECTRIC VEHICLES FOR PROFESSIONAL FLEETS



Agriculture    Electric delivery light vehicles    AGV and material handling    Opportunity charging e-buses

Traction battery taking advantage of fast charging

## TOOLS, BACK-UP & STATIONARY STORAGE



Electric tools    Stationary storage<sup>[2]</sup>    Back-up battery (12V) for vehicles

Power battery with fast charging    Power battery for grid stability    Power battery for multiple usages<sup>[3]</sup>

## PURE ELECTRIC VEHICLES



Electric moderate range BEVs<sup>[1]</sup>    Electric mopeds and bikes    Electric delivery light vehicles

Traction batteries for moderate range full electric vehicles

## STATIONARY STORAGE



Solar Panel production storage    Residential storage    Wind farms production storage

Allow to store renewable energy produced in excess for later use

Competition : LTO – NMC power

Advantages over competition :

- Product availability (Lithium for high energy density)
- Cost (vs LTO)
- Extreme safety
- Cycle life (vs NMC power)

Competition : LFP

Advantages over competition :

- Agnostic to Li price and availability fluctuation
- Sovereign supply
- Low and predictable cost
- Fast charge ability

## Gen<sup>1</sup> hybridization applications



**Product** : A-sample 48V MHEV  
0.8kWh / 30kW battery pack

**Market** : Automotive

**Customer** : Plastic Omnium



**Product** : B-sample 48V PHEV  
0.8kWh / 25kW battery pack

**Market** : Automotive racing  
applications (Formula 4 2023  
French championship)

**Customer** : Oreca / Mygale

## Gen<sup>1</sup> power tools application

**World premiere : On sale  
September 2023**



**Product** : 1Ah single-cell to 5Ah  
multi-cell battery pack

**Market** : Consumer electronics -  
DIY

**Customer** : Adeo / Leroy Merlin

# Commercial, industrial and product roadmap

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>kWh produced</b>	24	160	1 200	30 000	150 000	500 000	1 000 000	1 800 000	3 000 000	5 000 000

30 A Sample    200 B Sample    1500 C Sample    PRODUCTION

**Commercial Strategy**

**SCALING PHASE (Proof Of Concepts)**

**EXPANSION PHASE (commercialization)**

**Industrial Strategy**

**Manufacturing partners**

**Subcontracting**

**Licensing (domestic China and other licenses)**



**Own manufacturing (Europe & ROW)**

**Product Development**

**Gen<sup>1</sup> (Power)**

**5000 W/kg    >6000 W/kg**

- Hybrid electric vehicle (xHEV)
- Powertools
- Hybrid trains/aircraft/boats
- Stationary...

**Gen<sup>2</sup> (Energy)**

**NEW!!**

**140 Wh/kg    180 Wh/kg**

- Full electric vehicles (BEV)
- Stationary...





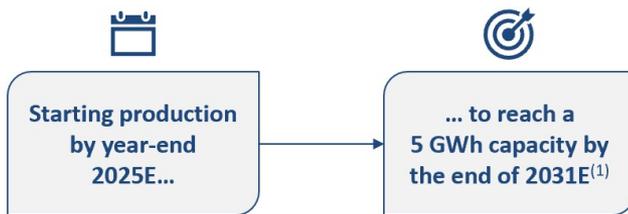
## Targeting a 5 GWh factory starting production by year-end 2025E

Tiamat's project is to build the first fully dedicated Sodium-ion battery cells plant in Europe

Tiamat factory plan



Tiamat current production plan



Source:  
Note:

Company

(1) Production plan built on the basis of current customer needs identified. Ability to accelerate the ramp-up timeline and/or increase the targeted production depending on the evolution of ongoing lead discussions

5 A 5 GWh factory by 2025E

Gen<sup>1</sup>



LOCATED IN FRANCE



1<sup>ST</sup> SODIUM-ION CELLS  
PLANT IN EUROPE



MANUFACTURING PROCESS  
SIMILAR TO  
LITHIUM-ION PLANTS



THE PLAN DESIGN WILL OFFER  
HEADROOM FOR ADDITIONAL  
PRODUCTION CAPACITY

## Focus on the gigafactory plan

Building 1 will be dedicated to the electrode preparation while other buildings will manage the cell assembly and cell finishing processes

### Low carbon footprint

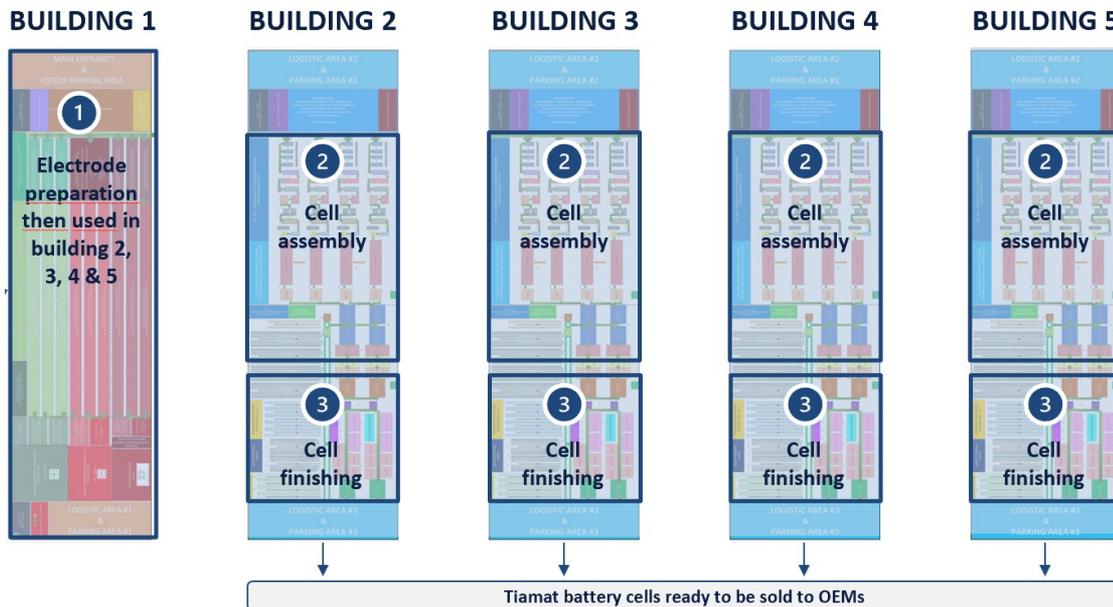
- Design to energy efficiency
- Efficient energy sourcing
- Efficient energy management

### Competitive manufacturing cost

- Design to cost
- Intelligent automation
- Current manufacturer partnership
- Operational excellence

### Scrap management

- Direct innovative recycling



150,000m<sup>2</sup> land to acquire



Source:

Company



5 buildings

(90,000m<sup>2</sup> total surface) to be built on the land



More than 300 machines to be bought for the gigafactory



More than 1,000 employees to work in the factory



TIAMAT



**Thank you**

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