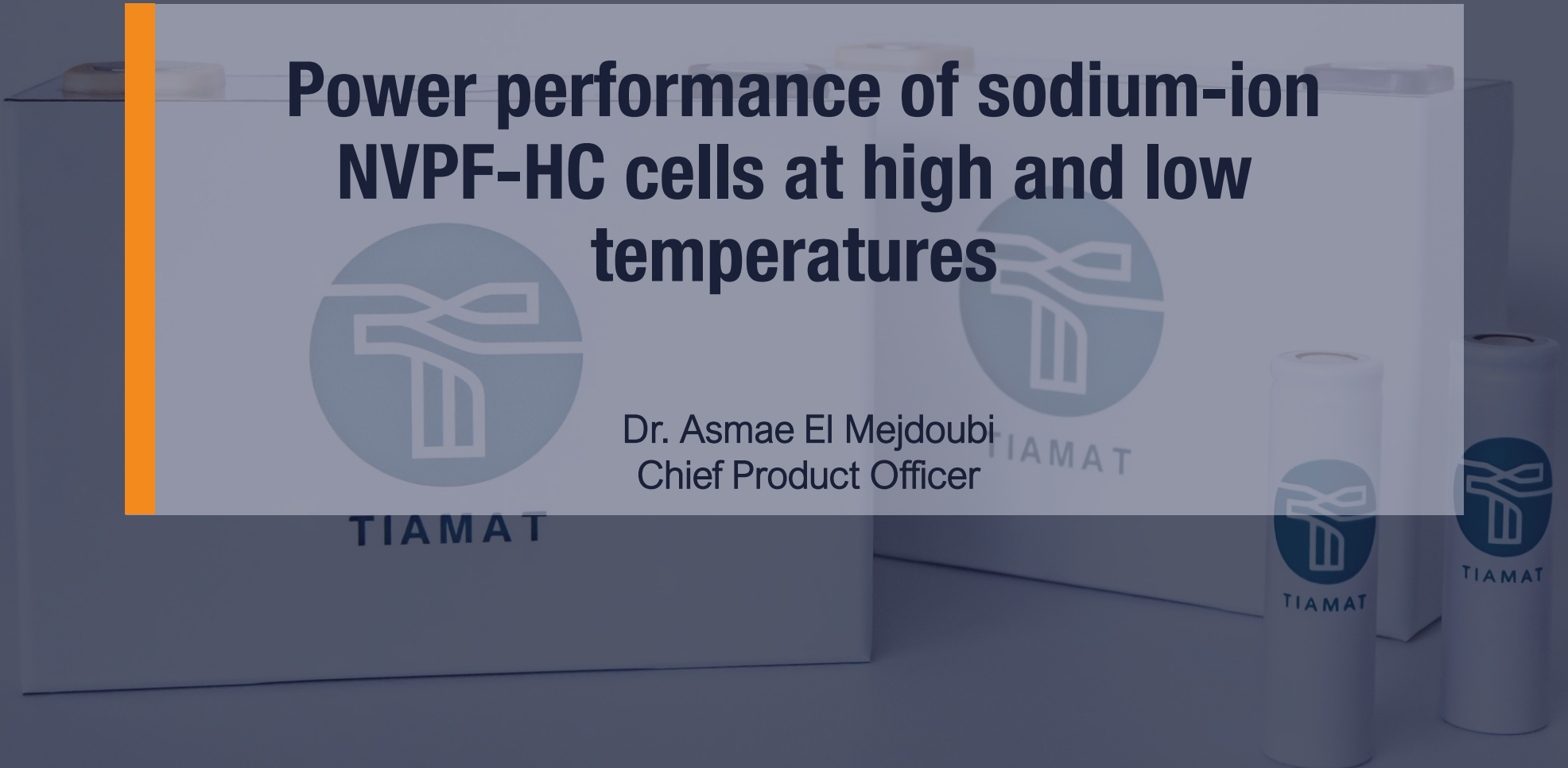


The background of the slide features a collection of TIAMAT batteries. On the left, there is a large, rectangular battery pack with a white top and a grey body, prominently displaying the TIAMAT logo. To its right, another similar pack is partially visible. In the foreground on the right, two cylindrical battery cells are shown, also bearing the TIAMAT logo. The entire scene is set against a dark, muted blue-grey background.

Power performance of sodium-ion NVPF-HC cells at high and low temperatures

Dr. Asmae El Mejdoubi
Chief Product Officer

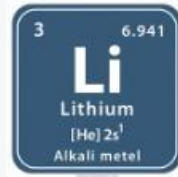
Context & Issues

Lithium-ion battery demand is increasing sharply, estimated to 4.5TWh by 2030.

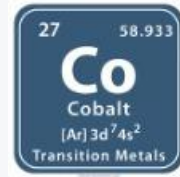
By 2030, the capacity to extract materials will be below the demand for:



-24%



-13%



+6%



Resources are limited & alternatives resources are needed



Our Story

TIAMAT is the leading producer of sodium-ion battery cells for high-power applications in portable tools, UPS, and mobility solutions, enabling us to address specific and niche requirements with industry-leading storage technologies.

2017

Birth of TIAMAT

Based on 10 years of french research



2023

First Commercialization

The first sodium-ion screwdriver with the Adeo group

2023

Capital Incease



2025

Long term partnership and investment



Our Solution

From CNRS research, Tiamat's Sodium-ion technology is **lithium, cobalt and nickel free**, eliminating the issues of limited resources

And delivering **exceptional performances**:



High power density



Fast charge



Long lifetime



Extreme Safety



Our chemistry

Tiamat's technology is based on a polyanionic cathode

NVPF ($\text{Na}_3\text{V}_2(\text{PO}_4)_2\text{F}_3$) / Hard Carbon



High voltage cathode



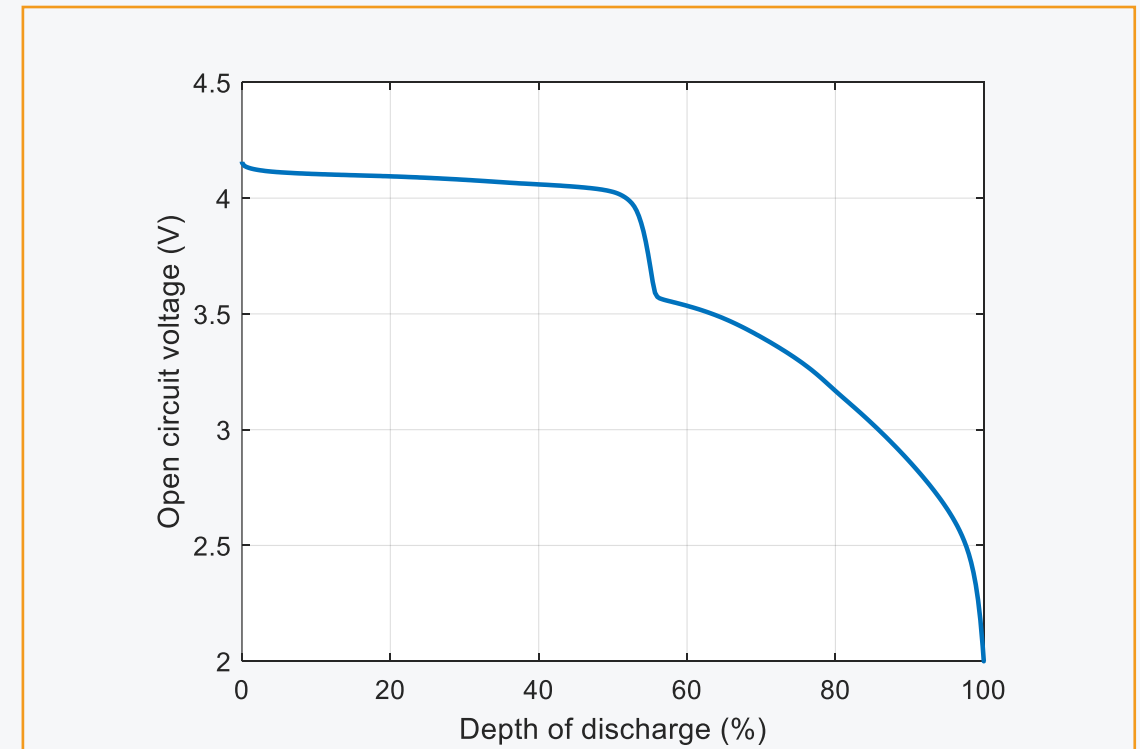
High power capability



Thermal stability



Lower energy density



Our product

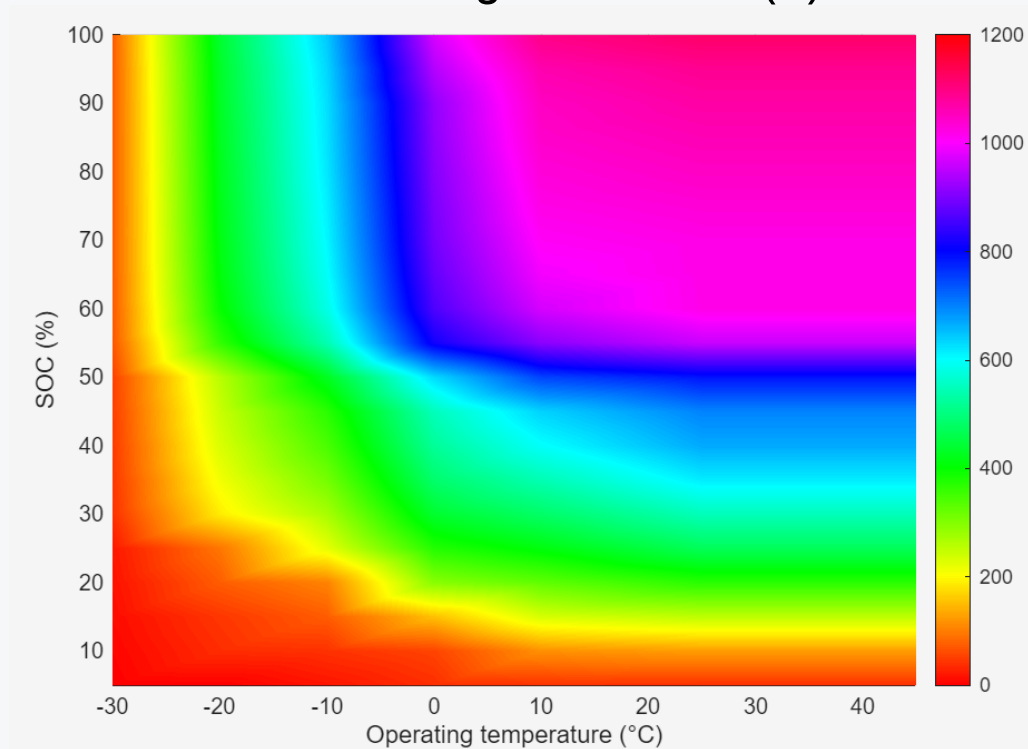
52148 prismatic cell specifications

Capacity	Typical	38Ah 140Wh
Nominal voltage	Nominal	3.7V
Charge current	Max. continuous	760A
Discharge current	Max. continuous	800A
Internal Resistance	AC (1 kHz)	<0.3mΩ
Ambient temperature	Charge Discharge	0 to 60°C -40 to 60°C
Energy Density	Volumetric Gravimetric	180Wh/L 110Wh/kg

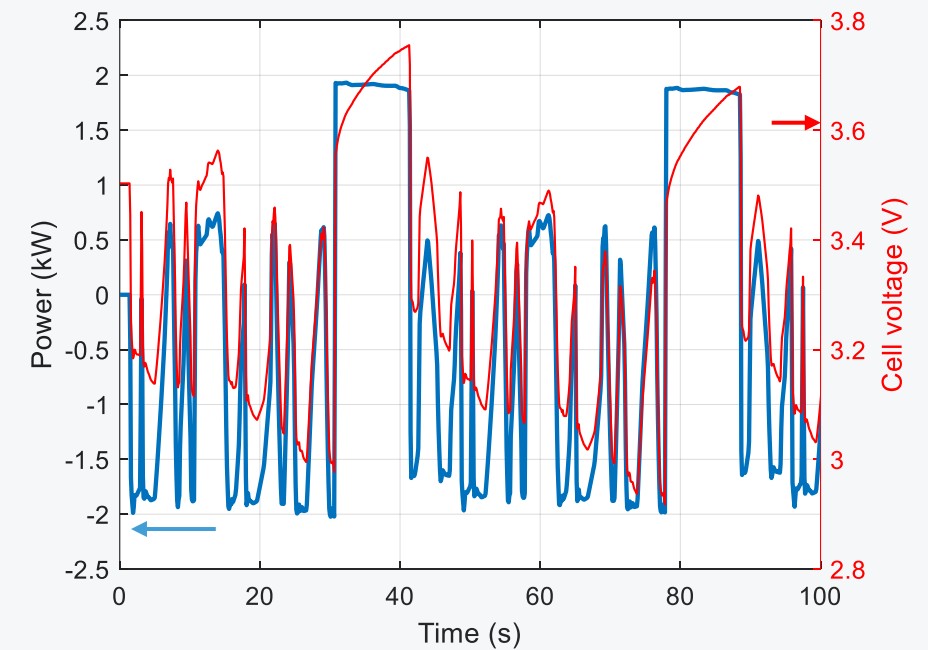


Power performances

Max discharge current 1s (A)



Example of high-power profile evolution at cell level

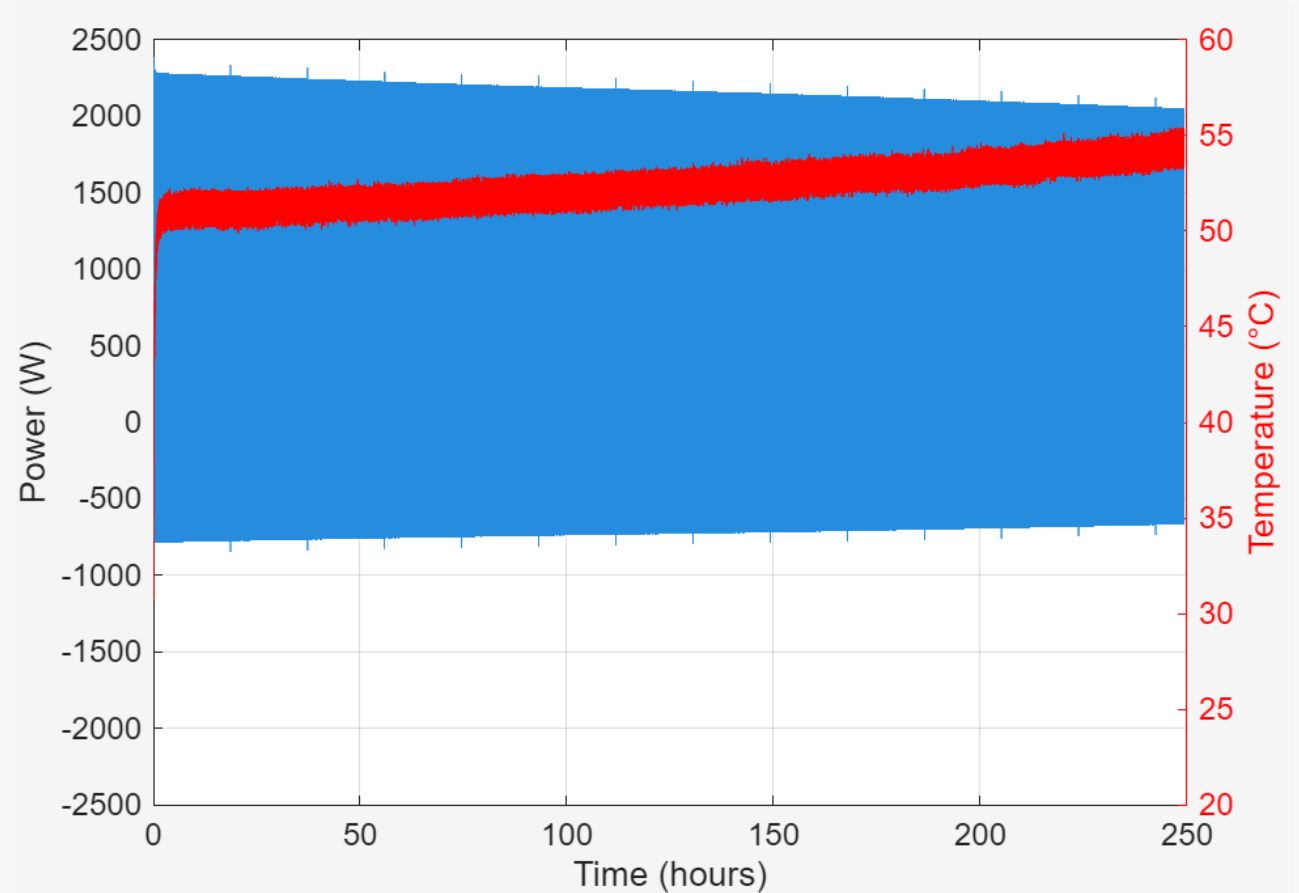


Power performances

High cycling power:

Max temperature 55°C after 250hours

=> Low temperature increase



Cycling performances

Cycling profile:

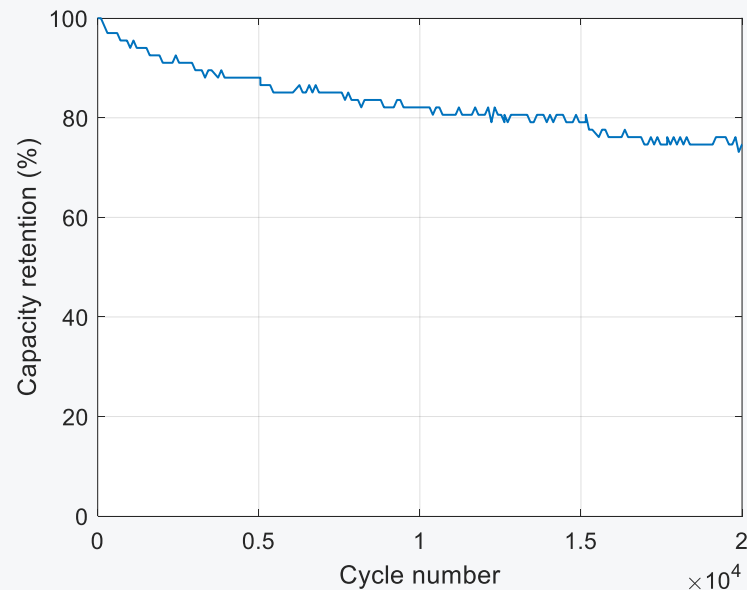
2C charge

5C discharge

Operating temperature 25°C

0 to 100% DOD

=> SOH 75% after 20000 cycles



Cycling profile:

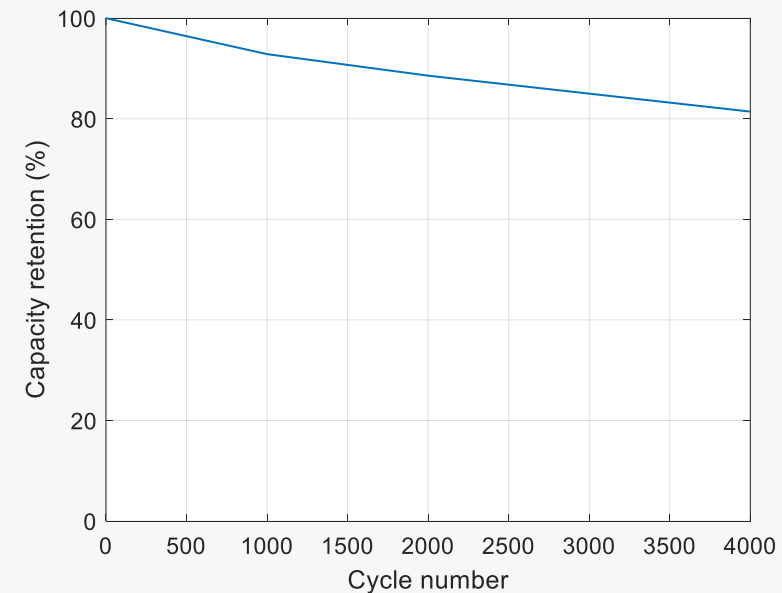
20C charge

20C discharge

Operating temperature 25°C

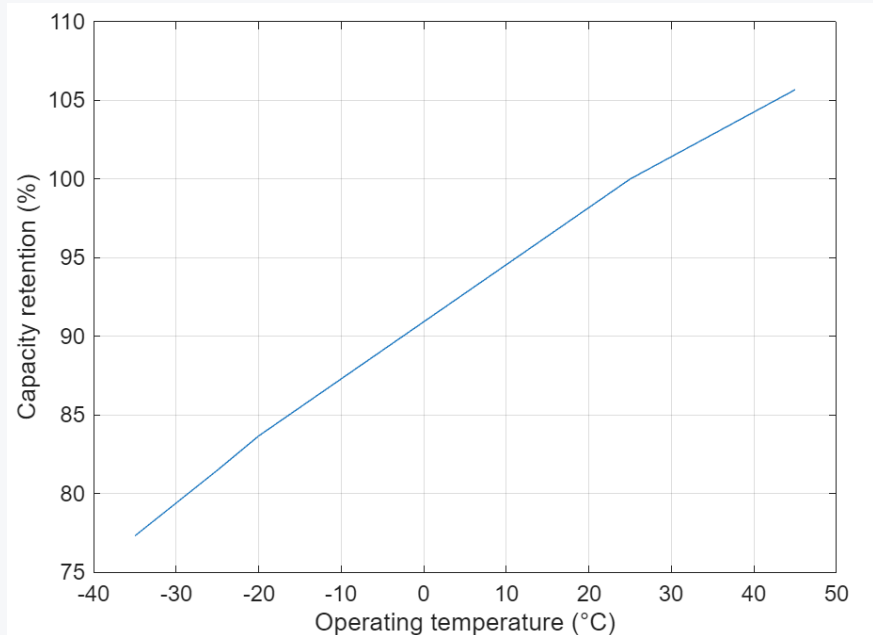
5 to 95% DOD

=> SOH 80% after 4000 cycles



Low temperature performances

Temperature impact on capacity



Cycling profile:

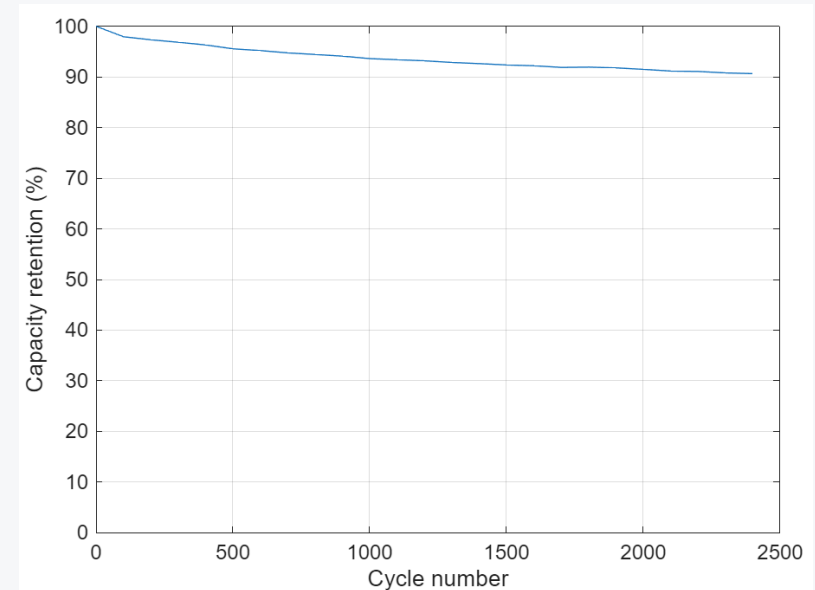
1C charge

1C discharge

Operating temperature 0°C

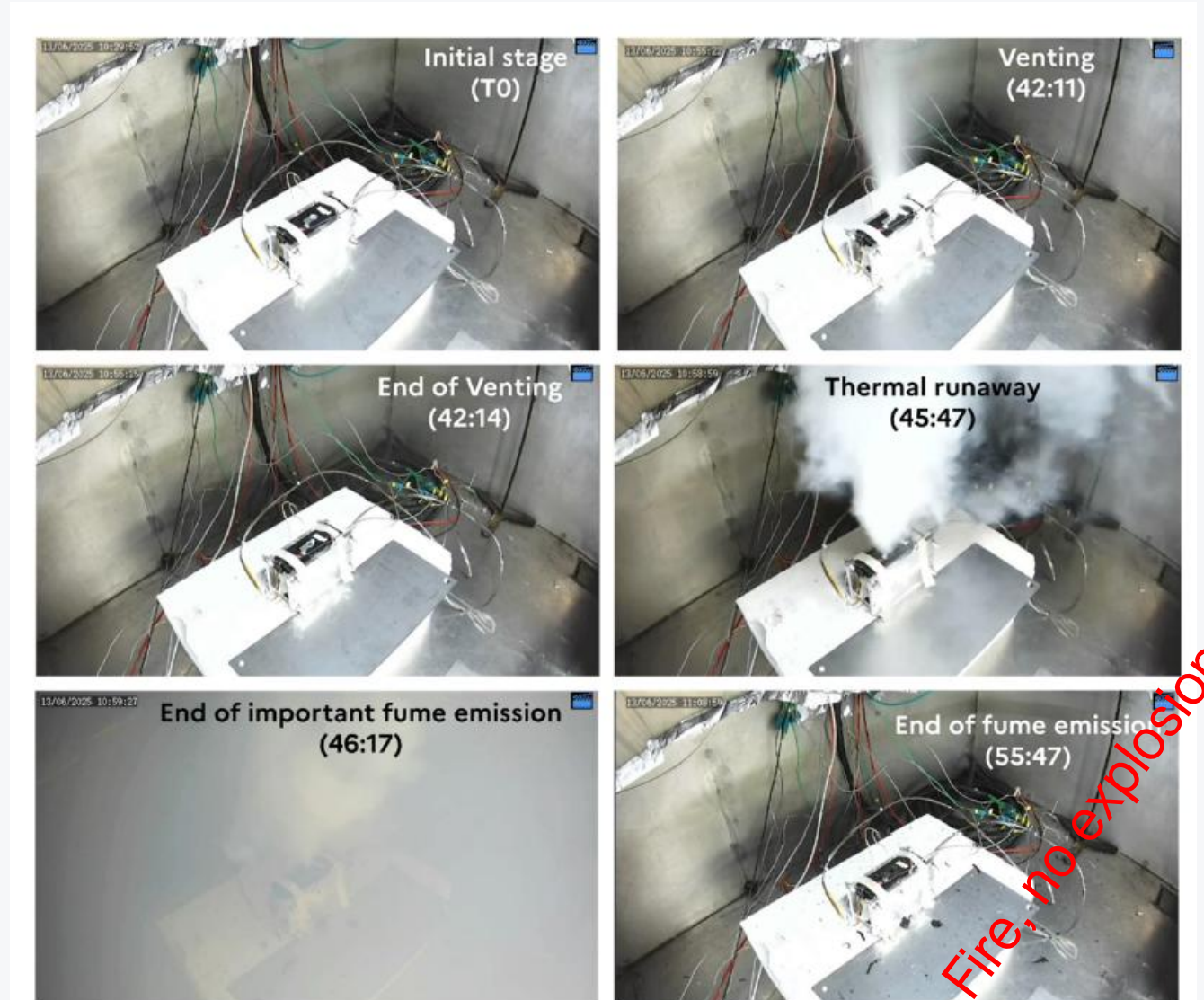
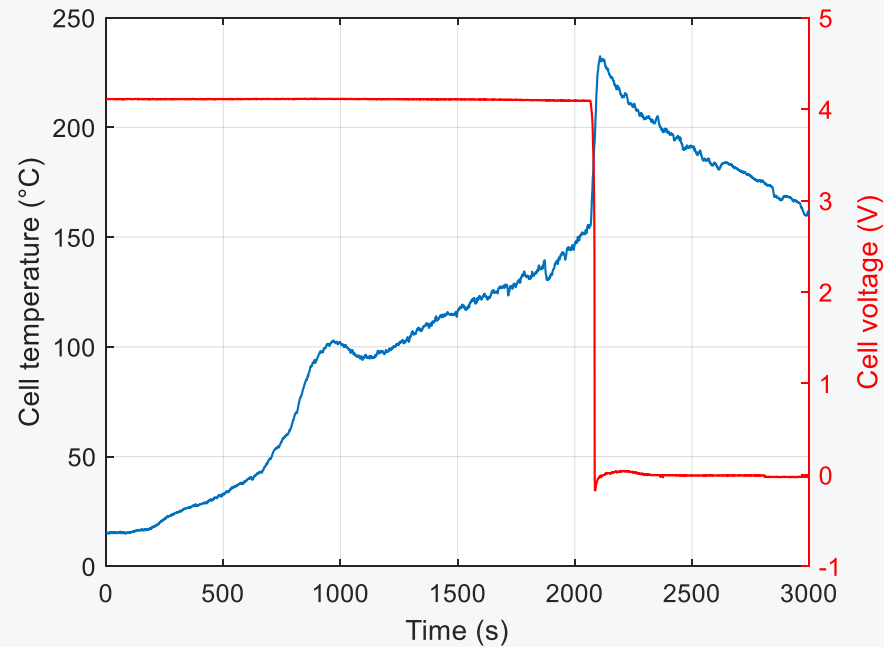
0 to 100% DOD

=> SOH 90% after 2500 cycles



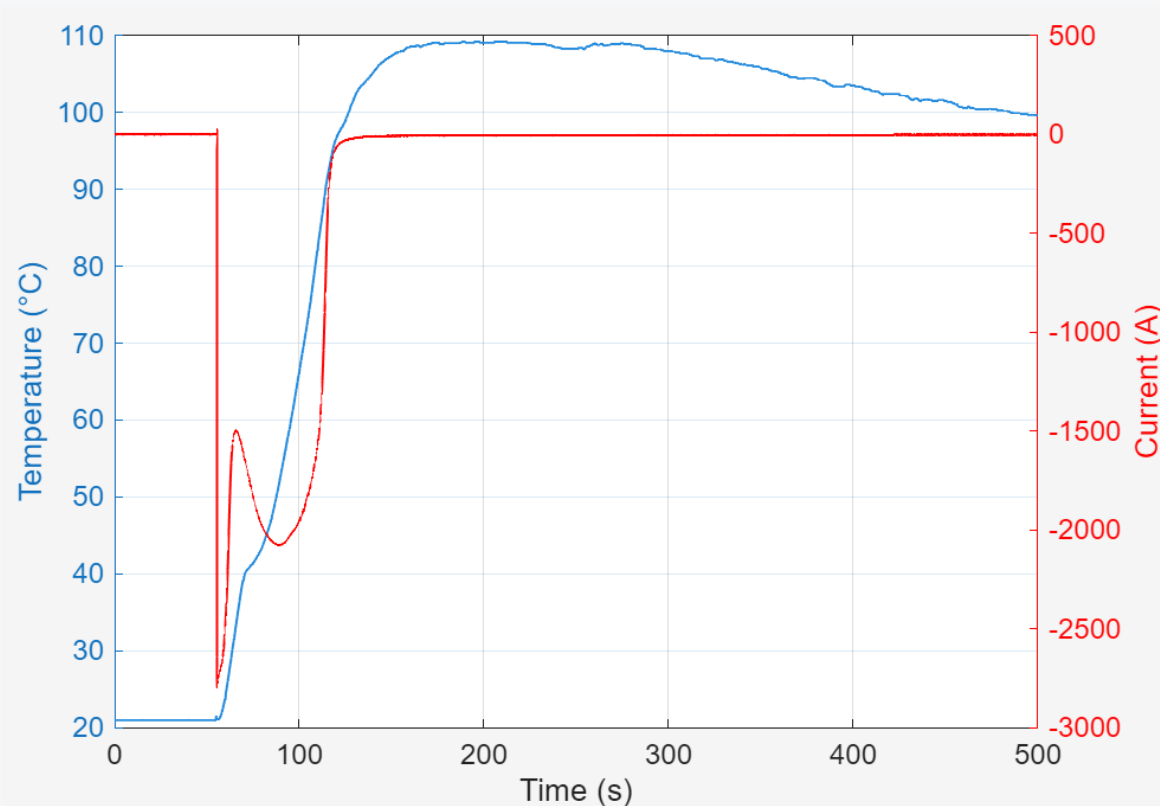
Safety performances

Overheating test: 230°C Max temperature

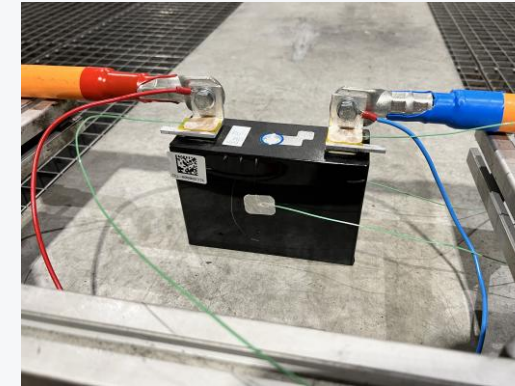


Safety performances

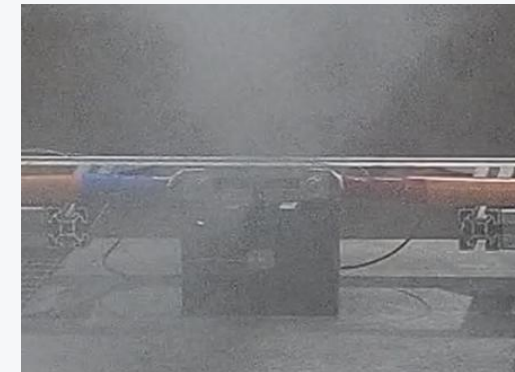
External short-circuit with 0.8mOhm resistance:
=> 230°C Max temperature



Before test



During test



After test



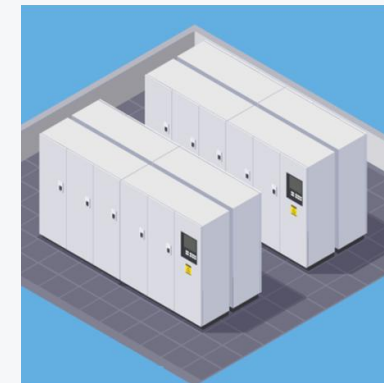


Example of high-power application: UPS for AI datacenter

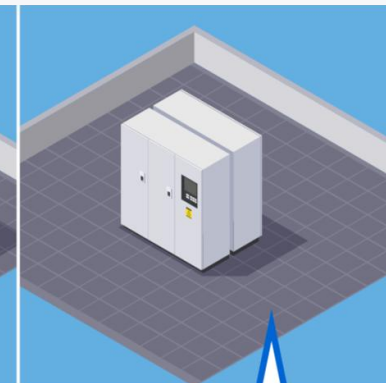
High power sodium-ion battery:

- Industry leading power density
- Long lifetime at high power
- No fire, no explosion
- Air cooling system
- Continuous AI peak shaving

Conventional lithium-ion
UPS



Sodium-ion UPS



Smaller and higher than
lithium-ion batteries



Long life of more than 20,000
charge/discharge cycles



Higher reliability than
conventional lithium-ion
batteries

Tiamat solution for xEVs

NICHE APPLICATION MARKET FIT - BATTERIES FOR HYBRID PASSENGER VEHICLES

P3

xEV concepts vary by electrification topology and primary energy source. Tiamat's high power-to-energy ratio suits MHEV and HEV applications.

	Motorization	Energy source	E-driving	Battery size [kWh]	Voltage level [V]	P/E ¹⁾ ratio	Rationale
Tiamat sweet spot	MHEV	 		 0.5-1	 <60		- E-machine primarily serves to improve efficiency: Braking energy is recovered, stored in a small battery and used for additional torque and to supply the on-board electrical system. - Saves 15-20% of fuel consumption, depending on the topology.
	HEV	 		 1-3	 100-400		- Full hybrids usually operate on a high-voltage basis and have a larger battery compared to MHEV. - Security requirements and system costs are therefore significantly higher. - Pure electric driving at low speed possible.
	PHEV	 	 	 10-20	 200-400		- Unlike mild and full hybrids, PHEVs enable all-electric driving at higher speeds and allow battery charging via the power grid. - They entail the highest system cost, driven by the need for both an internal combustion engine and a full EV drivetrain with a sizable battery.
	BEV			 40-120	 400-800		- Battery Electric Vehicles (BEVs) run exclusively on electricity, using large batteries and electric motors — they have no internal combustion engine. - Unlike hybrids, BEVs must be charged via external power sources and typically offer longer electric-only range.



Internal combustion engine



Electric engine



Fossil fuel



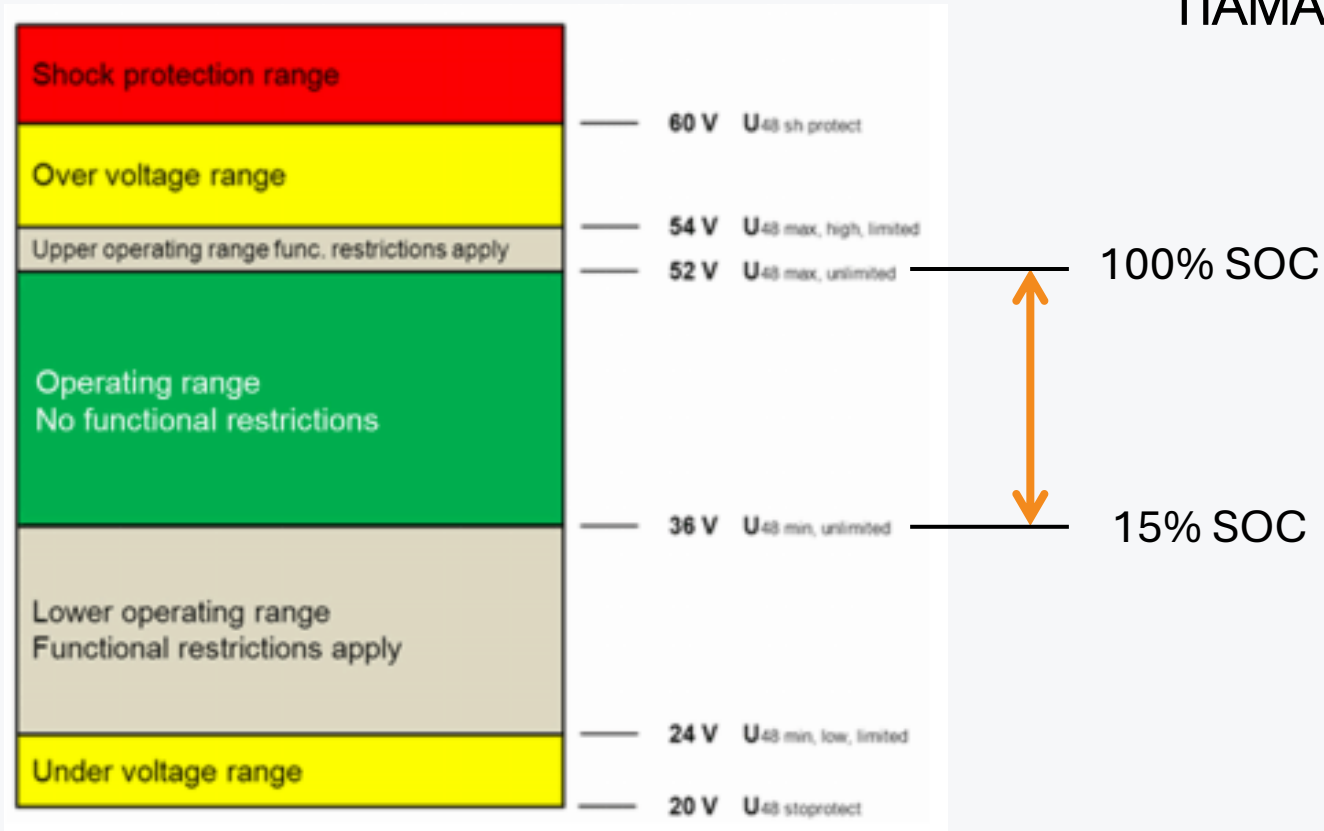
Electricity

Low  High

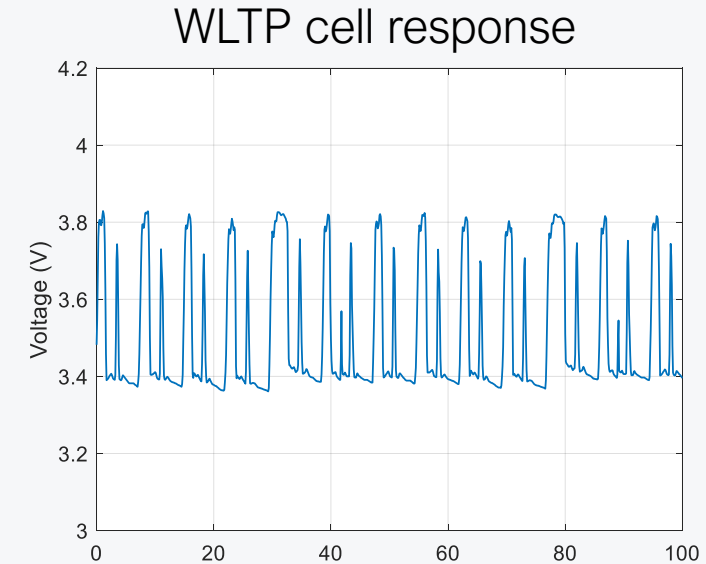
¹⁾ Power to energy on battery level (ratio of charge and discharge power [kW] in relation to installed capacity [kWh])

Good fit for hybridization: 48V MHEV case

TIAMAT solution at 12S configuration

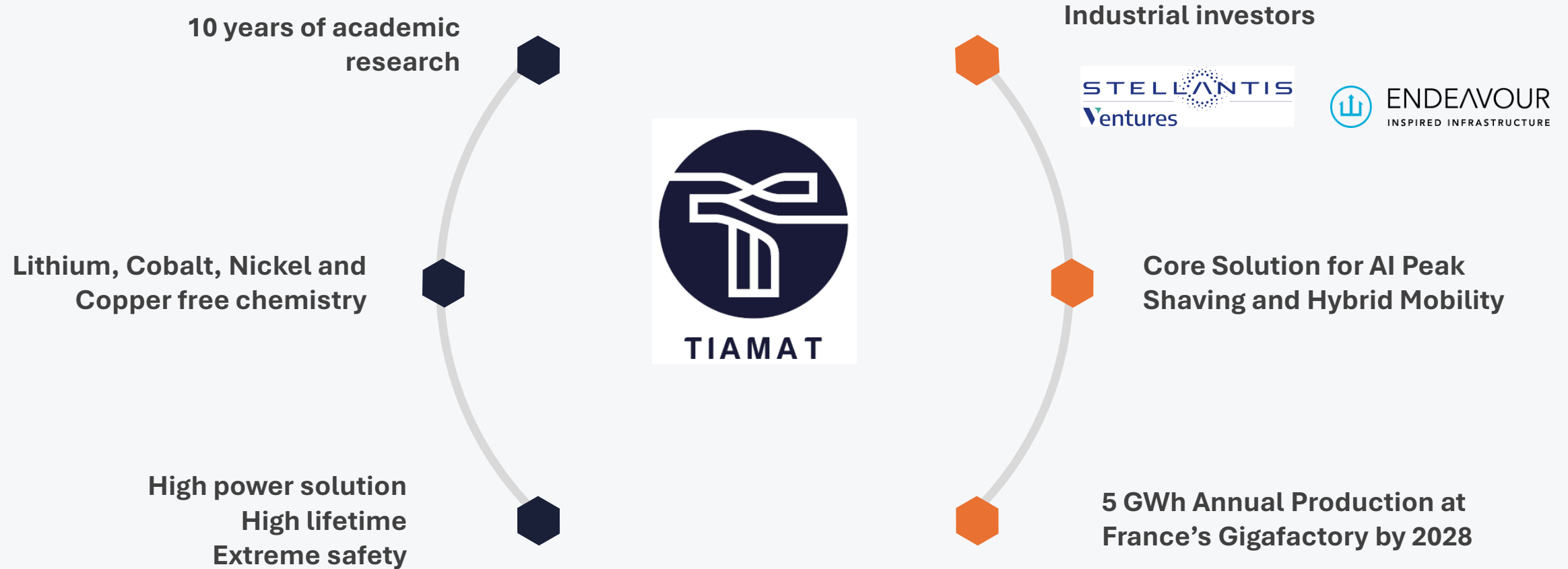


VDA



- 85% of usable energy
- Safety operations at high SOC
- Low dissipation at high power
- Good performances at low temperature

In Brief





TIAMAT

tiamat-energy.com

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