



**Altech Batteries**  
Limited

# QUARTERLY REPORT

March 2024

## Excellent Progress on ABS60 60kWh CERENERGY® Battery Prototypes

- Excellent progress with two 60 kWh battery pack prototypes
- Pilot plant re-design at Fraunhofer IKTS Hermsdorf for prototype manufacture
- All prototype materials have been procured from suppliers
- Ceramic tube manufacture is 50% complete
- Cell assembly progressing well with more than half completed
- Low reject and defect rates experienced
- Two battery vacuum casings delivered and undergoing heat loss testing
- Finalisation of prototypes will be mid 2024

## Excellent Definitive Feasibility Study for 120 MWh First Production Line CERENERGY® Battery Project

- Highly positive Definitive Feasibility Study (DFS) – 120 GridPacks (1MWh) pa
- Capital cost estimated at €156 million with excellent project economics
- Pre-tax Net Present Value (NPV9) of €169 million
- Attractive Internal Rate of Return (IRR) of 19%
- Steady state payback period is 3.7 years, with Annual Revenue of €106 million per annum
- EBITDA of €51 million or margin of around 47%
- Altech Board Decision to Proceed to Funding Phase
- Low lifetime levelised cost of storage €0.06/kWh vs lithium-ion batteries at €0.149/kWh
- Grid energy storage market projected to grow by 28% CAGR
- Grant funding applications underway
- Equity and mezzanine financing discussions in progress
- Offtake for 5 years production in progress

## Update on Silumina Anodes™ Project

- All equipment now received for the plant construction
- Commissioning of plant areas underway
- Non-disclosure Agreements signed for commercial samples with global automobile and battery supply chain companies
- Project includes robust economics including an NPV<sub>(10)</sub> of €684 million

## Investor Presentation

- CEO Iggy Tan recently presented at the RIU Conference held in Fremantle, Australia
- Shareholders are invited to view a recording of the presentation at the following website link

<https://investorhub.altechgroup.com/activity-updates/altech-riu-presentation-february-2024-iggy-tan>



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### Excellent Progress on ABS60 60kWh CERENERGY® Battery Prototypes

Altech advanced its ABS60 60 kWh CERENERGY® battery prototypes. The manufacturing of two such batteries dedicated to customer performance testing commenced last year. Altech's joint venture partner, German government owned Fraunhofer IKTS, had initially developed battery packs with capacities of 5 kWh and 10 kWh units. However, with the establishment of the joint venture with Altech, a significant upgrade was undertaken, resulting in the transformation of the battery pack into a substantial 60 kWh unit specifically designed for the grid storage market. Production of two of these substantial 60 kWh battery packs was initiated for the purpose of conducting performance tests and qualifying them for customer use.

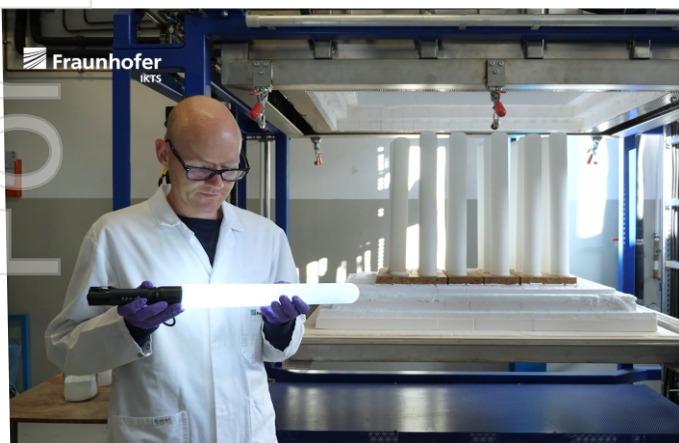
The pilot line at Fraunhofer IKTS, situated in Hermsdorf, Germany, has undergone a comprehensive redesign to facilitate the manufacturing of 60 kWh battery prototypes. Innovative tools and machinery have been developed and implemented specifically for producing the battery cells required for the 60 kWh prototypes. The battery pack is composed of 240 CERENERGY® cells, each rated at 2.5 V. These cells are organised in 4 rows, each comprising 12 cells, and stacked 5 modules high. The dimensional specifications of the battery packs are 2.6 meters in height, 0.4 meters in length, and 1.0 meter in width. Ensuring adherence to the Ingress Protection (IP) 65 standard, the packs are designed to be dust and weatherproof, reflecting high levels of sealing effectiveness for electrical enclosures.



Production of battery cells at Fraunhofer IKTS Hermsdorf pilot plant facility

All prototype materials have now been procured from specific suppliers. The crucial stages in cell production involve blending ceramic components, high-pressure pressing, tube formation, and ultimately sintering at 1,600 degrees celsius over a span of several days. Fraunhofer IKTS' Hermsdorf pilot plant facility successfully navigated the entire ceramic tube production, with half of the required tubes now manufactured. The battery cathode electrolyte, comprising sodium chloride and nickel powder granules, was produced using the mixing and pelletising equipment at the Hermsdorf pilot plant. The process of cell assembly, encompassing vacuum filling, heating, and welding, is ongoing, resulting in the completion of approximately half of the cells. To facilitate the infiltration of cathode material into multiple battery cells simultaneously, a vacuum chamber was developed. Promising pass results were obtained from laser welding tests on the battery cells conducted at Precitec GmbH & Co. KG

In order to confirm the precise alignment of all components following the welding closure of each prototype cell, a thorough examination is conducted using an industrial micro computed tomography ( $\mu$ CT) scanning system. This ensures the verification of filling height, composition, alignment, and the behavior of cathode material post cell initialisation. Upon successful completion of the  $\mu$ CT quality assurance, individual cells undergo charge and discharge performance tests, all of which have demonstrated satisfactory and as expected results thus far. As of now, fifty percent of the necessary cells have been successfully produced, showcasing excellent progress. Reject or defect rates have been low and with expected limits.



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### Module Frames and Cell Contacting System (CCS)

Once the cells are finalised, they are integrated into a module frame and welded to the specially crafted Cell Contacting System (CCS). This system, designed by Hofer AG, a supplier for Altech, facilitates pins and bus bar contact with all cells within an electrical isolation frame arrangement. Hofer AG has successfully completed the development of the CCS, delivering the initial prototype designs for the 60 kWh prototypes. Altech and Fraunhofer have meticulously validated all electrical specifications and tolerances of the CCS, and the electrical isolating material has demonstrated reliable performance.

### Battery Casing

König Metall GmbH has produced and delivered two casings for the 60 kWh battery houses. Fraunhofer IKTS, situated in Dresden, will furnish the testing racks for charge and discharge cycling to assess the battery performance. Simultaneously, the battery housings are undergoing heating cycles to evaluate the heat loss parameters of the vacuum-insulated casings. Specialised software has been developed to facilitate access to the parameters that the CERENERGY® BatteryPack will furnish during testing. The assembly of cells into the battery housing will be undertaken once all cells are finalised and is expected by the middle of 2024.

### Collaboration with Potential Customers

Once the prototypes are completed, Altech will provide access to the prototypes to select potential customers. This collaboration is aimed at demonstrating the practical applications and benefits of the ABS60 series in various industries, whilst also securing offtake agreements.



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### Excellent Definitive Feasibility Study for 120 MWh First Production Line CERENERGY® Battery Project

Altech announced the excellent results from a Definitive Feasibility Study (DFS) conducted for a CERENERGY® project with an annual capacity of 120 1MWh GridPacks each year, planned for construction on Altech's land in Saxony, Germany. The project is being developed by Altech Batteries GmbH (ABG) (75%) and joint venture partner Fraunhofer IKTS ("Fraunhofer") (25%), an incorporated society affiliated with the German government and partially financed by the German federal government. Altech Batteries GmbH (ABG) is owned 75% by Altech Batteries Limited (listed on ASX:ATC) and Altech Advanced Materials AG (listed on FSE:AMA).

### Excellent Project Economics

With a conservative investment estimate of €156 million, Altech's DFS not only demonstrates an excellent net present value (NPV) of €169 million (NPV9) but also generates a significant net cash flow of €51 million annually from operations. The estimated internal rate of return is 19%, ensuring a capital steady state payback in just 3.7 years. At full production capacity of 120 1MWh GridPacks, the anticipated annual revenue is €106 million. With an EBITDA of €51 million (margin of 47%), the project economics is compelling, even at this relatively small first production line capacity. With the anticipated growth of the grid storage market at 28% CAGR, Altech's Board and joint venture partners have enthusiastically given the green light to proceed to the funding phase (Final Investment Decision) for this exciting project.

### Fraunhofer IKTS Background

Fraunhofer, based in Germany, is the world's leading applied research organisation. Prioritising key future-relevant technologies and commercialising its technology in business and industry, it plays a major role in the innovation process. Founded in 1949, Fraunhofer currently operates 76 institutes and research units with over 30,000 employees throughout Germany. Fraunhofer Institute for Ceramic Technologies and Systems (IKTS) is one of the 76 institutes that conducts applied research on high-performance ceramics. The Institute's three sites in Dresden and Hermsdorf (Thuringia), Germany, collectively represent Europe's largest R&D institute dedicated to the study of ceramics.

The annual budget of IKTS is €83 million and it has 800 employees. As a research and technology service provider, Fraunhofer IKTS develops advanced high-performance ceramic materials, industrial manufacturing processes as well as prototype components and systems in complete production lines up to the pilot-plant scale. The electrolyte within the CERENERGY® battery is a ceramic product manufactured from alumina.

### Project Background and Technology

CERENERGY® Sodium Chloride Solid State (SCSS) batteries (also known historically as sodium nickel chloride batteries) is the grid battery storage of the future. This battery technology, although not novel, has been in existence since the 1990s, finding applications in mobility, telecommunications, and UPS systems. Presently, batteries are manufactured, but typically with cells one-third the size, suited mainly for small-scale power needs. Over the past eight years, Fraunhofer IKTS has pioneered the CERENERGY® technology, featuring cells three times larger, specifically tailored for grid storage applications. This innovation has transformed previous technologies by enabling greater energy capacity and reduced production expenses.

The world's largest SCSS-type batteries in terms of capacity have already been successfully tested in stationary battery modules. Fraunhofer IKTS has spent approximately €35 million in research & development on SCSS batteries and operates a €25 million pilot plant in Hermsdorf, Germany. Fraunhofer IKTS had been looking for an entrepreneurial partner, that possesses the know-how and expertise required for industrial and commercial development, has an industrial site in Germany available, has access to funding, has a battery background, and has expert technology background in the alumina used in ceramics. Altech fitted the criteria, and the joint venture was formed in September 2022. Altech group will own 75% of the project with Fraunhofer Society 25% free carried. The intellectual property is licensed exclusively to the joint venture.



Watch Video  
Cerenergy DFS Ann

Watch video of Cerenergy Battery DFS Announcement

<https://youtu.be/LLb6DxIHTws>

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Prof Alexander Michaelis  
(Fraunhofer IKTS),  
Uwe Ahrens (Altech),  
Iggy Tan (Altech)



### Joint Venture

The joint venture elected to develop a 120 MWh CERENERGY® battery plant on Altech's site in Saxony, Germany. The target market is specifically focused on the grid (stationary) energy storage market which is expected to grow by 28% CAGR in the coming decades. The global battery energy storage systems market is expected to grow from USD 4.4 billion in 2022 to USD 15.1 billion by 2027. Further out, growth is expected from 20 GW in 2020 to over 3,000 GW by 2050. CERENERGY® batteries can provide high security at low acquisition and operating costs for the stationary energy storage market.

The proposed battery plant will produce 518,400 cells; 2,160 Sixty kWh modules; 120 MWh GridPacks per annum. The target GridPack price is competitive and based on market rates of installed lithium-ion batteries and other grid storage technologies. The biggest cost advantage of the CERENERGY® batteries at the 120 MWh plant capacity is the expected low levelised cost of €0.06 per kWh for the life of the battery, compared to lithium-ion batteries at €0.149 per kWh. This is in part due to the fact that the CERENERGY® batteries have no moving parts, cooling fans, nor HVAC (heating, ventilation, air conditioning) systems and do not require a fire protection monitoring system as opposed to lithium-ion battery systems. In addition, costs in relation to CERENERGY® battery production will reduce significantly as capacity increases to GWh production, as foreseen in the joint venture with Fraunhofer once this first industrial and fully automated single production line with an annual capacity of 120 MWh has been put into operation.

### Definitive Feasibility Study

#### Technology Advantages - Challenges with Lithium-ion batteries

- Fire and Explosion Issues
- Narrow Operating Temperature Range
- Lithium-ion Battery Lifespan
- Lithium Costs and Availability
- Cobalt Supply Chain and Ethical Concerns
- Graphite Geo-political Risk
- Copper Crunch

#### CERENERGY® - The Ideal Battery

In response to the challenges confronting lithium-ion batteries, coupled with the escalating costs of essential materials and metals, a quest has emerged for a battery technology that addresses these issues. Enter CERENERGY®, a battery that stands as a beacon of safety, impervious to fire and explosions, boasting a lifespan exceeding 15 years, and demonstrating resilience in both frigid and desert climates. What sets this technology apart is its freedom from lithium, cobalt, graphite, manganese, and copper, thus mitigating the risks associated with fluctuating material prices and supply chain uncertainties. CERENERGY® is the battery solution the industry has been searching for.

Based on the above challenges facing lithium-ion batteries and the increasing prices of the critical materials and metals used in these batteries, there has been a search for a battery technology that resolves these problems. A battery that is fire and explosion-proof, has a lifespan of more than 15 years, and operates in cold and desert climates. A battery technology that is lithium free, cobalt free, graphite free, manganese free and finally copper free, which limits the exposure to critical materials prices rises and supply chain concerns.

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## Introducing Altech's CERENERGY® Batteries

CERENERGY® batteries resolve the biggest problems and challenges facing lithium-ion batteries today.



## CERENERGY® Batteries are Fire and Explosion Proof

CERENERGY® batteries present a distinct advantage over lithium-ion batteries by being entirely fire and explosion-proof and immune to thermal runaway. This stems from two primary features. Firstly, CERENERGY® batteries eliminate the use of flammable liquid electrolytes or plastic separators. Instead, they employ a solid, non-flammable ceramic tube as the electrolyte, facilitating the transfer of sodium ions. Secondly, the battery's chemistry precludes the presence of oxides and the generation of oxygen at the cathode, a characteristic observed in lithium-ion batteries during thermal runaway. This enhanced safety profile positions CERENERGY® as an ideal choice for indoor industrial and commercial energy storage installations. The battery is inherently secure, does not react with water, and is particularly sought after in sensitive environments, such as areas susceptible to flooding, where lithium-ion batteries are prohibited due to safety concerns.

## Large Operating Temperature Range - Cold and Desert climates

The CERENERGY® battery demonstrates exceptional operational efficiency across a wide temperature range, from minus 20°C to +60°C, ensuring high performance and durability in various ambient conditions. This adaptability is attributed to the absence of a liquid electrolyte (replaced by a solid ceramic electrolyte), rendering the battery impervious to adverse effects from ambient temperature fluctuations.

Moreover, CERENERGY® batteries function as internally high-temperature batteries, operating within the range of 270-350°C. Despite this internal heat, the battery modules are fully insulated, maintaining an external touch temperature. Unlike lithium-ion batteries, CERENERGY® batteries are self-sustaining in terms of core temperature and do not require external cooling systems. This feature makes them particularly well-suited for grid energy storage in cold and desert climates, addressing a significant drawback of lithium-ion batteries. Consequently, the CERENERGY® battery occupies a specific market niche without direct competition from lithium-ion batteries.

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### CERENERGY® Battery Life Span

The CERENERGY® battery stands apart from lithium-ion batteries in that it does not experience sodium ion degradation with each charge and discharge cycle. Notably, there is no first-cycle loss, no detrimental side reactions, no dendrite growth, and no breakdown of anode and cathode structures. The substitution of liquid electrolyte with a solid ceramic eliminates virtually any sodium deterioration in the battery. As a result, the CERENERGY® battery boasts a lifespan exceeding 15 years. A recent study conducted by ITP Renewables revealed that the Sodium Nickel Chloride battery technology exhibited no deterioration in the estimated state of health during the initial 700 cycles of testing, in strong contrast to the typical deterioration observed in LFP and NMC lithium-ion batteries. Furthermore, Sodium Nickel Chloride batteries have demonstrated lifetimes exceeding 2,000 cycles, with full-sized batteries showcasing a remarkable twenty years of functionality. Additionally, cell modules have exhibited over 4,500 cycles and fifteen years of operational performance, reinforcing the robustness and longevity of the CERENERGY® battery.

### Lithium Free Battery

CERENERGY® batteries do not contain lithium but use sodium ions from common table salt. The cathode consists of common salt (sodium chloride) and nickel. Sodium is the next reactive alkali metal on the periodic table under lithium (Li is -3.05 V whilst Na is -2.7 V) and is equally ideal for energy storage in batteries. Salt is not a critical element, is many times cheaper than lithium, and is readily available everywhere. CERENERGY® type batteries are also known as “sodium nickel chloride” batteries or “molten sodium” batteries. CERENERGY® technology is different from sodium-ion batteries or sodium sulphur batteries. These batteries are not exposed to rising lithium prices and potential supply constraints of lithium globally.

### Cobalt Supply Chain and Ethical Concerns

CERENERGY® batteries stand out by completely excluding cobalt from their composition. The cathode, comprising salt and nickel within a sodium aluminum chloride medium, eliminates the need for a layered structure found in lithium-ion batteries, thus circumventing any necessity for cobalt. This distinctive chemistry shields CERENERGY® batteries from ethical concerns and supply chain issues associated with cobalt. Additionally, these batteries boast an impressive specific energy ranging from 110-130 Wh/kg, surpassing the range of 90-160 Wh/kg seen in LFP lithium-ion batteries, thereby showcasing superior energy efficiency.

### Graphite and Copper Supply Risks

Another distinctive feature of the CERENERGY® battery is its absence of graphite or copper in the anode component. Remarkably, there is no designated anode within the CERENERGY® battery structure. Instead, the anode materialises during the charging phase as a molten sodium film between the steel electrode and the outer edge of the ceramic electrolyte. Likewise, the molten sodium anode dissolves during the battery's discharging process. This innovative design contrasts sharply with traditional lithium-ion batteries, where copper serves as the negative collector; in the CERENERGY® battery, a steel canister fulfills this role. Free from graphite and copper, the CERENERGY® battery offers a novel approach to energy storage.

Production of battery cells at IKTS Hermsdorf pilot plant facility



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### CERENERGY® Battery Unique Selling Propositions

Derived from the aforementioned CERENERGY® battery attributes, several notable unique selling propositions (USPs) emerge. These are anticipated to offer exceptional prospects for marketing and business development, providing Altech's CERENERGY® battery technology a sustained competitive edge:

#### Environmentally friendly:

CERENERGY® batteries do not use any critical minerals but consists only of salt, ceramic and nickel.

#### Local supply chain:

The raw materials for CERENERGY® batteries are not sourced from distant countries; rather, they are locally available in Germany and Europe.

#### Service life:

CERENERGY® batteries exhibit remarkable longevity, retaining 100% of their performance even after 10 years of operation. These batteries boast a service life extending beyond 15 years, showcasing their enduring efficiency.

#### Performance:

CERENERGY® batteries can run multiple cycles within 24 hours without any impact on performance or lifespan.

#### Any location:

Due to its safety, CERENERGY® batteries can be used anywhere, buildings, public places and others without any fire protection.

**All environments:** CERENERGY® batteries can be used in all climatic zones without external cooling or heating.

**No self-discharge:** CERENERGY® batteries have no self-discharge and can maintain its charge level for months without loss.

**Easy transport:** CERENERGY® batteries are not a dangerous good and can be easily transported using conventional means of transport: truck, train or ship.

**Maintenance free:** CERENERGY® batteries are practically maintenance-free and have no wearing parts such as fans or air conditioning systems.

### Basic Battery Cells

CERENERGY® cells exhibit a distinct internal structure, featuring a ceramic solid-state tube at the core, filled with sodium chloride and nickel metal powder granules. The central element is the positive nickel electrode, surrounded by molten chloroaluminate. These cells boast extended lifetimes exceeding 15 years without capacity loss. With a nominal energy capacity of 250 Wh and a voltage ranging from 1.7 to 2.8 volts, the basic CERENERGY® cell undergoes pressure-sealed welding during manufacturing, ensuring no active material loss and promoting enduring performance. The proposed battery plant aims to produce 518,400 cells annually, at a remarkable rate of one cell every 45 seconds.

### CERENERGY® - Cell Level

Voltage range:	1.7 - 2.8 V
Current Capacity:	100 Ah nominal
Nominal Energy Capacity:	0.25 kWh (100% DOD at <C/10)
Discharge Current:	cont. 25 A/trans. 33A
Operational SoC Range:	20% - 100%
Internal Ops Temp:	min. 279°C to +60°C
Ambient Ops. Temp:	-20°C to +60°C
IP Rating:	IP65
24h Cycle Capacity:	Yes, continuous without interruptions
Cyclability per day:	up to 3 @ 60 Ah / 1.8 FCE <sup>1</sup>





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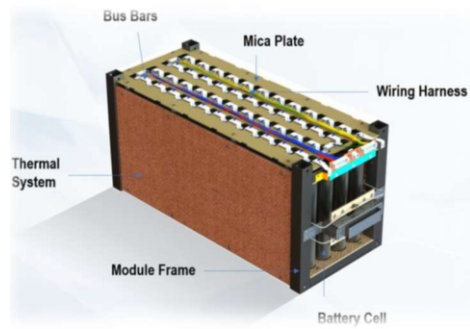
Ceramic solid state electrolyte at IKTS pilot facility

### 60KWh (AB60) Battery Product

The base unit intended for production by Altech is the 60 kWh (ABS60) battery pack. Within each ABS60 pack, there are five battery modules, each housing 48 cells, resulting in a total of 240 individual cells. The annual production target is set at 2,160 of these 60 kWh battery packs or 120 GridPacks. Internal structure of the pack casing, features five assembly frames holding 48 cells each. All cells are connected in series, enhancing energy capacity and electrical parameters such as voltage.

The battery's design showcases a sleek stainless-steel exterior adorned with the prominent CERENERGY® logo on top and "ALTECH Batteries" engraved at the bottom. This stainless-steel finish ensures durability in extreme temperature conditions, whether in snowy or desert environments while maintaining an impeccable appearance. The casing of the battery is equipped with a vacuum sealed, double-sided enclosure, ensuring optimal insulation and minimising heat transfer loss. Importantly, the exterior is safe for human contact. To facilitate a rapid and flawless connection of busbars to each cell, a large-scale connection system is incorporated within the battery. The base of the battery is reinforced to accommodate high-temperature-resistant electrical cables and connectors, effectively minimizing heat loss to the external environment.

To facilitate the initial installation from a cold start-up, low-voltage heating pads have been seamlessly integrated into the internal vacuum-packed casing. This heating process generally spans around ten hours, ensuring the comprehensive activation of the battery. Once initialised, the battery adeptly maintains its internal temperature, reducing its dependence on the heating pads. Whenever the battery is used regularly the technology provides a thermal self-sufficiency by generating heat while discharging and cooling while charging.



### ABS60 CERENERGY® Battery Specifications

Battery Model	ABS 60 Module
Dimension	500mm x 2499mm x 1145mm
Battery Type	Sodium Nickel Chloride
Nominal Voltage	600 V DC
Operation Voltage	410 V DC (MIN) to 670 V DC (MAX)
Nominal Current Capacity	100 Ah nominal
Nominal Energy Capacity	60 kWh (100% DOD at <C/10)
Nominal Energy Density	42 Wh/l 67 Wh/kg
Rated Power Density	15 W/kg (80% DOD at C/4) 8 W/kg (80% DOD at C/8)
Constant Power Discharge (Rated)	13.8 kW in 3.2h
Max. Continuous Discharge Current	25A
Max. Transient Discharge Current	33A
Max. Charging Rate	25A
Charging Time SOC 20%-30%	5 hours
Operation Temperature Range	-20°C to 60°C
IP Rating	IP65
Life time and design life	Min. 5000 cycles (at 80% DOD) 15 years

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### 1 MWh GridPack

Altech intends to produce for sale the CERENERGY® 1 MWh GridPack (ABS1000) destined for the renewable energy and grid storage market. Based on preliminary discussions with potential off-takers and to minimise on site installation of individual ABS60 60 kWh battery packs, a pre-installed solution has been launched. Each GridPack will have up to eighteen 60 kWh battery packs installed and connected to pack power management system. Every GridPack has a distinct rating of 600 volts DC and 100 Ah, and it can be arranged in series (cluster or array) to achieve the required rating of several thousand KWs for grid functioning.

The first product will be a standard 1 MWh container battery referred to as GridPack. Altech has designed an iso-container frame to house the eighteen (18) 60 kWh battery packs that make up the 1 MWh GridPack (ABS 1000). An additional cabinet has been included for power electronics, alongside another cabinet dedicated to the Energy Management System (EMS), both seamlessly integrated into the container.

The open style high cube sea container frame is specially designed for easy transport and simple site installation. The GridPacks will be assembled on the Altech site and then undergo a complete charge and discharge cycle before shipping to customers. These frames are being accredited for use.

The Altech GridPacks have been specifically engineered to adhere to the Ingress Protection (IP) 65 standard (relating to a high level of electrical enclosure sealing), ensuring complete protection from both dust and inclement weather. This means that there is no need for any additional shelters or buildings to house the Altech GridPack batteries, and they can be safely installed outdoors in any weather conditions. The Altech GridPacks will be constructed using a sea container design, which facilitates their easy transportation by sea or road to the installation site, as well as ensuring simple installation.

The “plug and play” feature of the site installation for the GridPacks ensures that they can be easily installed in remote locations. Additionally, the containers have been designed to be stackable, which minimises the battery footprint. Unlike other mega battery pack designs on the market, these GridPacks can be stacked on top of each other. This stackable feature, coupled with the “plug and play” design, makes the GridPacks easily scalable and adaptable to meet future energy storage requirements of the site.

Furthermore, the Altech GridPacks are designed without the requirement for any moving parts such as cooling fans, which are typically found in lithium-ion battery mega packs. This is a notable advantage as end-use customers have concerns about the noise generated by lithium-ion batteries, preventing them from being placed near residential areas. With the absence of any moving parts, the Altech GridPacks are completely noise-free operation, making them an ideal solution for noise-sensitive environments. Finally, GridPacks are extremely low in maintenance costs over the battery life.



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Altech's 1 MWh GridPacks are designed to operate in any climate, without the need for thermal management. The battery's internal temperature remains relatively constant throughout the charging and discharging cycles, due to its endothermic and exothermic properties. These 1 MWh GridPacks will offer significant benefits for the fast-growing renewable energy and grid storage sectors. These larger battery packs are capable of storing more energy, resulting in more efficient utilisation of renewable energy sources such as wind and solar power.

Altech believes that the proposed GridPacks are an excellent means of stabilising the grid by providing a source of backup power during periods of high demand or when renewable energy sources are not producing at capacity. They are also a cost-effective solution for storing and distributing renewable energy across a variety of applications, including grid-scale storage, microgrids, and electric vehicle charging.

Moreover, they are non-flammable and pose zero fire and explosion hazards. With a projected lifespan of over 15 years with unlimited cycling and can operate in extreme cold and hot climates. Altech believes that these GridPacks will be the preferred choice for companies seeking a reliable and long-lasting energy storage solution.



### ABS1000 CERENERGY® Battery GridPack Specifications

Battery Model	ABS 1000 GridPack
Battery Type	Sodium Nickel Chloride
Nominal Current Capacity	1,800 Ah (100% DOD)
Nominal Energy Capacity	1.0 MWh (100% DOD at <C/10)
Nominal Voltage	600 V DC
Operation Voltage	410 V DC (MIN) to 670 V DC (MAX)
Constant Power Discharge (Rated)	250 kW in 3.2h
Charging Time SOC 20%-80%	5 hours
Standard Circuit Design	18 battery packs connected in parallel
Container Frame Dimensions	5,900mm x 2,700mm x 2,400mm
Weight	<22t
Nominal Energy Density	26 Wh/l 45 Wh/kg
Rated Power Density	11 W/kg (80% DOD at C/4) 6 W/kg (80% DOD at C/8)
Operation Temperature Range	-20°C to 60°C
IP Rating	IP65
Life time and design life	Min. 5000 cycles (at 80% DOD) 15 years

### Levelised Costs of Storage Analysis

A comprehensive study examined the long-term costs of energy storage across various battery types, encompassing their lifespans, charging, operational and maintenance expenses, as well as replacement and investment costs. This analysis facilitates a direct comparison of battery types, ensuring an "apples-to-apples" evaluation. For instance, large grid storage batteries entail additional costs for cooling fans and airconditioners, impacting energy consumption and maintenance requirements. Replacement costs, especially if a battery requires replacing earlier than another, significantly influence the analysis. These factors collectively shape the energy storage costs throughout the battery's lifespan. Illustrated in the table below, CERENERGY® batteries exhibit a lifetime levelised cost of €0.06 per kWh, contrasted with lithium-ion batteries at €0.149 per kWh.

Levelised Costs of Storage	Altech GridPack	Redox Flow	LFP Battery	NGK NaS
Cycles (Calculation basis), 100% - cycle in 24h	1,80	1,75	1,41	1,30
Total Cost pe kWh (output) - grid service & storage (Euro)	0,060	0,132	0,149	0,164

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### Grid Storage Market

As the global energy sector transitions towards renewable sources, efficient energy storage systems are becoming increasingly vital. Grid storage batteries have emerged as a promising solution to tackle the intermittency and variability of renewable energy sources. In line with this trend, Altech recognises the potential of the grid storage battery market and is exclusively targeting this sector with its innovative CERENERGY® batteries.

The benefits of grid storage batteries include:

- Rising Renewable Energy Penetration
- Falling Battery Cost
- Government Support and Policies
- Grid Stability and Reliability
- Growing Demand for Electrification

### Patent Protection and Searches

Altech is dedicated to ensuring that the CERENERGY® technology's intellectual property remains free of infringement upon existing patents during the battery's commercialisation phase.

### Trademark Application and Registration

Trademark applications, integral to the Detailed Feasibility Study (DFS), encompass names like "Altech" and "Altech Batteries," along with the design and name of "GridPack." This proactive step aims to safeguard intellectual property and establish strong product branding, primarily focused on multiple countries, primarily in Europe.

### Application for Green Certification

CICERO has been engaged to conduct an independent evaluation of the Company's CERENERGY® plant that would be located at the Schwarze Pumpe Industrial Park, Saxony, Germany. The plant is being designed with a specific focus on minimising environmental impact and in accordance with prevailing German, European, and International environmental standards. CICERO will be assessing if the project is suitable for future green bond financing.



# GridPack

## ALTECH Batteries

### Trademark Applications

Applicant	File no.	Trade Mark	Countries
Altech Batteries GmbH	ATM00001EU	GridPack (Design)	Europe
Altech Batteries GmbH	ATM00001WO	GridPack (Design)	International
Altech Batteries GmbH	ATM00001ZA	GridPack (Design) Class 09	South Africa
Altech Batteries GmbH	ATM00001ZA01	GridPack (Design) Class 42	South Africa
Altech Batteries GmbH	ATM00002EU	Altech	Europe
Altech Batteries GmbH	ATM00002WO	Altech	International
Altech Batteries GmbH	ATM00002ZA	Altech (Class 09)	South Africa
Altech Batteries GmbH	ATM00002ZA01	Altech (Class 42)	South Africa
Altech Batteries GmbH	ATM00003EU	Altech Batteries	Europe
Altech Batteries GmbH	ATM00003WO	Altech Batteries	International
Altech Batteries GmbH	ATM00003ZA	Altech Batteries (Class 09)	South Africa
Altech Batteries GmbH	ATM00003ZA01	Altech Batteries (Class 42)	South Africa

### Commencement of Permitting

Altech appointed ARIKON Infrastruktur GmbH (Arikon) to manage the approval process, site infrastructure requirements, and the balance of the plant. Arikon has been responsible for managing the application process and working with relevant regulatory bodies to obtain all necessary approvals for the project. This includes securing necessary permits and licenses, coordinating with local authorities, and arranging utility connections. Additionally, Arikon has been responsible for designing the site infrastructure requirements for the site. Arikon has commenced the permit and environmental application process. The Company has decided to concurrently develop the project while the funding process is underway. The process will likely take until end-2024 and it is important that the Company keeps advancing the project.

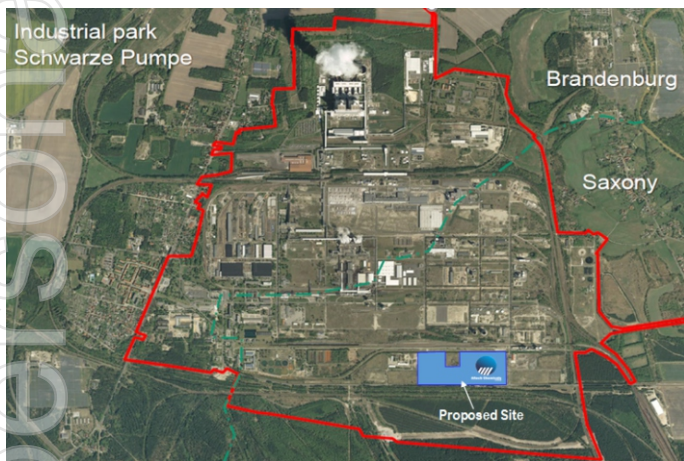
# Quarterly Report

## March 2024

### Plant Location - Saxony Germany

The project has secured land in the Schwarze Pumpe Industrial Park (ISP), strategically located at the Brandenburg-Saxony border, approximately 120 km from Berlin and 78 km from Dresden. Positioned in the southern part of the ISP within Spreetal municipality, the chosen CERENERGY® site offers advantages in terms of readiness, size, future expansion potential, logistic integration, renewable energy accessibility, existing facilities, and employee availability. Close proximity to Dresden, strong local stakeholder support, competitive pricing, and potential financial backing from state authorities further enhance the appeal of this greenfield site. It boasts fully developed infrastructure, utilities, and excellent logistics, including an on-site rail connection.

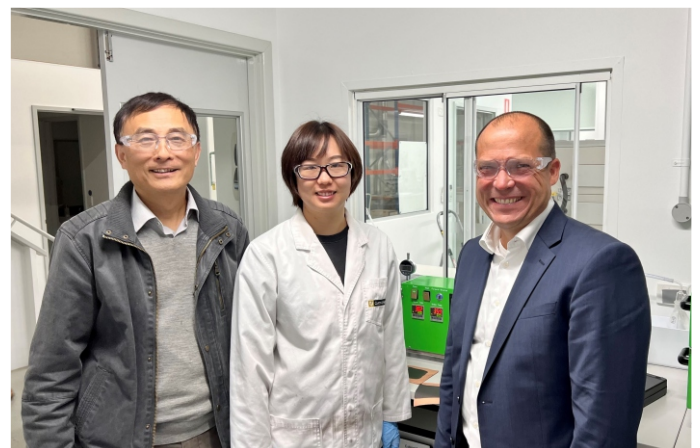
### CERENERGY® Project Location



### EPCM Contractor

Leadec Automation & Engineering GmbH (Leadec) was chosen as the lead engineer for the Definitive Feasibility Study as well as the EPCM contractor during the build of the CERENERGY® 120 MWh Battery project. Leadec is a leading global service specialist for factories across the entire life cycle and related infrastructure. For 60 years, the German company has been supporting customers in the manufacturing industries; from planning, installation, and automation of the factories. Entrusted with detailed engineering, design, and procurement of major equipment, Leadec will ensure a seamless and continuous approach to plant development. In addition to managing structural and balance of plant activities conducted by Arikon, Leadec will serve as the principal owner's representative. This entails overseeing project administration, design production, construction work breakdown, professional and competitive tender management, progress monitoring, contract compliance, estimating, planning, document control, procurement, cost control, financial analysis support, and project closeout activities, showcasing a comprehensive and integrated project management strategy.

The Automation arm of Leadec has been appointed as the contractor to provide advanced electric and automation solutions for the battery plant. This will include intranet-equipped control centres and local operation systems, allowing for centralised monitoring and control of operations. In addition, a SCADA realtime live system, ensuring real-time data acquisition, visualisation, and control will be incorporated. Track and trace functionality along with batch identification will be the key feature of the battery plant.



# Quarterly Report

## March 2024

### Building and Infrastructure Contractor

Arikon AG (“Arikon”) has been appointed as the building, infrastructure as well as permitting contractor for the CERENERGY® project. Arikon, a prominent project developer and industrial plant manufacturer, boasts expertise in diverse peripheral works, encompassing architecture, air, wastewater, and building technology. Proficient in overseeing environmental, building, and operational approval procedures, Arikon is well-versed in the specific requirements of the battery industry. Notably, Arikon successfully managed projects of comparable size and complexity, including the Tesla plant in Gruenheide, where it served as the contractor for plant infrastructure and supported permitting applications. With a track record in fast-track projects, adaptability to change, and a capacity to navigate complex process technology for CERENERGY® production, Arikon aligns Altech’s approach.

### DFS - Project Economics

With a capital investment of €156 million and working capital of €23 million, Altech's DFS predicts a net present value (NPV9) of €169 million and annual EBITDA of €51 million from operations. The estimated internal rate of return stands at 19%, with a steady state capital payback period of 3.7 years. At full production capacity of 120 1MWh GridPacks, the expected annual revenue is €106 million, boasting an EBITDA margin of around 47%. Considering the projected growth of the grid storage market at 28% CAGR, Altech Batteries Limited and its joint venture partners have approved the funding phase (Final Investment Decision) for this project.

### Life of the Project

The life of the project, as reflected in the financial model, is twenty (20) years, being typical of battery manufacturing plants. With regular maintenance and sustaining capital every year, these plants often last beyond 30 years. The model assumes annual sustaining capital expenditure of around EUR 3.1 million per annum over the life of the project.

### Capital Costs Estimation

The capital costs for the CERENERGY® project are estimated at €156 million. The major capital cost component for the project is the construction of the CERENERGY® facility and the associated site infrastructure, such as the administration building, maintenance workshop, and on-site QA laboratory.

The engineering design and cost estimate for the CERENERGY® facility has been based on the process design and equipment required to produce 120 MWh GridPacks per annum utilises equipment design and building layouts specifically developed during the DFS. ABG has assessed its capital estimate for the CERENERGY® plant to be accurate to ± 15% and can be defined as an Authorisation Budget class Estimate (AACE Class 3).

#### Capital Cost EUR

Production Process Equipment	73.0 Million
Building & Infrastructure	59.0 Million
Mobile Equipment & Fit Out	4.6 Million
Plant Electrical & IT Systems	7.4 Million
Contingency	12.0 Million
<b>Total</b>	<b>156.0 Million</b>

### Collaboration with Potential Customers

Once the prototypes are completed, Altech intends to give access to prototypes to select potential customers. This collaboration is aimed at demonstrating the practical applications and benefits of the ABS60 series in various industries, while also securing offtake agreements.

**Altech’s full announcement on the Definitive Feasibility Study for the 120MWh first production line CERENERGY® battery project was released to the ASX on 20 March 2024. Altech encourages shareholders access the full announcement for further details relating to the DFS.**

## Update on Silumina Anodes™ Project

Altech's Silumina Anodes™ project is aimed at including high-capacity silicon into the graphite anode of lithium-ion batteries for electric vehicles. Silicon has ten times the capacity of graphite and the industry recognises silicon as the most promising anode material, but it is so reactive that it can swell and crack. Altech's Silumina Anodes™ project involves coating the silicon with a nanometre layer of alumina, encapsulating the silicon, whilst eliminating the swelling and cracking.

Altech is pleased to advise that all equipment has been received in relation to the Silumina Anodes™ pilot plant and construction is now finalised in Saxony, Germany. Altech is now moving forward with commissioning of the pilot plant. Once commissioned, the pilot plant will produce 120 kg per day of the Silumina Anodes™ product. Commercial samples will then be available to provide to potential customers for their internal testing. Non-disclosure Agreements have been signed with global automobile and battery supply chain companies, and these potential customers will perform their own testing, which Altech envisages to lead to an offtake agreement.



Silumina Anodes™ pilot plant progress images





**Altech Batteries**  
Limited

# QUARTERLY REPORT

March 2024

## Company Snapshot

Altech Batteries Limited (ASX:ATC) (FRA:A3Y)  
ABN 45 125 301 206

## FINANCIAL INFORMATION

(as at 31 March 2024)

Share Price:	\$0.07
Shares:	1,653.3m
Options:	Nil
Performance Rights:	123.2m
Market Cap:	\$115.7m
Cash:	\$3.3m

## DIRECTORS

Luke Atkins	Non-executive Chairman
Iggy Tan	Managing Director
Peter Bailey	Non-executive Director
Dan Tenardi	Non-executive Director
Tunku Yaacob Khyra	Non-executive Director
Uwe Ahrens	Alternate Director
Hansjoerg Plaggemars	Non-executive Director

## CHIEF FINANCIAL OFFICER & COMPANY SECRETARY

Martin Stein

## HEAD OFFICE

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info@altechgroup.com

www.altechgroup.com

## SCAN ME

to join the  
Altech Batteries  
Investor Community  
and interact  
with Shareholders  
& Investors



## FORWARD-LOOKING STATEMENTS

This announcement contains forward looking statements that involve a number of risks and uncertainties. These forward-looking statements are expressed in good faith and believed to have a reasonable basis. These statements reflect current expectations, intentions or strategies regarding the future and assumptions based on currently available information. Should one or more risks or uncertainties materialise, or should underlying assumptions prove incorrect, actual results may vary from the expectations, intentions and strategies described in this announcement. The forward-looking statements are made as at the date of this announcement and the Company disclaims any intent or obligation to update publicly such forward looking statements, whether as the result of new information, future events or results or otherwise.

## SCHEDULE OF TENEMENTS

As per ASX Listing Rule 5.3.3, the Company held the following tenements (exploration and mining leases) as at 31 March 2024:

Tenement ID	Registered Holder	Location	Project	Grant Date	Interest end of quarter
E70/4718-I	Canning Coal Pty Ltd	WA Australia	Kerrigan	01/12/2015	100%
M70/1334	Altech Meckering Pty Ltd	WA Australia	Meckering	19/05/2016	100%

## RELATED PARTY TRANSACTIONS (APPENDIX 5B – ITEM 6.1)

The amount shown in the item is for the payment of directors' fees (inclusive of superannuation, where applicable), to the Company's Managing Director, Non-Executive Directors and Alternate Director, during the quarter.

Authorised by: Iggy Tan (Managing Director)



## Appendix 5B

### Mining exploration entity or oil and gas exploration entity quarterly cash flow report

Name of entity

ALTECH BATTERIES LTD

ABN

45 125 301 206

Quarter ended ("current quarter")

31 March 2024

Consolidated statement of cash flows	Current quarter \$A'000	Year to date (9 months) \$A'000
<b>1. Cash flows from operating activities</b>		
1.1 Receipts from customers	-	-
1.2 Payments for		
(a) exploration & evaluation	-	-
(b) development	-	-
(c) production	-	-
(d) staff costs	(1,178)	(3,955)
(e) admin and corporate costs	(1,545)	(5,498)
1.3 Dividends received (see note 3)	-	-
1.4 Interest received	37	111
1.5 Interest and other costs of finance paid	-	(61)
1.6 Income taxes paid	-	-
1.7 Government grants and tax incentives	576	576
1.8 Other (provide details if material)	-	-
<b>1.9 Net cash from / (used in) operating activities</b>	<b>(2,110)</b>	<b>(8,827)</b>

<b>2. Cash flows from investing activities</b>		
2.1 Payments to acquire or for:		
(a) entities	-	-
(b) tenements	-	-
(c) property, plant and equipment	(2,255)	(7,500)
(d) exploration & evaluation	(23)	(152)
(e) investment in Altech Advanced Materials AG	-	-
(f) other non-current assets	-	-

## Mining exploration entity or oil and gas exploration entity quarterly cash flow report

Consolidated statement of cash flows		Current quarter \$A'000	Year to date (9 months) \$A'000
2.2	Proceeds from the disposal of:		
	(a) entities	-	-
	(b) tenements	-	-
	(c) property, plant and equipment	-	-
	(d) investments (deferred consideration from 25% sale of subsidiary Altech Industries Germany GmbH)	-	2,596
	(e) other non-current assets	-	-
2.3	Cash flows from loans to other entities	-	-
2.4	Dividends received	-	-
2.5	Payments for research and development including on CERENERGY® battery	(2,018)	(5,185)
<b>2.6</b>	<b>Net cash from / (used in) investing activities</b>	<b>(4,296)</b>	<b>(10,241)</b>
<b>3.</b>	<b>Cash flows from financing activities</b>		
3.1	Proceeds from issues of equity securities (excluding convertible debt securities)	-	15,859
3.2	Proceeds from issue of convertible debt securities	-	-
3.3	Proceeds from exercise of options	-	-
3.4	Transaction costs related to issues of equity securities or convertible debt securities	-	(860)
3.5	Proceeds from borrowings (funding received for subsidiary companies from minority shareholders)	408	3,907
3.6	Repayment of borrowings	-	-
3.7	Transaction costs related to loans and borrowings	-	-
3.8	Dividends paid	-	-
3.9	Other - Lease repayments	(14)	(43)
<b>3.10</b>	<b>Net cash from / (used in) financing activities</b>	<b>394</b>	<b>18,863</b>
<b>4.</b>	<b>Net increase / (decrease) in cash and cash equivalents for the period</b>		
4.1	Cash and cash equivalents at beginning of period	9,294	3,571
4.2	Net cash from / (used in) operating activities (item 1.9 above)	(2,110)	(8,827)

## Mining exploration entity or oil and gas exploration entity quarterly cash flow report

<b>Consolidated statement of cash flows</b>		<b>Current quarter \$A'000</b>	<b>Year to date (9 months) \$A'000</b>
4.3	Net cash from / (used in) investing activities (item 2.6 above)	(4,296)	(10,241)
4.4	Net cash from / (used in) financing activities (item 3.10 above)	394	18,863
4.5	Effect of movement in exchange rates on cash held	110	26
<b>4.6</b>	<b>Cash and cash equivalents at end of period</b>	<b>3,392</b>	<b>3,392</b>

<b>5.</b>	<b>Reconciliation of cash and cash equivalents</b> at the end of the quarter (as shown in the consolidated statement of cash flows) to the related items in the accounts	<b>Current quarter \$A'000</b>	<b>Previous quarter \$A'000</b>
5.1	Bank balances	3,362	9,264
5.2	Call deposits	30	30
5.3	Bank overdrafts	-	-
5.4	Other (provide details)	-	-
<b>5.5</b>	<b>Cash and cash equivalents at end of quarter (should equal item 4.6 above)</b>	<b>3,392</b>	<b>9,294</b>

<b>6.</b>	<b>Payments to related parties of the entity and their associates</b>	<b>Current quarter \$A'000</b>
6.1	Aggregate amount of payments to related parties and their associates included in item 1	(216)
6.2	Aggregate amount of payments to related parties and their associates included in item 2	-

*Note: if any amounts are shown in items 6.1 or 6.2, your quarterly activity report must include a description of, and an explanation for, such payments.*

## Mining exploration entity or oil and gas exploration entity quarterly cash flow report

<b>7. Financing facilities</b>	<b>Total facility amount at quarter end \$A'000</b>	<b>Amount drawn at quarter end \$A'000</b>
<i>Note: the term "facility" includes all forms of financing arrangements available to the entity.</i>		
<i>Add notes as necessary for an understanding of the sources of finance available to the entity.</i>		
7.1 Loan facilities	-	-
7.2 Credit standby arrangements	-	-
7.3 Other (please specify)	-	-
7.4 <b>Total financing facilities</b>	-	-
7.5 <b>Unused financing facilities available at quarter end</b>		-
7.6 Include in the box below a description of each facility above, including the lender, interest rate, maturity date and whether it is secured or unsecured. If any additional financing facilities have been entered into or are proposed to be entered into after quarter end, include a note providing details of those facilities as well.		

<b>8. Estimated cash available for future operating activities</b>	<b>\$A'000</b>
8.1 Net cash from / (used in) operating activities (item 1.9)	(2,110)
8.2 (Payments for exploration & evaluation classified as investing activities) (item 2.1(d))	(23)
8.3 Total relevant outgoings (item 8.1 + item 8.2)	(2,133)
8.4 Cash and cash equivalents at quarter end (item 4.6)	3,392
8.5 Unused finance facilities available at quarter end (item 7.5)	-
8.6 Total available funding (item 8.4 + item 8.5)	3,392
8.7 <b>Estimated quarters of funding available (item 8.6 divided by item 8.3)</b>	1.59
<i>Note: if the entity has reported positive relevant outgoings (ie a net cash inflow) in item 8.3, answer item 8.7 as "N/A". Otherwise, a figure for the estimated quarters of funding available must be included in item 8.7.</i>	
8.8 If item 8.7 is less than 2 quarters, please provide answers to the following questions:	
8.8.1 Does the entity expect that it will continue to have the current level of net operating cash flows for the time being and, if not, why not?	
Answer: Yes	
8.8.2 Has the entity taken any steps, or does it propose to take any steps, to raise further cash to fund its operations and, if so, what are those steps and how likely does it believe that they will be successful?	
Answer: Yes	
8.8.3 Does the entity expect to be able to continue its operations and to meet its business objectives and, if so, on what basis?	
Answer: Yes. Altech currently has a Share Purchase Plan on offer to eligible shareholders. Additional capital to be raised, together with available cash reserves, will enable Altech to continue its operations and to meet its business objectives.	
<i>Note: where item 8.7 is less than 2 quarters, all of questions 8.8.1, 8.8.2 and 8.8.3 above must be answered.</i>	

## Compliance statement

- 1 This statement has been prepared in accordance with accounting standards and policies which comply with Listing Rule 19.11A.
- 2 This statement gives a true and fair view of the matters disclosed.

Date: 29 April 2024



Authorised by: MARTIN STEIN – CHIEF FINANCIAL OFFICER & COMPANY SECRETARY

On behalf of the Board of Directors

## Notes

1. This quarterly cash flow report and the accompanying activity report provide a basis for informing the market about the entity's activities for the past quarter, how they have been financed and the effect this has had on its cash position. An entity that wishes to disclose additional information over and above the minimum required under the Listing Rules is encouraged to do so.
2. If this quarterly cash flow report has been prepared in accordance with Australian Accounting Standards, the definitions in, and provisions of, *AASB 6: Exploration for and Evaluation of Mineral Resources* and *AASB 107: Statement of Cash Flows* apply to this report. If this quarterly cash flow report has been prepared in accordance with other accounting standards agreed by ASX pursuant to Listing Rule 19.11A, the corresponding equivalent standards apply to this report.
3. Dividends received may be classified either as cash flows from operating activities or cash flows from investing activities, depending on the accounting policy of the entity.
4. If this report has been authorised for release to the market by your board of directors, you can insert here: "By the board". If it has been authorised for release to the market by a committee of your board of directors, you can insert here: "By the [name of board committee – eg Audit and Risk Committee]". If it has been authorised for release to the market by a disclosure committee, you can insert here: "By the Disclosure Committee".
5. If this report has been authorised for release to the market by your board of directors and you wish to hold yourself out as complying with recommendation 4.2 of the ASX Corporate Governance Council's *Corporate Governance Principles and Recommendations*, the board should have received a declaration from its CEO and CFO that, in their opinion, the financial records of the entity have been properly maintained, that this report complies with the appropriate accounting standards and gives a true and fair view of the cash flows of the entity, and that their opinion has been formed on the basis of a sound system of risk management and internal control which is operating effectively.