AAM - POSITIVE FEASIBILITY STUDY FOR A FIRST PRODUCTION LINE OVER 120 MWh/y OF THE CERENERGY®-BATTERY PROJECT

Highlights

- Feasibility study for 120 MWh/year production, 120 GridPacks (line 1) finalized
- With investment costs of € 156 million and annual sales of € 106 million, the project generates an expected EBITDA margin of 47%:
  - Present value (NPV_9) of € 169 million
  - Project return (IRR) of 19%
  - Amortization period of 3.7 years
- Altech enters the next project phase - financing phase
  - Applications for funding at state and federal level have been submitted
  - Equity and mezzanine financing are in preparation
  - Purchase agreements are being processed
- Altech-CERENERGY® batteries are predicted to have great market potential:
  - CERENERGY® Total cost of ownership is only 0.06 €/kWh compared to the lithium-ion battery of approx. 0.13 -0.16 €/kWh
  - Market growth for stationary battery storage systems of 28% p.a.

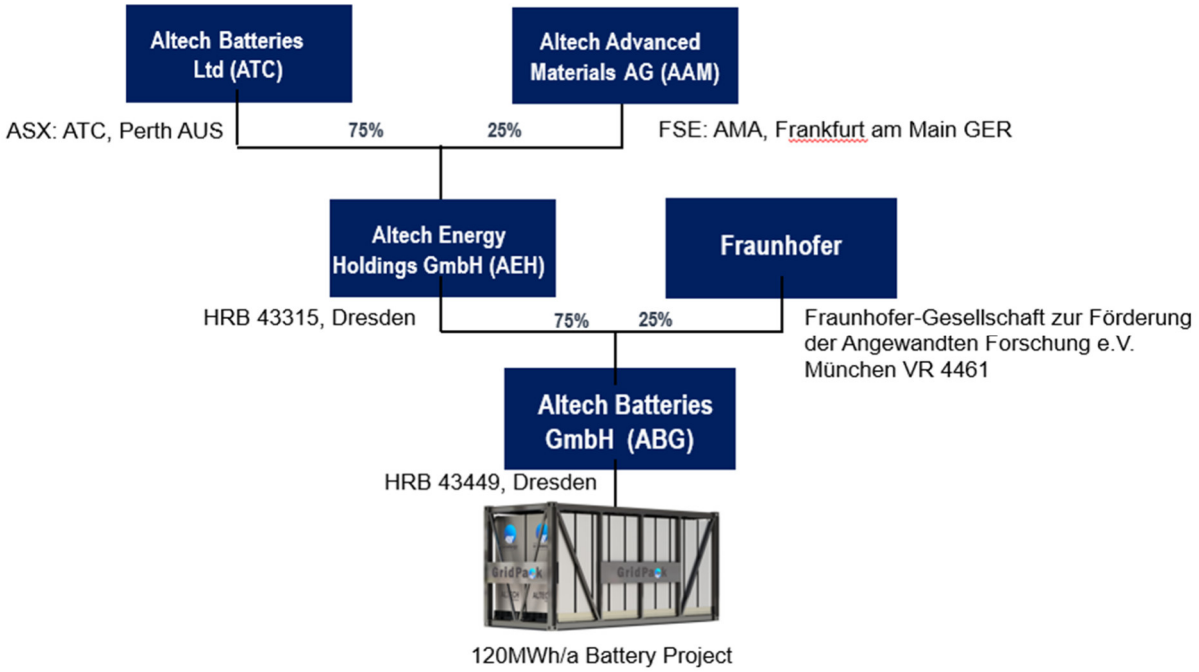
Heidelberg (20.03.2024): Altech Advanced Materials AG (FRA: AMA) announces the results of the definitive feasibility study (DFS) for the CERENERGY® battery project with an annual capacity of 120MWh per year. The fully automated industrial production facility is to be realized by the operating company Altech Batteries GmbH ("ABG") and will be built on its site in Schwarze Pumpe, Saxony. ABG is 75% owned by the Altech Group and 25% owned by our joint venture partner, the Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e.V. ("Fraunhofer"), represented by the Fraunhofer Institute for Ceramic Technologies and Systems ("IKTS") in Dresden. The Fraunhofer-Gesellschaft, based in Germany, is the world's leading organization for application-oriented research with currently 76 institutes and research facilities, 30,800 employees and an annual research volume of around € 3.0 billion. The Altech Group holds its 75% stake in ABG through Altech Energy Holdings GmbH, which in turn is 75% owned by Altech Batteries Limited, Australia (listed on the ASX: ATC) and 25% by Altech Advanced Materials AG, Germany (listed on the FSE: AMA).

EXCELLENT PROJECT ECONOMICS

With a conservative investment cost estimate of € 156 million, Altech's feasibility study not only promises a net present value (NPV_9) of € 169 million, but also generates a significant free cash flow of € 51 million before taxes per year. The estimated internal rate of return (IRR) is 19%, which guarantees a return of capital after continuous operation in just 3.7 years, and that with a relatively low production capacity of a first line of 120 MWh per year. This corresponds to 120 one MWh GridPacks with an annual turnover of around € 106 million. With an EBITDA margin of 47%, the profitability of the project is convincing even with this relatively low capacity of the first production line. In view of the expected growth in the grid storage market of 28% p.a. (CAGR), Altech has taken the decision to enter the financing phase of this exciting project in order to enable it to be realized as soon as possible.

OWNERSHIP STRUCTURE OF THE PROJECT COMPANY

In November 2022, comprehensive joint venture agreements were signed between the project developers and detailed planning for the industrial production and commercialization of CERENERGY® battery technology began. A joint venture (JV) company Altech Batteries GmbH (ABG) was founded, which holds all rights and know-how to the CERENERGY® technology. The project is now being implemented in close cooperation by the joint venture partners under the leadership of Altech.



FRAUNHOFER IKTS

The Fraunhofer-Gesellschaft, based in Germany, is the world's leading organization for application-oriented research. With its focus on future-oriented key technologies and the utilization of results in business and industry, it plays a central role in the innovation process. As a guide and driving force for innovative developments and scientific excellence, it helps to shape our society and our future. Founded in 1949, the organization currently operates 76 institutes and research facilities in Germany. Around 30,800 employees, most of whom are trained in the natural sciences or engineering, work on the annual research volume of around €3.0 billion. Contract research accounts for € 2.6 billion of this.

The institute's three sites in Dresden (Saxony), Arnstadt (Thuringia) and Hermsdorf (Thuringia) together form Europe's largest research and development institute dedicated to research into ceramics and battery materials. Fraunhofer IKTS has an annual budget of €83 million and employs 800 highly qualified staff and scientists. As a research and technology service provider, Fraunhofer IKTS develops high-performance ceramic materials, industrial manufacturing processes and prototype components and systems, such as in this case the further development of the CERENERGY® battery technology for a sodium chloride solid-state battery. The solid-state electrolyte in the CERENERGY® - battery is a ceramic product made from alumina.

PROJECT BACKGROUND AND TECHNOLOGY

CERENERGY® Sodium chloride solid state batteries (SCSS) (historically also known as sodium nickel chloride batteries or zebra batteries) have the potential to become the grid battery storage of the future. The CERENERGY® technology has been developed by Fraunhofer IKTS over the last eight years and has revolutionized previous technology by enabling higher energy capacity/energy density and lower production costs. These SCSS battery cells, the world's most powerful in terms of capacity, have already been successfully tested in stationary battery modules and have also met the expected performance parameters in long-term operation. Fraunhofer IKTS has invested around €35 million in research and development and operates a €25 million pilot plant in Hermsdorf, Thuringia. Fraunhofer IKTS was looking for a partner with the know-how and expertise required for industrial development, both in industrial production and in the processing of ceramics, and with an available industrial site in Germany. Altech met these criteria and convinced Fraunhofer with their development plan for CERENERGY®, so that the joint venture was founded in September 2022. The intellectual property of the technology and all pending patents were transferred exclusively to the joint venture company.

FRAUNHOFER'S PILOT MANUFACTURING PLANT IN HERMSDORF

As part of the further development of the CERENERGY® battery, Fraunhofer IKTS has built a €25 million facility to produce battery cells at its research center in Hermsdorf, Thuringia. This enabled Fraunhofer IKTS to produce cells at a cost-effective level, which was crucial for further development and testing. This was followed by the optimization and validation of the technology, which led to the first CERENERGY® battery modules with 5 kWh storage capacity in 2018. By 2021, Fraunhofer IKTS had completed a pilot production line, which enabled a capacity expansion and the production of a prototype battery module with 10 kWh in 2022. The pilot plant in Hermsdorf has comprehensive cell production capabilities that include all individual process steps and thus enable industrial commercialization through detailed investigations and tests. These investigations will be continued on an ongoing basis, enabling the development of process technology with a view to scaling and cost efficiency. No process or technology will be used in the planned production plant that has not previously been successfully implemented in the pilot plant.

Figure 1 - Pilot plant from Fraunhofer IKTS in Hermsdorf

THE JOINT VENTURE

The joint venture Altech Batteries GmbH (ABG) between Altech and Fraunhofer has decided to commercialize the CERENERGY® battery and is working on the implementation of a 120 MWh industrial production plant for CERENERGY® batteries on Altech's site in Saxony, Germany. The target market is specifically geared towards the market for grid-connected (stationary) energy storage, which is expected to grow by 28% p.a. (CAGR) in the coming decades. The global market for battery storage systems is expected to grow from USD 4.4 billion in 2022 to USD 15.1 billion in 2027. Furthermore, it is expected to grow from 20 GW in 2020 to over 3,000 GW by 2050. CERENERGY® batteries offer high safety with low acquisition and operating costs for the stationary energy storage market.

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

The planned battery factory will produce 518,400 cells, 2,160 60kWh modules and 120 MWh GridPacks per year. The targeted GridPack price is competitive and based on benchmark market prices for installed lithium-ion batteries and other grid storage technologies and their lifetime operating costs. The biggest cost advantage of CERENERGY® batteries is the expected low total cost of ownership, also called "Levelized Cost of Storage - LCOS", of €0.06/kWh over the lifetime of the battery compared to lithium-ion batteries at €0.13-0.16/kWh. This is partly due to the fact that, unlike lithium-ion batteries, CERENERGY® batteries do not require moving parts, cooling fans or HVAC systems (heating, ventilation, air conditioning) or fire protection and monitoring systems. In addition, the production costs of CERENERGY® batteries will reduce significantly as capacity increases to GWh production, as forseen in the joint venture with Fraunhofer, once this first industrial and fully automated production line with an annual capacity of 120 MWh has been commissioned.

TECHNOLOGICAL ADVANTAGES - CHALLENGES OF LITHIUM-ION BATTERIES

Risk of fire and explosion

A major disadvantage of lithium-ion batteries is their fire risk - there is always a risk of fires and explosions - a problem that has received a lot of media attention. There is no such thing as a 100% safe lithium-ion battery. A fire in the battery is caused by a chain reaction within a battery cell, generally referred to as "thermal runaway". Thermal runaway refers to the overheating of an exothermic chemical and electrochemical reaction in the battery due to a self-reinforcing heat-producing process. This process is difficult to stop once it has started, i.e. the fire cannot be extinguished. This phenomenon occurs when the internal

temperature of a battery reaches a critical point and triggers a chemical reaction that produces oxygen. Overheating, physical damage and overcharging are common factors that contribute to thermal runaway.

Narrow operating temperature range

Another disadvantage is the limited operating temperature range of lithium-ion batteries, which is usually between +15°C and +35°C. This limitation poses a major challenge for the use of lithium-ion batteries in cold regions and desert areas. Often, a large part of the available battery energy must be used for heating or cooling purposes to keep the battery at operating temperature.

Lithium-ion battery lifespan

The service life of lithium-ion batteries is limited to around 7-10 years, depending on the respective operating conditions and number of cycles per day. The degradation of the lithium ions occurs with each charge and discharge cycle. A process that is accelerated by harmful side reactions, dendrite growth and the collapse of the anode and cathode structures. This continuous degradation is particularly accelerated if the battery is operated outside the ideal temperature range. For electric vehicles, manufacturers usually provide a warranty of around 8 years, i.e. they guarantee the performance until the capacity falls below 70%. In contrast, a much longer service life is required for grid storage batteries. The cost of battery replacement will play a significant role in the economic viability of a battery storage system.

Lithium Costs and availability

The global market for the alkali metal lithium is experiencing rapid growth, accompanied by considerable price fluctuations. As the most important component of lithium-ion batteries, lithium is particularly susceptible to price fluctuations. The sharp rise in lithium prices observed a few years ago has driven up the production costs for lithium-ion batteries. Lithium mining is mainly concentrated in four countries: Australia, Chile, China and Argentina. There is a real concern that the development of mines and production capacities will not be sufficient to meet the forecast demand for electric vehicles (EVs) and stationary energy storage systems. This situation raises fears that the industry will not be able to cope with the expected demand.

Cobalt supply chain and ethical concerns

Cobalt plays a crucial role in increasing the energy density and extending the battery life of lithium-ion batteries. However, cobalt is currently considered the biggest short- and medium-term risk in the material supply chain for electric vehicles. Electric vehicle batteries can contain up to 20 kg of cobalt per 100 kWh, which accounts for up to 20% of the weight of the cathode in lithium-ion batteries. The Democratic Republic of Congo has a dominant position and produces about 70% of the world's cobalt, posing precarious challenges and risks to the lithium-ion battery industry. Furthermore, sourcing from the Democratic Republic of Congo is ethically questionable following reports of harsh and dangerous working conditions, child labor and human rights violations.

Geopolitical risk for graphite

Graphite is a crucial element in driving the global transition to electromobility. It is the largest component of lithium-ion batteries by weight, accounting for 20-30%. Currently, China dominates the global

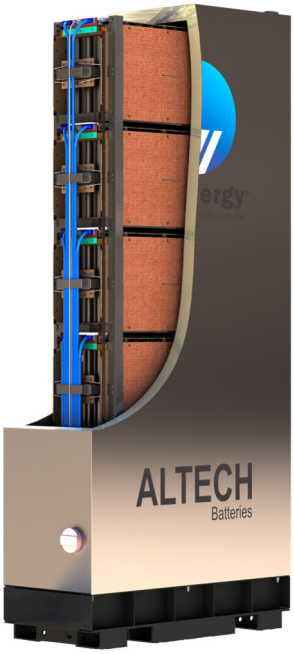
production of graphite anode material, accounting for 90% of global production. This concentration raises concerns about potential geopolitical risks for the industry due to its dependence on a single country where political decisions can quickly lead to major changes.

Copper shortage

Copper plays an important role as a current collector on the anode of a lithium-ion battery and its availability is becoming an important issue, especially in the wake of the energy transition and the increasing demand for electric vehicles (EVs). A recent report entitled "Future of Copper" highlights that achieving the 2050 climate targets will require a significant increase in copper production in the short and medium term, which is a challenge. A battery-powered electric vehicle requires 2.5 times more copper than a standard vehicle with a combustion engine. This high demand will lead to a shortage to meet the demand forecast by S&P Global, which predicts the sale of 27 million electric vehicles per year by 2030. Copper shortages may become a serious national energy security issue for some countries.

CERENERGY® - THE IDEAL ALTERNATIVE

With the challenges facing lithium-ion batteries and the rising cost of key raw materials and metals, the industry is looking for a battery technology that solves these problems. CERENERGY® batteries are 100% safe, CERENERGY® cannot burn, cannot explode, has a lifespan of over 15 years and can be used in both cold and desert conditions without any problems. CERENERGY®- batteries are free of lithium, cobalt, graphite, manganese and copper and are therefore not exposed to the risks of fluctuating material prices and uncertainties in the supply chain. CERENERGY® is the ideal solution.



ALTECH'S CERENERGY® BATTERY

CERENERGY® batteries solve the problems and challenges of lithium-ion batteries and are therefore ideal for stationary use.

CERENERGY® batteries are fire and explosion proof

CERENERGY® batteries offer a clear advantage over lithium-ion batteries because they are completely fire and explosion-proof and immune to thermal runaway. This is due to two main features. Firstly, CERENERGY® batteries do not use flammable liquid electrolytes or plastic separators but use a ceramic solid-state electrolyte, a non-flammable ceramic tube. Secondly, the chemistry of the battery excludes the presence of oxides and the formation of oxygen at the cathode. This outstanding safety profile makes CERENERGY® an ideal choice for industrial and commercial energy storage systems. The battery is inherently safe, does not react with water and can be installed anywhere, including public spaces, buildings and other safety sensitive areas, where lithium-ion batteries are prohibited due to safety concerns.

Large operating temperature range - cold and desert climates

The CERENERGY® battery demonstrates exceptional usability across a wide temperature range, from minus 20°C to +60°C, ensuring high performance and longevity under various environmental conditions without any external cooling or heating. This adaptability is due to the absence of a liquid electrolyte (a solid, ceramic electrolyte is used instead), which makes the battery insensitive to the negative effects of temperature fluctuations. This characteristic makes them particularly suitable for storing energy in cold and desert climates, which in turn are particularly suitable for solar systems, and eliminates a major disadvantage of lithium-ion batteries. CERENERGY® batteries can therefore also serve a specific market niche without direct competition from lithium-ion batteries.

> 15 years life

CERENERGY® battery life span

Unlike lithium-ion batteries, the CERENERGY® battery does not age. CERENERGY® does not lose power. By replacing the liquid electrolyte with a solid ceramic, virtually all sodium loss in the battery is avoided. As a result, the CERENERGY® battery has a lifespan of over 15 years. A recent study conducted by ITP Renewables found that the sodium nickel chloride (NaNiCl) batteries showed no degradation during the first 700 test cycles, in contrast to the typical degradation observed in LFP and NMC lithium-ion batteries (see Figure 2). In addition, NaNiCl batteries have demonstrated a remarkable service life of over 15 years in tests of more than 5,000 cycles.

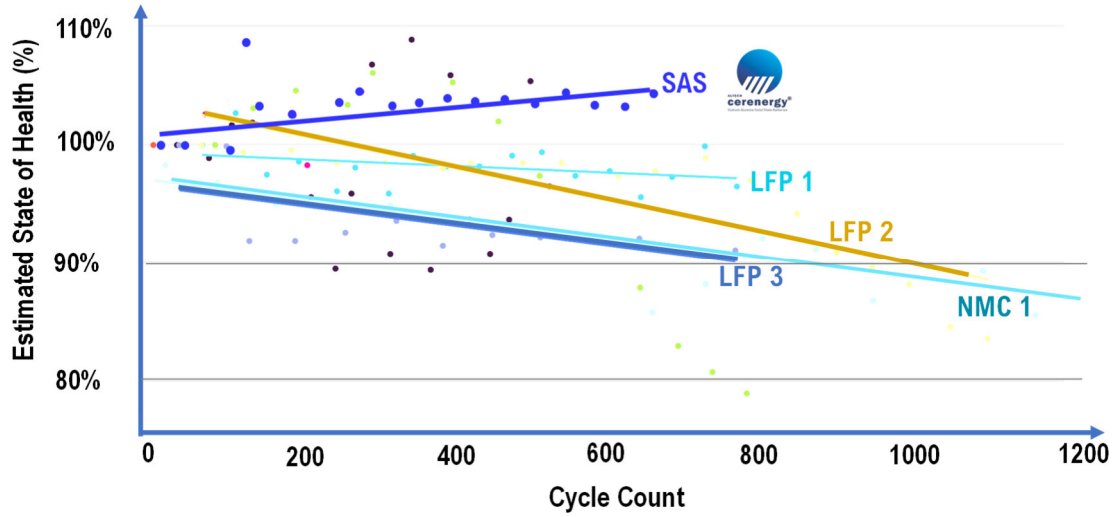


Figure 2 - Testing the service life of various batteries, including CERENERGY® batteries
Source: ITP Renewables Public Report 11 Lithium-ion Battery Testing Sep 2021

Lithium Free

Lithium free battery

CERENERGY® batteries do not contain lithium but use sodium ions from common salt. The cathode consists of sodium chloride and nickel. Sodium is the next most reactive alkali metal in the periodic table after lithium (Li is at -3.05 V, while Na is at -2.7 V) and is just as suitable for storing energy in batteries. Salt is not a critical element, is many times cheaper than lithium and is readily available everywhere. CERENERGY® batteries are also known as sodium nickel chloride batteries.

Cobalt Free

Cobalt supply chain and ethical concerns

CERENERGY® batteries are characterized by the fact that they work completely without cobalt. The cathode, which consists of salt and nickel, a sodium aluminum chloride medium, eliminates the need for the layered structure commonly found in lithium-ion batteries, eliminating the need for cobalt. This special chemistry makes CERENERGY® batteries free from ethical concerns and supply chain issues associated with cobalt. In addition, these batteries have a very good specific energy density of 110-130 Wh/kg, which

is comparable to the 90-160 Wh/kg range seen in LFP lithium-ion batteries, thereby showcasing superior energy efficiency.

Graphite and copper supply risks

Another distinctive feature of the CERENERGY® battery is the absence of graphite and copper in the battery anode. Remarkably, there is no special anode in the CERENERGY® battery structure. Instead, the anode forms itself during the charging phase and dissolves again during discharge. This innovative design is in stark contrast to conventional lithium-ion batteries, in which copper serves as the negative collector. In the CERENERGY® battery, a steel container takes over this task. The CERENERGY® battery is free of graphite and copper and offers the ideal solution for stationary energy storage.

CERENERGY® BATTERY UNIQUE SELLING POINTS

The above-mentioned characteristics of the CERENERGY® battery result in several remarkable unique selling propositions (USPs). These USPs are expected to offer exceptional prospects for marketing and business development and to secure a significant competitive advantage for Altech's CERENERGY® battery technology:

Environmentally friendly:	CERENERGY® batteries do not use any critical minerals, but consist only of salt, ceramic and nickel.
Local supply chains:	The raw materials for CERENERGY® batteries are not sourced from distant countries but are available locally in Germany and Europe.
Service life:	CERENERGY® batteries exhibit remarkable longevity and retain 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 affecting performance or service life.
Places of use:	Thanks to their safety, CERENERGY® batteries can be used anywhere, in buildings, public places and other locations without any fire protection.
All environments:	CERENERGY® batteries can be used in all climate zones without external cooling or heating.
No self-discharge:	CERENERGY® batteries do not self-discharge and can retain their state of charge for months without loss.

Easy transportation: CERENERGY® batteries are not hazardous goods and can be easily transported by conventional means of transportation such as truck, train or ship.

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

Figure 3 - CERERNERGY® battery module

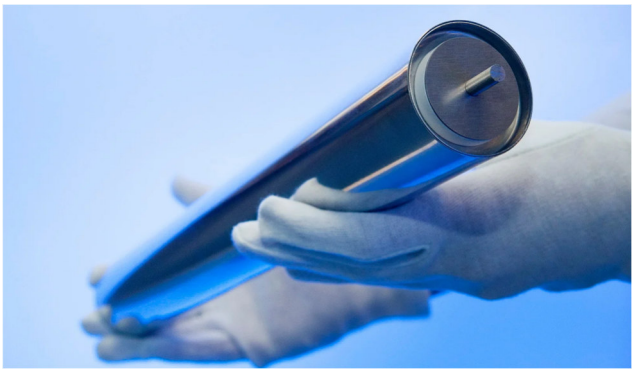


Figure 4 - CERENERGY® battery cell with 2.58 V each

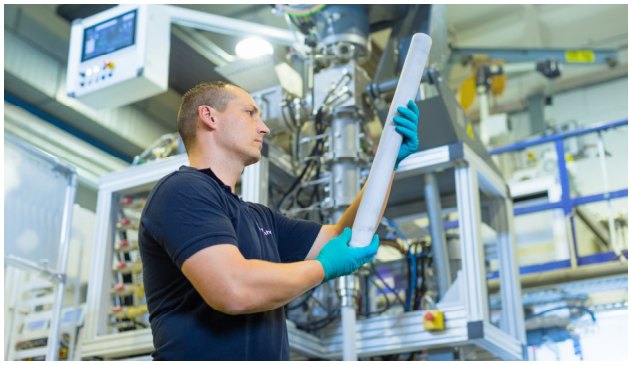


Figure 5 - Ceramic solid electrolyte in the pilot line

Figure 6 - CERENERGY® battery cells

WHAT IS A CERNERGY® BATTERY?

A CERENERGY® battery consists of a ceramic tube (conductive for sodium ions but insulating for electrons) with a positive pole in the center. (See figure 7). The solid ceramic tube (solid-state technology) fulfills the same function as a liquid electrolyte in a lithium-ion battery by enabling the transfer of sodium ions through the tube. IKTS has developed the solid-state technology to produce these large ceramic tubes with microstructures that enable rapid sodium ion transfer. The ceramic tube is filled with a cathode granulate consisting of common salt and nickel. To ensure contact between the solid cathode granules and the ceramic electrolyte tube, the positive electrode is flooded with molten chloroaluminate (NaAlCl4).

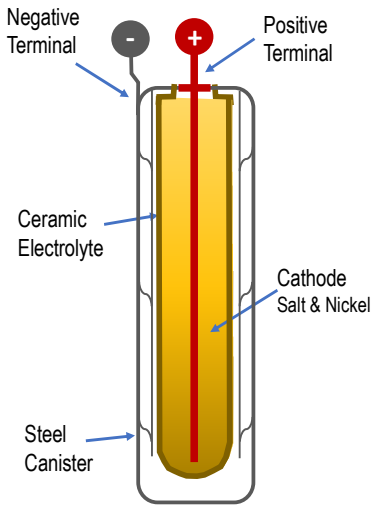


Figure 7 - Components of the CERENERGY® battery

The ceramic tube is housed in a metal container that serves as the negative pole (see Figure 7). The positive and negative poles are located at the top of the cell and are used for electron transfer and connection to other cells.

HOW THE CERENERGY® BATTERY WORKS

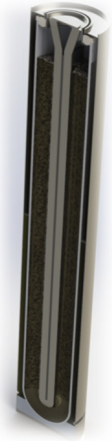


Figure 8 - Cross-section of CERENERGY® battery

When the CERENERGY® battery is charged, electrons flow from the positive terminal to the negative terminal. The sodium ions from the salt (sodium chloride) migrate through the solid ceramic electrode to the negative terminal of the container. The chloride ions bind to the nickel and form nickel chloride in the cathode medium. The sodium forms an anode layer on the outside of the ceramic tube, contacting the steel container (see Figure 9). The battery is fully charged. During discharge, electrons flow back, the sodium is oxidized to Na+ ions, which migrate through the solid-state ceramic tube and form sodium chloride. NiCl2 is reduced to metallic nickel.

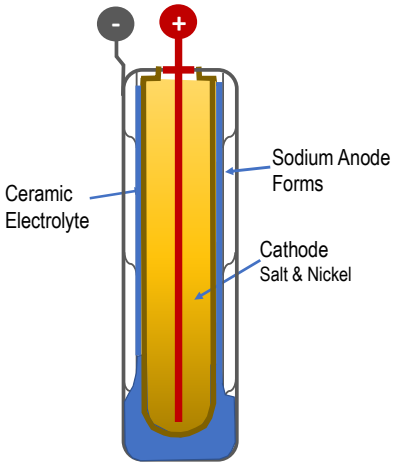
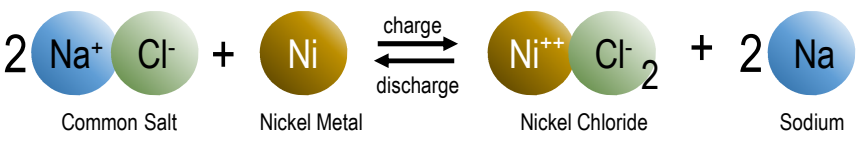


Abbildung 9 – geladene Zelle mit selbstformender Anode

The electrochemical reaction of the battery proceeds as follows:



Energy density

CERENERGY® batteries showcase exceptional energy and power density, as shown in Figure 10. With an energy capacity of 110-130 Wh/kg, they are on a par with LFP lithium-ion batteries (90-160 Wh/kg). With the ability to discharge 80% of their capacity within 4 hours, these batteries are ideal for efficient energy shifting and multiple cycles per day. In addition, they can discharge 25 % of their energy in just 15 minutes when fully charged, so they can also be used for rapid peak load smoothing.

In contrast to batteries for electric vehicles, mass and volume do not play a role for stationary storage. Due to the large amounts of energy and power required for stationary energy storage systems, the costs per unit of power or energy are decisive for competitiveness. The relevant metric for evaluating a technology for grid-scale storage is cost per watt hour (Wh) or watt (W), not Wh/kg (or W/kg). The joint venture believes that the CERENERGY® battery is ideal for grid-scale operation and storage for renewable energy. The battery can be configured for a voltage of more than 600 V, which is the control voltage for grid operations. Thanks to the modular design, the voltage can be adapted to the customer's requirements.

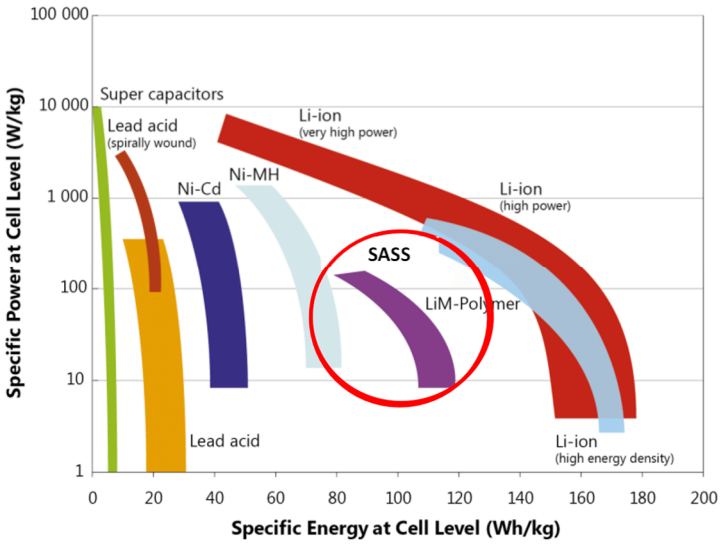


Figure 10 - Energy and performance curve of various battery technologies

CERENERGY® BATTERY CELL

The CERENERGY® cells have a unique internal structure, the core of which is a ceramic solid-state tube filled with sodium chloride and nickel metal powder granules. The central element is the nickel electrode, which is surrounded by molten chloroaluminate. These cells are characterized by a long service life of more than 15 years without loss of capacity. The CERENERGY® base cell with a nominal energy capacity of 250 Wh and a voltage of 1.7 to 2.8 volts is welded pressure-tight during production so that no active material is lost and constant performance is guaranteed over the entire service life. The planned fully automatic first line for 120MWH annual capacity can produce one battery cell every 45 seconds, which corresponds to an annual output of approx. 518,400 cells.

CERENERGY® - Cell level	
Voltage range:	1.7 - 2.8 V
Current capacity:	100 Ah nominal
Nominal energy capacity:	0.25 kWh (100% DoD, <C/10)
Discharge current:	cont. 25 A / trans. 33 A
Operating range (SoC):	20%-100%
Internal operating temp:	min. 270˚C - max. 350 ˚
Ambient temp:	-20°C to +60°C
IP standard	IP65
24-hour operation:	Possible without interruption
Cycles per day	up to 3 at 60 % / 1.8 full charge cycles

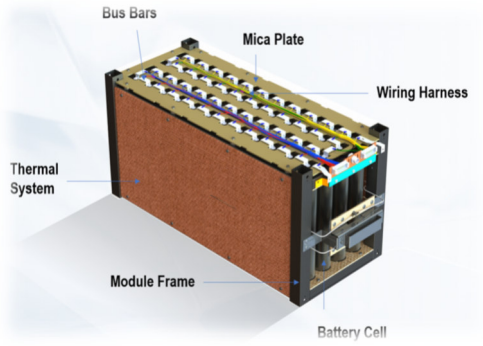
Figure 11 - CERENERGY® Prototype cells

60 kWh (ABS60) BatteryPack

The fundamental unit intended for production by Altech is the 60-kWh battery pack (ABS60). Each ABS60 pack consists of five battery modules with 48 cells each, resulting in a total of 240 individual cells. The annual production of the first line is set at 2,160 of these 60 kWh battery packs or 120 GridPacks. Figure 12 illustrates the internal structure of the battery housing and shows the five module frames, each holding 48 cells and enclosed together in a thermally sealed stainless-steel shell.

The design of the battery with an elegant stainless-steel housing, on which the CERENERGY® logo is engraved at the top and ALTECH Batteries at the bottom, is high-quality, robust and durable. The stainless-steel housing is vacuum-sealed and offers optimum insulation and ensures loss-free temperature management. The outside of the housing is at ambient temperature and can be touched at any time. A large contact system plate is integrated into the battery to enable fast and error-free connection of the busbars to each cell. The bottom of the battery is reinforced to safely accommodate high temperature resistant electrical cables, connectors and a battery management system (BMS) to minimize heat loss to the environment.

Figure 12 - Five battery modules in one BatteryPack

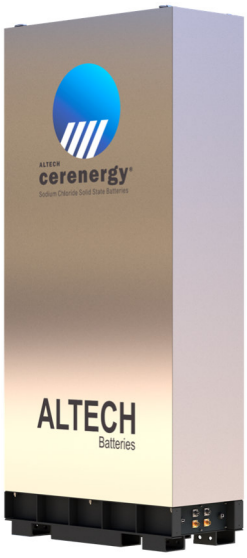


To facilitate the initial installation from a cold start-up, low-voltage heating pads have been seamlessly integrated into the internal vacuum-packed casing. This initial heating process from ambient temperature to operating temperature of 270ºC generally spans around ten hours and is then no longer required. During operation, the battery can maintain its internal temperature itself due to the endothermic charging reaction and exothermic discharging reaction.

Figure 13 - CERENERGY® battery module

ABS60 CERENERGY® BatteryPack specification

cerenergy® ABS60 - BatteryPack	
Dimensions:	500 mm x 2,499 mm x 1,145 mm
Weight:	≈ 800 kg
Nom. Voltage:	600 V DC
Voltage range:	410 (min) - 670 V DC (max)
Current Capacity:	100 Ah nominal
Nominal Energy Capacity:	60 kWh (100% DoD, <C/10)
Const. Power Discharge	13.8 kW in 3.2 h
Charging Time (20-80% SoC	5 h
Discharge Current:	cont. 25 A / trans. 33 A
Operational SoC Range:	20%-100% (80%)
Internal Ops Temp.:	min. 270°C – max. 350 °C
Ambient Ops. Temp.:	-20°C to +60°C
IP Rating:	IP65
Cyclability per day:	up to 3 @ 60% Ah / 1.8 FCE
Life time and design life	min. 5000 cycles (80% DoD), 15 years



1 MWh GridPack

As the first product to be sold, Altech will produce the CERENERGY® 1.0 MWh GridPack (ABS1000), which is optimally designed for the renewable energy and grid storage market. Based on preliminary discussions with potential customers, Altech offers a ready-made plug & play energy storage solution with the GridPack for quick and easy installation and commissioning. Eighteen 60 kWh BatteryPacks with integrated battery and energy management systems are installed in each GridPack. Each GridPack has a connection voltage of 600 volts DC and 100 Ah and can be connected in series (cluster or array) to achieve the output of several thousand kilowatts required for grid operation.

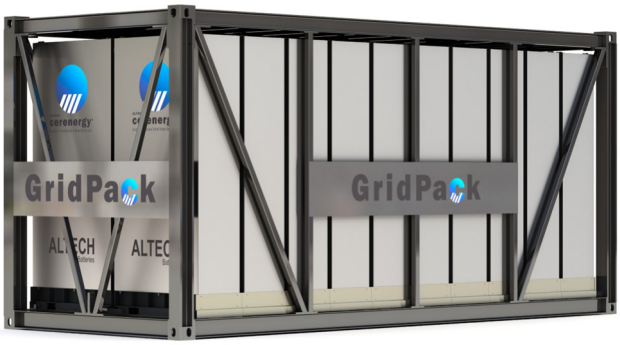


Figure 14 - 1 MWh GridPack

Figure 15 - Stackability of the GridPacks

The first product will be a standard 1 MWh container battery called the GridPack. Altech has developed an iso-container frame to house the eighteen (18) 60 kWh battery packs that make up the 1 MWh Grid-Pack (ABS 1000). An additional cabinet was provided for power electronics and another cabinet for the Energy Management System (EMS), both seamlessly integrated into the container.

The open frame of the standard size high-cube sea container is specially designed for easy and cost-effective transportation and installation on site. The GridPacks are assembled on the Altech site and undergo a full charge and discharge cycle before being shipped to customers. The battery is fully operational when collected by the end customer from the Altech factory.

The Altech BatteryPacks / GridPacks have been specially developed for robustness and durability with IP 65 standard, and offer complete protection against dust, sun, water and other environmental influences without any additional housing. This means CERENERGY® batteries can be installed anywhere. Altech GridPacks in sea container format can be easily transported by sea or road to the installation site and are ready for immediate use.

The plug-and-play capability of the GridPacks ensures that they can be easily installed in remote locations. In addition, the containers have been designed to be stackable, which minimizes the space required by the batteries (see Figure 15). Unlike other battery solutions on the market, the GridPacks can be stacked on top of each other and do not require a safety distance. This stackability combined with the

"plug-and-play" design makes the GridPacks easily scalable and adaptable to meet future energy storage requirements of any location.

Furthermore, the Altech GridPacks are designed without moving parts such as cooling, which are typically found in lithium-ion batteries. This is a notable advantage as some operators have expressed concerns about the noise generated, which currently prevents them from operating near residential areas. As the Altech GridPacks have no moving parts, they operate completely silently, making them an ideal solution for noise-sensitive environments. As a result, the maintenance costs of the GridPacks are extremely low over the entire battery life.

The Altech GridPacks are designed for operation in any climate without the need for thermal management. The internal temperature of the battery remains virtually constant during charge and discharge cycles. Altech's GridPacks will offer significant benefits to the rapidly growing renewable energy and grid storage sector. The GridPack's features enable more efficient use of renewable energy sources such as wind and solar power.

ABS1000 CERENERGY®-Battery GridPack Specifications

cerenergy® ABS1000 - GridPack	
Dimensions:	2.4 m x 5.9 m x 2.7 m
Weight:	< 22 t
Nom. Voltage:	600 V DC
Voltage range:	410 (min) - 670 V DC (max)
Current Capacity:	1,800 Ah (100% DoD)
Nominal Energy Capacity:	1 MWh (100% DoD, <C/10)
Const. Power Discharge	250 kW in 3.2 h
Charging Time (20-80% SoC	5 h
Discharge Current:	cont. 25 A / trans. 33 A
Operational SoC Range:	20%-100% (80%)
Power Output	cont. 250 kW / peak 340 kW
Power Intake	max. 280 kW
Internal Ops Temp.:	min. 270°C – max. 350 °C
Ambient Ops. Temp.:	-20°C to +60°C
IP Rating:	IP65
24h cycle capability:	up to 3 @ 60% Ah / 1.8 FCE
Life time and design life	min. 5000 cycles (80% DoD), 15 years

Altech believes that GridPacks are an excellent means of stabilizing the power grid by providing a backup power source during times of high demand or when renewable energy sources are not at capacity. They are also a cost-effective solution for the storage and distribution of renewable energy in a variety of applications, including grid storage, microgrids and electric vehicle charging.

They are also non-flammable and pose no risk of fire or explosion. They have a projected lifespan of over 15 years and are virtually maintenance free. Altech is convinced that these GridPacks will be the preferred choice for companies looking for a safe, reliable and long-lasting energy storage solution.

LEVELIZED COST OF STORAGE "LCOS"

LCOS is the term for a full cost calculation of the energy storage costs over the entire service life in relation to the total stored energy in kWh. LCOS describes the total costs per kWh supplied.

The LCOS of energy storage for various battery types were examined in a comprehensive study. The service life, charging, operating and maintenance costs as well as replacement and investment costs were considered. This analysis enables a direct comparison of the battery types and ensures a comparable assessment and gives the operator an indication of the cost-effectiveness of a battery park. Large grid storage batteries generally incur additional costs for ventilation and air conditioning systems, which has an impact on energy consumption and maintenance requirements. The cost of spare parts, especially if one battery has to be replaced earlier than another, has a significant impact on profitability. Taken together, these factors determine the energy storage costs over the lifetime of the battery. As shown in the table below, CERENERGY® batteries have a lifetime cost of approximately €0.06/kWh, compared to lithium-ion batteries at €0.13 - €0.16/kWh.

	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 per kWh (output) – grid service & storage (Euro)	0,060	0,132	0,149	0,164

Table 1 - Levelized costs of energy storage

GRID - BATTERY STORAGE SYSTEM (BESS)

Typical BESS Renewable Energies (source TE Connectivity)

Grid storage market

As the global energy sector transitions to renewables, efficient energy storage systems are becoming increasingly important. Grid storage batteries have proven to be a promising solution for managing the intermittency and variability of renewable energy sources and are also essential for relieving grid congestion. In line with this trend, Altech has recognized the potential of the grid storage battery market and is targeting this sector exclusively with its innovative CERENERGY® batteries.

Increasing market penetration of renewable energies
Renewable energy sources are experiencing rapid growth worldwide, with solar and wind energy leading the way. With the increasing integration of these energy sources into the electricity grid, the demand for energy storage solutions is also increasing. Grid storage batteries are an effective means of storing surplus energy during periods of high generation and releasing it during periods of low generation or increased demand. This enables a reliable and stable supply of renewable energy, enhancing grid stability, reducing dependence on fossil fuels and significantly reducing energy costs.

Falling battery costs
The decreasing costs of battery technologies have significantly changed the grid storage sector. The prices of lithium-ion batteries, which dominate the market, have fallen significantly due to economies of scale, technological advances and increased production capacities. As costs continue to fall, the use of grid storage batteries is becoming more affordable and feasible. This trend is attracting investment and encouraging innovation, leading to further cost reductions and technological advances. This also applies to CERENERGY®.

Government support and policies
Government funding and strong political support are key to the growth of the grid storage battery market. Many countries have recognized the importance of energy storage to meet their renewable energy targets and combat climate change. Governments are incentivizing the deployment of grid storage batteries through subsidies, tax credits and favorable regulatory frameworks. Such initiatives provide financial support, reduce project risks and encourage private sector participation. In addition, research and development grants drive innovation in battery technologies and enable the development of more efficient and durable grid storage solutions. This is generally true worldwide, but particularly true for Europe and the US.

Grid stability and efficiency
Grid storage batteries play a central role in maintaining grid stability and efficient utilization of existing grid capacities, which today have often already reached their capacity limits at peak load times such as early in the morning or after work. Energy fluctuations caused by intermittent renewable energy sources can put a strain on the power grid and lead to voltage fluctuations and power outages.

In addition, the grids are overloaded, especially in Europe at midday, when solar plants are producing at maximum capacity, so that energy cannot be fed into the grid but is lost unused. The same applies to wind energy that is produced in the north of Germany, for example, but cannot be transmitted to the south where it is needed at peak load times. Grid storage systems can react quickly to fluctuations and ensure a smooth and consistent energy supply. They act as a buffer and provide immediate energy to balance supply and demand. This improves grid stability, reduces costs and minimizes the need for costly infrastructure measures and increased expansion of the electricity grids. With the increasing integration of renewable energy, grid storage batteries are becoming essential for maintaining a robust and resilient energy infrastructure.

Growing demand for electrification

The electrification of transportation, industry and buildings is a key driver for the grid storage battery market. Electric vehicles (EVs) are on the rise worldwide, and their widespread adoption requires a robust charging infrastructure. Grid storage batteries can also serve as charging stations for EVs, or as a hybrid system with the power grids for fast charging and to help manage peak loads. The conversion of industry and buildings to electrical energy is also leading to a sharp increase in demand for electricity. Grid storage systems facilitate the integration of renewable energies in these sectors and ensure a reliable and uninterrupted energy supply.

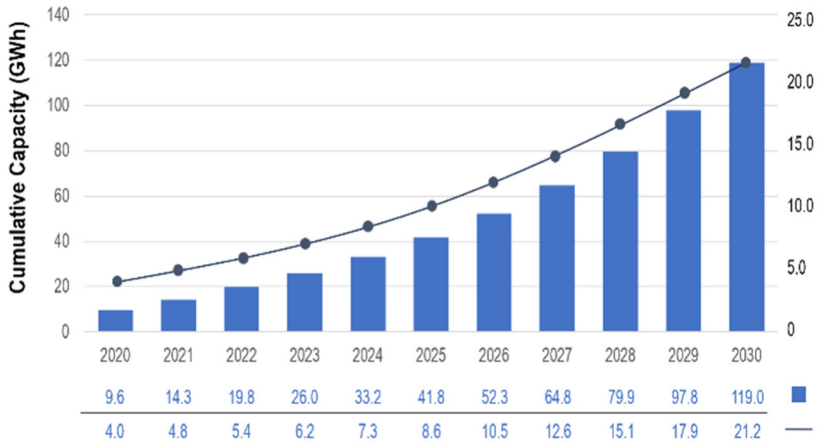


Figure 16 - Global market development for energy storage systems, source: Bloomberg NEF

Altech's CERENERGY® batteries are aimed at supplying the stationary energy storage market, which is expected to grow by 28% p.a. (CAGR) in the coming decades. The global market for battery energy storage systems (BESS) is expected to grow from USD 4.4 billion in 2022 to USD 15.1 billion in 2027. It is expected to grow from 20 GW in 2020 to over 3,000 GW by 2050.

Extensive energy storage systems are needed for the energy transition in Germany and Europe as a whole. The key market for CERENERGY® batteries is therefore the EU, followed by the USA as soon as GWh production capacity is reached.

The market prospects are considerable and are recognized by all stakeholders. Bloomberg NEF estimates that the global market for energy storage will grow at an average CAGR of 26.5% from USD 4 billion/year to USD 21.2 billion/year. The total market is estimated to reach USD 620 billion by 2040.

PATENT PROTECTION

Altech is dedicated to protecting the intellectual property of the CERENERGY® technology for the commercialization of the battery and allowing free distribution without restriction or infringement of third-party rights. Although Fraunhofer confirms that the basic battery chemistry is an open technology, there are several patents filed by Fraunhofer to protect the unique battery cell design. In addition, Altech is in the process of filing various applications to protect further special features of the manufacturing process and

the optimized cell design. For this purpose, Altech has engaged the services of the leading patent law firm in Germany, RUHR-IP Patent Attorneys Office Partnership. On behalf of Altech Batteries GmbH, RUHR-IP conducted a European technical overview search for a thermal battery cell, also known as a ZEBRA battery or sodium nickel chloride battery. The search identified only three third party patents that are considered highly relevant, one of which has lapsed, another is owned by Fraunhofer, the joint venture partner, and the third concerns the application of a glass soldering process essential to the battery cell. As the required glass soldering process has already been acquired by this third party, there is no patent infringement known to us. Based on the results of this professional investigation, Altech believes that the risk of potential patent infringement by Altech against third parties is minimal and we can proceed with the commercialization of CERENERGY® without restriction.

TRADEMARK APPLICATION AND TRADEMARK

The registration of trademarks, brand names, product rights, product design are part of the detailed feasibility study (DFS) and include names such as "Altech" and "Altech Batteries" as well as the design and name "GridPack". This proactive step is aimed at protecting intellectual property and establishing strong product branding and recognition. This worldwide, but especially in Europe. Altech has also commissioned the RUHR-IP patent attorneys for this purpose.

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

Table 2 - Trademark applications

In addition, there are a large number of technical patents to protect the CERENERGY® technology and the optimized production process.

APPLICATION FOR GREEN CERTIFICATION

CICERO, a company of the Standard & Poor rating agency, was commissioned to carry out an independent assessment of the planned CERENERGY® production plant. The plant to be built in the Schwarze Pumpe Industrial Park, Saxony, Germany, is planned with a particular focus on minimizing greenhouse gases and other environmental impacts and falls below the applicable German, European and international environmental standards. CICERO will assess the environmental impact of the plant as a whole and in relation to other technologies in order to obtain certification. With this financing, we can provide our customers with a CO2 certificate and the project would be eligible for future green bond financing.

APPROVAL PROCEDURE

Altech appointed ARIKON Infrastruktur GmbH (Arikon) to manage the approval process, define all site infrastructure requirements and plan the connection of all operating media. Arikon is responsible for managing the application process and coordinating all data from the various subcontractors, together with the Altech project management team. Arikon and Altech project management coordinate the cooperation with the relevant authorities to obtain all necessary permits, in particular the building permit, and the procedures under the Federal Emission Control Act (BimSchg application) in a timely manner for the project. All approval and environmental application procedures have begun and all documents have been submitted in full.

LOCATION OF THE PLANT IN SAXONY, GERMANY

Altech has acquired a 14-hectare industrial site in the Schwarze Pumpe Industrial Park (ISP) as the location for the planned plant. The industrial park is strategically located on the border between Brandenburg and Saxony, approximately 120 km from Berlin and 78 km from Dresden and has excellent infrastructure. The chosen CERENERGY® site is located in the southern part of the ISP in the municipality of Spreetal and offers sufficient area for future expansion potential, excellent transportation links, fully developed infrastructure, utilities and excellent logistics, including an on-site rail connection, access to renewable energy, and has full political and municipal support. Altech is welcome in Saxony. The proximity to Dresden, strong support from local stakeholders, competitive prices and potential financial support from state authorities add to the attractiveness of this location.

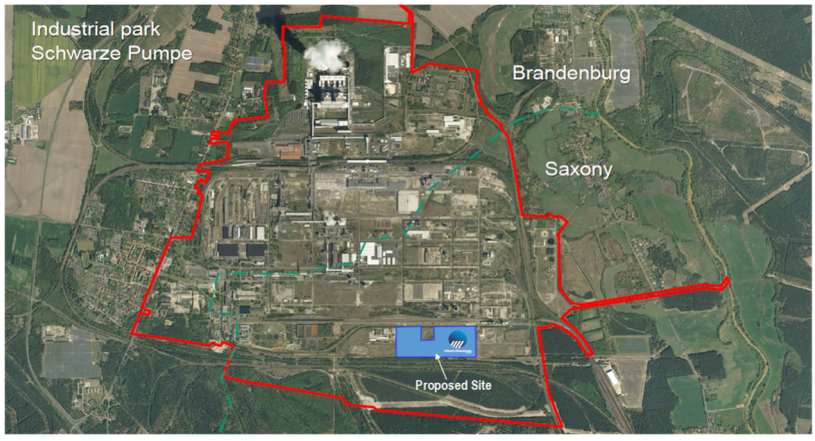


Figure 17 - CERENERGY® site

MAIN CONTRACTOR (EPCM)

Leadec Automation & Engineering GmbH (Leadec) was choosen as the lead engineering, process technology and plant construction company for the planning, construction and project management of the CERENERGY® 120 MWh battery project and was also in charge of the feasibility study. Leadec is coordinating the work of more than 40 selected subcontractors who will be involved in the construction of the plant.

Leadec Automation & Engineering GmbH is part of the Leadec Group, one of the world's leading engineering, management and service specialists for the entire life cycle of a factory and the associated infrastructure. The range of services extends from planning and installation to operation and maintenance. With 22,000 employees at more than 350 locations and a turnover of more than EUR 1.1 billion in 2022, Leadec is the preferred contractor with extensive experience in the field of battery manufacturing, combining expertise from all areas of engineering from infrastructure, mechanics and electrics to the production process and automation. References include the planning services for the VW battery plant in Braunschweig, the realization of battery cell production for Mercedes-Benz in Jawor, Poland, the planning of battery production lines in Thuringia for a leading global battery manufacturer and the complete automation of battery anode material production for the first automotive Li-ion cell production in Kamenz, Germany.

Leadec's responsibilities include overseeing project administration, design preparation, division of construction work, professional and competitive tender management, project management, subcontractor contract performance, cost estimating, project planning, document control, procurement, cost control, financial analysis input and project closeout activities for professional, efficient and successful project implementation.

Leadec's automation division has been contracted to supply advanced electrical and automation solutions for process technology and battery assembly. This includes intranet-equipped control centers and local operating systems that enable centralized monitoring and control of plant operations. In addition, a real-time SCADA system will be integrated to ensure real-time data acquisition, visualization and control. The key feature of the battery plant will be the traceability functionality together with batch identification to ensure optimum quality.

BUILDING AND INFRASTRUCTURE CONTRACTOR

Arikon AG ("Arikon") has been commissioned as architect and with the structural and civil engineering as well as all infrastructure measures. As described above, Arikon is responsible for all approval procedures. Arikon, headquartered in Berlin, is a leading project developer and industrial plant constructor and bundles the know-how for all peripheral trades including, but not limited to, architecture and air, wastewater and building services engineering and also manages the corresponding environmental, construction and operating permit procedures. Arikon is very familiar with the specific requirements of the battery industry, having completed a number of projects of similar size and complexity, such as the Tesla plant in

Grünheide, where Arikon was the contractor for the plant and most parts of the infrastructure as well as supporting the permit applications. With its track record of fast-tracked projects, its adaptability to change and its ability to master complex process technologies for CERENERGY® production, Arikon is a perfect fit for Altech's corporate culture.

CERENERGY MANUFACTURING PROCESS

Process steps

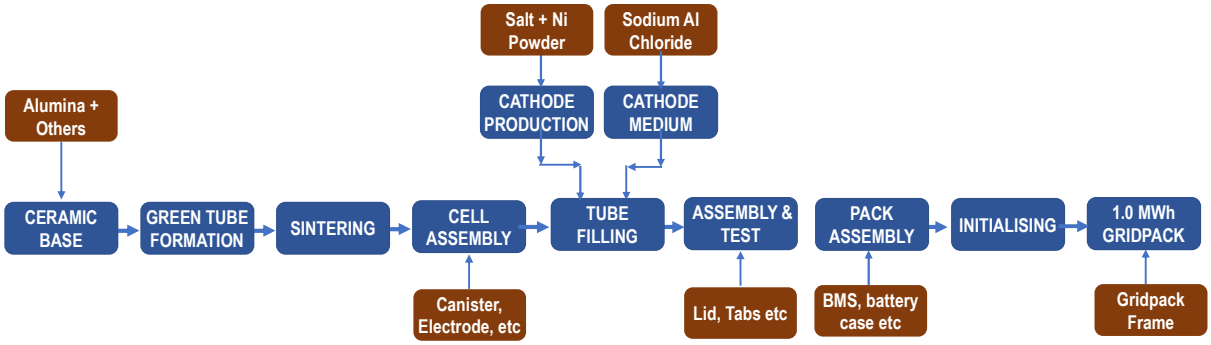


Figure 18 - Schematic process diagram

The planning of the CERENERGY® production plant has been completed. Production consists of defined sections for mixing raw materials, pressing the solid-state electrolyte, forming green bodies (in ceramics and in the production of sintered workpieces, a green body is an unfired blank that can still be easily machined), sintering and cell assembly. Subsequent areas include the production of the active materials, such as sodium chloride granulate and others, as well as the preparation for filling the tubes. Finally, the tubes are assembled, welded and sealed in metal housings and containers. The finished cells are then assembled into a battery system to be initialized and tested. The equipment and layout are designed so that a CERENERGY® battery cell can be completed in just 45 seconds. Battery production is automated to the latest standards and uses specially developed processes and containers specific to CERENERGY® technology to ensure the highest quality and efficiency.

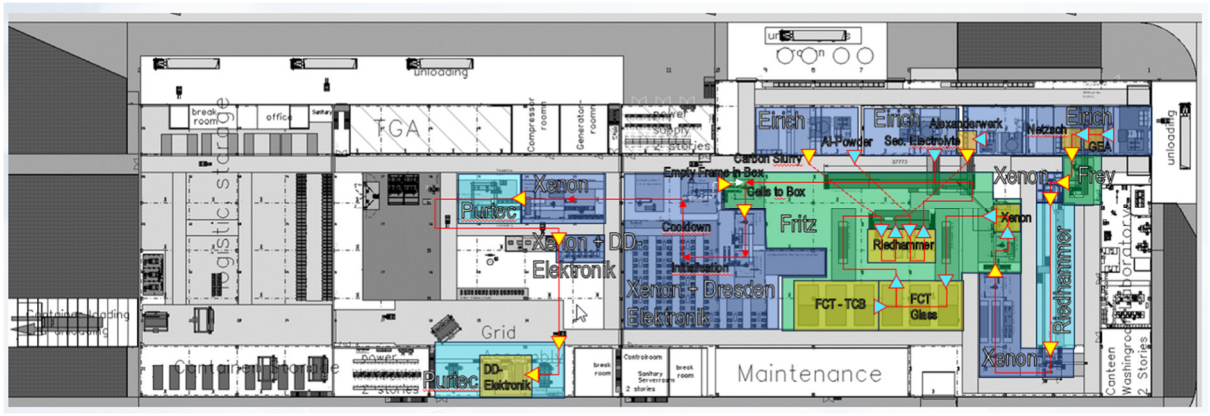
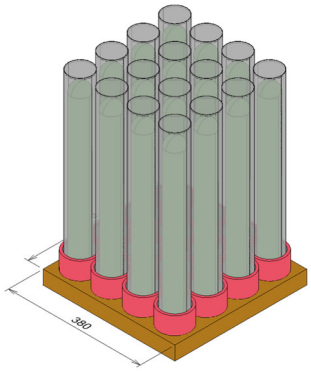


Figure 19 - CERENERGY® factory layout

The production of the ceramic tube, the solid-state electrolyte, involves receiving and processing the raw material in powder form, mixing, shaping and firing sodium ion conductive ceramic based on beta aluminum oxide. The overall process includes the following steps:

1. Mixing and slurry preparation
2. Slurry milling
3. Spray drying
4. Green tube pressing
5. Setter pressing
6. Loading green tube + setter on kiln tray
7. Sintering
8. Quality control
9. Feeding into the automatic assembly line



In the mixing and preparation phase, the powdered materials are mixed to form a high-quality ceramic paste and transferred to an aqueous phase in a defined sequence with simultaneous mixing and the addition of IP-protected additives. The paste is then reground to achieve the optimum grain size and morphology of the ceramic raw material. Altech has contracted Maschinenfabrik Gustav Eirich GmbH & Co KG (Eirich) to supply the necessary equipment for this process step. Eirich is a highly experienced German company that is a world leader in advanced mixing and pelletizing systems for ceramic powders and technologies (see Figure 20). Eirich will also supply the equipment and technologies for the processing of salt and nickel powder for the production of battery cathodes.

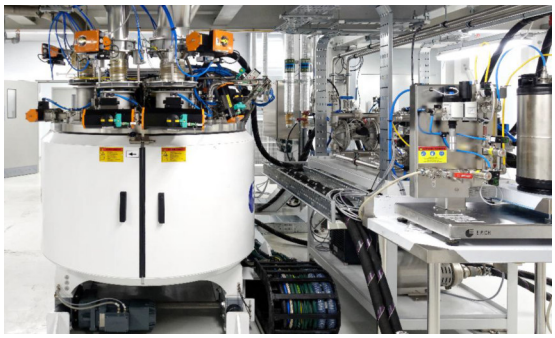


Figure 20 - Eirich process equipment

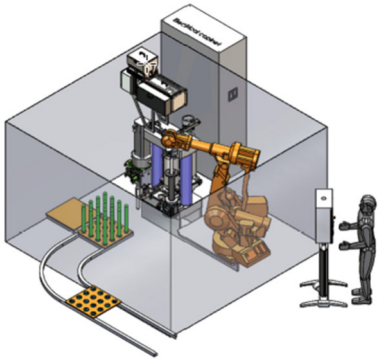


Figure 21 - Freys isostatic pressing unit

The next step is the spray-drying process, in which the liquid paste is converted into ceramic granules, strictly adhering to the secret specification for grain size and residual moisture. The dried ceramic granulate is pressed into ceramic tubes under high pressure using an isostatic press to give them the defined shape of the solid electrolyte (green tubes).

Frey Systeme GmbH (Frey) was selected to supply the isostatic pressing machines with the required production speed. Frey's advanced technology (see Figure 21) enables high-speed filling of press molds

using high pressure. This special technology and automation ensures a cycle time of less than 45 seconds to produce green tubes.

The green tubes are then transferred to assembly, mechanically stabilized and covered with a magnesium spinel protective coating for sintering. Sintering at 1,600°C takes place in a feed furnace specially designed by Altech, which, in contrast to conventional gas-powered furnaces, is operated exclusively with electricity. The firing process that now takes place represents a special know-how developed by Fraunhofer. This process ensures that the solid-state electrolyte meets the required operating criteria. Altech has commissioned Riedhammer GmbH (Riedhammer), one of the world's leading German suppliers of kiln systems, to supply the eclectically operated tunnel kiln for sintering ceramic tubes (see Figure 22). By using renewable electricity, the CO_2 footprint of the CERENERGY® battery is drastically reduced. This innovative approach has significant environmental benefits, saving around 480 tons of CO^2 emissions per year compared to conventional gas-fired kilns.

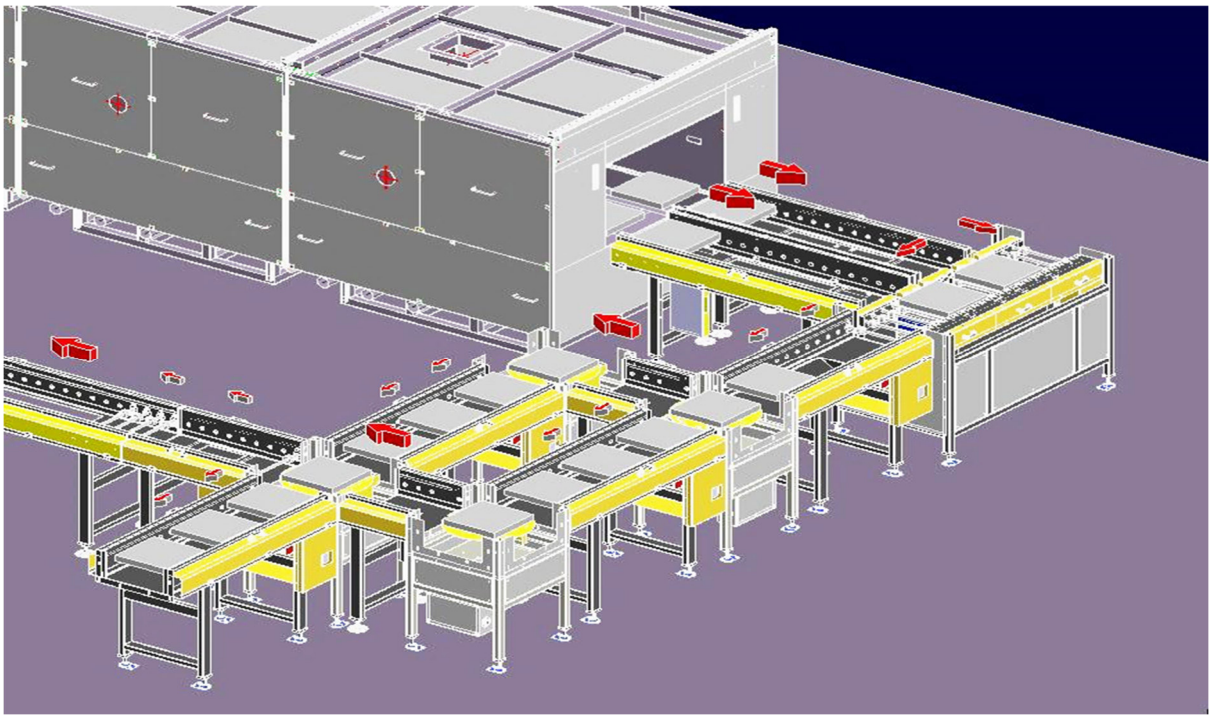


Figure 22 - Altech feed furnace from Riedhammer

After passing through the defined firing curve, the ceramic tubes are gently cooled and subjected to quality control, which ensures flawless, dimensionally accurate calcined ceramic tubes. Altech has commissioned Xenon Automatisierungstechnik GmbH (Xenon) to develop automated quality control systems for sintered ceramic tubes for the specific application in CERENERGY®. Xenon's technology includes various optical and acoustic wave inspection methods. In addition, Altech, together with Xenon and Dresden Elektronik, has developed the initialization process for the finished CERENERGY® battery cells.

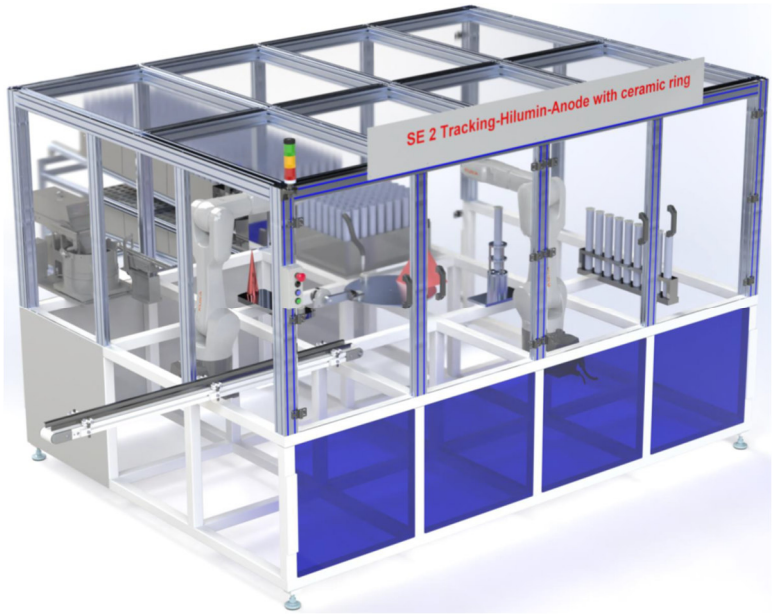
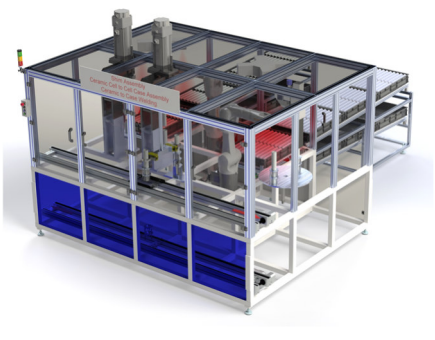


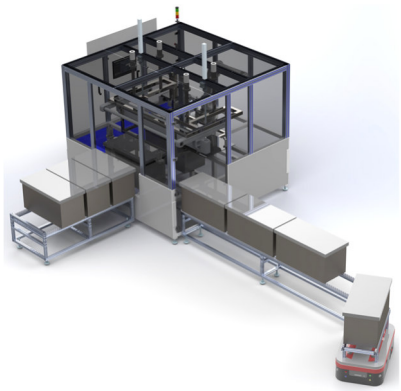
Figure 23 - System for thermocompression bonding process

In the next step, the solid-state electrolyte is sealed and provided with a nickel flange for preparation. This is ensured by a special thermocompression bonding process that achieves a leak tightness of 10^{-8} mbar*l/s (see Figure 23). This is another very important and secret know-how of the company.

The process, which is facilitated by special stacking aids, takes place in a high-temperature environment and ensures robust and effective assembly. A helium pressure test is carried out to check the sealing properties.

The metal housing of the cell is prepared for mounting the ceramic tube, then the electrode is installed and filled with the prepared cathode material. At the same time, the secondary electrolyte is heated and filled into the cell. The metal housing, the ceramic tube, the electrode, the cathode material and the secondary electrolyte are joined together and the cell is welded using laser technology according to strict dimensions. The bottom of the container is filled with a defined amount of aluminum powder to increase the stability and safety of the solid electrolyte. Altech has selected Fritz Automation GmbH (Fritz) as the supplier for the cell assembly line. Fritz has developed the advanced automation systems that ensure efficient and precise execution of all steps of the cell assembly process. In addition, Altech and Fritz have developed the various transport containers that are required for smooth and fast assembly, but which cannot be shown here due to their special nature and are subject to strict confidentiality.





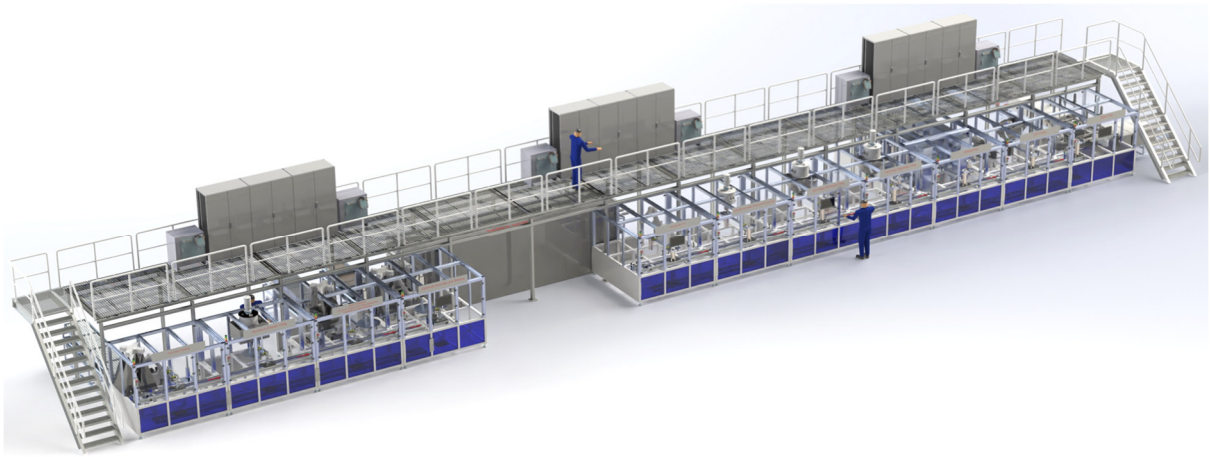


Figure 24 - Cell assembly, Fritz Automation

Upon completion of cell assembly, several cells are collected and stored in a larger thermal box. During this phase, each cell undergoes its first complete charge and discharge cycle within the thermal boxes. During the entire initialization process, the behavior of the individual cells is precisely recorded. Key electrical, electrochemical and spectrometric parameters are automatically recorded and compared with predefined target conditions. Dresden Elektronik GmbH was commissioned to carry out the cell initialization and subsequent performance tests on the finished battery cells. The automation and robotics required for this production step, including the recording of measurement logs, is part of Altech's expertise. The test station is designed to record test data and carry out charging and discharging cycles to ensure that the cells function properly before the system is installed. Tracking each individual cell during the manufacturing process is crucial for the planned battery system.

In subsequent step, the cells are connected and the cable trays are welded. During the welding process, all the busbars mounted on top of the cell contacting system (ZKS) are individually welded to the associated cells. A resistance testing mechanism then checks all the weld seams. If faults are detected, the cells can be reworked by removing the busbars from the affected cell. After successful testing, the modules are stored until a set of five modules is available. This set of five modules is then forwarded to the BatteryPack assembly station. Altech has chosen Hofer AG (Hofer) as the supplier for battery busbars, cable harnesses and cable trays as well as for the development of the ZKS.

A vacuum-insulated housing is used for the BatteryPack assembly. König Metall GmbH (König) was selected as the supplier for the insulated housing of the 60 kWh BatteryPack. The vacuum housing is durable and offers complete contact safety with a surface at ambient temperature. The housings comply with the IP 65 standard so that the batteries can be operated in all weather conditions without additional protection. The battery management system (BMS) and connection cabling are also integrated on the underside of the housing.

The BMS is inserted into the base of the enclosure and five battery modules are stacked and connected with safety pins and screws and the pre-configured wiring harnesses and BMS are connected. The end-

of-line test checks the functionality of the battery pack, including cells, heaters, BMS, CCS, sensors and safety requirements. As soon as 18 BatteryPacks have been completed, they are installed in the Grid-Pack.

Altech has commissioned the Volkswagen Group company IAV Ingenieurgesellschaft Auto und Verkehr GmbH (IAV) to develop an advanced battery management system for the 60 kWh BatteryPack and the 1 MWh GridPack. The BMS enables seamless integration into the respective software environment as well as into the customer's grid control systems. It ensures optimal performance and integration of the Grid-Pack and provides users with efficient management and monitoring capabilities both online and offline. The proposed BMS concept also offers the possibility of remote control as well as online monitoring by Altech, if requested by the customer. Remote control capabilities include optimizing energy storage and usage based on the real-time dynamics of supply and demand.

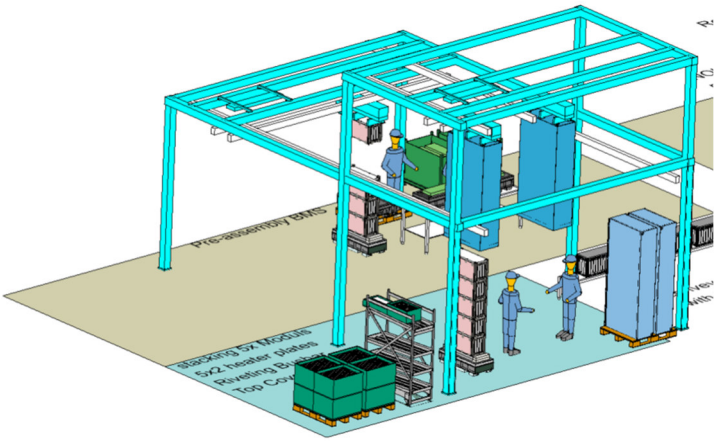


Figure 25 - BatteryPack installation

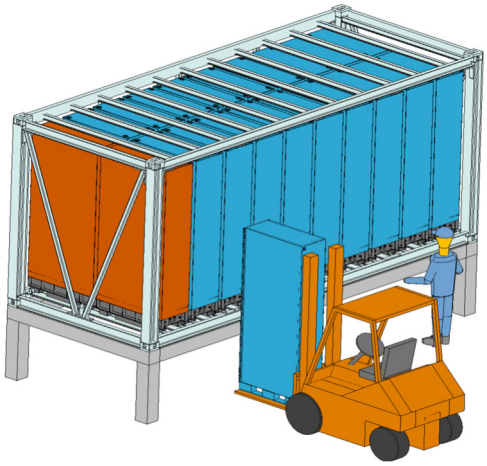


Figure 26 - GridPack installation

Figure 27: Diagram of BatteryPack assembly

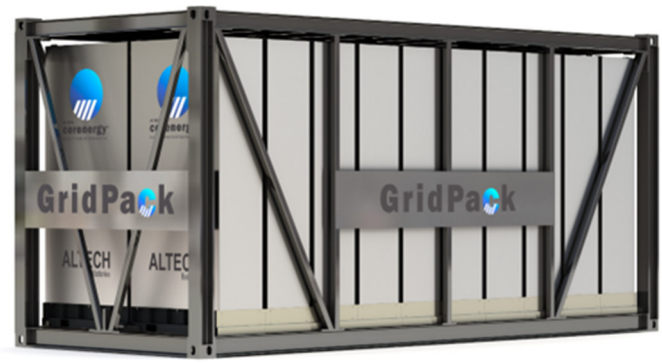


Figure 28 - Completed 1 MWh GridPack ready for delivery

DFS - KEY FINANCIAL FIGURES

With an investment of €156 million, Altech's feasibility study forecasts a net present value (NPV_9) of €169 million at and an annual free cash flow before taxes of €51 million at from operations. The estimated internal rate of return is 19% with an amortization period after continuous operation of 3.7 years. At full production capacity of 120 1 MWh grid packs per year, annual sales of €106 million are expected. The EBITDA margin is 47%. In view of the strong growth forecast for the stationary grid storage market of 28% p.a. (CAGR), the Altech Group and its joint venture partner Fraunhofer have decided to enter the financing phase for this project.

Investment	156 million €
Present value (NPV_9)	169 million €
Free cash flow	51 million €
IRR (internal rate of return)	19%
Turnover per year	106 million €

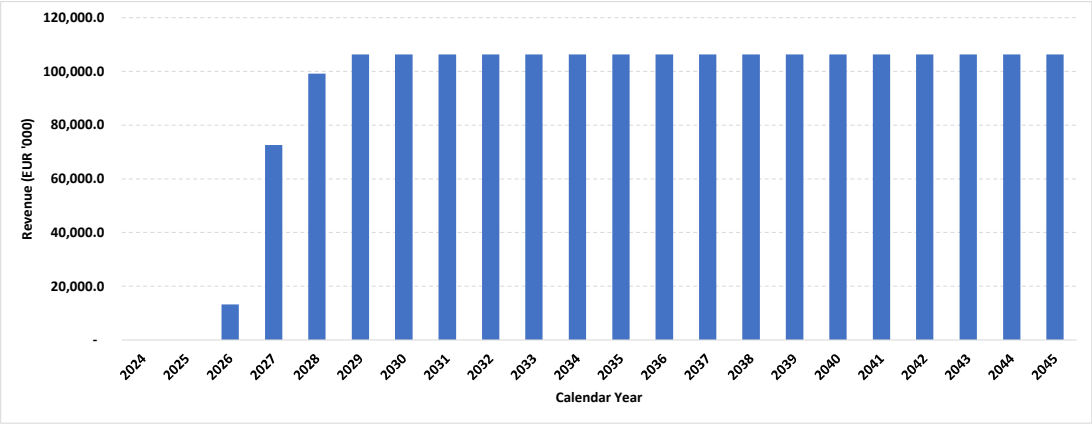


Figure 27 - Project turnover

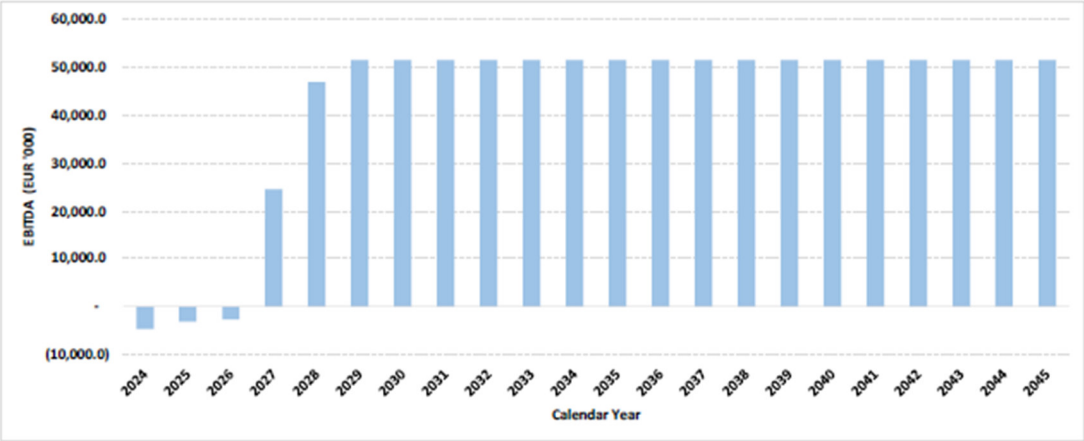


Figure 28 - Project EBITDA

CALCULATION PERIOD

The service life of the project, which is reflected in the financial model, is 20 years - a typical term for battery production plants. With regular maintenance and servicing, these systems sometimes have a service life of over 30 years.

MAINTENANCE

The financing model assumes annual maintenance investments of around €3.1 million over the entire duration of the project.

INVESTMENT VOLUME CERENERGY® - PROJECT

The capital costs for the CERENERGY® project are estimated at € 156 million (see Table 3). The majority of the investment for the project is for the construction of the CERENERGY® production facilities and machinery as well as the associated infrastructure at the Schwarze Pumpe site, such as the administration building, workshop and laboratory. The technical design and cost estimate for the CERENERGY® plant is based on the process design and equipment required for the production of 120 1MWh GridPacks per year. Suppliers have been selected for all trades and quotations have been received. The total investment estimate has a high accuracy with a deviation of less than ± 15 % and serves as a reliable basis for financing, which is recognized by banks and other financial institutions.

	Invest EUR	
Prozesstechnik & Anlagen	73.0	Mio.
Gebäude & Infrastruktur	59.0	Mio.
Mobile Fahrzeuge & Werkzeuge	4.6	Mio.
Elektrik & Steuerung & IT	7.4	Mio.
Mehrkosten Budget	12.0	Mio.
Total	156.0	Mio.

Table 3 - Investment cost estimate

BASIS OF THE INVESTMENT ANALYSIS

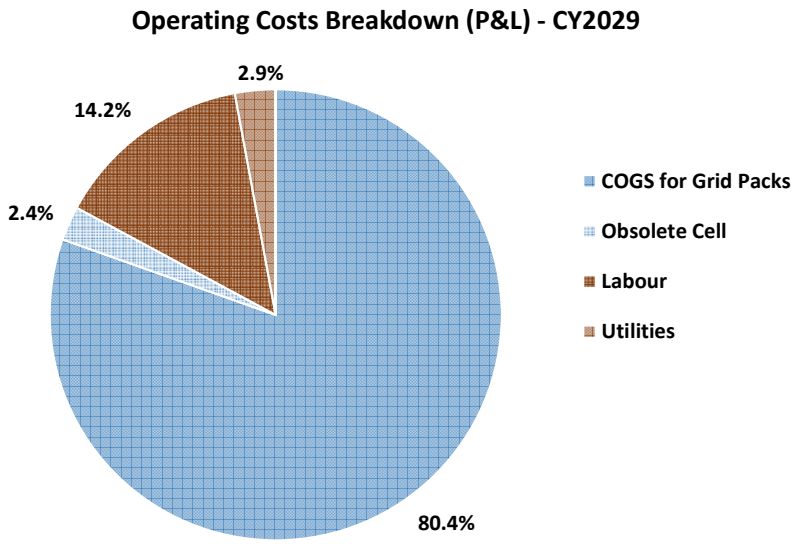
The basis for estimating the investment costs for battery production in Schwarze Pumpe is the machinery and equipment required for CERENERGY®. Leadec Automation & Engineering GmbH (Leadec), an engineering company based in Germany, was selected as the EPCM partner for the feasibility study and is responsible for the overall planning, specification and budgeting of the process equipment. Altech and Leadec selected 45 different subcontractors to design and price the full production line. Using the process flow diagram and mass balance used to develop process and instrumentation diagrams (P&IDs) and mechanical equipment lists, quotations were obtained for all machinery and equipment. The offers of all suppliers based in Germany and Europe were examined and the investment costs calculated. The costs for the construction of the plant buildings and the entire infrastructure were planned and the offer prepared by Arikon AG. Arikon was commissioned due to its extensive local planning and construction experience and many successful references, including the Tesla plant in Grünheide, as well as its precise knowledge of local and state approval authorities and procedures.

ESTIMATION METHODOLOGY

The investment cost estimate was prepared in accordance with the standards for Class 3 VDI engineering studies, whereby the estimates were assessed with an accuracy of +/- 15%. The estimate was prepared based on the detailed costs for the mechanical and electrical process equipment for the entire plant. Based on the plant configuration in Schwarze Pumpe, material quantity estimates and detailed designs for the various trades of earthworks, civil engineering and structural engineering were carried out. These material quantity estimates were passed on to several nominated construction companies, who then provided local unit rates, which Arikon used to calculate the total costs for this area of investment. The remaining direct costs of the plant such as equipment, tools, spares, vehicles and the like were estimated at market rates as appropriate for the level and accuracy of the study undertaken.

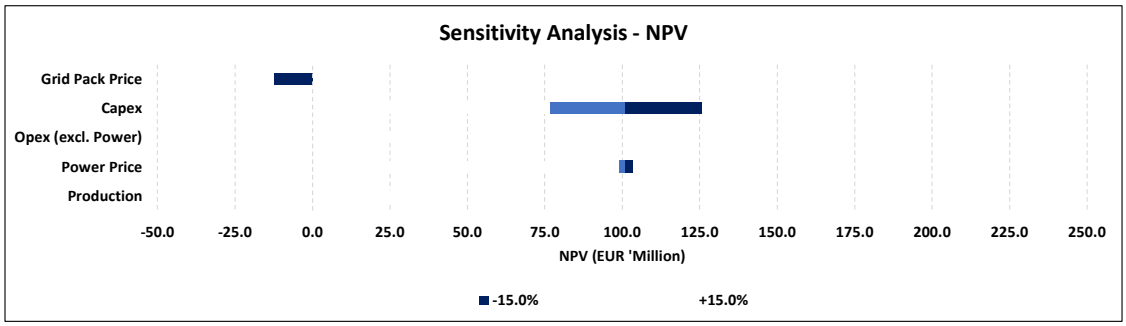
ANALYSIS OF OPERATING COSTS

The breakdown shows that 80% of the cost of goods sold consists of various consumables and components that make up the cell and consequently the GridPack. The share of labor costs is 14% and the share of electricity costs is 2.9%. Rejects from incorrect production are valued at 2.4%.



SENSITIVITY ANALYSIS

A sensitivity analysis of the project's projected cash flows, which forms the basis for the present value, shows a significant elasticity of earnings with respect to the underlying GridPack price. Operating expenses (excluding the electricity price) are the second most important driver of earnings, followed by production and capital expenditure, while the project's earnings sensitivity to the electricity price is marginal.



WATER MANAGEMENT

The system is designed in such a way that all sealed surfaces are connected to a central system that directs the accumulated water into designated retention facilities. This gray water is then used in the sanitary process or for irrigation purposes. An integrated closed water cycle has been set up for the entire production process, allowing up to 90% of the water used in various processes to be reused. The remaining wastewater is treated by the local supplier, ASG Spremberg GmbH, before being discharged into

public waters after purification measures. This comprehensive water management ensures efficiency, sustainability and compliance with environmental standards.

HAZARDOUS GOODS MANAGEMENT

With CERENERGY® battery technology, environmentally hazardous substances can be completely dispensed with. The required raw materials and supplier parts can be procured from local supply chains in Germany and Europe, meaning that there are no problematic extraction processes or supply chains. Short delivery routes, uncomplicated material extraction and straightforward, safe recycling characterize the CERENERGY® battery and thus enable unique sustainability compared to other battery technologies. The planned logistical delivery and distribution by rail also contribute to the product's environmentally friendly footprint and underline Altech's commitment to environmentally friendly practices throughout the production, distribution and recycling process.

RENEWABLE ENERGY USE

The factory concept is geared towards a production process without fossil fuels. In particular, a new type of electric oven was developed for this purpose, which makes the use of natural gas superfluous. The supply contract for renewable electricity was concluded with a local supplier. The annual energy consumption of approx. 20.5 million kWh is secured on a sustainable basis. The CO_2 reduction potential for production is estimated at 6.32 kg CO_2 /kWh, or 6.42 million kg CO_2. This represents a significant reduction, which not only underlines Altech's commitment to environmentally conscious manufacturing practices and sustainable energy use, but also represents a major sales argument. End customers can thus certifiably reduce their CO_2 footprint.

MECHANICAL EQUIPMENT COSTS

The estimate of the investment costs for the mechanical equipment is based on the cost estimates received for all major items of equipment after inquiries were sent out in 2023. The sizing of the equipment was determined based on process data for the 120 GridPacks per year. Mechanical equipment installation hours/costs were estimated based on equipment lists, industry experience, standards and Leadec's current knowledge and experience in the construction industry.

EARTHWORKS, CONCRETE AND CONSTRUCTION WORK

The quantities of concrete and structural steel were calculated using a quantity analysis from the 3D plant design and supporting design calculations for concrete, structural steel, platforms, walkways and cladding. The estimates for the earthworks, access road and internal road were also based on the detailed 3D plant design for the 120MWh per year CERENERGY® plant. Local material and labor rates were provided by Arikon and then used to develop the total costs for these areas. Cost estimates for the site buildings were determined using unit rates based on the detailed design drawings developed by Arikon during the design and construction phase. These costs include the construction of administrative offices with full staff facilities, process operations offices, control rooms, a laboratory and the maintenance workshop/warehouse. The costs for equipping the plant's QA laboratory were determined based on quotations from German suppliers and are also included in this direct cost item.

COSTS FOR ELECTRICAL AND INSTRUMENTAL EQUIPMENT

The estimate of the investment costs for the electrical equipment and control technology is based on the offers from suppliers that were requested in 2023 for all key equipment items. The dimensioning of the equipment was determined based on process data for the 120 GridPacks per year. Electrical equipment installation hours/costs were estimated based on equipment lists, industry experience, standards and Leadec's current knowledge and experience in the construction industry.

POWER SUPPLY

The plant's power supply system is divided into medium and low voltage, with Arikon responsible for the medium voltage and Leadec for the low voltage (excluding lightning protection and building infrastructure). A 12m x 24m, two-storey transformer and feed-in building is planned, which will house the medium-voltage supply on the lower floor and the low-voltage switchgear and control cabinets on the second floor. The technical requirements include redundant 30 kV feeds, circuit breakers, four transformers for the medium voltage and all components for the low voltage, emergency power generators and redundant 400 V UPS.

ERP SYSTEM

The concept includes MES software components in the battery factory, including the MES core system for central control, the production documentation system (PDS) for data acquisition, the analysis and reporting system (ARS) for production optimization and the LAB information management system (LIMS) for chemical processes. The interfaces include SCADA, ERP, machines, systems and identification devices, including barcode scanners.

IT SYSTEMS

Plant planning includes the entire state-of-the-art IT infrastructure, including user control (HME = HUMAN MACHINE INTERFACE), network structure, hardware (servers, PCs, data centers), software systems (MES, SCADA, engineering), data security, data protection, disaster recovery and software licensing.

DIRECT COSTS OTHER DISCIPLINES

In addition to the costs developed in detail above, there are other direct costs that need to be considered and have been estimated. These are:

- Critical spare parts - Included at 4% of the cost of the installed equipment.
- Mobile equipment - Estimated from the equipment price database from previous quotes for cranes, forklifts, vehicles; and
- The initial filling of the system for operation/commissioning - This includes all materials and purchased parts as well as the necessary media for the respective minimum order quantities.

INDIRECT COSTS

The indirect project costs were calculated using factors that are typical for battery production plants of similar size and complexity. The factor used to calculate the total freight costs takes into account the location of the site and the high proportion of process equipment and construction materials that would be sourced locally from German companies or neighboring European countries. EPCM costs were estimated based on the feasibility study scope, final equipment selection and execution strategy.

ADDITIONAL COSTS - BUDGET

To ensure that the project is completed within budget and without additional costs, it is necessary to provide a budget for unexpected additional costs and price increases during the construction period. This budget was calculated based on the individual equipment lines, with allowances varying according to design complexity, price accuracy, development status and supplier availability or delivery time. The estimate was developed based on the process and equipment design and quotes were obtained from the respective suppliers and service providers. The unexpected additional costs consider deviations that may result from minor adjustments to the process flow diagram that are expected during the detailed planning phase, as well as geotechnical conditions at the Schwarze Pumpe site or local building regulations that require a change in building and construction planning, and price fluctuations during the procurement period. The investment cost calculation includes an additional cost budget of € 12 million.

RAW MATERIALS AND SUPPLIES

The project's operating costs for the supply of ceramic raw materials, all key process materials, electricity and drinking water were determined on the basis of offers from local suppliers or utility companies received during 2023. All raw material suppliers have been secured and are available to supply the required quantities for the first production line with an annual production of 120 MWh. A total of twenty-one different raw materials will be used to produce the CERENERGY® cell. Four key materials account for the largest proportion of demand in terms of volume, amounting to 72.7 %.

ELECTRICITY SUPPLY COSTS

The plant in the Schwarze Pumpe industrial park is to be supplied with 100% electricity from renewable energy sources. This is usually provided to industrial customers via power purchase agreements (PPUs) or through the supply of guarantees of origin (GoOs) as part of a supply contract with one of the energy traders in the market. Due to the nature of the CERENERGY® plant's demand with high availability

requirements for its nominal load, a supply contract is concluded with a local energy supplier based in the industrial park, where no grid charges are incurred, thus providing an attractive supply of green electricity.

LABOUR COSTS

A detailed staffing plan was prepared for the plant, both for the construction and operational phases, covering operators, process engineering staff, administration, maintenance and management. Operating costs were then determined using local German wage rates provided by labor consultants, including all additional costs for items such as health, pension, unemployment and other legally mandated benefits.

MAINTENANCE & SERVICING

Progressive maintenance and servicing of the plant is essential to ensure the quality of battery production in the long term. The annual budget allocated amounts to approximately 1.5% of the investment value for buildings, 3% of the investment value for process plant and equipment, and 6% for mobile vehicles, cranes and forklift trucks. The provision for maintenance, repair and replacement amounts to 3.1 million euros per year.

FINANCING CONCEPT

The CERENERGY® battery project, which is positioning itself as a globally sought-after investment, has chosen the European market, particularly Germany, for its first CERENERGY® battery production plant. This strategic move by CERENERGY® aims to achieve the highest quality standards and longevity of German technology "Made in Germany" and is in line with Europe's focus on renewable energy and the resulting subsidy structure. The chosen project location in Spreetal, Saxony, corresponds to the funding opportunities in GRW Zone C, which is characterized by an economic strength below the European average, a higher unemployment rate, a declining population and proximity to the Polish and Czech borders and thus has access to all available funding measures, whether at European, federal or state level.

The funding landscape includes a wide range of opportunities at European, German federal and state level. The European Investment Bank (EIB), the European Innovation Council (EIC) and federal and state funding play a key role in supporting the battery sector. In particular, the EU Parliament's recent announcement on the Zero Valley concept designates certain regions as special economic zones, accelerating their development and financial support. Altech has submitted various applications and is managing the ongoing procedures for funding approval and hopes for a positive decision within 2024.

The financing concept includes equity, grants and debt-like venture capital loans, thus underlining the importance of financial and non-financial support for the success of the project. The concept includes contributions from institutions such as the European Investment Bank, the Ministry of Economy and Environment, the European Innovation Council and various regional initiatives. The involvement of supporting partner banks with experience in the battery industry provides further security for the successful implementation of the project. In summary, the CERENERGY® battery production plant aims to secure a solid financial structure through a comprehensive mix of funding sources to ensure the realization of this important renewable energy project.

OFFTAKE DISCUSSIONS WITH POTENTIAL CUSTOMERS

Altech has strategically entered into non-disclosure agreements (NDAs) with major utilities in Germany showing a strong interest in acquiring CERENERGY® 1 MWh GridPacks. Altech is currently in advanced discussions to secure the purchase of the entire first production line for five years to two prominent utilities. These far-sighted companies are actively involved in the expansion of renewable energy generation and have a diverse need for grid storage solutions. Altech's focus in the coming period will be on consolidating these promising partnerships and negotiating to secure offtake agreements to strengthen the joint commitment to promoting sustainable energy solutions within the German utility sector.

PROJECT RISKS

Altech conducted an expert workshop on February 8, 2024 with engineers, designers, safety managers, Altech management and experts from key suppliers to identify and review each risk associated with the project. Each risk point was assigned a consequence, a risk and a probability of occurrence. The following sections discuss the key risks associated with the success of the CERENERGY® project.

PRODUCTION AND MARKET RISKS

In managing production and market risks, we have systematically assessed conventional industrial operating risks, identified matrix-based risks and implemented risk mitigation measures. The technical risks in connection with the performance of the CERENERGY®- batteries and the production capacity of the plants are classified as low due to the mature battery chemistry, the extensive operation of the pilot plant at IKTS and the cooperation with renowned German contractors. The sales risk is considered in the sensitivity analysis.

RAMP UP RISKS

Deviation from utilization targets during operation poses a risk to capacity, which can increase unit costs and affect profitability. The result would be delayed positive cash flow. Altech recognizes the challenges of bringing battery production on line and has developed a robust plant design that includes planned preventative maintenance and accounts for potential downtime, such as power outages. Risk minimization is achieved through a conservative utilization concept and Altechs commissioning program as well as an accompanying maintenance program. In addition, a gradual ramp-up over the first two years has been strategically planned to improve operational stability and mitigate potential setbacks.

SUBSTITUTION RISKS

The potential risk of a sudden technological substitution of CERENERGY® battery technology is considered a moderate risk, which is why the market for new energy systems is continuously monitored. Purchasing from a start-up company entails high financing and warranty risks. Therefore, pre-sales of initial production, strategic partnerships and market establishment aim to mitigate these concerns. Altech actively manages price risks in the highly competitive market and ensures long-term cost-effectiveness and competitiveness through continuous optimization.

SUB CONTRACTOR RISKS

The risks in project development are effectively managed by an experienced team and first-class contractors in Germany/Europe, so that they are considered low and manageable. One medium risk worth mentioning is potential problems with subcontractors, such as insolvency or a change in the economic situation. To minimize this risk, Altech's project management has identified alternative suppliers and service providers for each work package. Operational challenges include the high risk of employee availability, which has motivated Altech to proactively engage in personnel programs to attract qualified employees in the region. Medium risks related to the supply of raw materials are closely monitored, with a focus on responsible procurement and logistics management to ensure continuous operations.

RISKS OF FINANCE

The ongoing crisis in Ukraine has led to challenges on the global banking and equity markets, which may have an impact on project financing. The uncertainties regarding delivery risks may lead to a delay in the financing processes. Despite these challenges, discussions are already underway with European banks and Altech has a defined financing plan, marketing strategy and ongoing communication ahead of the next capital raising. Based on the solid results of the detailed feasibility study, the company anticipates a successful project financing and seamless transition to project execution.

LEGAL AND COMPLIANCE RISKS

Altech, supported by experienced patent attorneys and legal advisors, ensures that CERENERGY can operate freely on the market without restrictions from third parties. There is always a residual risk of infringing third-party patent rights, but the company considers this to be low based on a thorough global Freedom to Operate (FTO) search. Compliance with laws, particularly with regard to permits, represents a medium risk, as non-compliance can lead to work interruptions. Altech addresses this issue with strict procedures, direct involvement of top management and close cooperation with the authorities in order to efficiently manage and, if necessary, immediately implement any necessary adjustments and requirements.

OWNERSHIP AND LOSS OF KEY PERSONNEL RISKS

As a start-up, two medium risks, the change of ownership and the loss of key personnel, pose potential challenges for project implementation. In response, detailed operating procedures are currently being defined and documented in an enterprise resource planning (ERP) software system. This strategic approach guarantees seamless business continuity and facilitates the smooth transfer of knowledge and responsibilities to minimize the impact of these identified risks on the company's performance of the project.

SOCIAL IMPACT RISKS

The social impact assessment identified several low risks, which are continuously reviewed. However, the cultural risk for international employees is classified as a medium risk, as their trust, satisfaction and sense of security are crucial for successful employment. Altech plans proactive measures to support employees in the best possible way. Training programs, language courses and continuous reflection aim

to support employee integration and ensure a positive work environment amidst evolving cultural dynamics and potential challenges.

HEALTH AND SAFETY RISKS

Health, safety and the environment have the highest priority in the company and are overseen by top management. Strict standard operating procedures are constantly developed, reviewed and updated. Despite these measures, the inherent risk of accidents is recognized and minimized through emergency drills, regular risk assessments and mandatory employee training. This proactive approach ensures a comprehensive and constantly evolving safety framework and the mitigation of potential health, safety and environmental risks within the organization.

ENVIRONMENT RISKS

As sustainability and the environment are Altech's main concerns, management ensures that all necessary and available monitoring and safety measures are implemented in accordance with the relevant regulations and the approval of the Federal Immission Control Act (BimSchG). Altech's panel of experts has therefore not identified any medium or high risk in terms of sustainability and the environment.

PROTOTYPE MANUFACTURE

The production of two 60 kWh prototypes, which are intended for performance tests and customer provision, began last year. Altech's joint venture partner, Fraunhofer, has already developed, built, tested and is still operating battery modules with capacities of 5 kWh and 10 kWh. However, with the establishment of the joint venture with Altech, a larger, industrial design was selected, the 60kWh BatteryPack. Last year, production of two 60 kWh BatteryPacks was started in order to test them under real conditions and carry out performance tests.

The pilot line at Fraunhofer IKTS in Hermsdorf was expanded for this purpose and also converted to the industrial series design in order to manufacture the prototypes according to the series design. This allows us to test the quality, performance and operation of the battery 100% and ensure future series production. New tools and machines have been developed to facilitate the production of the prototype cells. The BatteryPack consists of 240 CERENERGY® cells with a nominal voltage of 2.5 V each. These cells are arranged in 4 rows of 12 cells each and are stacked on top of each other in 5 modules. The dimensions of the battery packs are 2.5mx1.15mx0.50m (HxLxW).

All the raw materials required for the prototypes have already been sourced from potential series suppliers in order to best reflect the industrial series design. Several process steps are necessary in the preparation of the materials, such as mixing and compacting the ceramic components, shaping and sintering at 1,600 degrees Celsius. The entire ceramic tube production process was successfully completed at the IKTS Hermsdorf technical center, meaning that half of the required solid electrolytes have already been produced. The cathode material, consisting of sodium chloride and nickel powder granulate, was also produced using the mixing and granulation systems of the series suppliers at the Hermsdorf technical center. The cell assembly process, which includes assembly, vacuum filling, heating and welding, is also carried out in Hermsdorf. A new vacuum infiltration chamber was developed to facilitate the infiltration of

cathode material into several battery cells at the same time. The laser welding tests carried out by Precitec GmbH & Co KG on the battery cells were successful.

Figure 34 - Production of the prototype cells in the IKTS Hermsdorf pilot line

To confirm the exact alignment of all components after the welding closure of each prototype cell, a thorough examination is carried out using an industrial micro-computed tomography (µCT) scanner. This ensures verification of the fill level, composition, alignment and behavior of the cathode material after initialization of the cell. Once µCT quality assurance has been successfully completed, the individual cells are subjected to charge and discharge performance tests, with the results to date all meeting expectations. So far, fifty percent of the required cells have been successfully produced, which represents excellent progress. The reject or defect rates are low and within the expected range.

Figure 35 - Completed prototype cells ready for the test stand

Module frames and cell contacting system (CCS)

As soon as the cells are finished, they are integrated into a module frame and welded together with the specially manufactured cell contacting system (ZKS). The system, which was developed by Hofer AG, enables all cells to communicate via busbars in a predefined order. The necessary sensor technology is also integrated in order to record all relevant performance data. Hofer AG has successfully completed the development of the ZKS and delivered the first prototypes for the 60 kWh prototypes. Altech and Fraunhofer carefully defined and validated all electrical specifications and tolerances of the ZKS in advance.

BatteryPack casing

König Metall GmbH has manufactured and supplied two housings for the 60 kWh battery houses. Fraunhofer IKTS in Dresden has already upgraded the test stands for charging and discharging cycles to evaluate battery performance. At the same time, the battery housings are subjected to heating cycles in order to evaluate and adjust the heat loss parameters of the vacuum-insulated housings. Special software has been developed to run through a defined test regime in which all data is recorded and documented in real time. The modules will be installed in the battery housing as soon as cell construction has been completed and the cell contact system and prototype cells have been assembled. This is expected to take place by mid-2024.

Figure 36 - Delivery of the battery housings and preparation for thermal tests

Collaboration with potential customers

Once the BatteryPack prototypes are finalized, Altech intends to provide access to the prototypes to selected potential customers. This collaboration is aimed at demonstrating the practical applications and benefits of the ABS60 series in various industries while securing off-take contracts.

CAUTIONARY AND FORWARD LOOKING STATEMENTS

The DFS contains forward-looking statements that are based on the estimates of independent consultants and engineering firms. The forward-looking statements are not historical facts, but are based on the Company's current

expectations, estimates and projections about the grid storage battery market and beliefs and assumptions about the Company's future performance.

The statements are subject to several known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those anticipated in the forward-looking statements. Factors that could cause such differences include changes in the global supply of grid storage batteries, stock markets, technological advances in battery materials, the cost and supply of materials relevant to the project and changes in relevant regulations. Although Altech believes that the expectations reflected in forward-looking statements are reasonable, Altech does not guarantee future results, levels of activity, performance or achievements.

Although the forward-looking statements contained in the DFS are based on assumptions that management of the Company believes to be reasonable, the Company cannot assure investors that actual results will be consistent with these forward-looking statements. The forward-looking statements relate to the date of publication of the feasibility study and are expressly qualified in their entirety by this cautionary statement. Subject to applicable securities laws, the Company undertakes no obligation to update or revise any forward-looking statements contained in the Feasibility Study to reflect events or circumstances after the date of the DFS.

About Altech Advanced Materials AG

Altech Advanced Materials AG (ISIN: DE000A31C3Y4, DE000A31C3Z1 und DE000A3EX2C1), based in Frankfurt am Main, is a holding company listed on the regulated market of the Frankfurt Stock Exchange. The company's objective is to participate in the market for stationary batteries for grid operation -CERENERGY- as well as in the market for lithium-ion batteries for electromobility through innovative and high-performance anode material -silumina anodes-.

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