Executive Summary

DEFINITIVE FEASIBILITY STUDY FOR SILUMINA ANODES™ BATTERY MATERIALS PROJECT

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I. Highlights

- Silumina Anodes is now focused on the production of 100% aluminum oxide coated metallurgical grade silicon. The annual production capacity is 8000t/y
- Customers mix the 10% coated silicon themselves with their uncoated graphite and can increase the energy density and thus the performance of the battery by at least 30%
- 8000t/y of coated silicon is sufficient in the above-mentioned mixture for the production of 120 gigawatt hours (GWh)
- Capital cost estimated at €112 million with outstanding economics
- Pre-tax Net Present Value (NPV10) of €684 million
- Attractive Internal Rate of Return (IRR) of 34%
- Payback period is 2.4 years
- Battery industry has a high demand for silicon for the battery anode and is expected to grow at a CAGR of 16% until 2035
- Silumina Anodes is a certified green product with a reduced CO2 footprint and uses only renewable energy for production
- Pilot plant engineering for product qualification underway
- NDAs executed with two German automakers, two US automakers, one US battery materials supply company and one European battery maker

II. Summary Project Economics

With a capital investment of €112 million, Altech's DFS projects a net present value of €684 million (NPV_{10}), with net cash of €105 million per annum generated from operations. The internal rate of return is estimated at 34%, with investment capital paid back in 2.4 years. Total annual revenue at the 8,000tpa full rate of production is estimated €328 million per annum.

Figure 1 – Proposed 8,000 tpa Silumina Anode™ Plant at Saxony, Germany

III. All Alumina-Coated Silicon Project

A Preliminary Feasibility Study (PFS) was completed in April 2022 based on production of 10,000 tons per annum (tpa) of Silumina Anodes™ product, comprising 1,000 tpa of high-purity alumina-coated metallurgical silicon incorporated into 9,000 tpa of similarly coated graphite (10% silicon mix). Since then, during the preparation of the Silumina Anodes™ project DFS, Altech has switched the project's production to coating only metallurgical silicon, achieving an eight-fold increase in capacity relative to equivalent battery production from 15 gigawatt hours (GWh) to 120 GWh, all with the same plant and equipment. According to feedback from potential customers, utilising their existing qualified graphite source is a priority. Furthermore, although there is a marginal advantage in using alumina-coated graphite, the primary appeal for potential customers lies in integrating Altech-coated silicon into their battery products. Despite initial considerations regarding the benefits of coating graphite with alumina, such as the reduction of first-cycle loss, Altech's research has demonstrated that the cost-to-reward ratio for graphite is relatively minimal. Consequently, Altech's Silumina Anodes™ plant is now solely focused on producing 8,000 tpa of alumina-coated metallurgical silicon product. This product will be integrated into the graphite by the customers within their battery plants, rather than at Altech's facility.

See the Silumina Anode Plant Design at https://youtu.be/F15UzyoYC8I

Silumina Anode Plant Design

1. Silicon in Anodes is the Future

Tesla, a global leader in the electric vehicle and lithium-ion battery industry, has declared that the required step change to increase lithium-ion battery energy density and reduce costs is to introduce silicon in battery anodes, as silicon has ~ten times the energy retention capacity compared to graphite. Silicon metal has been identified as the most promising anode material for the next generation of lithium-ion batteries. However, until now, silicon was unable to be used in commercial lithium-ion batteries due to two critical drawbacks. Firstly, silicon particles expand by up to 300% in volume during battery charge, causing particle swelling, fracturing and ultimately battery failure. The second challenge is that silicon deactivates a high percentage of the lithium ions in a battery. Lithium ions are rendered inactive by the silicon, immediately reducing battery performance and life. The industry has been in a race to crack the silicon barrier.

One of the main barriers limiting future Li-ion battery improvements in the areas of vehicle range, battery weight, charging speed and cost, is the inherent energy capacity and performance of graphite as the anode material. Graphite anode material has a theoretical capacity of 372 mAh/g, and a volumetric capacity of approximately 700 mAh/cc and takes up more space than any other component in the battery cell. As a result, many believe the next breakthrough in Li-ion battery technology will relate to anode performance, and specifically, replacement of graphite with ultra-high-capacity silicon metal.

Metallurgical Silicon anodes have a theoretical capacity of 3,579 mAh/g, and a volumetric capacity of approximately 2,100 mAh/cc, meaning the mass and volume of anode material required to construct an equivalent kWh battery pack is significantly reduced. This equates to important reductions of the $/kWh costs of the Li-ion battery, reduced battery weight or extended vehicle range capability. Another major benefit is that thinner silicon anodes will enable much faster charging; thinner electrodes enable lithium ions to reach anode particles much faster. This decrease in the ion diffusion time results in significant improvements in charge speed.

Despite the significant performance improvements offered by high-capacity silicon anodes, Li-ion battery manufacturers are yet to adopt their use in large volumes due to a number of critical technical challenges. Silicon anodes undergo volumetric expansion of 300% when reacting with lithium ions during charging, and a corresponding 300% contraction during battery discharge. In contrast, graphite expansion/contraction is in the order of 7%. Such changes in the anode volume result in fracture and pulverisation of the large silicon particles typically used, and damage to the passivating nature of the SEI (solid electrolyte interface (SEI)), increasing lithium-ion loss and resulting in a rapid loss of battery capacity. Most of the development in silicon anodes to date has focussed on nano-sized particles which do not build up sufficient mechanical stress to fracture, and also the blending of relatively small amounts of silicon into existing graphite anode products to achieve relatively modest capacity increases.

2. Altech Alumina Coating Technology

Through in-house research and development, Altech has cracked the “silicon code” and successfully achieved 30% higher energy retention in a lithium-ion battery, with improved cyclability and battery life. At shorter cycle life the energy retention could be as high as 50-70% energy retention in a lithium-ion battery. Higher density batteries result in smaller, lighter batteries and substantially less greenhouse gases, and are destined for the EV market. To achieve its breakthrough, Altech successfully coated silicon particles with high-purity nano layer of alumina, producing the Silumina Anodes™ product. Altech’s alumina coating technology resolves the expansion defragmentation, as well as curbing the significant first-cycle loss associated with silicon. The Company believes that its technology will be a “game changer”, which would pave the way for increased lithium-ion battery energy density, battery lifespan and reduced first cycle lithium loss.

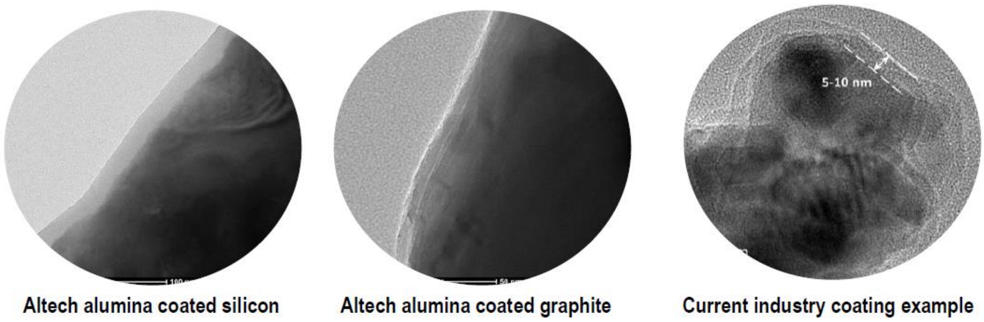

Figure 2 – Alumina layer coating (2 nanometer) of metallurgical silicon and graphite under SEM

To achieve its breakthrough, Altech successfully combined silicon particles that had been treated with its innovative proprietary technology, with regular battery grade graphite to produce a lithium-ion battery electrode containing 10% metallurgical silicon in the anode of the battery. When energised, these materials held greater than 30% more capacity compared to a conventional graphite only anode material. The materials were then subjected to a series of tests over a period of time, including charge and discharge cycling. From laboratory testing, the previously unresolved impediments for using silicon in lithium-ion battery anodes which are: silicon particle swelling; prohibitive first-cycle-capacity-loss of up to 50%; and rapid battery degradation, appeared to have been substantially overcome during Altech's testing of the composite graphite/silicon batteries.

Figure 3 – Research and Development Laboratory in Perth, Western Australia

3. Benefits to Battery Suppliers

Battery manufacturers have the choice to either produce batteries with higher energy density or maintain their current energy density while reducing the graphite content. By decreasing the use of graphite, the cost of producing batteries can be reduced.

However, the recent news about China, which accounts for approximately 90% of the global production of lithium-ion battery graphite, imposing limitations on the worldwide export of graphite, has begun to create challenges for battery manufacturers in Europe and the USA. The reduction in graphite usage will be become a major imperative.

4. Altech Process

There is extensive research and literature in the field that demonstrates the use of alumina coatings in anode applications. Alumina coated graphite has been shown to improve battery cycle and safety performance. The test results show that the alumina coating forms an artificial SEI layer and prevents 8-10% of lithium ions from being inactive at the commencement of battery life. Altech has applied this technology to coat metallurgical silicon with nano-layer alumina coatings. Such films need to be ultrathin to have high Li+ and electron conductivities while excellent conformality is needed to be sufficiently protective. The coatings serve as an artificial solid electrolyte interface (SEI) and can reduce lithium loss during each battery charge and discharge cycle, and also retards the silicon expansion and degradation of battery capacity throughout battery life.

There are several methods with which alumina coating can be applied to a graphite or silicon surface. This includes atomic layer deposition (ALD), solid method and hydrothermal method. In general, it has been suggested that ALD is costly and complex, and not suitable for mass production processes. Other coating methods such as hydrothermal and mechano-chemical processes have been developed but have significant drawbacks such as low yield or poor coating uniformity. However, some liquid coating methods such as the Altech coating technology have demonstrated a simple and low-cost treatment method. The Altech process utilises the use of an aluminium chloride solution to coat sub-micron metallurgical silicon particles and then calcine insitu to form nano layers on the surface of the silicon. The technology was developed by Altech and is protected by a series of world-wide patents.

5. Patent Protection

Altech is committed to protecting its intellectual property. Patent protection for Silumina Anodes™ battery materials technology is in place which covers an Australian provisional patent application originally filed on 13 May 2021. Since then, there has been broaden filings to extend reach and protection including National Patent filings in the United States, Europe, China, Japan and Korea. The International Patent filing has covered up to 156 countries. On 13 May 2022, an international patent application preserving the right to file national applications in up to 156 countries was filed. National patent applications have also been filed in the United States, Europe, China, Japan and Korea. All of these applications claim priority from Australian provisional patent application filed on 13 May 2021.

6. Certified as a Green Project

As announced on 18 November 2021, CICERO were engaged by AIG to conduct an independent evaluation of the company's Silumina Anodes™ plant that would be located at the Schwarze Pumpe Industrial Park, Saxony, Germany. The plant is being designed with a specific focus on minimising environmental impact, and in accordance with prevailing German, European and International environmental standards. CICERO's provided a rating of "Medium Green" to the project. This positive project evaluation, formally termed a *"Green Bond Second Opinion",* confirms that the project would be suitable for future green bond financing.

°CICERO
Medium Green

In determining the overall project framework rating of "Medium Green", CICERO assessed the proposed governance procedures and transparency as "Good" and confirmed that the project aligns with all green bond principles. In assessing the proposed plant design and coating process, CICERO noted "*The plant has near zero Scope 1 and 2 emissions as the plant's processes, including steam generation, are fully electrified, and it will use renewable electricity sourced from renewable energy certificates*".

A CO_2 footprint assessment of the proposed 8,000tpa plant determined that, when compared to the incumbent lithium-ion battery technology that uses a graphite only anode, coated silicon anode material could result in a CO_2 emissions reduction of ~19% where 5% coated silicon is used in a battery anode, and a reduction of up to ~ 52% if 20% coated silicon was used (refer Table 1).

Table 1: Estimated reduction in CO_2 footprint from use of coated silicon in Lithium-ion battery anode

Silicon Content %	Reduction in CO_2 footprint in LIB (equivalent power)
5%	18.7%
10%	34.9%
15%	44.9%
20%	51.8%

7. Plant Location - Saxony Germany

Land has been purchased for the project within the Schwarze Pumpe Industrial Park (ISP), which straddles the border between the federal states of Brandenburg and Saxony, approximately 120 km from Berlin and only 78 km from Dresden. The proposed AIG site is situated in the southern portion of the ISP, on the Saxony side of the border and within the municipality of Spreetal. The total project site area is 14 hectares located within the Schwarze Pumpe Industrial Park.

Figure 4 – Silumina Anode™ Project Location

8. Silicon Supply

For silicon supply, the Company have a MoU with Ferroglobe Innovation S.L. (Ferroglobe), a leading producer of high purity metallurgical silicon in Europe. The executed non-binding MoU details the relationship whereby Ferroglobe would supply silicon anode material to AIG battery material plant in Saxony. Ferroglobe is a leading producer of silicon metal with a proven ability to create new solutions and applications using state-of-the-art technology to drive innovation. It has technologies to produce high purity grade silicon and is specifically developing tailor made silicon powders for the anode of lithium-ion batteries.

By securing high quality silicon from a leading European based materials supplier, transport emissions attributed to feedstock shipments are reduced, supplier production facilities have the potential to utilise the extensive green electricity market in Europe. Importantly, these suppliers will, like AIG, be governed by the same stringent European Union (EU) environmental regulations. Both companies have a strong corporate focus on sustainability and reducing the environmental impact of their operations. Finally, the selection of EU based feedstock suppliers is expected to reduce any potential future supply chain risks, when compared with non-European suppliers.

9. NDA's with Potential Customers

Altech has executed non-disclosure agreements (NDAs) with prominent automotive conglomerates in Europe and the United States, who have shown keen interest in Altech's Silumina Anode™ technology. They have requested commercial samples for their testing and qualification procedures. NDAs executed with two German automakers, two US automakers, one US battery materials supply company and one European battery maker. Considering the limited production capacity of Altech's R&D laboratory in Perth, the larger samples will be procured from the Silumina Anodes™ pilot plant in Saxony. The pilot plant is nearing completion and is expected to be operational in mid-2024.

10. Commencement of Permitting

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

IV. Definitive Feasibility Study

1. Project Engineering

German engineering firm Küttner GmbH & Co. KG (now Hatch) was awarded the contract to conduct the engineering associated with definitive feasibility study of the Silumnina Anode™ project. Küttner is a German-based industrial plant engineering and EPC contractor, with strong experience in design, procurement, project and construction management and plant commissioning across a range of industries. Küttner is now part of the Hatch Group. They have previously completed metallurgical plant, water and off-gas treatment projects in Germany. Küttner bringing valuable local knowledge to the execution of the project.

2. Technology Design

One of the key areas of technology that is required for the coating process is the front-end calciners. The calciners, which have been designed in-house, are of the packed bed type and are intended to operate at temperatures around 600 degrees Celsius. These calciners play a crucial role in the Silumina Anodes™ process, wherein they facilitate the conversion of aluminium chloride present on the surface silicon particles into alumina. This patented and innovative coating technology has been developed by Altech. Notably, a distinct feature of these calciners is the utilisation of 3D-printed silicon carbide linings. These linings are employed to effectively handle the acidic atmosphere during the calcination process. Altech's process places significant emphasis on managing impurities, highlighting its importance in the overall production process.

Figure 5 – Front end section of Silumina Anodes™ plant design

The finalised design consists of two dryers and a four-circuit calciner/cooler configuration. The geometry of the calciners and cooler consist of twin-chamber design. Considering the specialised demands of the battery coating process, the manufacturing techniques required are cutting-edge and incorporate the latest advancements in SiC industry technology.

Figure 6 – In-house designed packed bed calciners

3. Plant Layout

The design of the 8,000tpa Silumina Anodes™ plant incorporates one main production building, and a further three ancillary buildings, to be constructed on the Schwarze Pumpe plant site. These include:

- Administration and Engineering building, which will include staff office areas, process control centre and QA laboratory facilities;
- Maintenance workshop and Stores building, which will include office areas for the maintenance team and mechanical, electrical and instrumentation workshop areas; and
- Guardhouse building, which will include security offices, visitor training areas and first aid facilities.

The site buildings and associated access roads and carparking areas take up approximately one fifth of the available Schwarze Pumpe 16ha site, refer to Figure 7 below.

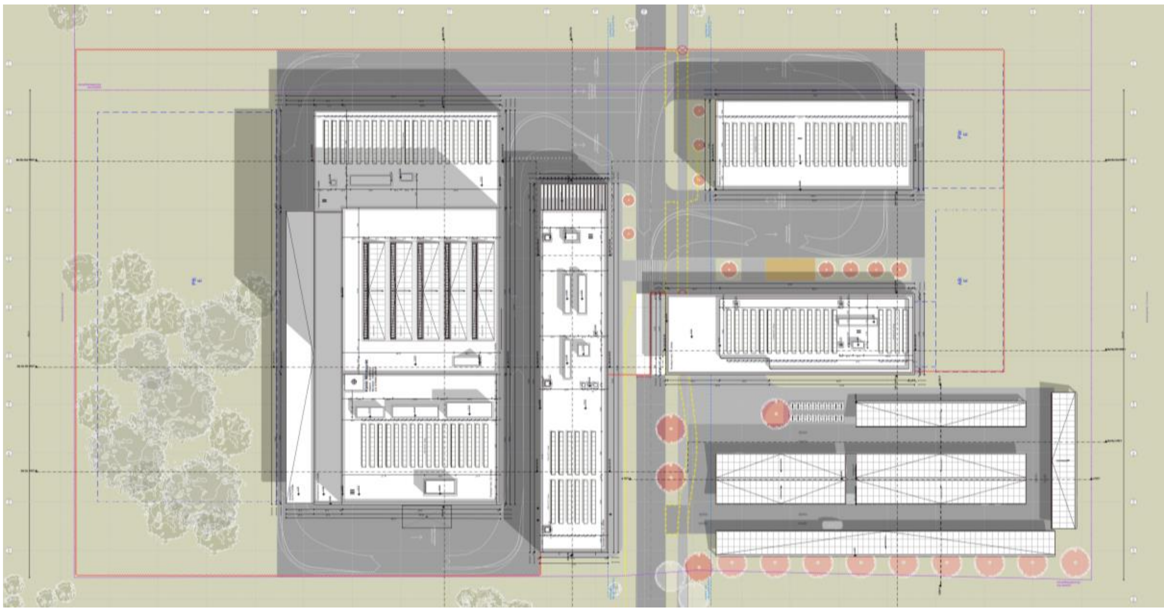

Figure 7 - Site Layout of Silumina Anodes™ Plant

4. Capital Costs Estimation

The capital costs for the Silumina Anodes™ project are estimated at €112.5M (See Table 2). The major capital cost component for the project is the construction of the Silumina Anodes™ facility and the associated site infrastructure, such as the administration building, maintenance workshop and on-site QA laboratory. The engineering design and cost estimate for the battery materials coating facility has been based on the process design and equipment required to process 8,000tpa of anode materials, and utilises equipment design and building layouts specifically developed during the DFS. AIG has assessed its capital estimate for the Silumina Anodes™ plant to be accurate to ± 15% and can be defined as an Authorisation Budget class Estimate (AACE Class 3).

Table 2 - Project Capital Cost Estimate

	Capital Cost EUR	
Plant	88.3	Million
Contingency	13.3	Million
Insurances	3.6	Million
Commissioning	6.8	Million
Corporate	0.5	Million
Total	112.5	million

a. Basis of Estimate

The basis for the Schwarze Pumpe plant capital cost estimate is the mechanical process equipment required for the 8,000 tpa facility. Hatch Kuettner, a German based engineering consultancy, were selected as the EPCM partner for the DFS, responsible for all process equipment design, specification and estimating. Altech provided the process flow sheet and mass balance, which was used to develop plant Process and Instrumentation Diagrams (P&IDs), mechanical equipment list, with pricing enquiries sent to equipment suppliers in Germany and Europe for the majority of items. Vendor quotations were reviewed, and total equipment pricing compiled. Costs associated with preparation of the site and construction of plant buildings were engineered and generated by a local preferred Contractor Arikon GmbH. Arikon have been engaged due to their extensive local design and construction experience and their intimate knowledge of local and state permitting authorities and processes.

b. Estimating Methodology

The capital cost estimate has been prepared as per the Association of Cost Engineers UK Standard Class III and American Association of Cost Engineers Class 3 for engineering studies, with estimates calculated to a degree of accuracy of +/- 15%. The estimate has been developed based on detailed process equipment costs per the mechanical equipment list. Material take-off (MTO) estimates and detailed engineering for the various disciplines of earthworks, civil and structural, were completed based on the plant configuration at Schwarze Pumpe. These material quantity estimates were provided to a number of nominated construction contractors who then provided local unit rates to develop total capital costs for these areas. The remainder of the plant direct costs have been estimated by discipline, as is appropriate for the level and accuracy of the study being completed.

Indirect project costs have been calculated using factors in line with those typical for chemical production facilities of similar size and complexity. The factor used to calculate total freight cost considered the location of the site and the high proportion of process equipment and construction materials which would be sourced locally from German companies or neighbouring European countries. EPCM costs have been estimated based on the DFS scope, final equipment selection and the execution strategy.

c. Mechanical Equipment Costs

The capital cost estimate for mechanical equipment is based on vendor quotations received for all major equipment items after enquiries were sent during 2023. Equipment sizing has been determined from process data for the 8,000tpa design basis. The mechanical equipment installation hours/costs have been estimated based on the equipment lists and industry experience, norms, and Hatch Kuettner's current construction industry knowledge and experience.

d. Earthworks, Concrete and Structural Works

Concrete and structural steel quantities have been calculated using material take-offs developed from the 3D plant layout design and supporting design calculations for concrete, structural steel, platforms, walkways and cladding. Estimates for bulk earthworks, access road and in-plant road quantities have also been based on the DFS 3D plant layout. Local material and labour rates have been prepared by Arikon and have then been used to develop the total costs for these areas. Site building cost estimates have been determined using unit rates developed during the design and engineering phase supplied by Arikon. These costs include the construction of administration offices with complete staff facilities, process operations offices, control rooms, laboratory and the maintenance workshop/warehouse. Costs associated with the fitout of the plant QA laboratory equipment have been based on vendor quotations from German suppliers and are also included in this direct cost item.

e. Electrical & Instrumentation Equipment Costs

The capital cost estimate for electrical equipment is based on vendor quotations received for all major equipment items after enquiries were sent during 2023. Equipment sizing has been determined from process data for the 8,000 tpa design basis. The electrical equipment installation hours/costs have been estimated based on the equipment lists and industry experience, norms, and Hatch Kuettner's current construction industry knowledge and experience.

f. Direct Costs Other Disciplines

Direct costs for the remaining disciplines and ancillary items have been included but have generally been based on a factor applied to the total installed mechanical equipment cost where material take offs have not yet been developed as part of the detailed engineering design. Additional direct costs included are:

- Critical spares - Factored as 4% of installed equipment costs;
- Mobile Equipment – Estimated from equipment price database from previous quotations for forklifts; and
- First Fills – Calculated for major reagents from vendor minimum order quantities and unit costs.

g. Indirect Costs

The following indirect costs have been determined by evaluation of the required scope and estimation of costs. These costs are in line with industry averages for complex hydrometallurgical plants in developed countries:

- Site temporary facilities - 2% of Direct Costs;
- Mobilization and demobilization – 0.5% of Direct Costs;
- Freight – 0.5% of Direct Costs;
- Vendor representation and site commissioning – 2.5% of Direct Costs; and
- Extras incl. Taxes and Insurance – 2.5% of Direct Costs.

h. Contingency

The contingency has been calculated on a line-by-line equipment basis, with allowances included for estimated design growth, pricing accuracy factors and overall equipment/area scope contingency required, based on the level of engineering, equipment quotations received and associated project risk. The estimate has been built up from first principles, based on the process design and equipment list, with significant vendor and contractor quotations and input. The contingency accounts for variations which may result from minor adjustments to the plant flowsheet expected during the detailed phase of engineering, geotechnical conditions of the Schwarze Pumpe site or local building regulations which require modification to the civil and structural design, and price fluctuations during procurement negotiations. The capital cost as presented includes a contingency of 15% of all estimated capex.

i. Feedstock, Reagent and Utility Costs

Project operating costs for the supply of boehmite feedstock, all major process reagents, electricity, and potable water have been based on quotations from local suppliers or utility providers, received during 2023.

j. Electricity Supply Costs

The Schwarze Pumpe facility plans to be operated using 100% green electricity. This is most commonly provided to industrial consumers by way of power purchase agreements (PPUs), or by the supply of Guarantees of Origin (GoOs) as part of a supply agreement with any of the energy retailers in the market. Due to the nature of the Silumina Anodes™ plant demand, with high availability requirements for its nominal load, GoOs are proposed as the most appropriate method to purchase green electricity supply to the plant.

k. Labour Costs

A detailed manning schedule for the plant during both the construction and operations phases has been developed, including operators, process engineering staff, administration, maintenance, and management. Operating costs have subsequently been determined using local German labour rates provided by labour consultants, including all on-costs for items such as health, pension, unemployment, and LTI benefits required under German labour laws.

l. Sustaining Capital

Sustaining capital of approximately 2.5% per annum of the initial plant buildings and equipment cost has been allowed over the life of the project.

5. Financial Modelling

The capital costs for the Silumina Anodes™ project are estimated at €112.5M. The construction period of the plant is over 24 months and the production ramp-up of the plant is over 3 years. The total annual revenue of the facility at the full rate of production of 8,000 tonnes per annum (tpa) is estimated at €328M. Production costs including all chemical processing, corporate overheads and sales costs are estimated at €222.4M per annum. This represents a net margin of the product of approximately 32%.

Annual average earnings before interest, tax and depreciation (EBITDA) for the project at full production is estimated to be €105.6M. Pre-tax net present value (NPV) for the Silumina Anodes™ project is €684.8M, at a discount rate of 10%. The internal rate of return (IRR) is calculated to be 34.6%, with a payback of capital of 2.4 years.

Production		**8,000**	tonnes
Exchange Rate		**0.91**	EUR/USD
Capex Exchange Rate		**0.91**	EUR/USD
Project Capex	**€**	**112.5**	million
Corporate Costs	**€**	**0.5**	million
Opex p.a.	**€**	**221.9**	million
NPV (pre-tax)	**€**	**684.8**	million
Discount Rate		**10.0%**	
Payback		**2.4**	years
IRR (from construction start)		**34.6%**	
IRR		**48.4%**	
Revenue p.a.	**€**	**328.0**	million
Costs p.a.	**€**	**222.4**	million
EBITDA p.a.	**€**	**105.6**	million
Revenue (Project Life)	**€**	**9,463.8**	million
Costs (Project Life)	**€**	**6,380.7**	million
EBITDA (Project Life)	**€**	**3,083.1**	million

V. Pilot Plant

As Altech accelerates its efforts to introduce its patented technology to the market, it is in the final stages of construction of a pilot plant in an existing building in Dock3 at Schwarze Pumpe. The product has generated significant interest in the market with NDAs been executed with two German automakers, two US automakers, one US battery materials supply company and one European battery maker. They have requested commercial samples for their testing and qualification procedures. The pilot plant's primary objective is to support the qualification process for the Silumina Anodes™ product. A YouTube video update of the pilot plant can be seen at https://youtu.be/lRWCDLx6UTI

Figure 8 - Pilot Plant in Dock3 facility, Schwarze Pumpe Industrial Park, Saxony, Germany

The on-site laboratory has been established and is fully commissioned. The lab enables Altech Germany to conduct necessary testing and analyses of the Silumina Anodes™ product from the pilot plant. Additionally, Altech established an on-site glove box, which facilitates the production of lithium-ion battery coin half cells. These half cells will be used to test the performance of the Silumina Anodes™ produced from the pilot plant. This is a crucial component of the product qualification process and will provide important data on the product's performance characteristics.

Figure 9 - Pilot Plant in Dock3 facility, Schwarze Pumpe Industrial Park, Saxony, Germany

The research plant is designed to produce 120kg per day of coated battery anode material, which will be made available to selected European and US battery manufacturers and auto-makers.

VI. Market Development

1. Growth of the Lithium-Ion Battery Market

From 2023 till 2035 the global demand for batteries – measured by its energy capacity in GWh - supplied to electric passenger cars and electric commercial vehicles grows at a pace of 16% CAGR (See Figure 10). Due to the expansion of battery manufacturing capacities in Europe, to balance battery supply and battery demand of the automotive industry in Europe, higher growth rates are expected in Europe. Based on data of BNEF and industry publications, Altech expects that 14% of the global battery production capacities in GWh will be located in Europe after 2033; up from about 8% in 2023.

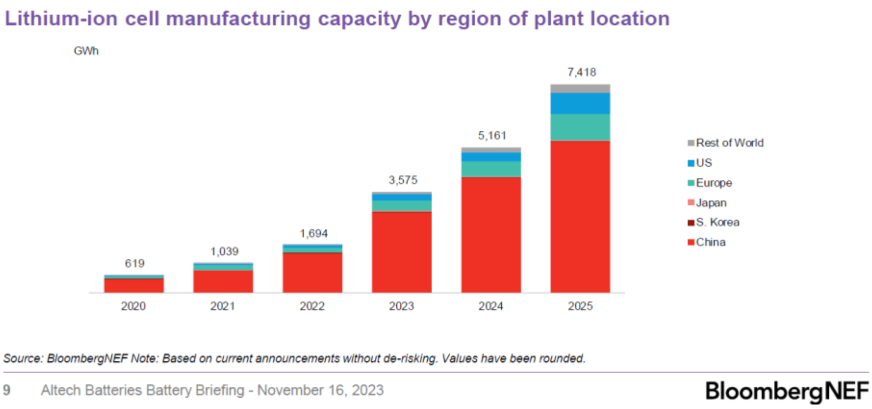

Figure 10 Global Battery Production Capacity

2. Supply Gap of Anode Materials in Europe

In 2023 Europe still suffers from a substantial gap in anode materials production capacities, as most anode materials required by the battery manufacturers were sourced from China. Global graphite anode markets have been dominated by Chinese producers, which have accounted for more than 90% of installed capacities, see Figure 11, depicting the Lithium-Ion Battery Components capacity Ratio by region of origin.

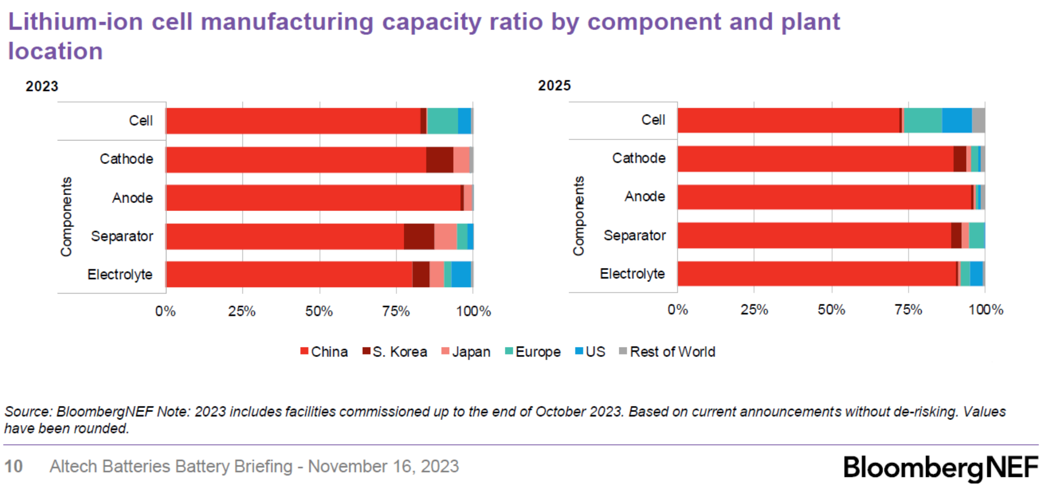

Figure 11 - Lithium-Ion Battery Components Capacity Ratio

The recently announced restrictions on anode graphite exports to the European Union (EU) by China will accelerate the development of the European anode materials industry. SGL Carbon is one of the most significant producers of synthetic graphite and graphite-based battery products in Europe.

3. Anode Silicon market

Calculations based on the BloombergNEF Base Case (ETS) outlook predicts global anode silicon demand – measured by weight including all silicon-based materials - from battery makers will grow at an accelerated pace of **18% CAGR from 2023 to 2035** to a total of 106ktpa. It is expected that the overall battery grade silicon demand stays at circa 100kt pa after 2032, while continuing to shift towards high value engineered silicon anode materials.

According to BNEF Base Case (ETS) the continued growth until 2033 is driven by the incremental substitution of anode graphite by silicon-based materials to improve the energy density of the anode, refer to Figure 3-7 below:

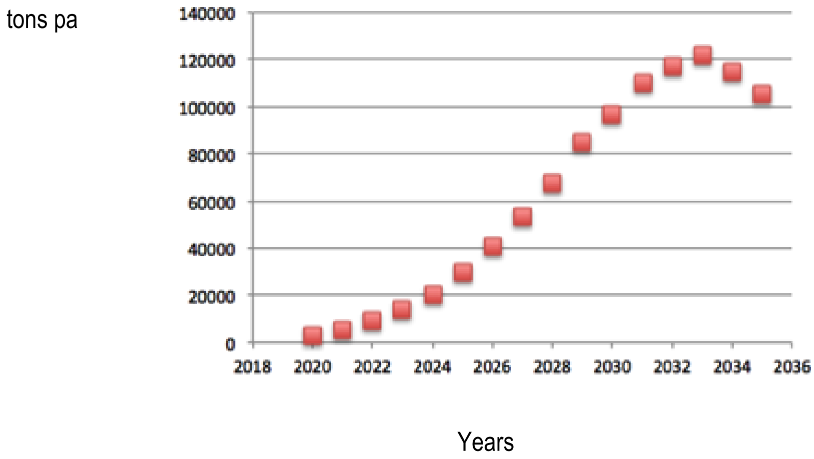

Figure 12 - Global demand for Silicon Based Products for electric vehicles, t (tons) p.a.

The dynamics of the demand for silicon-based materials results from the growth of electric vehicles and from the shift to silicon-rich chemistries. Based on the BNEF Base Case (ETS) demand outlook for battery anode chemistry the relative amount of silicon being used for anodes, forecast to triple from 2020 till 2032, from less than 6g per kWh to a total of circa 21g per kWh, partially substituting for (some of) the graphite used in anodes.