LI-S ENERGY LIMITED (LIS)

INITIATION: A battery technology developer moving to commercialise lithium sulphur batteries

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We say	Share Price	Target Price
SPEC BUY	**$1.21**	**$2.30**

Li-S Energy, with Deakin University, is developing lithium-sulphur (Li-S) battery material products and has made several technological breakthroughs which could lead to a materially superior commercial battery than current generation lithium-ion batteries. With a theoretical maximum energy density more than 5x that of lithium-ion batteries, stable lithium-sulphur batteries represent a potential step change in technology. We initiate coverage with a Spec Buy rating and target price of $2.30.

SHARE PRICE CHART

Source: IRESS

LI-S BATTERY AGREEMENTS

JANUS ELECTRIC

INSITU PACIFIC
A Boeing Company

COMPANY DATA & RATIOS

Enterprise value	$728m
Diluted market cap	$775m
Diluted shares*	643m
Free float	36%
12-month price range	$0.96-3.05
GICS sector	Industrials
Website link	Li-S Energy

EXPECTED RETURN

Capital Growth	91%

LEADING BATTERY TECHNOLOGY

The Li-S battery composition is lighter, safer, faster charging, and more environmentally friendly than current commercial batteries. LIS has addressed the key issues preventing the commercialisation of Li-S batteries in the past. With a high theoretical energy density LIS's battery is an excellent solution to the significant battery demand and has the potential to materially outperform its competitors' battery technology.

EXCEEDED CURRENT BATTERY STANDARDS

The LIS battery has reached a cycle life that exceeds most current consumer standards. LIS uses Boron Nitride Nanotubes (BNNTs) to extend its battery cycle life beyond what has previously been capable. Historically BNNTs were too expensive to source for commercial applications. LIS has global access and distribution agreements to low-cost BNNTs.

POSITIVE CATALYSTS HIGHLY LIKELY

LIS has already engaged in meaningful agreements to test its battery technology with OEM's. The significant potential of the LIS battery will further attract large players in the global battery space which is likely to be very well received by investors. LIS has $46.8m in cash, no debt and is well funded to commercialise its battery technology. We initiate coverage with a Spec Buy rating and target price of $2.30 using a comparative approach.

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INVESTMENT THESIS

Li-S Energy (ASX:LIS) is a $775m market cap battery technology developer focused on the commercialisation of lithium-sulphur and other types of metal based batteries. The company has $46.8m in cash and no debt. The key investment highlights for Li-S Energy include:

- **Next generational battery technology:** The lithium-sulphur battery composition has been widely researched over the last two decades as having many benefits over current lithium-ion batteries including having more than 5 times the theoretical energy capacity, being lighter, safer, faster charging, and using more environmentally friendly materials.
- **First to address key historical lithium-sulphur battery challenges:** Li-S Energy's BNNT and Li-Nanomesh battery solutions address a number of the key historical challenges that have prevented the commercialisation of lithium-sulphur batteries. LIS's solution addresses the polysulphide shuttle effect, lithium dendrite formation, cathode expansion and failure, and excessive heat during charging, all of which have caused lithium sulphur batteries to fail in the past.
- **Exclusive BNNT agreement:** One of the key breakthrough's in LIS's battery technology is the use of Boron Nitride Nanotubes (BNNTs). Historically, this incredible advanced material was prohibitively expensive to make and use in commercial applications at scale. LIS has exclusive access to low-cost, high-purity BNNTs for use in lithium-sulphur batteries from its largest shareholder PPK Ltd.
- **Strong mobile battery demand expected:** There is a strong consensus view that battery demand is expected to accelerate materially over the next decade, largely driven by the growing demand for electric vehicles, drones, general aviation, and consumer electronics. The electric vehicle battery market is expected to expand from USD$35bn to USD$165bn by 2030[1]. Li-S Energy's battery is lightweight, fast charging and has high energy capacity making it an excellent solution to address the demand for mobile batteries.
- **The best battery in the world:** There are a number of battery developers that are competing to be the next generation battery of choice. Li-S Energy's battery composition has a higher theoretical gravimetric energy density (the measure of how much energy a battery contains in proportion to its weight) than its competitors.
- **Strong business model:** Li-S Energy plans to licence its battery technology and intellectual property to battery manufacturers. We believe that this is the optimal business model for the battery development industry as it is much less capital intensive and allows for a faster entry to market than the alternative of building a giga-factory itself. Li-S Energy's business model provides the company with an advantage over some of its competitors without even considering its battery technology.
- **Multiple paths to commercialisation:** Li-S Energy has a multi-pronged business strategy to fast-track the company's commercialisation through its battery and Li-Nanomesh intellectual property. Li-Nanomesh has the potential to prevent dendrite growth in any battery with a metal anode, providing LIS with a diversified revenue stream and the potential to generate revenue before its Li-S battery has been fully commercialised.
- **Near term positive catalysts:** Given Li-S Energy's early stage of development, we believe the risk of a negative surprise is low. A number of positive catalysts can occur as the business executes its business model and moves closer towards commercialisation.
- **Fully funded for the next two years:** LIS is well funded to execute its business strategy.

[1]Source: SES November 2021 presentation, based on equity research.

COMPANY OVERVIEW

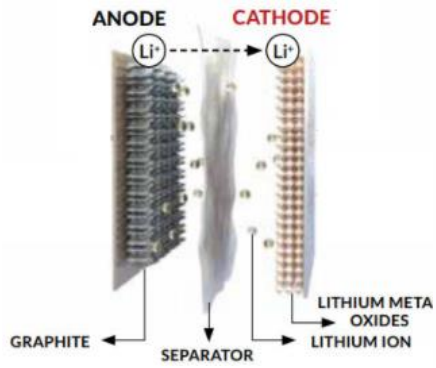
Li-S Energy (LIS) is a battery technology developer focused on the commercialisation of lithium-sulphur batteries. Li-S Energy is the result of a joint venture between PPK Group Limited (ASX:PPK), BNNT Technology Limited and Deakin University.

Lithium-sulphur batteries have many benefits over current lithium-ion batteries, including having more than five times the theoretical energy capacity, being lighter, safer, faster charging, and using more environmentally friendly raw materials. Conventional lithium-sulphur batteries tend to fail after a low number of recharge cycles which makes them inadequate for most commercial applications.

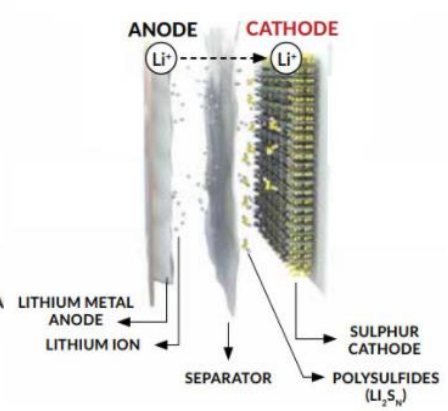
Li-S Energy has addressed this issue and designed a lithium-sulphur battery using Boron Nitride Nanotubes (BNNT) to increase energy density well beyond that of lithium-ion batteries, while also extending the number of times a battery can be charged and discharged.

A battery consists of three active components, an anode, a cathode, and an electrolyte that sits between them. Li-S Energy has placed BNNT between the separator and the sulphur cathode, and Li-Nanomesh between the separator and the lithium anode to address the key historical challenges of conventional lithium-sulphur batteries.

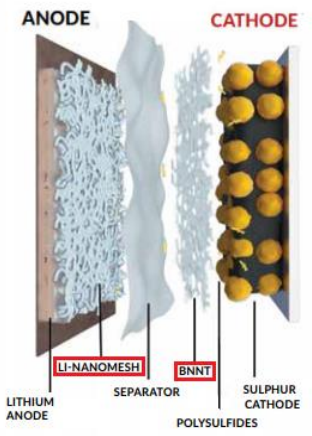
CURRENT LITHIUM-ION BATTERY



CONVENTIONAL LITHIUM-SULPHUR BATTERY



LIS LITHIUM-SULPHUR BATTERY SOLUTION



Source: How a Battery Works, Li-S Energy

CHALLENGES PREVENTING ADOPTION OF LITHIUM SULPHUR BATTERIES

We believe that Li-S Energy's technology and application of BNNT and Li-Nanomesh is a huge breakthrough in the battery industry as it enables one of the most lightweight, efficient and energy dense battery compositions to be suitable for near term commercial use. The adoption of these batteries will enable significant leaps in the performance and capabilities of technologies that rely on battery energy, including electric vehicles (EV), drones and general aviation, consumer electronics, and the internet of things.

PROBLEM - CONVENTIONAL LITHIUM-SULPHUR BATTERY	KEY ISSUE	SOLUTION – LI-S ENERGY LITHIUM SULPHUR BATTERY WITH BNNT
During operation, lithium ions combine with sulphur to create lithium polysulfide compounds in the cathode. Some of these polysulfides are soluble in the battery electrolyte and can deposit on the anode. This results in permanent loss of active sulphur from the cathode, causing battery capacity to deteriorate over relatively few charge cycles.	Polysulfide "Shuttle Effect" 	The BNNTs within the battery construction allow lithium ions to flow through, while reducing the movement of lithium polysulfides. This assists active sulphur retention in the cathode, helping to maintain battery capacity during charge and discharge cycles.
During battery cycling (charging/discharging), lithium ions return to the lithium metal anode. On arrival they can deposit irregularly, causing lithium "Spikes" or "Dendrites" to grow on the anode surface. These can damage the insulating separator, causing short circuits and failure.	Lithium Dendrite Formation 	Li-S Energy has developed its unique Li-Nanomesh for the anode which creates a more uniform lithium-ion influx across the anode surface, impeding dendrite formation in preliminary experiments. In this way Li-Nanomesh assists to maintain specific capacity and reduce risk of battery failure over a much longer cycle life.
During battery operation, lithium ions move between the lithium anode to the sulphur cathode. The presence of lithium within the sulphur cathode structure causes it to expand dramatically. This can damage the battery's structural integrity causing loss of capacity and failure.	Cathode Expansion and Failure 	BNNT assists by providing additional structural support to the cathode. This helps mitigate the effects of cathode expansion and contraction, reducing risk of failure due to mechanical stress.
Lithium-ion and conventional lithium-sulphur batteries can develop concentrated heat spots during charge and discharge cycles. This causes increased mechanical and chemical stress, limiting the speed of safe charging, and increasing the risk of failure due to excessive localised heating.	Heat During Charging 	BNNT conducts heat far more efficiently than copper, which has typically been used in batteries. BNNT may assist to spread generated heat more evenly, potentially reducing concentrated hot spots and the associated mechanical and chemical stress. This in turn may help to further increase the speed of safe charging and may reduce the risk of failure.

Source: Li-S Energy

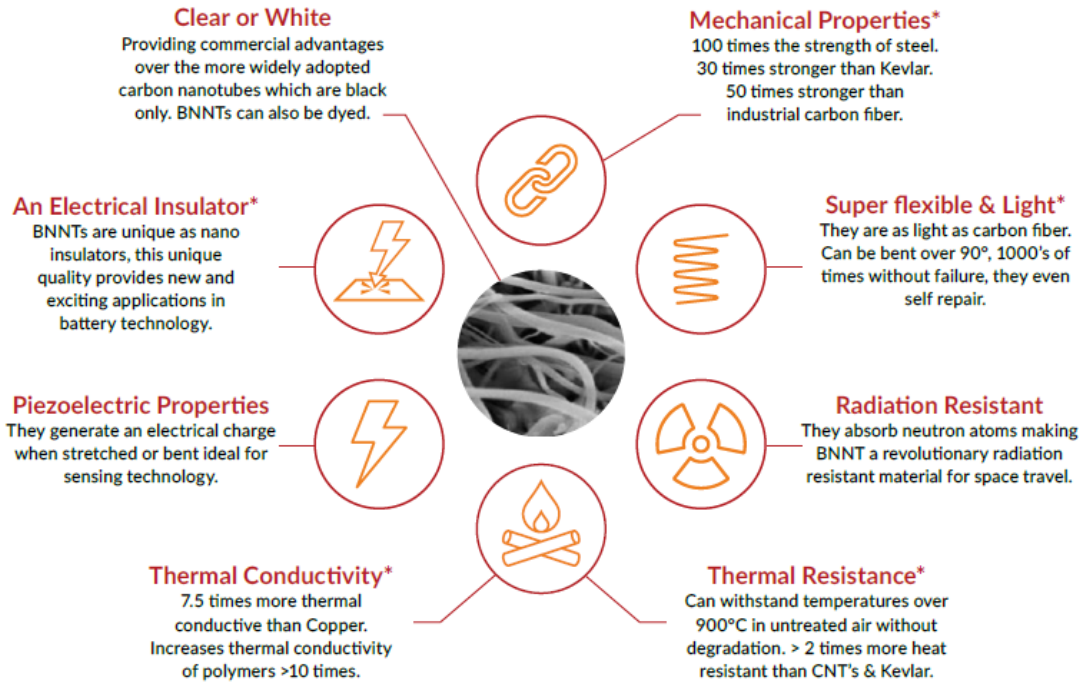
BORON NITRIDE NANOTUBES

A Boron Nitride Nanotube (BNNT) is an advanced nano material comprised of boron and nitrogen which has several unique properties, including high-strength, light weight, flexibility, thermal conductivity and thermal resistance, and the ability to act as a nano-insulator.

While BNNTs have been known about for many years historically it was very difficult to manufacture high purity BNNT at scale and consequently it was very expensive – as much as US$900,000/kg or US$900/g. As a direct result the use of BNNTs in commercial applications has been very limited.

However, an Australian company called BNNT Technology Limited (BNNTTL) has made a number of exciting breakthroughs and has demonstrated potential capacity to manufacture 50kg of BNNTs per year at >95% purity. Based on available global production figures, BNNTTL currently has the capacity to be the largest and lowest cost BNNT producer in the world. BNNTTL holds a 4.7% stake in Li-S Energy. PPK Group, LIS's largest shareholder, holds a 51% stake in BNNTTL.

THE UNIQUE PROPERTIES OF BNNT



Source: Li-S Energy. *Attributable to Li-S Energy Batteries

LIS has secured a supply agreement with BNNTTL to provide commercial quantities of BNNTs, as well as an exclusive distribution agreement to distribute BNNTs to the global battery industry for use in lithium sulphur batteries, and a distribution agreement to distribute BNNTs for use in non-lithium sulphur batteries. These agreements are important as they allow Li-S Energy to be the sole provider and licensee of their battery intellectual property, provides the company with a monopoly on anything lithium-sulphur BNNT battery related, and means that its intellectual property cannot be easily replicated by competitors.

Li-Nanomesh

Li-Nanomesh is being developed by Li-S Energy. Nanomaterials are chemical substances or materials that are manufactured and used at a very small scale. Nanomaterials are developed to exhibit novel characteristics compared to the same material without nanoscale features, such as increased strength, chemical reactivity, or conductivity.

Li-Nanomesh is a porous nano-matrix composite that utilises BNNT and its unique properties to protect lithium metal anodes from degradation and dendrite formation.

An important aspect of Li-Nanomesh is that it does not only have to be applied to the Li-S Energy battery. It has the potential to prevent dendrite growth in any lithium-metal battery. Li-S Energy can licence this technology to other battery developers, which can provide LIS with a diversified revenue stream and the potential to generate revenue before its Li-S battery has been fully commercialised.

ADVANTAGES OF LITHIUM SULPHUR BATTERIES OVER LITHIUM ION BATTERIES

LITHIUM-ION	LITHIUM-SULPHUR KEY ADVANTAGE	LITHIUM-SULPHUR
Conventional lithium-ion batteries are reaching their theoretical maximum gravimetric energy density (how much energy a system contains compared to its mass) of just 387Wh/Kg. A major Electric Vehicle (EV) battery supplier in the market has reported that their best batteries currently deliver 260Wh/Kg, with a forecasted improvement of just 20% over the next 5 years.	**Greater Energy Capacity** 	Lithium-sulphur batteries have a theoretical gravimetric energy density of 2,567Wh/Kg - in the order of 5x that of lithium-ion batteries. A battery with a higher gravimetric energy density will last longer before needing to be recharged, which should enable EVs to travel farther and drones to fly for longer between recharges, among benefits in other industries.
Lithium-ion batteries rely on heavy metals such as cobalt, manganese and nickel in the cathode. As a result, lithium-ion batteries can be up to 3 times heavier than equivalent energy lithium-sulphur batteries.	**Lighter Weight** 	The lithium, sulphur and carbon used in lithium-sulphur batteries are much lighter than the heavy metal oxides used in lithium-ion batteries. This facilitates a lighter battery for the same amount of energy stored. Lighter batteries are a significant advantage for applications such as wearable devices, EVs, medical devices, drones and general aviation.
The heavy metal oxides used in lithium-ion batteries are expensive, representing up to 34% of the total battery cost, and have volatile market pricing. For example, 70% of the global supply of cobalt is sourced from the geopolitically unstable Democratic Republic of the Congo. This creates an ongoing supply risk and potential cost risk.	**Cost per Wh** 	Sulphur is an abundant element in the Earth's crust and is often created as a discarded by-product of other industrial processes. It costs less than 1% the cost of lithium cobalt oxide (the material predominantly used in the cathodes of lithium-ion batteries). The low mass of lithium metal needed for a lithium-sulphur battery anode also keeps production costs down. These lower component costs assist to mitigate the cost of BNNTs used to provide the improved cycling stability of Li-S Energy battery cells.
Charge rate is governed by charge rate capacity. Lithium-ion batteries have a lower charge rate capacity, which means fast charging causes rapid heating and cell degradation. This limits the safe charging rate, creating an issue for all applications that require rapid charging, such as for drones and EVs.	**Faster Charging** 	Lithium-sulphur batteries have a higher charge rate capacity and can be recharged faster due to their chemical design. Li-S batteries do not have excessive heat issues when charging as Lithium-ion batteries do. The higher energy density also delivers more energy per charge/discharge cycle, leading to fewer charges being required.

Lithium-ion batteries have been cited in a number of catastrophic failures, including in mobile phones that have caught fire on a plane, exploded in a phone user's pocket, and in EVs that have caught fire causing death. Commercial lithium-ion batteries can be prone to "thermal runaway" resulting in these catastrophic failures and fires.	**Enhanced Safety** 	According to the Faraday Institute: "Lithium-sulphur cells offer significant safety benefits over other battery types due to their operating mechanism. The 'conversion reaction', which forms new materials during charge and discharge, eliminates the need to host Li-ions in materials, and reduces the risk of catastrophic failure of batteries. Alongside this, the highly reactive Li anode is passivated with sulphide materials during operation, which further reduces the risk of a dangerous failure. While thermal runaway remains a possibility in Li-S cells, research has shown that the magnitude of this failure is significantly lower than Li-ion cells."
The mining of heavy metals used for lithium-ion batteries causes significant environmental and ecological damage. Cobalt is mostly mined in the Democratic Republic of the Congo in central Africa. Discarded lithium-ion batteries can leach heavy metals into landfills and water sources.	**Socially Responsible, Cleaner and Greener** 	Lithium-sulphur batteries do not use heavy metals. Most lithium metal is produced from ore and brine reservoirs. Sulphur is naturally occurring and is available worldwide at low cost and with less environmental impact. While there can be environmental consequences of any form of metal ore mining process, discarded lithium-sulphur batteries do not leach heavy metals into the environment.

Source: Li-S Energy

PATENTS

Li-S Energy has several published patents and filed patents to protect its intellectual property. This includes a published international patent for flexible lithium sulphur batteries and two filed Australian patents for sulphur cathodes and metal anodes. These patents cover the seven key aspects of Li-S Energy's intellectual property:

- Composite chemistry of the cathode.
- A process of molecular bonding of cathode materials.
- A structural framework and construction of the cathode with BNNT.
- An integrated coating and process on the anode – Li-Nanomesh formulation.
- Re-proportioning the ratio of mass between anode and cathode.
- The chemistry and stability of the separator and electrolytes.
- Other know-how in relation to the application of BNNTs and Li-Nanomesh in the modified fabrication of battery components.

BUSINESS MODEL

Li-S Energy developed a strong business model and aims to derive revenue from:

- Licensing Li-S Energy intellectual property to battery manufacturers so that they can produce Li-S Energy batteries for product original equipment manufacturers (OEM).
- Supplying BNNT and Li-Nanomesh materials, and know-how in relation to the application of BNNTs and Li-Nanomesh in the construction of a battery, to battery manufacturers to enable them to produce Li-S Energy batteries.
- Supply Li-Nanomesh, and know-how for other forms of batteries that can make use of this material, to reduce dendrite growth.
- Engaging product OEMs in collaborative projects to retrofit and test Li-S Energy batteries in their products.

There are two main business models that a battery developer can take to commercialise a battery. The first is to establish a giga-factory to produce batteries in-house and on-sell those batteries to product manufacturers. The second is to licence the company's intellectual property to battery manufacturers as Li-S Energy plans to do.

We believe that the optimal business model is the licencing approach as it is much less capital intensive and allows for a faster entry to market than building a giga-factory. Additionally, many of the larger battery consumers have invested in their own battery manufacturing facilities, especially in the electric vehicle space, and will be more reluctant to make those investments redundant by purchasing from a giga-factory producer. Li-S Energy's business model provides the company with an advantage over some of its competitors without even considering its battery technology.

Collaboration to Power Electric Trucks with Janus Electric

Li-S Energy has made solid early progress on the execution of its business strategy. The company announced a collaboration with Janus Electric to power electric trucks. Janus Electric is an Australian company that has developed a system to convert diesel powered prime mover trucks to electric power. Subject to further commercial agreement and volume supply capability, Janus Electric intends to purchase battery cells from Li-S Energy, to progressively meet its anticipated future requirements of 495,000 battery cells by the end of 2023. This translates to Li-S supplying batteries for approximately 400 trucks.

For an understanding of what this opportunity looks like:

Janus Electric's lithium-ion batteries currently cost $120,000 apiece. If Li-S Energy sells its batteries for $100,000, the collaboration could generate $40m in revenues in 2023. The Australian Bureau of Statistics shows that there are ~110,000 trucks in the Australian market alone with a market size of ~$10bn. Janus Electric estimates that by 2030 50% of the Australian road truck fleet will be electric, making the theoretical opportunity for LIS ~50,000 trucks. At $100,000 a battery, if LIS serves only 10% of these trucks it will result in $500m of revenue, conservatively assuming that each truck is supplied just one battery.

The drive to convert trucks from diesel engines to battery power is strong. Janus Electric claims that converting to electric trucks can reduce capital costs by up to 70%, and maintenance and operating costs by 30% over the vehicle lifetime. Electric trucks are cheaper to run with the cost per KM for a diesel engine being $1.20 and only $0.73 for an electric engine. An electric engine enables trucks to travel further in a shorter time and is a zero-carbon solution.

Janus Electric has an aggressive growth strategy we believe 400 trucks to be supplied by Li-S Energy is just the beginning. There is strong immediate industry demand from industries like road haulage, retailers and mine site operations. The key drivers for this demand are Janus Electric's customers going Carbon Neutral and going green as many have already committed to do.

Memorandum of Agreement with Boeing's Insitu Pacific

Li-S Energy has signed a Memorandum of Agreement (MoA) with Boeing's Insitu Pacific to integrate and test Li-S Energy's innovative battery technology in Insitu's range of Uncrewed Aircraft Systems (UAS).

Insitu Pacific serves defence customers across the Asia Pacific region and commercial customers globally. Under the terms of the MoA, the parties will work together to define and execute a program to manufacture and test batteries to the same size, weight, and power constraints as Insitu Pacific's UAS, as well as utilizing the same payload space and connectors. A joint flight-testing campaign will then be run at Insitu Pacific's test range in Queensland to prove the performance gained from using Li-S Energy's battery.

Should the advantages of the Li-S Energy battery be confirmed, Insitu Pacific's UAS would be well positioned as a key contender for a number of global Small Tactical UAS opportunities that Insitu is pursuing. These opportunities are with a range of Defence forces globally.

According to Markets and Markets[1] the Drone Battery market is expected to grow from USD$4.0 billion in 2021 to USD$9.6 billion by 2026, a CAGR of 19%. Demand for Insitu Pacific's drones is high. The Australian Federal Government Department of Defence has released a tender for project LAND 129 Phase 4B (L129-4B). L129-4B will replace existing WASP AE drone systems. WASP AE drones are Small Tactical UAS's powered by lithium-ion batteries. An Li-S Energy battery has a high value proposition, allowing these drones to be lighter, fly for longer, increase flight range and improve payload (the equipment/technology a drone carries).

L129-4B's indicative demand is for 60-80 drones to be produced. Insitu Pacific has produced over 3,000 drones for global defence and commercial customers. Insitu Pacific's lowest specification drones sell from $1.0m to $1.5m each with high margins. Customers pay large prices for Insitu Pacific's drones and each drone requires multiple batteries. With the value proposition that the Li-S Energy battery potentially offers, LIS has significant pricing power to take a decent share of those high margins.

Insitu Pacific has been selected as a finalist in the tender for another drone project LAND 129 Phase C and has strong potential to win L129-4B with the help of Li-S Energy.

[1]Market and Markets Drone Battery Market by Technology, Component, Drone Type, Platform, Function, Point of Sale, Region - Global Forecast to 2026

LI-S BATTERY DEVELOPMENT

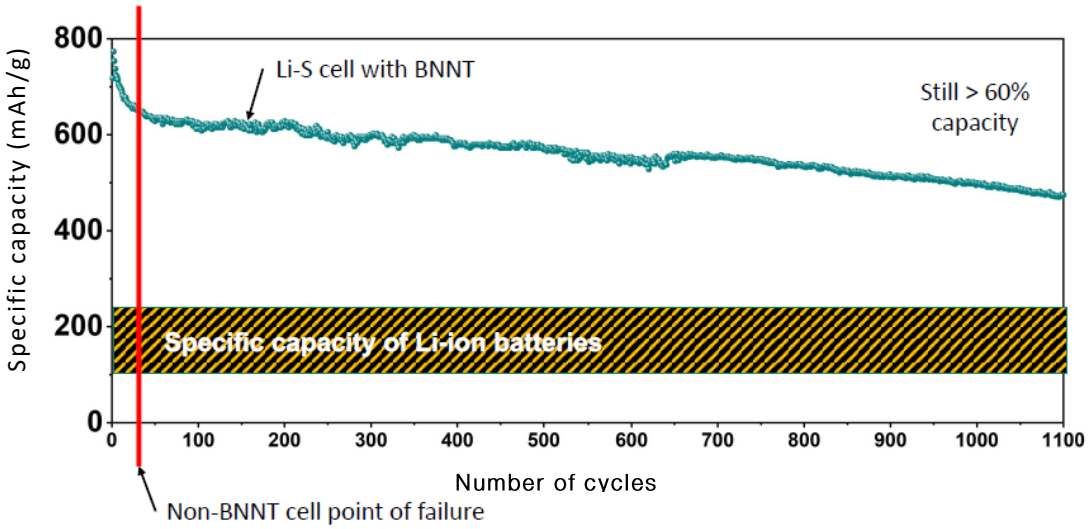
CURRENT DEVELOPMENT STATUS

Li-S Single Layer BNNT Protected Lithium Pouch Cell

Li-S Energy's research and development has shown that integrating BNNTs into lithium-sulphur battery components and architecture is an effective method of stabilising the battery components during charge and discharge, creating a lithium-sulphur battery cell with a cycle life up to or better than that of everyday consumer grade lithium-ion batteries.

Li-S Energy's current test results have proven that the Li-S Energy battery cell with BNNTs performs substantially better in terms of cycling stability and energy density compared to an identical cell without BNNTs. This offers the potential for a lithium-sulphur battery to finally be commercialised and mass produced.

TEST RESULTS: LI-S SINGLE LAYER BNNT PROTECTED LITHIUM POUCH CELL



Source: Li-S Energy

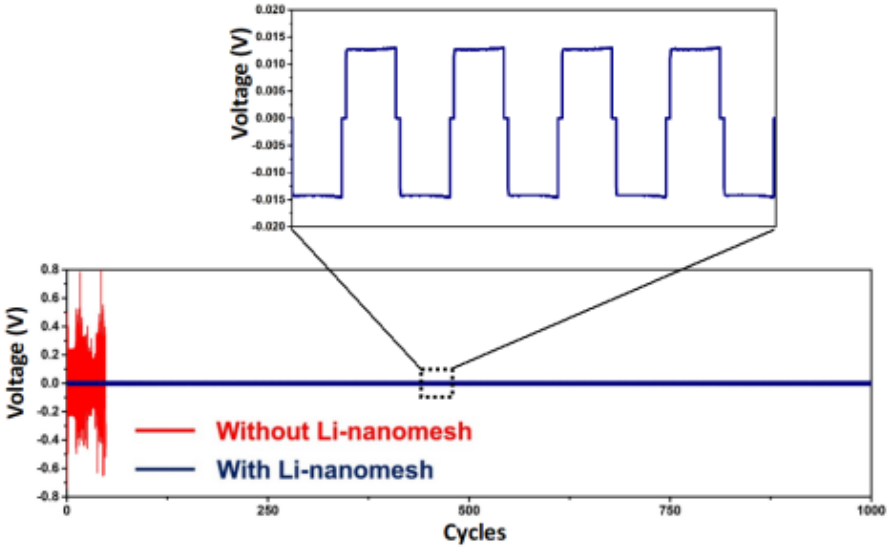
Current lithium-ion battery manufacturers specify the life of lithium-ion batteries in most consumer products as being between 300 and 500 discharge/charge cycles. With the Li-S Energy battery reaching 1,100 cycles the technology is already up to or better than most existing commercial standards. Existing Lithium Sulphur batteries have been shown to achieve greater than 450 Wh/kg enabling a 1,000km electric vehicle. Now with Li-S Energy achieving 1,100 cycles, a 1,000,000km electric vehicle battery is possible.

Li-Nanomesh

Li-S Energy has made significant progress with the development of its Li-Nanomesh material. Initial research has indicated that Li-Nanomesh can protect lithium metal anodes from degradation and dendrite formation to maintain specific capacity and reduce risk of battery failure over a much longer cycle life.

Initial testing on Li-S Energy's Li-Nanomesh has shown it can prevent dendrite growth on all lithium anodes for 1,000 charge/discharge cycles in symmetric lithium half cells. Identical tests on identical cells without Li-Nanomesh showed dendrite growth and failure in as few as 24 charge/discharge cycles.

LI-NANOMESH TESTING: HIGHER VOLTAGE DENOTES DENDRITE FORMATION



Source: Li-S Energy

DEVELOPMENT PROGRAM

Li-S Energy has a strong and fully funded development program to enhance the capabilities of its battery and Li-Nanomesh. The company plans to enhance its core technology and further develop its Li-S battery intellectual property.

Core Technology

Li-S Energy's progress towards developing its core technology will allow the company to commercialise its battery at a faster rate. The company will make efforts to optimise its battery performance and prove its benefits to its target market. We believe that as Li-S Energy continues to develop and show what its battery is capable of, then the company will receive significant growing interest and demand.

1. Li-S Energy Battery Optimisation

This is an ongoing core project to optimise the Li-S Energy battery to deliver the best performance in various use scenarios. The company intends to produce and optimise multi-layer pouches with up to 100 electrode layers. This will allow the company to maximise the energy capacity and energy density of Li-S Energy batteries.

2. Li-Nanomesh Anode Protection

The company intends to optimise Li-Nanomesh in different cell configurations and test a variety of charge cycling scenarios including fast charge/discharge. The company also intends to test Li-Nanomesh with other metal anode materials and other battery chemistries. If similar benefits are found, it is likely to expand substantially the total addressable market for this material.

3. Pilot Cell Plant and Production

Within 12 months, the company intends to build and commission a pilot battery cell production facility. The company is well funded to do this and expects that the pilot production facility to cost $6m.

4. Retrofit Batteries to Products

The clearest way to prove the benefits of Li-S Energy batteries is to show their increased performance against lithium-ion batteries in popular products. The company intends to collaborate with current product manufacturers to retrofit Li-S Energy batteries into commercial products and test the performance against identical products with conventional lithium-ion batteries. This has already commenced with LIS's first commercial agreement announced with Janus Electric and Memorandum of Agreement with Boeing's Insitu Pacific.

Projects to further enhance Li-S Energy Battery Intellectual Property

Further enhancement of Li-S Energy's battery technology will allow Li-S Energy batteries to be safer, expand the products that the battery can be used in, and improve the production of Li-S Energy batteries.

1. Flexible Form Battery

The company intends to adapt the Li-S Energy pouch cell battery to create a flexible form battery. This has the potential to expand commercial applications to include flexible screen devices, foldable mobile phones, wearable technologies, and small format devices where the battery must change form to fit the physical device shape.

2. Solid State Battery

Current lithium-ion and lithium-sulphur batteries use a liquid electrolyte which can be flammable. The company intends to capitalise on existing Deakin expertise into solid state electrolytes, with the aim to build a solid-state Li-S Energy battery, which further increases safety and further increases energy density.

3. 3D Printed Battery

The company intends to investigate the possibility of developing a process to 3D print complete multi-layer lithium-sulphur batteries. If successful, this research has potential to enable Li-S Energy batteries to be printed directly into other devices, for example into solar panels, printed circuits and other components in a wide variety of shapes and form factors; and enable product manufacturers to integrate power storage and power delivery directly into the components that use it.

TARGET TIMEFRAMES

YEAR 1 - 2022	YEAR 2 - 2023	YEAR 3 - 2024 AND BEYOND
• Optimise the single and multi-cell Li-S Energy batteries to further improve capacity and cycle life. • Retrofit batteries into products to demonstrate the benefits of Li-S batteries. • Commence the construction of a pilot Li-S Energy battery production plant. • Continue to engage in partner development with a view to enter into collaboration agreements with product OEMs to test Li-S Energy batteries in their products. • Commence additional projects and build on existing research focusing on Li-Nanomesh, 3D printed batteries, flexible form batteries and solid-state batteries.	• Complete battery pilot production plant. • Engage additional product OEMs with the aim to increase the number of collaboration agreements and expand the range of product categories covered. • Seek discussions with one or more battery manufacturers in relation to manufacturing Li-S Energy batteries. • Continue to progress on additional projects and research and development program.	• Focus on engaging with product OEMs and battery manufacturers with the aim to enter into agreements to licence Li-S Energy intellectual property, and to secure ongoing supply contracts for BNNT and Li-Nanomesh for the production of Li-S Energy batteries. • Supply intellectual property and consulting advice on the modification of lithium-ion battery production lines to suit the production of Li-S Energy batteries. • Continue to conduct research and development and leverage any successful research and development outcomes in solid-state, flexible form and 3D printed batteries by engaging product OEMs.

BOEQ COMMENTS		
LIS is well resourced to achieve its year 1 targets. We believe that the key milestones for LIS at this stage are to retrofit batteries into products and engage with OEMs to test Li-S batteries. This will prove the breakthrough that LIS has achieved and the many benefits of its batteries. Along with the construction of a pilot production plant, these activities are key to progress LIS closer to commercialisation. LIS is making fast progress having produced its first batches of multi-layer pouch cells and commencing cycle life testing. LIS is currently fitting out new laboratories, test facilities and small-scale pilot production facilities which should be operational by the end of March 2022. Battery optimisation and further R&D remain important as new battery technologies continue to emerge. LIS has the resources to run these activities in conjunction with other key activities. Progress with Li-Nanomesh has the potential to provide diversified revenues earlier than expected.	The completion of a pilot production plant in year 2 is important for two reasons; it allows LIS to produce in sufficient quantities to test larger drones, EVs and other devices; and it allows LIS to demonstrate how the production of Li-S batteries can fit into the production processes of existing battery manufacturers. This will significantly fast track the commercialisation of Li-S batteries. Solid collaboration agreements with OEMs and/or battery manufacturers at this stage have the potential to significantly firm up Li-S Energy's valuation and reduce some of the risks that the company faces. With the Janus Electric contract Li-S Energy aims to be commercially ready to supply batteries by year 2.	LIS plans to be able to mass licence its IP and supply BNNT and Li-Nanomesh by year 3. We believe that this target is achievable subject to the company completing its earlier milestones. This timeframe is not dissimilar to the commercialisation timeframes of other next-gen battery producers, with most targeting to be commercial in 2025-2026 and some at an earlier stage. Developments in the research of 3D printed batteries, flexible form batteries, and solid-state batteries would provide some additional upside for LIS. 3D printed batteries would enable manufacturers to print batteries in a wide variety of shapes and form factors, saving time, resources, and money. Flexible form batteries can be bent and manipulated to increase the range of products Li-S energy batteries can be used in. Solid-state batteries are the safest form of battery and have the potential to improve cycle life and battery capacity.

Source: Li-S Energy, BOEQ

BATTERY MARKETS

There are two key segments of battery markets, stationary batteries and mobile batteries. Stationary batteries provide large amounts of energy storage and are fixed in place, therefore they are less concerned with carrying extra weight or being larger in size. Stationary batteries are typically used in commercial and industrial applications, for off-grid use, or to maintain grid services.

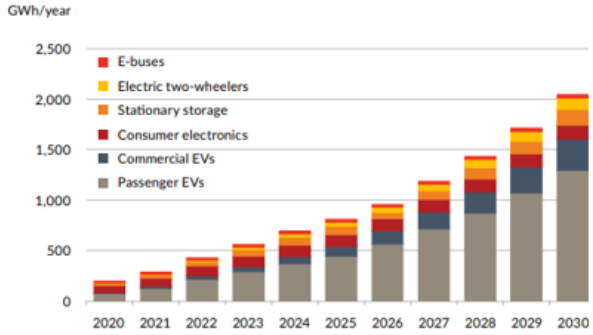
Mobile batteries are used to power moving objects such as vehicles, drones, and aircrafts. Mobile batteries therefore need to be lightweight, have a high energy density, recharge quickly, and have a long cycle life.

Lithium-sulphur batteries are one of the lightest batteries with a high energy capacity and fast recharge times, making them perfect for the mobile battery market.

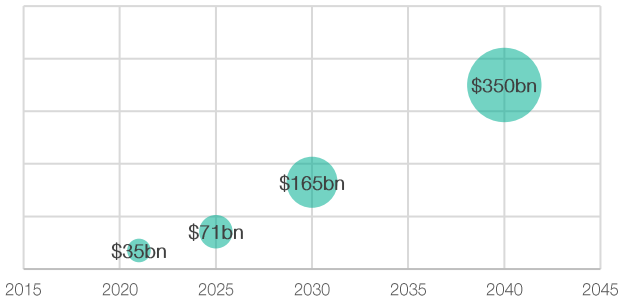
STRONG MOBILE BATTERY DEMAND EXPECTED

We believe that Li-S Energy's battery addresses the needs of the mobile battery market and is well placed to be an emerging leader in the highest growing battery markets.

BATTERY DEMAND OUTLOOK



ELECTRIC VEHICLE BATTERY MARKET SIZE



Source: Electric Vehicle Outlook 2020 Bloomberg NEF, Li-S Energy, Solid Energy Solutions

NEXT GENERATION BATTERY DEVELOPERS

There are a number of organisations engaged in battery research and/or development that improve on the current lithium-ion batteries. The two main next generation battery technology developments are lithium-sulphur batteries and solid-state batteries.

We have identified a number of key players in the industry in order to understand how Li-S Energy's technology compares to other battery technologies that are being developed. In most cases it is difficult to come by consistent information to use as a standardised comparative, with most organisations withholding certain information to protect their sensitive IP and commercialisation strategies.

Lithium Sulphur Battery Developers

COMPANY	VALUATION	BATTERY PERFORMANCE	PATH TO COMMERCIALISATION	BATTERY DESCRIPTION	LI-S ENERGY COMPARISON
Lyten	Private company. Not disclosed.	Claimed potential energy density of 900 Wh/kg. Current voltage 2.1 to 2.3 with a specific capacity of 409 mAh/g. Currently demonstrated 1,400 cycles.	Lyten has applied their technology to cylindrical, pouch, and prismatic prototype cells. Lyten plans to build its own gigafactory to produce batteries for EV's. Lyten expects full production and market availability in 2025-2026.	Lithium-sulphur battery with a 3D Graphene based architecture. Lyten employs a coating on the lithium metal anode to mitigate the formation of dendrites and prevent the polysulfide shuttle effect.	The Li-S Energy Battery has maintained around 550mAh/g, meaning it has a higher specific capacity than the Lyten battery of 409 mAh/g. Lyten's claim to reach 1,400 cycles is not backed up by any relevant information on the form of its prototype battery, which is likely a coin cell overloaded with electrolyte designed specifically to extend cycle life and not suitable for commercial applications. The two companies differ largely in their path to commercialisation. Lyten's gigafactory production approach is very capital intensive, will take time to establish, and could face barriers as Lyten will have to compete against existing battery manufacturers. We prefer Li-S Energy's approach of licensing its IP and supplying BNNT and Li-Nanomesh materials to battery manufacturers which is cheaper and faster to market. The Lyten battery is being designed specifically for EV's whilst the Li-S Energy battery has been designed for multiple applications.
Gelion (AIM:GELN)	AUD$210m Market Cap	Li-silicon-sulphur: Estimates can achieve an energy density of 750Wh/kg-800Wh/kg. Cycle life up to 500 cycles.	Gelion has manufactured its zinc-bromide battery, which and is currently generating revenue from in-field demonstrations. Gelion will scale up manufacturing, aiming to sell its first stationary battery in late 2023. Gelion's lithium-sulphur-silicon battery technology was established in 2021, and the company is working on producing a pouch cell. The company aims to licence its lithium-sulphur-silicon additive in 2025.	Gelion is developing two batteries: Stationary Zinc-bromide non-flow gel battery. Mobile lithium-sulphur-silicon battery additive: High power silicon anode with sulphur cathode, dendrite-free ultra-high-density cells.	Gelion provides minimal information regarding the capabilities of its battery technology. Gelion's stationary battery development is ahead of Li-S Energy with the battery appearing to be near commercially ready. Zinc-bromide batteries are more suitable for large scale stationary applications compared to lithium sulphur batteries which are ideal for mobile applications due to their lighter weight. Li-S Energy's key market is in mobile batteries, therefore best compared with Gelion's lithium-sulphur-silicon battery additive. The two companies have a similar commercialisation approach with the aim to license their technologies to battery manufacturers. Li-S Energy has developed a pouch cell and appears to be slightly ahead of Gelion on the path to commercialisation of mobile batteries. From the limited information that Gelion has provided, it seems that the Li-S Energy battery has a higher energy density than Gelion's mobile battery.

Source: Lyten website, Gelion website, AFR

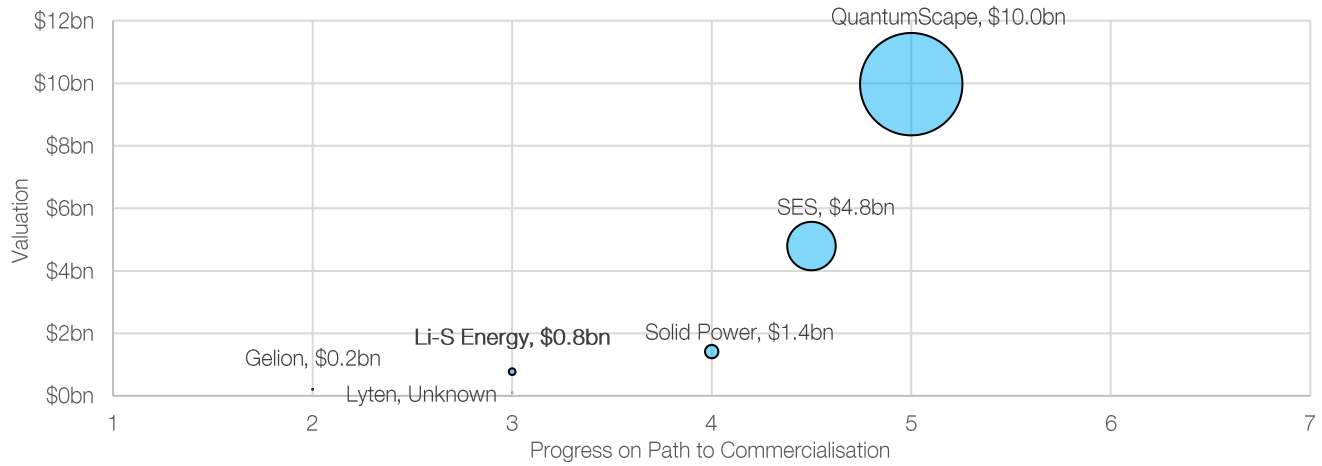
Solid State Battery Developers

Solid state batteries are a recent development that use a solid electrolyte over the typical liquid electrolyte. Solid state batteries show improved stability and a higher energy density than lithium-ion batteries. Solid state batteries can be seen as a mid-point between current lithium-ion batteries and lithium-sulphur batteries in terms of performance and are generally safer than batteries that have a liquid electrolyte.

COMPANY	VALUATION	BATTERY PERFORMANCE	PATH TO COMMERCIALISATION	BATTERY DESCRIPTION
Quantum Scape (NYSE:QS)	AUD$10.0bn Market Cap	Energy density target of 350 to 450 Wh/kg. Currently demonstrated 1,000 cycles.	QuantumScape has developed a single layer cell battery and a multi-layer cell prototype. The company is currently engaged in OEM testing and aims to commercialise their batteries in 2025. QuantumScape has entered into an agreement with Volkswagen Group of America, Inc. and is ramping up production in its joint-venture solid-state battery pre-pilot production line facility.	The QuantumScape battery is a solid-state lithium-metal design that is manufactured anode free in a discharged state, and the anode forms in situ on the first charge. Since QuantumScape's battery has a solid electrolyte it appears to be slightly safer than Li-S Energy's battery. The key reason for this is that a solid electrolyte is less flammable than a liquid electrolyte which LIS' battery uses. LIS plans to research and develop a solid-state battery solution. The Li-S Energy battery has a theoretical specific energy density of 2,567 Wh/kg and has the potential to achieve greater than QuantumScape's target of 350 to 450 Wh/kg, meaning the LIS battery is lighter and more powerful. Both batteries have demonstrated maintaining capacity over a similar number of cycles.
Solid Power (NASDAQ: SLDP)	AUD$1.4bn Market Cap	Energy density ranging from 400 to 600 Wh/kg. 1000+ cycle life.	Solid Power has developed a single layer cell battery and a multi-layer cell battery. The batteries have been independently tested by OEM manufacturers, and the company is currently establishing manufacturing in its pilot production line. The company aims to produce and sell its solid sulphide electrolyte technology and licence its battery IP starting in 2024.	Solid Power replaces a battery's liquid electrolyte with a sulphide solid electrolyte. The sulphide electrolyte is the best all-round performing electrolyte material, has a low cost and is scalable. The company has two product groups, sulphide solid electrolytes to be used with any battery, and battery pouch cells.
SES	SPAC valued at AUD$4.8bn	Projected energy density of 400 Wh/Kg Projected cycle life up to 800 cycles	SES aims to commence OEM pre-production development in 2022 and has two prototype facilities to do this. Full scale gigafactory production and commercialisation targeted for 2026.	SES is developing a hybrid lithium-metal battery, using a solvent in salt liquid electrolyte formula to improve performance and slow dendrite growth.

Source: IRESS, QuantumScape Investor Presentation, Solid Power Presentations, SES Presentation.

BATTERY DEVELOPERS



Source: IRESS, QuantumScape Presentations, Solid Power Presentations, SES Presentation.

General battery development path to commercialisation. Bubble Size = Valuation $bn

1 - Coin Cell
2 - Pouch Cell
3 - Multi-Layer Pouch Cell
4 - Completed OEM Testing
5 - Pilot Production Facility
6 - Scale Production
7 - Commercial

Other Battery Technology Developers

There are a range of other battery technology companies that are all competing for a share of the future battery market. Most of these companies have limited information detailing their progress and technology, highlighting the secretive nature of the industry. We believe that the majority of these companies do not relevantly compare to Li-S Energy as their technology has lower performance, is underdeveloped, or too late to the party.

COMPANY	ABOUT
Sion Power	Previously focused on lithium sulphur batteries and could not extend life beyond 100 cycles. Now developing a lithium anode and cathode separated by a ceramic polymer barrier. Licerion Electric Vehicle pouch cell 400 Wh/kg.
Polyplus	Previously focused on lithium sulphur batteries and could not extend cycle life. Now focused on developing glass protected lithium metal batteries. 500 Wh/kg Lithium-Air battery pack intended to serve specifically as man-portable power.
Blue Solutions	Solid state battery with two reversible electrodes using a Lithium-Metal-Polymer. 250 Wh/kg.
Ilika	Solid state battery with silicon anode. can be miniaturised at mm-scale for powering next-generation Active Implanted Medical Devices (AIMD) or Industrial IoT sensors. Listed on LSE (IKA) with a $218m market cap. 450 Wh/kg.
Brightvolt	Solid state lithium-polymer battery.
Preto Battery	3D solid state lithium-ion battery.
Factorial Energy	Transformational solid-state battery.
EOS	Aqueous zinc stationary battery. Listed on NASDAQ (EOSE) with a market cap of AUD$569m. Not a direct competitor to Li-S Energy.
Amprius	Developing a silicon nanowire anode for lithium-ion batteries. 400 to 500 Wh/kg.
ProLogium Technology	Taiwan based battery company. Successfully developed, mass produced and commercialised a solid-state lithium ceramic 300 Wh/kg battery. Recently secured funds to expand production capacity in Asia, Europe and the US between 2023 and 2025 to supply major OEMs with high-quality 250 Wh/kg EV batteries. Valued between $2bn to $3bn.
Highview Power	Liquid air energy storage technology focused on stationary storage.
StoreDot	Extremely fast charging lithium-ion battery developer.

Source: Company websites

VALUATION

FINANCIAL FORECASTS

Due to the early-stage nature of its business, Li-S Energy has provided relatively limited financial forecasts and in section 9.5 of its prospectus stated:

> *As Li-S Energy is at an early stage of development, there are significant uncertainties associated with forecasting the future revenues and expenses of Li-S Energy. On this basis, the Directors believe that there is no reasonable basis for the inclusion of financial forecasts in this Prospectus.*

Given the company itself it not yet willing to commit to financial forecasts, we believe it would be remiss of us to attempt the task, particularly given we have considerably less visibility on the current state of the business and the current level of engagement with potential OEM partners who have been partially referred to at the recent Annual General Meeting.

Li-S Energy currently has $46.8 million in cash and is well funded to execute on its 3-year business strategy. The company has provided some insight as to what the funds will be used for:

- $29.1m used for project expenditure to further optimise and research Li-S batteries and Li-Nanomesh.
- $6.0m of that will be used to construct a pilot plant starting within the next 12-months and expected to complete within 2 years.
- $16.5m of other working capital will be used to fund potential expansion and/or to accelerate existing projects, commence new development projects and pursue and engage in revenue generating opportunities through OEM collaboration and other partnerships.

LIS Cash Flow $'000	FY20A	FY21A	1Q22A	2Q22
Net cash from operating activities	- 251	- 1,525	- 1,834	- 2,698
Net cash used in investing activities	- 919	- 698	- 169	- 837
Net cash from / (used in) financing activities	4,206	17,794	33,960	- 182
Cash and cash equivalents at the beginning of the period	-	3,036	18,607	50,564
Net change in cash and cash equivalents	3,036	15,571	31,957	- 3,717
Cash and cash equivalents at the end of the period	**3,036**	**18,607**	**50,564**	**46,847**

LIS Capital Structure (m)	Shares	Performance Rights	Fully Diluted Shares	Fully Diluted Ownership %
Board	4.1	3.2	7.2	1.12%
Dr Ben Spincer	0.2	0.7	0.9	0.14%
Dr Lee Finniear	0.2	1.0	1.2	0.19%
Mr Robin Levison	2.8	0.5	3.3	0.51%
Mr Tony McDonald	0.9	0.5	1.3	0.21%
Ms Hedy Cray	0.0	0.5	0.5	0.08%
PPK Australia	290.8	-	290.8	45.21%
Deakin University	83.3	-	83.3	12.95%
BNNT Technology Limited	30.0	-	30.0	4.66%
Other Shareholders	231.9	-	231.9	36.05%
Total	**640.2**	**3.2**	**643.4**	**100%**

Source: Li-S Energy, BOEQ

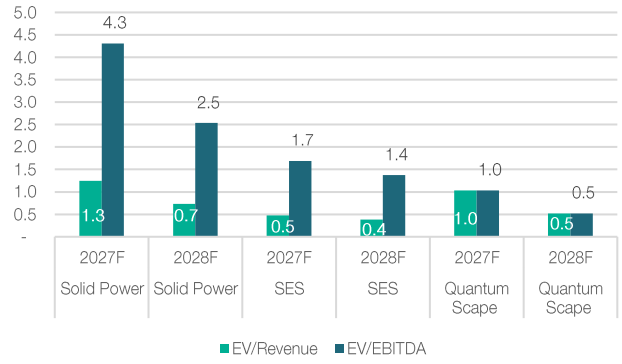
VALUATION

In light of the lack of financial forecasts from the company (as outlined in the previous section), we believe any attempt at a DCF-based valuation of Li-S Energy is compromised.

Instead, we prefer to take a comparative based approach. We can estimate the potential value of Li-S Energy by reviewing the future earnings multiples of Li-S Energy's peers. Since some of these companies are slightly further down the track compared to LIS, they have a clearer view of what the future looks like and therefore have provided earnings estimates.

PEER REVENUE & EBITDA FORECASTS $BN

PEER EV/REVENUE & EV/EBITDA MULTIPLES



Source: QuantumScape Presentations, Solid Power Presentations, SES Presentations.

We believe these competitor forecasts are more than achievable for Li-S Energy given the superior potential of its Li-S Energy battery. It is difficult enough to forecast long term revenues, let alone operating costs to arrive at an EBITDA number, therefore, we take the average of peer revenue forecasts and multiples and apply a 50% discount to Li-S Energy to account for the higher risk, given the business is at an earlier stage of its life cycle. We arrive at a target price of $2.30 per share and initiate with a Spec Buy rating.

Li-S Energy Valuation	2027F	2028F
Peer average revenue $m	3,300	5,033
Peer average EV/Revenue mutliple	0.92	0.55
Peer average enterprise value	3,030	2,746

Average Li-S Energy estimated enterprise value $m	**2,888**
Li-S Energy cash $m	51
Average Li-S Energy estimate of fully diluted market capitalisation $m	**2,939**
Li-S Energy fully diluted shares (m)	643
Li-S Energy value per share	4.57
Average Li-S Energy value per share	4.57
Discount to account for higher risk	50%
Risk adjusted Li-S Energy value per share	**2.30**

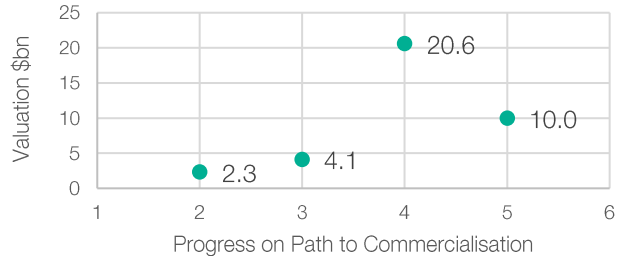
Source: QuantumScape Presentations, Solid Power Presentations, SES Presentations, BOEQ

VALUATION POTENTIAL

The early data points from LIS are very encouraging and with some peers valued up to $10bn, we believe the upside potential for LIS could be very substantial, if the company can execute on its plans.

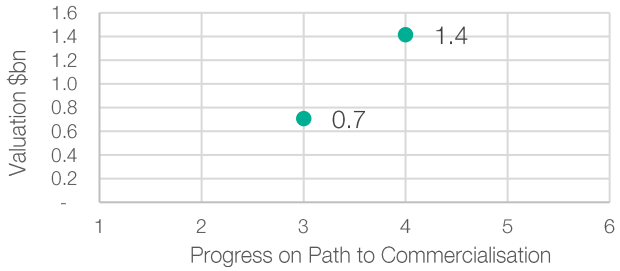
In the longer term, we look to see how the valuations of comparable battery developers change as they progress towards commercialisation given the speculative nature of battery developer valuations. Due to the secretive nature of the industry, we only have a limited amount of data points.

QUANTUMSCAPE VALUATION



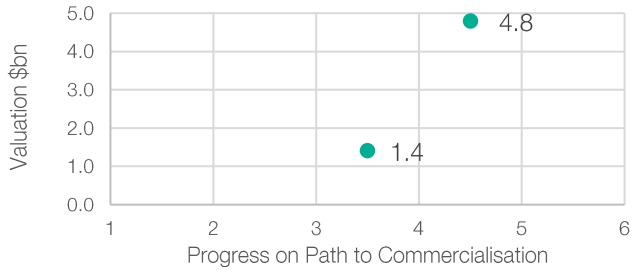
QuantumScape was valued at ~AUD$2.3bn pre-IPO when the company had just completed a single pouch cell. The company closed at a market cap of ~AUD$4.1bn at its IPO. At this stage QuantumScape had developed a multi-pouch cell and the valuation increased ~78%. The company completed an OEM testing milestone with Volkswagen. After releasing the announcement QuantumScape's market cap was ~AUD$20.6bn. The company is now trading at ~AUD$10.0bn and is ramping up production in its pre-pilot production line facility.

SOLID POWER VALUATION



Solid Power was valued at ~AUD$0.7bn in a Series B capital raise when the company completed OEM testing with BMW and Ford. The company listed in 4Q21 at a valuation of ~AUD$1.4bn, an increase of 128%. Solid Power has now established a pilot production line.

SES VALUATION



SES was valued at ~AUD$1.4bn in a Series D capital raise led by General Motors when the company was going through OEM testing. SES was recently valued 239% higher at ~AUD$4.8bn as part of a SPAC transaction and is currently commencing pre-production OEM development.

Source: QuantumScape Presentations, Solid Power Presentations, SES Presentations, BOEQ

As battery developers progress towards commercialisation, sign agreements with significant large OEMs, continue to prove their battery technology, and commence pilot manufacturing, valuations can increase anywhere from 200% to 400% as potential earnings increase and risk reduces. Given the superior potential of Li-S Energy's battery, if LIS can successfully execute its business model and partner with several large OEMs along the way, valuation could increase by ~200%, meaning a market capitalisation of ~$2.3bn or ~$3.62 per share. This values Li-S Energy at 1.41% of the estimated 2030 electric vehicle battery market alone, with commercial electric vehicles, drones and other applications further expanding the market.

LIKELY CATALYSTS

Given Li-S Energy's early stage of development, we believe the risk of a negative surprise is low. A number of positive catalysts can occur as the business executes its business model and moves closer towards commercialisation. Some likely catalysts include:

- A key component of Li-S's business plan over its first 12-months is to invite OEMs to test the company's battery technology. If the company can confirm that large players in the global battery space have engaged and are testing the Li-S's battery technology, the news is likely to be very well received by investors. We believe that this program has already commenced.
- Completion of Li-S Energy's pilot production plant allowing the company to produce more batteries for OEM testing and bring it closer to commercialisation.
- Continued testing to prove the superior performance of Li-S Energy batteries and the robustness of the companies BNNT and Li-Nanomesh solution.
- A working multi-layer cell that will allow the Li-S Energy battery to demonstrate its energy capacity.

KEY RISKS

- **Reliance on Supply Agreement and Distribution Agreement with BNNTTL:** Li-S Energy and the Li-S Energy Battery are reliant on a supply of BNNTs at its required volumes and at a commercially viable price point. Li-S Energy has a long-term supply contract with BNNTTL for the supply of BNNTs. BNNTTL has demonstrated potential capacity to manufacture at least 50kg of BNNTs per year at >95% purity at a low cost. BNNTTL holds a ~4.7% stake in Li-S Energy therefore their interests are well aligned. Additionally, PPK Group, LIS's largest shareholder owns 51% of BNNTTL.
- **Pilot phase research and technology and scale up:** The Li-S Energy Battery technology is currently at the pilot research and development phase. Investment in the Company should be considered in light of the risks, expenses and difficulties frequently encountered by companies at this stage of development, including factors such as design and construction of efficient research, development and processing facilities within capital expenditure budgets, and the ability to scale up to commercial production.
- **Market Adoption:** The market for new and advanced rechargeable batteries based on chemistries other than lithium-ion are at an early stage of development and the extent that the Li-S Energy Battery will be able to meet customer requirements and achieve significant market acceptance is uncertain. If the Li-S Energy Battery technology is not adopted by customers, or if the company's Li-S Energy battery technology does not meet industry standards for power and energy storage capacity in an efficient and safe design, the Li-S Energy Battery is unlikely to gain market acceptance.
- **Evolving Technologies:** With technology continuously changing, there is a risk that lithium sulphur batteries could experience a fall in demand if subsequent and future technology advancements of other batteries or alternative technologies should occur. Li-S Energy batteries currently have the highest potential energy capacity compared to other next generational battery technologies.

BOARD OF DIRECTORS

Dr Ben Spincer, Non-Exec Chairman: Dr Spincer has extensive experience supporting and developing businesses and applied research. For six years he was the Executive Director of Deakin Research Innovations, responsible for Deakin's commercial research partnerships, as well as the commercialisation and translation of the University's research and oversight of the ManuFutures advanced manufacturing scale-up facility. He was a member of the Victorian Government Innovation Taskforce in 2020 and represented Deakin on a number of research centre and institutes Boards.

Prior to joining Deakin in 2015, Dr Spincer was Director of Technology Strategy and Innovation at Telstra, working with the Chief Technology Officer to oversee the long-term technology strategy of the company and to instil a culture of innovation in the company. From 2007 to 2013, Dr Spincer was the Director of Investor Relations for Telstra, managing relationships between the company and its shareholders after its full privatisation.

Mr Robin Levison, Non-Exec Director: Mr Levison has 20 years of public company management and board experience. During this time, he has served as Managing Director at Industrea Limited and Spectrum Resources Limited and has held senior roles at KPMG, Barclays Bank and Merrill Lynch. He is a Non-Executive Director of a number of PPK Group Limited's related companies including BNNTTL and White Graphene Limited.

Mr Levison holds a Master of Business Administration from the University of Queensland, is a Member of the Institute of Chartered Accountants Australia and NZ and is a Graduate and Fellow of Australian Institute of Company Directors. Robin recently retired as Chair of the University of Queensland Business, Economics and Law Alumni Ambassador Council.

Mr Tony McDonald, Non-Exec Director: Mr McDonald has graduated with a Bachelor of Laws from the Queensland University of Technology in 1981and was admitted as a solicitor in 1981. He has been involved in the natural resource sector for many years both within Australia and internationally and for the past 19 years has held senior management roles in this sector. He is a Non-Executive Director of a number of PPK Group Limited's related companies including White Graphene Limited and Strategic Alloys Pty Ltd.

Ms Hedy Cray, Non-Exec Director: Ms Cray graduated with a Bachelor of Laws with Honours in 1996 and a Master of Laws in 1999 from the Queensland University of Technology. She has been a law firm partner since 2001 and a partner with Clayton Utz since 2005 and is the Senior Partner of the Workplace Relations Employment and Safety Group for the firm.

She has experience in commercial and corporate strategy, risk management, corporate governance, acquisitions, company restructuring, employment, human capital and safety and has worked with multinationals across energy, renewable resources, manufacturing, transport and logistics and the government sector.

SENIOR MANAGEMENT

Dr Lee Finniear, CEO: Mr Finniear has more than 25 years' experience as a senior executive, including 10 years with Intergraph Corporation, (a US based Fortune 1000 technology company) in roles including Vice President – Asia Pacific, plus 5 years as the Chief Executive Officer and Managing Director of NASDAQ and ASX listed technology company, Metal Storm Limited. Over the past 5 years, Lee has been the founder and director of a company delivering innovative Internet of Things (IoT) products to business and consumer markets. He was also the Vice President – Asia Pacific for a European telecommunications operator with a market focus on automotive manufacturers and enterprise IoT solutions. Mr Finniear has a First-Class BSc. (Hons) degree in Civil Engineering and a PhD in Artificial Intelligence and Geographic Information Systems.

Mr Ken Hostland, CFO and Joint Company Secretary: Mr Hostland is acting as Chief Financial Officer for Li-S Energy in accordance with an agreement between Li-S Energy and PPK Aust, a subsidiary of PPK Group Limited. Mr Hostland is the Chief Financial Officer of PPK Group Limited and its related mining service companies and the Chief Financial Officer and Company Secretary for BNNTTL, White Graphene Limited and other companies. He has more than 30 years' experience in Australia as a senior finance executive with public and private companies.

Dr Steve Rowlands, CTO: Dr Rowlands has over 20 years' experience in the energy storage sector, including the last eight years as Deputy CTO at OXIS Energy, a pioneer of lithium-sulphur battery technology. At OXIS Energy, Steve managed the cathode, electrolyte, cell test engineering and production development teams. He has extensive knowledge of nanomaterials and their effect on the detailed mechanisms of lithium-sulphur technology. Managing the OXIS Energy production development team, he gained detailed knowledge of the scale-up processes required in delivering a pilot production line for lithium-sulphur battery manufacture. Dr Rowlands has a First-Class BSc. (Hons) degree in Applied Chemistry and a PhD in Electrochemical Supercapacitors for Energy Storage.

Mr Glenn Molloy, Chief Strategic Advisor: Mr Molloy founded PPK Group Limited, then known as Plaspak Group Limited, in 1979 and has been a director of PPK since that time. He has extensive experience on public company boards, commercial aspects of mergers, acquisitions and divestment activities. He is a director of a number of PPK Group Limited's related companies including Executive Chairman of BNNTTL and White Graphene Limited.

Mr Andrew Cooke, Joint Company Secretary: Andrew has extensive experience in law, corporate finance and as a Director/Company Secretary of a number of ASX listed companies. Andrew was the Company Secretary for PPK Group Limited for nine years and is responsible for corporate administration together with stock exchange and regulatory compliance.

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DISCLAIMER

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The Analyst of this report does not own shares in Li-S Energy Limited.