

Ensurge Micropower

Expecting to ship samples 'shortly'

Ensurge Micropower's CEO took the opportunity in the recent Q122 results presentation to brief investors on the status of the company's programme to ship samples of its milliampere hour (mAh) scale solid-state lithium microbatteries to customers. The company expects to deliver samples to its customers 'shortly'. This is discussed in the body of this note. Ensurge already has agreements with five customers waiting for the samples.

Losses widen as company prepares for production

Ensurge did not generate any revenues during Q122. Payroll costs were \$0.6m higher year-on-year at \$2.1m as management invested in engineering and manufacturing personnel, resulting in a widening of EBITDA losses, excluding share-based payments, by \$0.6m to \$3.8m. Investment in capital expenditure was only \$0.2m as most of the work adapting the roll-to-roll (R2R) facility for volume manufacture of microbatteries was completed in FY21. All R&D activity was expensed. Free cash outflow totalled \$5.2m.

February placing extends cash runway into Q322

In February 2022, Ensurge completed a private placement and share allocation at NOK5.4/share (after adjusting for a share consolidation), which raised \$10.9m net and left it with \$10.1m cash (excluding restricted cash) at end March 2022. The company also issued warrants with an exercise price of NOK5.40. 50% of these are exercisable at end June 2022, potentially raising up to NOK50m (\$5.2m), the other 50% at end November 2022, also potentially raising up to NOK50m. Management notes that Ensurge has sufficient funds to support operations into Q322 and is seeking alternative sources of financing to continue operations beyond that.

Valuation: Potential market of over 1bn units a year

Ensurge is initially targeting the medical wearables and hearables markets, followed by the connected sensor and sport & fitness wearables markets. Our scenario analysis calculates that a 5–10% share of these markets represents annual revenues of \$330–550m and EBITDA of \$211–365m. Management has stated that when the R2R factory in San Jose is fully utilised it could potentially generate EBITDA of more than \$100m, depending on product mix.

Historical financials

Year end	Revenue (\$m)	EBITDA (\$m)	PBT* (\$m)	EPS* (\$)	DPS (\$)	P/E (x)	Yield (%)
12/18**	3.4	(49.3)	(54.3)	(0.93)	0.00	N/A	N/A
12/19**	1.2	(30.6)	(35.9)	(0.61)	0.00	N/A	N/A
12/20	0.5**	(11.3)	(14.9)	(0.04)	0.00	N/A	N/A
12/21	0.0	(14.6)	(17.2)	(0.01)	0.00	N/A	N/A

Source: Company accounts. Note: *PBT and EPS are normalised, excluding amortisation of acquired intangibles, exceptional items and share-based payments. **Discontinued business.

Tech hardware & equipment

6 June 2022

Price **NOK2.86**
Market cap **NOK608m**

Share price graph



Share details

Code ENSU
 Listing OSLO & OTCQB
 Shares in issue 212.7m
 Last reported net cash (\$m) at 31 March 2022 (excluding \$1.6m restricted cash and \$10.6m finance leases) 1.3

Business description

Ensurge Micropower's solid-state lithium battery technology combines advanced energy cell design with proprietary materials and manufacturing innovation to produce thin, flexible batteries that can power safer and more capable wearable devices and connected sensors.

Bull

- The high-energy density, flexible form factor, enhanced cycling and improved safety features of solid-state batteries are highly suitable for the hearables and medical wearables markets.
- Markets for microbatteries already established.
- When fully equipped, Ensurge's volume manufacturing facility will be able to generate c \$100m EBITDA.

Bear

- Ensurge has yet to generate meaningful revenues from microbattery sales.
- Revenue growth dependent on companies incorporating microbatteries in their products.
- Management has identified a probable funding gap in Q322.

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Expecting to ship samples ‘shortly’

Ensurge notes that there are three key steps in producing customer samples, and that it has completed the first two and has identified how to complete the final one.

Building individual unit cells

Ensurge has successfully built unit cells that consistently achieved the required capacity and cycling metrics for customer samples. Importantly, the cells charge three times more quickly than conventional lithium-ion battery cells and can achieve a 5C high-pulse discharge, which is very important for applications which include high-frequency communications.

Validating packaging technology

Ensurge has confirmed that the packaging technology provides an effective hermetic seal, preventing air and moisture from penetrating the battery and degrading the lithium cycling performance. It has also confirmed that the internal packaging materials used remain neutral throughout battery operation. Management noted that Ensurge can build individual cells into a stack with high yields.

Integration of microbatteries

Ensurge has successfully integrated battery cell processing, stacking and packaging microbatteries. This is particularly notable given the relative difficulty of handling the ultrathin (10-micron) steel substrate required to achieve the flexibility and energy density required. However, the resultant microbatteries do not consistently meet the initial target cycling performance yet, although the company has identified a solution to meet this parameter which is undergoing cycle-life testing.

Delivery to customers

Once the lifecycle testing process has finished, potentially validating the solution, Ensurge will need to produce sufficient quantities of packaged and cycle-tested microbatteries for its customers to try out in their products. CEO Kevin Barber has reiterated that the company expects to deliver samples to its customers ‘shortly’.

Reducing development cycle time

The experience gained during the development process has enabled Ensurge to halve the time it takes to manufacture and test each new iteration of the microbattery. It currently takes around nine days to complete the front end of the process, which is manufacturing the unit cells. Then it takes an additional nine days for the packaging step. Testing the complete microbattery typically takes two weeks.

Protecting IP

The company has recently filed several provisional patent applications for its technology. The applications cover core inventions and manufacturing processes that integrate battery fabrication, packaging, stacking and materials innovation; package architectures and the atomic-scale interface and layer engineering which enables fast charge/discharge times and long cycle life while improving battery manufacturability.

Market opportunity remains strong

Filling industry gap for mAh scale solid-state microbatteries

Customers are keen to use Ensurge's solid-state batteries as a replacement for conventional coin and button batteries in hearing aids, because the switch enables them to either reduce the size and weight of devices or increase the time between battery charges, as well as providing devices that charge more quickly and only need the batteries changing every three or four years. Customers in the connected sensors and sports wearables markets are also interested in the novel form factors available with Ensurge's solid-state microbattery, without which some of their product designs are not viable. In addition, Ensurge's microbattery is reflow compatible, which makes it much easier to integrate into a circuit board than conventional lithium-ion batteries and enables it to be integrated into products which are moulded at high temperatures, which cannot be done with conventional lithium-ion batteries. The [review of the competitive landscape](#) we carried out in March showed that other companies developing solid-state batteries are either limited to capacities of several hundred μAh ($1000 \mu\text{Ah} = 1 \text{mAh}$) or are developing much larger batteries for electric vehicles. Ensurge's microbattery supports the 1–100 mAh capacities required by the hearables, medical wearables and sports wearables sectors, which other microbattery companies will struggle to address.

Five customers already signed up

Ensurge has already signed agreements with five customers. These include a Fortune 500 industrial company active in manufacturing capital equipment, a customer in the digital health market, two agreements in the medical hearables market and one in the broader wearables market. Ensurge is currently helping these customers to build printed circuits which will include its microbatteries. It has already delivered mechanical samples to help customers design circuit boards so there is minimal delay to their product launch schedules. These five customers will receive samples first. Ensurge is also in discussion with 12 other companies operating in the wearables and Internet of Things (IoT) sectors.

Exhibit 1: Commercial pipeline

Status	Number of customers	Applications
Agreement signed	5	Digital health (wearable) Fitness (wearable) Hearing health (hearable) – customer A Hearing health (hearable) – customer B Industrial (Internet of Things)
Active engagement	7	Wearables – eye, ear, wrist and other
Active engagement	5	Internet of Things – sports equipment, automotive, personal hygiene and other
Next targets	10-15	Wearables – eye, ear, wrist and other
Broader pipeline	50+	Broader pipeline of identified targets

Source: Ensurge Micropower

First microbattery revenues expected Q422

Ensurge intends to start generating revenues from microbattery sales in Q422. Management expects that the initial revenues will be attributable to smaller companies with faster development cycles where the flexibility of form factor offered by Ensurge's microbattery technology is essential. The larger companies with longer development cycles are likely to introduce products incorporating Ensurge's micro-batteries in H223.

Valuation: Addressing a market of over 1bn units/year

Since Ensurge is still at the pre-revenue stage with regards to its solid-state battery technology, we continue to present a scenario analysis rather than a formal valuation based on peer multiples. Referencing research from IDTechEx and others, management notes that the medical wearables,

hearables, connected sensor and sport & fitness wearables markets are predicted to grow to more than one billion units per year by 2025. As discussed in our [March note](#), these markets require batteries in the 1 mAh to 70 mAh capacity range. This capacity range is already covered by conventional lithium-ion batteries, though the relative size of lithium-ion batteries compared to solid-state batteries makes it likely that a material percentage of device manufactures will elect to pay a premium for the solid-state option. Consequently, while we note that Farnell sells 5.5mAh conventional lithium-ion rechargeable coin cells from Seiko Instruments for £1.34–2.99 (ex-VAT) depending on volume required, Ensurge has had detailed conversations with potential customers with which it has shared design details and in H121 stated that it believed a price of \$3–10/unit was achievable.

Exhibit 2: Potential annual revenues from milliwatt hour market (\$m)

		Market share (%)				
		1%	3%	5%	7%	10%
Price/unit (\$)	1	11	33	55	77	110
	2	22	66	110	154	220
	3	33	99	165	231	330
	5	55	165	275	385	550
	7	77	231	385	539	770
	10	110	330	550	770	1,100

Source: Edison Investment Research

Our scenario analysis presents the annual revenues realisable from these markets for a range of unit prices and levels of market penetration. The analysis shows that a 5–10% share of these markets at a \$3–10 price range represents annual revenues of \$330–550m. Based on previous management guidance of c \$20m fixed costs (current levels are \$14.6m), and 30% variable costs, this gives an EBITDA range of \$211–365m. Management notes that when the R2R factory in San Jose is fully utilised it should be able to output several hundred million mAh of batteries each year, potentially generating EBITDA of more than \$100m depending on product mix.

Exhibit 3: Financial summary

	\$m	2018*	2019*	2020	2021
Year-end December		IFRS	IFRS	IFRS	IFRS
PROFIT & LOSS					
Revenue		3.4	1.2	0.5*	0.0
EBITDA		(49.3)	(30.6)	(11.3)	(14.6)
Operating Profit (before amort. and except.)		(53.3)	(34.5)	(11.4)	(14.6)
Intangible Amortisation		0.0	0.0	0.0	0.0
Exceptionals		(15.6)	(42.4)	0.0	0.0
Share-based payments		(1.8)	(0.2)	(0.7)	(4.9)
Operating Profit		(70.6)	(77.1)	(12.0)	(19.6)
Net interest		(1.1)	(1.4)	(3.6)	(2.6)
Exceptional charges relating to issue of warrants		0.0	0.0	(23.2)	(8.8)
Profit Before Tax (norm)		(54.3)	(35.9)	(14.9)	(17.2)
Profit Before Tax (FRS 3)		(71.7)	(78.5)	(38.8)	(31.0)
Tax		(0.0)	0.0	0.0	0.0
Profit After Tax (norm)		(54.4)	(35.9)	(14.9)	(17.2)
Profit After Tax (FRS 3)		(71.7)	(78.4)	(38.8)	(31.0)
Average Number of Shares Outstanding (m)		58.6	58.6	393.2	1,368.3
EPS - normalised (\$)		(0.93)	(0.61)	(0.04)	(0.01)
EPS - (IFRS) (\$)		(1.22)	(1.34)	(0.10)	(0.02)
Dividend per share (\$)		0.00	0.00	0.00	0.00
EBITDA Margin (%)		N/A	N/A	N/A	N/A
Operating Margin (before GW and except.) (%)		N/A	N/A	N/A	N/A
BALANCE SHEET					
Fixed Assets		35.3	0.6	0.8	2.6
Intangible Assets		2.4	0.0	0.0	0.0
Tangible Assets		22.5	0.0	0.2	2.0
Other		10.4	0.6	0.6	0.6
Current Assets		44.1	11.7	6.9	8.7
Stocks		2.6	0.0	0.0	0.0
Debtors		8.9	2.8	1.1	1.8
Cash excluding restricted cash		31.0	7.3	4.2	5.3
Restricted cash		1.6	1.6	1.6	1.6
Current Liabilities		(8.1)	(6.8)	(32.7)	(8.0)
Creditors		(8.1)	(5.5)	(29.5)	(4.1)
Short term borrowings		0.0	(1.4)	(3.2)	(3.9)
Long Term Liabilities		(11.5)	(25.1)	(21.9)	(16.8)
Long term borrowings excluding finance leases		0.0	(11.8)	(9.7)	(5.9)
Other long-term liabilities		(11.5)	(13.2)	(12.2)	(10.9)
Net Assets		59.7	(19.7)	(46.9)	(13.4)
CASH FLOW					
Operating Cash Flow		(52.3)	(29.1)	(11.9)	(14.6)
Net Interest		0.3	(1.4)	(3.2)	(3.2)
Tax		(0.1)	0.0	0.0	0.0
Capex		(11.2)	(5.1)	(0.3)	(1.8)
Acquisitions/disposals		0.0	0.0	0.0	0.0
Financing		(0.0)	0.0	13.3	25.2
Dividend payments and Other items		(1.6)	0.0	0.0	0.0
Net Cash Flow		(64.9)	(35.5)	(2.1)	5.6
Opening net debt/(cash) excluding finance leases and restricted cash		(96.5)	(31.0)	5.9	8.8
Finance leases initiated		0.0	0.0	0.0	0.0
Other		(0.6)	(1.4)	(0.7)	(1.3)
Closing net debt/(cash) excluding finance leases and restricted cash		(31.0)	5.9	8.8	4.5

Source: Company reports. Note: *Discontinued business.

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