Statement of Requirement (SoR)

Purpose

This document is for new Extra-Mural (EMR) Contracts. Use the Redacted under FOIA Section 43 – Commercial Interest Redacted under FOIA Section 43 – Commercial Interest *page on WikiD when filling out this SoR and a supporting RCA. Please seek assistance if desired from* Redacted under FOIA Section 43 *or your Divisional Procurement Representative.*

This document is supplier facing and the RCA is an internal document. Please delete non-essential grey text before issuing externally/ to suppliers.

Reference Number	**RQ0000041839**
Version Number	**0.91**
Date	**25/09/2023**

1.	**Requirement**
1.1	**Title**
	Next Generation Pure Silicon Anode Lithium Ion Cells
1.2	**Summary**
	Dstl wishes to procure next generation high energy lithium ion rechargeable battery cells that utilise a pure silicon anode for assessment. The cells should be of at least 1 Ah capacity, ideally between 1.5 to 5 Ah and no larger than 8 Ah.
1.3	**Background**

	Much military equipment is now powered by lithium ion batteries. These are improving with investment, mostly by the automotive industry. It is noted that lithium ion is a generic term for a wide range of battery chemistries that all involve the lithium ion shuttle mechanism but use different active materials as the electrode materials. Dstl wishes to asses so called 'next generation' lithium ion cells and in particular pure silicon anode cells for this call. It should be noted that although conventional silicon can store significantly more lithium than the graphite anodes used in 'normal' lithium ion batteries it swells and cracks on intercalation causing degradation and limited life. Hence current silicon enhanced batteries can only use a small percentage of silicon added to graphite and as such only exhibit a small increase in energy. Novel strategies (e.g. nanostructuring, protection etc.) are required to use a pure silicon anode loading. It is these emerging pure silicon anode cells which Dstl wishes to assess to determine the additional energy density they can offer and understand any limitations of the pure silicon chemistry. Other chemistries are not of interest for this call since the aim is to better understand pure silicon anode cells and other work will explore different chemistries. It should be noted that the battery industry is currently full of much hype and unsubstantiated claims over cell performance due to the 'gold rush' to get city and EV OEM investment. Dstl only wishes to assess cells from manufacturers that have presented credible results and have prototype multilayer cells of sensible scale; in excess of 1 Ah, ideally around 1.5 Ah to 5 Ah, but no greater than 8 Ah.
1.4	**Requirement**

	Dstl requires samples of 12 prototype next generation pure silicon anode cells offering higher specific energy than current standard lithium ion cells. It is recognised that small cells such as may be available now will have a lower specific energy than larger cells that may be available in the future due to a greater proportion of parasitic packaging. Therefore evidence of growth potential to greater than 350 Wh/kg for cells of greater than 4 Ah is also desirable. The supplier is required to provide 12 prototype multilayer pouch cells: Specific energy > 300 Wh/kg Chemistry – Lithium ion with Prototype pure silicon anodes Performance – provide evidence of performance at prototype multi layer cell scale and ideally independent assessment of results Delivery timescales – No later than 15th Jan 2024 Capacity between 1 Ah to 8 Ah, ideally 1.5 to 5 Ah Cycles > 30
1.5	**Options or follow on work** *(if none, write 'Not applicable')*
	If the cells prove promising Dstl may would like to procure further identical cells for additional analysis or to build (or have built on our behalf) a functioning battery using such cells. IN addition it is expected that the manufacturer will continue to improve their cells via their own internal development process and Dstl may wish to buy such improved cells for further assessment. Details of options are given below. Option 1 – (Planned start date: February 2024) An additional identical 12 cells for further analysis. Option 2 – (Panned start date : March 2024) An additional 12 cells of at least double the capacity of the original cells supplied. Option 3 – (Planned start date – April 2024) An additional 12 cells of at least 20 % greater specific energy than the original cells

1.6	Deliverables & Intellectual Property Rights (IPR)

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***Technology Readiness Level required**

Notes- IPR should be inserted / checked by commercial staff before sharing with the supplier(s) to ensure accuracy.

1.7	**Standard Deliverable Acceptance Criteria**
	Deliverables will be accepted by the Dstl Project Manager. Deliverables will be held for consideration by Dstl for up to 30 days and returned with any requested edits or changes. These changes should be made and returned to Dstl within 14 days. After acceptance of a given deliverable, the supplier may then invoice for payment.
1.8	**Specific Deliverable Acceptance Criteria**
	Cells should be of suitable quality to test in a laboratory environment Cells should be accompanied with a data sheet listing their properties, the chemistry used and usage conditions e.g. voltage, current and temperature

2.	**Quality Control and Assurance**
2.1	**Quality Control and Quality Assurance processes and standards that must be met by the contractor**
	☒ **ISO9001** (Quality Management Systems) ☐ **ISO14001** (Environment Management Systems) ☐ **ISO12207** (Systems and software engineering — software life cycle) ☐ **TickITPlus** (Integrated approach to software and IT development) ☐ **Other:** (Please specify below)
2.2	**Safety, Environmental, Social, Ethical, Regulatory or Legislative aspects of the requirement**
	Cells should be of suitable quality to test in a laboratory environment Cells should be accompanied with a data sheet listing their properties, the chemistry used and usage conditions e.g. voltage, current and temperature.

3.	Security

Redacted under FOIA Section 26 - Defence

3.2	Security Aspects Letter (SAL)
Redacted under FOIA Section 26 - Defence	
3.3	**Cyber Risk Level**
Redacted under FOIA Section 26 - Defence	
3.4	**Cyber Risk Assessment (RA) Reference**
	Redacted under FOIA Section 26 - Defence

4.	Government Furnished Assets (GFA)

GFA to be Issued - Choose an item.

If 'yes' – add details below. If 'supplier to specify' or 'no,' delete all cells below.

GFA No.	Unique Identifier/ Serial No	Description: *Classification, type of GFA (GFE for equipment for example), previous MOD*	Available Date	Issued by	Return Date or Disposal Date (T0+)

		Contracts and link to deliverables			*Please specify which*
GFA-1					

5.	Proposal Evaluation criteria
5.1	Technical Evaluation Criteria

Question No.	Criteria	Max Score	Weighting (%)
1.	What is the specific energy of the cell in Wh/kg? Desired specific energy is as high as possible but 300 Wh/kg or greater is desired.	100	40
2.	What is the cell capacity in Ah? Multilayer cells between 1 to 8 Ah are desired, with a preference for 1.5 to 5 Ah. Cells are desired in a 'useful' capacity range so more isn't better.	100	20
3.	What evidence can be provided to verify cell performance. E.g. test reports verifying capacity, cycle life etc.	100	20
4.	What is the cycle life of the cell (quote the cycling regime the cycle life data was achieved at)? Ideally the cell should achieve in excess of 50 cycles, although more is always desirable as long as it doesn't compromise specific energy. Cycles can be obtained using manufacturers recommended discharge rates but should be achieved at around room temperatures (15 to 30 deg C) and from 100 % State of charge down to at least 20 % state of charge.	100	10

Please find below an explanation of what each score means for the technical criteria.

Question No.	Criteria	Max Score	Weighting (%)
1.	What is the specific energy of the cell in Wh/kg? Desired specific energy is as high as possible but 300 Wh/kg or greater is desired.	100	40
	100 – Excellent Energy of the cell is greater or equal to 400 Wh/Kg 70 – Good Energy of the cell is greater or equal to 300 Wh/Kg 30 – Adequate Energy of the cell is greater or equal to 280 Wh/Kg 0 – Inadequate Energy of the cell is greater or equal to 279 Wh/Kg		
2.	What is the cell capacity in Ah? Multilayer cells between 1 to 8 Ah are desired, with a preference for 1.5 to 5 Ah. Cells are desired in a 'useful' capacity range so more isn't better.	100	20
	100 – Excellent The cell capacity is between 1.5 and 5 Ah 70 – Good		

		The cell capacity is between 1 and 1.5 Ah or the cell capacity is between 5 and 8 Ah 30 – Adequate The cell capacity is between 0.75 to 1 Ah or the cell capacity is between 8 and 10 Ah 0 – Inadequate The cell capacity is less than 0.75 Ah or greater than 10 Ah		
	3.	What evidence can be provided to verify cell performance. E.g. test reports verifying capacity, cycle life etc.	100	20
		100 – Excellent Independent test reports verifying capacity, cycle life and safety under abuse. 70 – Good Independent test reports verifying capacity and the cycle life. 30 – Adequate Manufacturer reports showing capacity and cycle life. 0 – Inadequate No proof of claimed evidence.		
	4	What is the cycle life of the cell (quote the cycling regime the cycle life data was achieved at)? Ideally the cell should achieve in excess of 50 cycles, although more is always desirable as long as it doesn't compromise specific energy. Cycles can be obtained using manufacturers recommended discharge rates but should be	100	10

5.	**Proposal Evaluation criteria**			
5.1	**Technical Evaluation Criteria**			
		achieved at around room temperatures (15 to 30 deg C) and from 100 % State of charge down to at least 20 % state of charge.		
		100 – Excellent The cycle life of the cells is more than 200 Cycles 70 – Good The cycle life of the cells is more than or equal to 100 cycles. 30 – Adequate The cycle life of the cells is more than or equal to 50 cells. 0 – Inadequate The cycle life of the cells is less than 50 cycles.		
5.2	**Commercial Evaluation Criteria**			
	The suppliers proposal shall be evaluated on a pass/fail basis against the following criteria: Has the supplier accepted DSTL terms and conditions Has the supplier provided technical details in the proposal of the prototype multilayer pouch cells as outlined in section 1.4. Has the supplier confirmed they can provide the deliverables by the dates given in section 1.6 Has the supplier complied with the security requirements			

5.2	**Commercial Evaluation Criteria (Continued)**

	Has the supplier provided a firm price for the deliverables Has the supplier given a full cost breakdown for the deliverables Has the supplier completed the statement related to good standing The Authority shall evaluate the contract pricing on the basis of the NAPNOC principle (No Acceptable Price, No Contract). The Authority reserves the right to not enter into any contract that is unacceptably priced or unaffordable.