RCloud Tasking Form – Part B: Statement of Requirement (SoR)

Title of Requirement	Use of Synthetic Biology for the Manufacture of Advanced Energetic Materials
Requisition No.	RQ0000000947
SoR Version	**1.0**

1.	**Statement of Requirements**
1.1	**Summary and Background Information**
	Synthetic biology aims to design and engineer novel biologically-based parts, devices and systems, as well as redesign existing natural biological systems for useful purposes. Dstl is interested in the use of Synthetic Biology to address a range of different defence challenges – one of these areas is how advances in synthetic biology can support the development of advanced energetic materials. The Advanced Energetic Materials project aims to accelerate the discovery and delivery of new explosives and energetic materials for future use by UK Defence and Homeland Security. With ever-increasing demands on energetics to meet tougher mission requirements, perform safely and have a lower environmental impact, the UK requires new materials that are able to meet these challenges. This high technical risk, low technology readiness level (TRL) research programme aims to harness new and under-exploited technologies for the purposes of identifying new energetic materials, as well as to find new synthesis pathways – both to those new energetic materials, and to existing ones for which significant barriers to production currently exist . As a critical, underpinning technology, new energetic materials (propellants, explosives and pyrotechnics) are required for a wide range of defence and security applications. Novel energetic molecules, for use in warhead (explosives) and propulsion (propellants) formulations, are the strategic focus for this very low technology readiness level (TRL) research. Energetic materials (or ‘energetics’) are metastable stores of chemical energy which can be rapidly released upon demand. Foremost amongst these are explosives, propellants and pyrotechnics, with additional examples including energetic additives in the form of binders, plasticisers or bonding agents. Dstl are keen to use the developments made in synthetic biology to assist in the development of new energetic materials or the improved manufacture of key existing materials. Synthetic Biology has the possibility to develop synthesis pathways that are either not possible through standard chemistry routes or have the ability to be simpler, cheaper and/or more

	environmentally friendly. Synthetic biology also has the potential to develop completely new materials that could not currently be made through traditional chemistry routes. The aim of this research stream is to address the need for new energetic materials and mitigate associated risks by exploring alternative and emerging technologies in the synthetic biology domain. In this way, the project aims to discover and deliver advanced energetic materials (and potentially valuable new precursors to known materials), and enable their production on-demand to meet tightly-defined production and performance criteria.
1.2	**Requirement**
	Dstl are interested in synthetic biology solutions and therefore we are keen to encourage proposals using approaches such as metabolic engineering, using complex genetic modifications informed by predictive models, of biosynthetic pathways to allow/enhance production of useful products, or engineering organisms to include systems or parts not found in nature to impart new capacities or chemistry. It is expected that proposals will require strong multidisciplinary partnerships between bioscience and chemistry/energetics and proposals must demonstrate they have the appropriate team to deliver this. Bids that are perceived as having high technical risk or novelty will be encouraged, and the generation of patents or publications for the benefit of national prosperity will be positively explored. The innovation in proposals will receive specific scoring criteria when assessments of the returns are undertaken. ***Please note that Dstl has a duty of care to ensure research is conducted safely under our sponsorship, and that this responsibility is of utmost importance to us.*** Where practical work involving energetic materials is unavoidable, on the basis that it is deemed fundamental to successful delivery, bids will need to demonstrate sufficient prior experience and/or suitable capability to work with energetic materials, or else will be rejected. To this end, collaborative bids with partners with the required energetics experience/facilities are welcomed. Where sufficient experience and/or capability to work safely with energetic materials is not demonstrated, bids will still be considered by Dstl as long as energetic materials work is not necessary for their successful delivery. In all such instances, practical work must instead be restricted to the study of justifiably representative, non-energetic model compounds and systems only. Bids will be assessed by a panel of Government technical experts from the Centre of Excellence for Energetic Materials (CoEEM) using Proposal criteria in Section 5. Communications will be managed through R-Cloud and in accordance with the standard Dstl Commercial process. After the contract(s) have been awarded, activity will be instigated by the Authority, with a Project Kick-Off Meeting at the agreement of all parties.

	Dstl seeks research proposals that utilise Synthetic Biology pathways in the production of energetic materials, thereby providing a specific advantage over traditional routes in terms of product quality, yield, crystalline form, cost, safety/hazards, environmental or energetic properties (list not exhaustive). We are interested in proposals that use Synthetic Biology for one or more of the following: • The discovery & identification of Synthetic Biology pathways to **new** energetic materials by using *in silico*, machine-aided (ML/AI) techniques or other methods. • The generation of synthetically versatile or otherwise high-value heterocyclic systems or high-strain molecules with comparatively high energy-densities (e.g. tetrazoles, furazans, oxadiazoles, cubanes, bicyclobutanes, etc.). • The manufacture of existing energetic materials where synthetic biology offers a significant advantage over traditional routes (e.g. CL20 (hexanitrohexaazaisowurtzitane), FTDO ([1,2,5] oxadiazolo [3,4-e] [1,2,3,4]-tetrazine-4,6-Di-N-dioxide)). • The generation of key precursors or intermediates for the production of energetic materials, with a focus on molecules that are challenging to synthesise by traditional chemical means (e.g. highly reproducible cellulose, benzylamine, complex polyols). • The manufacture of key components of energetic formulations, such as binders and plasticisers (e.g. poly(glycidyl nitrate) (polyGLYN)). Synthetic biology is not required to be the sole means of manufacture of the energetic material. The proposals can focus on the manufacture of a challenging precursor or intermediate, with conventional chemistry routes detailed to show how the final energetic material can generated. A demonstration of manufacture of the final energetic product is desirable but not essential, and should only be carried out by those with suitable experience and facilities for working with energetic materials. We would also be interested in other uses of Synthetic Biology for energetic materials synthesis, which may include things like reducing hazardous waste streams, reducing energy usage or avoiding the use of expensive catalysts. **Indicative Budget** The Authority has currently identified confirmed funding of £1.1M (EX VAT) with £600K available in FY 22/23 and £500k available in FY 23/24, however these figures are purely indicative, and bidders are invited to submit costed proposals above these figures as the Authority may be able to secure additional funding prior to award of any Contract. Please also note that the Authority may place more than one contract as a result of this competition, therefore please note that bids that do not maximise the full funding availability will be considered as well as those that maximise availability of funding for each FY. Please also note that PhD proposals will also be considered for this ITT. Proposals for these should include firm price and breakdown as appropriate for a three year PhD.
1.3	**Options or follow on work** *(if none, write 'Not applicable')*

	Two year contracts are offered. Options for follow-on work in Year 3 will potentially be available, subject to technical review of Yrs 1 & 2 outputs. Follow on work could for example include, practical support, etc., subject to agreement between DSTL and the supplier at the end of Yr2. If PhDs are submitted in Year 1 this would be supported throughout the 3 year standard period. **The Authority shall not be obliged to exercise these options.**
1.4	**Contract Management Activities**
	All successful bids, after contract award will be initiated by a Project Kick Off Meeting organised by the Authority. It is expected that kick off meetings will be scheduled in promptly after contract award. Submission of Research Worker Forms will be required following notification of preferred bidder status (winning bids), where required. Proposals should state how many Research Workers Forms will be submitted for the proposed contract, or if SC clearance is already held, then how many workers will be presented for verification of SC or above status. Deliverables will be managed by the Authority and expected to the timescale as outlined in Table 1.6 At Contract Closure, a wash up meeting will be delivered to discuss next steps, recommendations and feedback which will be captured by the Dstl Project Team.
1.5	**Health & Safety, Environmental, Social, Ethical, Regulatory or Legislative aspects of the requirement**
	All work is to be performed in compliance with relevant UK legislation (including H&S). See also the Requirement (section 1.2) for information relating to Dstl's duty of care when sponsoring work involving energetic and/or potentially energetic materials.

1.6	Deliverables & Intellectual Property Rights (IPR)					
Ref.	**Title**	**Due by**	**Format**	**Expected classification (subject to change)**	**What information is required in the deliverable**	**IPR Condition**
D – 1	Progress meeting	T+3, T+6, T+9, T+12, T+15, T+18, T+21 months.	Presentation from Supplier (remote or in-person meeting)	UK OFFICIAL	Presentation to Dstl project team, to include: • Update on technical progress • Commercial aspects • Review of deliverables • Risks/issues • GFA and supplier performance	DEFCON 705
D - 2	Year-End Report	T+12 months	Report	UK OFFICIAL	Full year-end report, to include: • Project background • Summary of Yr1 work • Conclusions • Recommendations for follow-on research, with plans for following year • Identification and summary of IP (potential or actual) arising in-year. • Progress versus deliverables	DEFCON 705

					Recommendations for any potential parallel research	
D - 3	Final report	T+24 months	Report & presentation	UK OFFICIAL	Full final report, to include: • Project background • Summary of Yr1 & Yr2 work • Conclusions • Recommendations for follow-on research • Copies of relevant publications arising or pending • Identification and summary of IP (potential or actual) arising • Progress versus deliverables • Any other technical issues or findings that Dstl should reasonably be made aware of Additional presentation, to include: • Brief summary of each year's work • Overall progress and conclusions • Demonstration of system and/or technology outputs	DEFCON 705

					• Recommendations for future work • Summary of publications and IP (submitted or pending) arising	
D – 4						
D - 5						

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1.7	**Deliverable Acceptance Criteria**
	All deliverables to be emailed to: Redacted under FOIA exemption Stakeholder presentation deliverables to include attendance of meetings with Dstl and delivery to key stakeholders. All material intended for external publication to be emailed to Redacted under FOIA exemption for technical review. If any published papers include GFI, Dstl must have sight of them and must provide permission to publish prior to the papers being shared.

2	**Evaluation Criteria**
2.1	Method Explanation

The Tender evaluation utilises an absolute method, whereby a Value For Money (VfM) Index is applied to identify the preferred bidder. This approach divides the total score of the non-cost (Technical) criteria by the tender cost. It ranks tenders on the quality (represented by the non-cost score) for each £ (or £k or £m) of cost.

An illustrative example is outlined below for reference purposes only:

Tender	Non-Cost Score	Cost (£)[Thousand]	VfM Index Score	Rank
A	62	20	3.10	3
B	85	24	3.54	1
C	100	29	3.44	2

2.2 Technical Evaluation Criteria

The technical evaluation shall be scored on the following questions, noting that any proposal that is marked as a Fail against Serial 1 or 2 shall not be considered for task award.

Serial	Question	Weighting	Score
1	The proposal provides a clear and unambiguous statement which meets the technical requirements in the Statement of Requirement.	N/A	Pass / Fail
2	The proposal demonstrates sufficient prior experience/provenance of the applicant's organisation and/or Principal Investigator in the relevant technical fields (at an internationally publishable standard or any other equivalent indication of skills and knowledge), to be able to undertake the proposed work.	20	0,2,3,4,5
3	The proposal demonstrates the existence of suitable experimental facilities or assets, either in the home capability or allied/accessible labs for example, to be able to undertake the proposed work.	20	0,2,3,4,5

4	The proposal is based on and demonstrates a suitable level of novelty/innovation.	20	0,2,3,4,5
5	The proposal clearly demonstrates how the outcomes will be delivered and the work completed	20	0,2,3,4,5
6	The proposal outcomes demonstrate impact for the UK Energetics sector.	20	0,2,3,4,5

The technical questions shall be assessed and marked using the following scoring definitions

Definition	Characteristics	Score
Excellent	The response addresses all elements of the requirement, and provides a comprehensive, unambiguous and thorough explanation of how the requirement will be fulfilled.	5
Good	The response addresses all of the elements of the requirement and provides sufficient detail and explanation of how the requirement will be fulfilled.	4
Adequate	The response addresses the majority of elements of the requirement but is weak in some areas and does not fully detail or explain how the requirement will be fulfilled.	3
Inadequate	The response does not address or explain how the requirement will be fulfilled and fails to demonstrate the ability to meet the requirement.	2
Fail	The response does not address the requirement at all.	0

Under the Technical Evaluation the maximum available weighted score is 500, under the VFM Index this score (Non-Cost) shall be divided by the cost of your proposal to generated the VfM Index Score.

2.3 Commercial Evaluation Criteria

The commercial evaluation shall be assessed against the following Pass / Fail questions. Please note, a fail against any of the commercial questions will result in your proposal not being considered for Technical Evaluation.

Serial	Question	Score
1	The proposal has been submitted as a firm i.e. non-variable price for the proposed two year duration (except if a PhD is being offered as a solution, in which case it should be priced for the entire proposed duration of the PhD topic)	Pass / Fail
2	The Tenderers proposal includes a completed RCloud Part C Task Response Form	Pass / Fail
3	The proposal prices do not exceed the R Cloud Rates submitted upon application and acceptance.	Pass / Fail
4	Cyber Security - the Tenderer has completed a Supplier Assurance Questionnaire demonstrating their compliance with the LOW Cyber Security Controls detailed in DEF STAN 05-138. If the Tenderer is unable to demonstrate compliance at ITT return, then the Tenderer must provide a draft Cyber Implementation Plan (CIP) detailing the steps they will take to meet the Controls.	Pass / Fail
5	Bidders should indicate whether they will be presenting Research Worker Forms, or verification of SC and above status - if notified of their status as a preferred bidder. Please state that you will be willing to comply with either the RWF	Pass / Fail

		process or verification of SC (and above) staff where appropriate.		
	6	The Supplier submits a priced Commercial proposal (Qty 1) and an unpriced Technical Proposal (Qty 1).	Pass / Fail	
	7	The proposal accepts the Additional Terms and Conditions laid out in 20220127_RCloud_Tasking_Form_Part A-Task_Overview_v1.1_WP4 SynBio	Pass / Fail	