Results of Competition: EUREKA GlobalStars Singapore CRD – Round 2

Competition Code: 2006_EUREKA_SINGAPORE_RD2

Total available funding is £1,900,000

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
ECOMAR PROPULSION LTD	Zero Emission Systems for ship propulsion	£247,059	£172,941
University of Exeter		£79,204	£79,204

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants
Ecomar Propulsion Ltd (UK), Durapower Technology Group (Singapore) and The University of Exeter, Centre for Future Mobility (UK) aim to develop high efficiency, low and zero emission propulsion systems for ships. Combining the expertise of these companies in battery system design, development and integrations, will provide commercially-viable options for rapid reduction of ship pollution, delivering operational benefits and reducing the environmental impacts of the global shipping industry.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
ROSLIN TECHNOLOGIES LIMITED	Lobster Source: Singapore and UK partnership to generate cultured lobster	£335,154	£234,608

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants
The market for cultured meat is expanding rapidly, opening huge opportunities for businesses in this sector. Roslin Technologies' vision is to serve cultured meat companies globally by providing them with key cellular and media tools to cost-effectively develop their own food products. Roslin Technologies has already developed innovative tools that serve companies working on cultured pork products and, in this project, plans to work with Singaporean company, Shiok Meats, a world leader in the generation of cultured shrimp meat. Here, the two companies have come together to develop cultured meat from lobster, a key global market that is set to benefit widely from the provision of cultured meat products. This project will blend recent advances in crustacean cell biology made by Shiok Meats with those in animal stem cell biology made by Roslin Technologies to generate novel cell lines from the European Lobster for the development of edible crustacean meat products.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
URA THRUSTERS LTD	The Water Electrolysis Hall Effect Thruster (WET-HET): Paving the Way to Dual Mode Chemical-Electric Propulsion	£373,112	£261,178
Imperial College London		£88,495	£88,495

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants
Most satellites built to date manoeuvre in space using two very different types of thrusters and propellants. High thrust functions are met by extremely toxic chemical fuels (Hydrazine) that are costly and challenging to handle as they are lethal to humans from brief exposure. Where high fuel efficiency is required and low thrust can be accepted, electric propulsion (EP) thrusters are used, fed by expensive high purity noble gas (Xenon), stored at very high pressure. These two entirely separate systems are both present on many larger spacecraft platforms to cover the full required ranges of thrust and fuel efficiency. Alternative low-cost and non-toxic propellants have been increasingly adopted for small satellites, where their price and handling advantages have a particularly high impact. Our project's ultimate goal is to replace both Xenon and Hydrazine with water, the ultimate green, low-cost propellant, for both chemical and electric propulsion functions in large satellites. The proposed HYDRA system concept electrolyses water on-demand during a mission into oxygen and hydrogen. The project is focussed on the EP sub-system: development of a Water ElecTrolysis Hall Effect Thruster (WET-HET), which ionises and accelerates positively charged oxygen to the very high speeds required for fuel efficiency. This is combined with an electron-emitting hollow cathode device, fed with hydrogen, required to keep the spacecraft charge-neutral. Both of these device types have not been used with those propellants in spaceflight to date. For the higher thrust impulses required by the satellite, these two gasses will in addition be used in a chemical bipropellant thruster, ICE. This allows a spacecraft to fly with both fuel efficient electrical and high thrust chemical propulsion options, but a single low pressure water propellant tank, propellant management system, and associated hardware. This completely novel overall architecture allows a full spectrum of mission scenarios that are not possible with either technology alone, without the cost and mass penalties of flying two completely separate systems and propellants, at the very low propellant price and high storage density of water. The project focusses on the technical and engineering challenge of adapting existing technology concepts of Hall Effect thrusters and neutralizers to run on the unconventional oxygen and hydrogen fuels, in prototypes with sufficiently high performance and lifetime. Work will focus on all aspects of these two device designs from material selection to manufacturability, and culminate in extensive test campaigns in vacuum chambers to simulate the conditions of space.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
LIBERTY PRODUCE LIMITED	Hybrid Advanced Research Vertical-Farming Environment Systems and Technology (HARVEST)	£312,850	£218,995
The James Hutton Institute		£108,638	£108,638

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants
The recent COVID-19 pandemic has highlighted the fragility of global food supply chains. Countries urgently seek a healthy, base level of food security and self-sufficiency at a time when agricultural land is depleted, the population is growing, and climate-related weather events are increasing. As a result, new, dynamic and groundbreaking collaborative solutions are required on a global level. This is not a single-nation issue. In the UK, self-sufficiency is at around 50% for fresh produce, but has been in decline for 30 years. In Singapore, where over 90 percent of the food supply is imported from over 170 countries, the country is vulnerable to fluctuations in food supply and prices. As a result, the Singaporean government announced a series of strategic policy initiatives, including the increase of self-production by 30% by 2030 through investment in high technology urban farms, among other measures. This project responds to this urgent need, targeting crop-based foods and herbs -- key components of the Singaporean national diet -- via an innovative combination of vertical farming (VF) and high-tech greenhouse techniques. With diverse expertise and customer bases, its partners are uniquely placed to deliver a joined-up coherent approach to the problem and develop a leading-edge turnkey solution fit for the Singaporean market: LIVFRESH (LF) is a Singapore-based farming company with a mission to revolutionise access to fresh, locally grown crafted produce through high precision controlled environment (HPCE) farming methods. Liberty Produce (LP) is a UK AgriTech company driving the sector towards greater sustainability, efficiency and security by building leading-edge TCEA farming technology that enables the growth of local produce year-round. The James Hutton Institute (JHI) is Europe's premier agriculture and environment institute. Republic Polytechnic, Singapore (RP) provides agricultural/horticultural expertise with site/facilities for installing, testing and developing the solution. This two-year project will install a shipping-container-based farm at RP for JHI, RP and LP to run trials and understand optimal conditions for crops needed by the Singaporean market. The team will investigate how combined-system growing can provide optimum efficiency for crops for the domestic Singaporean market, and determine how to build a fully optimised combined system. The second year will focus on commercial rollout, with the installation of a farm at LF, based on the specifications identified during Year 1\. Additional research at the RP farm facility will concern growing high value crops within TCEA to fulfil further aspects of Singaporean domestic needs.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
IONATE LIMITED	Decarbonisation through Smart Hybrid Transformers	£342,781	£239,947
University of Edinburgh		£99,233	£99,233

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants
IONATE Limited, The University of Edinburgh, and EverComm are working together to develop a novel smart hybrid transformer in conjunction with a system wide decarbonisation software platform for the electricity grid. Upon completion, this hardware technology and software platform will be a key enabler for power systems in transitioning to a low-emission future through boosting flexibility and efficiency of power control. The UK is leading the energy transition as the first major economy in the world to commit to net zero emissions by 2050, placing clean growth at the heart of its Industrial Strategy. In line with this, the electricity system is undergoing drastic changes. Rapidly increasing levels of wind and solar generation, the electrification of transport and heat, and battery storage are completely changing the nature of power flows within the grid. To maintain reliable power supply under growing unpredictability, the system's power control capabilities need to be upgraded. This is not a straightforward challenge. A commonplace approach to improve the electricity system is to add new layers of digital technology on top of the grid. However, this alone is not sufficient to reinforce the system for a once-in-a-hundred year energy transition as it is prohibitively expensive. Furthermore, it adds new levels of complexity and fragility -- two things to avoid in a future-proof system. There has not been a more urgent need for innovation to enable our power systems to continue to supply reliable and affordable electricity in a zero-carbon world. IONATE has patented a new technology to replace transformers and an array of add on technologies with a single smart hybrid transformer. This device has performance capabilities of multiple other digital technologies -- without the associated cost and complexity. This is made possible by its innovative design; a hybrid combination of power electronics and electromagnetics is optimised to deliver the highest efficiency and performance at the lowest cost. When combined with EverComms software platform for coordination and control optimisation, the benefits to the energy system can be enormous, enabling an affordable and reliable energy transition. This project is a key step towards the commercialisation of this new technology at scale. Once in use, IONATE's smart hybrid transformers build into the electricity grid and renewables projects where they can stabilise power flows at a much lower cost than alternatives. Ultimately, they will contribute to lower electricity prices and reliable power in a zero-carbon world.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
PLASTICELL LIMITED	Improved engineering and manufacture of iPSC-derived CAR-NK cells for immunotherapy	£196,703	£137,692
LambdaGen Pte. Ltd (Singapore) https://www.lambdagentherapeutics.com/		£0	£0

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
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Project description - provided by applicants
Cancer is still a leading cause of death worldwide, and is thought to have been responsible for 9.6million deaths in 2018 (about 1 in 6 deaths). Unfortunately, despite improvements in cancer care and treatment, the incidence and the number of deaths from cancer are set to increase along with an aging and growing population. There is therefore a need for more effective treatments. Immunotherapy aims to boost the body's immune system to fight disease, and can be used to fight cancer. It uses substances made by the body or in a laboratory to improve how the body's immune system works to find and destroy cancer cells. Cellular immunotherapy is one type of immunotherapy that uses special blood cells of the immune system (T-cells or natural killer cells), and 'arms' them with the capacity to detect and destroy tumour cells. These so-called 'chimeric antigen receptor (CAR)-T' or 'CAR-NK' cells have revolutionised the treatment of patients with otherwise incurable cancers. However, these therapies have so far mostly relied on harvesting these blood cells from the patient or healthy donors. Whilst this method does work, it makes this therapeutic approach unpredictable, very expensive, and it requires a complex infrastructure for delivery. Another problem has been the development of adverse side effects in some patients with the use of CAR-T cell therapies. Therefore, any therapy that seeks to reduce variability, decrease cost, increase safety and make the manufacturing process faster and/or more robust, is hugely attractive. One such area of research is the use of 'induced pluripotent stem cells' (iPSCs). These cells can be made from adult tissue, and have the capacity to be cultured in the lab indefinitely and, more importantly, to give rise to any type of cell in the body - making them an ideal starting material for the manufacture of off-the-shelf cell therapies. They are also very amenable to genetic modification, which also makes them ideal for the 'arming' process mentioned above. There are two major aims of this project. The first is to deploy LambdaGen's advanced gene editing technology to arm iPSCs with multiple elements for enhanced capabilities for the detection and killing of tumour cells. The second is to deploy Plasticell's next generation screening technology to develop efficient methods to generate iPSC-derived natural killer cells. The combination of these two technologies promises to create an affordable, effective and safe therapy for the treatment of cancer.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
RICHMOND DESIGN & MARKETING LIMITED	ABACAS - Autonomous Baggage Automation for Changi Airport Stakeholders	£499,638	£349,747
Changi Airport Group Singapore Pte Ltd		£105,600	£0
Civil Aviation Authority of Singapore		£105,600	£0

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Project description - provided by applicants
ABACAS will use self-driving vehicle technology to enable safer and more efficient baggage handling for the aviation industry. Despite the current downturn due to the Global Pandemic, worldwide air passenger numbers are estimated to double in the next 18 years. Airports all face the challenge of using existing buildings and infrastructure more efficiently to handle this dramatic increase, and the subsequent increased volumes of baggage. Today's baggage handling systems typically start in a hall full of sorting equipment to bring checked bags together onto a conveyor system where tags are scanned, enabling bags to be manually packed into Unit Load Device (ULD) containers. ULDs are then pushed onto trailers, called dollies, that are pulled in trains of 4 by an electric tug. The efficiency of such systems is limited by the physical space available inside the baggage hall, which is typically located underneath the main terminal buildings, with no room for expansion. Furthermore, baggage handlers are working in conditions best described as being 'hostile' from a health and safety perspective. They compete for space with fuellers, in-flight catering vehicles, tugs, engineering vehicles, and the plane itself, and in extreme conditions of light (night and day), temperature (summer and winter) and noise from the plethora of vehicles and machines. The ABACAS project will overcome these challenges by developing technology to turn every trailer into an autonomous dolly (AutoDolly). This will enable many more ULDs to be moved within the same available space, and in a much more efficient manner, as each can move uniquely. 8 autonomous dollies with their own ULDs could be accommodated in the same space as a tug and 4 traditional trailers, leading immediately to a potential doubling of capacity. ABACAS will be delivered by RDM, a Coventry based SME, internationally recognised as a leader in autonomous technology, supported by Changi Airports Group (CAG), operator of Singapore international airport and Civil Aviation Authority of Singapore (CAAS), a pioneer of aircraft & airside operational safety and implementation of advanced technology. The project will build upon new ideas and technology arising from previous Innovate UK projects; SWARM and T-CABs. This UK based intellectual property will be used as the foundation for further innovation in airside autonomous systems. Through this project, RDM will take to market the electric AutoDolly systems that will enhance the competitiveness and robustness of the UK's aviation sector and make working airside safer.

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