DRIVING ENERGY EFFICIENCY FOR SUSTAINABLE MANUFACTURING

CONTEXT

Energy efficiency in the manufacturing industry has become a significant area of focus in recent years, primarily driven by increasing concerns about climate change and the escalating costs of energy. Companies are looking to understand and monitor their energy usage to identify potential areas for improvement. However, they face several challenges while attempting to improve their energy efficiency practices.

This problem statement is co-owned by two companies. The first challenge owner is a solution provider that focuses on digitalising enterprise operations to enhance companies' operational efficiencies. They offer a proprietary solution that enables data-driven decision-making by monitoring and identifying machine performance matrix, optimising manufacturing costs for their clients. The second challenge owner serves clients like mobile device and EV/battery manufacturers to help them manage their technology asset lifecycle. They ensure efficient management (e.g. through e-waste recycling, IT asset disposition, and battery recycling) and promote sustainability throughout the product lifecycle stages, from deployment to decommissioning, disposition, and recycling.

One key challenge faced by both companies in the tracking of energy management is dealing with disparate sources of data. Fragmented systems and processes impede their ability to obtain a comprehensive understanding of energy consumption patterns and potential inefficiencies across the entire production system.

- The first challenge owner encounters difficulties in collecting data from its clients due to their varying protocols and systems. This necessitates a significant level of customisation and integration of their solution with their clients' systems, which is time-consuming and challenging for them to gather data in a standardised and cohesive manner. Merging data from different sources of their clients' manufacturing line into a unified format becomes complex due to the uniqueness of each client's protocols and systems
- Similarly, the second challenge owner experiences fragmented data sources within their own processing line. The absence of an integrated management system makes it challenging to obtain a holistic view of energy consumption across various machineries and identify the key areas or operations that contribute the most to energy usage. This lack of visibility hinders their ability to identify hotspots of excessive energy usage and recommend operation control for better energy efficiency of their production system.

Thus, the challenge owners are looking for an integrated energy management solution that can seamlessly connect with different systems and extract data in a consistent and automated manner. This would facilitate the collection, merging, and analysis of data, allowing for standardised and a more cohesive approach to energy management and optimisation within their operations.

This sector-wide challenge is supported by the Advanced Remanufacturing and Technology Centre (ARTC), as part of the A*STAR Advanced Manufacturing Startup Challenge 2023, focused on the theme of "Sustainability". ARTC is led by the Agency for Science, Technology and Research (A*STAR), in partnership with Nanyang Technological University Singapore. ARTC's expertise in advanced manufacturing and remanufacturing accelerates the transfer of innovation from applied research to industrial applications and solutions, building capabilities through collaboration with their industry members. A*STAR aims to catalyse startup challenge winners to co-innovate and co-deploy advanced manufacturing solutions through ARTC's consortium.

PROBLEM STATEMENT

How might we develop a smart energy management system to measure, monitor and control energy consumption throughout the manufacturing process to provide recommendations to optimise energy efficiency and reduce consumption?

WHAT ARE WE LOOKING FOR?

The challenge owners are looking for a smart energy management system designed to measure, monitor and control energy consumption in real-time throughout the manufacturing process.

The solution should meet the following criteria:

- Real-time monitoring of individual system usage. Ability to monitor energy usage of individual systems in real-time to enable timely intervention.
- System/ Datalake integration and data collection. Integrate easily with multiple data protocols and existing manufacturing systems and consolidate into a central repository, such as:
    - Sensors (including digital powermeters, which has different protocols from different brands) to access real-time energy consumption of machines and system;
    - Building Management System (BMS) to access HVAC (heating, ventilation, air conditioning), and other energy consuming devices within the facility;
    - Enterprise Resource System (ERP) for resource planning and inventory management.
- Dashboard. Include dashboard to present data. Utilise visuals, charts, one click-reporting to effectively visualise and simply information for easy comprehension and analysis.
- Notification alerts. The system should issue notifications or alerts when energy consumption exceeds predefined thresholds to enable prompt interventions to address these issues.

OVERALL PERFORMANCE REQUIREMENTS

- Easy to use. Intuitive and user-friendly interface.
- Scalable. Adaptable to different manufacturing environments and equipment types, allowing for international implementation.
- Capacity. The solution should be able to handle large volumes of energy data (up to six months for prototype development) without sacrificing performance and quality of the data analysis.

There are no restrictions on the geographic location of the problem solvers who may choose to apply to this challenge. However, the prototype needs to be demonstrated in Singapore.

POSSIBLE USE CASES

1. Optimising energy consumption. Andy, the manager of a battery recycling plant, requires real-time insights into energy distribution within the facility, specifically focusing on the energy consumption of individual systems. By implementing the new solution, Andy gains access to a comprehensive dashboard that enables him to monitor energy usage, receive notifications, and obtain recommendations for reducing and optimising energy consumption across the various machinery units in the recycling plant. This empowers Andy to make informed decisions to improve energy efficiency and drive sustainable practices within the facility.

2. Ease of obtaining data insights. Jerome is the technical manager for a solution provider that offers a proprietary solution for data-driven decision-making by monitoring and identifying machine performance metrics for clients. With the newly implemented solution, the data collection and analysis process are unified and standardised, reducing the need for extensive customisation for each client. The solution's predictive capabilities forecast energy consumption patterns across different manufacturing lines, regardless of variations in protocols and systems. This simplifies the data gathering process and enables the merging of data from diverse sources into a cohesive

format. As a result, the turnaround time for Jerome's team to provide the necessary data to its clients has been reduced, resulting in increased customer satisfaction.

WHAT'S IN IT FOR YOU

- SGD50,000 of prize money for each winner of this challenge (see Award Model)
- Access to IMDA's innovation consultancies (e.g. Design Thinking, Digital Storytelling, UI/UX) and PIXEL corporate innovation hub (e.g. hot-desking, project studios, ARVR, usability, 5G test labs) for prototyping and commercialisation
- SGD150,000 A*STAR Innovation Voucher and 2-year ARTC membership
- Shortlisted 3 Grand Winners of the Startup Challenge 2023 to be fast tracked to ESG's SLINGSHOT Top 50 and can look forward to SGD30,000 Startup SG grant
- Opportunity to commercialise solution for deployment and adoption by ARTC members

EVALUATION CRITERIA

The evaluation process shall take place over two stages. Proposals shall be evaluated based on the evaluation criteria set out for the first stage. Thereafter, shortlisted proposals shall be subjected to a second stage evaluation in the form of an interview / pitch, and the scoring shall be based on a re-defined assessment criteria for the selection of the challenge finalist(s).

Solution Fit (20%)	Relevance: To what extent does the proposed solution address the problem statement effectively?
Solution Readiness (40%)	Maturity: How ready is the proposed solution to go to the market? Scalability: Is there any evidence to suggest capacity to scale?
Solution Advantage (20%)	Quality of Innovation: Is the solution cost effective and truly innovative? Does it make use of new technologies in the market, and can it potentially generate new IP?
Company Profile (20%)	Business Traction/Model: Does the product have user and revenue traction? Is the company able to demonstrate financial capabilities and resources to complete the prototype? Team Experience: Do the team members possess strong scientific/technical background?

AWARD MODEL

30% of the prize money will be awarded to each selected finalist at the start of the POC/prototype development process. The remaining 70% will be awarded after completion of the POC/prototype solution, based on milestones agreed between Problem Owner(s) and the solver. Prize money will be inclusive of any applicable taxes and duties that any of the parties may incur.

Note that a finalist who is selected to undertake the prototype development process will be required to:

- Enter into an agreement with Problem Owner(s) that will include more detailed conditions about the prototype development;
- Complete grant application form(s) with IMDA that will require more financial and other related documents for potential co-funding support.

Teams with public research performers are required to seek an endorsement from their respective Innovation and Enterprise Office (IEO) and submit the IEO form together with the proposal.

DEADLINE

All submissions must be made by **11 August 2023, 1600 hours (SGT/GMT +8)**. Problem Owner(s) and IMDA may extend the deadline of the submission at their discretion. Late submissions on the OIP, or submissions via GeBIZ, will not be considered.