Energy generation technology for enhanced capability on critical missions

Identify the problem

Energy availability is the most limiting factor for critical missions on earth and in space. In a Defence domain a power management strategy is shaped by the weight, duration, environment, detectability, need for unmanned or manned to name a few. All major defence forces are dedicating resources to find next generation power generation technologies that will enhance capability and give them a critical edge over adversaries. To a Space mission, power and heat generation can determine operability across an array of applications. During a lunar night, for example, a mission may not carry enough conventional battery power to run electronics and the heating required. As a result, mission operators must attempt to wake a spacecraft after the lunar night, often missing out on two earth weeks of valuable data collection. The most difficult balance to reach is in the payload planning. The aim is to launch as much useful equipment as possible with adequate power generation and storage to allow assets to perform the tasks assigned to them. These limitations are currently holding back humankind's ability to explore beyond this world, while protecting against the threats of the one we live in.

The solution

The scientific team in the entX Space and Defence pillar are progressing energy generation technologies that are poised to impact these sectors by facilitating step changes in capability enhancement that provide the revolutionary solutions to the limited equipment availability problem where we really need it.

The GenX radioactive battery uses a combination of novel semiconductor assembly and an internalized radioactive layer of beta-isotope to generate electrons. Coupled to an electrode system, the GenX provides long term power for decades, depending on the selected isotope. The GenX, in a defence application, will trickle charge lithium batteries without the need to start a generator, often giving away a covert position. The GenX will also provide primary or tertiary power for unmanned equipment operated remotely for extended periods in land, air and sea domains.

The entX Radioisotope Heating Unit (RHU) is based on a NASA design, however, substituting the plutonium heating core with a selection of beta emitting radioisotopes. This significant development now makes the technology available to civil and commercial space programs. Now, an RHU can be launched without the lengthy senior political approvals process and without the prohibitive safety concerns. The entX RHU is in the tens of grams and solves the payload planning crisis when attempting to design a mission to endure lunar nights without carrying excessive battery and electric heater mass. Now commercial missions can constantly operate collecting, processing and transmitting critical data which will provide a better mission ROI.

The current Market

The global space and defence sector, experiencing rapid growth, is forecasted to reach a revenue of USD $1 trillion by 2040, with 5-10% (approx. USD $50 - $100B) allocated to energy supply. While these entX technologies will substitute existing energy generation and storage capability, our defence clients believe that our successful technology R&D is poised to inspire the development of new technologies around this enhanced energy availability. The upside is somewhat unfathomable at this point.

Features and Benefits

Unique Intellectual Property: entX possesses exclusive intellectual property for electrode configurations and semiconductor technology, ensuring market-leading power densities, simplified manufacturing, and potential world-leading efficiencies.
Volume Manufacturing Philosophy: Unlike competitors, entX adopts a volume manufacturing philosophy, facilitating a platform approach for broader applications and scalability.
Focus on Radioisotope Recycling: entX prioritizes radioisotope recycling from waste streams, offering a sustainable, long-term supply of low-cost materials.
Systems Integration: entX recognises that rapid uptake for these energy generation technologies will benefit from a systems engineering capability to assist clients in integrating the GenX and/or RHU into existing platforms and subsystems. entX has added systems engineers and payload integrators to the team.

Competitive advantage

entX diversity is the very thing that has assisted bridging the commercialisation gap that has seen the demise of many promising technology developers. Our technical teams work across a number of projects. While the technologies are diverse, the core of entX's capability is nuclear and materials science with chemical engineering. Our teams cross pollinate ideas and focus on projects that require the effort at the right time. No-one sits still.

entX leverages our strong relationships with academia and industry partners. This has resulted in a high success rate for awarded grants. This also translates to gaining access to the best academic minds and facilities, along with industry stakeholders who provide expertise and capability that entX entrusts to drive towards commercialisation. Our grant funding has complimented capital raising and has propelled our programs forward to designated Technology Readiness Level advancement outcomes. Projects are led by a management team with decades of experience in resources, energy, defence and automotive R&D.

The competition

The GenX has few commercial peers beyond technology development projects in the academic sector and those devices that generate milliwatts of power with isotopes like tritium. The commercial competition is convention battery manufacturers, solar (PV) generation and combustion engine generators.

The RHU is currently under research and development in a number of markets using similar types of isotopes including americium and strontium. These are all attempting to substitute plutonium, where entX is focusing more of shorter lunar based missions where availability is required for between a few months and five years. The race will be to get space qualified and gain flight heritage in order to open up to commercial markets.

The Revenue Model

entX has commenced early demonstrator and prototyping work. Clients will often sponsor the latter stages of this work, which has already occurred with the GenX securing a rapid prototyping contract with an Australian Commonwealth customer. As the technologies align closely with Australian and allied nations' technology development roadmap, grant funding will provide a critical early source of capital. Once commercial, our technologies will be specified and sold into programs during the early design phases. Recurring revenue will be underpinned by committed defence and space programs.

Milestones