

## **An Innovative High Energy Density Power Pack for Portable and Off-Grid Power Applications**

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**Abstract :** This research focuses on developing a compact and light Hydrogen Generator (HG), coupled with fuel cells (FC) to provide a High-Energy-Density Power-Pack (HEDPP) solution, which is 10 times Li-Ion batteries. The HEDPP is designed for portable & off-grid power applications such as Drones, UAVs, stationary off-grid power sources, unmanned marine vehicles, and more. Hydrogen gas provided by this device is delivered in the safest way as a chemical powder at room temperature and ambient pressure is activated only when the power is on. Hydrogen generation is based on a stabilized chemical reaction of Sodium Borohydride (SBH) and water. The proposed solution enables a 'No Storage' Hydrogen-based Power Pack. Hydrogen is produced and consumed on-the-spot, during operation; therefore, there's no need for high-pressure hydrogen tanks, which are large, heavy, and unsafe. In addition to its high energy density, ease of use, and safety, the presented power pack has a significant advantage of versatility and deployment in numerous applications and scales. This patented HG was demonstrated using several prototypes in our lab and was proved to be feasible and highly efficient for several applications. For example, in applications where water is available (such as marine vehicles, water and sewage infrastructure, and stationary applications), the Energy Density of the suggested power pack may reach 2700-3000 Wh/kg, which is again more than 10 times higher than conventional lithium-ion batteries. In other applications (e.g., UAV or small vehicles) the energy density may exceed 1000 Wh/kg.

**Keywords :** hydrogen energy, sodium borohydride, fixed-wing UAV, energy pack

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