Answers to Toyota's question

1. Compared to the alkaline water electrolysis system or other existing systems, what would be the advantage for H2Power's technology in terms of cost effectiveness & efficiency? Or any issues?
    - The H2 Power process occurs in minutes and is 100% efficient without any emissions or the need for additional chemicals, catalysts, or externally supplied power.
    - Our data shows a positive energy balance for our solution with less than 33kW per kg of hydrogen produced.
    - The low CO2 balance will vary with the smelting process and the source of electricity used throughout the rest of the life cycle.
    - The hydrogen production process of our mixers operates at room temperature.
    - Our solution works with industrial water and sea water. Alumina is filtered out between each cycle and water is added as necessary before the next one.
    - Low CAPEX expenditure with proprietary equipment for refueling stations based on 40ft container modules offering a small footprint and quick installation.
    - The quick reaction allows smaller size of gaseous hydrogen storage at refueling stations.
    - Low-cost and safe transportation and storage of aluminium powder.
    - The by-product of the reaction is non-toxic (aluminum oxide) which can be reused for existing business applications.
    - Our solution enables the deployment of hydrogen refueling stations anywhere in the world at locations equipped with a supply of industrial water and electricity to power the equipment.
    - The raw material is available: Europe and the U.S. recently qualified aluminum and alumina as critical raw materials and want to limit the export of 3 million tons of scrap aluminum annually, 50% of which is cast aluminum and unwanted by recyclers.
    - H2 Power validated its industrial process by making powder from untreated aluminium scrap provided by Toyota Tsusho. The resulting powder produced 1220ml of hydrogen per 1g of powder.
    - Toyota paid up to $30 per kg of hydrogen for its customers in California in 2023. The Inflation Reduction Act offers a $3 tax credit per kg of green hydrogen; The States of Illinois and Colorado offer an extra $1 tax credit per kg of green hydrogen, and H2 Power could offer Toyota's customers a discount of up to $2 per kg of hydrogen at the pump in repayment for the scrap provided. For a sale price of 1kg of hydrogen at $15, Toyota's customers would pay $10 in the US, and $9 in Illinois and Colorado.

2. We think that a transformation of aluminum into powder is unique and innovative, is this technology something only H2 Power could do?
    Yes, we have a worldwide and exclusive license for this technology patented by the U.S. Army Laboratory. It is recognized by experts as the most efficient hydrogen production process for the environment, and accessible to everyone around the world. That's why we would like to collaborate with the market leader for hydrogen vehicles. We can produce clean hydrogen using Toyota's aluminum scrap and attract potential buyers of its hydrogen vehicles by offering a discount on the kg of hydrogen at H2 Power's hydrogen refueling stations, anywhere in the world.

3. Is your technology patented for the whole process of the transformation, or just partially?
    - The patent covers all key elements of the whole transformation process.
    - Please refer to the Japanese Patent Office for more details on the patent (see attached certificate).

	H2 power	Electrolysis	Comparison
Efficiency	Aluminum-based nanogalvanic alloys, including those with tin, produce hydrogen rapidly at room temperature without the need for external energy inputs, chemicals, or catalysts. This method demonstrates a high yield, producing 1000 ml of hydrogen per gram of aluminum in under a minute	Electrolysis involves splitting water into hydrogen and oxygen using electricity. The efficiency of converting electricity to hydrogen is a key focus, with ongoing efforts to improve this over a wide range of operating conditions.	Nano-galvanic technology shows a higher immediate efficiency in hydrogen production without needing external power, whereas electrolysis efficiency is dependent on the electricity source and technology used.
Practicality	These alloys can be produced using low-energy processes like ball milling at room temperature and remain stable under standard conditions. However, the practicality of scaling this method for industrial hydrogen production is not fully established.	Electrolyzers used in electrolysis vary in size and can be scaled from small, appliance-sized equipment for distributed production to large-scale facilities tied to renewable or non-greenhouse-gas-emitting electricity sources.	Electrolysis offers scalable and diverse application options, making it more practical for large-scale production compared to the less established scalability of nano-galvanic technology.
Environmental Impact:	The reaction by-products are non-toxic, and no additional health hazards have been observed with handling the nanogalvanic powders, indicating a low environmental impact.	Hydrogen production via electrolysis can result in zero greenhouse gas emissions, especially when powered by renewable or nuclear energy sources. However, the environmental benefits depend on the electricity source, with some regions' power grids not ideal due to greenhouse gas emissions from electricity generation.	Both technologies offer environmentally friendly hydrogen production, but electrolysis's impact is closely tied to the source of electricity used.
Safety	The safety profile is favorable due to the absence of hazardous materials or complex processes in the production of hydrogen.	The safety of electrolysis is well-established, with a focus on improving the durability of electrolyzer systems and understanding their degradation processes to enhance operational life.	While both technologies have favorable safety profiles, electrolysis is a more mature technology with established safety protocols, compared to the emerging nano-galvanic method.

In conclusion, while nano-galvanic aluminum-tin powder technology shows promising efficiency and safety, its practicality and scalability are less clear compared to the well-established and scalable electrolysis method. The environmental benefits of both methods are significant, but they depend on various factors like the source of electricity for electrolysis and the scalability of nano-galvanic technology.