Hydrosonics

Boosting Hydrogen Production Using Sound

Los Alamos NATIONAL LABORATORY

TECHNOLOGY SNAPSHOT

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APPLICATION AREA

Sector: Climate & Energy Transition

Area: Hydrogen Futures

Industry: Renewable Energy

Market: Alkaline Electrolyzer Systems

PARTNERSHIP OPPORTUNITIES

This is a startup and license opportunity.

- ☐ Cooperative Agreement
- ☒ License
- ☐ Tech Assistance
- ☒ Start-up Opportunity

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TECHNOLOGY READINESS LEVEL: 4

Validated (functionality) in lab research

IP STATUS

Patent Pending

OVERVIEW

Laboratory scientists have demonstrated the use of ultrasound to clean oxidation off the surface of electrolyzer components during operation, measurably improving hydrogen production of alkaline electrolyzer systems and making them competitive with more costly and material-constrained Polymer Electrolyte Membrane (PEM) electrolyzer systems. Hydrosonics can be used to clean both H_2 and O_2 electrodes on-demand. This minimizes the use of energy to clean the electrodes, while enabling integration with renewable energy.

The Hydrosonics solution clamps on to new or existing novel alkaline electrolyzer systems, consistently and significantly increasing the performance of these systems without compromising the electrolyzer lifetime.

Currently, alkaline electrolysis systems account for over 1000MW of hydrogen production with production expected to grow 100x as early as 2027. There will be a need for additional electrolysis systems to be built and solutions to expand H_2 productivity will grow along with this market.

There is interest in spinning out this opportunity.

ADVANTAGES

- ☑ Significantly increase/restore hydrogen production without increasing power consumption.
- ☑ Sustain higher hydrogen production levels without impacting the life expectancy of the electrolyzer.
- ☑ Enable system integration with intermittent renewables (solar and wind) by lowering degradation due to start-stop operation.
- ☑ Operators have the ability to choose whether to sustain current hydrogen production volume using less electric power or to increase production volume at current operating costs.

NNSA National Nuclear Security Administration

TECHNOLOGY DESCRIPTION

Enhanced performance and electrode recovery has been demonstrated using nickel in a liquid alkaline electrolyzer catalyst test article. Laboratory staff are extending the demonstration process with industry-relevant Ni-based electrodes and developing a prototype device to validate results in a commercially relevant electrolyzer test device.

MARKET APPLICATIONS

Hydrosonics would serve the rapidly growing market for electrolyzers used for clean hydrogen production. Electrolyzer capacity is typically measured in wattage. At the end of 2021, global electrolyzer capacity was about 510 MW. It surpassed 1,000 MW (1 GW) by the end of 2022, and according to public estimates is now expected to reach nearly 9,000 MW (9 GW) by 2026This is expected to almost 150 GW by 2030 and could reach 1,500 GW by 2040. Presently, there are nearly 500 electrolyzer deployment projects globally. The electrolyzer market is comprised of three major segments: Alkaline water electrolyzers comprise over two-thirds of the installed bases, and Hydrosonics innovation is particularly applicable for retrofitting existing alkaline water electrolyzers as well as for designing into next generation products. This innovation may also benefit other electrochemical systems where electrode degradation due to oxidation is a concern, such as in batteries and in water purification.

NEXT STEPS

Hydrosonics has successfully demonstrated effect in electrocatalysts and in industry-relevant reactions. The next steps include demonstrating Hydrosonics in industry-ready conditions, on a lab-scale commercial system, and run a field test in a facility with a large-scale electrolyzer. There is interest in spinning-out this technology, a co-founder with a business development background in energy is needed for this startup opportunity.