

Novacium's METAGENE™ On-Demand, Autonomous, Hydrolysis-Based and Pressurized Hydrogen Production System Reaches Major Milestone

- The METAGENE™ technology harnesses hydrogen released from low-cost and low-carbon footprint metallic alloys via hydrolysis, establishing an autonomous, on-demand pressurized energy process
- Lab scale pilot tests results help strengthen the patent application before progressing to PCT national phase and reaching 'Patent Pending' status
- Patent examiners' offices reports highlights the METAGENE™ unique innovation and robustness without any anteriority, which is very rare
- The technology simplicity and safety potential attract interest from defence related institutional and industrial partners in Europe who have pre-selected the project for a grant allocation to finance up to 75% of the €1 million cost of manufacturing an Industrial scale pilot plant
- The Technology's key innovation lies in its use of a non-powder-based, non-explosive, and non-hazardous consumable energy source to produce hydrogen. This stands in contrast to traditional processes, which rely on highly explosive fossil fuels or nano- and micro-sized metallic powders as combustibles
- In addition to being a Novacium shareholder HPQ holds an exclusive North American (Canada, USA and Mexico) METAGENE™ licence

Montreal, Canada, November 20th, 2024 — [HPQ Silicon Inc.](#) (“HPQ” or the “Company”) ([TSX-V: HPQ](#), [OTCQB: HPQFF](#), [FRA: O08](#)), a technology company specializing in green engineering of silica and silicon-based materials, is pleased to update shareholders on the latest hydrogen milestones achieved by its France-based affiliate, NOVACIUM SAS (Novacium).

A disruptive technology

Novacium METAGENE™ is an autonomous on demand hydrogen production system using hydrolysis which can generate compressed hydrogen at pressures needed for industrial civilian and military applications.

The Patent Pending technology's key innovation lies in its unique ability to use a bulk, non-explosive, and non-hazardous aluminum silicon-based alloy as the consumable energy source for hydrogen production. This breakthrough addresses the two critical issues highlighted in an [August 21, 2021 MIT News Article](#) that have hindered aluminum from being used as a safe and economical hydrogen source: ensuring the aluminum surface remains clean and reactive with water and enabling the use of scrap aluminum from various sources as feedstock, since pure aluminum is energy-intensive to mine and produce.

METAGENE™ offers another unique advantage: the process operates without requiring electricity, extensive storage, or complex transportation infrastructure, providing a truly autonomous solution. In contrast, traditional hydrogen production systems, such as electrolysis and steam methane reforming, are capital-intensive, emit significant amounts of carbon, and depend on large quantities of electricity, along with costly storage and complex logistical transportation infrastructures.

Technology validated at lab scale

In July 2022, a lab-scale pilot plant was designed, built, and assembled at Novacium's laboratory. Preliminary tests were conducted over a 10-month period, culminating in the filing of a provisional patent application in May 2023 for a low-carbon-footprint, chemical-based, on-demand, high-pressure autonomous hydrogen production system (HPQ September 7, 2023, release).

Testing continued over the 18 months leading up to the patent's progression to the PCT national phase. During this time, efforts focused on completing the scale-up design for an industrial pilot plant and initiating discussions with potential clients to secure grant financing covering 35% to 75% of the costs required to deliver the first working prototype.

As shown in the image below, the process uses a bulk, non-explosive, and non-hazardous aluminum-silicon-based alloy as the consumable energy source to produce hydrogen. [[link to a short video demonstrating the reaction](#)].

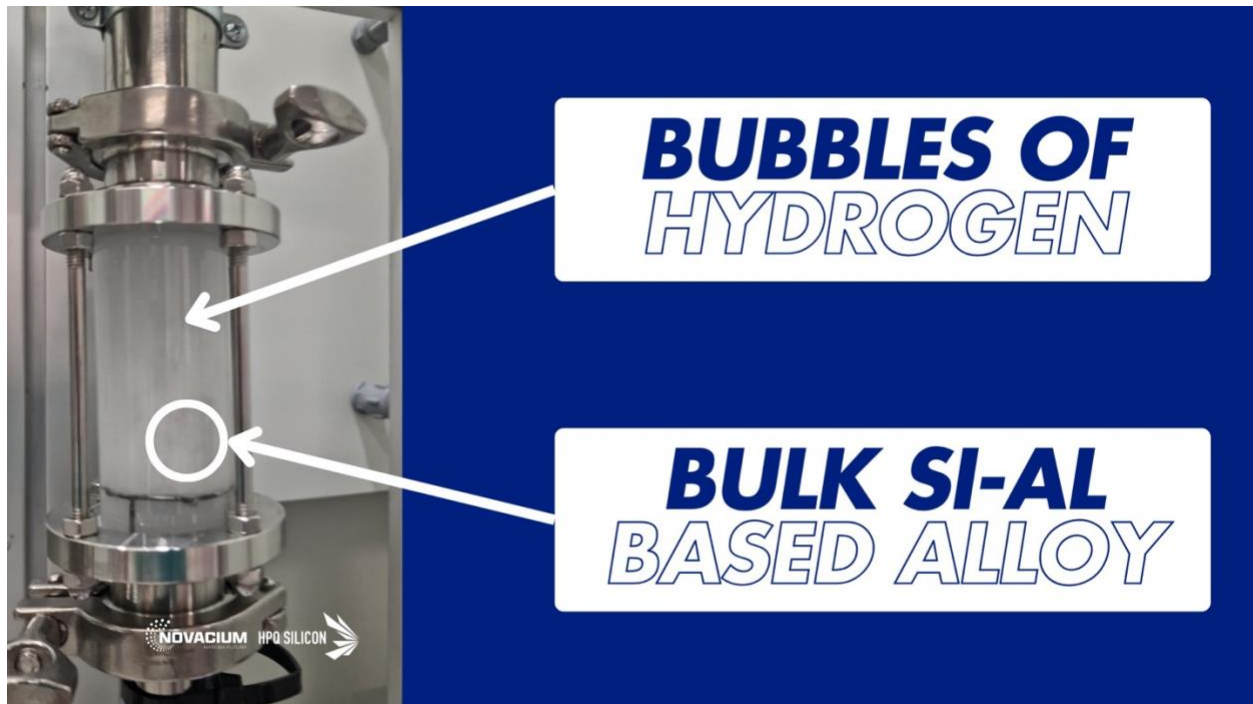


Image 1) Lab-scale pilot plant reactor in action

Very positive research report from patent examiners received prior to entering the PCT national phase

In October 2024, Novacium received a highly commendatory research report from the patent examiner's office reviewing its provisional patent application. The report not only highlighted the unique value proposition of the technology but also stated that no prior art could be identified, making the patent very strong.

"It is rare, in a field as established as hydrolysis, to achieve a true technological breakthrough," said Dr. Jed Kraiem, Chief Operating Officer of Novacium. *"The recognition of our process as unprecedented, with no prior art, demonstrates that it is still possible to push the boundaries of innovation, even in mature fields."*

"For startups like HPQ and Novacium, having a solid intellectual property portfolio is crucial. It not only allows us to protect our technologies but also enhances their value and strengthens our position in the market," added Dr. Kraiem.

Technology generates strong interest from defence and civilian related partners in Europe

METAGENE™'s strategic potential has already drawn significant interest for military applications requiring off grid compressed hydrogen production process from the French Defence Procurement Agency (DGA). As a result, Novacium has been pre-selected by the DGA for funding under the RAPID program, which supports SMEs developing innovative technologies for the French armed forces.

The RAPID program, an acronym for 'Régime d'Appui pour l'Innovation Duale' (Support Scheme for Dual Innovation), is a highly selective program that supports projects with both civil and military applications, enabling companies to develop cutting-edge technical innovations.

This grant financing, representing 75% of the project cost of €1 million, will enable Novacium to accelerate the development phase of its prototype, designed to test high-pressure hydrogen production capabilities under real-world conditions.

The French army, through its Technical Section (STAT), will be the first player to test this technology in real environments. STAT's mission is to evaluate equipment and technological solutions that can meet the operational needs of the land forces, and METAGENE™ hydrogen production technology perfectly meets the mobility, safety and reliability requirements required for missions in difficult conditions.

“By providing the armed forces with the means to produce hydrogen on the ground, this innovation could represent a major step forward in achieving energy autonomy for European and North American armed forces. It strengthens their ability to operate independently without relying on conventional energy networks,” said Bernard Tourillon, President and CEO of HPQ Silicon Inc. and NOVACIUM SAS. *“With its exclusive license, HPQ is well-positioned to introduce this innovative solution to North American markets.”*

About NOVACIUM SAS

Novacium is an HPQ - affiliated company that started in Q3 2022. This green technology startup is based in Lyon, France and is a partnership with HPQ and three of France's leading research engineers, Dr. Jed KRAIEM PhD, Novacium's Chief Operating Officer (“COO”), Dr. Oleksiy NICHIPORUK PhD, Novacium's Chief Technical Officer (“CTO”), and Dr. Julien DEGOULANGE PhD, Novacium's Chief Innovation Officer (“CIO”). Novacium is a new Research and Development company which allows researchers to develop their own technology in high-added-value fields connected to renewable energy and allows HPQ Silicon Inc. a Canadian company, to expand the depth and reach of its technical team to help develop its silicon and new renewable energy projects.

About HPQ Silicon

[HPQ Silicon Inc. \(TSX-V: HPQ\)](#) is a Quebec-based TSX Venture Exchange Tier 1 Industrial Issuer.

HPQ is developing, with the support of world-class technology partners [PyroGenesis Canada Inc.](#) and [NOVACIUM SAS](#), new green processes crucial to make the critical materials needed to reach net zero emissions.

HPQ activities are centred around the following four (4) pillars:

- 1) Becoming a green low-cost (Capex and Opex) manufacturer of Fumed Silica using the **FUMED SILICA REACTOR**, a proprietary technology owned by HPQ Silica Polvere Inc being developed for HSPI by PyroGenesis.
- 2) Becoming a producer of silicon-based anode materials for battery applications with the assistance of NOVACIUM SAS.
- 3) HPQ SILICON affiliate NOVACIUM SAS is developing a low carbon, chemical based on demand and high-pressure autonomous hydrogen production system.

- 4) Becoming a zero CO₂ low-cost (Capex and Opex) producer of High Purity Silicon (2N+ to 4N) using our **PUREVAP™ “Quartz Reduction Reactors” (QRR)**, a proprietary technology owned by HPQ being developed for HPQ by PyroGenesis.

For more information, please visit [HPQ Silicon web site](#).

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For further information contact:

Bernard J. Tourillon, Chairman, President, and CEO Tel +1 (514) 846-3271

Patrick Levasseur, Director Tel: +1 (514) 262-9239

Email: Info@hpqsilicon.com