



INTERNAL TECHNICAL AND ECONOMIC STUDY INDICATES HPQ FUMED SILICA REACTOR'S ROBUST POTENTIAL AT COMMERCIAL SCALE

MONTREAL, Canada, January 10th, 2024 — [HPQ Silicon Inc.](#) ("HPQ" or the "Company") ([TSX-V: HPQ](#)) ([OTCQB: HPQFF](#)) ([FRA: O08](#)), a technology company specializing in green engineering processes for silica and silicon material production is pleased to announce the completion of an internal technical and economic study (the "Study") related to its proprietary Fumed Silica Reactor technology. The study was prompted by an inquiry from a participant in the Fumed Silica industry under NDA.

The study assessed the technical and economic viability of quickly scaling up the HPQ Silica Polvere's Fumed Silica Reactor (FSR) from the current 50 tonnes per year (TPY) pilot plant configuration to a 1,000 TPY commercial configuration, following the successful completion of the pilot plant testing phase.

The significance of this preliminary assessment lies in its confirmation of the technical feasibility of rapid scaling up to a 1,000 TPY FRS [1] while preserving the best-in-class environmental advantages inherent in the FSR technology [2]. Moreover, the study unveiled its robust economic potential, emphasizing potential EBITDA margins three times higher than the industry average of 20% [3] and a capital investment 93% less than that required for building a conventional Fumed Silica plant [4].

"The shift of interest in our Fumed Silica offering, from the initial signing of our first NDA to explore the material commercial potential to a current keen focus on the commercial scalability potential of our proprietary Fumed Silica Reactor technology, marks another major step forward for HPQ Silica Polvere," said Mr. Bernard Tourillon, President and CEO of HPQ Silica Polvere Inc. and HPQ Silicon Inc.

IMPLEMENTING AN INCREMENTAL COMMERCIALISATION STRATEGY FOR HPQ POLVERE FUMED SILICA

To meet the anticipated demand for low carbon fumed silica materials, HPQ Polvere commercialisation strategy is based on building a 1,000 tonnes per year (TPY) Fumed Silica Reactor and scaling up capacity to meet demand with an additional 1,000 TPY Fumed Silica Reactor.

To prepare the internal economic study, HPQ Polvere management used technology provider and equipment supplier [PyroGenesis Canada Inc.](#) ([TSX: PYR](#)) ([OTCQX: PYRGF](#)) ([FRA: 8PY](#)) (PyroGenesis) rough order of magnitude study regarding the cost of building the first 1,000 tonnes per year (TPY) Fumed Silica Reactor. HPQ management then used selling prices for the Fumed Silica and potential operating costs from information derived from third party sources and publicly available data.

The salient points of the internal economic study indicate that the HPQ Fumed Silica Reactor will have:

- Capex between US\$ 9.00 and US\$ 10.00 cost per Kg of annual capacity [5]
- Energy consumptions between 10 – 15 KWh per Kg of Fumed Silica [6]
- EBITDA margins between 60% and 65% [7]
- Payback period per 1,000 TPY Reactor of around 1.7 years [8]

"HPQ Silica is uniquely positioned to be the sole provider capable of supplying the materials required to meet the increasing demand for low carbon Fumed Silica products," added Mr. Tourillon. *"This demand is anticipated to necessitate the deployment of numerous 1,000 TPY Fumed Silica Reactors in the future."*

While HPQ Polvere technology is the only ultra-low carbon footprint process, no green premium was used when calculated the selling price of the material used for the internal economic study.



HPQ POLVERE DISRUPTIVE ADVANTAGES IN ONE TABLE

	FUMED SILICA MANUFACTURING		
	USING TODAY CONVENTIONAL PROCESSES	WITH HPQ POLVERE FUMED SILICA REACTOR	HPQ POLVERE DISRUPTIVE ADVANTAGES
CAPEX (Cost per Kg of capacity)	US\$ 145.91	US\$9.50	93% Less ^[3]
Energy Consumption (kWh / Kg of Fumed Silica)	100 – 120 ^[9]	10 – 15 ^[10]	87.5 to 90% Less
EBITDA Margins	20%	60% - 65%	3X better ^[3]
GHG Impact (Kg CO2 eq / Kg of Fumed Silica)	8 – 17 ^[9]	1 – 2.5 ^[6]	84 to 88% Less
European Carbon Taxes (90€ per tonne released ^[11])	720€ - 1 530€	90€ - 225€	630€ to 1 350€ Less
HCl Production (Kg / Kg Fumed Silica)	2.4 ^[12]	0	NO HCl GAZ

“This table clearly shows that HPQ Polvere Fumed Silica Reactor (FSR) has many disruptive advantages that can **threaten traditional Fumed Silica Manufacturing and can be a significant opportunity for HPQ and its shareholders,**” continued Mr. Tourillon.

HPQ management plans to update and further validate these projections when more data is collected from an upcoming pilot plant testing phase later in the year. This will be achieved with the completion of an engineering cost and feasibility study that will be conducted by an independent party at the appropriate time.

REFERENCE SOURCES

- [1] The scale-up from the 50 TPY pilot plant to a commercial 1,000 TPY represents a factor of 20. Literature on the subject, such as 'Plant Design and Economics for Chemical Engineers' by Peters & Timmerhaus, suggests that scale-ups of pilot equipment to industrial scale, by a factor of 5, 10, or 20, are reasonable and easily achievable.
- [2] HPQ Silicon [June 13, 2023](#), and [November 8, 2023](#) releases.
- [3] Average EBITDA margins of 20% are derived from two sources, [with Link #1 leading to Source #1](#) and [Link #2 leading to Source #2 \(Specialty Additives division\)](#). Management has calculated the EBITDA margins for the Fumed Silica Reactor (FSR) based on data derived from third party sources and publicly available information. These figures will be updated upon completion of the pilot testing phase. The 5% range in HPQ Polvere's EBITDA margins takes into account PyroGenesis' option to convert its 10% royalties into a 50% ownership stake in HPQ Polvere's remaining equity.
- [4] Traditional Fumed Silica manufacturing involves a complex three-step process. Step 1: Conversion of Quartz to Silicon Metal (Si), with an average Capex of around US\$9.38 per kilogram of annual capacity ([for reference, the PCC BakkiSilicon Plant in Iceland cost US\\$300 million for an annual capacity of 32,000 tonnes](#)). Step 2: Conversion of Si to Silicon Tetrachloride (SiCl₄), with an average Capex of approximately US\$125.00 per kilogram of annual capacity (e.g., [Wacker Chemie AG Polysilicon's US production plant cost US\\$2.5 billion for an annual capacity of 20,000 tonnes](#)). Step 3: Burning Silicon Tetrachloride (SiCl₄) with Hydrogen and Oxygen to produce Fumed Silica (SiO₂), incurring an average Capex of around US\$11.54 per kilogram of annual capacity ([Wacker Chemie AG's US Fumed Silica plant cost US\\$150 million for an annual capacity of 20,000 tonnes](#)). The combined Capex for these three steps averages at US\$145.92 per kilogram of annual capacity. According to a rough order of magnitude study by PyroGenesis, our one-step process for making Fumed Silica is estimated to have an average Capex per kilogram of annual capacity between US\$9.00 and US\$10.00, which is approximately 93% less than traditional processes.

- [5] According to a rough order of magnitude study by PyroGenesis, our one-step process for making Fumed Silica is estimated to cost about CAD\$13 million, which equals an average Capex per kilogram of annual capacity between US\$9.00 and US\$10.00.
- [6] The 1 Kg eq of CO₂ per Kg of Fumed Silica is based on [Hydro Quebec data](#) that indicate in Quebec 1.3 g of CO₂ are generated eq per KWh. While the 2.5 is based on the Canadian average for electricity generation carbon intensity of 150 g per KWh.
- [7] Management has calculated the EBITDA margins for the Fumed Silica Reactor (FSR) based on data derived from third party sources and publicly available information. These figures will be updated upon completion of the pilot testing phase. The 5% range in HPQ Polvere's EBITDA margins takes into account PyroGenesis' option to convert its 10% royalties into a 50% ownership stake in HPQ Polvere's remaining equity."
- [8] Management has calculated the Payback for the Fumed Silica Reactor (FSR) based data derived from third party sources and publicly available information. These figures will be updated upon completion of the pilot testing phase.
- [9] Frischknecht, Rolf, et al. "Life cycle inventories and life cycle assessment of photovoltaic systems." International Energy Agency (IEA) PVPS Task 12 (2020).
- [10] PyroGenesis Canada Inc.
- [11] The Wall Street Journal article, April 18, 2023, "World's First Carbon Import Tax Approved by EU Lawmakers"
- [12] Cai, H., Wang, X., Kelly, J. C., & Wang, M. (2021). Building Life-Cycle Analysis with the GREET Building Module: Methodology, Data, and Case Studies (No. ANL/ESD-21/13). Argonne National Lab. (ANL), Argonne, IL (United States).

Cautionary Statements

There can be no assurance that the economic projections upon which this Study is founded will be realized. Not limited to the viability of mass production scale-up, product optimization, financial considerations, and macroeconomic and environmental factors, several risks and uncertainties are inherently associated with any nascent technology commercialization. The Study is intended to be comprehended as a cohesive whole, and individual sections should not be interpreted or relied upon in isolation or without the accompanying context. Readers are duly advised to consider all assumptions, limitations, and exclusions that pertain to the information provided in the Study."

About PyroGenesis Canada Inc.

PyroGenesis Canada Inc., a high-tech company, is a leader in the design, development, manufacture and commercialization of advanced plasma processes and sustainable solutions which reduce greenhouse gases (GHG) and are economically attractive alternatives to conventional "dirty" processes. PyroGenesis has created proprietary, patented, and advanced plasma technologies that are being vetted and adopted by multiple multibillion dollar industry leaders in three massive markets: iron ore pelletization, aluminum, waste management, and additive manufacturing. With a team of experienced engineers, scientists and technicians working out of its Montreal office, and its 3,800 m² and 2,940 m² R&D and manufacturing facilities, PyroGenesis maintains its competitive advantage by remaining at the forefront of technology development and commercialization. The operations are ISO 9001:2015 and AS9100D certified, having been ISO certified since 1997. For more information, please visit: www.pyrogenesis.com

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 being developed for HPQ by PyroGenesis.
- 2) 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.
- 3) Becoming a producer of silicon-based anode materials for battery applications with the assistance of NOVACIUM SAS.
- 4) HPQ SILICON affiliate NOVACIUM SAS is developing a low carbon, chemical base on demand and high-pressure autonomous hydrogen production system.

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

Disclaimers:

This press release contains certain forward-looking statements, including, without limitation, statements containing the words "may", "plan", "will", "estimate", "continue", "anticipate", "intend", "expect", "in the process" and other similar expressions which constitute "forward-looking information" within the meaning of applicable securities laws. Forward-looking statements reflect the Company's current expectation and assumptions and are subject to a number of risks and uncertainties that could cause actual results to differ materially from those anticipated. These forward-looking statements involve risks and uncertainties including, but not limited to, our expectations regarding the acceptance of our products by the market, our strategy to develop new products and enhance the capabilities of existing products, our strategy with respect to research and development, the impact of competitive products and pricing, new product development, and uncertainties related to the regulatory approval process. Such statements reflect the current views of the Company with respect to future events and are subject to certain risks and uncertainties and other risks detailed from time-to-time in the Company's ongoing filings with the security's regulatory authorities, which filings can be found at www.sedar.com. Actual results, events, and performance may differ materially. Readers are cautioned not to place undue reliance on these forward-looking statements. The Company undertakes no obligation to publicly update or revise any forward-looking statements either as a result of new information, future events or otherwise, except as required by applicable securities laws.

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Source: HPQ Silicon Inc.

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