

HPQ Silicon GEN3 PUREVAP™ Quartz Reduction Reactor Pilot Plant to be Commissioned in Q4 2021

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MONTREAL, June 10, 2021 - [HPQ Silicon Resources Inc.](#) ("HPQ" or the "Company") (TSX-V: HPQ) (OTCQX: HPQFF) (FWB: UGE), an innovative silicon solutions company, is pleased to announce that technology provider PyroGenesis Canada Inc. (TSX: PYR) (NASDAQ: PYR) (FRA: 8PY) has confirmed that the *GEN3 PUREVAP™ Quartz Reduction Reactors (QRR)* pilot plant project is transitioning from the assembly phase to the commissioning and testing phases of the program and that the start of the *GEN3 PUREVAP™ QRR* will be during Q4 2021.

Mr. Bernard Tourillon, President and CEO of HPQ Silicon discusses the significance of this news in the following Q&A format.

Q1. First, before we delve into the specifics of this news, can we deal with the elephant in the room, this is not the first time that HPQ and PyroGenesis have mentioned starting dates for the *GEN3 PUREVAP™ QRR* pilot plant, what is different this time?

A. The following images, just taken in the HPQ dedicated section of PyroGenesis production facility, of Mr. P Peter Pascali, President and CEO of PyroGenesis and me next to a fully assembled *GEN3 PUREVAP™ QRR* pilot plant, demonstrates the advancement of the project. We are awaiting one final component that has been delayed due to COVID and now expect it to arrive in Q3 - sometime this summer, after all the paperwork and final inspection has been completed.

A photo accompanying this announcement is available at
<https://www.globenewswire.com/NewsRoom/AttachmentNg/a807c986-2a13-4946-9755-244abe9d9556>

Image 1) P. Peter Pascali, President and CEO of PyroGenesis & Bernard Tourillon, President and CEO of HPQ Silicon next to *Gen3 PUREVAP™ QRR* Pilot plant (right image blurred for confidentiality)

Q2. Could you refresh investor memories about the *PUREVAP™ QRR* process and how it compares versus traditional processes to make silicon (Si)?

A. Certainly, the *PUREVAP™ QRR* is a new innovative process, which will permit the one-step transformation of quartz (SiO_2) into high purity silicon metal (>99.5% Si, referred to as 2N) (patent pending #1) at reduced costs, energy input, and carbon footprint.

Q3 How does the process work and how does it compare to processes currently being used?

A. I will answer that in reverse order: As Image 2 below represents, traditional carbothermic processes to make Silicon are two steps. The first step shown here produces a semi - finished product that needs further refinement but note the energy consumption of this first step. This is almost equal to the entire energy input to make pure silicon using QRR™. These conventional processes require extremely pure feedstock, and the 6 to 1 feedstock to a semi - final product ratio results in feedstock impurities being concentrated in the silicon produced, which must be removed in complex and energy intensive second and third steps.

A photo accompanying this announcement is available at
<https://www.globenewswire.com/NewsRoom/AttachmentNg/a205a819-b9c5-493d-bdd3-bd8f7b989eca>

Image 2) Conventional First Step Carbothermic process, additional downstream refining is necessary

Furthermore, conventional carbothermic processes also have these additional drawbacks:

- New conventional plants are very capital intensive with a minimum size requirement of 30,000 metric tonnes per year (MTY), with capex exceeding USD\$600 million for new industry entrants.
- Conventional plants are not capable of having more than 40% of their production at the minimum 99.5% Si (2N+) purity threshold sought by end buyers from the Silicones, Polysilicon (Solar) and Batteries sectors.
- 20% of the cost¹ of the conventional process is directly attributable to specific low ash coal demanded by the process, however
 - For Western producers, a) there are only 2 sources in the world that can supply it (the 100% Ferroglobe owned Blue Gem Coal and Colombian coal)²; and b) a US\$ 10 per MT increase in its cost has a US\$ 13 per MT produced impact on the producer's bottom line².

¹ Ferroglobe_Investor_Day_Presentation_17_Oct_2017 (Page 40)

² Ferroglobe_Investor_Day_Presentation_17_Oct_2017 (Page 46 -41)

Now, to answer the first part, how does our QRR process work? The central advantage of the process is its unique capability (patent pending #2) of continuously operating a carbothermic process under vacuum, resulting in the early removal of impurities. As Image 3 below demonstrates, the *PUREVAP™ QRR* is the only one - step carbothermic process that can make high purity Silicon metal from quartz while efficiently removing most (99%) of the impurities present in the feedstock. Importantly, the process does not require the extremely pure feedstock required by conventional processes to make high purity Si, and it also only requires 4.5 MT of raw material to make 1 MT of Silicon, versus 6 MT of conventional.

A photo accompanying this announcement is available at

<https://www.globenewswire.com/NewsRoom/AttachmentNg/db9b3ac6-215f-4229-b0f2-68024cada295>

Image 3) the *PUREVAP™ QRR Process*. One step from Quartz to Pure Silicon Metal

Q4. What are the real-world implications for the *PUREVAP™ QRR* unique capabilities?

A. The three main advantages to QRR are as follows:

1. the *PUREVAP™ QRR* once-step process is capable of converting low quality inputs into the high purity Silicon (Si)³ metal to produce the products desired by end buyers from the Silicones, Polysilicon (Solar) and Batteries sectors. HPQ will use this material as feedstock to produce our nano silicon powders and wires.
2. The *PUREVAP™ QRR* can match the production yields of conventional processes⁴ at a much smaller scale, providing for greater flexibility. The systems are commercially scalable by increments of 2,500 MTY, and two 2,500 MTY systems built in tandem will compete very well with the Capex cost per Kg of annual capacity of Tier-1 producers for a fraction of the total investment required (85% - 90% less).
3. Finally, the *PUREVAP™ QRR* is a disruptive technology that meets the demands of today's world, lower cost, less energy intensity, and smaller carbon footprint. That smaller carbon footprint of the process is clearly critical in helping reduce GHG's, and this is before we start making carbon - capture improvements to the system which our engineers are already putting on the design board.

³HPQ February 26th 2019 Release

⁴HPQ April 25th 2019 Release

Q5. Can you talk about the addressable markets where this new process could make a difference?

A. Certainly, the addressable markets that can use HPQ *PUREVAP™ QRR* Silicon are enormous, and they can be divided in 3 following market segments:

1. The market for standard purity silicon (98.5% to 99.5%, or 2N), according to CRU latest reports, is estimated to reach 3 million MT worth over US\$ 10 Billion by 2025.
 1. The bulk of the demand will be for 2N+ Si material used as feedstock for Silicone's manufacturing, a market worth US\$ 14 Billion in 2020 that is expected to grow at a CAGR of 10.7% to US\$ 23 Billion in 2025 (source: marketsandmarkets.com).
2. According to Facts and Factor Research, the global Solar Energy Market in 2019 was approximately USD 50 Billion, it's expected to surge at a CAGR of 20% and surpass US\$ 200 Billion by 2026. This will be a key factor driving demand for Solar Grade Silicon (SoG-Si).
3. Energy storage demand is about to explode, with Investment dedicated to energy storage exceeding \$40 billion by 2040 (BNEF) and this will have a massive impact in the newly emergent market for Nano Silicon material for Li-Ion and other batteries.

Q6. Final question, how excited are you about the HPQ PUREVAP™; QRR project business case going forward?

A. Tremendously I would say, I have been scrutinizing the market forces that influence the Silicon markets since 2015, and what excites me the most is the timing of the start of the pilot plant, just as we are needing QRR made feedstock for the battery revolution. It is very serendipitous. We knew if we were to enter the market, we would need to bring something very unique, or you could say, disruptive, in order to compete. Our partners at PyroGenesis ((TSX: PYR) (NASDAQ: PYR)) had the in-house capability to drive the science and engineering behind our vision, so we entered into an exclusive agreement in 2016.

At the start, the *PUREVAP™ QRR* project was dedicated to developing a new, low cost, process to make Solar Grade Silicon ("SoG-Si") to meet the demand of an ever-expanding solar market. Over time we realized that the operational efficiencies of the QRR process combined with its unique cost (Capex and Opex) advantages represented game changing opportunities in many key segments of the Silicon industry for HPQ.

Demand for higher purity Silicon (2N+ Si), materials that the *PUREVAP™ QRR* was designed to produce, but one that traditional silicon producer have a difficult time making, is about to enter a massive growth phase, driven by worldwide demand from the silicones, solar, and batteries industries. The Covid-19 pandemic accelerated the closing of old inefficient traditional Silicon plants and combining this with the chronic under investment in new conventional Silicon plants that occurred in the past decade, and the need for more efficient and environmentally friendly processes has created a perfect storm for the industry. HPQ should be a key beneficiary of this new reality.

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 products. The Company provides its engineering and manufacturing expertise and its turnkey process equipment packages to customers in the defense, metallurgical, mining, advanced materials (including 3D printing), and environmental industries. With a team of experienced engineers, scientists and technicians working out of its Montreal office and its 3,800 m² and 2,940 m² manufacturing facilities, PyroGenesis maintains its competitive advantage by remaining at the forefront of technology development and commercialization. The Company's core competencies allow PyroGenesis to provide innovative plasma torches, plasma waste processes, high-temperature metallurgical processes, and engineering services to the global marketplace. PyroGenesis' operations are ISO 9001:2015 and AS9100D certified. For more information, please visit www.pyrogenesis.com.

About HPQ Silicon Resources

[HPQ Silicon Resources Inc.](http://HPQ.SiliconResources.Inc) (TSX-V: HPQ) is a Quebec-based innovative silicon solutions company that offers innovative silica (SiO₂), silicon (Si) based solutions and is developing a unique portfolio of high value-added silicon (Si) products sought after by battery and electric vehicle manufacturers.

Silicon (Si), also known as silicon metal, is one of today's key strategic materials needed for the decarbonization of the economy and the Renewable Energy Revolution ("RER"). However, silicon does not exist in its pure state and must be extracted from quartz (SiO₂) in what has historically been a capital and energy-intensive process.

With PyroGenesis Canada Inc. (TSX: PYR) (NASDAQ: PYR), a high-tech company that designs, develops,

manufactures and commercializes plasma - based processes, HPQ is developing the *PUREVAP™ "Quartz Reduction Reactors"* (QRR), an innovative process (patent pending), which will permit the one-step transformation of quartz (SiO₂) into high purity silicon (Si) at reduced costs, energy input, and carbon footprint that will propagate its considerable renewable energy potential. Through its 100% owned subsidiary, HPQ NANO Silicon Powders Inc., the *PUREVAP™ Nano Silicon Reactor* (NSiR) is a new proprietary process that can use different purities of silicon (Si) as feedstock, to make a wide range of nano/micro spherical powders of different sizes and nanowires. For more information, please visit HPQ Silicon web site.

Disclaimers:

The Corporation's interest in developing the PUREVAP™ QRR and any projected capital or operating cost savings associated with its development should not be construed as being related to the establishing the economic viability or technical feasibility of any of the Company's Quartz Projects.

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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