

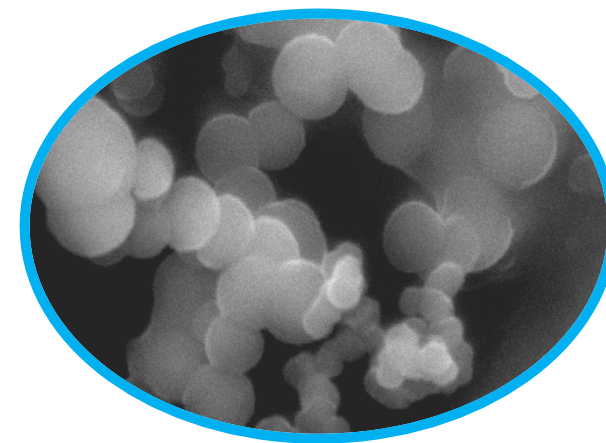
# Innovative Silicon Solutions



FROM QUARTZ



HIGH PURITY SILICON



NANO SILICON



# DISCLAIMERS

This presentation includes certain

## “FORWARD-LOOKING STATEMENTS”

All statements, (other than statements of historical fact included herein), including, without limitation, statements regarding future plans and objectives of the company, are forward-looking statements that involve various risks, assumptions, estimates and uncertainties, and any or all of these future plans and objectives may not be achieved.

These statements reflect the current expectations or beliefs of HPQ-Silicon Resources Inc. (“the Company”) and are based on information currently available to the Company. There can be no assurance that such statements will prove to be accurate, and actual results and future events could differ materially from those anticipated in such statements. All of the forward looking statements contained in this presentation are qualified by these cautionary statements and the risk factors described above. Furthermore, all such statements are made as of the date this presentation is given.

An investment in the Company is speculative due to the nature of the its business. The ability of the Company to carry out its plans as described in this confidential presentation depends on obtaining the required capital. There is no assurance that the Company will be able to successfully raise the capital required or to complete each of the growth initiatives described. Investors must rely upon the ability, expertise, judgment, discretion, integrity and good faith of the management and Board of the Company.

The Corporation is focused on developing the *PUREVAP™ processes*. The *PUREVAP™ Quartz Reduction Reactor (QRR)*, (Patent Pending) a new carbothermic process to transform Quartz into Silicon, and the *PUREVAP™ Nano Silicon (Si) Reactor (NSiR)*, (Provisional Patent applied) a new process to transform Silicon (Si) into Spherical Nano powders and Nano wires for Lithium-ion batteries. The terms Silicon, Silicon Metal and Si are used interchangeably. Metallurgical Grade Silicon or Mg Si refers to Silicon Metal of a purity between 98.0% Si and 99.5% Si.

Any monetary values given to end product produced by the equipment, projected capital or operating cost and savings associated with the development of process should not be construed as being related to establishing the economic viability or technical feasibility on any of the Company’s quartz properties or more specifically the Roncevaux Quartz Project, Matapedia Area, in the Gaspé Region, Province of Quebec.

# THE OPPORTUNITY

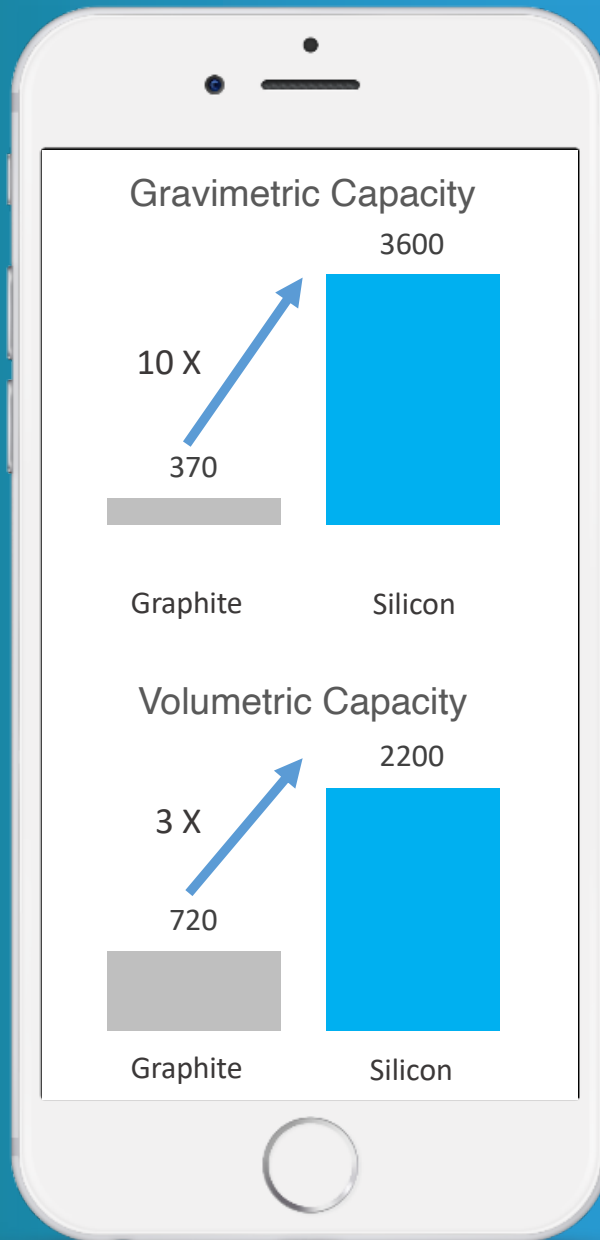
## SILICON (Si) IS NEEDED TO BREAK LI-ION BATTERIES LIMITATIONS

*“With returns from improvements in battery cathode performance beginning to taper, Berdichevsky began to consider the next bottleneck — the poor energy density of the traditional graphite anode.”*

**Gene Berdichevsky, Engineer, Employee #7 at Tesla & founder Sila Nano**

*“Silicon anodes are projected to replace graphite anodes in Li-ion batteries with a huge impact on the amount of energy stored. Silicon anodes are generally viewed as the next development in lithium-ion battery technology ... Silicon's ability to absorb more charge translates to longer battery life and smaller batteries.”*

**Yury Gogotsi, Director, A.J. Drexel Nanomaterials Institute, Drexel University**



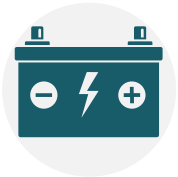
# THE CHALLENGES

## DEPLOYMENT OF SILICON (Si) IN BATTERIES FACE CHALLENGES



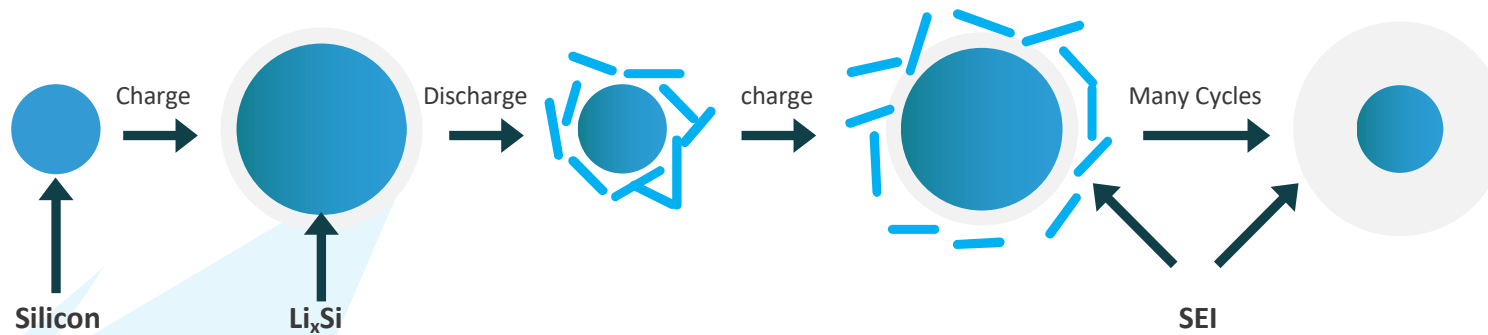
### THE BIG ONE

- The volumetric fluctuations (>300 %) of Silicon (Si) during charge/discharge cycles lead to irreversible energy storage capacity loss



### WHY

- Repeated exposure of the fresh silicon surface to battery electrolyte lead to a continual reformation of the Solid electrolyte interphase (SEI);
- Basically, the SEI grows thicker with each charge/discharge cycle



RESULTING IN POOR BATTERY LIFE CYCLE





# THE SOLUTION

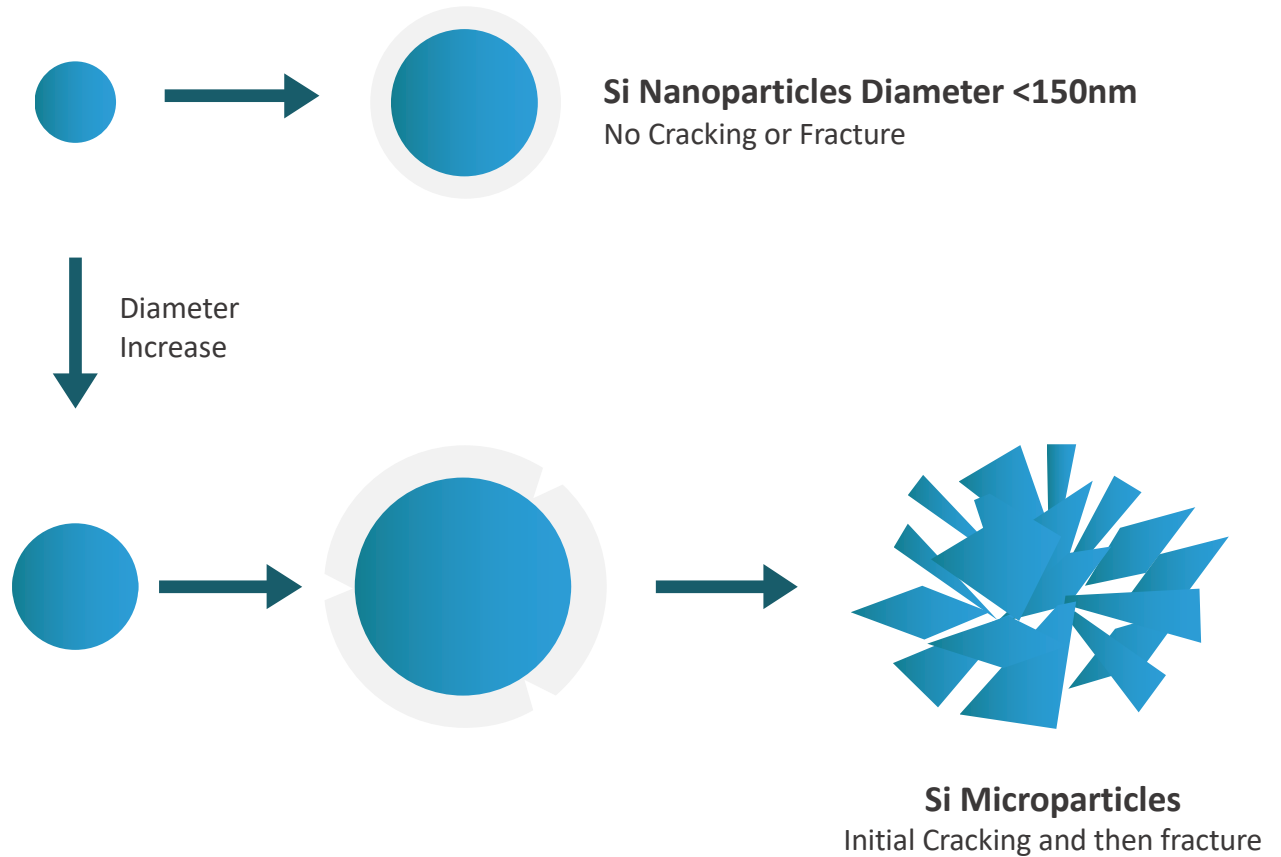
## NANO SIZE SILICON (Si) IS THE SOLUTION

*“One effective strategy is to reduce the active particle size to the nanometer range, at which point, nanosized particles can accommodate significant stress without cracking”*

Todd, A. D. W.; Ferguson, P. P.; Barker, J. G.; Fleischauer, M. D.; Dahn, J. R., *Journal of The Electrochemical Society*, 2009, 156, A1034.

*“Scientists at the University of California Riverside have been focused on nano silicon for a while, but it's been degrading too quickly and **is tough and expensive to produce in large quantities**”*

Max Langridge and Luke Edwards - January 3, 2020



# HPQ NANO SILICON PATHWAY

## WORKING WITH WORLD CLASS TECHNOLOGY PARTNERS:

- HPQ is about to start the commercial validation of low cost processes that can make up to 4N purity Silicon (Si) and convert it into Nano Silicon (Si) materials

## HPQ IS DEVELOPING:

- With PyroGenesis the *PUREVAP™ Quartz Reduction Reactor (QRR)* (Patent Pending)
  - A New Scalable, Versatile and Low Capex and Opex Carbothermic Process that can make the high purity Silicon (up to 4N Si) the Energy Storage sector is looking for
- With PyroGenesis the *PUREVAP™ NANO SILICON REACTOR (NSiR)* (Provisional Patent applied)
  - A New Scalable, Versatile and Low Cost Plasma Process that can transform *PUREVAP™ QRR* Silicon (Si) into < 200nm Spherical Nano powders and Nanowires
- With Apollon Solar of France
  - Deploying their patented process to develop a capability to produce nano porous silicon (Si) powders using *PUREVAP™ QRR* Silicon (Si) as feedstock

# HPQ IMPLEMENTATION PLAN

## FAST TRACKING INNOVATIVE SILICON SOLUTIONS!

- Lab scale and proof of concept tests already completed
- Fully funded QRR pilot plant and testing program
- Getting ready to go live and produce:
  - Nanoscale Spherical Si Powders and Nano Si Wires for next Gen Li-ion Batteries
    - ✓ Project potential already generated NDA's with battery manufacturers and advance material companies
  - High Purity Nano Porous Silicon Powders for Li-ion Batteries
  - Porous Silicon Metal Wafers for solid state Li-ion Batteries
    - ✓ NDA signed with a solid-state battery manufacturer
  - Metallurgical Grade, Chemical Grade and High Purity Silicon (1N to 4N Si)





# SILICON (Si) OVERVIEW

- One of today's key strategic minerals according to the EU Commission - US DOJ
- Needed for Renewable Energy Transition / Does not exist in its pure state
  - Quartz is one of the most abundant minerals in the earth's crust
  - Expensive Carbothermic process needed to extract it from Quartz ( $\text{SiO}_2$ )
- Silicon Demand ~ 3.8 Million MT worth ~ US\$ 10 Billion by 2025 (CRU)
- Silicon Demand growth to be driven by the chemical sector (2N) & EV

## Usages

## Global Megatrends

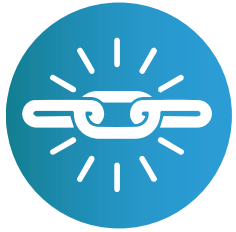


	Megatrends	Implications	End Customer Product
<b>Metallurgical Grade Si</b> (98.0% - 98.9% Si)	Population Growth	Growing middle class China and India: consumption economy	<ul style="list-style-type: none"> <li>• Silicones: healthcare, cosmetics, packaging</li> </ul>
	Urbanization	India, Brazil and other emerging markets: infrastructure build	<ul style="list-style-type: none"> <li>• Silicon: aluminum for cars, housing growth</li> <li>• Silicon: Silicone sealants for construction</li> </ul>
<b>Chemical Grade Si</b> (99.0% - 99.5% Si)	Energy Efficiency	Reduce weight of vehicles and Electric vehicles	<ul style="list-style-type: none"> <li>• Silicon as alloying agent for aluminum to replace steel in vehicles</li> <li>• Prospects for silicon alloys in batteries</li> </ul>
	Alternative Energy & Sustainability	Growing demand for solar and other sources of renewable energy	<ul style="list-style-type: none"> <li>• Silicone sealants for wind turbine and solar</li> <li>• Higher consumption of silicon for polysilicon used to make solar cells</li> <li>• Prospects for silicon Base Energy Storage</li> </ul>

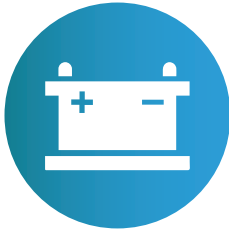


# SILICON (Si) PART OF EV SUPPLY CHAIN

The aluminum alloy chassis of Tesla cars is 10% Si!



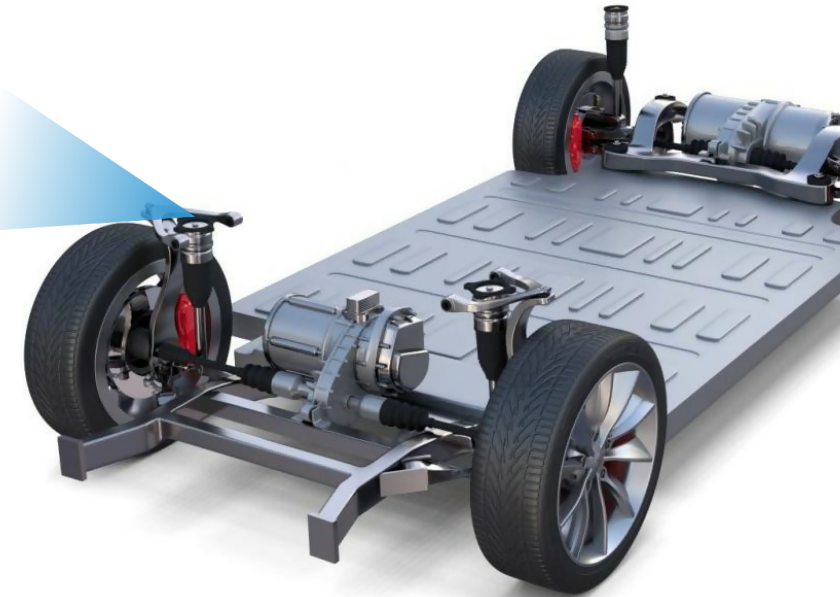
Aluminum silicon alloy makes the aluminum lighter and stronger



Small quantities of Silicon powder are already used in Tesla batteries



Silicon in the windshield



PLUG  
IN EV SALES  
(annual)

566,000

2015

54,000,000

2030E

# HPQ Building a World Class Silicon Innovation Cluster

With Technology Partner PyroGenesis Canada Inc, HPQ is developing:



The *PUREVAP™ Quartz Reduction Reactor (QRR)*  
(Patent Pending)

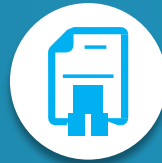


The *PUREVAP™ Nano Silicon Reactor (NSiR)*  
(Provisional Patent Filed)

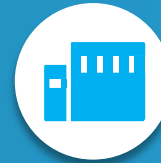
**PYROGENESIS** Plasma Expertise: One of the largest in the World



+25 years of experience  
& > 70 employees



>60 Patents  
worldwide (issued  
or pending)



40,900 ft<sup>2</sup>  
Manufacturing  
facility



Contract Backlog in  
excess of \$30MM



World Leader In  
Advanced Plasma  
Processes



Technology Sold To US  
Navy For Use On  
Aircraft Carriers



Technology Tested and  
Validated By DARPA



Leaders in High Purity  
Spherical Metal Powders for  
Industrial 3D printing



Developer of PUREVAP One-Step  
Process To Produce High Purity  
Silicon



Developer of DROSRITE™: a  
Green Aluminum Recovery from  
Dross process



Agreements With Global  
Manufacturers and Trading  
Houses



# PUREVAP™ QRR – A SCALABLE – VERSATILE – ADAPTABLE PROCESS

- ✓ The PUREVAP™ QRR process is scalable by increments of 2,500 MTY – (maximum size of one Reactor)
- ✓ New plants using conventional process require a minimum plant capacity > 30,000 MTY

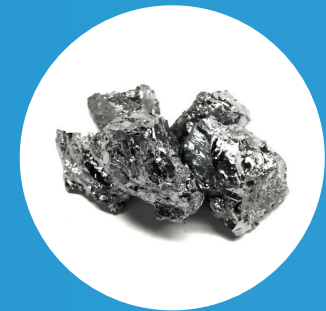
✓ **Advantage  
PUREVAP™**



SiO<sub>2</sub> + Carbon



A ONE STEP PROCESS



UP TO 4N Si

## The PUREVAP™ QRR is very competitive versus conventional process (cost per kg of annual capacity)

- With a US\$ 6.22 Cost per Kg of annual capacity for a (2) 2,500 MTY PUREVAP™ QRR Reactor Plant
  - We match the CAPEX costs of Tier 1 producers for a fraction of the investment (85% - 90% less)
- Mississippi Silicon (Rima Subsidiary) built a new traditional Silicon plant in Burnsville Mississippi (USA) in 2015, and while their Capex per Kg of annual capacity was US\$ 6.11, they had to build a plant with an annual capacity of 36,000 MTY to get that number

✓ **Advantage  
PUREVAP™**

# PUREVAP™ QRR – A SCALABLE – VERSATILE – ADAPTABLE PROCESS

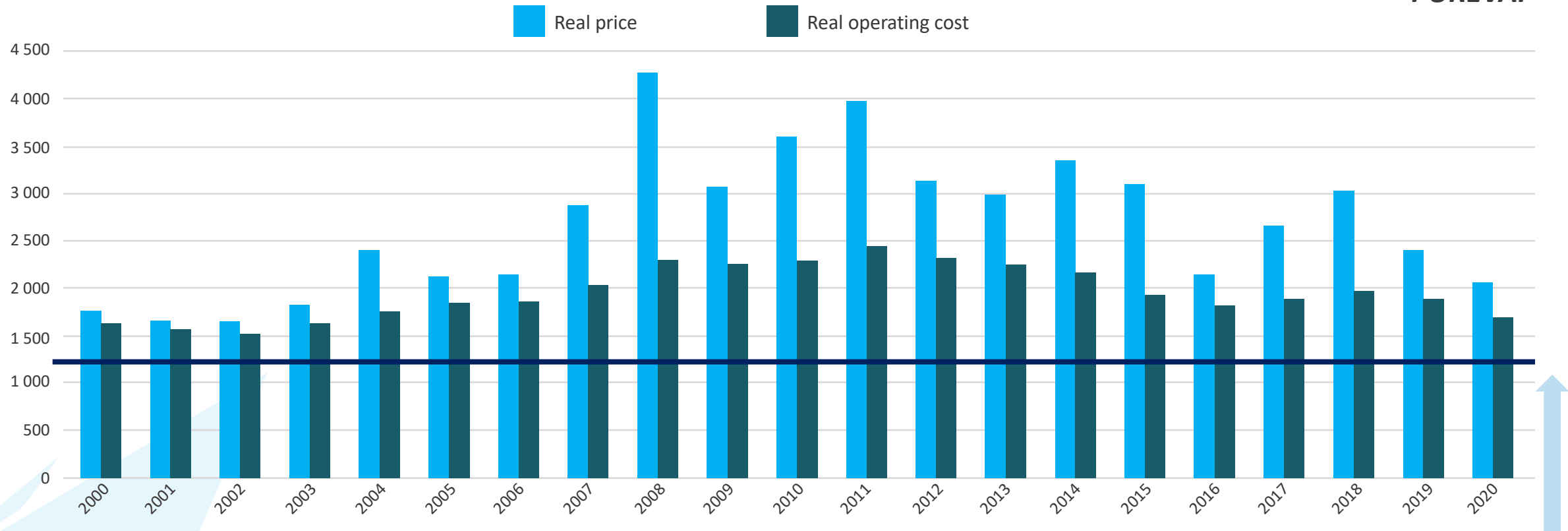
## PUREVAP™ QRR OPEX VERSUS CONVENTIONAL Si PRODUCERS

Silicon in the 2020s

**Inflation-adjusted prices are higher than they were in the early 2000s**

US spot price of 5.5.3 grade silicon vs. avg. operating cost at plants outside China and the CIS in real terms, \$/t

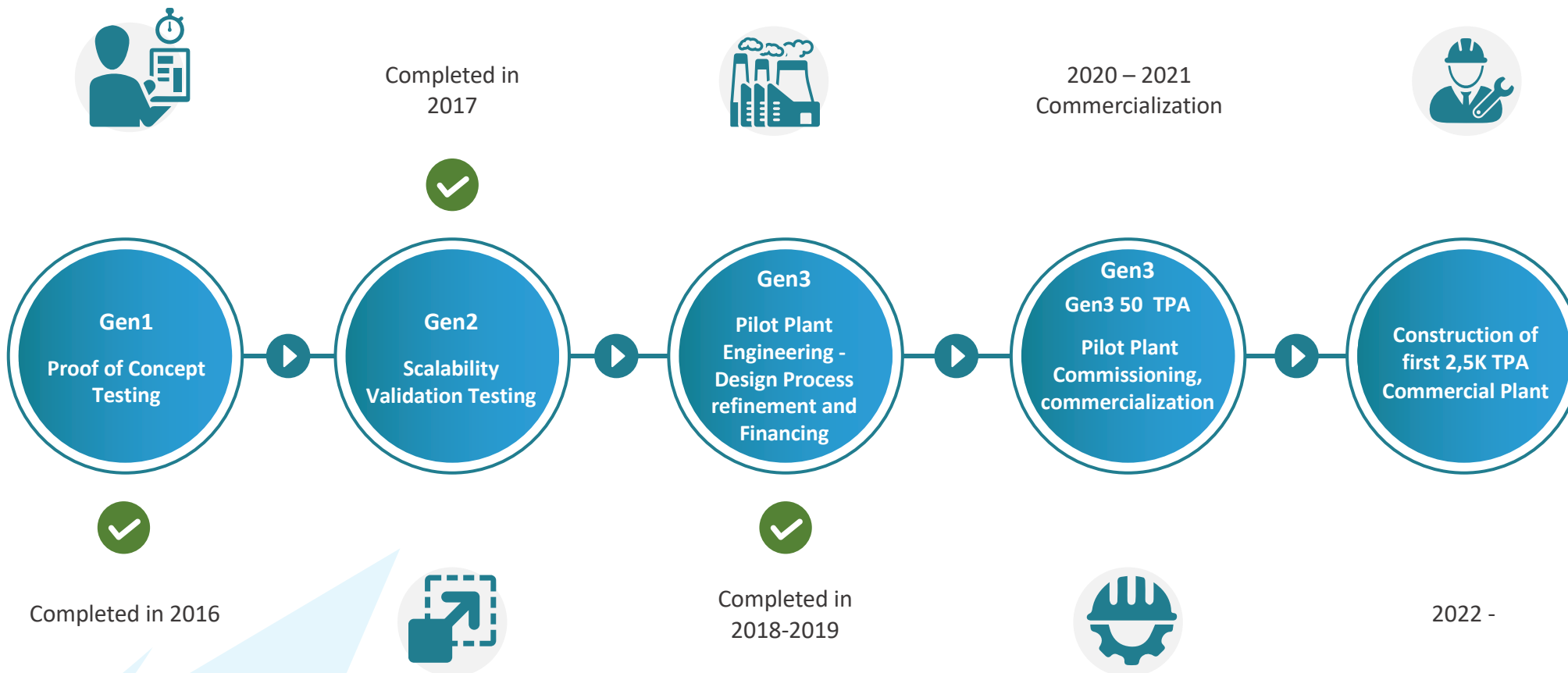
✓ **Advantage  
PUREVAP™**



PUREVAP™ QRR estimated operating cost to produce up to 4N Si (To be firm up during Gen3 Pilot Plant)

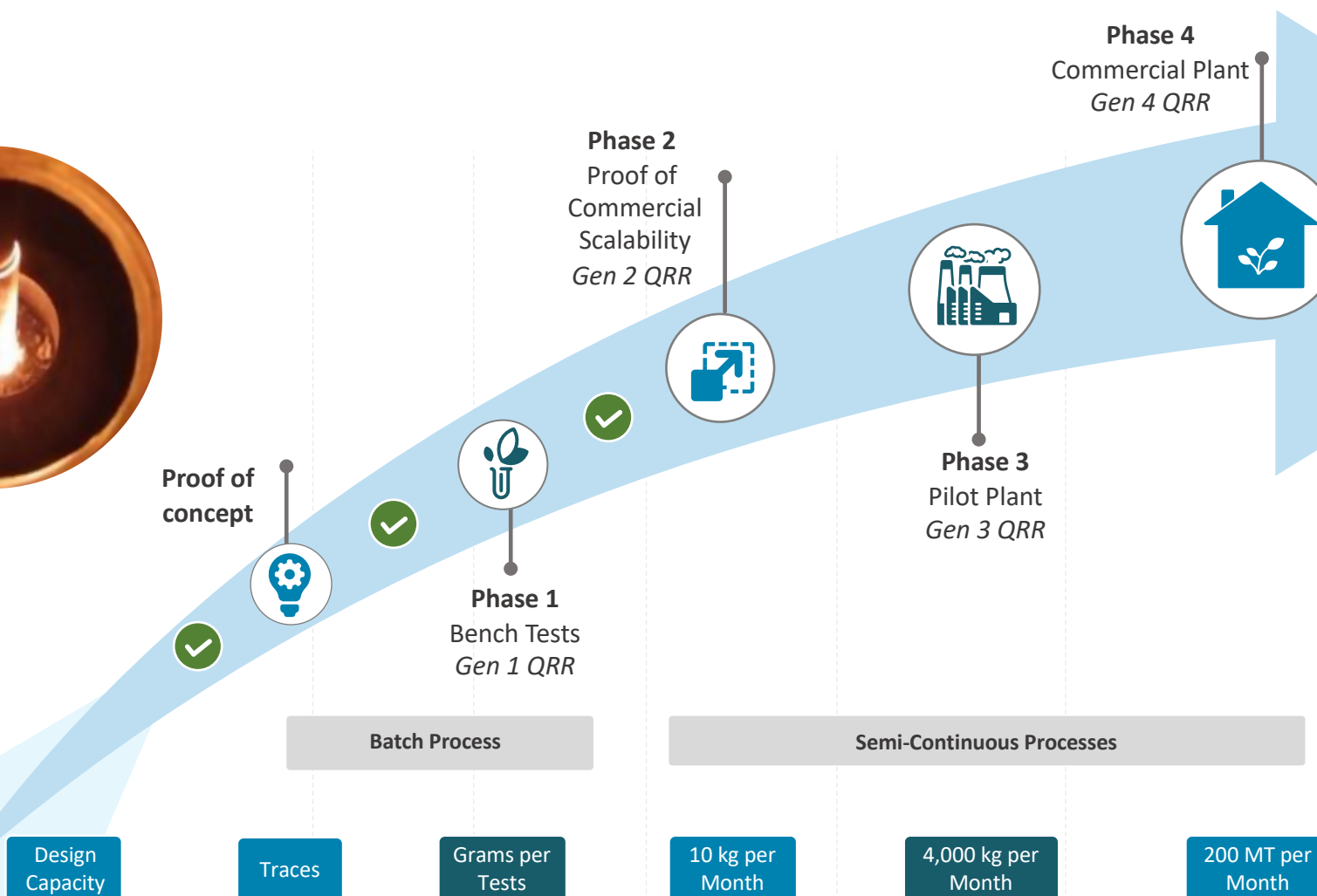
# PUREVAP™ QRR – A SCALABLE – VERSATILE – ADAPTABLE PROCESS

## PROJECT MILESTONES AND INDICATIVE TIMELINE – PUREVAP™ QRR

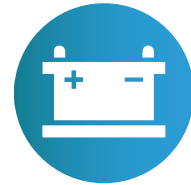


# PUREVAP™ QRR – A SCALABLE – VERSATILE – ADAPTABLE PROCESS

## PUREVAP™ Quartz Reduction Reactor (“QRR”) - Indicative Scaling-up Pathway



# SILICON (Si) The Graphite Killer for Li-Ion Batteries



Silicon Allows greater energy storage capabilities



Allows for smaller size batteries for electronic devices and electric cars

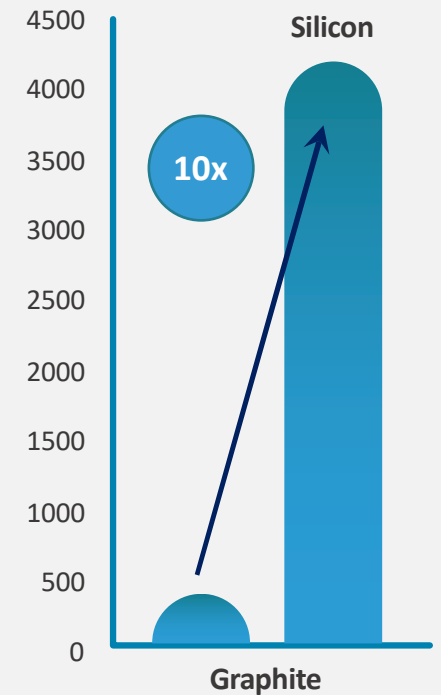


Energy storage potential for renewable energy could reshape the global economy



Silicon can increase battery charge 10X and energy density of batteries by 40%

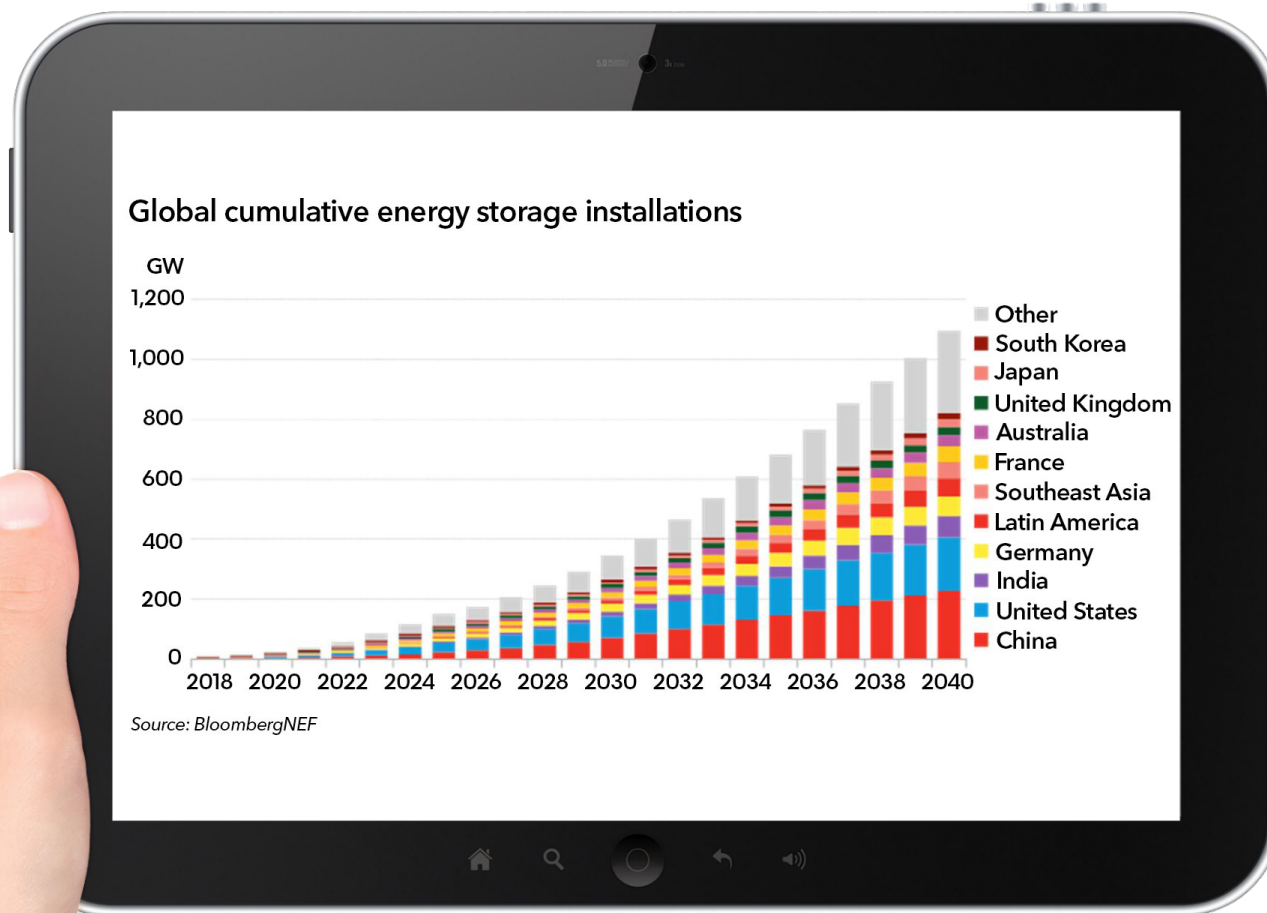
Anode Chemistry Option  
Theoretical Capacity





# ENERGY STORAGE – A MASSIVE MARKET

DEMAND FOR ENERGY CAPACITY MUST INCREASE TO OFFSET THE VARIABILITY OF  
RENEWABLE ENERGY GENERATION IN THE ELECTRICITY ECOSYSTEM

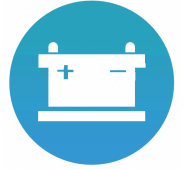


- “Investment dedicated to energy storage will exceed \$40 billion by 2040 ” according to Yayoi Sekine, energy storage analyst for BNEF



# ENERGY STORAGE – A MASSIVE MARKET FOR NANO SILICON

## Nano Silicon for Energy Storage: An unexpected positive for HPQ



The real problem is not “Can we get a battery that is powerful?” It’s: “Can we make that **battery cheap enough to build trillions of them?**” **Alexander Girau, Advano’s founder & CEO**

- A thousand (1,000) MT of Silicon is barely enough to make lithium-ion batteries that will store 5 gigawatt hours (GWh) of energy
- As BloombergNEF indicates, by 2040, this could translate into a demand for 920,000 MT of Nano Silicon
- Manufacturing Nano Powders not yet commercially feasible with US\$ 30,000/kg selling prices

**HPQ and PyroGenesis decision to develop a low cost process to make Nano Silicon Powders could not have been timed better...**



## *PUREVAP™ NSiR* – A SCALABLE – LOW COST PROCESS TO MAKE NANO SILICON

- In 2019 HPQ asked PyroGenesis to use their more than 20 years of experience using plasma atomization to make metal powders and see if they could develop a low cost process that can transform *PUREVAP™ QRR Si* into the Silicon Material batteries manufacturers are searching for
- These efforts resulted in the creation of the ***PUREVAP™ NANO SILICON REACTOR (NSiR)***, a new proprietary process being develop by HPQ and PyroGenesis to make the Spherical Silicon (Si) Nanopowders and Nanowires needed for Next Generation Li-ion Batteries

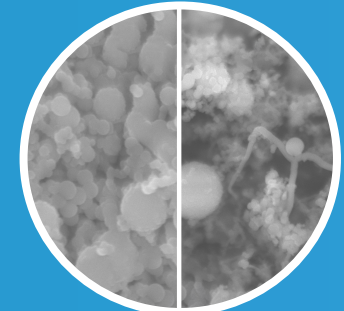
### Silicon (Si) to Spherical Nanopowders and Nanowires of Si



*PUREVAP™ QRR Si*



*PUREVAP™ NSiR*

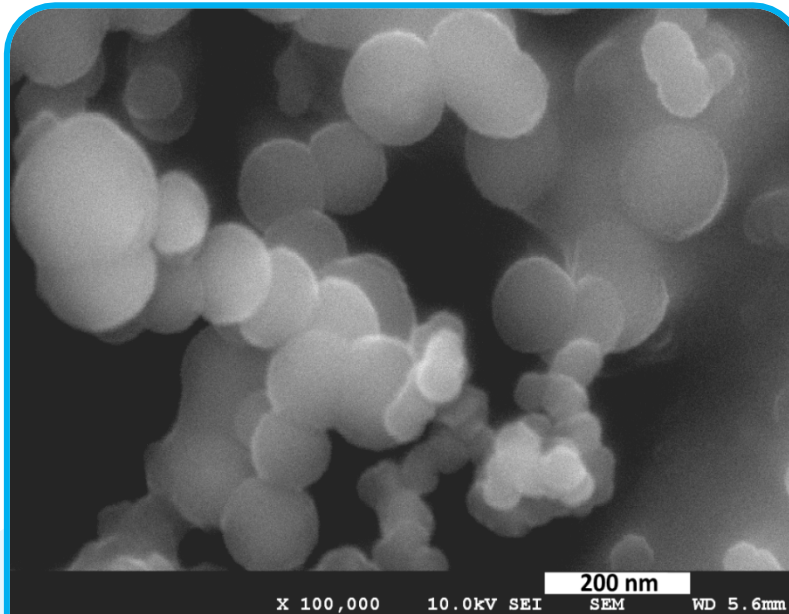


SPHERICAL Si  
NANOPOWDERS & NANOWIRES

## PROOF OF CONCEPT TEST VALIDATED POTENTIAL OF PUREVAP™ NANO Si REACTOR



- *Gen2 PUREVAP™ QRR successfully used to synthesize Spherical Nano Powder and Nanowires from Silicon (Si)*



**Spherical Nano Powders**

*size < 0.5  $\mu$ m*

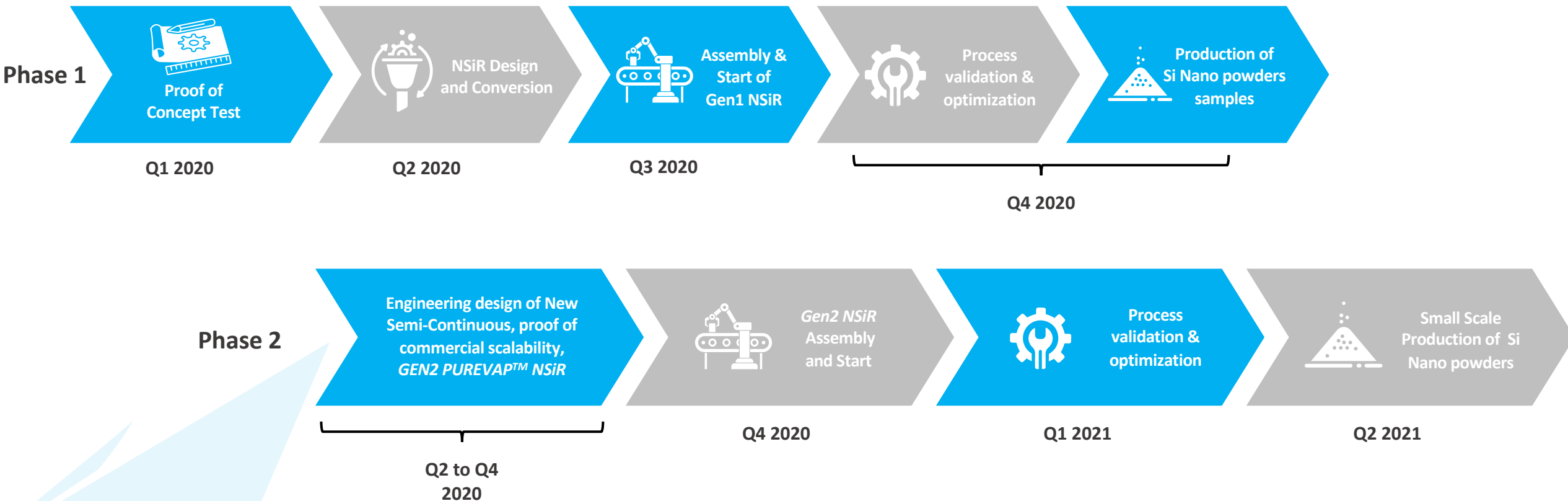


**Nanowires**

*size < 0.5  $\mu$ m*

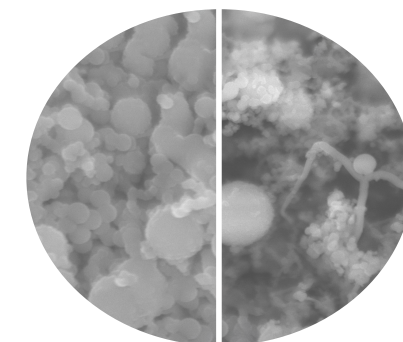
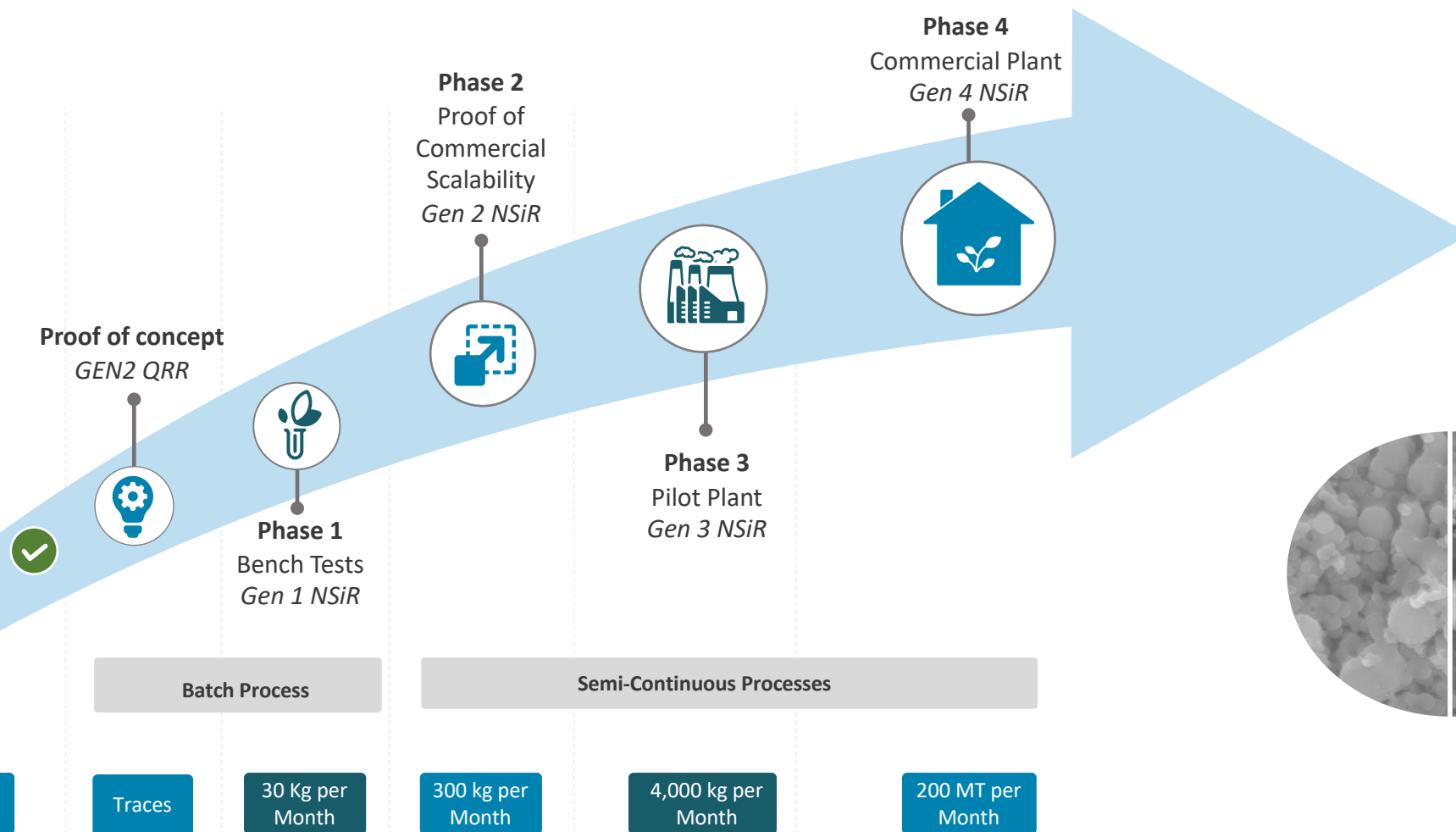
# PUREVAP™ NSiR – A SCALABLE – LOW COST PROCESS TO MAKE NANO SILICON

## PROJECT MILESTONES AND INDICATIVE TIMELINE – PUREVAP™ NANO SILICON REACTOR (“NSiR”)



# PUREVAP™ NSiR – A SCALABLE – LOW COST PROCESS TO MAKE NANO SILICON

## PUREVAP™ Nano Silicon Reactor (“NSiR”) - Indicative Scaling-up Pathway





# HPQ Building a World Class Silicon Innovation Cluster

With Technology Partner Apollon Solar Sa, HPQ is developing:



A lower cost approach to make nano-porous silicon powders using Apollon patented process to make porous Si with *PUREVAP™* QRR Silicon (Si) as feedstock



**A French Engineering and R&D Company fully dedicated to the field of energy transition**



Created in 2001 by a team of engineers and scientists with longstanding expertise in Silicon Purification and Crystallisation - Solar Silicon - Photovoltaic Cells - Photovoltaic Modules



Now Part of Elixens Group, active in Fine Chemistry, Aromatic and Renewable Energies



23 Patents to their name

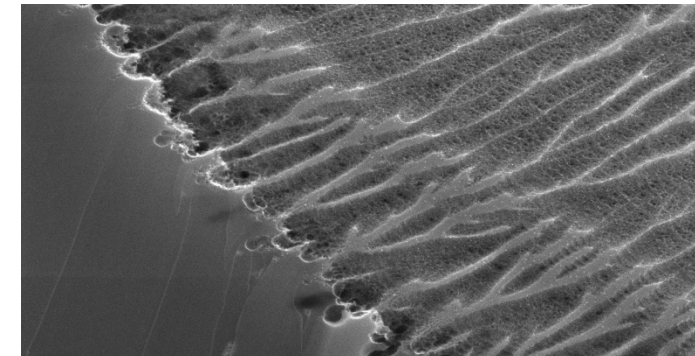
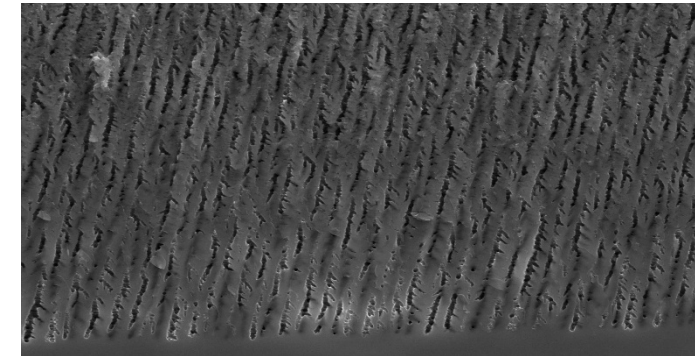
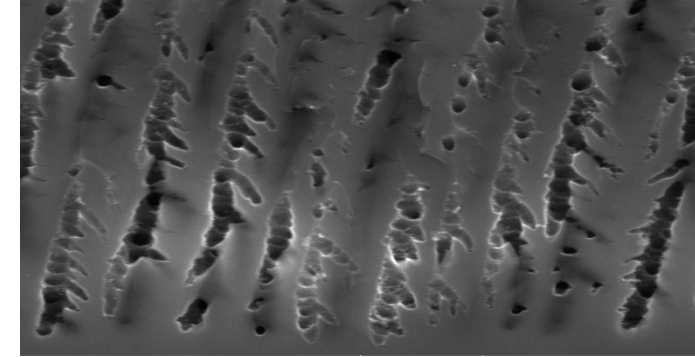


Obtained, an independently confirmed, world record conversion efficiency of 22.6% with ANU University of Australia, using monocrystalline ingots, for a solar cell made with 100% “SoG Si UMG”



# APOLLON LOWER COST NANO POROUS Si MANUFACTURING

- Apollon and partners<sup>1</sup> designed and patented, in 2012, a porous silicon production process based on electrochemical anodization of low-cost Metallurgical grade Si wafers
- The Process can produce a range of porous Silicon nanopowders:
  - Pore Size:
    - ✓ Microporous (<5nm)
    - ✓ Mesoporous (5nm – 50nm) or
    - ✓ Macroporous (>50nm)
  - Particle Size from 2 nm to 1  $\mu\text{m}$ 
    - ✓ Possibility to customize the granulometry and the distribution
  - Following can be customized to specific client spec:
    - ✓ The surface area, density and even encapsulated the Si in carbon if needed



1: CNRS (Centre National de la Recherche Scientifique) and INSA Lyon (Institut National des Sciences Appliquées)

# PUREVAP™ QRR & APOLLON LOW COST NANO POROUS Si

## Combining HPQ PUREVAP™ QRR with Apollon patented low-cost approach of Making Porous Si

PUREVAP™ QRR



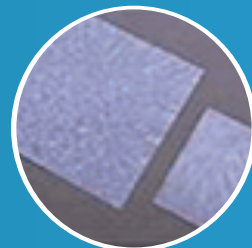
PUREVAP™  
QRR Si

CRYSTALLIZATION



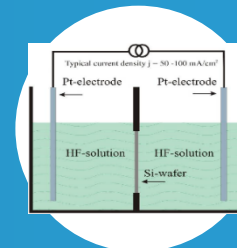
Si INGOTS

WAFERING



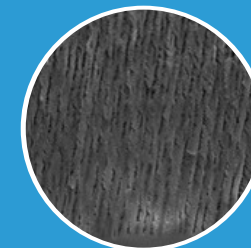
Si WAFERS

ANODIZATION



Apollon Patented  
Process

POROUS Si WAFER



crushed into Nano  
Porous Si

### PROCESS FLOW BETWEEN PUREVAP™ QRR AND ANODIZATION:

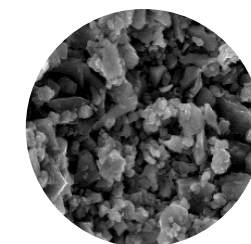
- Easy to scale-up, based on equipment and process used in the Solar Industry

### ANODIZATION:

- Only part of the process that requires R&D for commercial scale-up!

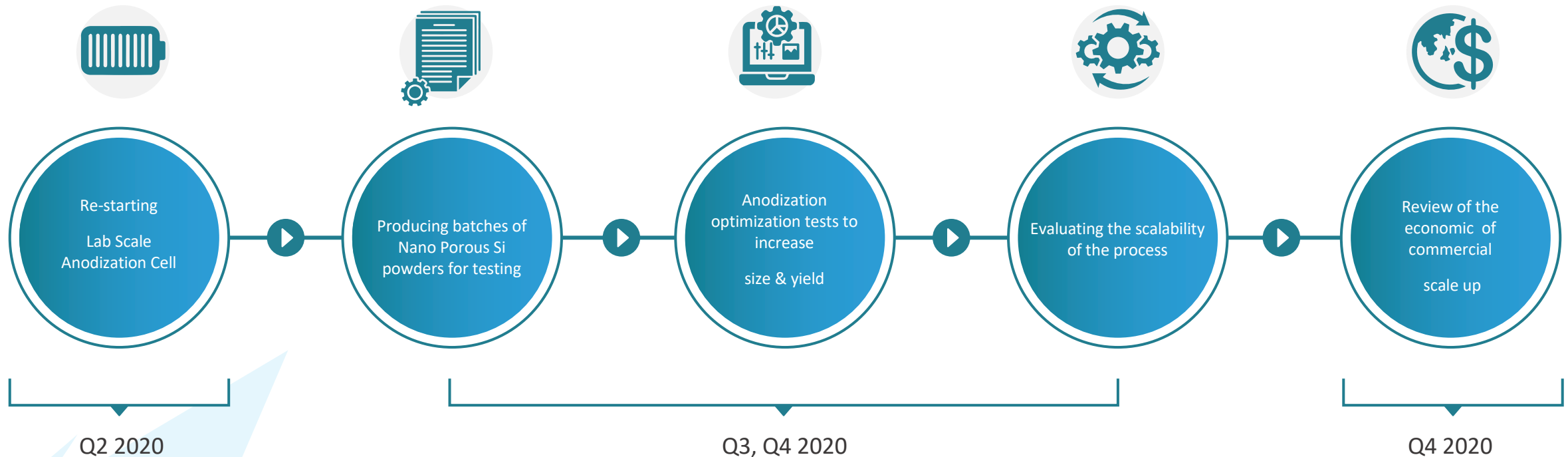
### HPQ AND APOLLON WORKING ON

- Re-starting lab-scale anodization cell equipment; Capacity should be around 1,5kg/month
- Study to feasibility of scaling up the capacity up to 15kg/month
- Building a business case for larger production capacity



# PUREVAP™ QRR & APOLLON LOW COST NANO POROUS Si

## Indicative Project Timeline – PUREVAP™ QRR – APOLLON Porous Si



# WHY INVEST IN HPQ?



UBS estimates that over the next ten years the energy storage market in the United States could grow to as much as \$426 billion, and there are many ways to buy into the surge!

(CNBC Dec 30, 2019 : The battery decade: How energy storage could revolutionize industries in the next 10 years)

- **HPQ – Silicon: An investment opportunity to participate in the Surge!**
- **Getting ready to go live and produce:**
  - Nanoscale Spherical Si Powders and Nano Si Wires for next Gen Li-ion Batteries
    - ✓ [Project potential already generated NDA's with battery manufacturers and advance material companies](#)
  - High Purity Nano Porous Silicon Powders for Li-ion Batteries
  - Porous Silicon Metal Wafers for solid state Li-ion Batteries
    - ✓ [NDA signed with a solid-state battery manufacturer](#)
  - 1N to 4N Si
  - In 2020 samples will be sent to research centers for independent validation and to potential end users for product qualification and sales
- **Supported by two (2) world class technology partners**



# HPQ Share Performance 12 months





# HPQ CAPITAL STRUCTURE

Share Price (June 26, 2020)	\$0.210	Cash and equivalent in hand				\$ 900,000
		IN THE MONEY WARRANTS				\$ 10,519,035
52 Week Low	\$0.045	Dedicated Cash Toward Pilot Plant				\$ 1,950,000
52 Week High	\$0.250	TOTAL CASH POSITION				\$ 13,369,035
		Warrants Breakdown				
Shares Outstanding:	246,162,427	Expiration	Warrant	Exercise	Potential	In the money
		Date	Outstanding	Price	Cash to HPQ	Cash value
IQ Convertible debenture	16,653,361	Oct-20	3,000,000	0.180	\$ 540,000	\$ 540,000
		Nov-20	11,989,000	0.135	\$ 1,618,515	\$ 1,618,515
Warrants:	76,510,600	Feb-21	4,375,000	0.110	\$ 481,250	\$ 481,250
		Jul-21	750,000	0.150	\$ 112,500	\$ 112,500
Options:	11,400,000	Aug-21	31,250,000	0.155	\$ 4,843,750	\$ 4,843,750
		Jan-22	4,152,000	0.155	\$ 643,560	\$ 643,560
Fully Diluted:	350,726,388	Jul-22	3,250,000	0.150	\$ 487,500	\$ 487,500
		Aug-22	350,000	0.150	\$ 52,500	\$ 52,500
Market Capitalization:	\$51,694,110	Dec-22	3,000,000	0.100	\$ 300,000	\$ 300,000
		Apr-23	10,000,000	0.100	\$ 1,000,000	\$ 1,000,000
Market Capitalization (FD):	\$73,652,541	Jun-23	4,394,600	0.100	\$ 439,460	\$ 439,460
		TOTAL	76,510,600	0.135	\$ 10,519,035	\$ 10,519,035



# MANAGEMENT, BOARD & KEY INVESTORS



## Management

**Bernard J Tourillon, BAA, MBA**  
Chairman, President, CEO and Director

**Patrick Levasseur**  
Vice-President, COO and Director

**Noelle Drapeau, LLL, MBA, PMP**  
Corporate Secretary and Director

**Francois Rivard**  
CFO



## Major Investors

Management & Board	≅ 9.0%	≅ 10.5% (FD)
PyroGenesis	≅ 9.8%	≅ 14.0% (FD)
Investissement Québec		≅ 9.0% (FD)
Strategic Investors	≅ 1.2%	≅ 1.7% (FD)
Key Investors	≅ 17.5%	≅ 19.2% (FD)



## Independent Director

**Richard Mimeau, B.Sc.**  
Director

**Peter Smith, PhD, P. Eng.**  
Director

**Robert Robitaille, M.B.A., L. Ph.**  
Director

**Daryl Hodges H. BSc, M.Sc.**  
Director



# CONSULTANTS, TRANSFER AGENT AND AUDITORS



## Consultants/ Technical Advisors

Marcel Drapeau, BA, BSC. Comm, LLL

PyroGenesis Canada Inc

Apollon Solar Sa



## Transfer Agent

Computershare



## Auditors

Raymond Chabot Grant Thornton



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