

HPQ – SILICON  
R E S O U R C E S



***Becoming the World's Leader in Low Cost  
Solar Grade Silicon Metal  
"Polysilicon"***

***TSX-V: HPQ***



## 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. The terms SGSI, Solar Grade Silicon and Polysilicon are used interchangeably and refer to high purity silicon used in the solar panel industry, with 99.9999% purity, also referred to as “6N”.

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 is depending 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 Disruptive Technology in Solar Grade Silicon Metal***

***HPQ Has recently developed with its partner PyroGenesis a one-step Solar Grade Silicon Metal process***



***The results are radical but the science is simple***

- **High Purity Silicon Metal is a foundation of the solar panel industry**
- **Solar Grade Silicon is a US \$ 5 Billion per year market, growing at 15% CAGR**
- **High Barriers to Entry: Capex, Operating Cost, Permitting are resolved in this simple one – step process**



## Corporate and Capital Summary

Share Price (November 23, 2016)	\$0.115	Cash and equivalent in hand	\$1,450,000	
52 Week Low	\$0.020	Cash value of warrants in the money	\$1,922,821	
52 Week High	\$0.305	Breakdown of warrants in the money	#	\$
Shares Outstanding:	148,262,845	Warrants with \$0.07 Strike Price	26,805,176	\$1,876,362
Warrants:	50,148,745	Warrants with \$0.10 Strike Price	464,587	\$46,459
Options:	12,187,672	Warrants with \$0.15 Strike Price	4,375,000	\$0
Fully Diluted:	210,599,262	Warrants with \$0.20 Strike Price	8,000,000	\$0
Market Capitalization:	\$17,050,227	Warrants with \$0.25 Strike Price	6,200,000	\$0
Market Capitalization (FD):	\$24,218,915	Warrants with \$0.30 Strike Price	2,840,909	\$0
		Warrants with \$0.35 Strike Price	1,462,500	\$0

Debt free after gold spinout

### Management

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

**Patrick Levasseur**  
President, COO and Director

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

**Francois Rivard**  
CFO

### Independent Director (\*)

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

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

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

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

### Auditors

Raymond Chabot Grant Thornton

### Transfer Agent

Computershares

### Consultants

**Marcel Drapeau, BA, B.Sc. Comm, LLL**  
Company Lawyer

**Marc Richer-Lafleche, P. Geo, PhD**  
Technical Advisor (INRS- ETE)

### Major Investors

Management & Board ≈ 17% ≈ 25% (FD)

Key Investor Group ≈ 18% ≈ 17% (FD)

Fancamp ≈ 4% ≈ 7% (FD)

Institutions ≈ 4% ≈ 6% (FD)

Taiwanese Group ≈ 2% ≈ 3% (FD)

PyroGenesis ≈ 2% ≈ 2% (FD)

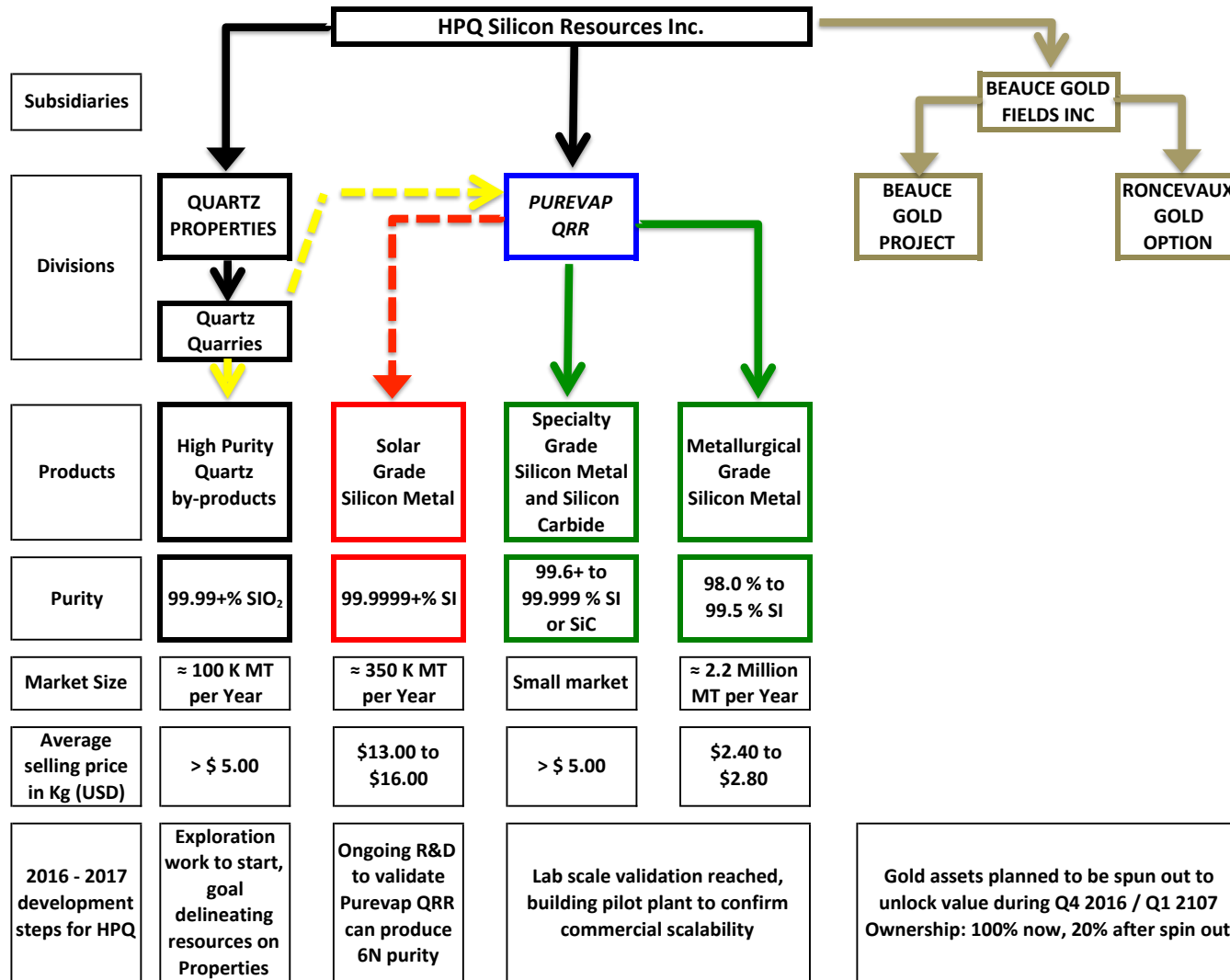
**TOTAL** ≈ 47% ≈ 60% (FD)

\* Independent directors may receive additional compensation for project work.



# Corporate Structure and Businesses

HPQ Silicon plans to become a vertically integrated *Silicon Metal* Company







## Outsourcing R & D And Partnering With The Industry Leader



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### INNOVATIVE TECHNOLOGY

Patented Technology – 18 innovations, covered by 49 patents (issued or pending) worldwide.  
*USING **PLASMA** LIKE NO ONE ELSE*

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### INTERNATIONAL REPUTATION

Montreal based with Industry credibility established through continued relationship with the US Navy and the US Air Force, and cutting edge research credibility with universities around the world

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### UNSURPASSED EXPERTISE

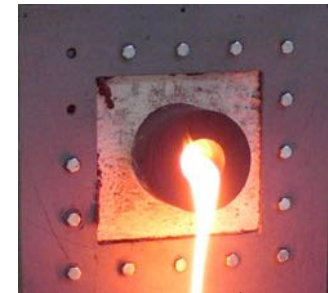
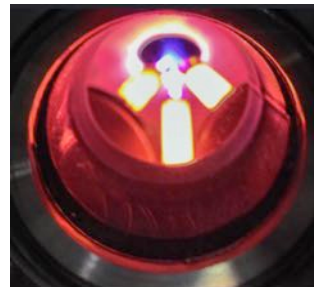
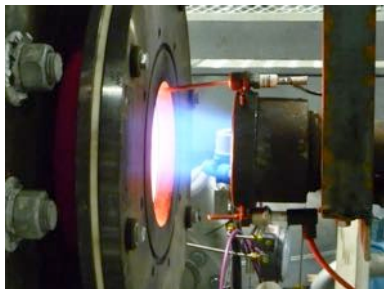
Largest concentration of **plasma experts** in the world make up our team of 50 employees, with more than 25 engineers dedicated to technologies development.

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### CULTURE

Proven leadership since 1991, ISO 9001:2008 certified since 2007, 2 facilities including a 38,000 ft<sup>2</sup> manufacturing facility in Montreal, TSX-V:PYR, OTCQB:PYRNF

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## **RAPID PROGRESS SINCE FINALIZING AGREEMENT**

### **STRATEGIC DEVELOPMENT AGREEMENT WITH PYROGENESIS**

- HPQ has acquired the intellectual property rights to the **PUREVAP™ QRR** process and will finance the development as it relates exclusively to the production of silicon metal from quartz (\*)
- PyroGenesis is developing for HPQ-Silicon's exclusive use the **PUREVAP™ QRR** (Patent Pending) a 1 Step, Clean Tech process for making SG Si directly from Quartz, using a plasma submerged arc
- PyroGenesis will build and commence production from a 200 TPY SG Si R&D pilot plant (Press releases August 2, 2016, September 30, 2015)

### **VALIDATION**

- HPQ confirms the **PUREVAP™ QRR** process can transform Quartz into >99.9 % Silicon Metal (Si)
- HPQ announces independent confirmation validating the **PUREVAP™ QRR** capabilities of
  - Production of up to 99.97% (3N+) during phase 1 test
  - Demonstrated the removal of key impurities from the final product, notably Boron (B)
- Second phase of testing underway (Press releases June 29, September 1 and September 29, 2016)
- HPQ announces on November 2, 2106 that the **PUREVAP™ QRR** is capable of
  - Using 97.57 % SiO<sub>2</sub> feed material, (below minimal industry specification for Ferrosilicon) and still produce High Purity Silicon Metal of 99.936 % Purity

\* PyroGenesis retains a royalty-free, exclusive, irrevocable worldwide license to use the process for purposes other than the production of silicon metal from quartz



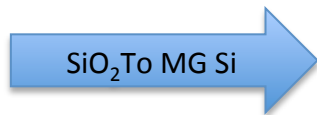
# SILICA / QUARTZ / SILICON METAL 101

**Silicon dioxide, Silica, Quartz and SiO<sub>2</sub>**, Synonym for the world's most common mineral...  
**High Purity deposits (SiO<sub>2</sub> > 99.0%) with low impurities are rare!**

## High Purity Quartz: The Key To Produce Metallurgical Grade Silicon Metal (MG Si)

- **Today's Key Green Strategic Minerals With Applications In The Silicone, Aluminium, Solar And High Tech Industries**
- **Designated A Critical Raw Materials For The EU In 2014 And A Critical Ingredients For Making Aluminum, Solar Panels And Other Products By The US Department Of Justice In 2015**

**Presently Solar Grade Si Can Only Be Made By Refining MG Si Into Higher Purity Material**



### Quartz / SiO<sub>2</sub> For MG Si

Purity	99.5% to 99.7%
Price (US\$/Ton)	40 to 60
Cash Cost (US\$/ Ton)	20 to 30
Supply Picture	In equilibrium
Price Trend	Stable

### MG SI

Si Purity	98 % to 99.5%
Market Size (Ton)	≈ 2.2 Million Tons
Market Size (US\$)	≈ 6 Billion
Demand Growth	≈ 6% CAGR
Supply Picture	In equilibrium
Price Trend	Up from 2016
Price (US\$/kg)	2.4 to 2.8
Cash Cost (US\$/kg)	1.75 to 2.25
Capex Cost (US\$/kg)	7 to 14

2015 Data (Sources CRU, Ferroglöbe, Bloomberg, Viridis.oq, Roskill)

### Solar Grade SI and Higher

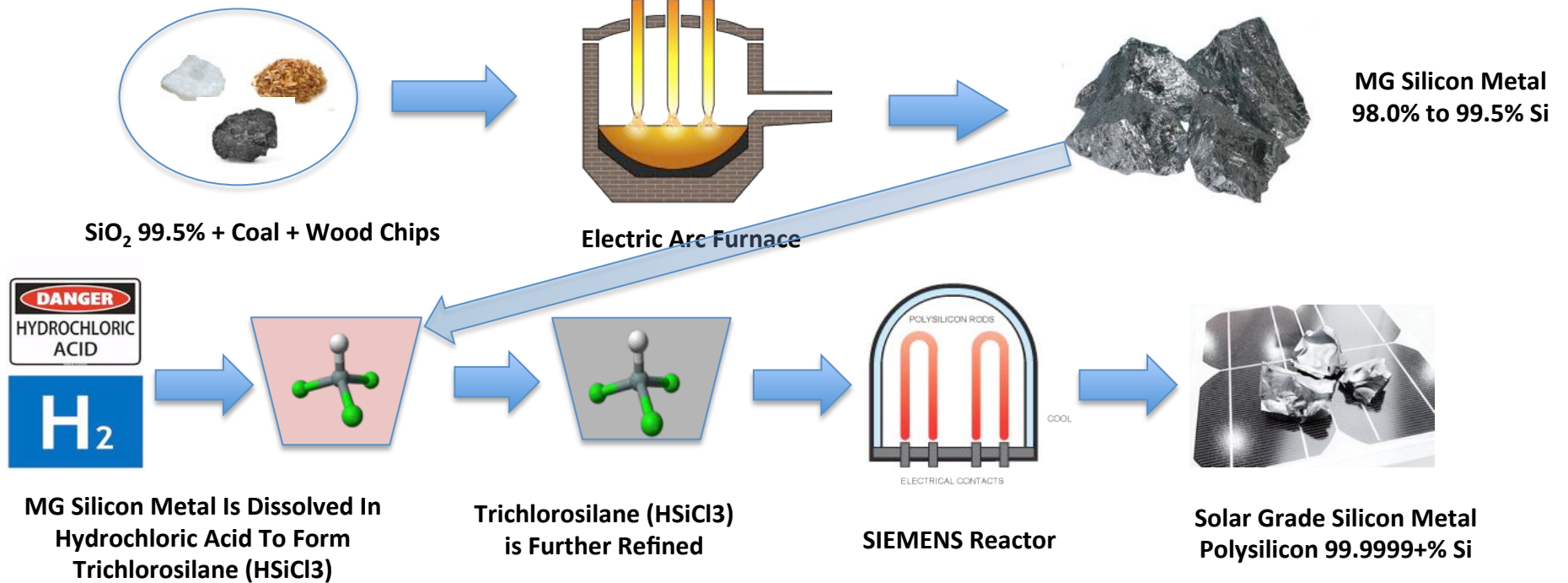
Si Purity	6N to 9N
Market Size (Ton)	≈ 350 K Tons
Market Size (US\$)	≈ 5 Billion
Demand Growth	≈ 15% CAGR
Supply Picture	In Deficit
Price Trend	Up
Price (US\$/kg)	12.80 to 15.67
Cash Cost (US\$/kg)	12.0 to 17.0
Capex Cost (US\$/kg)	75 to 100

2015 Data (Sources CRU, GTW, IEEE JOURNAL OF PHOTOVOLTAICS, VOL. 5, NO. 2, MARCH 2015, Bloomberg)  
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# CURRENT TECHNOLOGY PROCESS vs. PUREVAP™



## PUREVAP™ Quartz Reduction Reactor

**A Proprietary (Patent Pending) One-step Process To Make Solar Grade Silicon Metal**





# SIMPLE PUREVAP™ 1-STEP PROCESS

**"ELEGANT IN ITS SIMPLICITY"**

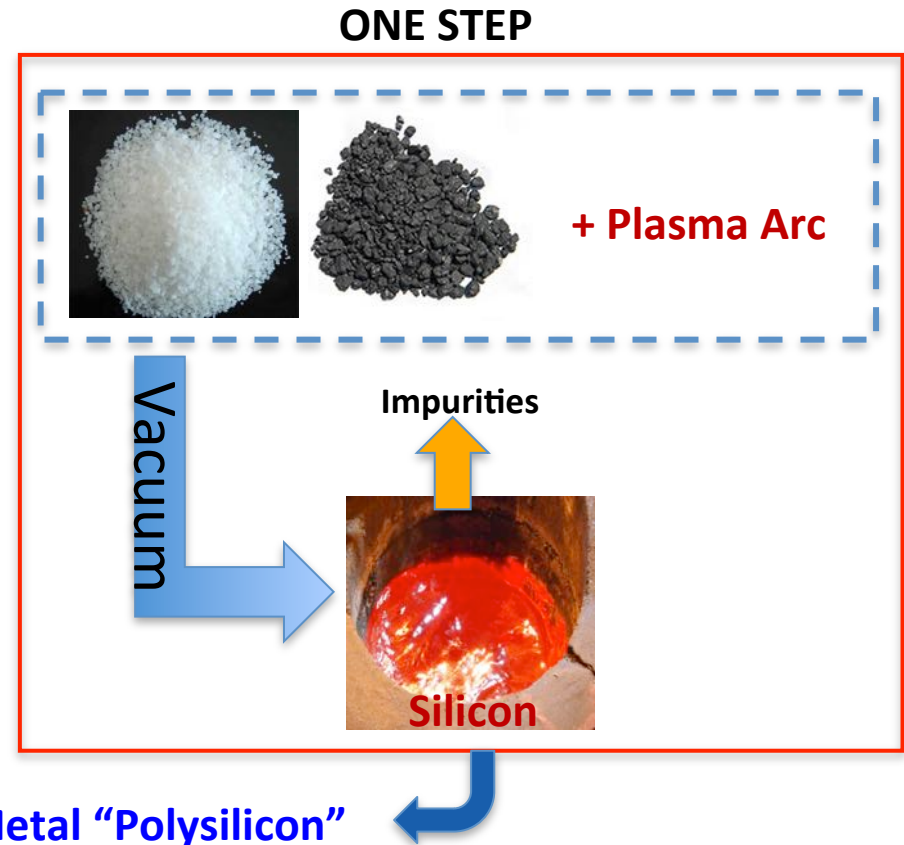


## Quartz Reduction Reactor

- Quartz reduction with carbon using plasma submerged arc
- Silicon refining under vacuum to remove impurities

## Vacuum Arc Furnace

- Reaching very low air pressure level
  - ✓ (m bar)
- Very high temperature plasma arc
  - ✓ +3500 degC
- Resulting in vaporized impurities before Si can vaporize
  - ✓ P, K, Mg, Zn, Ca, Mn, Pb, Al, Fe, etc

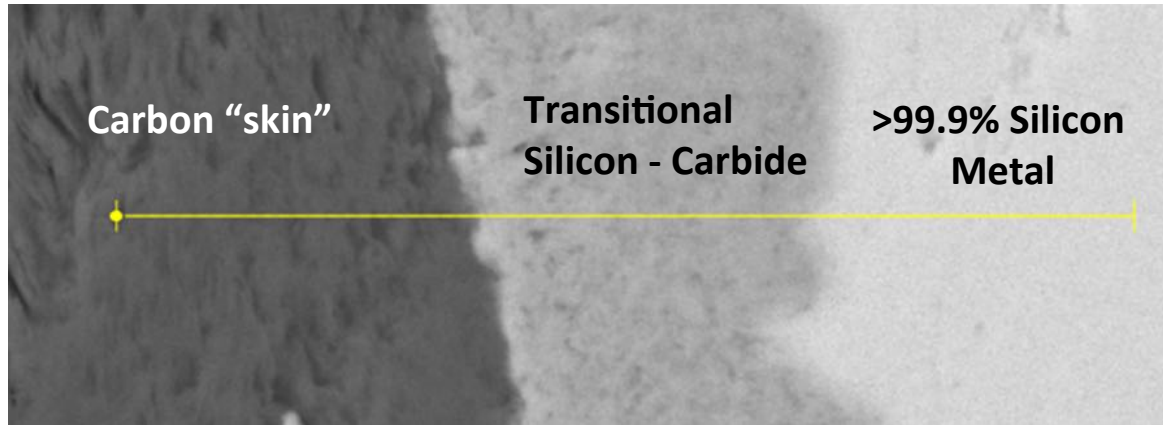


**Solar Grade Silicon Metal "Polysilicon"**



# PUREVAP™ PROVEN CONCEPT AT LAB SCALE

**Capture of transition from C to SiC to Si using Purevap™**



SEM-EDX image from test done at Centre de Caractérisation Microscopique des Matériaux (CM<sup>2</sup>)

Phase 1 Testing Program confirmed that the *PUREVAP™ Quartz Reduction Reactor ("QRR") concept of combining different known steps into a one step process is working*

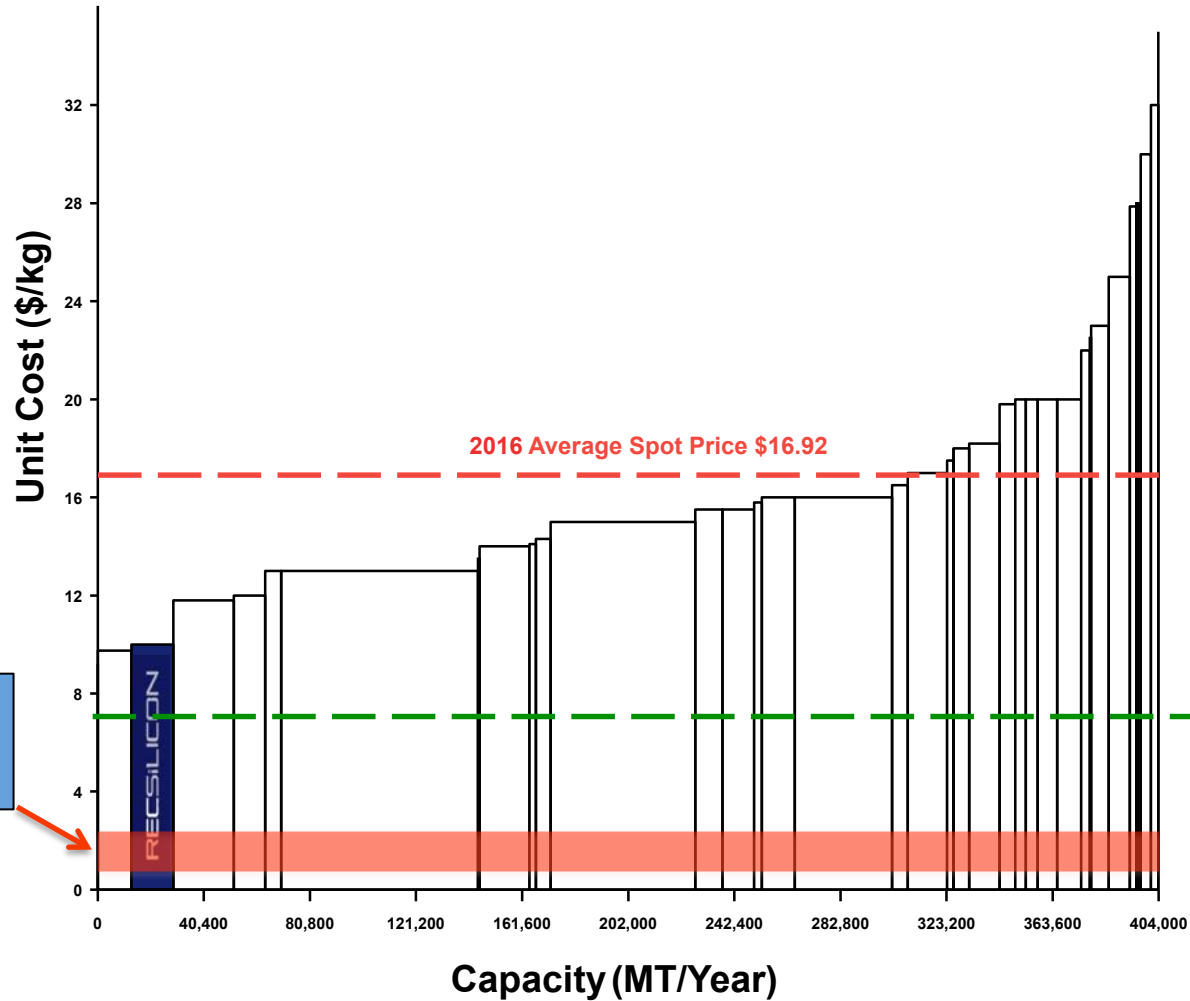
- Test results clearly indicate that the process can successfully remove impurities from the material while transforming SiO<sub>2</sub> into Silicon Metal (Si) in one step as predicted by PyroGenesis Theoretical Model

Elem.	<i>Impurity removal per Phase 1 test that produce material</i>				
	#6	#7	#9	#10	#15
Al	86%	96%	98%	97%	74%
B	97%	98%	91%	83%	96%
Ca	12%	23%	99%	96%	82%
Fe	-208%	61%	-214%	-148%	7%
P	94%	97%	67%	78%	92%
Ti	-321%	-63%	-93%	-49%	-93%



# PUREVAP™ OPEX DISRUPTIVE POTENTIAL

## Cash Cost vs. Capacity for all SG Si Manufactures



**PUREVAP™ QRR  
Potential Opex Range  
(Cash Cost)**

*Silcor Materials Inc. is investing US \$665 Million to build a new plant in Iceland that will have a cash cost of US \$7 per KG.*



## PUREVAP™ CAPEX DISRUPTIVE POTENTIAL

		Capital Cost Per Technologies Available To Produce SG Si Material (all \$ values in USD)				
		EXISTING TECHNOLOGY		NEW TECHNOLOGY	HPQ TECHNOLOGY	
Technologies	Feed Material	Siemens HC	FBR Reactor with Silane	Silicor Aluminum Solvent Refining	PUREVAP QRR R&D Pilot Plant	PUREVAP QRR Commercial plant
Capable of Transforming	SiO <sub>2</sub> to				Solar Grade Si	Solar Grade Si
Capable of Upgrading	MG Si to	Solar Grade Si	Solar Grade Si	Solar Grade Si		
Number of effective competitors		7		1	1	
Key Capex matrix						
Minimum Capacity Requirement (MT)		6,500		19,000	200	10,000
Cap Ex per Kg of annual installed capacity (US\$/kg)		70 (U.S.) 45 (China)	100 (U.S.) 75 (China)	35	18	4
Capital Cost requirements (US\$ million)		455 (U.S.) 292 (China)	650 (U.S.) 488 (China)	665	4	38
SOURCES:		IEEE JOURNAL OF PHOTOVOLTAICS, VOL. 5, NO. 2, MARCH 2015		Silicor Materials	PyroGenesis Canada Inc (PR August 2, 2016)	Roug Order of Magnitude Study by PyroGenesis

- **PUREVAP™ QRR** Pilot plant with its US\$18.5 CapEx per kg of capacity has the potential to transform quartz to Solar Grade Si in one step and becoming **the disruptive technology for the Solar industry**

### Following Pilot Scale Validation of the **PUREVAP™ QRR** process;

- The goal will be to move to a commercial phase, with an objective of building capacity capable of producing 20,000 TPY of SG Si within 5-7 years





## ***2016 R&D – Pilot Plant Work Outline***

- 1. Lab scale testing are ongoing until the end of January 2017**
  - I. Results are being used as the basis for the Furnace's Section design**
- 2. Detailed Engineering Work In Progress:**
  - i. General Process Design**
  - ii. Process Simulation**
  - iii. Process flow diagram (PFD)**
  - iv. Piping and instrumentation diagram (P&ID)**
- 3. Process Drawings**
  - I. To be completed by the end of December 2016**



# Design and Pilot Plant Fabrication Schedule

Task Name	Schedule														
	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17
<b>Phase 1: Detailed Engineering</b>	[Blue bars from Sep-16 to Jul-17]														
Process Engineering	[Yellow bars from Sep-16 to Mar-17, then blue bars from Apr-17 to Nov-17]														
Mechanical Engineering	[Yellow bars from Jan-17 to May-17]														
Electrical Engineering	[Yellow bars from Jan-17 to Apr-17]														
Automation Engineering	[Yellow bars from Feb-17 to May-17]														
<b>Phase 2: Pilot Plant Fabrication</b>	[Blue bars from Mar-17 to Nov-17]														
Equipment Sourcing	[Yellow bars from Mar-17 to Apr-17]														
Equipment Delivery & Inspection	[Yellow bars from Apr-17 to Aug-17]														
Fabrication, Assembly & Installation	[Yellow bars from May-17 to Nov-17]														

**Phase 3: Hot commissioning of Pilot Plant schedule from Nov 2017**

**Phase 4: Testing and Operating Pilot Plant schedule from March 2018**



## **PUREVAP™ PILOT PLANT: CAPITAL NEEDS, TIMING**

**The total cost to purchase and commission the PUREVAP™ QRR Pilot Plant and related Intellectual Property is CDN\$8,260,000 over the next 30 months:**

- \$ 1,000,000 for purchase of the related Intellectual Property (**Completed**)
- \$ 4,430,000 for design, fabrication, assembly, cold commissioning & testing (**\$490 K Done, over time to Oct-2017**)
- \$ 520,000 for hot commissioning of the pilot system (**To be paid From Nov-2017 to Feb-2018**)
- \$ 2,310,000 for testing and operating the pilot system during 10 months (**To be paid From March to Dec-2018**)

**The Projected Cash call over the next 30 months are:**

- \$1,900,000 for the remainder of 2016
- \$2,296,000 for 2017
- \$2,570,000 for 2018

**HPQ Silicon funding advantages:**

- HPQ will be entitled to R&D research credits worth about 30% of CDN\$7,260,000 of the program
- The project is eligible for government funding (Provincial and Federal) for 55% to 80% of the costs
- *Over CDN\$ 1,900,000 worth of warrants are in the money, majority in friendly hands*
- The acquisition of PUREVAP™ Intellectual property opens up additional options for financing because investors want to see direct control over the key intellectual property
- Management is exploring several likely non – dilutive paths for financing the Pilot Plant



## HPQ – PUREVAP™ RAW MATERIAL

- **HPQ-Silicon is the largest holder of High Purity Quartz properties in Quebec, with over 3,500 Ha under claims**
- The High Purity Quartz from our Roncevaux property is already in high demand, as it successfully passed rigorous testing protocols of a major silicon metal producer





## QUARTZ PROPERTIES LOCATION

- 12 High Purity Quartz Deposits In Quebec
- 61 Claims Totaling 3,500 Ha
- All Close to Transport, Infrastructure & Target Markets







## ***HPQ VERTICAL INTEGRATION STRATEGY***

### **Plans Are To Establish HPQ Quarry Operations in order to meet our Raw Material Requirement For Future *PUREVAP™ QRR* Plants.**

- In parallel to scaling up our *PUREVAP™ QRR* process, HPQ will be developing the Roncevaux Quartz Potential, with a goal of delineating a significant resource on the Property
- Event when a significant resource is delineated on the Roncevaux property, work on a Preliminary Economic Assessment (PEA) will only be undertaken when required for permitting purposes
- Until that time, all our financial models will assume purchasing the raw High Purity Quartz required for the plants in the open market at market prices
- Upon successful start of quarry operations on Roncevaux, HPQ Silicon will be a fully integrated Silicon Metal Producer



# ***Why Invest in HPQ Now?***

## ***HPQ Is Canada's Only Public Pure Play Investment In the Lucrative Solar Grade Silicon Market***

HPQ Silicon has a staged plan to become a capital efficient integrated producer to a rapidly growing industry

***HPQ PUREVAP™ Proprietary technology is:***

- **Low Opex, Low Capex, Minimal Carbon Footprint and Environmentally friendly**
  - Less than 20% of the Industry's cash cost,
  - 5% of Industry Capex, and
  - With a 75% reduction in carbon footprint since the **Process is estimated to generate 14.1 kg CO<sub>2</sub> eq per Kg SG Si produced** compared to the standard 2 stage process currently in use that generates about 54.0 kg CO<sub>2</sub> eq per Kg SG Si produced

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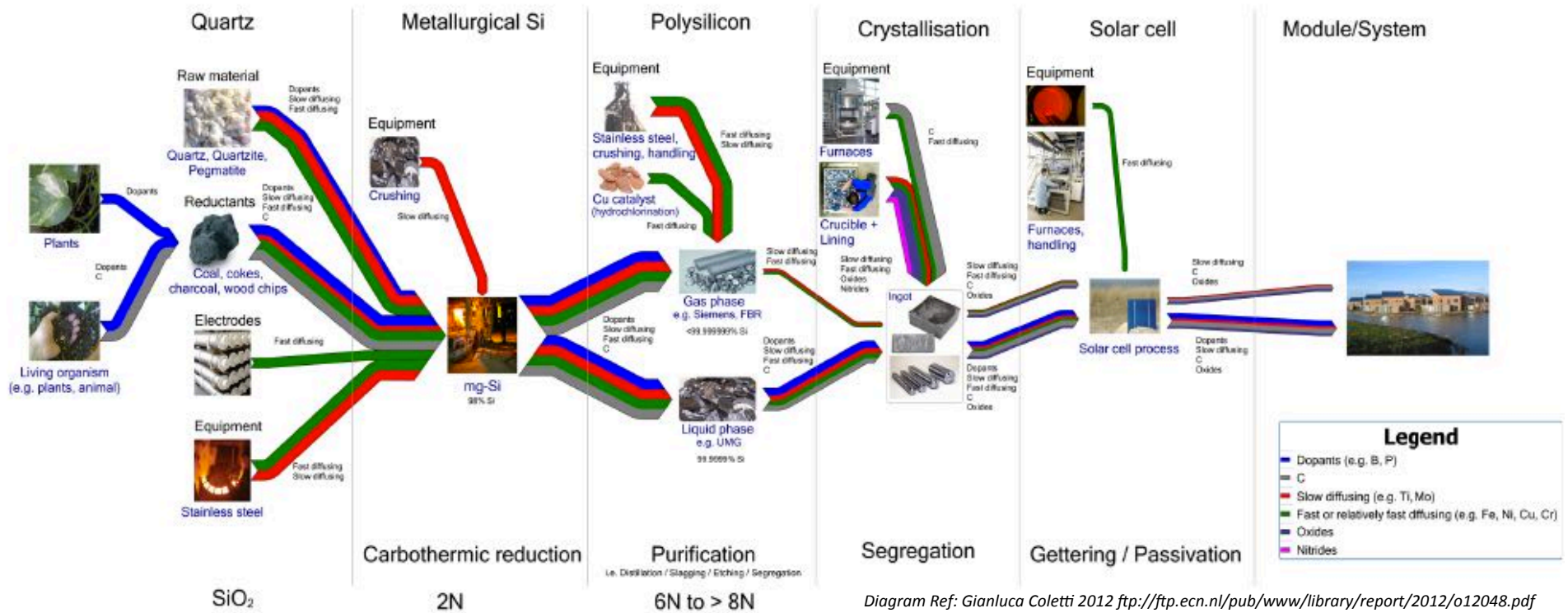


***Appendix  
(Supporting Slides)***

***TSX-V: HPQ***



## Traditional Solar Cell Manufacturing and Impurities

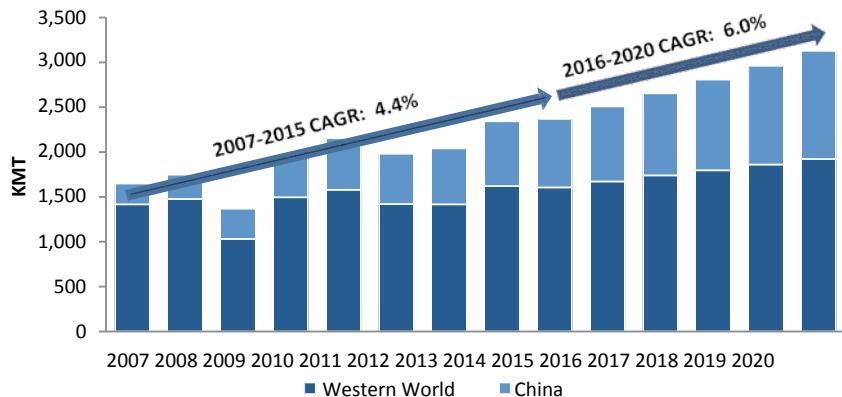


**Successfully Going From Quartz To Crystallisation in one step, HPQ Could Reduce The Cost Of Solar Cell Systems Enough To Make Solar Energy The Greenest And Lowest Cost Energy Source**

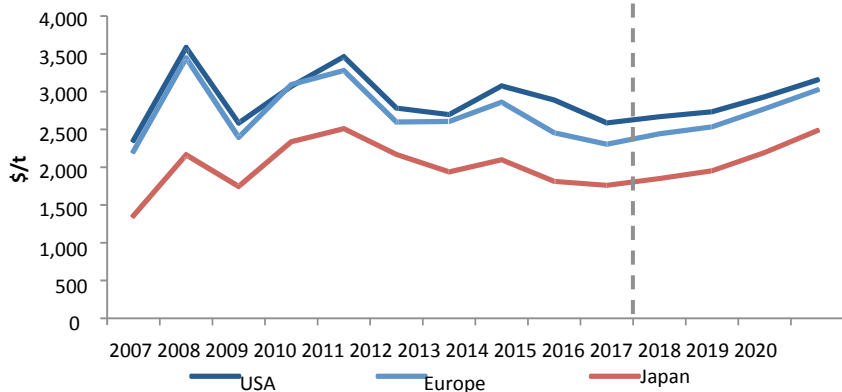


## GROWING METALLURGICAL GRADE SILICON METAL MARKET

### Growth in MG Si Consumption Expected to Accelerate from Historical Levels



### Rising MG Si Demand Expected to Drive Price Recovery in 2017-2020



Source: CRU 2015, Ferroglobe

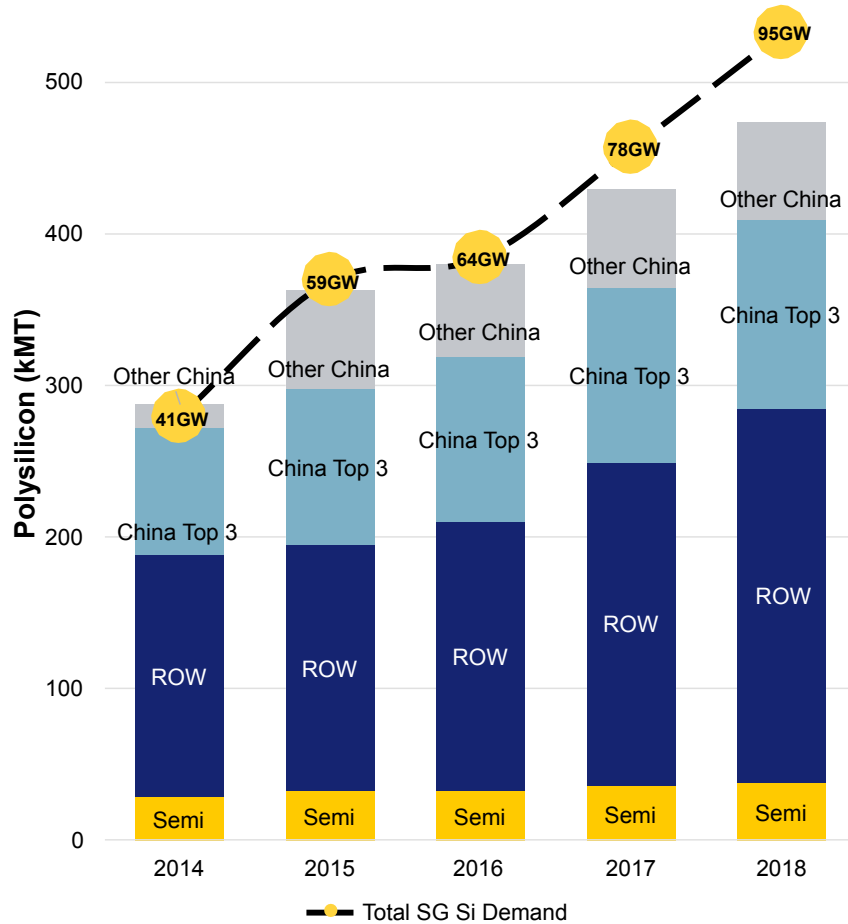
Note: Silicon consumption, pricing, and capacity data are from CRU.

- MG Si 2015 consumption was 2.2 Million Tons;
  - > \$US 6 billion in worldwide sales
- Demand is expected to grow at 6.0% CAGR from 2016 – 2020
- CRU forecasts a 2017-2020 price recovery for MG Si driven by rising MG Si demand
- **In 2015, 15 % of Global MG Si (98.5% Si) production was further refined to Solar Grade Si (SG Si, or “Polysilicon”) at 99.9999% (6N) purity**
  - 350 K Tons of SG Si was sold in 2015 (≈ \$US 5Billion)
- Growth will be largely driven by the growing demand for Solar Grade (SG) Si (Polysilicon) material to be used in Photovoltaic (PV) solar panels
- Each Watt (W) of energy produced by a PV solar system demands ≈ 5 gr of SG Si
- GTM Research estimates that Installed PV demand to growth 15 % - 23 % annually, representing about 10 Gigawatt (GW) per year
- Significant SG Si Deficit are forecast from 2017 on as Gigawatt (GW) produce with Solar panels increases

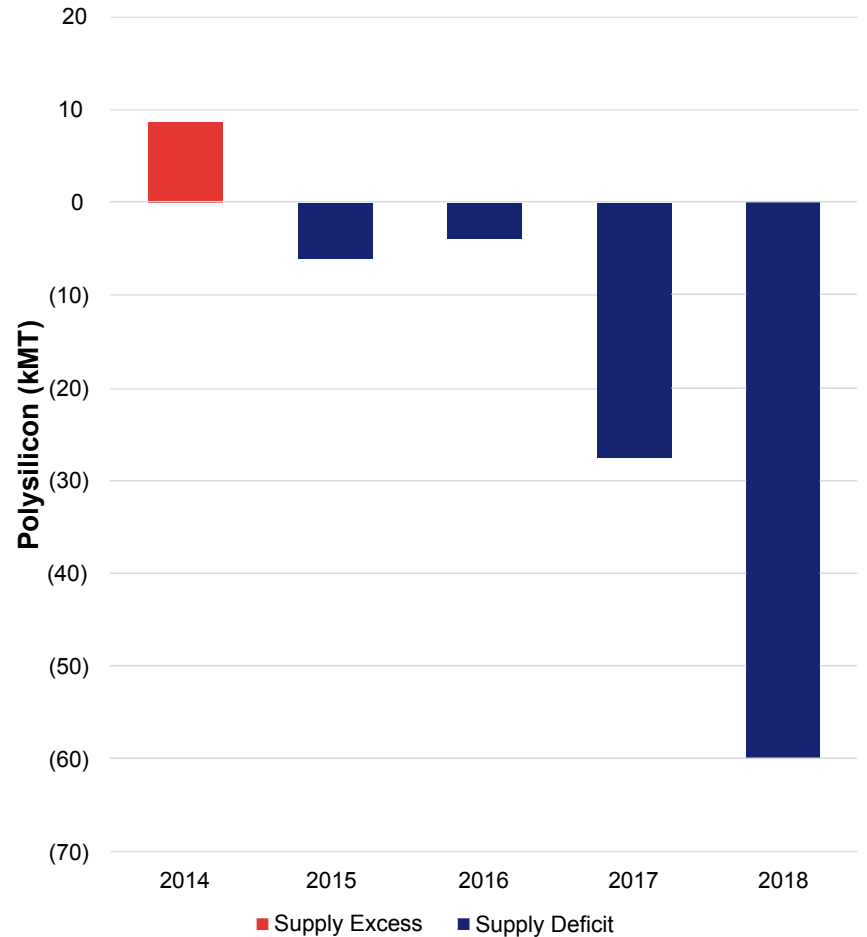


## Low SG Si (Polysilicon) Production Limiting PV Growth

SG Si (Polysilicon) Supply/Demand Forecast



SG Si (Polysilicon) Market Balance Forecast



Source: Demand Data Installations: GTM Research, PV Pulse, January 2016  
Supply Data: Competitor releases, industry analysts, REC Market Intelligence

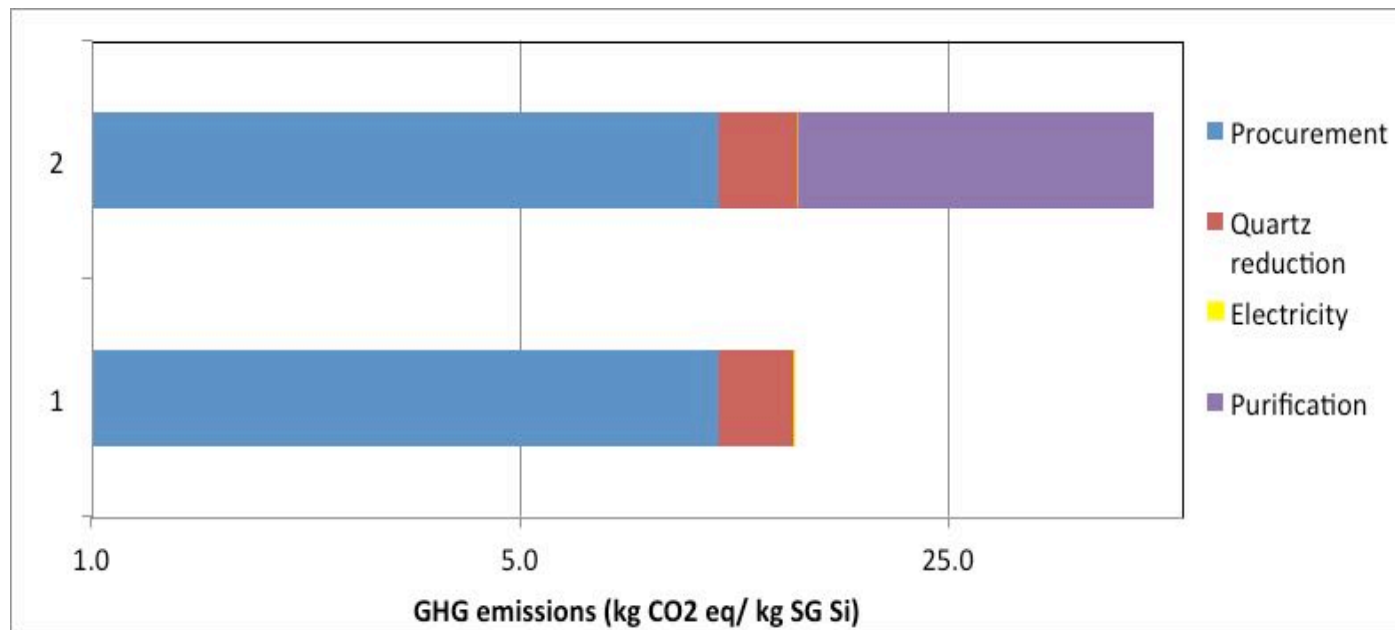
## PUREVAP™ Environmentally Friendly

### Carbon Footprint 75% Lower Than Conventional Process.

The *PUREVAP™ QRR* process is estimated to generate 14.1 kg CO<sub>2</sub> eq/Kg SG Si;

The Siemens process (the industry standard) normally generates 54.0 kg CO<sub>2</sub> eq/Kg SG Si of emissions.\*

- This represents 75% fewer greenhouse gas emissions, which is justified by elimination of the emissions emanating from the use of chemicals, as well as, energy consumption from the additional purification step.





# PUREVAP™ RECAP

Capital Cost Per Technologies Available To Produce SG Si Material (all \$ values in USD)							
			EXISTING TECHNOLOGY		NEW TECHNOLOGY	HPQ TECHNOLOGY	
Technologies	Feed Material	Traditional electrical Arc-Furnaces Smelters	Siemens HC	FBR Reactor with Silane	Silicor Aluminum Solvent Refining	PUREVAP QRR R&D Pilot Plant	PUREVAP QRR Commercial plant
Capable of Transforming	SiO <sub>2</sub> to	MG Si				Solar Grade Si	Solar Grade Si
Capable of Upgrading	MG Si to		Solar Grade Si	Solar Grade Si	Solar Grade Si		
Number of effective competitors		> 100	7		1	1	
Key Capex matrix							
Minimum Capacity Requirement (MT)		35,000	6,500		19,000	200	10,000
Cap Ex per Kg of annual installed capacity (US\$/kg)		7 (U.S.) 4.5 (China)	70 (U.S.) 45 (China)	100 (U.S.) 75 (China)	35	18	4
Capital Cost requirements (US\$ million)		245 (U.S.) 158 (China)	455 (U.S.) 292 (China)	650 (U.S.) 488 (China)	665	4	38
Key Opex matrix							
Best in Class Reported Cash Cost (US\$/kg)		1.8	13	10	7	10	2
Key Green matrix							
Kg of Co <sub>2</sub> estimated to be produced (Kg CO <sub>2</sub> eq/kg Si produced)		14.2	39.8	?	?	14.2	7
SOURCES:		Ferroglobe, Viridis.iQ GmbH, Bloomberg	IEEE JOURNAL OF PHOTOVOLTAICS, VOL. 5, NO. 2, MARCH 2015		Silicor Materials	PyroGenesis Canada Inc (PR August 2, 2016)	Roug Order of Magnitude Study by PyroGenesis