

Pioneering Low-Cost Solutions for Solar Silicon



Above: The New Spin-off Company, Solar Technology Research Corporation (STRC). The Team is pictured: Robert Hall, Terje Skotheim, Gordon Geiger, and David Lynch; inserts Harald Øye & Jeff Baymor

Below: A competitive comparison provided by STRC shows their calculations for cost and environmental benefits of the company's new silicon refining method.

Arizona seems the perfect fit for utilizing solar energy as a viable alternative energy source. And yet, few consumers or industries are utilizing the technology to power their homes and businesses. Much of that has to do with cost, but one Arizona start-up company is changing that with the help of a \$298,000 investment grant from Science Foundation Arizona.

In terms of solar manufacturing costs and processes, the photovoltaic (PV) industry has historically relied on high-purity silicon produced in submerged arc furnaces (referred to as metallurgical silicon) and refined the silicon with the industry standard, the Siemens™ process. Demand for this high-purity silicon, the most critical and costly material in solar cell panels, exceeded supply beginning in 2006, running upwards of \$300 per kilogram (kg). A decade earlier, silicon sold for as little as \$25 per kg. The result has been that the growth of the PV industry has been severely thwarted by the limited availability and high cost of silicon.

With an investment grant from Science Foundation Arizona, Professors David Lynch at the University of Arizona and Harald Øye at the Norwegian University of Science, were able to develop a new method for refining silicon using a metallurgical process that relies on inherent chemical reactivity of impurities in metallurgical silicon. With the new method, processing now removes impure elements to acceptable levels for solar cells; a seemingly small but significant breakthrough in decreasing the costs and environmental impact of silicon production.

To move toward commercializing of this process, Drs. Lynch and Øye, along with Tucson entrepreneurs Terje Skotheim and Jeff Baymor, and Professors Gordon Geiger and Robert Hall (Hall is one of the pioneers of the solar cell industry) have formed a spin-off company aptly named **Solar Technology Research Corporation or (STRC)**. STRC predicts that the new refining process can reduce production costs of purified silicon up to 50%. Since silicon constitutes 40% of the cost of a silicon photovoltaic cell and 25% of the final solar panel cost, this will make a major contribution in reducing the cost of solar energy to the end user.

Comparison of Siemens™ and STRC Processes		
Item	Siemens™ Process	STRC Process
Annual Production	3200 metric tons	3200 metric tons
Capital Cost	\$ 300 million	\$ 40 million
Marginal Cost	\$ 25 per kg	\$ 12 per kg
Electrical Energy	150 kWh per kg	20 kWh per kg
Inputs (except metallurgical silicon)	toxic gases	benign gases and solids
Waste Products	toxic & explosive	benign
Footprint	large	small
Process	high	low

STRC plans to establish a production facility based on modular units capable of producing 600 metric tons of refined silicon annually. A modular unit can provide silicon for 2 PV fabrication lines, and occupy no more space than a semi-truck trailer. Thus, a single unit can be incorporated within an existing PV fabrication facility, or multiple units can be grouped to provide refined silicon for more than one consumer.

Clearly STRC has a bright solar future and this equates to great economic benefits for the environment, the state and Arizona businesses and consumers.