



# Forecasting the Future

SEMICONDUCTOR ASSET  
OPPORTUNITIES | *For the  
Growing Photovoltaic Industry*



2020  
VISION



**ATREG** believes surplus semiconductor assets will play a significant role in driving down costs necessary to achieve grid parity and accelerate the photovoltaic industry's growth through 2020.

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## SEMICONDUCTOR MANUFACTURING ASSETS *Unprecedented Supply Spike Expected*

ATREG has witnessed a significant increase of surplus semiconductor manufacturing assets as integrated device manufacturers (IDMs) have embraced either asset-light or fabless operating models in favor of third-party or 'foundry' manufacturing in Asia. Furthermore, memory companies such as Samsung, Hynix, Micron, and Nanya are accelerating the migration of their manufacturing portfolios from 200mm semiconductor fabrication plants (fabs) to more cost-effective 300mm fabs. As a result, a wave of surplus manufacturing assets is expected to flood an already soft market. In the next 12 months, ATREG projects there will be more than sixteen 200mm fabs available for purchase in North America and Europe. The value of surplus manufacturing equipment alone is expected to spike from \$300 million in 2007 to more than \$8 billion in 2009, according to consulting firm Semiconductor Partners. It is important to note that these numbers are not a forecast of used equipment sales, but rather a forecast of the volume of tools (and corresponding value) that will become available.

## SOLAR SNAPSHOT

- Today the solar industry is estimated at \$13 billion, but is projected to reach \$40 billion by 2012.
- The market for photovoltaic cells is expected to grow by 40% annually until 2010, and continue to grow at a rate of 20% thereafter.
- Projections show the world demand will grow by 40% by 2032.
- By 2010, photovoltaic production is expected to reach 12 Gigawatts.
- According to iSupply, the photovoltaic industry will see grid parity reached in 2012 for regions with high levels of sunshine and in areas of medium sun exposure, grid parity is projected in 2018.

ATREG has represented many semiconductor companies and have been successful selling some of their operational fabs for their highest and best use in order to maximize the return on our clients' investment. However, with the market out of equilibrium, many of these semiconductor fabs will not sell as ongoing operations. Instead, companies that have spent hundreds of millions (even billions) of dollars on these advanced technology manufacturing operations will eventually be forced to move towards pure asset sales wherein equipment lines sell separately from the real estate. We believe redeployment of complete tool lines and real estate will become an increasingly common and necessary trend within the market.

A growing number of semiconductor manufacturing facilities in the U.S. and Europe have already been sold to real estate investors for redevelopment and in some cases been torn down completely. Under this worst case disposition scenario, sellers receive a minimum return on their investment as the buyers are not able to take advantage of the infrastructure in place.

## SOLAR SURGE *A Ray of Hope?*

The growing number of surplus assets in the semiconductor sector has created a unique window of opportunity for photovoltaic companies, which can acquire these assets at a price far below replacement cost. Breathing new life into these fabs by retrofitting for both raw silicon wafer production and silicon-based solar cell manufacturing is appearing to be a viable, cost-effective opportunity which could ultimately help accelerate the photovoltaic industry.

Why solar? According to SVTC Technologies, many of the silicon solar processes are built off of the same foundation as semiconductor manufacturing, and many of the base tools overlap. In fact, Micrel, a semiconductor company, reportedly runs solar-cell wafers right alongside semiconductor wafers on their manufacturing line in San Jose, California in order to enhance fab utilization. Approximately 95% of the equipment Micrel uses for their semiconductor products were suitable for solar, with the remaining tools customized and adapted.

Today, Micrel is the exception rather than the rule. Very few semiconductor companies have embraced the photovoltaic

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## SEMICONDUCTOR TO SOLAR *Early Examples of an Emerging Trend*



2007 - MUNICH, GERMANY  
BUYER: SOLSONICA | SELLER: EEMS

The former backend chip manufacturing plant is being converted to solar use by fab builder M+W Zander for Solsonica. While financial details of the transaction were not disclosed, the conversion to polysilicon solar cells will aim to expand capacity to 120MW.



2007 - HILLSBORO, OR, USA  
BUYER: SOLARWORLD | SELLER: KOMATSU

A former chip manufacturing facility previously owned by Komatsu was being converted by Solarworld AG becoming the largest solar wafer and cell factory in the United States. The adaptive reuse of this facility is expected to create 1,000 new jobs and received substantial support from the State of Oregon and the Anti Global Warming Fund.

## ADAPTIVE REUSE *ATREG Case Study*

ATREG is representing a client's million square foot semiconductor facility under contract in Europe. Although the facility was built in 1997, it was not fully completed and has never been occupied. Its intended use was semiconductor manufacturing and many features of the campus allowed for adaptability to solar wafer production.

ATREG has tracked the adaptive reuse market over the past decade and saw a strong fit with this facility. Retrofitting for raw silicon wafer production and silicon-based solar cell manufacturing processes are often cost effective because they are built off the same foundation as semiconductor manufacturing, and many of the base tools overlap.



2003 - FRANKFURT, GERMANY  
BUYER: CONERGY | SELLER: COMMUNICANT

This previous 200mm pure-play SiGe foundry designed by M+W Zander was acquired by Conergy AG and converted to have 250MW capacity. The €250 million investment represents 1000 new jobs, and complete conversion to a fully integrated mass volume solar wafer facility.

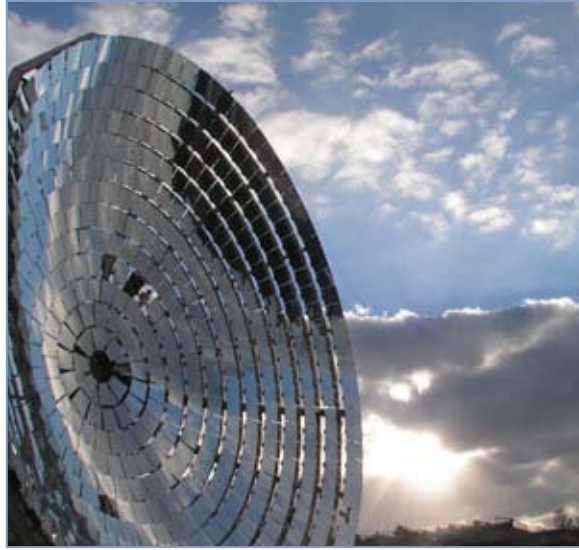


2000 - TRES CANTOS, SPAIN  
BUYER: BP SOLAR | SELLER: AGERE/LUCENT

This facility, first built in 1987 by AT&T, was acquired by BP Solar from Agere/Lucent in 2000 and converted to increase their photovoltaic production from 50MW to 300MW and is one of the largest facilities of its kind in Europe.

This sale is currently pending, and the buyer intends to utilize the campus to manufacture silicon based photovoltaic cells. The excess land on the site is going to be used to manufacture feedstock for photovoltaic cells. Slated to be fully operational in 2011, the buyer is finalizing the site and completing the full feasibility. The buyer has embarked on plans to manufacture world class high efficiency solar cells with a targeted annual production equivalent to 500MW of power. The strategic acquisition of this infrastructure rich facility will enable a rapid and cost-effective production.

sector to leverage their existing manufacturing portfolios. To remain competitive, however, semiconductor firms will have to adapt. By 2020, we predict 50% of today's semiconductor manufacturing companies will have either launched their own photovoltaic business units, or taken on external solar-wafer supply contracts as a 'fab-filler' to maximize asset utilization.



Growth and investment in the solar industry in the next ten years is unquestionable. With rising oil costs, population growth, and growing dependency on electric energy, it is paramount that companies find renewable solutions for our everyday consumption of electricity. While the world is already seeing broader adoption of this technology, the manufacturing side has not yet matured to the point where the economics of solar power is on par with grid power. Once grid parity is reached, widespread adoption will take hold. According to McKinsey & Company, "Within three to seven years, unsubsidized solar power could cost no more to end customers in many markets, such as California and Italy, than electricity generated by fossil fuels or by renewable alternatives to solar." (The McKinsey Quarterly, 26 June 2008) McKinsey also forecasts that by 2020, "global installed solar capacity could be 20 to 40 times its level today."

In order to achieve these ambitious goals, ATREG believes surplus semiconductor assets will play a significant role in driving down costs necessary to achieve grid parity and accelerate the photovoltaic industry's growth through 2020.

**ATREG** advises advanced technology companies on how to strategically divest and acquire business units or their components. Established in 1997, the group has represented over US \$2 billion in transactions.

**ATREG** understands your assets are not just buildings. They're also your people, tools, business processes, intellectual property, and products. We serve the advanced technology manufacturing sector - characterized by volatility, major capital investments, unpredictable market demand, rapidly evolving technologies, fierce global competition, and consolidation. For more information about ATREG, including current offerings, please visit: [www.ATREG.com](http://www.ATREG.com)

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**STEPHEN ROTHROCK**  
Senior VP, Director ATREG  
206.287.4757  
[Stephen.Rothrock@Colliers.com](mailto:Stephen.Rothrock@Colliers.com)



**DOUG BARRETT**  
Senior VP, Director ATREG  
206.223.0206  
[Doug.Barrett@Colliers.com](mailto:Doug.Barrett@Colliers.com)



**TOM MORTON**  
Legal & Operations ATREG  
206.287.4756  
[Tom.Morton@Colliers.com](mailto:Tom.Morton@Colliers.com)



**ERIN CONGER**  
Vice President ATREG  
206.223.0496  
[Erin.Conger@Colliers.com](mailto:Erin.Conger@Colliers.com)



**ERIC LARSEN**  
Vice President ATREG  
206.515.4491  
[Eric.Larsen@Colliers.com](mailto:Eric.Larsen@Colliers.com)



**NICK PAPA**  
Project Manager ATREG  
206.287.4767  
[Nick.Papa@Colliers.com](mailto:Nick.Papa@Colliers.com)



**DREW KOSSEN**  
Associate / Research ATREG  
206.223.5584  
[Drew.Kossen@Colliers.com](mailto:Drew.Kossen@Colliers.com)



**JENELL QUICK**  
Team Administrator ATREG  
206.515.4497  
[Jenell.Quick@Colliers.com](mailto:Jenell.Quick@Colliers.com)

**ATREG**

601 Union Street, Suite 5300  
Seattle, Washington 98101

[www.ATREG.com](http://www.ATREG.com)



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