ENERGY NEWS REPORT
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ET TRENDS

BUSINESS NEWS

World Solar Market - World solar photovoltaic (PV) market installations reached 1,744 megawatts (MW) in 2006, for a growth of 19% annual growth. World leader, Germany, had a grid-connect PV market of 960 MW in 2006 and now accounts for 55% of the world market. Japan's market size barely advanced, but Spain saw a 200% growth, with 33% for the United States. World solar cell production reached a consolidated 2,204 MW in 2006, up from 1,656 MW, or 33% over a year earlier. Japanese producers lost share over the past 12 months, dropping from 46% to 39% share, at the expense of Chinese cell manufacturers. Polysilicon production rose 16% in 2006, which, when combined with aggressive PV industry procurement, allowed a marginally higher market growth rate than projected 12 months ago. Nonetheless, polysilicon supply issues could still constrain cell production in 2007 although alternatives may be feasible. There have been supply-side constraints recently, but high capital investment throughout the PV chain over the past 12 months is positioning the industry for strong growth. PV companies have raised over $4-billion since January 2006 to support expansion. Worldwide PV industry revenue growth will range from $10.6-billion in 2006 through to between $18.6 and $31.5 billion in 2011 (source: SolarBuzz).

Solar Rises - ***Applied Materials*** was awarded a contract to provide T-Solar Global S.A (Spain) with Europe's first thin film solar module production line using ultra-large 5.7-square meter glass panels. By scaling to these large-area substrates, the same size used in Generation 8.5 flat panel displays, this integrated line can drive down the cost of solar panel manufacturing while doubling rated factory output, according to Applied Materials. For installations such as large commercial rooftops and solar farms, these ultra-large substrates are expected to enable an additional 25% reduction in the cost of solar electricity, the company said. Earlier, Moser Baer India Ltd. selected Applied Materials to develop and install what is believed to be the world's first Generation 8.5 thin film solar module production line in New Delhi, India. T-Solar is expected to produce panels using the thin film production line supplied by Applied Materials by mid-2008. The contract provides that Applied will deliver a fully integrated equipment line for a solar panel manufacturing facility with a nominal rated capacity of 40 MW per year. This line can be configured for end-market product sizes from 1.4 square meters to 5.7 square meters, for customer flexibility, the company said. Applied Materials officially announced its intention to enter the burgeoning solar market in September now that the solar industry had finally reached the inflection point. Applied Materials has

since become a major player in the alternative energy realm, providing a combination of manufacturing tools, technology and process innovations from the flat panel and semiconductor industries, and has said it is looking forward to revenues of $500-million by 2011 from solar panel applications alone.

Solar Module Prices - The decline in average selling prices of solar modules in Europe was short lived and prices rebound. Solar module prices in the US have remained steady. The price trend in Europe beat expectations as most industry players predicted continual price drops in March. The US market continues to show a balanced price picture with upward moves traceable to particular company product lines. As of March 2007, there were 192 solar module prices below $4.75/Wp, or 11.3% of the total sample, versus 173 modules priced below the same price in January. The lowest retail price for a multi-crystalline solar module was $4.32/Wp from a US retailer where the lowest retail price for a mono-crystalline module is US$4.24/Wp, from a retailer in Germany marketing a Chinese module. The recorded lowest thin-film module price was at $3.00/Wp per watt from a US retailer. The US is aggressively pushing the introduction of solar systems. The US Department of Energy (DOE) announced recently that it has selected 13 industry-led solar technology development projects for negotiation for up to US$168 million in funding during 2007-2009. Selected industry players include BP Solar, Dow Chemical and Sun Power, etc. Under this proposal, annual manufacturing capacity of solar systems will be expanded from 240 MW in 2005 to as much as 2,850 MW by 2010, representing more than a ten-fold increase. Corresponding costs of electricity produced by solar systems is expected to reduce to $0.05-0.10 per kWh by 2015, down from the present $0.18-0.23, DOE said. For Europe, industry players noted that although inventory clearance starting from the third quarter of 2006 and Germany government's reduction of subsidies have both weighed on pricing, demand from Southern Europe including Italy and Spain is solid. They are optimistic about the future price trend, saying that the observed rebound shows that the European module market has stepped out from its previous trough.

MORE SOLAR

Solar Implementation - Applied Materials will install more than 1.9 MW of solar power generation capability at its research campus in Sunnyvale, CA. The company believes this will be the largest solar power installation on an existing corporate facility in the U.S. The project will be rolled out in three phases. Applied said the project, when complete, will have a silent, non-polluting 1.9 MW power plant on what is currently open roof space and parking areas; a great hedge against future energy cost increases. Applied will pursue a strategy to significantly drive down the overall solar cost-per-watt and feels it is important to lead through example and that installations of this size will help lower consumer cost and spur overall market growth. Applied said it will start installing panels later this year, utilizing a variety of solar technologies. Once completed in 2008, Applied expects its system will generate more than 2,330

MW hours annually, the equivalent of powering 1,400 homes. Already, the company says it has reduced its overall electricity consumption in the San Francisco Bay Area by approximately 20% on a normalized basis over the last few years as part of its commitment to reduce its carbon footprint. Last year, Applied announced its intention to enter the solar photovoltaic equipment market, and has since expanded its corporate structure to include a solar power group. Applied's solar strategy is to bring significant change to the industry by allowing lower cost-per-watt solutions for solar cell manufacturing, with the goal of making solar power a significant alternative source of global energy.

JA Solar (Hebei, China) is a monocrystalline solar cell supplier who plans to install four additional solar cell production lines on its existing Ningjin site in Hebei, China, with each line to have a manufacturing capacity of 25 MW per year. JA Solar expects to have the four new lines running at full commercial production and yield targets by the end of Q3, bringing the company's total manufacturing capacity to 175 MW per year, when added together with its three existing 25 MW solar cell production lines. The company noted that it originally planned to build the four new 25 MW production lines approximately 40 miles outside Shanghai with targeted commencement of commercial operation by the end of Q3. Under that plan, the company was to lease the land and buildings for the Shanghai manufacturing facilities from Jinglong Industrial and Commerce Group Co. Ltd. but since the Jinglong Group has not obtained the required land use right certificates and other relevant approvals from relevant governmental authorities, JA Solar said it decided to transfer the newly-ordered equipment to its current manufacturing facilities in Ningjin, Hebei and install the four new 25MW production lines there. They still think the Shanghai location is attractive and plan to establish a dedicated R&D facility there, but their main priority must be keeping our capacity expansion plan on track. Moving the planned 4 new lines to Hebei will allow them to avoid potential delays in order to meet our targeted schedule of bringing an additional 100MW of solar cell production capacity online. The centralizing of manufacturing facilities will also improve efficiently of production lines. Construction on the new Hebei building is expected to be completed by June, adjacent to the company's existing production lines in the same industrial park, with the news buildings to be leased from Jinglong Group.

Solar AC - SolCool One has developed an air conditioner that runs off the sun, called a hybrid solar air conditioner. The solar-powered air conditioner is one of a growing number of energy-efficient products designed to save money, reduce pollution and maintain power during blackouts. The unit operates at a maximum of 500 watts, far less than half the power of typical air conditioning units. Air conditioning takes the biggest load on the power grid. The idea is to use small PV (photovoltaic solar) cells and equip them with 18,000 BTUs of air conditioning. The system includes batteries, for blackout/brownouts that can run the unit for either 12 or 24 hours depending on the battery size. The latest version can also heat a room and has attachments for purifying water and running other DC (direct current) appliances, like lights and ceiling fans. The SolCool system, which has been under development for about four years, is one of a growing number of energy-efficient

products gaining favor among consumers and businesses. With high energy prices and concerns over pollution, manufacturers are making energy efficiency a priority in product design. SolCool's unit can be thought of as going solar incrementally. Putting solar panels on a roof can cost $20,000 to $40,000 before subsidies, according to installers, a price tag that makes some consumers balk. But, one can adopt solar power for smaller applications. Some companies are betting that solar water heaters, which cost about $7,000, will gain popularity in this manner. SolCool has optimized the air conditioner to run on the direct current generated by the solar panels or batteries, rather than the alternating current that comes from electrical plugs. Building the product for direct current has allowed the company to build a very energy-efficient product which can run off-grid as well. The SolCool includes a sealed, two-gallon water tank that stores cooled water, which the air conditioner draws cooling from during a power outage.

Metallurgical-grade Silicon for Solar? - The persistent shortage of polysilicon is prompting solar cell makers to seek substitutes such as metallurgical-grade silicon as alternative raw material. This trend is growing obvious and industry players are aware of the potential development as this may pose structural changes to the industry. Polysilicon supply will remain tight until 2008. In light of concerns towards persistent polysilicon supply, more polysilicon suppliers are developing metallurgical-grade silicon because of its relatively low production cost. Industry players including Dow Corning, Japan's Nippon Steel and JEF, Canada's Arise, Germany's Solar Value, the US's Global PV Specialists and Norway's Elkem are some of the vendors that are tapping into this segment. Silicon is extracted from silica in electric furnaces using carbon electrodes at high temperatures. During the process of production, liquid silicon is collected at the bottom of the furnace. Drained and cooled liquid silicon is called metallurgical-grade silicon and this sort of silicon is at least 98% pure. Metallurgical-grade silicon cost about $ 0.77 per pound in 2005. Polysilicon prices have been rising by 22-33% each year since 2003. Polysilicon prices may continue to rise to $60 per kg, representing a 9% on year increase in 2007. Starting from 2007, more solar cell makers will apply metallurgical-grade silicon as the sole raw material for solar cells, instead of mixing it with conventional polysilicon, according to industry players. They noted that 2007 would be a pivotal year concerning the trend of metallurgical-grade silicon, as once this silicon is applied in solar cells on a large scale, the entire solar cell industry will to see fundamental changes. Industry players are generally open to adopting new raw materials and there are a growing number of players who have commenced testing the production of silicon wafers from metallurgical grade silicon. However, many of these silicon wafers are below standard at the current stage (JP Morgan).

Polysilicon supply-demand analysis, 2003-2008 (metric tons)						
	2003	2004	2005	2006	2007	2008
IC semi demand	17,000	19,350	20,500	22,000	23,500	25,100
Solar demand	9,000	11,000	16,500	22,170	25,939	33,072
Supply	26,700	28,800	31,000	36,330	45,250	58,350
Shortage	700	(1,550)	(6,000)	(7,840)	(4,189)	178

Solar Benefiting Thin Film Equipment Suppliers - (Electronic News) - The shortage of polysilicon is driving the solar cell industry to thin film technology and there will be a ramp in commercial production equipment. The total market for commercial solar cell production equipment is expected to grow from revenues of $1.2-billion in 2006 to $4.5-billion in 2010 that includes commercially available equipment for coating, etching, diffusion, and cleaning in its analysis. The crystalline silicon (c-Si) sector includes equipment for SiN, back reflectors, and contacts. The thin film sector includes equipment for transparent conductive oxide (TCO), deposition, contacts, and automation tools. The real growth in the solar cell market will be in equipment for newer thin film technologies, such as cadmium telluride (CdTe) and copper indium (gallium) diselenide. Key innovations are roll-to-roll equipment and printable inks instead of sputtering and chemical vapor deposition. Projections are that (CAGR) of c-Si and a-SI will be approximately 40 % between 2006 and 2010, whereas CdTe is projected to exhibit a CAGR of nearly 75% will show a CAGR of an 200 %. Other technologies, such as GaAs films will also grow at triple the rate of silicon-based cells.

WIND

New England Windmills - Finally? - A plan to build the nation's first offshore wind farm cleared a key hurdle winning state approval of an environmental report submitted by the project's developers. Cape Wind Associates hopes to build 130 windmills over 25 miles of federal waters in Nantucket Sound, off the Massachusetts coast. The turbines would reach heights as high as 440 feet above sea level when the tallest blade is pointing straight up, a concern for some opponents. The state secretary of energy and environmental affairs, approved the report in a ruling announced Friday, saying it complies with state environmental laws. Overall, the Cape Wind project will contribute to the long-term preservation and enhancement of our environment. *[The project has been opposed by a myriad of objections from the powerful, including Ted Kennedy].*

BIO-FUELS

Brazil's Petrobras to start ethanol production from bagasse - Brazil's state-owned oil and gas company Petrobras will start producing ethanol from bagasse in its research center in Rio de Janeiro. A pioneering plant will start operating in May 2007, and another plant to produce ethanol from bagasse on industrial scale is expected to be inaugurated in 2008. Petrobras' studies in the area began about 5-years ago. Another local private company Dedini, a manufacturer of equipments for the biofuel sector, is also carrying out research on that type of ethanol, which derives from lignocellulosic biomass found in bagasse, but while such raw material is

rather cheap in Brazil, the process of producing the fuel is still expensive. Japan and Brazil have been negotiating partnerships in the ethanol field for years. Petrobras and Japan's state-owned Nippon Alcohol Banhai have created the joint venture Brazil-Japan Ethanol in 2005. The Brazilian company signed this month a memorandum with the Japan Bank for International Cooperation (JBIC) on sugarcane culture, logistics and plants, aiming at increasing ethanol exports to the eastern country. Petrobras expects to send its first 20 million liters of anhydrous alcohol to Japan in 2007. Petrobras also expects to export 850 million liters of anhydrous alcohol to Nigeria and Venezuela this year, up from 120 million in 2006, and to start exporting the products to the United States as well, he added. (Source: Xinhua)

STORAGE

OpiXtal has developed a new kind of capacitor with 10 times the power of a battery-based energy source. Instead of being tightly wound and contained in heavy metal or ceramic cylinders, the new SuperXcap capacitors from OptiXtal are thin, light, flexible and can be easily stacked for added capacitance. SuperXcap capacitors are rated for 2.7 Volts. Given the high demand for battery-operated electronics, this new bridge power SuperXcap capacitor could quickly help manufacturers create new or improved battery-powered products that are clearly superior to comparable products offered by the competition. SuperXcap 5F capacitors have almost 5x the power density by weight and are 1.5x more volumetrically efficient than other capacitors. This means they deliver more W/kg., for that extra power new applications could soon require. SuperXcap capacitors are not sensitive to temperature and deliver a constant charge from -40ºC to +50ºC plus users can count on at least 500,000 charge/discharge cycles before change out may be required. By delivering a burst of instantaneous power at the start of battery-driven devices, the OptiXtal SuperXcap can considerably extend a battery's length of service. Plus the SuperXcap re-charges itself in seconds, so it's always prepared for the next squeeze of the trigger. SuperXcaps can be arranged in series, parallel, or any other design configuration where bridge technology makes sense.