

## Merrill Lynch Japan Conference 2008 (September 18, 2008)

Director & Senior Managing Executive Officer

General Manager of Corporate Solar Energy Group, Tatsumi Maeda

### <Slide 2: PV Global Market Trend>

Let me begin this presentation by explaining global photovoltaic market trends.

### <Slide 3: Contribution of Subsidies to Expansion of European and U.S. Markets>

The photovoltaic market today is characterized and driven by various subsidies and policies. Here, we can see the contribution of these subsidies and policies to expansion in the European and U.S. markets. As you can see on the bottom left of this slide, the number of countries in Europe implementing a high-price buyback system for electricity, namely, the feed-in tariffs increased to 22 countries, which contributed to market expansion that has made Europe, the world's largest photovoltaic market. The market is expanding rapidly in the United States as well, as shown at the bottom right, with incentives having been implemented in 38 states.

### <Slide 4: Toward the Realization of Low-Carbon Society of Japan Photovoltaics>

Next, I will describe the outlook for the market in Japan. Ahead of the G8 Summit meeting in July this year, Prime Minister Yasuo Fukuda announced a set of national guiding principles. Under this vision, the government aims to increase Japan's solar power generation 10-fold by 2020 and 40-fold by 2030 relative to 2005 levels. In terms of residential use, this represents the introduction of solar photovoltaic systems in 3.2 million households by 2020, or approximately 70% in case of new houses. Review of concrete policy aimed at realizing this vision has been already started, and signs of revitalization have already started to emerge in the Japanese market.

### <Slide 5: Principal Market Outlook>

Next, I will explain the market outlook for each area. The bars on the left in each graph represent market outlook under a scenario of policy driven, or incentive policy-oriented leadership. The bars on the right represent a conservative outlook, in the case that incentive policy does not spread. Market size in Europe is expected to expand by around 3.6 times to 4.7GW by the year ending March 31, 2013 ("fiscal 2013") as compared with current levels in line with the proliferation of the feed-in tariff systems that I mentioned earlier, which means that the European market will remain the world's largest market for the next five years. With the expansion to implement variety of incentives in the United States, the market there is forecast to be 2.6GW in fiscal 2013, an increase of 10.4 times as compared with current levels. This growth far exceeds that of the Japanese market. Furthermore, feed-in tariff systems are already underway in Korea and India. Market size in Korea is expected to equal that of Japan by fiscal 2013 at 0.9GW, and rapid growth is expected in the Asia market, including India. Global market size is forecast to be 7GW in the year ending March 31,

2011 ("fiscal 2011"), up 3.3 times over current levels, and 10.9GW in five years, up 5.2 times, if incentive policy-oriented leadership becomes widespread.

**<Slide 6: Comparison between Expansion Plans of Material Manufacturers and Market Requirements>**

Development in the solar energy business is currently being greatly affected by material production volumes. This slide portrays the situation of the supply of silicon material toward the future. The blue line and the green line show the requirement for silicon in the semiconductor industry and the solar industry, respectively, while the red line depicts the total requirement from these industries. The area in yellow represents the production expansion plans of existing silicon material manufacturers. The area in gray above shows production at new entrant material manufacturers. The material shortage problem can be redressed if new entrants continue to expand material production in this way. Some of the production plans at these new manufacturers are already behind schedule, however, and accordingly, Kyocera will keep a close eye on material production trends worldwide going forward, and will proceed with its business development plans.

**<Slide 7: Demand Forecast in Four Principal Markets>**

This slide shows the demand forecast in major markets. In addition to the three traditional markets, namely, stand-alone power source, residential, and public and industrial markets, shown from the bottom of the bar graph going up, demand for 10MW-class large power plants, newly included in red, is expected to grow. While seizing firmly the traditional growing markets, Kyocera will aggressively expand business into the large power plant market by leveraging our competitive advantage of high conversion efficiency in multi-crystalline solar cells.

**<Slide 8: Overseas Solar Photovoltaic (PV) System Manufacturers>**

The number of new solar photovoltaic system manufacturers has increased considerably in the past 2 to 3 years on the back of rapid market growth and production expansion by material manufacturers. Here, I will explain the current condition of growth in solar cell and module manufacturers in three key countries. The blue dots on the map represent existing major solar photovoltaic system manufacturers, and the red stars represent recently established new entrants. In Germany, shown in the upper center, although there are numerous original major manufacturers, the number of solar photovoltaic system manufacturers has been increasing as the market expands. There are also many new entrants with semiconductor technology in the United States, shown at the bottom left, particularly on the West Coast. On the right, as far as we know, at least 20 new manufactures in China have entered the market. Although only major manufacturers are shown here, it is said that the number of manufactures climbs to over 300 worldwide if small and medium-sized manufactures are included. Further to this, other companies from other industrial sectors such as Intel, GE, Hewlett Packard, Samsung, LG and Bosch are beginning to enter the solar industry. The solar energy related market is expected to develop to exceed the IT industry going forward.

### <Slide 9: Market Conditions: Overview>

Let's look at an overview of market conditions based on the aforementioned factors. As the expansion of incentive policy-oriented leadership is expected to continue in certain countries, the market is also expected to show continuous growth going forward. This should spur increased production at material manufacturers, culminating in more stable supply and pricing. As a result, the number of solar photovoltaic system manufacturers is expected to increase further. Amid these circumstances, the buyback price of feed-in tariff system is being reviewed in Germany, which is the world biggest photovoltaic market. The buyback price has traditionally decreased at an annual rate of 5%. However, the buyback price will decrease by the higher rate of 8-10% annually from next year onward. In other words, market price is expected to decline at the same rate every year. These factors truly signal the start of an “intense competition era” heading toward grid parity. With an increasing number of new solar photovoltaic system manufacturers entering the picture as the market expands, market price is expected to decline. Under such circumstances, there is expected to be a shakeout of those manufacturers that can survive. To survive in such an era, Kyocera must gain comprehensive competitive advantages in terms of cost-effectiveness by achieving higher conversion efficiency and improving productivity, ability to develop differentiated products, and high quality.

### <Slide 10: About Kyocera Solar>

Next, I will introduce Kyocera's solar energy business.

### <Slide 11: Technology Market Trend>

First, I will explain technology trends in the market. In the bar graph at the bottom of this slide, the vertical axes at the left and right sides refer to market size and market share of thin-film solar products, respectively. The horizontal axis refers to fiscal year. The green line graph represents share of thin-film solar products. The proportion of thin-film solar cells is expected to increase gradually going forward. The diagram at the top left shows current module conversion efficiency by technology. Kyocera's multi-crystalline product has achieved a module efficiency of 14.1% compared with 8~11% for other companies' thin-film products. We seek to further entrench this competitive advantage and grasp this expanding market.

### <Slide 12: Influence of conversion efficiency on Solar System Costs>

On this slide, I will explain the effect of a conversion efficiency on photovoltaic power generation systems. The bar graph on the left represents the cost breakdown when multi-crystalline solar modules with a conversion efficiency of 14% are used in a general residential system. Costs other than those for the solar modules and inverter, which are construction costs and rack cost, etc., account for 22.9% of the total. On the other hand, in the case when a conversion efficiency is 8%, the number of cells and racks required will be approximately 1.7 times that for 14%, resulting in significantly higher construction costs. The determination as to which of multi-crystalline or thin-film system will lead the market will be made going forward based on total system costs, including

installation, and long-term reliability.

**<Slide 13: Cost competitiveness: Improvement of conversion efficiencies>**

This slide shows the competitive advantages of Kyocera that will enable us to survive this era of intense competition. First, let me address the achievement of conversion efficiency, which most significantly affects cost. The entire production process for photovoltaic systems, from casting to finished module, affects the conversion efficiency of these systems. To be more specific, all of the following are key to conversion efficiency: in the casting process, temperature control technique in melting and concretion of materials; in the ingot cutting and wafer slicing process, methodologies to minimize the damage to surfaces that takes place during slicing; in the process of making solar cells, techniques to minimize reflection of light, such as RIE; and in the process of making solar modules, optimization of the lining to prevent voltage reduction. At Kyocera, we have developed a fully integrated process for the production of photovoltaic systems, which enables us to optimize all production steps. Therefore, we can manufacture multi-crystalline photovoltaic systems with the world's highest conversion efficiency.

**<Slide 14: Cost competitiveness: Productivity>**

This slide shows technology development trends for higher production efficiency. The challenge is to make solar cells more efficient and thinner. First, I will address enhancement of the efficiency of solar cells. In the year ended March 31, 2005 ("fiscal 2005"), Kyocera developed a module with a three-bus-bar structure, rather than a two-bus-bar structure, thereby improved conversion efficiency by 0.8 percentage points, to 16.5%. As a result of this improvement, power output per cell has been enhanced by 5%, to 3.86W. By producing a larger cell with enhanced power output in 2008 and using a back contact structure, which we are currently developing, we aim to improve conversion efficiency to 17.5% and eventually 18.5%, meaning each cell will be able to generate 4.50W of power, which is approximately a 17% improvement over current levels. In addition, regarding the efforts to make cells thinner, Kyocera succeeded in developing a cell with a thickness of 200 $\mu$ m, and then last year succeeded in further reducing this to achieve thickness of 180 $\mu$ m for all cells, from a thickness of 240 $\mu$ m in fiscal 2005. As a result we have been able to improve productivity by approximately 40% compared with fiscal 2005. Kyocera aims to make cells even thinner going forward by further studying the properties of the cells.

**<Slide 15: Development of Differential Products>**

On this slide we look at developments for product differentiation. This map shows temperature distribution around the world. As the market has expanded, requirement has become increasingly diversified based on differences in region and environment. In regions of heavy snowfall, circled in blue at the top left, modules that can resist snow cover are essential. Likewise, modules with excellent heat resistance properties are essential in regions with high temperatures, circled here in red. In regions circled in black and green, demand calls for design-oriented black back sheets and frameless modules to ensure compatibility with landscape and architecture. By fully grasping these

market requirements, Kyocera will introduce products into its markets that are characterized by modules designed to meet diversified demand, thus differentiating Kyocera's products from those of others.

#### **<Slide 16>**

On this slide we look at an approach to product development. On the left you can see modules that can resist snow cover. These modules are designed to withstand 5,400 Pa of snow load, as stipulated by the IEC. The upper right is an example of a black module. Making back sheets black may result in temperatures above normal levels. More research is required to fully analyze the effect of this. The bottom right is a frameless module. It is necessary to test in advance the effect of the absence of a frame on strength at the time of mounting. Kyocera has been conducting various analyses, including structural analysis and thermal analysis, in advance through CAE, and is steadily and speedily implementing design of modules.

#### **<Slide 17: Development of Solar Modules>**

This slide shows the development of solar modules over time. In fiscal 2005, Kyocera shifted to cells with a three-bus-bar structure and improved module power output to 200W. In the year ending March 31, 2009 ("this FY") we will introduce a 210W module, and in the year ending March 31, 2010 ("fiscal 2010") a 220W module using back contact solar cells. We will work hard (continuously thereafter) to improve the conversion efficiency of our solar cells to increase the power output of modules, with the aim of further reducing total system costs.

#### **<Slide 18: No. 1 Quality Evaluation in Germany>**

Next, I will explain regarding our approach to the quality of our products. Long-term reliability is most essential for solar PV products. I will introduce one example here. A German consumer group voluntarily gathered solar modules from 15 photovoltaic system manufacturers worldwide through random selection from markets and tested and evaluated their output, durability, reliability, etc. Each test item was evaluated on a six-point scale, with one being the best grade. Kyocera's solar module received the top rating of 1.9 points, and the results were published in an industry journal. Consumers, when purchasing products, take this group's opinion very seriously. Due to the received evaluation, as solar photovoltaic products are used for long periods of time, and there are many cases in which Kyocera's solar photovoltaic products are selected not only based on price but also due to durability. We intend to place further emphasis on quality as a key element.

#### **<Slide 19: Major Characteristics Required of Solar Cells>**

This slide summarizes Kyocera's technologies that I have discussed. The two biggest requirements for solar photovoltaic products are total system cost reduction, including installation cost, and reliability in continuing to generate stable output over long term. First, let's look at cost. The factor with the biggest impact on cost is conversion efficiency. As conversion efficiency increases, cost decreases. Kyocera has achieved solar cells with a conversion efficiency of up to 18.5% through

back contact technology. Compared with this a conversion efficiency of thin-film solar cells is 8~11%. Next, let's look at long-term reliability, the other vital element for solar cells. Kyocera has already verified product lifespan evaluation of for over 20 years.

**<Slide 20: Kyocera's Production Expansion Plan of PV Systems>**

This graph shows the trend in production expansion plans for Kyocera Group's photovoltaic systems. The vertical axis shows MW to be produced and the horizontal axis shows fiscal year. The blue balloons show notable policy events. Residential subsidies were introduced in Japan in the year ended March 31, 1995. After that, the German EEG Act was enacted in the year ended March 31, 1999, and then reviewed in the year ended March 31, 2004, while the California Solar Initiatives Program was brought into effect in the year ended March 31, 2007. Implementation of such policies has contributed to rapid market expansion. Kyocera has expanded production volume in a precise and step-wise manner in accordance with such market expansion. In line with the forecast of continued market growth, Kyocera will expand production volume steadily from 300MW this fiscal year to 400MW in fiscal 2010, while launching highly efficient solar cells using the latest back contact technology. We originally announced a production plan of 500MW in fiscal 2011, but have since revised this upward to 550MW. Furthermore, we hereby announce our plan to produce 650MW in the year ending March 31, 2012. We will work to secure materials and enhance productivity in order to further expand production going forward.

**<Slide 21>**

This slide shows Kyocera's bases for the production and sales of photovoltaic systems. The area in orange at the top represents Kyocera's eight sales bases worldwide. We newly established a sales base in Korea this year. Many of these bases have established dense distribution channels globally based on strong relationships of trust, with distributors working with us for extended periods of 10~20 years. This enables us to gather market information and grasp customer needs in a timely fashion to improve sales quality. The area in blue at the bottom shows our production bases worldwide. We have four production bases: the Czech Republic covering Europe, China (Tianjin) covering China and Asia, Japan (Yokkaichi, Shiga Prefecture, and Ise, Mie Prefecture), and Mexico covering North America. A second factory was completed at the Ise Plant this year, increasing annual production capacity there to 150MW. The Mexico Plant also constructed a factory capable of producing 240MW per year. It is our basic policy for development of overseas operations that production will be undertaken where markets exist. This allows us to respond optimally to the market with quick delivery. We respond swiftly to market needs and engage in market-oriented module design.

**<Slide 22>**

Finally, I will introduce some examples of our photovoltaic systems installed recently. Through this, you can obtain a good insight into the great extent of our business development. This slide shows the photovoltaic power plant installed in Salamanca, Spain, which has an output of 13.8MW. A

system with an output of 15MW is currently under construction in Dulcinea, Spain, which when completed will constitute a further large power generating facility in Spain, with such facilities having a continued output of approximately 30MW by a single maker.

**<Slide 23>**

This slide shows a photovoltaic system at a soccer stadium in Bern, Switzerland that has an output of 1.35MW. This is the largest such system installed at a soccer stadium in the world. The stadium was used as one of the venues in EURO 2008, which was held recently.

**<Slide 24>**

Here you can see Europe's highest photovoltaic system at an altitude of 4,000 meters installed on the wall of the Jungfrau railway station, which sits in the Swiss Alps.

**<Slide 25>**

Let's look at examples of photovoltaic systems in the United States. At the top of this slide you can see a system installed for the Alaska pipeline and used to send weak electric current as a measure against corrosion. The system stands in an upright position due to the high latitude of Alaska. In the center of this slide at the left, you can see a photovoltaic system at a water purification facility in California with an output of 1.2MW. Industrial application has expanded to include use at a university and parking lot. The number of 1MW class systems at power plants has also increased, as shown at the bottom right.

**<Slide 26>**

Let's look at Japan. AEON Group has installed photovoltaic systems at 30 of its stores with a total output of 2.6MW, as you can see in the upper left of this slide. The photo at the right shows a 1MW photovoltaic system installed by J-Power, demonstrating how these systems are starting to be used by power companies in Japan as well. At the bottom of this slide you can see a 300kW system installed at the Shiki Arts Center of the Shiki Theatre Company.

**<Slide 27: PV from Polar to Equator>**

Let's look at solar photovoltaic systems in use in the Marshall Islands, the Maldives and Antarctica. Systems are being used for electricity and ice makers in the Marshall Islands, for a power supply of a pump to draw up water in the Maldives, and for a power supply of measuring equipment in Antarctica. Kyocera's photovoltaic systems are utilized in a wide array of scenes, from one of the coldest places on earth in Antarctica to one of the hottest equatorial region.

**<Slide 28>**

That concludes my presentation on Kyocera's solar energy business, which we aim to expand steadily and speedily in accord with rapid market expansion.