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The world's largest solar energy powered sport stadium

As the year 2009 draws to a close and in the holiday spirit, I want to celebrate the year in a sports-hearted mood by dedicating this column to a sport stadium, embellishing with ebullient photos.

This stadium is the epitome of engineering ingenuity, eco-friendliness, renewal energy and beauty.

However, celebration?—celebrating the economically horrific downturn year?

Yes, there are something to be celebrated. First, the economic recession was officially ended in June, and most countries' GDP moved upward in the second half of the year, as did the balance sheets of almost all companies across the industry sectors.

In the solar industry, the year has been bitter and sweet, albeit more bitterness from market growth perspective. It is estimated that the global new installed PV power dropped from approximately 5.4 GW in 2008 to 4.6 GW this year, and the new installed PV revenue plummeted from a ballpark of US \$30 billion in 2008 to \$18 billion this year (It should be noted that Spain alone contributed a significant chunk to this drastic dip due to its 2008 growth of more than 2.6GW of new installed PV power over 2007, which was discussed in my previous columns).

Over the time horizon of a decade from year 2000 to 2009, this year indeed broke the almost perfect exponential growth curve for the PV market.

Nonetheless, this year has some bright spots in the PV solar industry around the world. One example: The world largest solar energy powered sport stadium was completed early this year in Kaohsiung, Taiwan and was actually put in use promptly. (Other examples will be covered in future writings.)

The stadium served as the main stadium

for 2009 World Games during July 16-26 2009. The Games featured sports that are not contested in the Olympic Games.



Saddle-shaped solar-panel roof of 2009 World Games Stadium, Kaohsiung, Taiwan (Courtesy Delta Electronics, Inc.)

The building was constructed with spiral steel girders. The saddle-shaped solar cell roof occupies 19-hectare. It can house 55,000 spectators. As exhibited in the inset photos, the solar panels covering the vast external face of the stadium are able to generate most of the power required for its operation. It is more than self-sufficient in electricity needs. During the non-games



Steel girders of 2009 World Games Stadium, Kaohsiung, Taiwan (Courtesy Toyo Ito Architect).



Solar panels of 2009 World Games Stadium, Kaohsiung, Taiwan. (Courtesy Delta Electronics, Inc.)

period, the surplus energy can be saved and sold. Its solar energy system meets 1 MWp (megawatt peak) capacity and can generate 1.1 M kwh of electricity annually.

This mind-boggling solar system was integrated and constructed by Delta Group, Delta Electronics, Inc., including the design and manufacture of solar cells and modules. The light-through 8,844 solar panels were all designed and manufactured in house. The solar panels cover a surface area of 14,155 m² integrated into the roof construction. The stadium's solar energy system also uses Delta's energy inverters converting DC to AC power and feeding electricity into the grid with inverting efficiency of 98%.

This spectacular architecture created by the famed, innovative architect Toyo Ito is artistically and eco-friendlily landscaped with palm trees and thick plants imitating a tropic forest. Its open design and wind-sun-conforming orientation provide a welcoming and comfortable sports ambience. The solar panels allow 30% of total sunlight through, so the audience can enjoy a real-time outdoor climate. Spectators can observe the spiral bracings of the roof through the glass roof (thanks to the light-through solar panel technology offered by Delta group). The stadium is certified by the International Association of Athletics Federations as a first-class sports arena.

After the city was granted the right to host the 2009 World Games by the International World Games Association, construction commenced on July 6, 2006 and was completed in January 2009. It cost about NT \$5 billion. Another worth-noting record is that it is reported that despite the challenging technical difficulties encountered by installing spiral steel girders and 8,844 solar panels, no site accidents have occurred.

Environmentally, the 1.14 M kwh of electricity generated by solar PV reduces approximately 660 tons of CO₂ emissions annually. It is reported that all raw materials used in the stadium are 100% reusable. The building meets a "Green Building Code."

The confluence of crucial virtues—entrepreneurship, collaboration and efficiency—culminates in accomplishing this very first solar energy powered stadium in the world. It is a beauty indeed!



2009 World Games Stadium, Kaohsiung, Taiwan (Courtesy Delta Electronics, Inc.).



Aerial view of 2009 World Games Stadium, Kaohsiung, Taiwan (Courtesy Toyo Ito Architect).

Dr. Jennie S. Hwang has extensive experience in global market and international business in her executive capacities with both corporate America and entrepreneurial businesses. She is inducted to the WIT International Hall of Fame, elected to the National Academy of Engineering, and named an R&D-Stars-to-Watch (Industry Week). Dr. Hwang is a member of the U.S. Commerce Department's Export Council, and serves on university, civic and Fortune 500 NYSE company boards. Among others, she has served on National Research Council's "Globalization Committee" and "Forecasting Emerging, Disruptive Technologies Committee". Her education includes Ph.D., M.S., M.A., B.S. degrees in engineering and sciences, respectively, and Harvard Business School Executive Program. An author of 300+ publications, she is also a worldwide speaker on trade, technology, business, education, and social issues. Tel: (216) 839-1000; E-mail: JennieHwang@aol.com. www.JennieHwang.com