SMT PERSPECTIVES AND PROSPECTS

What Can We Expect in 2012?

SUMMARY

After a protracted recession, how bleak is the global economic outlook for 2012? Is there a light at the end of the tunnel? How will the global economy affect business? This month, Dr. Jennie S. Hwang takes a look at critical market movement and technological trends the industry will be focused on in the New Year.

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Once again the time to look at the year ahead has arrived. In this month's column, I will take a long view on market thrusts and technological trends in selected areas deemed critical and relevant to the industry. Each of these areas will be briefly reviewed, but more detailed discussions can be found in future publications and speeches. After a protracted recession—or lack of a speedy recovery—how bleak is the global economic outlook for 2012? Is there light at the end of the tunnel? How will the global economy affect business?

Global Economic Outlook

A crisis-riddled Europe, a weak U.S. recovery and lack of a clear governmental strategy in Washington D.C., in both deficit and debt reduction, pose the most economic concern and uncertainty for 2012. General consensus points to a U.S. GDP of 2.3 to 2.9% while the Organization for Economic Cooperation and Development (OECD) forecasts the U.S. economy to grow merely 1.8% and the euro-zone to expand by only 0.3%. The U.S. unemployment rate is projected to stay high, above 8%. The housing market remains sluggish, so far largely impervious to various economic "stimuli" instrumented by the Federal Reserve, although a bottoming-out is likely in 2012. Additionally, the upcoming U.S. presidential election adds another variable.

Although not without challenges, Asia continues to be the high-growth region—the world's economic engine. China is still sitting on a $2.7 trillion foreign exchange reserve. The evolving balancing act in the country's export and domestic consumption with manageable inflation is shaping up. While China is labouring to expand domestic spending to balance the export-centric economy, the weak economies in both Europe and the U.S. are hurting China's exports.

A slowdown in China would have profound consequences worldwide, from commodity prices to U.S. export to financial backing to Europe. However, I do expect that China will monitor its economic dynamics very closely and take the necessary measures to keep its economic engine humming, all while mitigating the risk of any unwanted level of inflation. Easing the monetary policy by reducing bank reserve requirements has already begun and more is expected in the future. Nonetheless, growth in China in 2012 is expected to reach more than 7.5%.

Multi-national corporations continue to perform well, enjoying strong balance sheets. These corporations collectively hold more than $1 trillion in cash, which makes them poised for investing in growth when the time is right.

Overall, indicators point to a not-so-strong economy in 2012. Under this low-growth economic environment, the wise practice is to operate efficiently, be fiscally conservative and keep the powder dry.

Electronics Industry: Hardware

The semiconductor industry is expected to register positive growth in 2012, averaging a mid-single-digit growth. Some industry sectors will grow more than the others, just like 2011 when some companies (namely, Qualcomm and Intel) generated more than 23% growth and some dropped more than 30%.

Moving to the "smart" world will be the driving force for the electronic hardware in innovation, as well as in manufacturing. Today, China functions as the manufacturing center for electronics hardware. Despite new and renewed challenges, I see China making a concerted effort, though slow and gradual, to shift toward a more consumption-based economy. This shift should further expand the demands of electronics products for all industry sectors, be it automotive, smartphone or industrial equipment, which should benefit all multi-national companies doing business in China.

And China will continue to take on or take over the global demands of electronics for solar photovoltaics, harvesting from its manufacturing prowess of solar cell, modules and installation, as well as its huge market.

Solar Photovoltaic Market & Technology

As stated in my forecast column last year, solar is here to stay as one of many viable renewable energy sources. Regardless of heavy downward pricing, solar PV installations have risen by 25% +/- 2% in 2011, having reached 24GW.

Going forward, reality will set in. We are going to see a heightened rebalancing and shakeout in 2012, which will inevitably cause short-term pain for suppliers.

The rebalancing act will clear up some illusions and make the supply-and-demand and pricing theories appear non-applicable. It will also provide a wake-up call in modifying business models to generate revenues and profits. The shakeout will create immense challenges for companies that do not have a solid business plan and will also render changes in the supply chain and industry infrastructure. Many cell- and module-making companies will vanish. Yet the risk

of non-participation and missing the market outweighs the risk of staying in the uncertain, challenging landscape.

Then there is the "China factor," a potent one. Back in 2007-2008, China announced its vertical integration approach covering the entire spectrum of the value chain in an attempt to control the market. Most recently, China raised its target for solar power capacity to 15 gigawatts by 2015 (National Energy Administration). China further implemented the feed-in-tariff (FiT) program, emanating from the European model. In U.S., the tax credit and military projects will further increase demand.

In the next two years, the total market value in dollars is uncertain due to various factors, but the continued increase in GW installation is anticipated. Nonetheless, the low prices and strained margins will be the name of the game.

In technology, thick-film, crystalline silicon (c-Si) technologies will remain viable. The lower efficiency thin-film technology must be able to deliver less expensive front-end cost to compensate the back-end area penalty and hardware cost that thin-film technologies require, and must be able to resolve other technological and performance concerns. Consequently, thick-film, crystalline silicon (c-Si) cells will continue to dominate the market.

Challenges created by this transitioning and rebalancing processes will truly separate the winners from the losers. Glorified winners have reaped not only revenue and profits, but also market share.

A viable solar operation requires a business plan that is positioned to weather the industry's boom-and-bust cycle. It takes four core

competencies to do business in the solar space: Technology capability, manufacturing prowess, operational agility and strategic foresight. These competencies are key to the future of a company, be it a cell and module maker or a materials and device supplier. Sustained success requires these integrated forces to defy the impact of unwanted external conditions.

The most "adverse" phenomenon in today's solar industry is pricing and the price drop. Yes, pricing in solar cells/modules are going on a wild ride. To paraphrase Winston Churchill's wise words: The more we understand the past, the better we can see the future. Analyzing current industry dynamics, coupled with understanding the industry's historical backdrop, is the way to formulate foresight and vision in weathering this rigorous, yet rewarding, industry.

Environmentally-Friendly Manufacturing & Lead-Free Solder Reliability

The mission is yet to be accomplished.

In lead-free, I am hoping that my statement from last year, "…the industry has been long on generating reliability test results, but short on actions for what it takes to have a high-performing lead-free alloy…" will become invalid in 2012. But this hope may not pan out.

It bears repeating again and again. Within an SAC system, the current performance is as good as you can get. Having high reliability in mind, the true reliability improvements will have to go outside the SAC ternary system. The "core values" and "deep" metallurgy including dislocation theory, microstructure and strengthening and failure modes, as discussed in my previous publications, must be put to use. And we have to resort to that cliché: innovate and work out of the box for sweepingly better performance. Simply put, a quaternary or higher alloy system is necessary. The substantive guiding principles were covered in my book, *Environment-Friendly Electronics—Lead Free Technology*. This set of principles works and has proven to work exceedingly well. Trust, but verify.

More and more products will become RoHS-compliant, or move closer to the directive, and this means more existing exemptions will be removed. Environmentally-friendly production, from cradle-to-grave, will continue to gain momentum. For our industry, this ranges from semiconductor packaging to PCB fabrication to solder material to PCB assembly.

As I write this column, the United Nations Climate Change Conference is being held in Durban, South Africa. The conference aims to boost green economy, signaling the increased awareness, cooperation, collaboration and actions on environment and climate issues, including fossil-fuel emissions. In 2009, the top five countries by fossil-fuel emissions (CO_2), according to data from the U.S. Energy Information Administration, were: 1) China, 2) the U.S., 3) India, 4) Russia and 5) Japan.

Corporations' environmental stewardship for global sustainability continues to be one of the most important corporate business policies in 2012. **SMT**

Dr. Hwang, a pioneer and long-standing contributor to SMT manufacturing since its inception as well as to the lead-free development, has helped improve production yield and solved challenging reliability issues. Among her many awards and honors, she has been inducted into the WIT International Hall of Fame, elected to the National Academy of Engineering and named an R&D Stars to Watch. Having held senior executive positions with Lockheed Martin Corporation, Sherwin Williams Co., SCM Corporation and IEM Corporation, she is currently CEO of H-Technologies Group providing business, technology and manufacturing solutions. She is a member of the U.S. Commerce Department's Export Council, and serves on the board of Fortune 500 NYSE companies and civic and university boards. She is the author of 300+ publications and several textbooks and an international speaker and author on trade, business, education and social issues. Contact her at (216) 577-3284; e-mail JennieHwang@aol.com.