

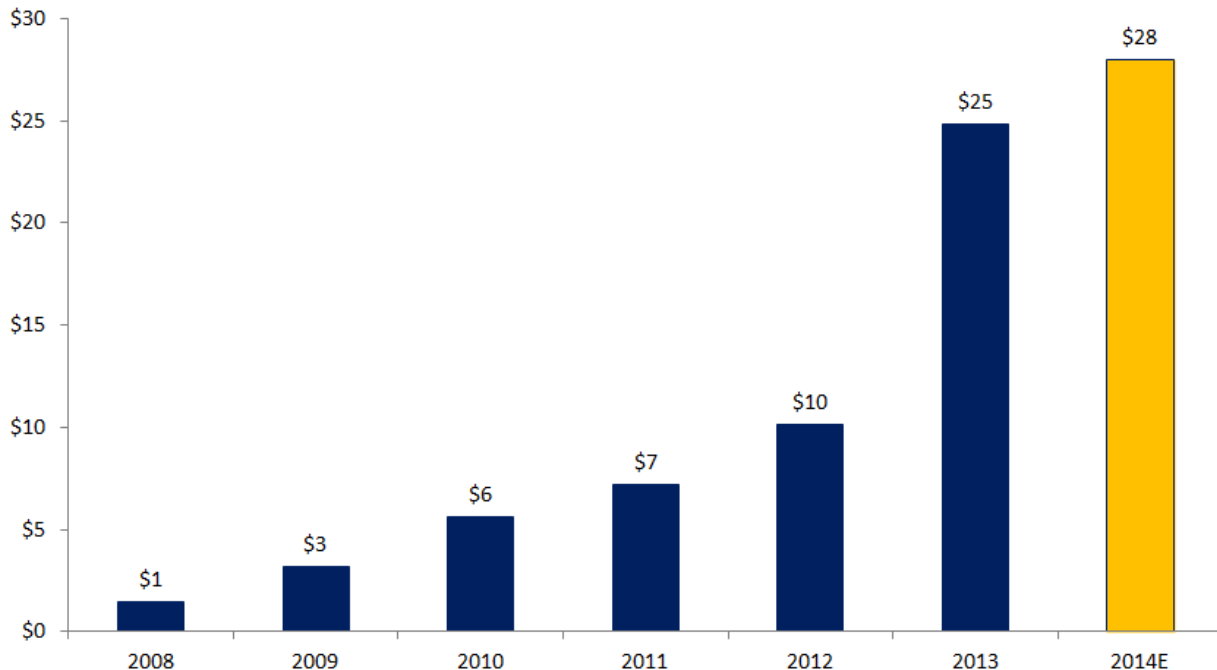
SOLAR POWER IN JAPAN: FROM THE GROUND-UP

Analysis by PHOTON Consulting research in Japan conducted by Vincent Filter, Nana Hori, Joe Lara, Ravi Manghani and Michael Rogol

From the top looking down, Japan's solar power sector looks healthy. The annual revenue pool of new solar power system installations in Japan increased from \$1bn/year in calendar year 2008 to \$6bn in 2010 and \$10bn in 2012. The sector again grew significantly in 2013, reaching revenue of \$25bn, and is on a path to achieve \$28bn in 2014. This equates to impressive average spending in 2014 of ~\$220/person across Japan's population, up from only ~\$12/person in 2008. This may be the largest category of new spending in the entire Japanese economy.

REVENUE POOL FROM NEW SOLAR POWER SYSTEM SALES - JAPAN

(\$billion/year)



Source: PHOTON Consulting, LLC. Analysis is based on primary research in Japan's solar power market conducted starting in 2003. Data displayed in US\$ to be consistent with PHOTON Consulting's global coverage of more than 70 solar power markets and market segments and more than 60 storage markets and market segments. Exchange rates for yen to US\$ based on annual average from Oanda. Note: All data are rough estimates.

The remarkable growth in Japan's solar spending and revenue pool enabled companies at the top of Japan's solar sector to achieve impressive results. In 2013, four large Japanese solar companies (Sharp, Kyocera, Panasonic and Solar Frontier) achieved aggregate solar revenue of >\$7bn and aggregate operating profit of >\$500mn. Most of this solar revenue and profit came from domestic sales. In calendar year 2014, these four large Japanese players are on a path to achieve \$8bn of aggregate revenue and >\$1bn of operating profit, with most of this revenue and profit coming from domestic sales.

SOURCE: PHOTON Consulting, LLC. All rights reserved. All data are preliminary rough estimates.

Despite the positive top-down perspective, Japan's solar sector appears much less positive when looking from the ground-up. Since the start of 2013, PHOTON Consulting has interacted in-person with >600 Japanese electricians involved in the installation of solar power systems. We do this to better understand the core needs of Japanese electricians and get a bottom-up view of the Japanese electricity sector. Dominant themes that come from these interactions with local Japanese electricians include:

- Nearly unanimous belief among electricians that traditional Japanese electricity companies will be bankrupted and nationalized due to the rapid rise of distributed energy
- Nearly unanimous conviction outside Japan's largest urban areas that solar power has strong fundamentals for growth (high electricity prices, low interest rates), but that Japanese solar manufacturers do not make genuine efforts to get close to end-customers and electricians/installers in order to understand and satisfy their core needs (i.e., Japanese solar manufacturers often work through distributors partners)
- Nearly unanimous belief outside Japan's largest urban areas that the addition of storage to solar power is essential to enable continuing solar power system sales and also to sustain the electricians' businesses, but that Japanese suppliers are not providing products designed to address the true needs of electricians and end-customers
- General pessimism among the significant majority that solar sales will crash within three years due to the combination of challenges to Japan's traditional electricity companies, insufficient responses from Japan's largest solar power companies and lack of products (in particular PV+storage) that address the needs of electricians and end-customers

Overall, **the view from the bottom-up is filled with risks and expectations of major challenges ahead, including a downturn in the Japanese solar power market.**

During the upcoming JREF Conference (http://jref.or.jp/en/activities/events_20140225.php), we look forward to discussing the implications of what we have learned interacting with Japan's solar power sector from the top-down and the bottom-up.