Cheaper Chinese solar panels are not due to low-cost labor

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A study of the photovoltaic industries in the US and China shows that China's dominance in solar panel manufacturing is not driven solely by cheaper labour and government support, but by larger-scale manufacturing and resulting supply-chain benefits.

But the researchers say a balance could be achieved through future innovations in crystalline solar cell technology, which have the potential to equalise prices by enhancing access to materials and expanding manufacturing scale across all regions.

The study is published today in the Royal Society of Chemistry journal *Energy & Environmental Science*.

Researchers at the US Department of Energy's National Renewable Energy Laboratory (NREL) and Massachusetts Institute of Technology (MIT) developed a bottom-up cost model to examine the underlying causes for the shift in the global manufacturing base of photovoltaics from the US and Europe to China.

To carry out their economic analysis, they adopted the perspective of a multi-national firm evaluating locations for a solar panel manufacturing facility in either the US or China. They predicted how the firm would decide by examining a factor called Minimum Sustainable Price (MSP) for monocrystalline silicon solar panels manufactured in each region. The MSP represents the minimum price at which a company can sell its products while providing an adequate return for the company.

Using industry-validated figures from the first half of 2012, they estimated an MSP of $1.19 per Watt for US solar panels, compared to $0.91 per Watt for Chinese solar panels, representing a price advantage of 23 per cent for a China-based manufacturer.

But when they examined country-specific factors for this price difference, they found that China's historical advantage of low-cost labour was counteracted by other regional influences, and that the dominant reason behind its success is primarily the scale of solar panel manufacturing in the region, enabled by access to capital and a less restrictive business and regulatory environment.

The study shows that the density of production and the cost-benefit of using local suppliers give a China-based manufacturer access to cheaper materials and machinery. These scale and supply-chain advantages provide a China-based solar panel factory with a significant MSP advantage of $0.28 per Watt.

Al Goodrich, Senior Analyst at NREL and lead author of the study said: "These advantages, which are not indigenous to China, could be replicated by manufacturers based in other countries if comparable scale could be achieved.

"But for solar power, there's a chicken and egg problem: consistent demand is needed to provide manufacturers with access to the capital required to achieve large scale production, but large-scale production will be necessary for solar power to compete as an energy source without subsidies.

"Future innovations in silicon solar panels – which may be most quickly and effectively realised through global collaborative effort – have the potential to reduce key investment risks for manufacturers. This would enable manufacturing on an equivalent scale across most regions,

bringing the benefits of high volume production to them all."

Professor Tonio Buonassisi, associate professor at MIT and co-author of the study added: "The 'holy grail' is a photovoltaic module that gives the biggest bang for its buck – with high efficiency, lower materials costs, streamlined and scalable manufacturing and unquestionable reliability. The photovoltaic modules you can buy today have a few of these attributes, but not all of them together."

He continued: "The glass industry between the 1880s and the 1950s underwent innovations that streamlined the process to one integrated tool, where you put feedstock in one end and get one product out at the other end.

"We envisage a similar evolution for solar panel manufacturing. Practical innovations in photovoltaic technologies will accelerate the convergence of solar power and traditional energy sources in the future, terms of both price and scale.

"This common goal, for the benefit nations across the world, is an opportunity for international cooperation that leverages our complementary strengths."

More information: pubs.rsc.org/en/content/articl … g/2013/ee/c3ee40701b

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