

# RENEWABLE ENERGY POLICY BRIEFING

WORLDWIDE SECTOR

## China's fast-growing renewable energy sector, and others driven by Western government policy: experts

The International Renewable Energy Agency published its annual review in May, reporting that the number of jobs in renewable-energy industries from all over the world—excluding large hydroelectric power—amounted to 6.5 million in 2013, up from 5.7 million in 2012

By ALEX VRONCES

Largely fuelled by government policies from around the world, the renewable-energy industry is growing globally and has got people rhetorically clashing over whether the trend is a good or bad one.

The International Renewable Energy Agency published its annual review in May, reporting that the number of jobs in the renewable-energy industries from all over the world—excluding large hydroelectric power—amounted to 6.5 million in 2013, up from 5.7 million in 2012. In 2013, according to its report, the largest employers of such workers were, in descending order, China, Brazil,

the United States, India, Germany, Spain, and Bangladesh.

Drawing on data from various sources, the intergovernmental organization that promotes the adoption of renewable energy sketched out renewable-energy job-developments as they're unfolding around the world.

The authors of the review found that solar photovoltaic (PV) technology makes up the lion's share of these jobs, with liquefied biofuels and wind power taking second and third, respectively. They also found that the change in the total number of renewable energy jobs in 2013 reflected significant swings in China's renewable-energy jobs, partly thanks to a "marked increase in annual installation and manufacturing activity."

Growing from 1.4 million jobs in 2012 to 2.3 million jobs in 2013 by the International Renewable Energy Agency's estimates, employment in solar PV—the highest among all renewable sources—significantly shifted from the U.S. and Europe to Asia. The share of solar PV production coming from the U.S. and Europe declined from 43 per cent in 2007 to about 14 per cent in 2012, whereas China's share clocked in at 63 per cent in 2012. Other Asian countries, including Japan, South Korea, and Taiwan, accounted for 21 per cent of global production.

Setting International Renewable Energy Agency's estimate as the baseline—somewhere between 0.3 million and 0.5 million jobs—employment in China's solar PV sector jumped by about 220 to 433 per cent from 2011 to 2013. In 2013, China's solar PV value-chain employed about 1.6 million people, translating into about 70 per cent of the value-chain's global employment.

The Fraser Institute's Ken Green told *The Hill Times* that government policies from around the world created the demand that's driving the growth of renewables markets everywhere, including China's solar PV industry.

Relying on the country's lax labour standards, liberal environmental regulations, mass labour pool, and control of the rare earth metals market, solar PV producers in China are well-positioned to benefit from energy standards enacted by western governments, said Mr. Green, senior director to the Fraser Institute's Centre for Natural Resources, in an interview with *The Hill Times*.

Energy standards, such as renewable portfolio standards, are policies designed to encourage the

use of renewable energy, as they require that a certain percentage of power generation come from renewable energy sources.

Benjamin Thibault, the Pembina Institute's electricity program director, told *The Hill Times* that the U.S. is one of the world's leaders in the policy-race to encourage the investment in and the production and adoption of renewable energy sources.

The U.S. Environment Protection Agency, or EPA, says on its website that more than 30 states have enacted renewable portfolio standards. Though the standards vary in their size, structure, and enforcement, they all work to reach the same goal, namely, to increase the share of renewables in the jurisdiction's energy portfolio.

A report issued in July by Ceres and Clean Edge—organizations dedicated to "sustainability leadership" and providing research and advisory to the clean-tech sector, respectively—found that these policies appear to be doing what they have been designed to do. More specifically, their report found that "state policies are a key driver in utility clean energy investment."

"The top-performing utilities on renewable energy sales are typically based in regions with aggressive policy goals," reads their report, "while utilities delivering the lowest amounts of renewable energy to their customers are mostly located in the Southeast, which historically has had weak state-level support for clean energy."

According to one analysis by Bloomberg New Energy Finance, finished solar modules made up "95 per cent of the solar products exported by China to the United States" in 2011, the last year for which such data were available. Total solar PV sector exports from China to the U.S. amounted to nearly \$3-billion in 2011.

Still, experts are at odds over whether these markets ought to exist as they currently do.

"Governments are driving the generation of power to the renewables away from conventional fossil fuels and nuclear power," said the Fraser Institute's Mr. Green. "Without mandates and subsidies to wind and solar, my understanding is that you get virtually none of it in the mix—you simply wouldn't have it, with rare exceptions."

Mr. Green told *The Hill Times* that these "faux markets" and "green jobs" tend to yield "rubbish" returns on investment, which, according to him, is why they need the governmental help they shouldn't be getting. If policymakers want to curb

greenhouse gas emissions, added Mr. Green, going renewable is the costliest route to take.

Brookings Institution senior fellow Charles Frank wrote a paper in May that estimated the "costs per megawatt per year for wind, solar, hydroelectric, nuclear, and gas combined cycle electricity plants." He based his estimates on "avoided emissions and avoided costs" instead of using levelized costs.

Though economists commonly use levelized cost—that is, the net present value of costs over the source's lifetime divided by the source's expected output of electricity over its lifetime—to do their assessments, the metric is not without its flaws. A professor of economics at the Massachusetts Institute of Technology, Paul Joskow, wrote a paper in May 2011, "Comparing the Costs of Intermittent and Dispatchable Generating Technologies," pointing out these flaws that appeared in the *American Economic Review Papers and Proceedings*.

One thing that the levelized costs cannot capture, writes Prof. Joskow, is the cost of intermittency, namely, the cost of keeping conventional power plants online because sun and wind energy are not so reliable. Wind energy is dependent on relatively strong winds and solar energy on relatively sunny days, and so the conventional measure fails to cover the cost of what needs to be done when the sun doesn't shine and the wind doesn't blow.

Using his cost-benefit approach, Mr. Frank found that the energy, emission, and capacity costs of solar and wind energy might outweigh their benefits. By his approach, the sources of energy that don't fall in the red are hydro, nuclear, and very efficient sorts of gas plants.

"Assuming that reductions in carbon dioxide emissions are valued at \$50 per metric ton and the price of natural gas is not much greater than \$16 per million Btu, the net benefits of new nuclear, hydro, and natural gas combined cycle plants far outweigh the net benefits of new wind or solar plants," wrote Mr. Frank.

When asked about the findings, Mr. Thibault at the Pembina Institute told *The Hill Times* that the report is based on outdated data.

"It's time to give the tired old message about expensive renewables a break," he told *The Hill Times* via email. "Both solar and wind energy have become more efficient and less expensive, so, if you update the numbers, renewable energy is among the most cost-effective greenhouse gas reduction options that we have."

According to a response to Mr. Frank's paper by the Colorado-based Rocky Mountain Institute, or RMI, a non-profit that produces research on renewables and efficiency, Mr. Frank erred in his assumptions. More precisely, RMI's report said he erred in "assuming wind and solar power half as productive and twice as costly as they actually are, gas power twice as productive as it actually is...nuclear power at about half its actual cost and construction time and one-fifth its actual operating cost, a supposed need for new generating capacity and for bulk electricity storage, and no efficiency opportunities worth mentioning."

Whether good or bad if the goal is to reduce greenhouse gas emissions, there is no clear sign that investment in cleaner energy sources will slow down or decline. Quite the contrary, according to the president of the Ottawa-based consulting firm Analytica Advisors, Céline Bak, policy changes in China and the global push to liberalize trade will further incentivize investment in clean-tech.

An Analytica Advisors report on Canada's clean-tech industry, released recently this year, pointed to a possible change in Chinese policy that may ensure that "economic growth will be balanced with environmental protection." The report also highlighted a joint statement made this January in Davos, Switzerland by representatives of Australia, Canada, the European Union, China, the U.S., and many other countries, which made clear their goal to "achieve global free trade in environmental goods."

"Yes, regulations partly create these markets," said Ms. Bak, when asked about whether or not policy should be used to promote the investment in and the adoption of various forms of clean-tech.

"If those countries decide that they want to try to reduce the waste and improve the resource efficiency of their industries, then why wouldn't that be a good thing and why wouldn't we want our companies to be seeking out those markets and delivering solutions?"

Analytica Advisors, an Ottawa-based consulting firm, also reported that the Canadian clean-tech sector grew by nine per cent in 2012 and the industry is growing faster than every other major sector of the economy. Clean-tech companies in Canada directly employed 41,000 people and generated \$11.3-billion in revenues in 2012, said Analytica Advisors, based on a survey of more than 70 mostly small and medium sized companies, showing the sector is an outlier in the Canadian economy.

Industry Canada says between 2011-2012, mining, oil and gas sector grew by 0.3 per cent, while the clean-tech sector grew by nine per cent.

"If you look at the sum of the investments and revenues of all these companies, we have a significant industry today," Ms. Bak told *The Hill Times* in June. "Given the growth in investments today, it will continue to be significant and can grow into an industry comparable in size to other significant industries, like aerospace, for example."

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### RENEWABLE WORLDWIDE

#### Estimated Direct and Indirect Jobs in Renewable Energy Worldwide

Industry	2013	2012
Biomass	782,000	753,000
Liquid Biofuels	1,452,000	1,379,000
Biogas	264,000	266,000
Geothermal	184,000	180,000
Small Hydropower	156,000	109,000
Solar PV	2,273,000	1,360,000
Wind Power	834,000	753,000
Other	546,000	
Total	6,492,000	5,729,000

Source: IRENA Renewable Energy and Jobs, Annual Review 2014; IRENA Renewable Energy and Jobs 2013

#### Estimated Direct and Indirect Jobs in Renewable Energy Worldwide

Country	Jobs
Brazil	894,000
United States	625,000
China	2,640,000
India	391,000
Germany	371,000
Spain	114,000
Rest of EU	166,000
Bangladesh	114,000
World	6,492,000

Source: IRENA Renewable Energy and Jobs, Annual Review 2014