Global solar dominance in sight as science trumps fossil fuels

Solar power will slowly squeeze the revenues of petro-rentier regimes in Russia, Venezuela and Saudi Arabia. They will have to find a new business model, or fade into decline

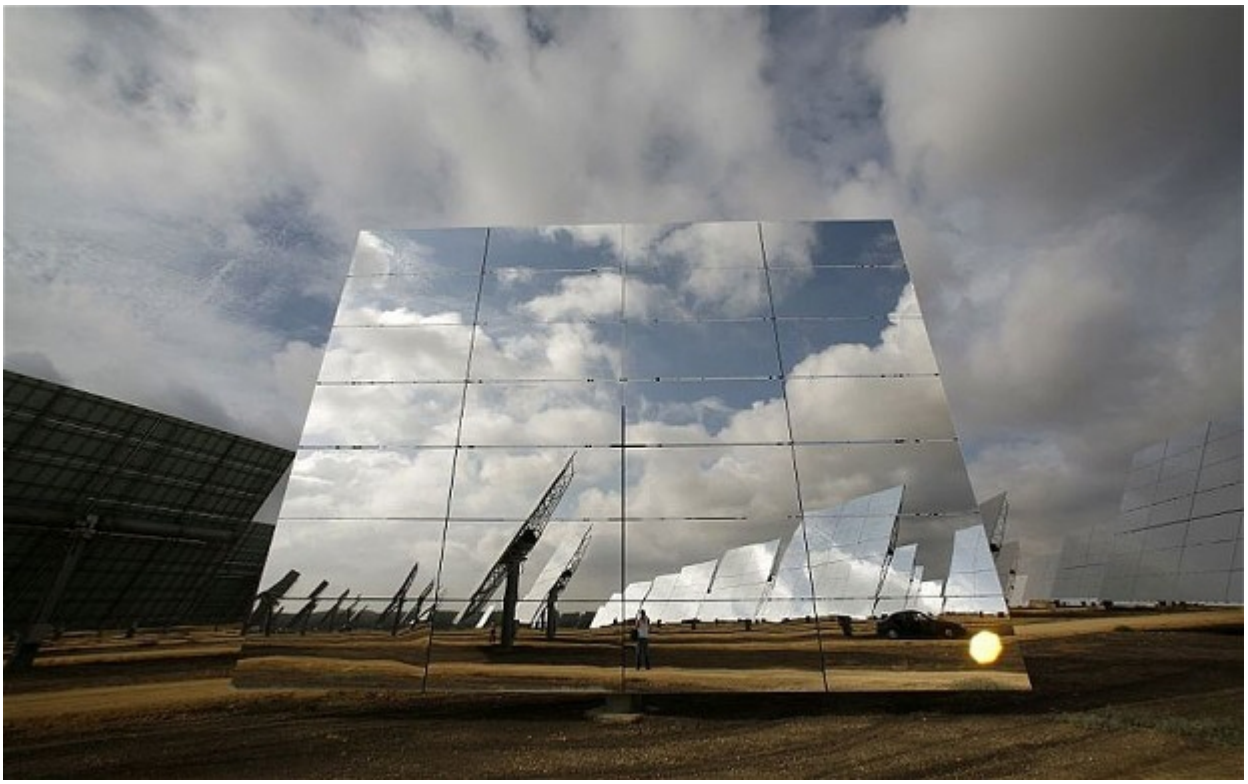

Image 1 of 2

There are already 19 regional markets around the world in which PV solar panels can match or undercut local electricity prices without subsidy Photo: Reuters

By Ambrose Evans-Pritchard

5:58PM BST 09 Apr 2014

Solar power has won the global argument. Photovoltaic energy is already so cheap that it competes with oil, diesel and liquefied natural gas in much of Asia without subsidies.

Roughly 29pc of electricity capacity added in America last year came from solar, rising to 100pc even in Massachusetts and Vermont. "More solar has been installed in the US in the past 18 months than in 30 years," says the US Solar Energy Industries Association (SEIA). California's subsidy pot is drying up but new solar has hardly missed a beat.

The technology is improving so fast - helped by the US military - that it has achieved a virtous circle. Michael Parker and Flora Chang, at Sanford Bernstein, say we entering a new order of "global energy deflation" that must ineluctably erode the viability of oil, gas and the fossil fuel nexus over time. In the 1980s solar development was stopped in its tracks by the slump in oil prices. By now it has surely crossed the threshold irreversibly.

The ratchet effect of energy deflation may be imperceptible at first since solar makes up just 0.17pc of the world's $5 trillion energy market, or 3pc of its electricity. The trend does not preclude cyclical oil booms along the way. Nor does it obviate the need for shale fracking as a stop-gap, for national security reasons or in Britain's case to curb a shocking current account deficit of 5.4pc of GDP.

But the technology momentum goes only one way. "Eventually solar will become so large that there will be consequences everywhere," they said. This remarkable overthrow of everthing we take for granted in world energy politics may occur within "the better part of a decade".

Installations (MW)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Residential	1	5	11	15	24	27	38	58	82	164	246	304	494	792
Non-Residential	2	3	9	27	32	51	67	93	200	213	339	831	1,072	1,112
Utility	0	3	2	3	2	1	0	9	16	58	267	784	1,803	2,847
Total Installations	4	11	23	45	58	79	105	160	298	435	852	1,919	3,369	4,751

If the hypothesis is broadly correct, solar will slowly squeeze the revenues of petro-rentier regimes in Russia, Venezuela and Saudi Arabia, among others. Many already need oil prices near $100 a barrel to cover their welfare budgets and military spending. They will have to find a new business model, or fade into decline.

The Saudis are themselves betting on solar, investing more than $100bn in 41 gigawatts (GW) of capacity, enough to cover 30pc of their power needs by 2030 rather than burning fossil fuel needed for exports. Most of the Gulf states have comparable plans. That will mean more crude - ceteris paribus - washing into a deflating global energy market.

Clean Energy Trends says new solar installations overtook wind turbines worldwide last year with an extra 36.5GW. China alone accounted for a third. Wind is still ahead with 2.5 times old capacity but the "solar sorpasso" will be reached in 2021 as photovoltaic (PV) costs keep falling.

The US National Renewable Energy Laboratory says scientists can now capture 31.1pc of the sun's energy with a 111-V Solar Cell, a world record but soon to be beaten again no doubt. This will find its way briskly into routine use. Wind cannot keep pace. It is static by comparison, a regional niche at best.

A McKinsey study said the average cost of installed solar power in the US across all sectors has dropped to $2.59 from more than $6 a watt in 2010. It expects this fall to $2.30 by next year and $1.60 by 2020. This will put solar within "striking distance" of coal and gas, it said.

Solar cell prices have already collapsed so far that other "soft costs" now make up 64pc of residential solar installation in the US. Germany has shown that this too can be slashed, partly by sheer scale.

It is hard to keep up with the cascade of research papers emerging from brain-trusts in North America, Europe and Japan, so many brimming with optimism. The University of Buffalo has developed a nanoscale microchip able to capture a "rainbow" of wavelengths and absorb far more light. A team at Oxford is pioneering use of perovskite, an abundant material that is cheaper than silicon and produces 40pc more voltage.

One by one, the seemingly intractable obstacles are being conquered. Israel's Ecoppia has just begun using robots to clean the panels of its Ketura Sun park in the Negev desert without the use of water, until now a big constraint. It is beautifully simple. Soft microfibers sweep away 99pc of the dust each night with the help of airflows.

Professor Michael Aziz, at Harvard University, is developing a flow-battery with funding from the US Advanced Research Projects Agency over the next three years that promises to cut the cost of energy storage by two-thirds below the latest vanadium batteries used in Japan.

He said the technology gives us a "fighting chance" to overcome the curse of intermittency from wind and solar power, which both spike and drop off in bursts. "I foresee a future where we can vastly cut down on fossil fuel use."

Even thermal solar is coming of age, driven for now by use of molten salts to store heat and release power hours later. California opened the world's biggest solar thermal park in February in the Mojave desert - the Ivanpah project, co-owned by Google and BrightSource Energy - able to produce power for almost 100,000 homes by reflecting sunlight from 170,000 mirrors onto boilers that generate electricity from steam. Ivanpah still relies on subsidies but a new SunPower project in Chile will go naked, selling 70 megawatts into the spot market.

Deutsche Bank say there are already 19 regional markets around the world that have achieved "grid parity", meaning that PV solar panels can match or undercut local electricity prices without subsidy: California, Chile, Australia, Turkey, Israel, Germany, Japan, Italy, Spain and Greece, for residential power, as well as Mexico and China for industrial power.

This will spread as battery storage costs - often a spin-off from electric car ventures - keep dropping. Sanford Bernstein says it may not be long before home energy storage is cheap enough to lure households away from the grid en masse across the world.

Utilities that fail to adapt fast will face "disaster". Solar competes directly. Each year it is supplying a bigger chunk of peak power needs in the middle of the day when air conditioners and factories are both at full throttle. "Demand during what was one of the most profitable times of the day disappears," said the report. They cannot raise prices to claw back lost income. That would merely accelerate what they most fear. They are trapped.

Michael Liebreich, from Bloomberg New Energy Finance, says we can already discern the moment of "peak fossil fuels" around 2030, the tipping point when the world starts using less coal, oil and gas in absolute terms, but because they cannot compete, not because they are running out.

This is a remarkable twist of history. Just six years ago we faced an oil shock with crude trading at $148. The rise of "Chindia" and the sudden inclusion of 2bn consumers into the affluent world seemed to be taxing resources to breaking point. Now we can imagine how China will fuel its future fleet of 400m vehicles. Many may be electric, charged by PV modules.

For Germany it is a bitter-sweet vindication. The country sank €100bn into feed-in tariffs or in solar companies that blazed the trail, did us all a favour, and mostly went bankrupt, displaced by copy-cat competitors in China. The Germans have the world's biggest solar infrastructure, but latecomers can now tap futuristic technology.

For Britain it offers a reprieve after 20 years of energy drift. Yet the possibility of global energy deflation raises a quandry: should the country lock into more nuclear power stations with strike-prices fixed for 35 years? Should it spend £100bn on offshore wind when imported LNG might be cheaper long hence?

For the world it portends a once-in-a-century upset of the geostrategic order. Sheikh Ahmed-Zaki Yamani, the veteran Saudi oil minister, saw the writing on the wall long ago. "Thirty years from now there will be a huge amount of oil - and no buyers. Oil will be left in the ground. The Stone Age came to an end, not because we had a lack of stones, and the oil age will come to an end not because we have a lack of oil," he told The Telegraph in 2000. Wise old owl.