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Lower oil prices but more renewables: What's going on?

Why the renewables sector is more resilient than ever.

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Not that long ago, the plunge in oil prices that has occurred over the past year would have been to renewables what kryptonite was to Superman, as the *Financial Times* put it.[1] Not any more. Yes, it's true that American investors would have been better off putting their money into the S&P 500 from April 2014 to April 2015 than in clean-tech funds. That was the period that saw oil prices drop from almost $100 to less than $50 a barrel, before recovering a bit. But in the first quarter of 2015, many clean-tech funds handily outperformed the S&P. Moreover, the sector did not see a wave of bankruptcies and pullbacks like the one that scarred it a decade ago, when a glut of Chinese manufacturing drove dozens of solar companies into oblivion. In fact, global clean-energy investments increased 17 percent in 2014, reaching $270 billion, reversing two years of declines. While government-policy support remains crucial, renewable companies also did well raising money in the markets; equity investment rose 54 percent in 2014.

There are other reasons for optimism. One is that deployment of renewable technologies continues to rise. The United States is on course to install 12 gigawatts of renewable capacity this year, more than all conventional sources combined.[2] Wind capacity grew by 8.1 percent in 2014, and based on its analysis of projects in the works, the US Energy Information Administration (EIA) estimates capacity will grow another 13.1 percent in 2015 and 10.9 percent in 2016. Solar is growing even faster, though from a smaller base. Between now and 2022, the EIA predicts that renewables will account for

the majority of new power; by 2040, its US market share could be 18 percent, up from 13 percent in 2013.

Globally, 2014 saw a record 95 gigawatts of new wind and solar, and the International Energy Agency (IEA) expects renewables to account for 25 percent of power generation in 2018, up from 20 percent in 2011. In 2014, nonhydro renewables accounted for almost half (48 percent) of net new power capacity. This was the third year in a row the figure was above 40 percent. Solar, in particular, is hitting its stride and has grown an average of almost 30 percent a year for the past decade.

Why haven't the much lower oil prices been kryptonite for renewables? And what does this mean for the future?

Trends and possibilities

There are four main reasons why the link between oil and renewables appears to be weakening.

They operate in different markets. Oil is predominantly used for transport—cars, trucks, planes. Very little of it is used for power; oil accounts for less than 1 percent of power generation in the United States and Canada, for example, and not much more in Europe. Globally, the figure is around 5 percent. Renewables, in contrast, are used mostly to create electricity. The more important factor for renewables, then, is not the price of oil, but the price of electricity, and the latter is not entirely a function of the cost of fuel. The electrical grid itself is expensive, which is why US power costs, which are relatively low in global terms (an average of 12 cents per kilowatt-hour), have been rising. In Europe and Japan, electricity costs are significantly higher, and the relative position of renewables is correspondingly better.

In some markets, gas is linked to the price of oil. Because gas is a major player in power production (27 percent in the United States and 18.6 percent in Europe), in effect, it becomes the floor price for power. That matters because in most markets, most renewables are still more expensive. So it is certainly possible that cheap gas can drive out or at least slow the growth of renewables. But that need not be crippling. To the extent that gas displaces coal, that's good for the environment, because gas is cleaner when it comes to both greenhouse-gas emissions and air pollution. And this shift is already happening. In the United States, the use of coal for power generation has fallen from almost half in 2005 to 39 percent in 2014. That is a large part of the reason that greenhouse gas–related emissions in the United States actually fell over the same period.

And because energy investment is long term, changes in the spot price of gas will not in themselves derail investment in other sources. As long as renewables keep getting cheaper, there is room for both. Also, it bears remembering that wind and solar are inherently intermittent: the wind doesn't blow on demand, and the sun sets every day. Therefore, a backup source of power that can be switched on and off at will—as coal, gas, and nuclear can—is essential for the industry. In this sense, cheap gas can actually complement renewables.

The economics of renewables are improving. In 2011, when annual global investment in renewables peaked at $279 billion, 70 gigawatts were installed. In 2014, almost 40 percent more (95 gigawatts) was installed, though investment was slightly lower, at $270 billion. In that comparison lies the most important reason that renewables have held their own, and then some, even as the oil price fell so drastically. To put it simply, renewables are getting cheaper all the time. Moreover, most regulatory supports, such as portfolio standards, tax credits, and feed-in tariffs, remain in place. These do protect the sector to some degree, but the larger story is that of fast-increasing competitiveness.

In the United States, the National Renewable Energy Laboratory (NREL) estimated in 2014 that the cost of residential and commercial solar photovoltaic (PV) systems fell an average of 6 to 7 percent a year (depending on size) from 1998 to 2013, and by 12 to 15 percent from 2012 to 2013. Costs kept falling in the first half of 2014 and are expected to continue to do so for the foreseeable future.

In fact, when it comes to the price of solar, even the most optimistic estimates have not been optimistic enough. As NREL notes, today's price projections to 2020 are about half of what was being predicted a decade ago. The IEA, which has had a reputation of being cautious about renewables, now estimates that the "levelized" cost of solar PV (total lifetime costs divided by total output) is at or near parity in many markets. In the United States, McKinsey projects, solar will be competitive with conventional fuels in most states by 2020. As for wind, it is generally the cheapest nonhydro renewable; since 2009, its cost has fallen 58 percent, thanks to less expensive materials and greater efficiency. As a result, wind is either at or near to being competitive, on a cost-per-watt basis, without subsidy, in a number of markets.

Crucially, there is no reason to believe that the economics of renewables are going to deteriorate. Coal could get cleaner, but no one really expects a big change in its efficiency, and tighter regulation is driving up costs. For gas, the best technologies in use are already highly efficient. But for renewables, particularly solar, substantive improvements in cost and efficiency are not only possible but likely.

In production, for example, economies of scale can be expected to continue driving down costs. More significant savings are likely to come on the service side, known as "soft costs," such as permitting, licensing, and maintenance. In the United States, there is a wide variation in the cost of installation; if and when best practices spread, one would expect to see convergence at the lower end of the scale. And even the cheapest US states (Florida, Texas, and Maine) are considerably more expensive than Germany, which has driven down soft costs markedly. In 2013, it cost Californians $4.94 to install a watt of solar; the figure for Germany was $2.05. Cutting tariffs on foreign (meaning Chinese) modules would also lower costs. There is a lot of room for improvement, and this holds true for many global markets.

Counterintuitively, there is even a way in which much lower oil and gas prices can actually help renewables. Many countries have helped pay for the cost of fossil fuels through consumer subsidies; in 2012, the IEA estimated that these subsidies cost governments $544 billion. As all subsidies do, these policies led to higher consumption than if people had to pay the market price. When oil prices crashed, several countries in Africa, as well as Egypt, India, Indonesia, Ukraine, and others, took the opportunity to cut these subsidies. China raised gas taxes, which had the same effect of dampening demand. When oil and gas prices increase, as they have already begun to do, renewables will be in an improved relative position.

For governments and companies considering the long term, one way to think about it is that the cost of conventional fuels may go down. Or up. More likely, it will do both, as we have seen in 2014–15. Renewables, in contrast, are going in one direction only: down. That's an intriguing proposition with regard to creating a resilient energy portfolio.

The global dynamics of energy are changing. Because renewables have been relatively expensive, historically, most investment has come from developed countries; poorer ones felt they could not afford these energy sources. In addition, oil-rich countries, many of them in places well suited for solar, didn't bother either, because they could burn cheap oil. Both of those assumptions are swiftly changing.

In 2013, China for the first time invested more in renewable energy than Europe, according to the United Nations, and is now the global market leader. That year, new renewable capacity was greater than any other kind. In 2014, China installed 11 gigawatts of solar, and there are plans in the works for just as much this year. (China is also pouring money into cleaner coal—a form of clean tech that many greens disdain but that could be enormously beneficial.) Last year, China was the world's biggest single investor in renewables ($83.3 billion), almost 40 percent more than in 2013; the United States was second ($38.3 billion), and Japan third.

Then there is India. Prime Minister Narendra Modi wants to rely on solar in large part to bring power to the hundreds of millions of Indians who lack it. While the country's chief economic adviser, Arvind Subramanian, acknowledged that "for the foreseeable future, India will be reliant on coal," the country's ambitious goal is to install 170 gigawatts of clean energy by 2022. India's spending on clean energy rose 14 percent in 2014, to $7.4 billion. South Africa ($5.5 billion) is also getting serious about the sector, as are countries in Latin America. In 2012, Mexico's president Felipe Calderón stated a goal of getting 35 percent of electricity from low-carbon sources by 2024. According to a McKinsey analysis, even after taking a hit due to the financial crisis, the region's investments in solar have risen 54 percent a year since 2008; in biomass, by 11 percent; and in wind, by 24 percent. Brazil, Mexico, and Chile are leading the way. McKinsey estimates that of the 40 gigawatts of new power Brazil will add by 2040, at least 15 gigawatts will be renewable, mostly wind; for Mexico, the estimate for renewables is 16 gigawatts by 2020. As a whole, developing countries accounted for just a bit less than half ($131.3 billion) of global investment in clean energy in 2014, and this figure rose much faster (36 percent) than spending in the developed world (up 3 percent).

It's also worth noting that some countries in the Middle East are getting much more thoughtful about the possibilities of solar. A Saudi conglomerate recently purchased a major Spanish solar developer, Fotowatio Renewable Ventures, which has a pipeline of almost 4 gigawatts of capacity. Egypt wants to increase renewables to 20 percent of capacity by 2020 and is nearing approval of a $3.5 billion, 2-gigawatt solar project with Bahrain's Terra Sola. And Dubai's state utility signed a deal late last year with a Saudi solar company for what could be the cheapest solar in the world—less than six cents per kilowatt-hour. McKinsey estimates that even at prices of $35 to $45 per barrel of oil, solar PV pays for itself—and that frees up more oil for Saudi Arabia to sell.

Japan is also becoming a major player. In the wake of the Fukushima nuclear accident in 2011, the government has markedly increased its commitment to renewables. While nuclear accounted for 20 percent of power generation in 2009, it was down to just 1 percent in 2013, according to a McKinsey analysis. In 2011, the country introduced a "feed-in tariff"—essentially, a guaranteed, above-market price—to encourage renewable production. Solar-power installations soared. There have been problems associated with this effort, with utilities saying they cannot economically absorb the surge in capacity, but there seems little doubt that Japan will continue on this course. The country is now the third-largest investor in renewables, and McKinsey has found that the sector is now attractive enough that many non-power players are entering the field.

The science is improving. New solar technologies could allow solar cells to be rolled out via 3-D printer and applied almost anywhere. Japan is managing to make fuel cells work. Techniques to convert manure into methane are getting cheaper. Perhaps most important, storage is getting better and cheaper, and investment in the area is rising.

The biggest barrier to the widespread deployment of nonhydro renewables is that they cannot be stored for a rainy (or cloudy or windless) day. But there is good reason for optimism. The energy density of batteries—that is, how much can be stored by weight—has improved steadily over the past two decades, and the pace appears to be picking up, with the price of storage down 60 percent in the past decade, according to the *Economist*.[3] McKinsey estimates that the cost of producing lithium-ion batteries, now about $400 per kilowatt-hour, could go as low as $150 by 2020. IHS, an energy consultancy, estimates that storage installations will reach 40 gigawatts by 2017; and the market for energy storage could be as much as $70 billion over the next decade, according to Navigant Consulting.

With that kind of potential in play, many smart minds are working hard on this. Major companies in the United States, Europe, and Asia, for example, are pouring resources into storage technologies. In early May, Tesla Motors launched two lithium-ion automated battery systems, adapted from the technology used in its electric cars, which would allow even small businesses and homes to store and release energy on demand. With a base price of $3,000 to $3,500, these 220-pound batteries, known as the Powerwall, could be at work as soon as this summer. At this price, storage becomes economically feasible in a large percentage of buildings, depending on the regulatory environment and cost of power.

The European Union is testing a project in Ireland in which a motorized flywheel can harness surplus energy from the grid, store it in turbines, and then release it on demand. The US Department of Energy's famous innovation lab, the Advanced Research Projects Agency–Energy, is funding a dozen storage-related projects. It is not far-fetched to believe these efforts will discover a variety of cost-effective solutions. The demand for time-shifted energy storage, according to McKinsey, could grow ten times by 2050; that kind of potential attracts innovation. Getting there will require regulatory creativity; however, McKinsey analysts note that at the moment, there are price-signal distortions and a general lack of clarity about how to integrate stored power into the system.

The long game

The world is not running out of fossil fuels in the immediate term. There are enough known oil reserves for the next 53 years, and the rise of shale gas in the United States is an example of how innovation and technology can change the game. Coal is abundant.

So the case for renewables cannot be that they will keep the lights on as hydrocarbons thin out; this isn't even a medium-term concern. The better argument is that renewables are, by and large, cleaner than the alternatives, and they provide a welcome diversity to energy supply and therefore enhance national energy security. Even this would not be enough, however, if renewables were expensive and/or unreliable. But on both these dimensions, the sector is making great strides, and more can be expected.

That said, a sense of proportion is necessary. Trends do not necessarily continue, nor should every bit of good news be expanded, extrapolated, and hastened, as too often happens. Headlines that proclaim the death of the car as we know it or the end of Big Oil are premature. (Reality check: electric vehicles accounted for only 0.5 percent of vehicle sales in 2014; conventional cars and hybrids the other 99.95 percent.) And it's worth remembering that the share of fossil fuels in primary-energy consumption, a category that includes transport, didn't budge a fraction between 2005 and 2013, sticking at 87 percent.

Big, complicated change is not easy, particularly when it comes to something as fundamental as energy. For developed countries, incorporating renewables

into existing electrical systems is proving very difficult indeed. For example, former US energy secretary Steven Chu notes that most of Germany's wind power is in the north; to get it to industry in the south means building transmission capacity—and that runs into "not in my backyard" politics. American utilities are fighting policies that force them to buy off-grid power at retail rates. Emerging markets without an extensive power infrastructure in place will be able to skip these problems but will have to deal with issues of access, finance, stability of supply, and the rising expectations of their citizens.

In short, a world powered by renewables is not around the corner. This will be a long-term transition—a matter of decades, not years. But the resiliency of the sector in the face of much lower oil and gas prices is a sign that it may just be on its way. ■

[1] Pilita Clark, "The big drop: Cheap oil burns green energy," *Financial Times*, December 17, 2014, ft.com.

[2] The term *capacity* refers to maximum output. Because of lower efficiency, however, a gigawatt of installed capacity of solar or wind produces considerably less power than that of coal, combined-cycle gas plants, nuclear, biomass, or geothermal. One gigawatt of electricity is enough to power about 700,000 American homes.

[3] "Not a toy," *Economist*, April 11, 2015, economist.com.

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