



ECONOMY

A Carbon Tax Could Bolster Green Energy

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A couple of years ago, the smart money was on wind. In 2012, 13 gigawatts worth of wind-powered electricity generation capacity was installed in the United States, enough to meet the needs of roughly three million homes. That was some 40 percent of all the capacity added to the nation's power grid that year, up from seven gigawatts added in 2011 and just over five in 2010.

But then a federal subsidy ended. Only one gigawatt worth of wind power capacity was installed in 2013. In the first half of 2014, additions totaled 0.835 gigawatts. Facing a Congress controlled by Republicans with little interest in renewable energy, wind power's future suddenly appears much more uncertain.

"Wind is competitive in more and more markets," said Letha Tawney at the World Resources Institute. "But any time there is uncertainty about the production tax credit, it all stops."

Wobbles on the road to a low-carbon future are hardly unique to the United States. In its latest Energy Technology Perspectives report, the International Energy Agency noted that the deployment of photovoltaic solar- and wind-powered electricity was meeting goals established to help prevent temperatures from rising more than 2 degrees Celsius (3.6 degrees Fahrenheit) above the average in the preindustrial era, the limit agreed to by the world's leaders to avoid truly disruptive climatic upheaval.

In the same report, however, the organization noted that other technologies — bioenergy, geothermal and offshore wind — were lagging. And it pointed out that worldwide investment in renewable power was slowing, falling to \$211 billion in

2013, 22 percent less than in 2011.

These wobbles underscore both the good news and the bad news about the world's halting progress toward reducing the greenhouse gas emissions that are capturing heat in the atmosphere and changing the world's climate.

The good news is that humanity is developing promising technologies that could put civilization on a low carbon path that might prevent climate disruption.

These technologies allowed the Environmental Protection Agency to pass new rules aimed at achieving a 30 percent reduction in carbon dioxide emissions from American power plants by 2030, compared with 2005.

They allowed President Obama last week to promise that the United States would curb total greenhouse gas emissions by 26 to 28 percent from 2005 levels by 2025 — a big step that, White House officials say, can be achieved without further action from Congress. And they allowed China to commit to start cutting emissions after 2030.

The bad news is that civilization is mostly not yet on such a low carbon path. While promising technologies to get there have been developed, it is unclear whether nations will muster the political will and mobilize the needed investments to deploy them.

New energy technologies have become decidedly more competitive. The United States' Energy Information Administration projects that the levelized cost of onshore wind energy coming on stream in 2019 — a measure that includes everything from capital costs to operational outlays — could be as little as \$71 per megawatt-hour measured in 2012 dollars, even without subsidies. This is \$16 less than the lower cost projection four years ago for wind energy coming online in 2015.

Similarly, projections for the levelized cost of energy from photovoltaic solar cells have tumbled by more than 40 percent, much faster than the cost projections of energy from coal or natural gas.

Challenges remain to relying on intermittent energy sources like the sun or the wind for power. Still, experts believe that hitching solar and wind plants to gas-fired generators, and using new load management technologies to align demand for power with the variable supply, offer a promising path for aggressively reducing the amount of carbon the power industry pumps into the atmosphere, which accounts for nearly 40 percent of the nation's total carbon dioxide

emissions.

And new Energy Information Administration projections to 2040 show prices for renewables falling even lower. By then, electricity from photovoltaic solar plants could be generated for as little as \$86.50 per megawatt-hour, without subsidies. In some areas wind-based plants could produce it for as little as \$63.40.

Nuclear energy is also becoming more competitive. Without any subsidies, new-generation nuclear power coming on stream in 2040 could cost as little as \$80 per megawatt-hour, all costs considered. This is only marginally more expensive than electricity produced with coal or natural gas, even without the added cost of capturing the carbon dioxide.

And there are much more optimistic cost assessments out there than the Energy Information Administration's.

But for all the optimism generated by cheaper renewable fuels, they do not, on their own, put the world on the low-carbon path necessary to keep climate change in check.

Progress is faltering on several fronts. The precipitous fall in the prices of photovoltaic cells from 2008 to 2012 pretty much stopped in 2013, after rapid consolidation of the industry.

The International Energy Agency now projects that installed global nuclear capacity in 2025 will fall 5 percent, to 24 percent below what will be needed to stay on the safe side of climate change. And carbon capture technologies, which will be essential if the world is to keep consuming any form of fossil fuel, remain hampered by high costs, meager investment and scant political commitment.

"The unrelenting rise in coal use without deployment of carbon capture and storage is fundamentally incompatible with climate change objectives," noted the International Energy Agency in its Technology Perspectives report.

Despite the falling costs of renewable energy in the United States, the Energy Information Administration's baseline assumptions project that in 2040 only 16.5 percent of electricity generation will come from renewable energy sources, up from some 13 percent today. More than two-thirds will come from coal and gas. Without some carbon capture and storage technology, drastic climate change is almost certainly unavoidable.

What is necessary to get us on a safer path?

White House officials trust that the administration has the tools, including

fuel economy and appliance efficiency standards, the Environmental Protection Agency's new limits on power plant emissions and regulations to limit other greenhouse gases.

Yet the Energy Information Administration's projections suggest how hard the task will be. Though they were developed before the Environmental Protection Agency issued its new rules, they included hypothetical outlines that could mimic some of its effects. In one, coal power plants were decommissioned more quickly; in another, subsidies to renewable energy were kept until 2040. In another, the price of renewables fell faster than expected. None of them did much to move the carbon dial.

There is one tool available to trim carbon emissions on a relevant scale: a carbon tax. That solution, however, remains off the table.

If a carbon tax were to be imposed next year, starting at \$25 and rising by 5 percent a year, the Energy Information Administration estimates, carbon dioxide emissions from American power plants would fall to only 419 million tons by 2040, about one-fifth of where they are today. Total carbon dioxide emissions from energy in the United States would fall to 3.6 billion tons — 1.8 billion tons less than today. By providing a monetary incentive, economists say, such a tax would offer by far the most effective way to encourage business and individuals to reduce their use of fossil fuels and invest in alternatives.

Is this enough? No. This proposal still leaves the United States short of the 80 percent cut in greenhouse gas emissions that the White House is aiming for and that experts consider necessary by 2050 to prevent climatic havoc. But at least it's in the same order of magnitude.

Most important, perhaps, the Energy Information Administration's estimates make clear that the real constraint lies not in our ability to develop the necessary technologies but in our political will to deploy them.

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