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Energy Alternatives

The end of big hydro

By **Robert McCullough**

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(January 23, 2019, 10:50 AM EST) -- From the Tennessee to the Columbia rivers, hydroelectric dams have played a decisive role in making cheap electricity widely distributed throughout the North American economy. From declining fish populations to flooded land, some Canadians and Americans have had to pay a higher price to make hydro power possible.

That social trade-off is making less sense today as the levelized cost of energy (LCOE) from wind and solar generation has now dropped below the LCOE of hydro and most all thermal energy resources. The portion of a U.S. state's power generation by hydro no longer predicts its electricity prices.

Levelized cost of energy

The LCOE measures the overall competitiveness of different generating technologies to compare the per-megawatt-hour cost of building and operating a plant over its assumed financial life. Onshore wind has a lower LCOE than hydro. Solar has now dropped down to a hydro level LCOE, and its momentum for decline continues. The U.S. Energy Information Administration (EIA) predicts that for new projects entering service in 2040, solar power will be significantly cheaper than hydro.

These latest EIA numbers are significant, because their LCOE estimates of wind and solar power have been conservative compared to investment advisory services like Lazard's annual LCOE estimates, which come out every November. Last November the global financial analyst Lazard found solar LCOE's under US$46 per megawatt hour.

Interestingly, even Lazard's estimates have been overtaken by the market. Xcel Energy conducted a request for proposal for its operations in Colorado. The bids it received rocked the industry.

Overall, Xcel received over 52,000 megawatts of renewables with a weighted average price of US$20.1 per megawatt hour. Unlike the forecasts from the EIA and Lazard's, these are actual market prices.

Does hydro generation predict electricity prices?

One way to corroborate these numbers is to test whether the amount of hydro power in a U.S. state's electricity generation will predict prices. If hydro is no longer the relatively cheap source it once was, then it should be statistically insignificant when regressing electricity prices on to generation technology.

Indeed, this is the case when using the most recent data from the EIA. Using the latest monthly generation numbers and that month's reported prices a cross-sectional regression shows that from a base price of US$8.37 per kilowatt hour, higher population density raises rates higher, so does a higher percentage of power generation from biomass and petroleum have higher rates, but the percentage generated by hydropower has no measurable impact on these prices.

There was a day when hydropower offered some of the lowest levelized costs of energy. Those days are over. Research from both Lazard and the EIA shows wind and solar have become just as cheap, and in the case of land-based wind, cheaper than hydro. Xcel's recent RFP confirms their estimates.

Even more recent market evidence supports these forecasts, albeit that the forecasts are turning out to be far too conservative.

State production and pricing data confirms this. States with the most power generated by hydropower no longer enjoy the lowest prices.

The end of big iron has also come. We will explain why in part two of this two-part series..

Robert McCullough is principal of McCullough Research *in Portland, Ore., and advises governments, utilities and Aboriginal groups from California to Quebec on energy issues*. *Eric Shierman, Michael Weisdorf and Louis Bengtson helped in the preparation of this article.*

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