Cost of renewable energy sources

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In 2023, the global weighted average levelised cost of electricity (LCOE) from newly commissioned utility-scale solar photovoltaic (PV), onshore wind, offshore wind and hydropower fell. Between 2022 and 2023, utility-scale solar PV projects showed the most significant decrease (by 12%). For newly commissioned onshore wind projects, the global weighted average LCOE fell by 3% year-on-year; whilst for offshore wind, the cost of electricity of new projects decreased by 7% compared to 2022. Battery storage project costs dropped by 89% between 2010 and 2023.

Renewable power generation has become the default source of least-cost new power generation. The progress made in 2023 is a significant step toward transitioning to a system based on energy efficiency and renewable technologies.

A spokesperson for Wood Mackenzie, who was in charge of one of the studies indicates, “In areas of the country that have a decent mix of wind and solar potential, those places can probably get to 50% renewables without struggling. Above 50%, the challenge of ensuring reliable grid operations starts to take off." No large and complex power system in the world operates with an average annual wind and solar generation level greater than 30 percent. Another issue is that installers of wind turbines will be faced with NIMBY (not-in-my-back-yard) challenges.

The critical factor in 100-percent renewable energy with no nuclear power depends on the future of utility-scale battery storage. The firm estimated that 1,600 gigawatts of new wind and solar capacity would be required to replace all U.S. fossil fuel generation and 900 gigawatts of battery storage backup would be needed. There are only 5.5 gigawatts of battery storage world-wide in operation or under construction. If wind or solar replaced a 2-gigawatt nuclear power plant, and batteries provided the only backup, 6 to 8 gigawatts of battery storage would be required.

An 80 percent carbon-free target with natural gas generation providing the other 20 percent would reduce new battery storage costs by 60 percent. Natural gas provides an important back-up fuel for solar and wind power, which are intermittent technologies and are not available when the sun is not shining and the wind is not blowing. Natural gas can be ramped up or down quickly, is abundant and low cost. As such, it has helped the U.S. generating sector reduce carbon dioxide emissions, which declined by 27 percent between 2005 and 2018.

According to an analysis by the American Action Forum, the proposal to transition 100 percent of U.S. electricity production to renewable sources by 2030 would require at least $5.7 trillion of investment in renewable energy and storage. This is a ballpark estimate and not an in-depth projection, and may not include all the contingencies necessary to make the system work. The group also notes that it is likely to be a significant underestimation, as it reflects the lowest possible cost.

As these two studies indicate, a 100-percent renewable electricity system is not realistic by 2030 as the Green New Deal requires and certainly not at a reasonable cost. Wind and solar technologies are intermittent, as they depend on the weather and have low capacity factors, meaning that much more capacity would be required than the coal or natural gas capacity that they would be replacing. Further, battery storage is currently not a viable option as the technology is expensive and still developing.