

Rethinking grid integration of a massive renewable power expansion to achieve carbon neutrality

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There are many uncertainties about pathways to mid-century carbon neutrality in China and other major emitting nations, but one

fundamental aspect is certain: they will require massive expansions of wind and solar power to displace coal- and gas-fired power. The problem is not the cost and feasibility of sufficient renewable generation, but rather the challenges it introduces into the grid because of its variability: the wind doesn't always blow and the sun doesn't always shine.

Now, a team of researchers from Harvard University, Huazhong University of Science and Technology and Tsinghua University have developed a cross-sector, high-resolution model to find the best and most cost-effective way for China's power system to become [carbon neutral](#) by 2050. A comprehensive strategy moving beyond conventional planning assumptions to include large offshore wind generation, power storage, [electric vehicles](#), green hydrogen production, and expanded transmission to balance power on a national basis can sharply reduce costs of integrating renewable power into the grid. In fact, the results show that realizing the carbon neutrality of China's power system by 2050 is not only feasible but need not necessarily cost more than reliance on coal- and gas-fired power, with no carbon constraints at all, to meet future electricity demands.

The research was published in *Joule*.

More information: Xinyu Chen et al, Pathway toward carbon-neutral electrical systems in China by mid-century with negative CO₂ abatement costs informed by high-resolution modeling, *Joule* (2021). [DOI: 10.1016/j.joule.2021.10.006](#)

Research brief: [chinaproject.harvard.edu/files/...ion.pdf?m=1634845191](#)

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