

NEWS | APRIL 01 2024

## Exploring impacts of wind turbines on carbon capture facilities **FREE**

Avery Thompson



Scilight 2024, 141101 (2024)

<https://doi.org/10.1063/10.0025615>

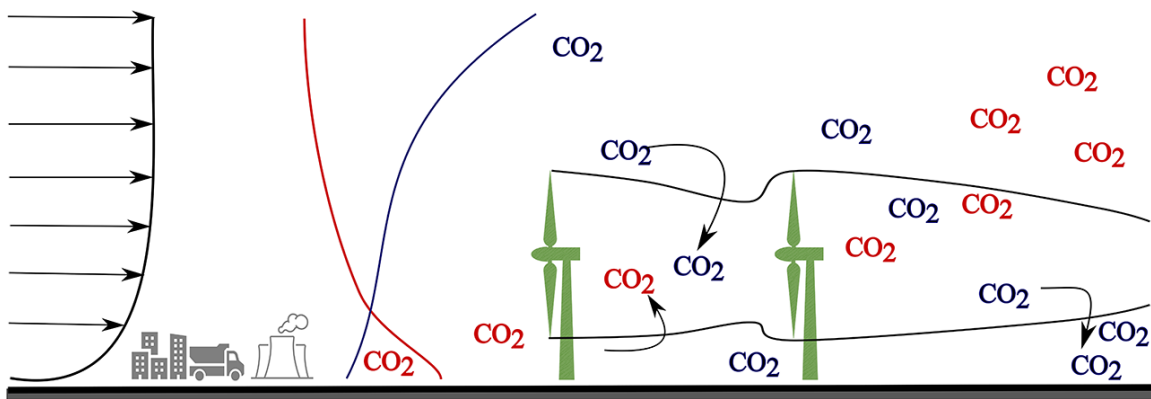


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Wind turbines can affect the carbon dioxide concentration in their wake, leading to potential synergies with carbon capture technologies.



To avert the worst effects of climate change, humanity not only has to reduce its carbon dioxide emissions, but also recapture much of the CO<sub>2</sub> that it has produced over the last few centuries. However, because CO<sub>2</sub> is still a trace gas, making atmospheric CO<sub>2</sub> capture devices that are economically and technologically feasible poses a challenge.

Pulletikurthi et al. studied how CO<sub>2</sub> concentrations are affected by wind turbines, exploring the possibility of integrating CO<sub>2</sub>-capturing methods with existing wind farms to increase the local concentration. They used realistic atmospheric CO<sub>2</sub> profiles and computational fluid dynamics simulations to identify the downstream effects of turbine wakes.

Air packets moving in the wake of a wind turbine naturally have less energy than surrounding air, which can either bring extra CO<sub>2</sub> down from above the turbine or pull it away from the ground, in both cases affecting the performance of nearby CO<sub>2</sub> capture devices.

“We quantified that 138 kg/m of CO<sub>2</sub> within 7 rotor diameters of wind turbines is removed from the surface if the bottom of the wind turbine has higher concentration,” said author Venkatesh Pulletikurthi. “Conversely, if the concentration is higher above the top tip, it increases the local concentration by 27 kg/m behind the second wind turbine if two wind turbines are placed one behind the other.”

This result could be used to guide CO<sub>2</sub> capture devices to maximize their efficiency and reduce the damage caused by climate change.

“We hope that our research further helps new designs and technology advancements in CO<sub>2</sub> capture devices to work together with wind farms,” said Pulletikurthi.

**Source:** “Potential of wind turbines on the alteration of carbon dioxide concentration,” by Venkatesh Pulletikurthi, Clarice Nelson, and Luciano Castillo, *Journal of Renewable and Sustainable Energy* (2024). The article can be accessed at <https://doi.org/10.1063/5.0179608>.

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