



The Role of Carbon Removal in Achieving Net-Zero Greenhouse Gas Emissions

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Abstract: To achieve net-zero greenhouse gas emissions goals, both decarbonization and carbon dioxide removal are required. Removing greenhouse gases from the atmosphere is no one's first choice for climate restoration - it is the contingency, the backup plan. We know we will need it, but it is still unclear what its true scale of application will ultimately become. The question of scale for requirements in 2050 is fundamentally unknowable. The true scale of removal required will be dictated by how rapidly direct decarbonization alternatives scale, what the energy demand will be, what CDR cost reductions occur, and what barriers to future deployment will arise. The more we can decarbonize industrial sectors, the less we may need to rely on carbon removal approaches for counterbalancing hard to abate sectors. Carbon capture coupled to industrial decarbonization and its potential impact will be discussed across various sectors. The various approaches of carbon dioxide removal from engineered to nature-based will be presented with a deep dive into work carried out in the [Clean Energy Conversions Lab](#), which will include alkalinity extraction from industrial waste materials (e.g., mine tailings, fly ash, etc.) for storing CO₂ in addition to domestic critical mineral production opportunities.

Bio: Jennifer Wilcox is Presidential Distinguished Professor of Chemical Engineering and Energy Policy at the University of Pennsylvania, with a home at the Kleinman Center for Energy Policy and the School of Engineering and Applied Science. At Penn, she oversees the [Clean Energy Conversions Lab](#).

Wilcox also works with Isometric as their Chief Scientist and is a senior fellow at the World Resources Institute, where she leverages her expertise to help accelerate policy support and investments in research, development, and deployment of industrial decarbonization and carbon removal solutions in order to achieve net-zero emissions by 2050. Most recently, Wilcox served as Principal Deputy Assistant Secretary for the Office of Fossil Energy and Carbon Management at the Department of Energy.

Wilcox's research takes aim at the nexus of energy and the environment, developing both mitigation and adaptation strategies to minimize negative climate impacts associated with society's dependence on fossil fuels. This work carefully examines the role of carbon management and opportunities therein that could assist in preventing 2° C warming by 2100. Carbon management includes a mix of technologies spanning from the direct removal of carbon dioxide from the atmosphere to its capture from industrial, utility-scale exhaust streams, followed by utilization or reliable storage of carbon dioxide on a timescale and magnitude that will have a positive impact on our current climate change crisis.

Funding for her research is primarily sourced through the National Science Foundation, Department of Energy and the private sector. She has served on a number of committees including the National Academy of Sciences and the American Physical Society to assess carbon capture methods and impacts on climate. She is currently a member of the [Energy & Environmental Science](#) Journal Editorial Board. She is the author of the first textbook on carbon capture and, most recently, the [CDR Primer](#). In 2023, she was named one of the [TIME 100 Climate](#).

Hosted by: Prof. Erdem Sasmaz