

Hope for CO₂ air capture

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community at Mount Holyoke College in *Defining Women's Scientific Enterprise*.²

This is not to say that female physicists in the US didn't face plenty of barriers as well—they certainly did! Rather, it is a telling confirmation of how contextual and changeable culture is.

References

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Hope for CO₂ air capture

John Tanner's summary of carbon dioxide air-capture costs (PHYSICS TODAY, February 2023, page 12) takes the

glass-half-empty approach to an extreme. At the average US retail price for electricity (12¢/kWh), the thermodynamic energy demand of direct air capture¹ would indeed add \$15 to the cost of collecting a metric ton of CO₂ from air. But large power consumers, such as aluminum smelters, get much better pricing.²

Moreover, removing 8 billion metric tons of CO₂ for a mere \$120 billion would be a good deal. It would cancel past emissions from about 20 billion barrels of oil. The world buys that much oil every 200 days for \$1.6 trillion. Prices for such a quantity have fluctuated between \$200 billion and \$3 trillion over the years. The implied surcharge of \$6 per barrel seems cheap for fixing the climate.

Can air capture achieve such economics? The bad news is that current costs are above \$500 per metric ton of CO₂. I agree with Tanner that thermodynamic limits plus unavoidable raw-material inputs set a lower bound around \$10–\$20 per metric ton.³ The good news is that no physical law prevents approaching that bound through learning by doing. Betting against an order-of-magnitude cost reduction ignores the two-orders-of-magnitude re-

duction in wind and solar. It collides with the frequently expressed optimism that batteries will get cheaper if we produce a lot of them. Mass production has proven over and over that costs can drop 10-fold if cumulative capacity increases 1000-fold.⁴ For air capture, which needs to grow more than a millionfold, that represents just the beginning of the growth curve.⁵ Obviously, success is not guaranteed, but closing the door to the opportunity without trying is self-defeating.

References

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