Wind Turbines May Offset Part of Global Warming

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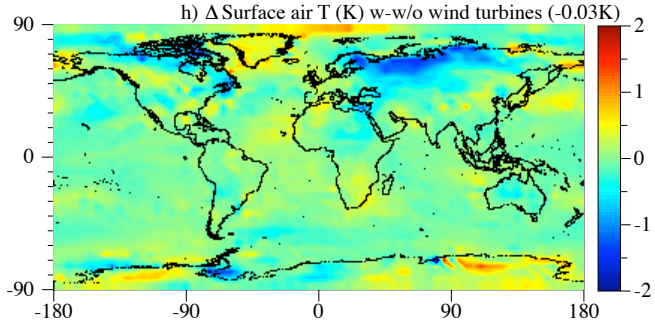
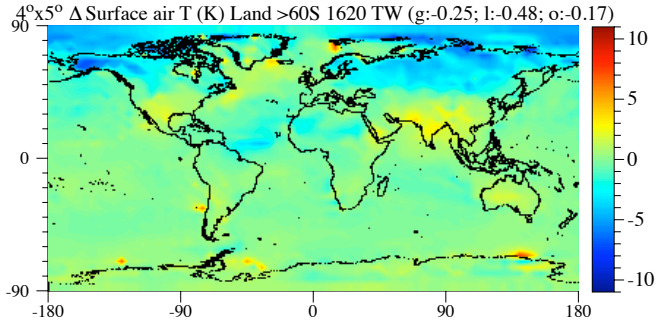
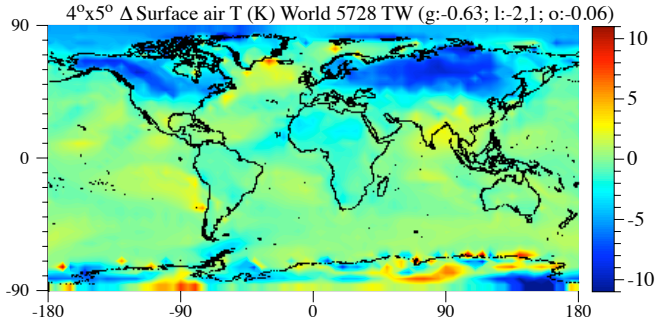
Energy extraction by 2.5 million 5-MW wind turbines needed to power 37% of world all-purpose end use energy in 2050 after all sectors have been electrified, **may reduce global temperatures by ~0.03 K, or ~3% of observed global warming**. See explanation on P. 243-244 and Section S1.E of Ref. [1], where this figure originates.



Consistently, energy extraction by 324 million 5-MW wind turbines over land (far more than will ever be needed by humans) may reduce global temperatures by ~0.25 K. See the explanation on P. 15,683 of Reference [2], where these data originate.



Consistently, energy extraction by 1.15 billion 5-MW wind turbines over land and ocean (far more than will ever be needed by humans) may reduce global temperatures by ~0.63 K. See the explanation on P. 15,683 of Reference [2], where these data originate.



References

1. Jacobson, M.Z., M.A. Delucchi, M.A. Cameron, and B.V, Mathiesen, Matching demand with supply at low cost among 139 countries within 20 world regions with 100% intermittent wind, water, and sunlight (WWS) for all purposes, *Renewable Energy*, 123, 236-248, 2018, https://web.stanford.edu/group/efmh/jacobson/Articles/I/CombiningRenew/WorldGridIntegration.pdf
2. Jacobson, M.Z., and C.L. Archer, Saturation wind power potential and its implications for wind energy, *Proc. Nat. Acad. Sci.*, *109*, 15,679-15,684, doi:10.1073/pnas.1208993109, 2012, https://web.stanford.edu/group/efmh/jacobson/Articles/I/SatWindPot2012.pdf