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Comment on Jacobson et al., *Low-cost solution to the grid reliability problem with 100% penetration of intermittent wind, water, and solar for all purposes*, *PNAS* 2015 112 (49) 15060-15065; doi:10.1073/pnas.1510028112

Three problems with the proposal by Jacobson et al. for transitioning off fossil fuels are:

1) Jacobson et al. WWS has no electrical system. The existing transmission system is not capable of handling the WWS power levels. The WWS needs a new grid design that meets the rigorous North American Electric Reliability Council (NERC) testing procedures (1). Legal challenges are likely to stop or delay many of the new power lines (2). Who will pay for the new lines?

2) Jacobson et al. suggests many new storage technologies. Some are being tested (3) while others will need more time and money to reach commercialization. Even though battery costs have dropped dramatically, an hourly model of ERCOT (Texas) powered 100% by wind and solar shows seasonal variations requires 330 hours of storage costing trillions of dollars (4).

3) Jacobson et al. err in interpreting reliability in section S1.L., "The electric utility industry standard for reliability is a loss of load expectation (LOLE) of 1 day (24 hours) in 10 years." This is an incorrect definition of the LOLE (5). One day in ten years means there is a brief outage that occurs on-a-day once in 10 years on average, not a 24 hour outage.

1. NERC, *Transmission Planning Rules*, <http://www.nerc.com/files/TPL-001-4.pdf> , accessed 22 Dec 2015.
2. Southern California Edison Co., *Devers-Palo Verde 500 kV Project*, http://prod-http-80-800498448.us-east-1.elb.amazonaws.com/w/images/9/94/WP11_DPV2.pdf , accessed 09 Dec 2016.
3. DOE, *Grid Energy Storage*, http://www.sandia.gov/ess/docs/other/Grid_Energy_Storage_Dec_2013.pdf , accessed 09 Jan 2016.
4. Preston, Eugene, *Microgrids Can Play An Important Role In Reducing ERCOT's Fossil Fuel Dependency*, 2016 Renewable Energy Law Conference, Feb 9-10, 2016, Austin, Texas, <http://egpreston.com/PrestonFeb2016.pdf> , a preprint, accessed 09 Jan 2016.
5. Keane, Andrew et al, *Task Force on the Capacity Value of Wind Power*, IEEE Power and Energy Society, [http://www.nerc.com/docs/pc/ivgtf/ieee-capacity-value-task-force-confidential%20\(2\).pdf](http://www.nerc.com/docs/pc/ivgtf/ieee-capacity-value-task-force-confidential%20(2).pdf) , accessed 09 Jan 2016.