Clarification to "A low-cost solution to the grid reliability problem with 100% penetration of intermittent wind, water, and solar for all purposes," by Mark Z. Jacobson, Mark A. Delucchi, Mary A. Cameron, and Bethany A. Frew, first published December 8, 2015; 10.1073/pnas.1510028112 (Proc Natl Acad Sci USA 112:15060-15065).

The authors clarify Footnote 4 of Table S2 (Supplementary Information) to state, "As stated in Section 5.4 of [1] but reiterated here, 9.036 GW of the 87.48 GW of previously-installed hydropower in this table are Canadian installations providing pre-existing imported hydropower. (The difference between the 87.48 GW here and the 87.86 GW in [1] is that the former is for the 48 contiguous United States and the latter is for all 50 states). The 87.48 GW in this table is not only the contemporary installed hydropower capacity, it is also the maximum potential annually averaged discharge rate of hydropower both today and in 2050 in this study. Thus, this maximum potential annually averaged rate is held constant over time here. The actual annually averaged discharge rate of hydropower in this study for 2050 is 45.92 GW (Table 2), which is much less than the 87.48 GW maximum potential annually averaged value. However, as indicated in Figures 2b, S4b, and S5b, it is assumed here that 1,282.5 GW of turbines are added to existing hydropower dams to increase the maximum instantaneous discharge rate of hydropower to a total 1,370 GW without changing the reservoir size or maximum potential annually averaged discharge rate of hydropower of 87.48 GW. Thus, while the peak discharge rate may increase significantly for some hours, it decreases significantly for others to ensure the actual annually averaged discharge rate of hydropower is not much different from today and much less than maximum annual value, 87.48 GW. This can be accomplished by modifying powerhouses to increase either the number or capacity of turbines and the instantaneous flow rate of water to them, by either adding pipes around or above dams or widening penstocks through dams. The cost of electrical equipment (turbines, generators, and transformers) in a hydropower plant ranges from $560/kW for 500 MW plants to $200-$300/kW for 1000 MW plants (Figs. 4.5 and 4.7 of [2]). We start with the cost for a large 1000-MW plant and add costs for pipes or widening penstocks and for equipment housing and contingencies due to possible supply shortages to arrive at an estimated total cost of the additional hydropower turbines of roughly $385 (325-450) per kW. This amounts to $494 billion for all of the additional turbines proposed here, which would increase the total all-sector capital cost in Table 2 by a mean of just over 3%. We believe this cost increase has no impact on the main conclusions of this study. Even if costs were much higher, there are multiple other low-cost solutions with zero added hydropower turbines but more CSP and batteries instead, not only for North America, but also for 20 world regions, so the increase in hydropower peak instantaneous discharge is just one of several options."