

July 28, 2018

Assemblyman Chris Holden, Chair
Assembly Committee on Utilities and Energy
State Capitol, PO Box 942849
Sacramento, CA 94249-0041
Email: assemblymember.holden@assembly.ca.gov
Re: Strong support for AB 813

Dear Chairman Holden,

I am writing to strongly endorse California Assembly Bill 813 (AB813) that authorizes the transition of CAISO to have a fully independent board as a first step towards creating a western regional transmission organization (RTO). There are multiple reasons for this, as explained below.

Reducing Cost: With the levelized cost of electricity generation from solar and wind are already lower than that of all fossil fuels, and with further cost reductions expected in the future, we are going to witness increasing penetration of solar and wind in much of the western region, which is known for its rich renewable resources. However, with increasing penetration of solar/wind (50 and 80 percent of electrical energy used annually), the key challenge will not be the cost of electricity generation, but rather the cost of integration, i.e. providing balancing services for the intermittency inherent in solar and wind. Having larger number of balancing resources over a larger geographical region reduces the cost of renewables^{1,2,3}. Currently, CAISO is limited in its day-ahead market planning to only California resources. If we are to reduce cost of electricity in the wholesale market in the future, CAISO should transform into a western RTO.

Reducing Carbon Emissions: If California approaches its goals of 50 and 80 percent renewable penetration by 2030 and 2050 respectively, we will need grid services to balance against intermittency. These balancing services have to compete in the wholesale market. Today, these services are provided by natural gas, because it is the cheapest way to do so. The most inexpensive approaches to provide balancing services is hydroelectricity, which is not only carbon free, but is also much cheaper than that provided by natural gas and coal. Our neighboring states have hydroelectric resources that California does not have. Therefore, turning CAISO into a western

¹ A.E. MacDonald, et al., "Future cost-competitive electricity systems and their impact on US CO₂ emissions, *Nature Climate Change* **6**, 526–531 (2016).

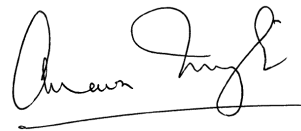
² E. Lantz, et al., "Long-term implications of sustained wind power growth in the United States: Direct electric system impacts and costs," *Applied Energy* **179**, 832-846 (2017).

³ S. Behboodi et al., "Interconnection-wide hour-ahead scheduling in the presence of intermittent renewables and demand response: A surplus maximizing approach," *Applied Energy* **189**, 336-351 (2017).

regional RTO would allow these carbon-free balancing services to be utilized, which will reduce California's carbon emissions. Furthermore, at 50-80 percent renewables penetration, there will be times where California will produce excess renewable electricity. Without a western regional RTO, such renewables will have to be curtailed. A western regional RTO will allow renewable electricity generated in California to be utilized in neighboring states, thus reducing the carbon emissions of the whole western region.

It is for these and many other reasons I feel that is in the best interest of California to broaden the balancing authority of CAISO and turn it into a western RTO. As a first step to achieve this goal, it is important that CAISO have a fully independent board.

Sincerely,

A handwritten signature in black ink, appearing to read "Arun Majumdar", with a horizontal line underneath.

Arun Majumdar
Jay Precourt Provostial Chair Professor