

Storage

There may be additional ways to alleviate the storage issue. One would be to use hydropower produced by the New York Power Authority at their Niagara Falls and Messina facilities to provide back-up electricity. Providing back-up for renewables would also involve some type of smart metering and improved electric transmission lines.

Another recommendation by Richard Perez, Director of Atmospheric Science Research Center of the State of New York at Albany, is labeled “Overbuild and Curtailment”. *Overbuild and Curtailment: The Cost-Efficient Enablers of Firm PV Generation*, Solar Energy Journal, volume 180, pages 412-422, R. Perez, et al, (2018). Overbuild and Curtailment is also supported by the studies conducted by Mid-Intercontinental System Operators (MISO) indicating that a 150% overbuild of solar and wind facilities beyond electricity actually needed, could provide electricity at \$0.045 per kilowatt hour. The overbuild cancels out the need for most storage requirements including the resources needed to build the batteries and dispose of batteries. The MISO study showed that an overbuild of 55% solar photovoltaics, 40% wind power, and a 5% use of legacy natural gas could reduce storage costs to the point where electricity could be provided 24/7 for our electric needs, transportation, and heating and cooling at the cost of \$0.045 per kilowatt hour. Similar studies have been conducted in other areas. Notably a Minnesota Solar Pathways study showed that 95% of electricity for electric use and transportation could be provided at \$0.035 per kilowatt hour utilizing this method.

Regulations and policies would have to be shifted to allow payments for solar and wind produced electricity to include both the cost of generating the electricity and compensation to owners for overbuilt physical capacity. The fact that the cost of electricity can be determined by power purchase agreements and/or feed-in-tariffs shows that such regulatory change is possible.