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July 15, 2016

The Honorable Andrew M. Cuomo
Governor of New York State
NYS State Capitol Building
Albany, NY 12224

RE: New York nuclear power plant subsidies

Dear Governor Cuomo,

I am the lead author of two New York State 100% clean, renewable energy roadmaps that were published in the scientific peer-reviewed literature in 2013 and 2015, respectively. The plans are available here

http://web.stanford.edu/group/efmh/jacobson/Articles/I/WWS-50-USState-plans.html

I am writing to comment about a recent proposal to subsidize three upstate nuclear reactors. Below is my simplified summary of the impacts of such subsidy on cost and jobs.

The main conclusion is that shutting the three upstate nuclear reactors (Ginna, Nine Mile Point Unit 1, and Fitzpatrick) today and replacing them with onshore wind is cheaper ($11.9 billion over 34 years) to New York State than keeping the reactors open 12 years then replacing them with wind ($19.5 billion). Both those options are less expensive than keeping the reactors open 34 years (minimum of $25.3 billion). The energy output is exactly the same in all three cases.

Further, conversion to 100% clean, renewable energy (namely wind, water, and solar, WWS) in New York will result in a net addition to New York of ~82,000 40-year jobs based on the 2015 published New York energy plan at

http://web.stanford.edu/group/efmh/jacobson/Articles/I/USStatesWWS.pdf

This net job creation due to conversion of all fossil and nuclear energy to WWS far exceeds the 1778 jobs lost at the 3 nuclear reactors to be considered for subsidy.

With regard to cost, there are three relevant simplified scenarios: 1) The nuclear reactors stay open until 2050; 2) the nuclear reactors stay open until 2028 and are then replaced

by, for example, wind; 3) the nuclear reactors close today and are replaced by, for example wind. Let's compare these scenarios

Scenario 1: Nuclear stays open until 2050: For the first 12 years, nuclear will receive $7.6 billion in subsidy. After that time, the subsidy must continue at a minimum rate already defined as $805 million/yr for the remaining 22 years until 2050, totaling an additional $17.7 billion from 2028 to 2050 or $25.3 billion ($7.6 + 17.7 billion) over the entire 34 years from 2016 to 2050.

Scenario 2. Nuclear stays open until 2028 at a cost of $7.6 billion then is replaced by wind. Right now, the three nuclear reactors Fitzpatrick (855 MW), Nine Mile Point Unit 1 (621 MW), and Ginna (581 MW) generate 16,330 GWh/yr. The installed capacity of wind turbines needed to provide 16,330 GWh/yr with a capacity factor in New York of 25% is 7.46 GW. At $1.6 million/MW, this costs $11.9 billion. So, in Scenario 2, the total cost to New York is $7.6 billion + $11.9 billion = $19.5 billion.

Scenario 3. Nuclear closes today and is replaced by wind. In this case, the cost of installing wind today to meet demand is $11.9 billion total. Onshore wind turbine lifetimes are at least 30 years today, and many simply require part replacements over time rather than need to be shut down.

Thus, to summarize, shutting nuclear down today and replacing it with onshore wind is the cheapest ($11.9 billion); keeping nuclear open 12 years costs a total of $19.5 billion. Keeping nuclear open 34 years costs a minimum of $25.3 billion for the exact same energy output in all three cases.

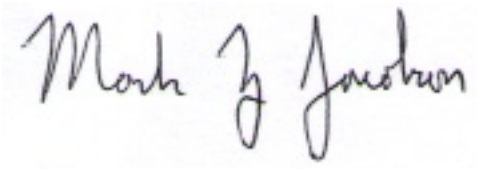
Replacing nuclear with utility PV (with a capacity factor of 18% in New York and capital cost of $1.6 million/MW) today costs $16.5 billion, which is also cheaper than keeping nuclear open 12 years.

One more point. Nuclear is baseload in New York so requires peaking power, as do wind and solar. Low cost methods of matching power demand with intermittent WWS supply can be found at

http://web.stanford.edu/group/efmh/jacobson/Articles/I/CombiningRenew/combining.html

There is no reason costs on the grid should rise due to the growth of intermittent WWS sources to 100% penetration, as shown for the first time in that paper.

Sincerely,



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