From: Robert Gibson <puttotest1948@gmail.com>
Sent: Sunday, July 28, 2024 9:32 PM
To: PalisadesRestartEnvironmental Resource
Subject: [External_Sender] My Comments on the Palisades Restart: Docket ID NRC-2024-0076
Attachments: Palisades Impacts of Nuclear Energy.pdf

Dear NRC

I am in favor of restarting the Palisades nuclear energy plant in Michigan. I have made some comments in the attached PDF document.

Rob Gibson
Aurora IL

Federal Register Notice: 89FR53659
Comment Number: 81

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Palisades Impacts of Nuclear Energy.pdf	143817	

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Dear Nuclear Regulatory Commission:

Docket ID NRC-2024-0076

If the Palisades nuclear energy plant in Michigan is restarted, it will displace the building of any new fossil fuel electrical generation. Thus, carbon emissions will be lowered by a lot. Holtec is planning to build some SMRs at the Palisades site. Could these SMRs be used to blackstart the largest reactor during a regional gird blackout? If true, the Palisades plant could be the first nuclear plant with blackstart capability using clean energy.

Last Friday, I watched the PBS program, Energy Switch. As I watched the episode on the Environmental Land Impact of Energy, Mark Mills bought up three parameters which need our focus when we decide on our energy solutions. These parameters are 1) Reliability, 2) Cost, and 3) Environmental Land Impacts of Energy. I would like to add a fourth parameter to the list: average carbon intensity over an 80-year period.

Reliability of Nuclear Energy

How can we measure reliability of electricity with some numbers? I would use a metric called capacity factor. Back in 1975, nuclear energy had a capacity factor of 56%, and in 2007, the capacity factor rose gradually to over 90%. Since 2007, nuclear energy has had a capacity factor of over 90%, except for 2011 and 2012. Nuclear energy is the world's most reliable energy source.

Cost of Nuclear Energy

Since 2007, the capacity factor for nuclear energy has been flat. Even though nuclear energy's capacity factor improvements have been flat, the operating costs of nuclear energy have dropped by 17% since 2012 without considering inflation. If nuclear energy's operating costs were

adjusted to real dollars, the effective cost drop would be even more. Nuclear energy operating costs are already low.

Environmental Land Impact of Energy

Because the energy density of nuclear energy is the highest of all energy sources, land impact of nuclear energy is very low and maybe the lowest of any human made energy source.

Carbon Intensity of the Energy System in 2050

The state of Minnesota has propose an electrical grid whose carbon intensity may be 83 grams of $CO_{2(eq)}$ per kWh [my calculation] and has 76% of its electrical generation coming from solar energy and wind energy and with some battery backup. The Center of the American Experiment has proposed an electrical grid whose carbon intensity may be 12 grams of $CO_{2(eq)}$ per kWh [my calculation] and has 86% of its electrical generation coming from nuclear energy and a very small amount of battery backup.

How can a renewable energy grid have more carbon intensity than a nuclear energy grid? If too little natural gas or nuclear energy is not allowed to back up a grid, which depends primarily on renewable energy, you must add many more solar energy and wind energy units to the energy system than what was originally planned to compensate for the low-capacity factors and the intermittency of the energy sources. How the overall electrical grid is designed makes a huge difference in the carbon intensity of an electrical grid.

Sincerely,

Rob Gibson

References:

[1] **8. Nuclear Energy**, US EIA, https://www.eia.gov/totalenergy/data/monthly/pdf/sec8.pdf

[2] **Table 4.08.B. Capacity Factors for Utility Scale Generators Primarily Using Non-Fossil Fuels**, US EIA, https://www.eia.gov/electricity/annual/html/epa_04_08_b.html

[3] **Table 8.4. Average Power Plant Operating Expenses for Major U.S. Investor-Owned Electric Utilities**, 2011 through 2021, https://www.eia.gov/electricity/annual/html/epa_08_04.html

[4] **Quadrennial Technology Review - An Assessment of Energy Technologies and Research Opportunities**, 2015, Chapter 10, p 390, https://www.energy.gov/sites/prod/files/2017/03/f34/qtr-2015-chapter10.pdf

[5] **The High Cost of 100 Percent Carbon-Free Electricity by 2040** [of a hypothetical grid for Minnesota], Isaac Orr, Mitch Rolling, & John Phelan, 09/12/2022, https://www.americanexperiment.org/reports/the-high-cost-of-100-percent-carbon-free-electricity-by-2040

My carbon intensity calculations were loosely based on the Minnesota report. Any errors are probably mine.

[6] **Blackstart (and Advanced Reactors) to the Rescue**, July 8 2024, https://thebreakthrough.org/journal/no-20-spring-2024/blackstart-and-advanced-reactors-to-the-rescue