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CHENE3810: Final Blog

The recent closure of Unit 2 of the Indian Point Nuclear Plant has brought the idea of nuclear energy, often on the sidelines, back into public view. The idea of nuclear energy has for a long time been marred by perceptions that this source of energy is dangerous and comes with great risks of radiation exposure. Disasters like at Three Mile Island, Chernobyl, and Fukushima understandably add fuel to the argument that is often driven by proponents of conventional energy sources and those who dislike the idea of any imposing industrial site existing in their backyard. Despite these fears, the benefits of nuclear energy as a clean energy source cannot be undervalued.

The blanket assumptions that nuclear energy is not worth the risk fails to fully consider how significant a role this energy source can have in combating climate change. For instance, Forbes reports that the closure of Indian Point will result in a 15% increase in New York State's carbon emissions as natural gas will be used instead. As a comparison, it would take about 500 square miles worth of wind farms to produce the same 16 TWh per year that Indian Point generates.[1]

To further understand how nuclear energy holds up against other forms of energy, it is helpful to look at its capacity factor. This is a value representing the amount of electricity that is actually generated from a particular source compared to the maximum electricity that could be generated from that source. Capacity factor, along with values of efficiencies and energy density, proved useful in the Solar Cell experiment conducted in our lab in comparing solar and wind energy generation and framing such renewable sources against the world's current energy dependence context. The U.S. Energy Information Administration shows nuclear power with a capacity factor of 93.5%, while wind and solar have values of 34.8%, and 24.5%, respectively.[2] Though nuclear plants still fall subject to Carnot losses, the huge amount of energy released from nuclear fuel allows for efficiency values around 38% compared to literature values of solar and wind generation that we confirmed in our lab experiment of about 10-20%.[3]When looking at the energy density of U-235 (used in nuclear fission) at 77,000,000 MJ/L compared to coal at 32.5 MJ/L, the benefit of nuclear is again starkly apparent.[4]

Nuclear energy has game-changing potential for transitioning the world away from fossil-fuels towards cleaner technologies. Improvements in plant design and safety, along with the ongoing research that may add nuclear fusion to this discussion, further support how commercialization of such energy sources could be more widely adopted in the coming decades. Regardless of the negative reputation that nuclear may have now, the extreme potential of the power held within the nucleus leaves me excited for the role of nuclear energy in the future.

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[1] https://www.forbes.com/sites/robertbryce/2020/04/12/new-york-has-1300-reasons-not-to-close-indian-point/#6668c37a523b

[2] https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_b

[3] https://www.brighthubengineering.com/power-plants/72369-compare-the-efficiency-of-different-power-pla nts/

[4] https://arewetoast.com/energy-content-of-selected-fuels.html