October 9, 2019

Distinguished Members of the Board,

Nuclear Power is often given short shrift when discussing clean, renewable power sources, but it should be considered seriously, given its strengths in these regards.

Nuclear Power produces no carbon emissions, and even the 50-year old current American-designed, Light Water Reactors (LWRs) are phenomenally safe and reliable.

Planning for the future, however, we will want to take advantage of the improvements developed over the last 50 years. Collectively, the improved reactor designs are called "Advanced Nuclear Power". The currently favored advanced designs are different forms of Molten Salt Reactors (MSRs). In these designs, instead of dealing with solid fuels (Uranium ceramics) with a liquid moderator (water) running under high pressure conditions, we have a liquid fuel with a solid moderator. A liquid fuel system can be refueled on the fly, as opposed to taking a LWR offline for 6 months to refuel. A liquid fuel system can be fully mixed and also run through a chemical separations system to remove impurities and wastes during normal operation. These MSRs can provide a very high level of fuel burn-up, where LWRs burn approximately 0.5% of the fuel in the fuel rods, which then need to be stored. Also, because MSRs do not require a large, continuous supply of water, they can be sited closer to the energy needs, not just close to rivers, lakes, or the ocean. From a safety perspective, MSRs run under normal atmospheric pressure which is inherently safer than a high pressure system. Finally, in a situation requiring shutdown, all that is required is for gravity to drain the liquid fuel into a drain tank, where the fuel solidifies into salt crystals; restarting the reactor would involve remelting the fuel and pumping it back into the reactor for a restart.

In short, MSRs are easier to run and maintain, and thus safer and less expensive. With recent changes within the Department of Energy which enable advanced reactor research (1), these new designs become possible realities which should be included in our long-term planning. New Jersey may be able to secure several of these advanced reactors by preemptively approaching the DoE.

The next level of advanced nuclear power involves a type of MSR called a LFTR (pronounced "lifter"), standing for the Liquid Fluoride Thorium Reactor. The main difference between a standard MSR and a LFTR is the fuel, as LFTRs burn the element Thorium (90) instead of Uranium (92). Given that Thorium is 4x as plentiful in the Earth's crust as garden variety Uranium ore, it is cheaper to procure. Also, Thorium does not require the elaborate separations needed to produce U235, further reducing its cost. For more details, I'm including a line to a 5 minute introduction to the LFTR and its fuel cycle (2).

Any of the current and advanced nuclear power designs are going to be superior in every way to crudely "burning stuff" to release chemical energy for electrical power, especially in reducing our carbon impact.

My best regards,

Jeff Murdoch, Stewartsville, NJ

(1) https://www.energy.gov/articles/secretary-energy-rick-perry-announces-60-million-us-industry-awards-support-advanced
(2) https://www.youtube.com/watch?v=GqzBtOdsRXo