I pledge my honor I have abided by the Stevens Honor System

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The X-Energy Revolutionary Generation IV Gas-Cooled Reactor

Over the years, nuclear energy has endured a chaotic life with a reputation that has become shaky due to rare catastrophes like the Fukushima-Daiichi meltdown. Thankfully, the new Generation IV designs have been restructuring the nuclear energy landscape as a whole, giving way to a future that may one day flourish with nuclear energy. At the frontlines of this energy revolution is X-Energy, a nuclear energy company on a mission to change the way society views nuclear energy. Namely, the Xe-100 reactor design brings energy efficiency, expansion and cost into consideration.

Think about how large present day nuclear power plants are. While these massive structures provide an immense amount of energy, it is difficult to expand nuclear energy to areas with limited space. However, unlike the sizable traditional light water reactor (LWR) designs that we have become accustomed to, the Xe-100 is a type of small modular reactor that requires much less space to generate the same amount of energy as LWR's. This is due to its high temperature gas reactor (HTGR) design that uses Helium gas to transport heat generated from fission to boiling water, as opposed to the LWR design that requires much more space, as it contains one loop of pressurized water to transport heat from fission to another adjacent loop of water that is converted to steam and spins a turbine. Also, the Xe-100 uses graphite pellets as a moderator, conserving internal space in the atomic fission sector of the reactor.

A setback to many nuclear reactor designs is the cost and construction time of a nuclear power plant. However, the smaller Xe-100 design is the solution to this impediment. A common nuclear

power plant typically requires around 10 years to construct, with immense costs involved that often lead to an extensive amount of running time before the power plant can break even from the expenses. With X-Energy's compact design, both the costs and construction time are cut to only 2 years worth of assembly before the plant starts generating revenue. Besides that, the HTGR design allows for a much greater energy efficiency, as it can be operated at much higher temperatures due to its already gaseous coolant. While the LWR design is limited to an operating temperature of about 300ºC, the Xe-100 contains Helium that is heated from 250ºC to 750ºC, which leads to a much greater heat energy efficiency while also requiring a much lower internal pressurization. Lastly, the fuel used in the Xe-100 reactor is spherical in shape, composed of Uranium enriched to 20%. Encompassing a tri structural isotropic particle nuclear fuel design, it allows for much longer periods between refueling.

As seen from these specs, the Xe-100 small modular reactor is certainly a one of a kind, revolutionary design. The fact that it provides a larger supply of energy while also taking up much less space at a lower cost is a game changer, and is without a doubt going to turn heads. To top this already impressive design, the Xe-100 is tailored to be meltdown proof, with X-Energy representatives and engineers, like Yvotte Brits[1], stating that it is "walkaway safe," – a bold claim that is sure to draw attention. All in all, the future is depending on an insurgent implementation like the Xe-100 as climate change continues to ravage our planet, and X-Energy is ready to make a difference. The question then becomes: Are you ready?

References

[1] Yeung, Isobel. “Tiny Nuclear Reactors Are the Future of Energy - Youtube.” YouTube. Vice Media LLC, December 15, 2020. https://www.youtube.com/watch?v=kMCf7XquYKw.