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Relationship between SMR and Planetary Boundaries: A mitigation strategy for the global environmental crisis

Relationship between SMR and Planetary Boundaries: A mitigation strategy for the global environmental crisis

Scientific evidence indicates that of the 9 planetary boundaries that have been defined, 6 have been exceeded. High CO2 emissions, land use change, disturbance of nitrogen and phosphorus cycles, damage to the integrity of the biosphere, the effects on fresh water and the excessive emergence of new entities are the geophysical bases of the global environmental crisis (Richardson, 2023).

In this article, we analyze the future potential of SMRs modular reactors in mitigating the global environmental crisis and its beneficial relationship with planetary boundaries.We calculate the m2/MWhy indicator related to the areal intensity and we find that SMRs can require between 0.06 m2/MWhy to 0.07 m2/MWhy. Additionally, the life cycle (LCA) of the SMR is reviewed, comparing its variables with other types of generation sources (Vinoya, 2023).

Annually, fossil fuel emissions are responsible for the deaths of 1 million people in the world. The nuclear energy industry is the only one in its field that is responsible for waste management and the emissions associated with its activity have a low impact on air quality (Freese, 2022). The implementation of SMRs in various non-interconnected populations in LATAM, where energy based on coal or liquid fuels is still generated, can be a very relevant step (UPME, 2022). Additionally, the desalination with SMR can improve access to drinking water in communities vulnerable to climate change (Al-Othman, 2019)

In conclusion, SMRs are technologies that contribute to facing the global environmental crisis beyond reducing CO2 emissions. They achieve more efficient use of the land, demand less natural resources than other generation sources and are a tool to improve air quality and the availability of drinking water.

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