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The energy requirements of artificial intelligence supplied by innovative types of nuclear power plants may create substantial vulnerabilities in radiation protection for populations

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In recent years, artificial intelligence (AI) has been exponentially developed by a growing number of Big Tech companies with an increasing number of applications in a large variety of domains. Since AI requires establishing, maintaining, and giving permanent access to massive databases, the corresponding robust computation needs play a significant role in increasing energy demands, sparking a renewed interest in nuclear energy, particularly small modular reactors (SMRs). Promoting SMRs appears as a potential path for local energy production to meet AI's large-scale demands, close to the point of consumption. The other *a priori* SMRs advantages are numerous: flexibility and affordability, sobriety in space and resources, standardized conception and optimized production at low cost, modulation of electricity production, passive safety.

The recent approval of NuScale Power's US460 SMR (May 29, 2025) by the US Nuclear Regulatory Commission (NRC) (https://www.nrc.gov/docs/ML2512/ML25129A004.pdf) marks the beginning of a new era. However, NuScale Power's US460 is a water-pressurized reactor of 77MWe, just like the majority of nuclear power plants. The smaller size of SMRs does not imply reduced risks, although it is a pivotal shift in the nuclear energy sector (Lee, 2024). The NuScale system can be viewed as a passive safety design that uses gravity or natural circulation of coolant for safety, requiring no external power source and capable of operating with minimal human intervention. However, concerns about nuclear safety and radiological protection, including transportation and logistics, remain critical from a public health perspective. One can bet that the most successful SMR will be one for which the design guarantees no spread of radioactivity in the environment, either in normal functioning or in an accidental situation, a significant concern for populations.

The decentralization of nuclear processes fostered by the spread of SMRs may create numerous channels for radioactive material production and supply, thereby increasing management complexity and risks associated with theft and illicit activities, which is a significant concern. Moreover, multiplying the number of nuclear installations increases the risks of radioactive contamination. For integrating nuclear energy production in urban settings to meet AI initiatives, it is also necessary to enhance public situational awareness and education through effective communication of risks associated with radiation protection protocols. Addressing all these challenges is a necessity.

In fine, Castelvecchi (Castelvecchi, 2024) explores the relationship between AI's energy needs and the revival of nuclear power through various lenses such as philosophy, sociology, politics, and economics, contributing to the overall discourse on nuclear project realization. The International Commission should address these new concerns on Radiological protection in its next revision of the system of radiological protection (Clement *et al.*, 2021; Laurier and Schneider, 2025).

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Conflicts of interest

The author declares no conflicts of interest.

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