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Simplification, the atout of LFR-AS-200

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LFR-AS-200 is under development by Hydromine in cooperation with ENEA. LFR stands for Lead-cooled Fast Reactor, AS stands for Amphora-Shaped, referring to the shape of the inner vessel and 200 is the electrical power in MW. The project has been carried out by a team of engineers who had participated to the construction of SPX1.
The strengths of the LFR-AS-200 are safety, simplicity, cost-competitiveness and operational simplicity.
Safety relies on lead properties and is enhanced by innovative solutions including passively actuated and operated decay heat removal systems and a Steam Generator (GV) featuring a spiral-tube bundle, partially raised above the cold collector free level.
The SG features a lower inlet window and an upper outlet window in correspondence of the lead free level, in order to drastically reduce the mass of displaced lead in case of SGTR.
LFR-AS-200 dispenses with several components, hitherto typical of fast reactors, up to achieving a volume of the primary system per unit power of less than 1 m3/MWe, i.e. about 4 times lower than that of the SPX1 Sodium-cooled Fast Reactor (SFR), and also several times less than other international LFR projects, a key-factor for cost competition.
The smaller size has been achieved through design simplification, that did mainly consist in the elimination, besides of the intermediate circuits (feature common to any other LFR project), of several components typical of SFRs and also of previous LFRs, namely (i) the in-vessel refueling machine, (ii) the above-core structure, (iii) the diagrid, (iv) the strongback, (v) the shielding elements, (vi) in-lead bearings of the pumps, (vii) the "LIPOSO"or equivalent tubular hydraulic connection between the pumps and the core and (viii) the "Deversoir" or equivalent system aimed at keeping the reactor vessel at the temperature of the cold collector.
Several operational benefits pertaining to the proposed LFR-AS-200 technology are the result of insightful choices, typically the adoption of Fuel Assemblies (FAs) with a stem that extends above the lead free surface, and hung by a support system which is integral part of the FA's head, i.e. located in the gas plenum and therefore visible by the operators. This keeps the support system free from neutron damage and thermal loads and strongly reduces the burden of in-service inspection of the primary system.

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