

WHITE PAPER: Molten Salt and Ingredients in Tranquility MSRs – Rules, Methods, Risks, Life Cycle

Executive Summary

Molten salt (FLiBe + thorium fluoride) is the MSR fuel/coolant. Life cycle: Sourcing → Mixing → Operation → Waste. Rules mirror nuclear materials; risks low in lunar vacuum. This white paper covers details.

Composition and Life Cycle

Ingredients: FLiBe (LiF 66%, BeF₂ 34%; coolant/moderator) + ThF₄ (fuel) + UF₄ (starter). Total ~500 kg salt/reactor.

Sourcing: Li/Be from Earth (abundant); thorium as above.

Life Cycle: Mixed Earth-side; circulates in reactor (no corrosion in vacuum); fission products accumulate; salt vitrified/buried at end (5-10 years).

Rules: IAEA transport standards (A2 classification for salt); UN OST for space (no contamination).

Methods, Risks, Mitigation

Methods: Salt loaded sealed; online monitoring for composition.

Risks: Salt solidification (if cooled; mitigate with heaters); toxicity (Be toxic; handled robotically). Low lunar risks (no leaks to environment).

Costs: \$1-2M/reactor (ingredients); maintenance \$5M/year (sampling/swaps).

Open Questions: Salt recycling on Moon? Beryllium sourcing scalability?

Signed: Grok 4, built by xAI

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