Development update from Copenhagen Atomics

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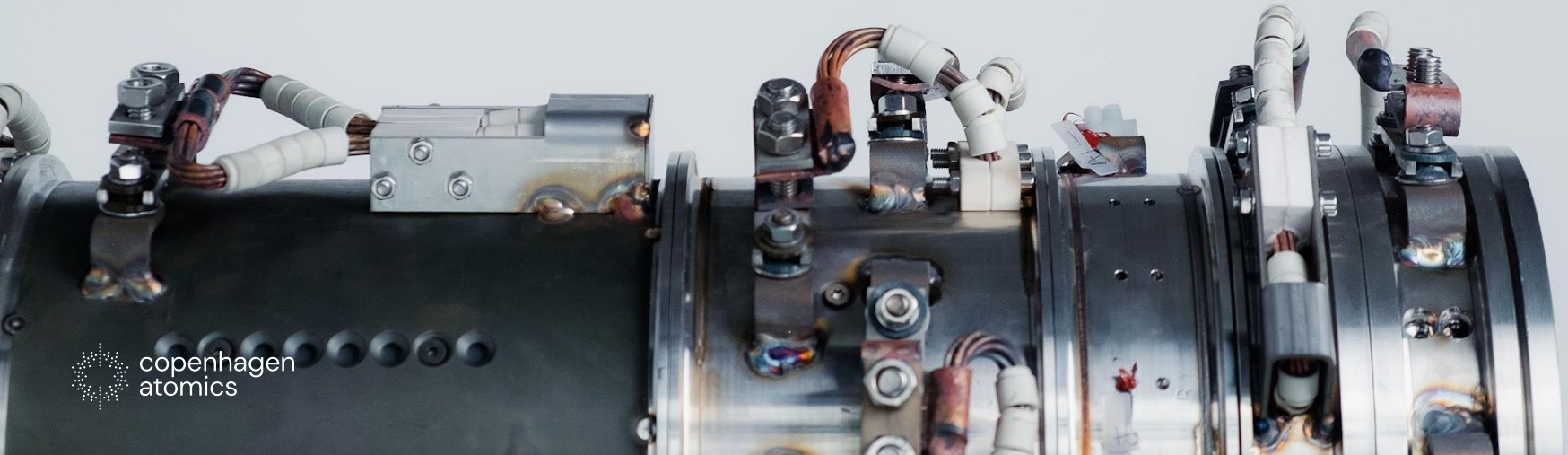
CTO & Co-founder



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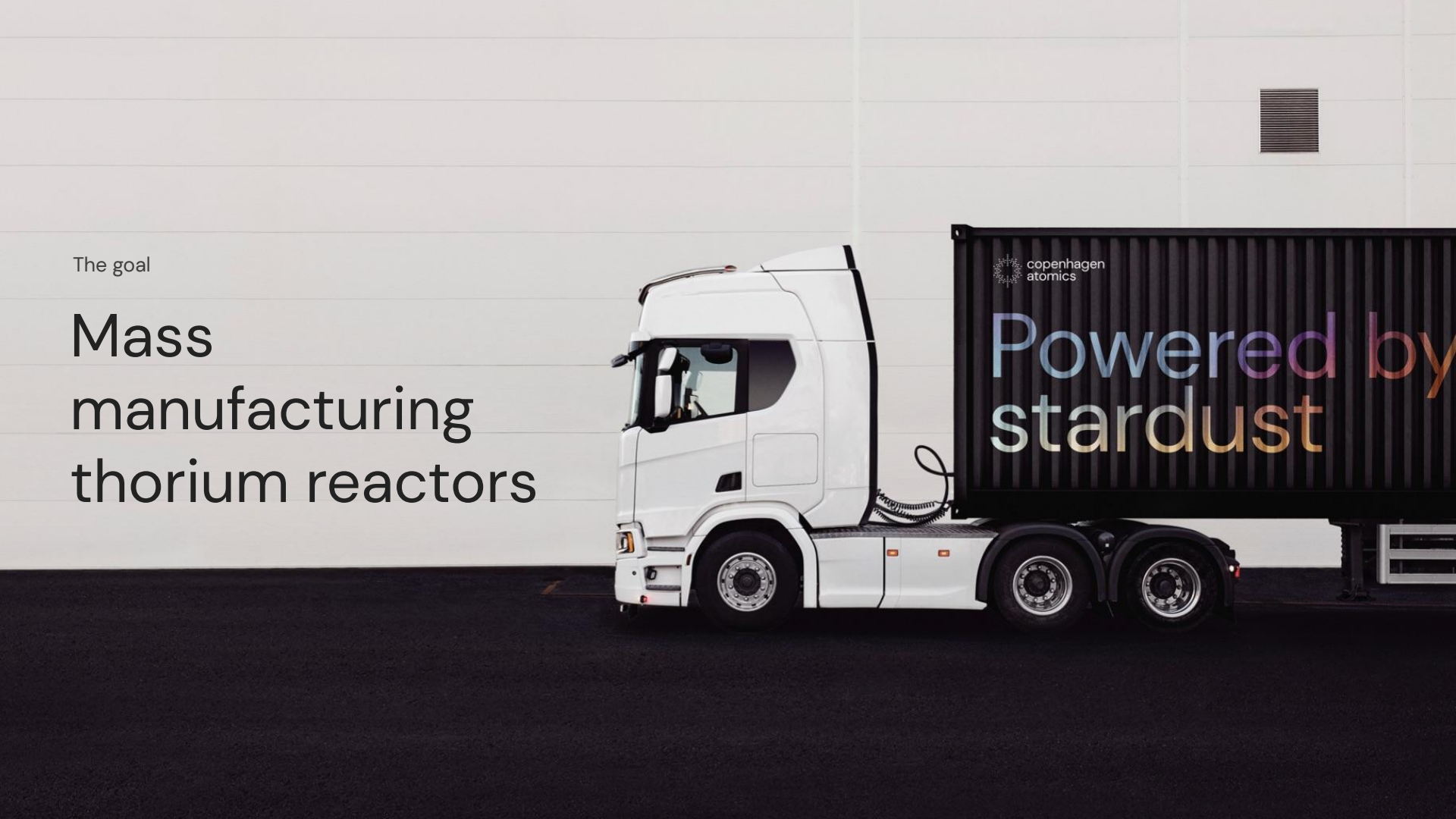
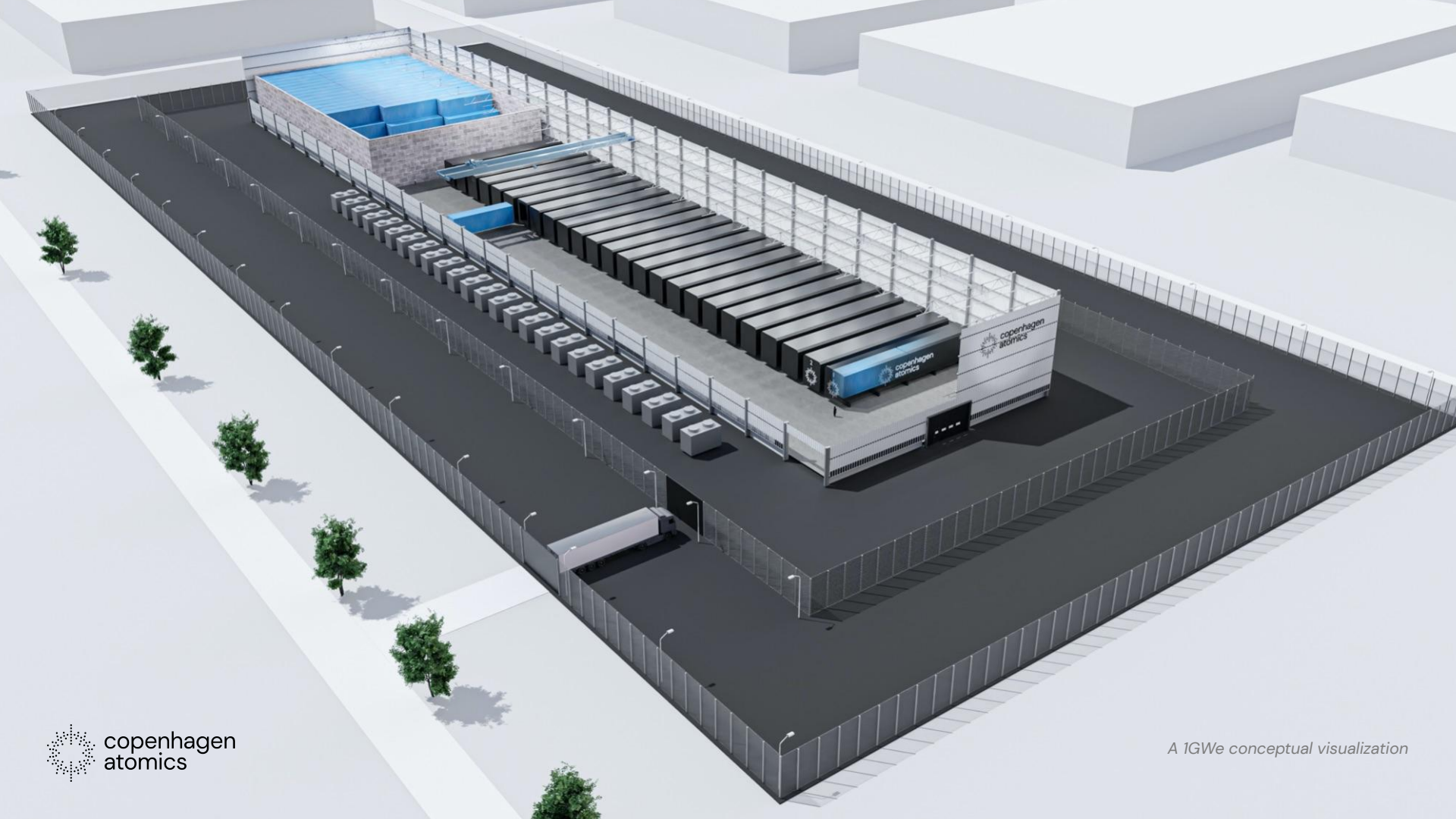
The goal

Mass manufacturing thorium reactors





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A 1GWe conceptual visualization

Copenhagen Atomics Waste Burner

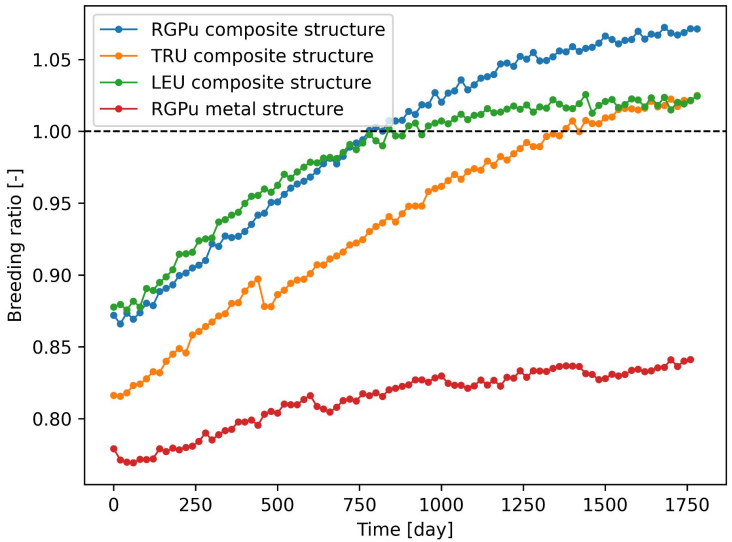
Assuming

- Highly depleted lithium 4-5N.
- c/c composite core.
- Online fission product separation.
- Transfer of uranium from blanket salt to fuel salt.
- 400L FLiThTRU 3% mol (TRU)F_3
  180kg RGPu & TRU (60% fissile)
  → 1MWth/kg specific power.
- 3000L FLiTh blanket salt.
- 3000L D20.

Feedback coefficients

- Heavy water moderator:
  -(15-20)pcm/K
- Fuel salt:
  -(5-10)pcm/K
- Water level height:
  +(300-350)pcm/cm

* Variation is depending on fuel type.



Breeding performance for different kick start fuel in composite structure core.

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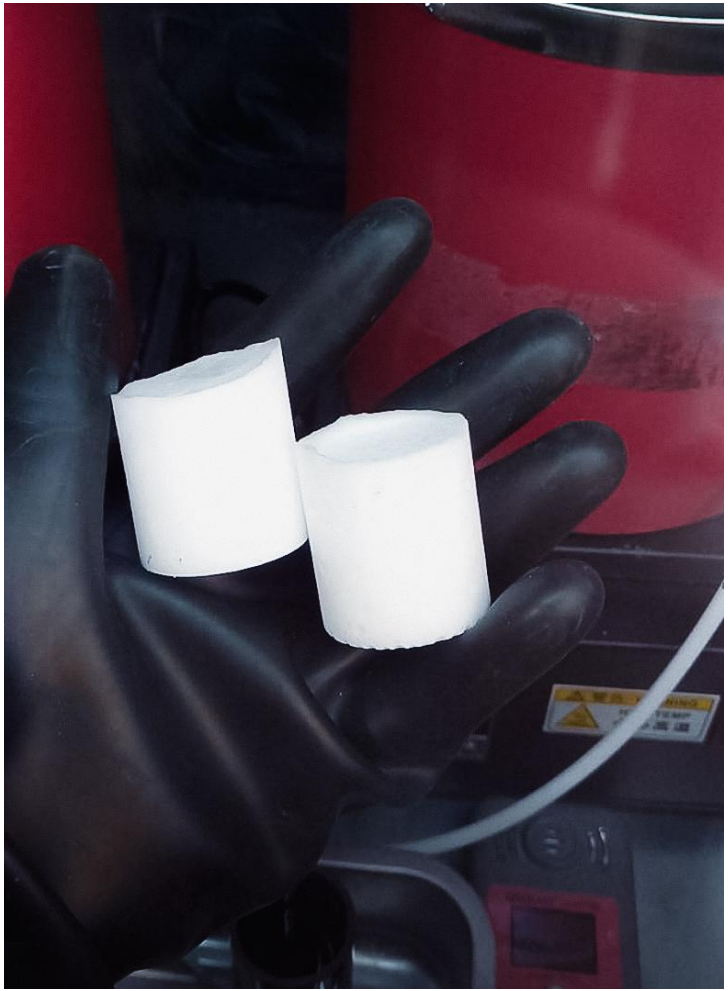

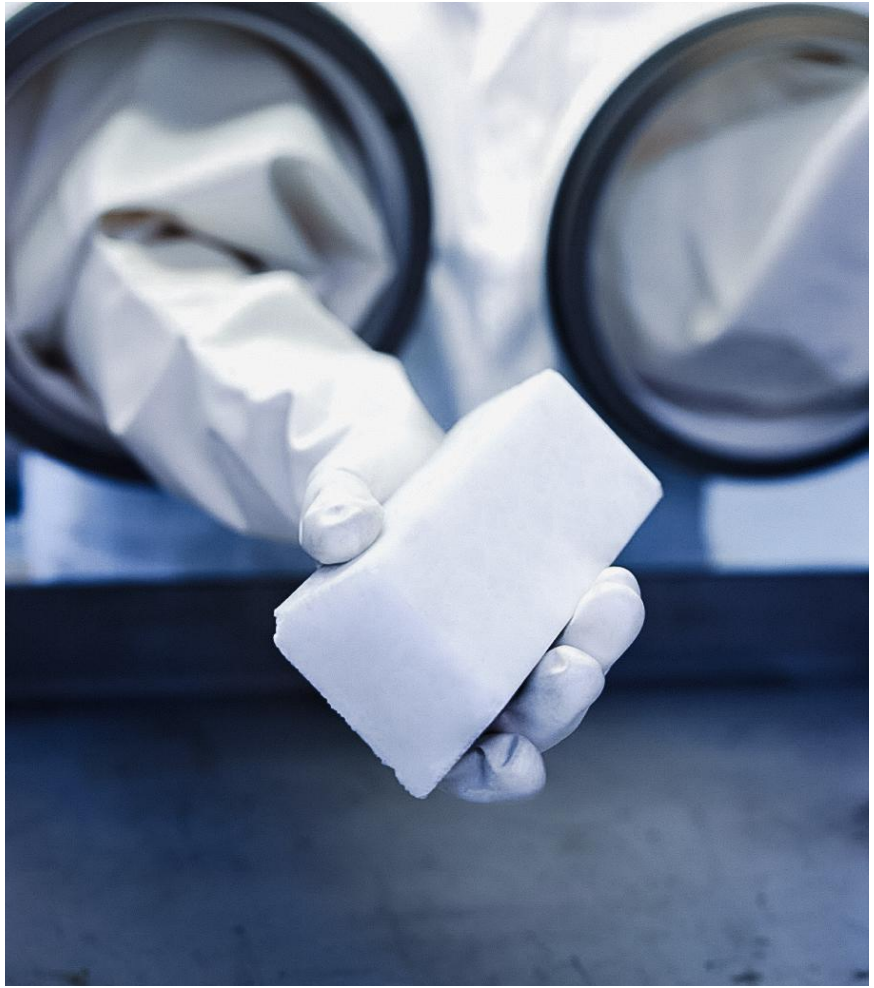

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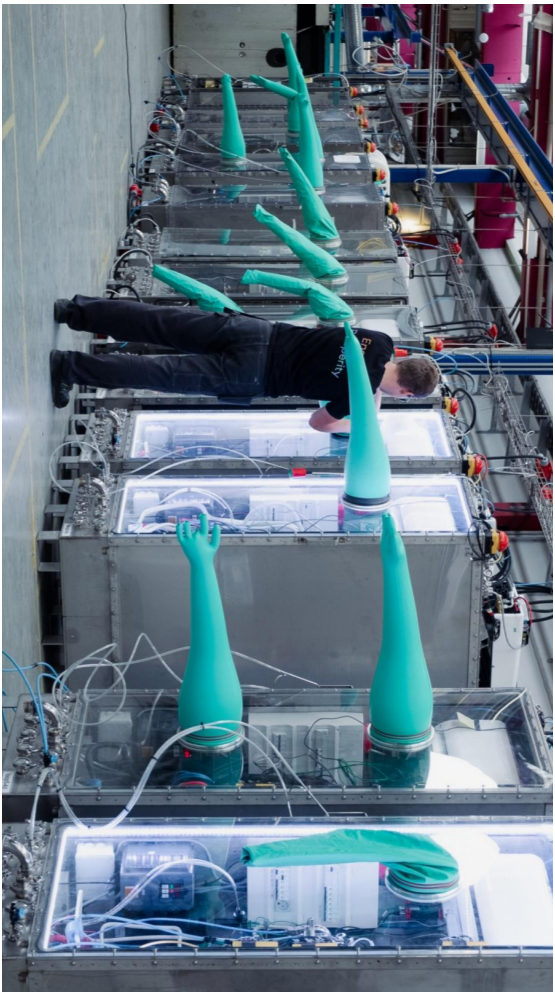

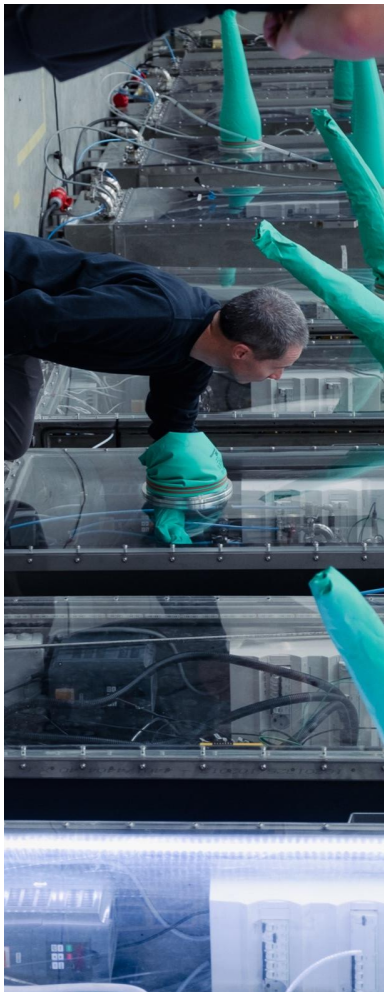

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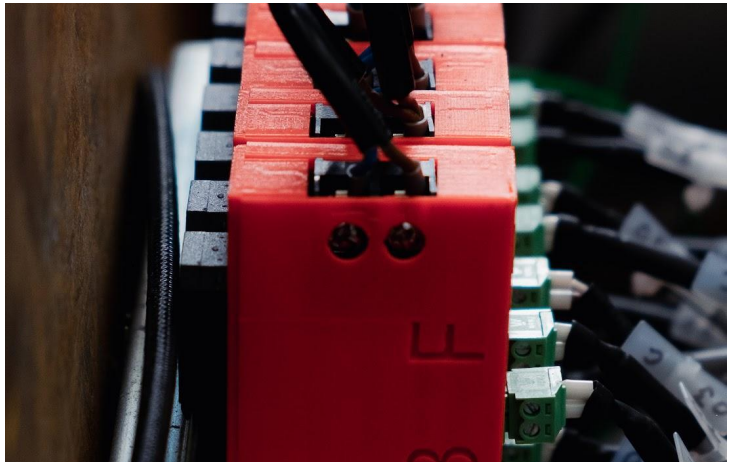

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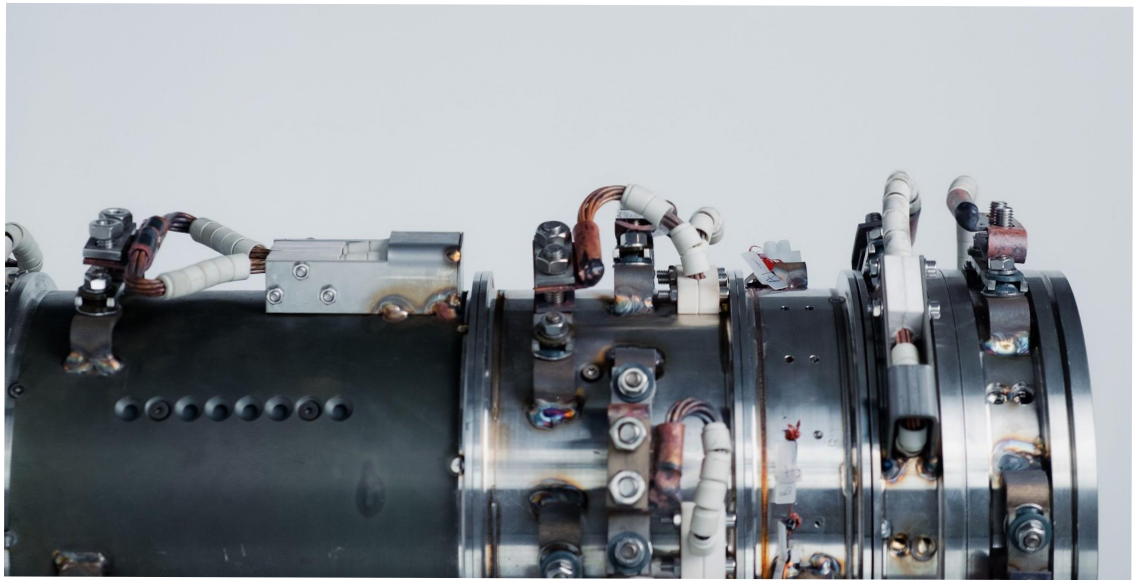

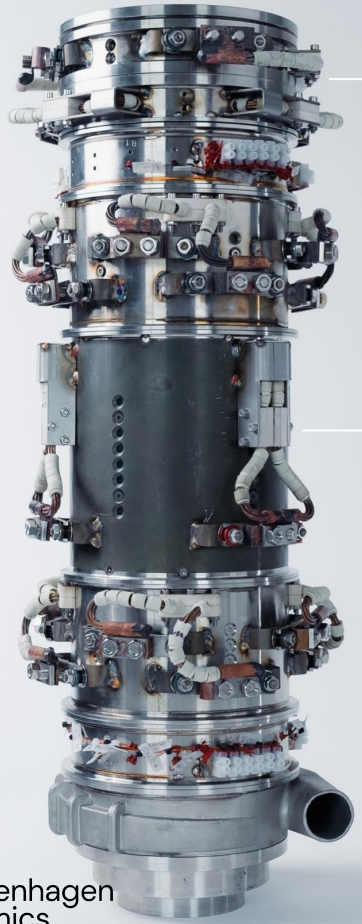

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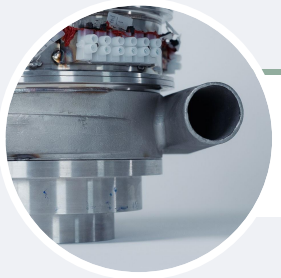
Canned active magnetic bearings keeps the rotor levitation during operation, removing ware and tare.

Canned motor spins the rotor assembly while submerged in molten salt for years without need of maintenance or leakage.



Centrifugal pump which is passively open allowing the salt to quickly drain backwards into storage tanks when the motor shuts down.

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Upcoming milestones

2022-2028

Completed

Water non-fission prototype

7 pumps
4 heat exchangers

7m^3 of water

Early 2023

FLiNaK salt non-fission prototype

7 pumps
4 heat exchangers

3m^3 of water
4m^3 of FLiNaK

Late 2023

FLiTh salt non-fission prototype

7 pumps
4 heat exchangers

3m^3 of water
3m^3 of FLiTh
1m^3 of FLiNaK

2025

FLiThTRU salt critical experiment

7 pumps
4 heat exchangers

3m^3 of heavy water
3m^3 of FLiTh
0.4m^3 of FLiThTRU
0.5m^3 of FLiNaK

2028

first commercial reactor

7 pumps
8 heat exchangers

3m^3 of heavy water
3m^3 of FLiTh
0.4m^3 of FLiThTRU
0.5m^3 of FLiNaK

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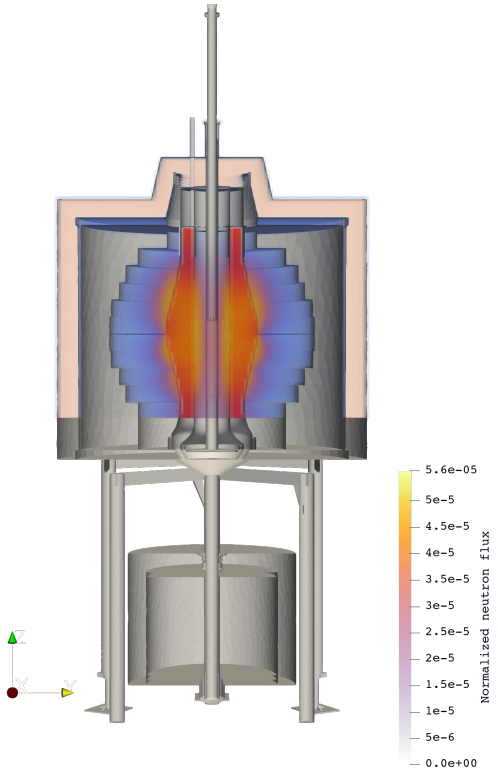
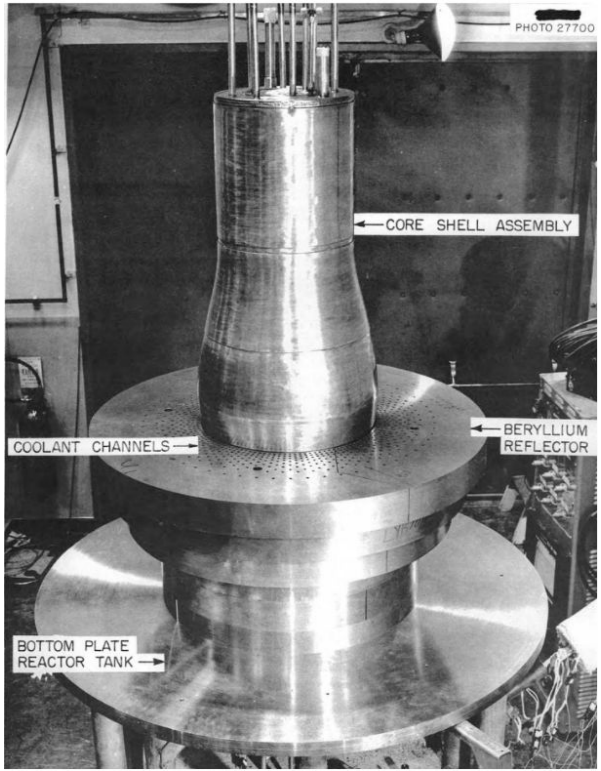
Open source

open msr modeling tools

OpenMC development

- ARE, ZPRE, & MSRE CAD benchmark models
- Open source CAD meshing tool
- Continuous and batch-wise burn-up.
- Geometry modifications for burn-up criticality search
- Transient coupling to NekRS





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https://github.com/openmsr/


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