

# The LFR-AS-200 and the LFR-TL-X

June 18-19, 2019

Idaho

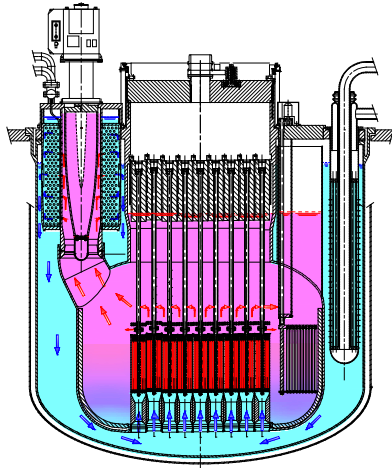
PREPARED FOR PRESENTATION TO

**GAIN-EPRI-NEI-US NIC  
MICRO-REACTOR WORKSHOP**

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## LFR-AS-200

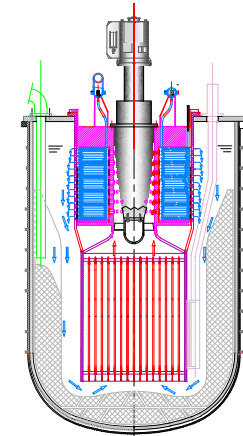
AS stands for Amphora Shaped referring to the shape of the inner vessel.



## LFR-TL-X

TL stands for Transportable reactor and Long-life core.  
 5MWe ≤ X ≤ 20MWe – Core outlet T= 420°C  
 20MWe ≤ X ≤ 50MWe – Core outlet T= 530°C

A pump-SG assembly located above the core without in-site refueling makes possible to maintain a compactness similar to that of a large reactor.



Power (MWth/MWe)	480/200
Core inlet/outlet T (°C)	420/530
Secondary cycle (six steam-generators)	Superheated steam/180 bar/500°C
Fuel	MOX
DHR	Passive actuation and operation

**Mission: economic electricity generation for central power stations (nearly self sustaining in Pu or Pu burner).**

- Compact primary system: 1m<sup>3</sup>/MWe (to be compared with 4m<sup>3</sup>/MWe of SPX1).
- No intermediate loops.
- Compact reactor building

## LFR-TL-5

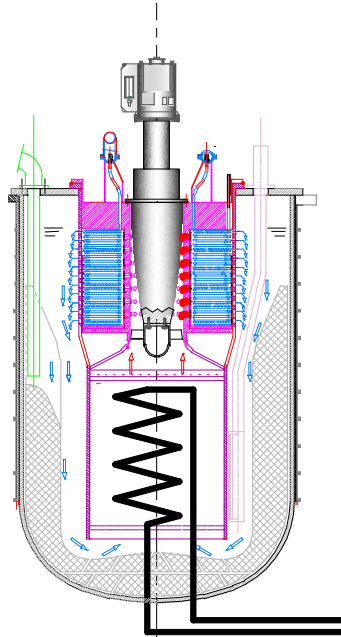
Power (MWth/MWe)	15/5
Core lifetime (years)	15
Core inlet/outlet T (°C)	360/420
Secondary cycle (six steam-generators)	Superheated steam/130 bar/400°C
Fuel	UO <sub>2</sub> (19,75% enriched U)
DHR	Passive actuation and operation

**Mission: electricity generation in remote regions and especially ship propulsion because of:**

- Compactness
- Robust barrier provided by frozen lead if the reactor vessel is submerged by water in case of ship wreck.

# Hydromine's Development Plan

## Phase 1

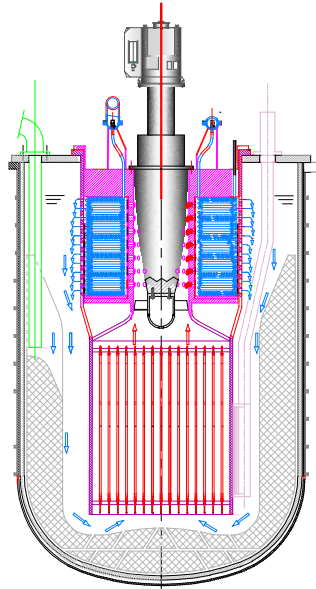


### Precursor

Electrically heated facility  
15MWth, 5MWe reproducing  
the LFR-TL-5 except for fuel.

**Target: end 2021.**

## Phase 2

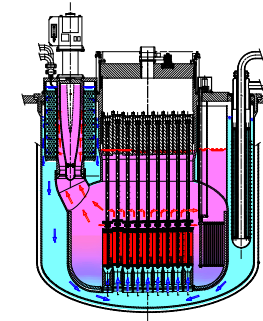


### LFR-TL-5

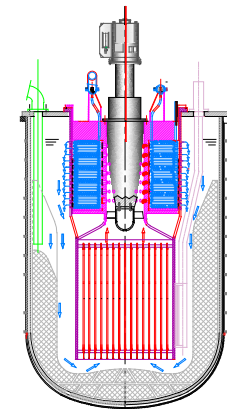
Core outlet T=420°C)

**Target: 2025-2026.**

## Phase 3



### LFR-AS-200

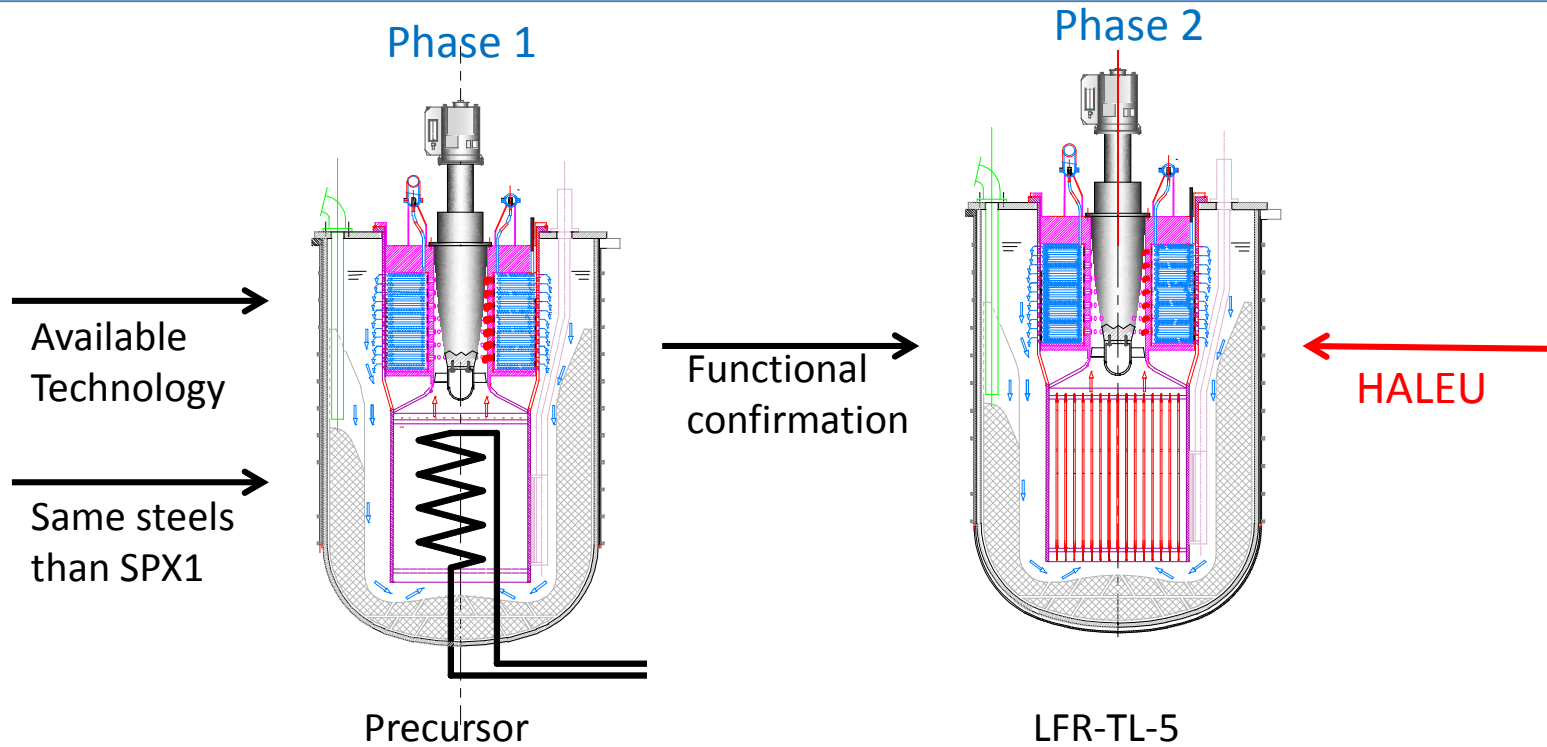


### LFR-TL-X

Core outlet T=530°C

**Target: 2028-2030.**

# Operation at low temperature

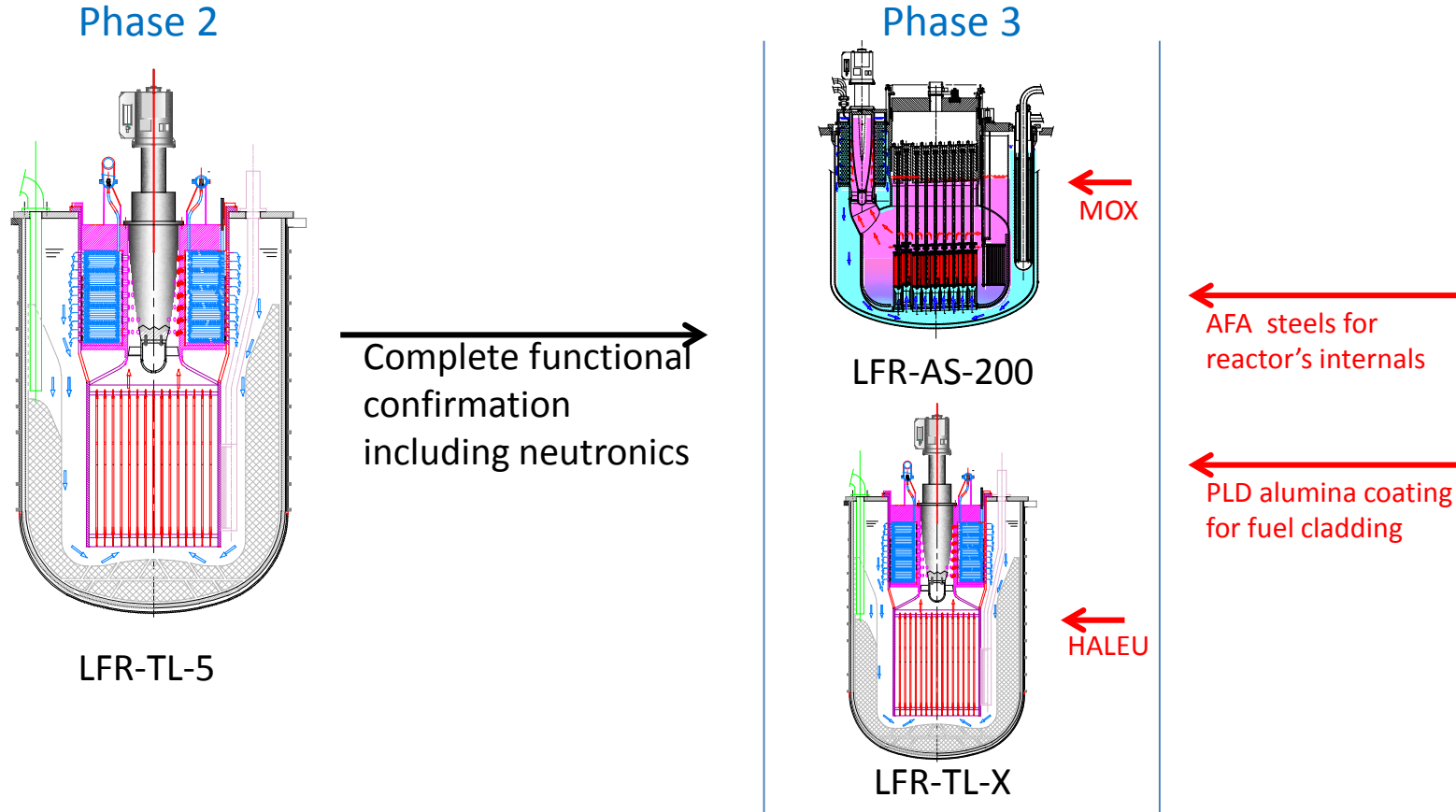


It will be installed at the Brasimone site of ENEA (Italy) for confirmation of:

- operation of the pump and the flat spiral-tube steam generator assembly;
- coupling of the steam generator with the turbo-generator;
- mechanics and hydraulics of control rod and passive shut down systems;
- operation of DHR systems;
- lead freezing/de-freezing;
- I&C.

**Key issue: HALEU availability**

# Operation at high temperature



## Key issues:

- availability of manufacturing capabilities of MOX fuel for LFR-AS-200;
- availability of HALEU for LFR-TL-X;
- availability of fast flux irradiation facilities for qualification of new steels and/or coatings (use of LFR-TL-5 as irradiation facility could be a back up solution)