Status of Fast Reactor Technology Development

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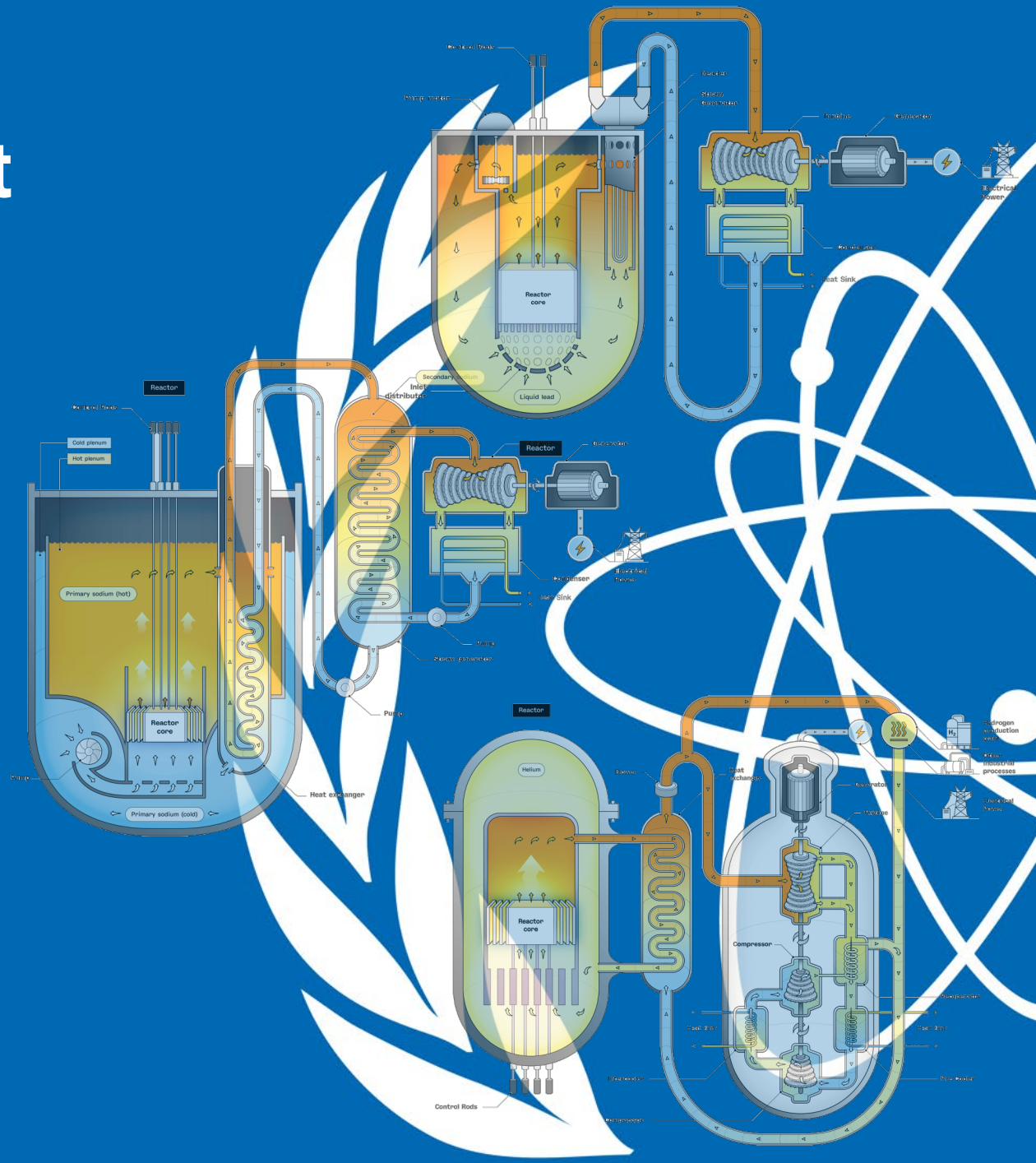
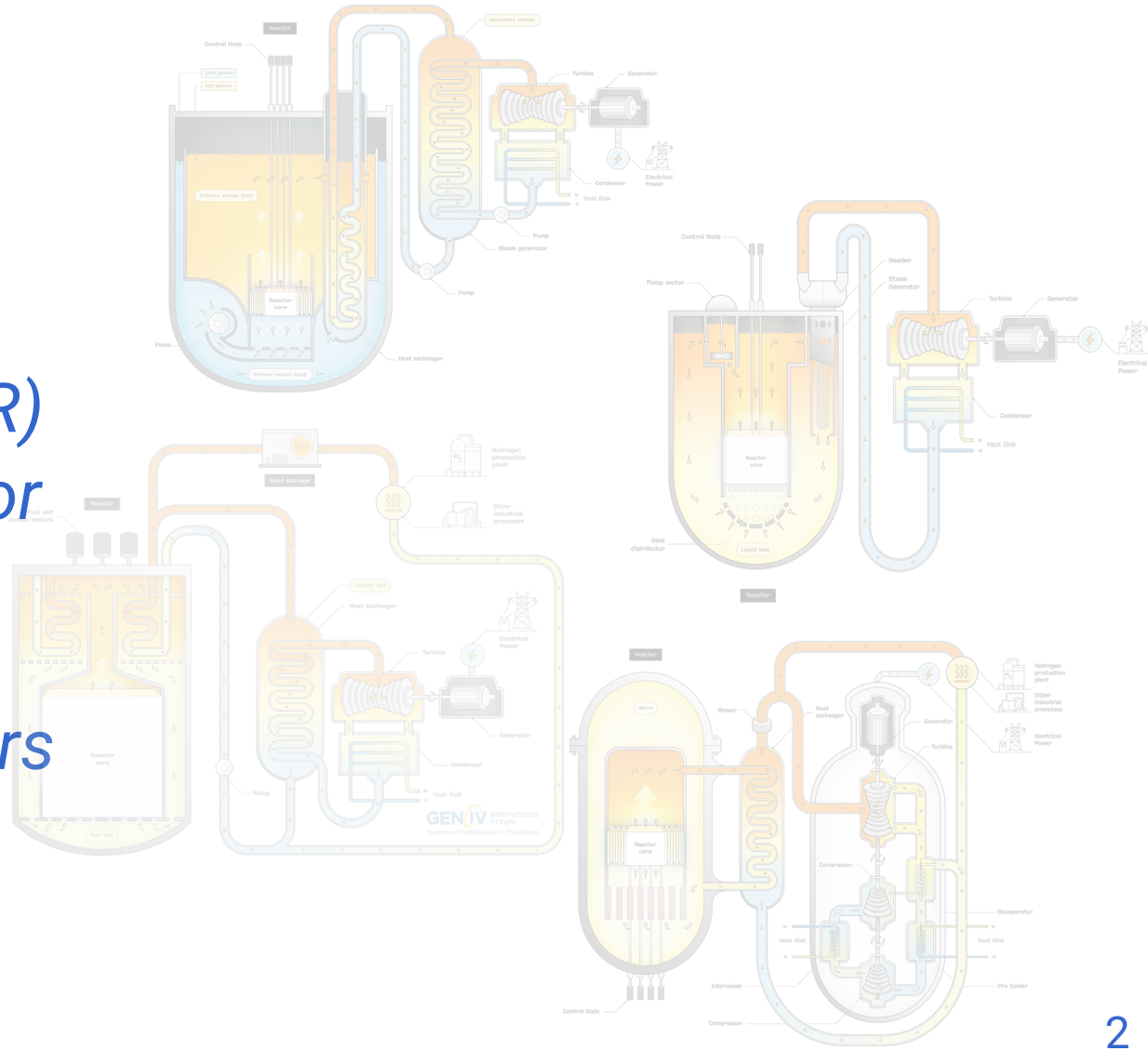


https://www.iaea.org/topics/fast-reactors

World Status of Fast Reactor Technology Development

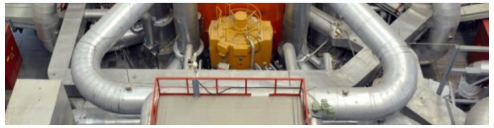
- In Operation
- Under Construction and Decommissioning
- Developing of Innovative Reactors
  - *Sodium cooled Fast Reactor (SFR)*
  - *Lead and LBE cooled Fast Reactor (LFR)*
  - *Gas cooled Fast Reactor (GFR)*
  - *Molten Salt cooled (Fast) Reactors (MSR)*



Fast Reactors in Operation & under Commissioning

Country	Name	Coolant	Fuel	Purpose	Power (th/e) MW	Year (Op.)	Status
Russia	BOR-60	sodium	UO_2	experimental	**60/12**	1969	operating
	BN-600	sodium	UO_2	prototype	**1470/600**	1980	operating
	BN-800	sodium	UO_2/MOX	commercial	**2100/880**	2015	operating
China	CEFR	sodium	UO_2	experimental	**65/20**	2011	operating
	CFR600	sodium	UO_2/MOX	prototype	**1500/650**	2023	operating
India	FBTR	sodium		experimental	**40/13**	1985	operating
	PFBR	sodium	UO_2	prototype	**1250/500**	2025	commissioning
Japan	JOYO	sodium	MOX	experimental	**100/--**	1978	resume operation 2026

BN-600
Russia, 1980



BN-800
Russia, 2015

CEFR, 20 MW(e)
China, 2011

FBTR, 13 MW(e)
India, 1985

PFBR, 500 MW(e)
India, 2024

As presented by Mr Partha Sarathy Uppala at TWG-FR Meeting in June 2025

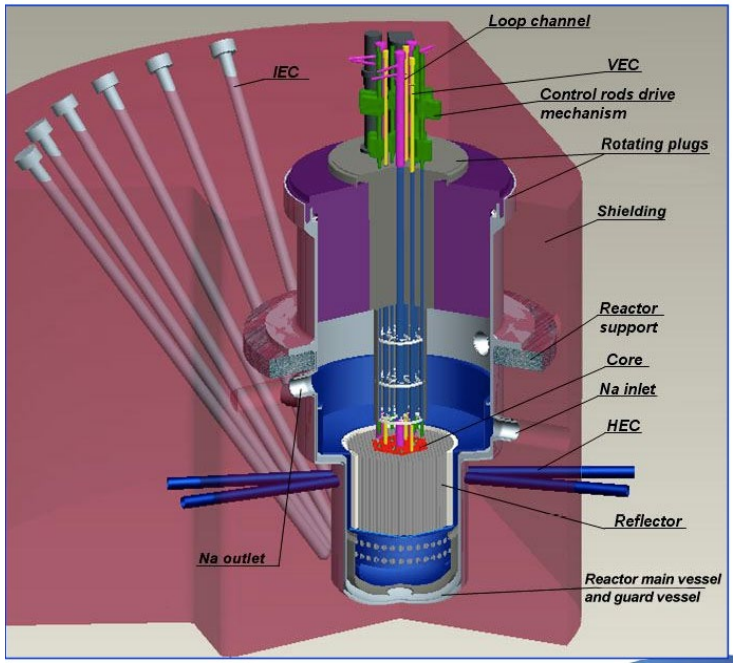
PFBR: Prototype Fast Breeder Reactor (India)

Power	: 1250 MW_t (500 MW_e)
Primary circuit	: Pool Type
Reactor coolant	: Sodium
Number of PSP	: 2
Number of IHX	: 4
Number of sec loops	: 2
Number of SG per loop	: 4
Containment building	: RCC rectangular shape
Design Life	: 40 Years

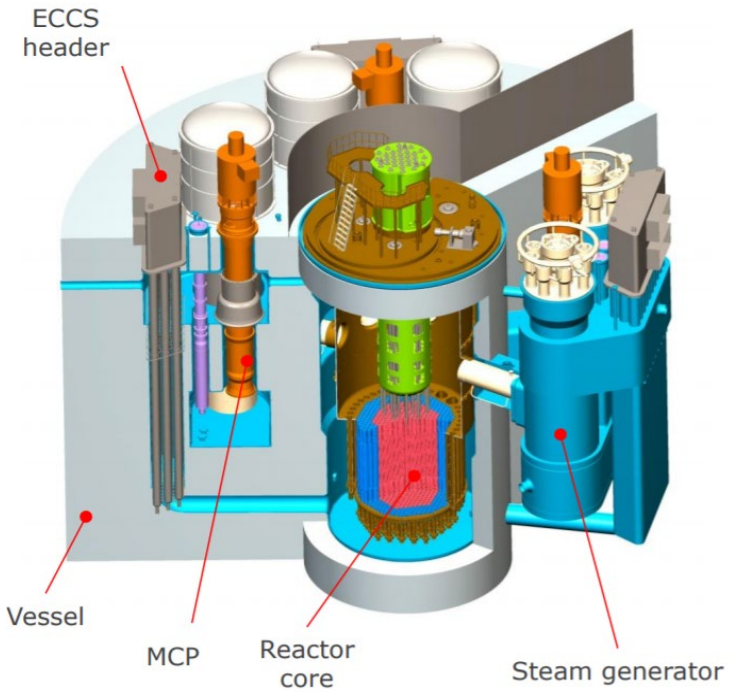
Fast Reactors under Construction

Country	Name	Coolant	Fuel	Purpose	Power, MW(th/e)	Year (Op.)	Status
Russia	MBIR	sodium	MOX	experimental	**150/55**	~2028	construction
	BREST-OD-300	lead	PuN/UN	demonstrator	**700/300**	~2026	construction
China	CFR600-2	sodium	UO_2/MOX	prototype	**1500/650**	~2028	construction

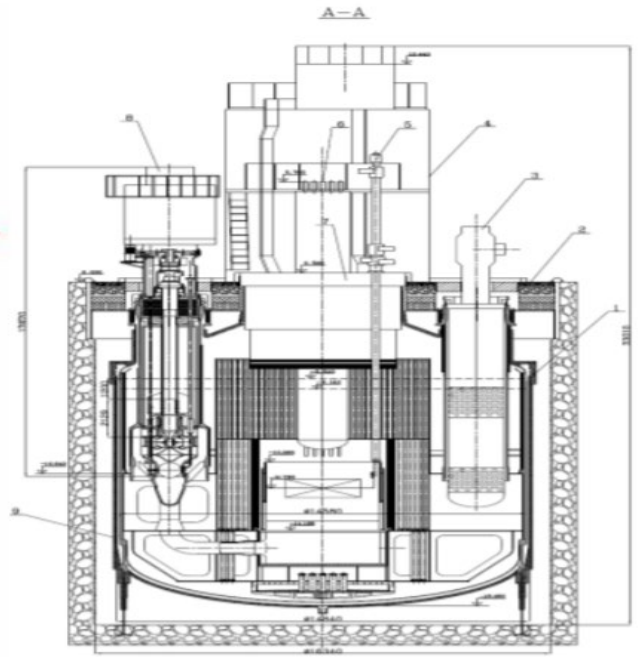
MBIR, Russia



BREST-OD-300
Russia



CFR600, China



As presented by Ms Y. Kyzina at TWG-FR Meeting in June 2025

Status of MBIR

CURRENT STATUS OF CONSTRUCTION

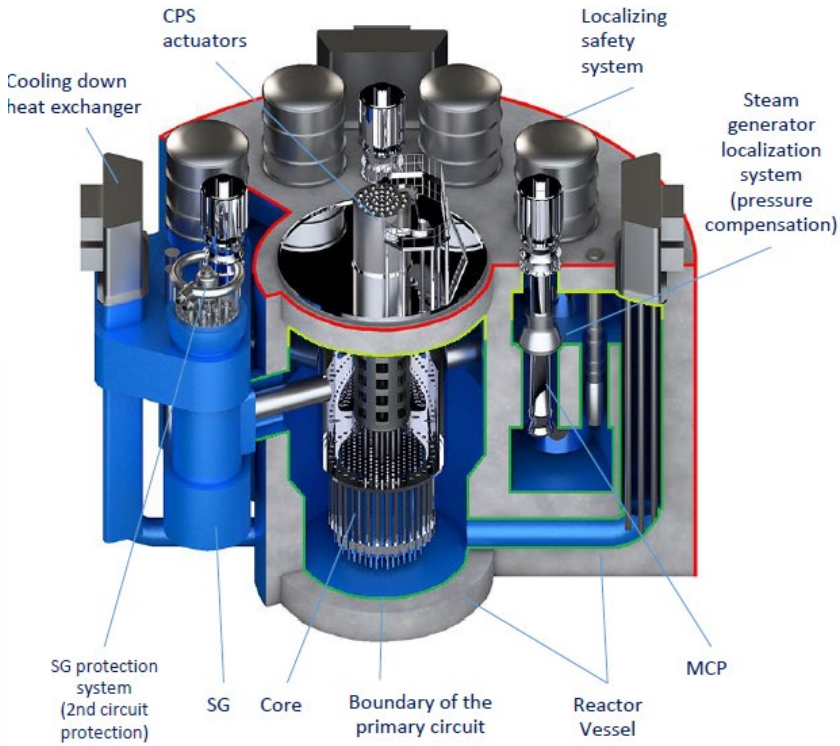
MBIR construction site (2024)

CONSTRUCTION

MBIR construction site (2024)

As presented by Ms Y. Kyzina at TWG-FR Meeting in June 2025

Status of BREST-OD-300



Construction status at Pilot Demonstrational Energy Complex (PDEC) site (2024)

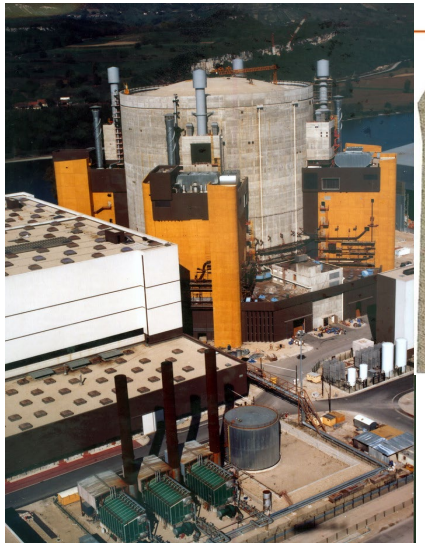
НИКИЭТ
РОСАТОМ

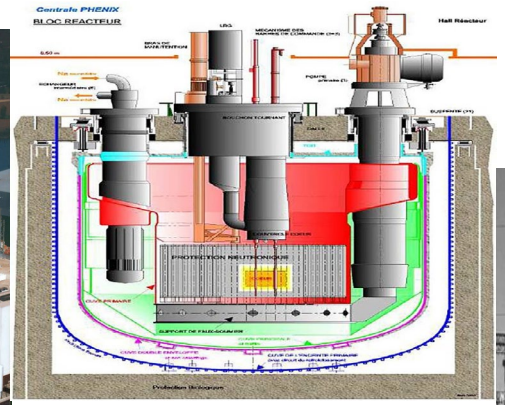
BREST-OD-300 construction site (2024)

Fast Reactors under Decommissioning

Country	Name	Coolant	Fuel	Purpose	Power, MW(th/e)	Year (Op.)	Status
France	Phenix	sodium	UO_2	prototype	590/250	1973	decommissioning
	Superphenix	sodium	UO_2	FOAK	3000/1242	1986	decommissioning
Japan	MONJU	sodium	UO_2	prototype	714/280	1994	decommissioning
USA	FFTF	sodium	UO_2	experimental	400/--	1980	decommissioning
Kazakhstan	BN-350	sodium	UO_2	prototype	1000/350	1973	decommissioning

Superphenix, France



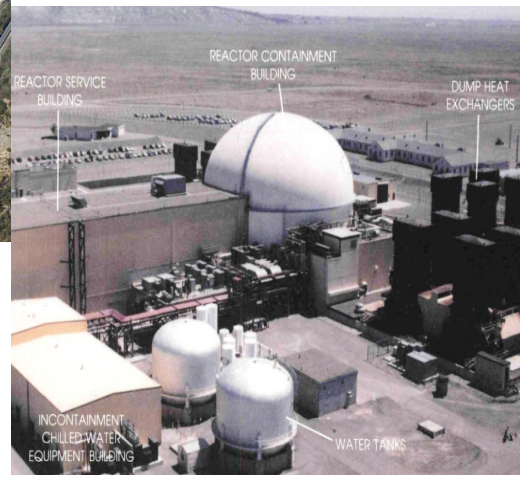


Phenix, France

BN-350, Kazakhstan

MONJU, Japan

FFTF, USA



Innovative SFRs under Development and Design

Country	Name	fuel	Purpose	Power (th/e), MW	Status
Russia	BN-1200M	PuN/UN/MOX	Gen-IV, industrial	2900/1220	design
China	CFR1200	MOX	Gen-IV, industrial	2800/1200	design
	CiFR1000	U-Pu-Zr	Gen-IV, industrial	2800/1200	design
France	ASTRID	MOX	demonstrator	1500/600	suspended
	HEXANA	MOX	SMR prototype	2x400/Flexible	concept
	OTRERA	MOX	AMR prototype	295/110	concept
EU	ESFR	MOX, (U,Pu)Zr	Gen-IV prototype or AMR	3600/1500 360/150	concept
India	PFBR-2	U-Zr	experimental/SMR	320/100	concept
	FBR 1&2	UO_2	prototype	1250/500	design
	FBTR-2	U-Pu-Zr	experimental	100/30	design
R. of Korea	KALIMER-600	U-TRU-15-Zr	GEN-IV, prototype	1523/600	design
	PGSFR	U-Zr/U-TRU-Zr	GEN-IV, prototype	400/150	suspended
	SALUS-100	U-Zr	AMR prototype	267/100	design
USA	NATRIUM	U-Zr	demonstrator	1000/345-500	design
	VTR	U-Pu-Zr	experimental	300/-	suspended
	ARC-100	U-Zr	demonstrator	260/100	concept
	Oklo	U-Pu-Zr	demonstrator	/15-50	concept

Innovative LFRs under Development and Design

Country	Name	Type	coolant	fuel	Purpose	Power (th/e), MW	Status
Russia	SVBR-100	LFR	LBE	UO_2	prototype	280/100	design
China	CLFR-300	LFR	LBE/Pb	UO_2	demonstrator	740/300	concept
	CLEAR-I	LFR	LBE	UO_2	experimental	10/-	design
	CLEAR-M10d	LFR	Pb	UO_2	demonstrator	25/10	concept
Belgium	MYRRHA	ADS	LBE	MOX	experimental	100/-	design
Italy + EU	LFR-AS-30/200 (newcleo)	LFR	Pb	MOX	Experimental /prototype	/30 or /200	concept
Romania +	LEANDREA	LFR	Pb	MOX	Gen-IV	30/	design
Italy +	ALFRED	LFR	Pb	MOX	Gen-IV	300/120	concept
Belgium	EAGLES-300	LFR	Pb	MOX	Gen-IV	900?/350	design
Sweden	SEALER-55	LFR	Pb	UN	demonstrator	140/55	design
USA	Westinghouse LFR	LFR	Pb	MOX	demonstrator	950/450	design
	SSTAR	LFR	Pb	U-Pu-Zr	experimental	45/20	suspended

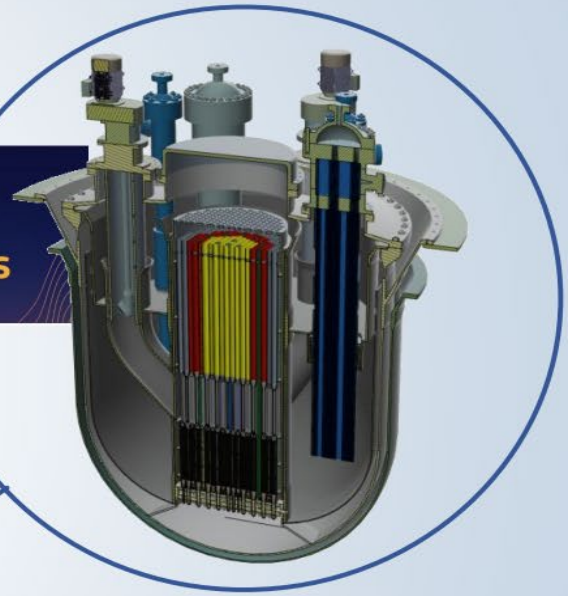
Joint Romania-Italy- Belgium EU-SMR-LFR

International collaborations

Collaboration agreement for accelerating the development of LFR technology

EU-SMR-LFR
(re-branding EAGLE-300)

European Industrial Alliance on SMALL MODULAR REACTORS



- Competitive economics
- Proven passive safety features
- Sustainable closed fuel cycle
- High temperature heat
- Commercial fleet deployment by 2040

Reference design
Simplified, robust, modular

Candidate sites
Mol-Belgium and Pitesti-Romania

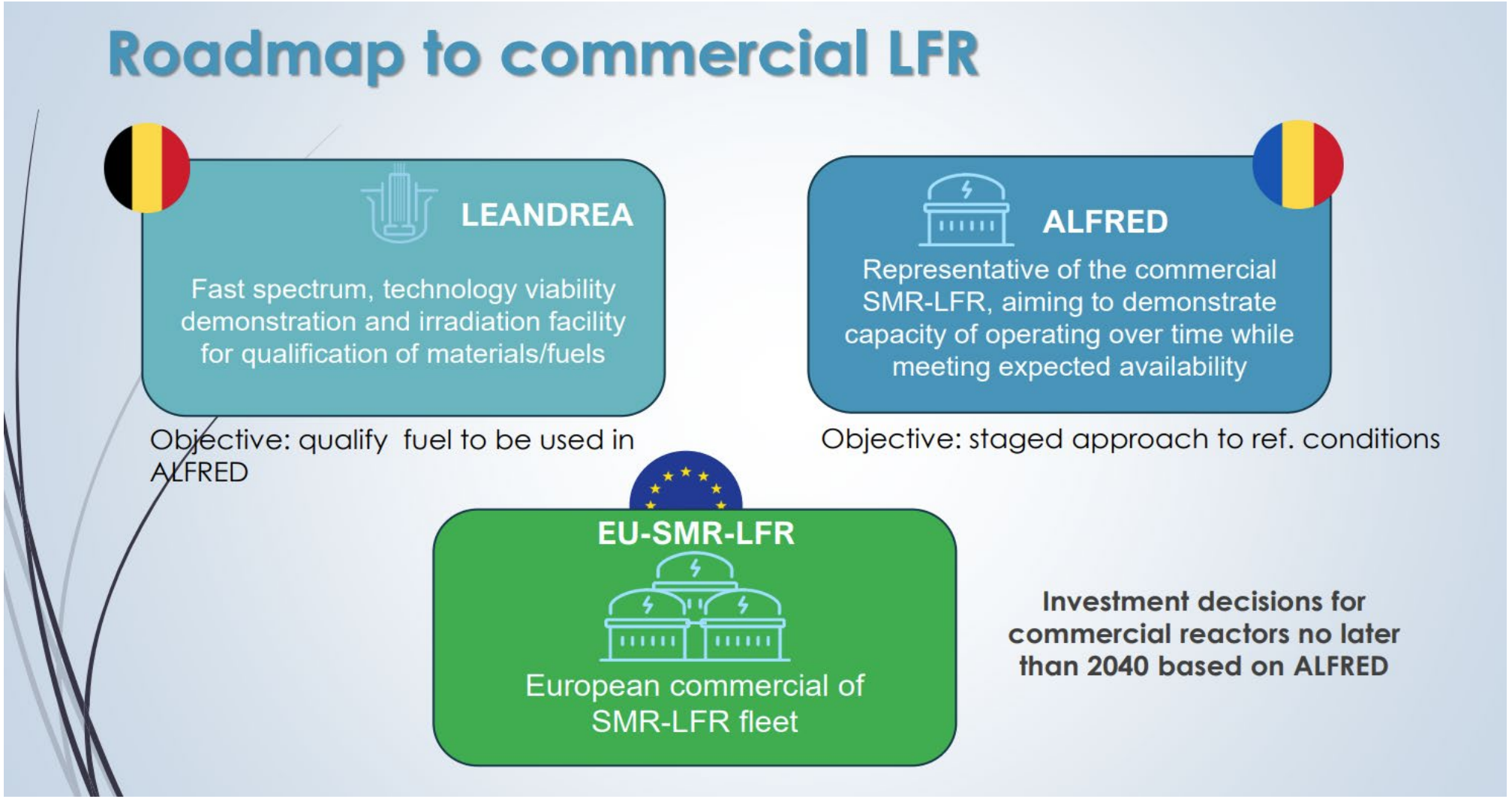
Shared roadmap
Jointly owned IP

ansaldo nucleare | ENEA Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile | RATEN REGIA AUTONOMĂ TEHNOLOGII pentru ENERGIA NUCLEARĂ | sck cen Belgian Nuclear Research Centre

Eagles Consortium - a newly established alliance which goal is to develop and commercialize EAGLES-300, a next-generation lead-cooled Small Modular Reactor (SMR).

As presented by Ms M. Nitoi at TWG-FR Meeting in June 2025

Joint Romania-Italy- Belgium LFR Programme



As presented by Ms M. Nitoi at TWG-FR Meeting in June 2025

Innovative GFRs under Development and Design

Country	Name	Type	coolant	fuel	Purpose	Power (th/e), MW	Status
Japan	KAMADO FBR	GFR	CO_2	Oxide	demonstrator	3000/1000	Concept
EU	ALLEGRO HeFASTo	GFR	He	MOX	Gen-IV, demonstrator	75/- 200/	design
USA	EM^2	GFR	He	UC	demonstrator	500/265	Concept
	FMR	GFR	He	MOX/UF4/ UCO	demonstrator	100/44	Concept

Innovative Fast MSRs under Development and Design

Country	Name	Type	coolant	fuel	Purpose	Power (th/e), MW	Status
Canada	SSR-W	MSR	molten salt	UO_2	demonstration	750/300	demo
France	MSFR	MSR	molten salt (LiF-AFn)	U/Th/TRU	Gen-IV, prototype	3000/	concept
	STELLARIA	MSR	NaCl	$TRUF_3$	Prototype SMR	250/110	concept
	XS(A)MR (Naarea)	MSR	molten salt	ThO_2/UO_2	Prototype SMR	80/40	concept
Netherlands/ EU	Thorizon	MSR	molten salt	U/Th/TRU	Prototype SMR	250/100	concept
Russia	MOSART	MSR	molten salt	U/TRU	prototype	2400/	concept
USA	MCFR	MSR	NaCl	U/TRU	experimental	1800/800	design

Advanced Reactors Information System (ARIS)

Designs in ARIS	Design Organizations	Countries
127	> 75	~25

Web accessible database and a tool for Member States at various stages of nuclear power development, offering standardized, impartial data on reactor designs, including evolutionary and innovative concepts, to support informed reactor technology assessments

Access online: Advanced Reactor Information System | Aris

Atoms for Peace and Development…

Thank You!

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