

Introduction of Innovative Nuclear Reactors and GEN-IV Concepts

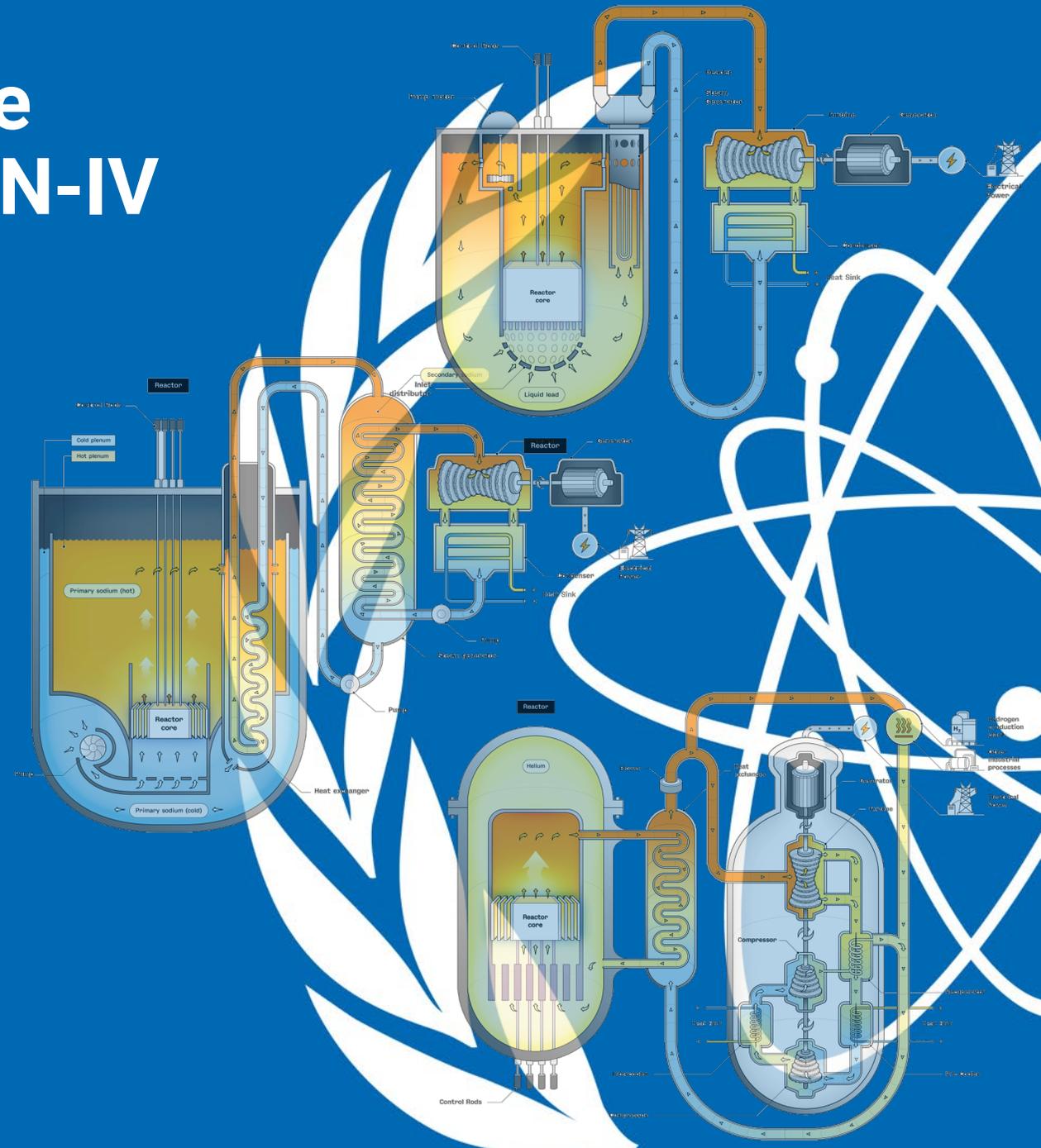
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Department of Nuclear Energy
International Atomic Energy Agency

IAEA National Training Course on
Heavy Liquid Metal Cooled Fast Reactors: Benefits and Challenges

16-20 February 2026

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



Outline: Introduction of Innovative Nuclear Reactors and GEN-IV Concepts



• Innovative Nuclear Energy Systems and Gen-IV Reactor Concepts

- IAEA and GIF Terminology
- Thermal vs. Fast Neutron Reactors
- What is wrong with WCR? What about SWCR?
- Gas cooled: HTGR and GFR
- Liquid Metal cooled: SFR and LFR
- Molten salt cooled: MSR
- IAEA Advanced Reactors Information System (ARIS)

• Fast Reactor Technology: World Status

- In Operation and Commissioning
- Under Development and Design

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Classification of Nuclear Fission Reactors 1/2

- Moderator

- Water / Heavy Water
- Graphite
- None (fast neutron systems)

- Coolant

- Water/Heavy Water
- Liquid Metal
 - Sodium/Lead/Lead-Bismuth Eutectic (LBE)
- Gas
 - Air
 - CO₂
 - He
- Molten Salt
 - Fluoride
 - Chloride

- Fuel

- UO₂
- MOX (UO₂ + PuO₂)
- Metallic
- U/Pu Nitride
- U/Pu Carbide
- Molten Salt

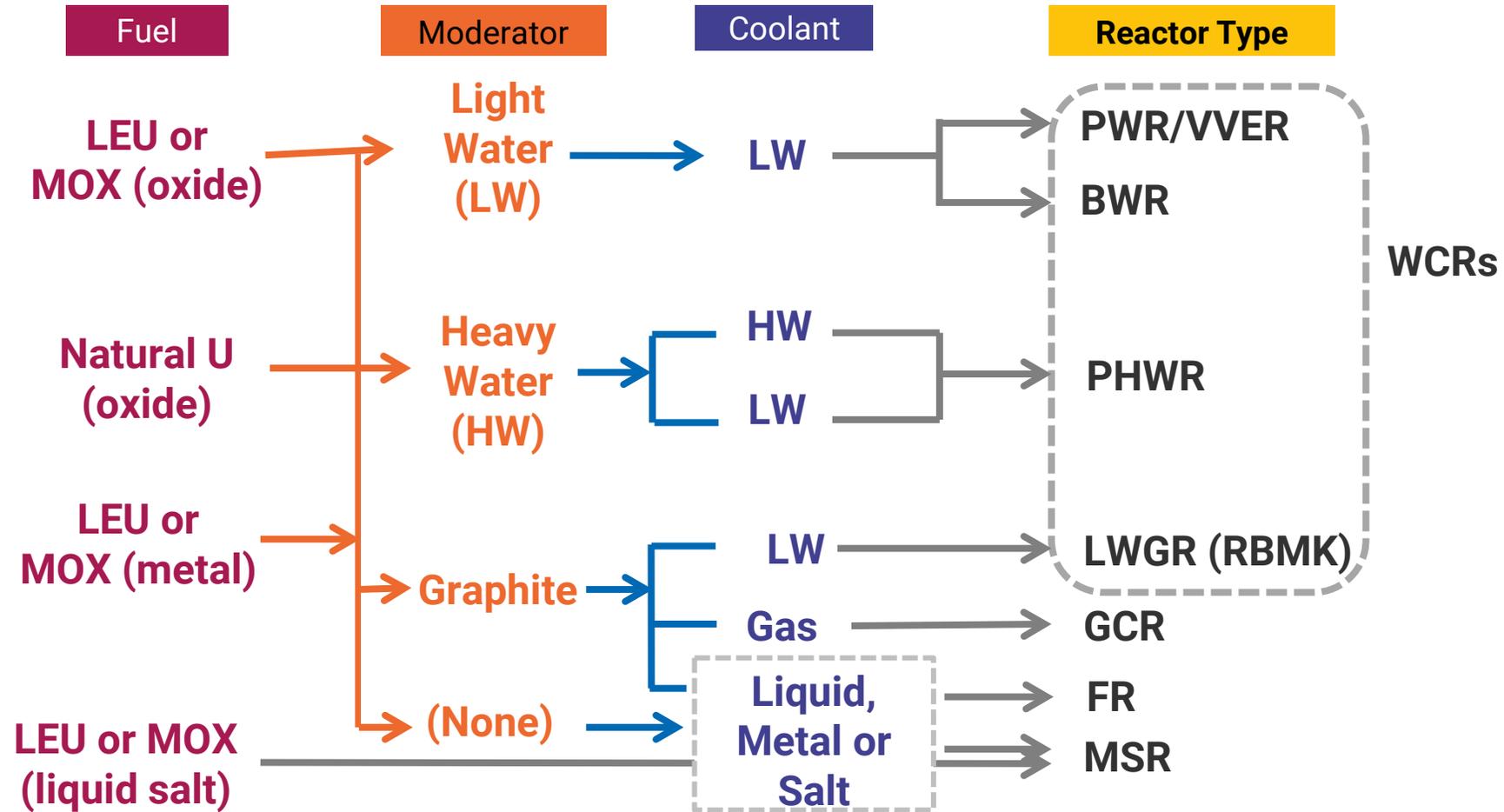
- Purpose

- Electricity Generation
- Non-Electric Application
 - District Heating
 - Water Desalination
 - Industrial Purposes
 - H₂ Production

- Power

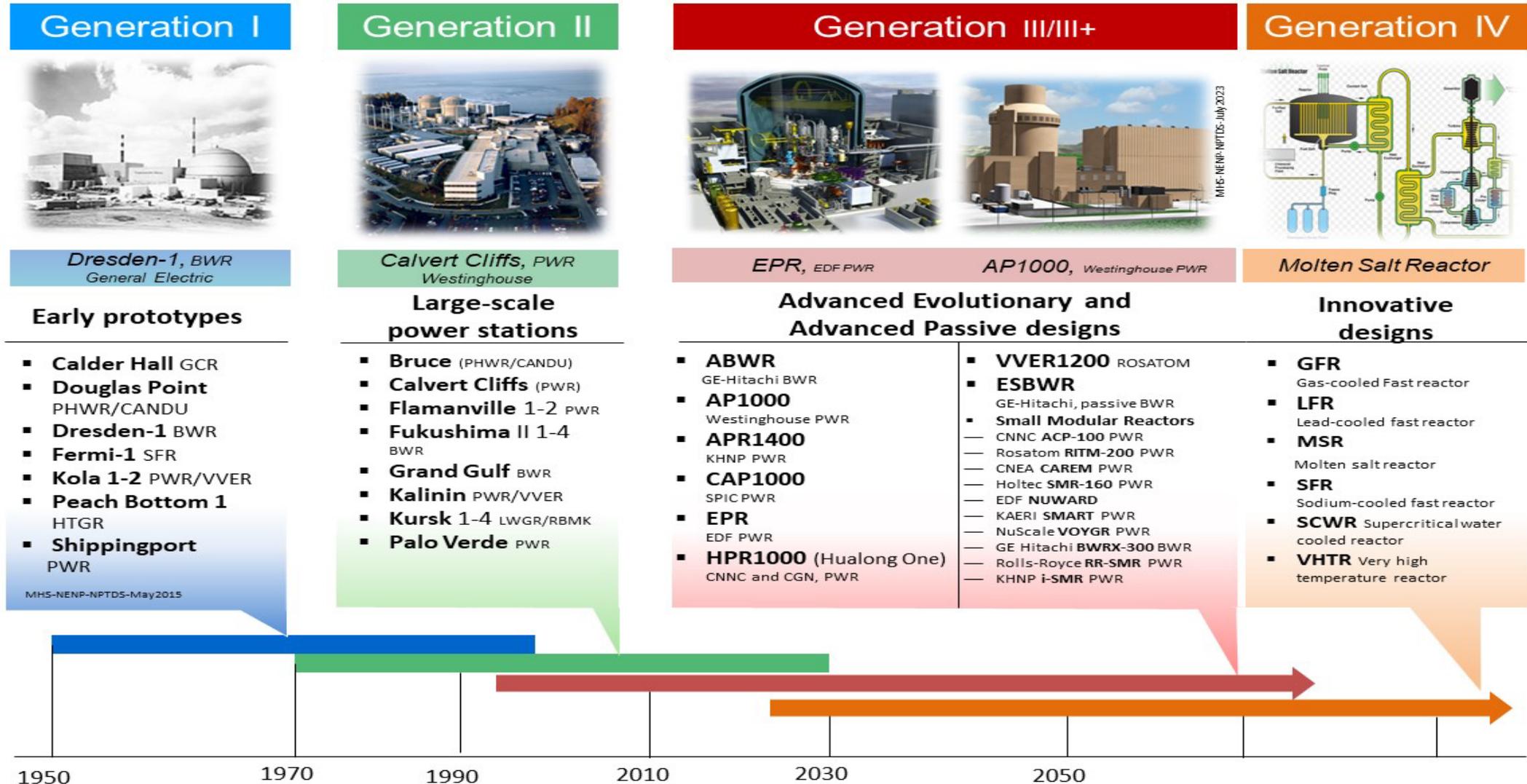
- Low/Middle/High

Nuclear Power Reactor Classifications 2/2



MOX: mixed-oxide containing any combination of U, Pu and Th

Evolution of Nuclear Power Reactor Technology



Innovative Reactors (Gen-IV)

Innovative Reactor:

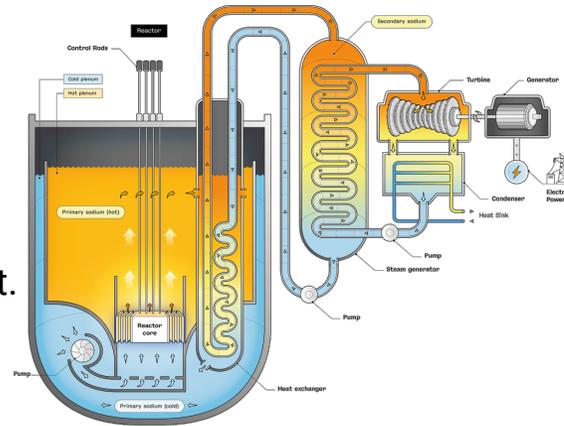
Advanced design which incorporates conceptual changes in design approaches or system configuration in comparison with existing practice. Substantial R&D, feasibility tests, and possibly a prototype or demonstration reactor are required prior to deployment.

- Early Prototypes and Demonstration Plants Gen-I
- Current Fleet Gen-II/III
- Advanced Nuclear Reactors

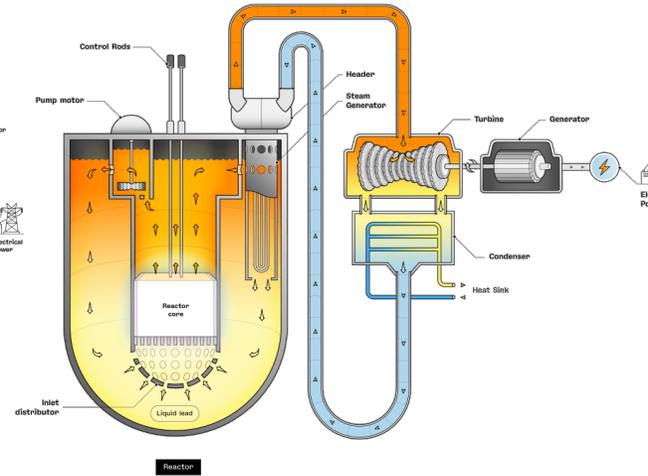
- Evolutionary designs Gen-III and Gen-III+
- Innovative designs Gen-IV
- SMRs can be either evolutionary or innovative
- Innovative SMR

Advanced Modular Reactor (AMR)

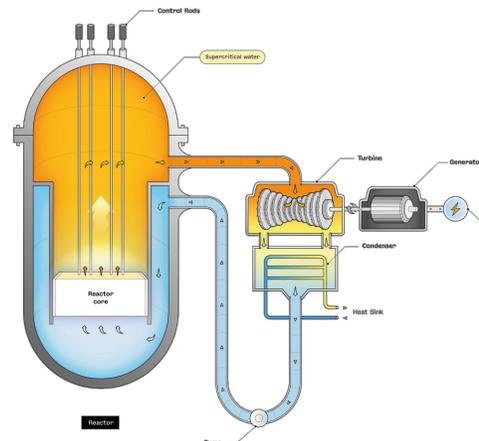
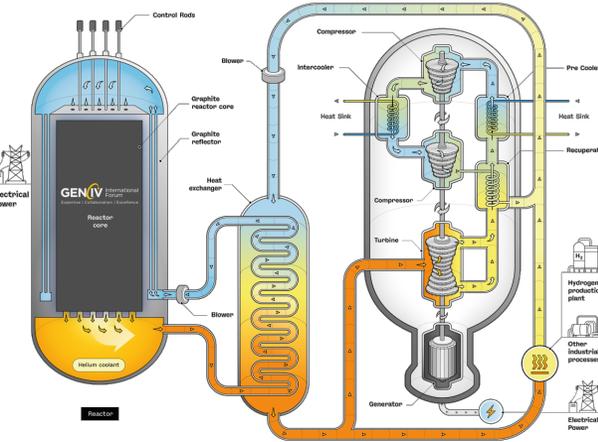
Sodium cooled Fast Reactor (SFR)



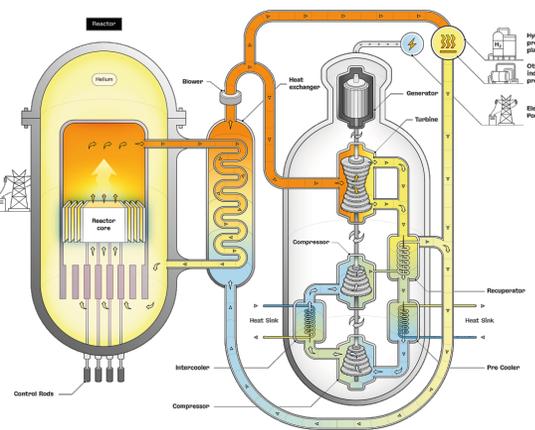
Lead cooled Fast Reactor (LFR)



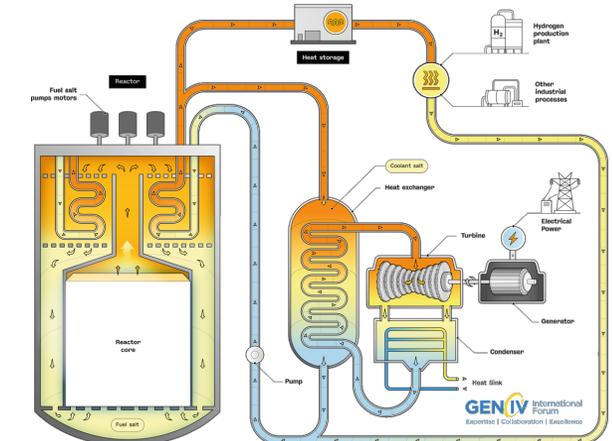
Very-High-Temperature Reactor (VHTR)



Supercritical Water cooled Reactor (SCWR)



Gas cooled Fast Reactor (GFR)



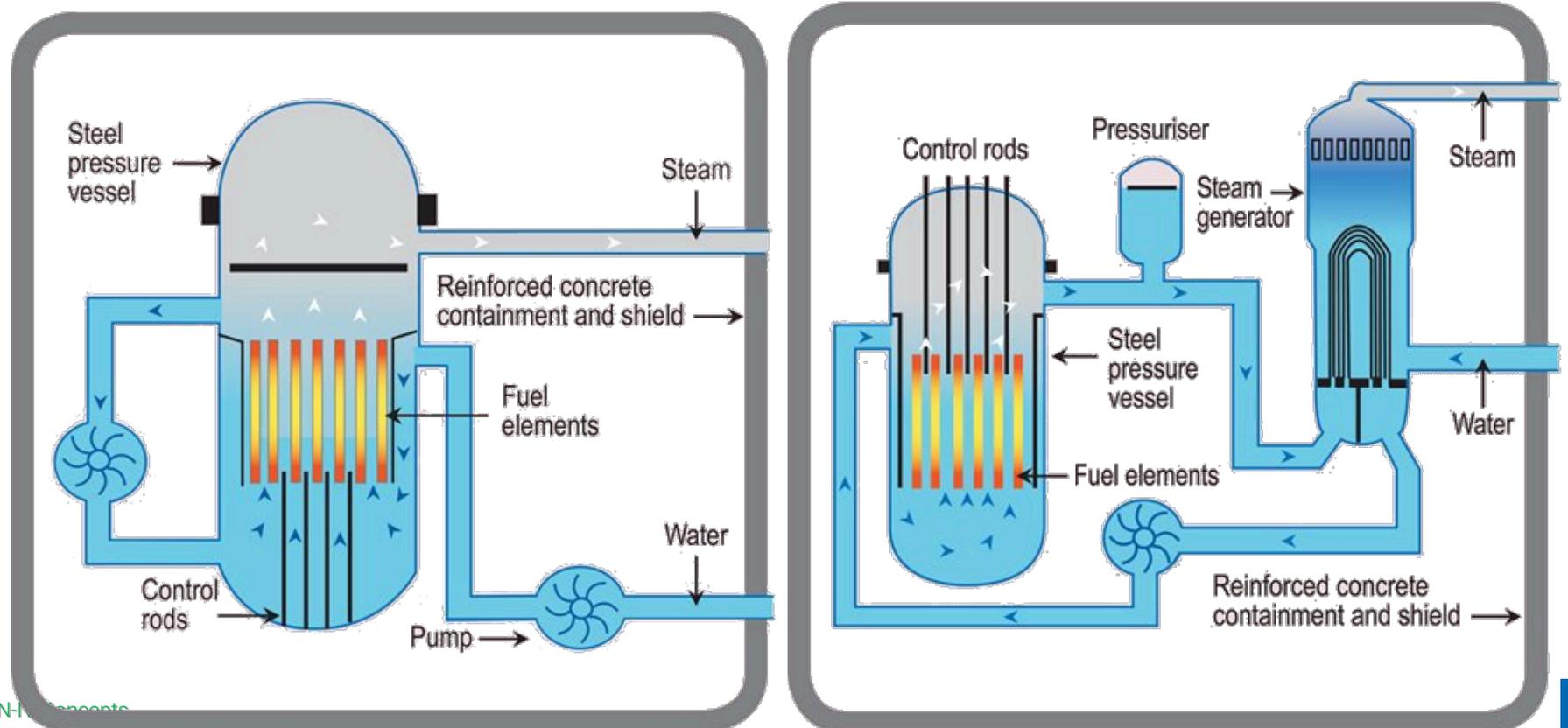
Molten Salt Reactor (MSR)

Source: GIF homepage (www.gen-4.org)

Water Cooled Reactors: Why are we unsatisfied?

	WCR
coolant	H ₂ O/D ₂ O
outlet T, C	288-329
efficiency, %	35
max P, MPa	7-17
spectrum	thermal

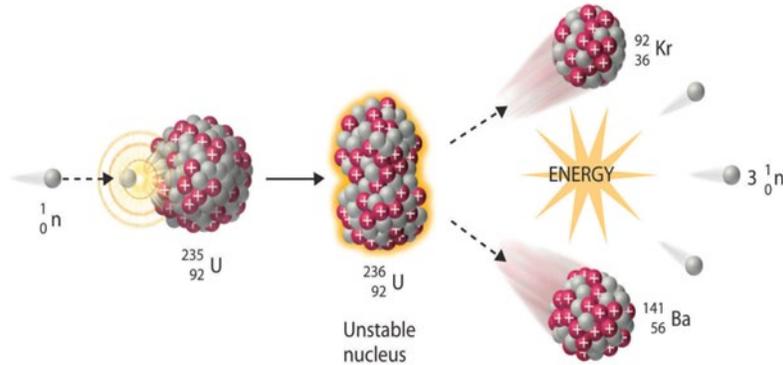
- *Mature Technology*
- *Low T => Low Efficiency*
- *High Pressure => safety issues*
- *Only thermal spectrum => not sustainable*



GIF: Goals for Gen-IV Nuclear Energy Systems

Sustainability-1	Generation IV nuclear energy systems will provide sustainable energy generation that meets clean air objectives and provides long-term availability of systems and effective fuel utilisation for worldwide energy production.
Sustainability-2	Generation IV nuclear energy systems will minimise and manage their nuclear waste and notably reduce the long-term stewardship burden, thereby improving protection for the public health and the environment.
Economics-1	Generation IV nuclear energy systems will have a clear life-cycle cost advantage over other energy sources.
Economics-2	Generation IV nuclear energy systems will have a level of financial risk comparable to other energy projects.
Safety and Reliability-1	Generation IV nuclear energy systems operations will excel in safety and reliability.
Safety and Reliability-2	Generation IV nuclear energy systems will have a very low likelihood and degree of reactor core damage.
Safety and Reliability-3	Generation IV nuclear energy systems will eliminate the need for offsite emergency response.
Proliferation Resistance and Physical Protection	Generation IV nuclear energy systems will increase the assurance that they are very unattractive and the least desirable route for diversion or theft of weapons-usable materials, and provide increased physical protection against acts of terrorism.

Nuclear Fission: 'Thermal' and 'Fast' Neutron Reactors



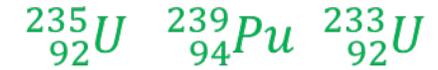
Thermal fission requires slow 'thermal' neutrons (0.025 eV, 2km/s) → needs moderator (light nuclei) required to slow fast neutrons

Neutrons created after fission are fast neutrons (high energy)

Thermal Neutron Reactor

Fast Neutron Reactor

Fast fission requires fast neutrons (1 MeV, 14000km/s) → moderator must be excluded



Fissile:

Nuclides that can be induced to fission with high probability by thermal neutrons are referred to as **fissile**

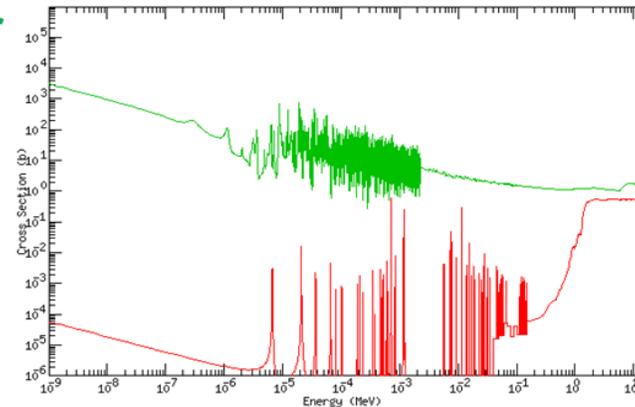
Fissionable:

Fissile Nuclides and those that fission when induced by fast neutrons are referred to as **fissionable**

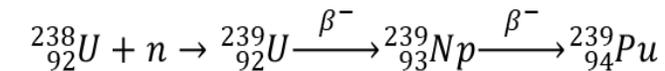
Fertile:



Nuclides from which fissile material is generated by neutron absorption and subsequent nuclei conversions



Microscopic cross sections (probability of neutrons inducing fission)



Thermal vs. Fast Neutron Reactors: Sustainability?

Two main Isotopes in Natural Uranium:

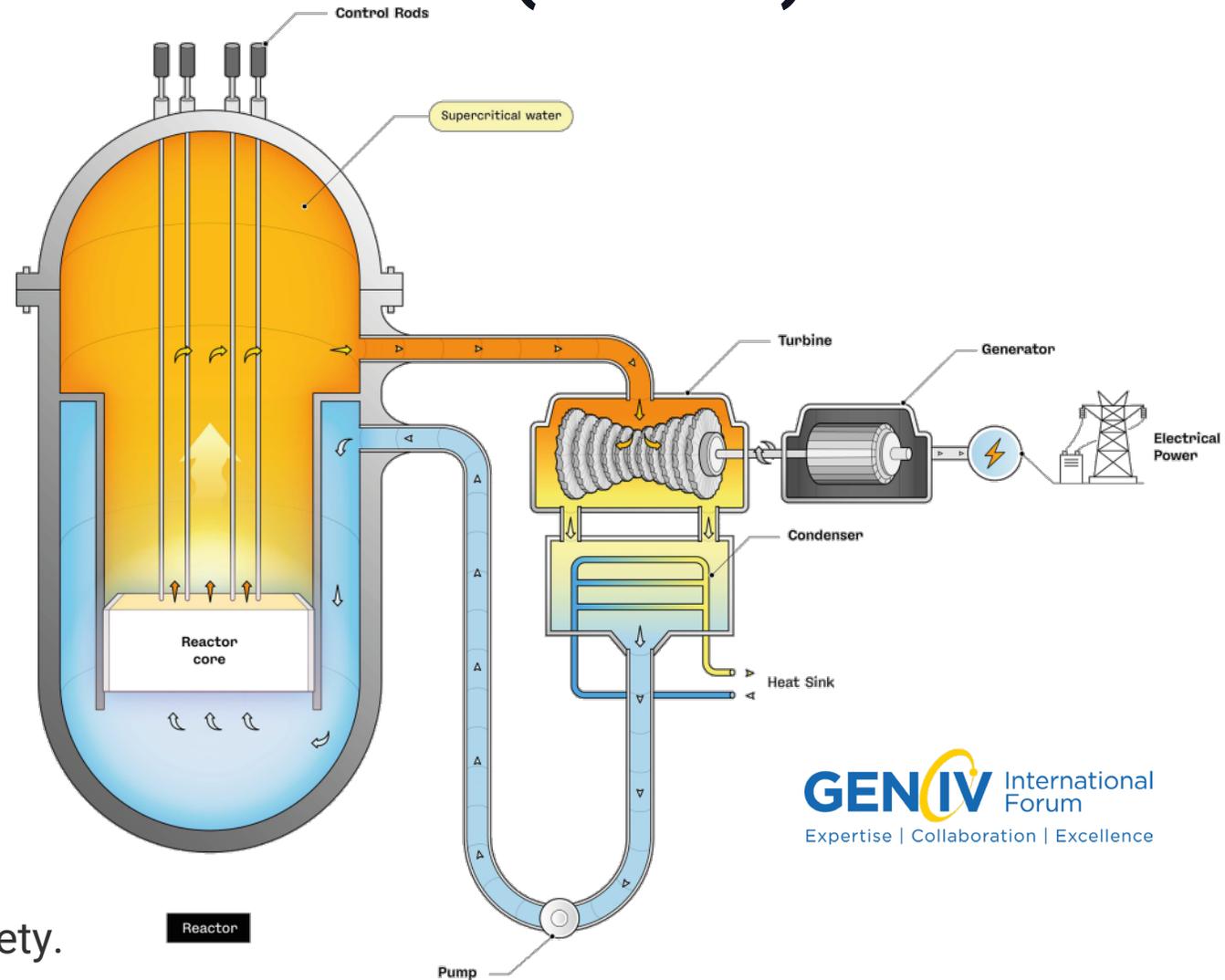
fissile ^{235}U 0.7%

fertile ^{238}U 99.3%

	Thermal Reactor	Fast Reactor
fuel efficiency (sustainability-1)	less 1% of natural U used	can utilize 60 times more U
waste production (sustainability-2)	significant amounts of long-lived radioactive waste	potentially less waste; burnup of long-lived isotopes is possible
enrichment	<3-5%	15-100% (20% ref.)
proliferation issues	easier	more problems as it require closing the fuel cycle
coolant	H ₂ O	water is not possible
neutron flux density (material damage)	$10^{13} - 10^{14}$ n/cm ² /s	$10^{14} - 10^{15}$ n/cm ² /s
compatibility of structural materials	long experience	needs qualifications
technology readiness	mature technology	pong experience with Na coolant but not with others
Safety	Well-established but...	to be proven

Super-Critical Water-cooled Reactors (SCWR)

	WCR	SCWR
coolant	H ₂ O	H ₂ O
outlet T, C	288-329	500
efficiency, %	35	45
max P, MPa	17	25
spectrum	thermal	thermal/fast

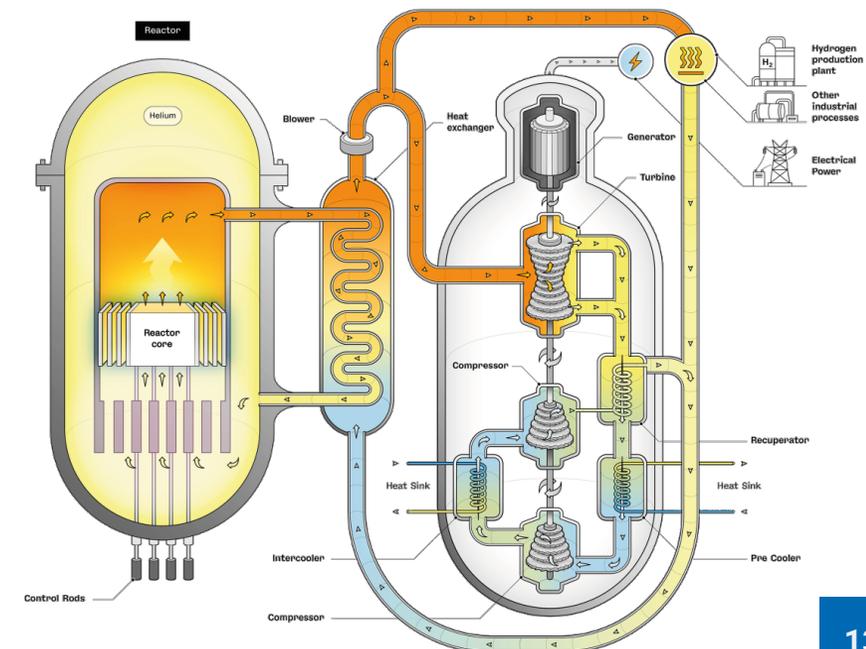
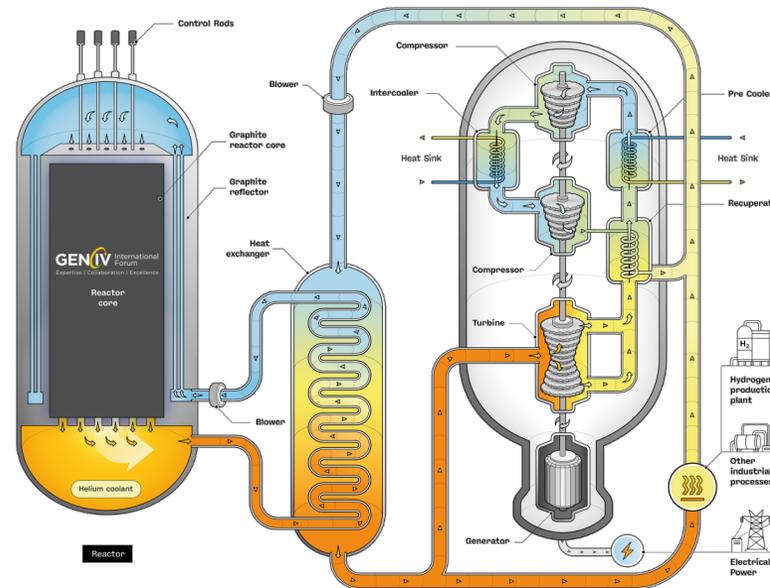
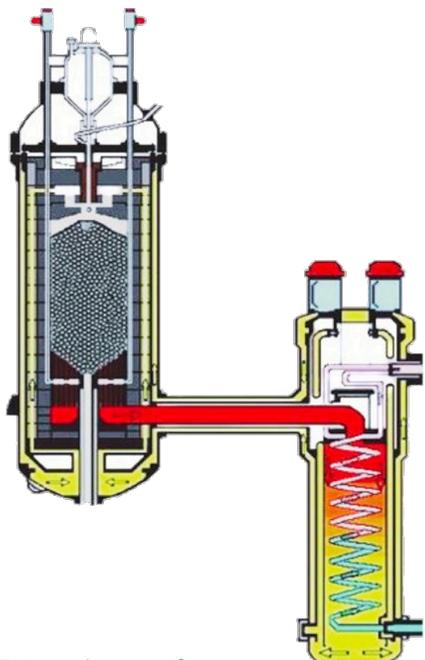


- Use water above critical point (22.12MPa and 647.14 K) as coolant.
- The high outlet temperature increases efficiency
- Potential for fast neutron spectrum in some designs.
- High Pressure -> increased costs for ensuring safety.
- Known technology for gas and coal plants but no experience in nuclear reactors.

Gas cooled Reactors (HTGR - VHTR, GFR)

	WCR	SCWR	HTGR	GFR
coolant	H ₂ O	H ₂ O	He	He
outlet T, C	288-329	500	750	750
efficiency, %	35	45	50	50
max P, MPa	17	25	7	7
spectrum	thermal	thermal/fast	thermal	fast

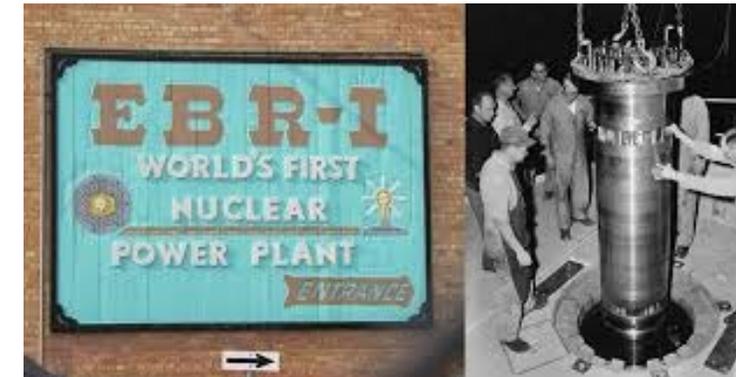
- The high temperatures and direct cycle increase efficiency
- The high temperature enables non-electric industrial applications
- Extended experience in gas and coal power plants but limited experience in nuclear
- GFR design allows for fast spectrum
- *Low Voiding Reactivity*



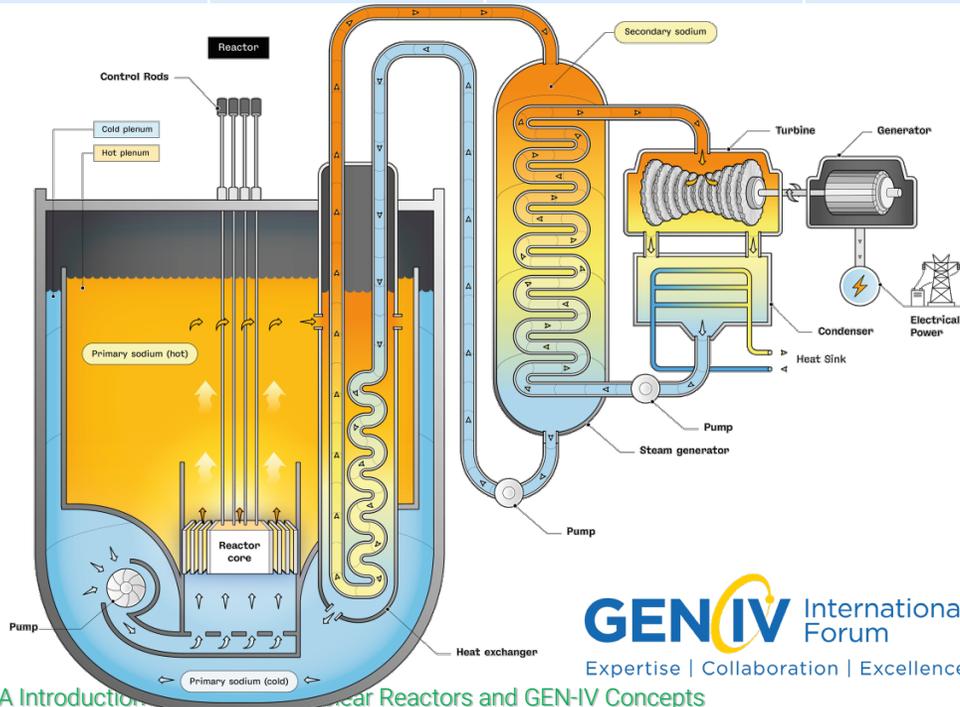
Sodium cooled Fast Reactors

	WCR	SCWR	HTGR	GFR	SFR
coolant	H ₂ O	H ₂ O	He	He	Na
outlet T, C	288-329	500	750	750	550
efficiency, %	35	45	50	50	45
max P, MPa	17	25	7	7	~0.2
spectrum	thermal	thermal/fast	thermal	fast	fast

EBR-I 1951



- *High coolant T => High Efficiency*
- *Low Pressure*
- *Mature Technology*
- *Fast spectrum*
- *Sodium violently reacts with water and air*



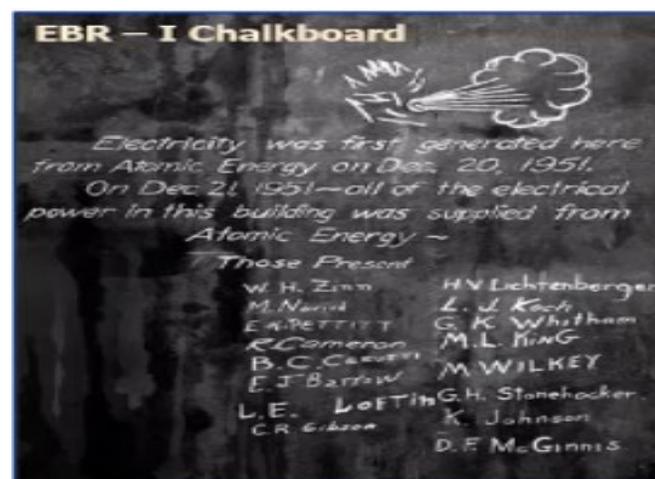
GEN IV International Forum
Expertise | Collaboration | Excellence

Experimental Breeder Reactor (EBR-I)

(First Ever Electricity Generated from Nuclear Reactor)

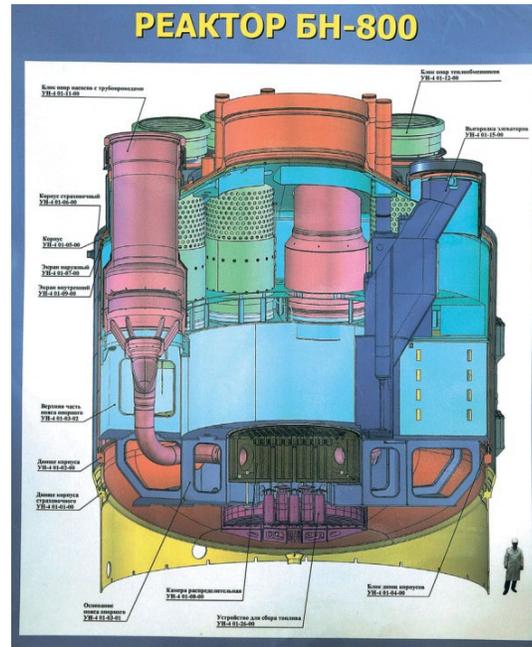
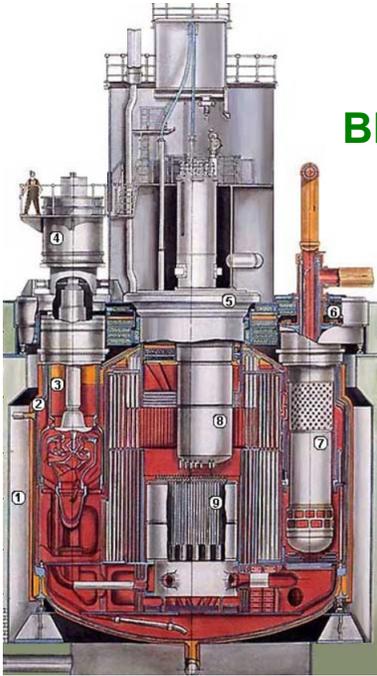
- First ever **liquid metal cooled fast reactor** built by Argonne National Laboratory (ANL) – West (now Idaho National Laboratory (INL))
- The primary purpose of EBR-I is to demonstrate **breeding** of fissile material
- Coolant: NaK Eutectic Alloy
- Fuel: Metallic Uranium

- On 20 December, 1951, EBR-I generated first **usable electricity** to power four light bulbs
- Later, EBR-I continued to supply 200 kW to power its own building. Reactor operated for **12 years** before its final shutdown in 1953



SFR: Existing Fleet > Evolutionary > Innovative

BN-600 >>> BN-800



BN-800 >>> BN-1200

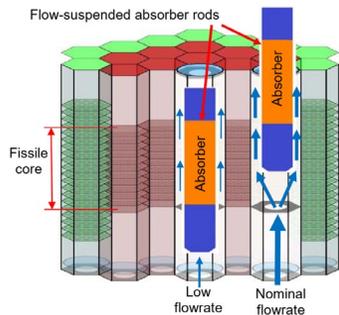


Similar:

- sodium circuits design
- Basic safety systems
- I&C systems including
 - reactor monitoring systems

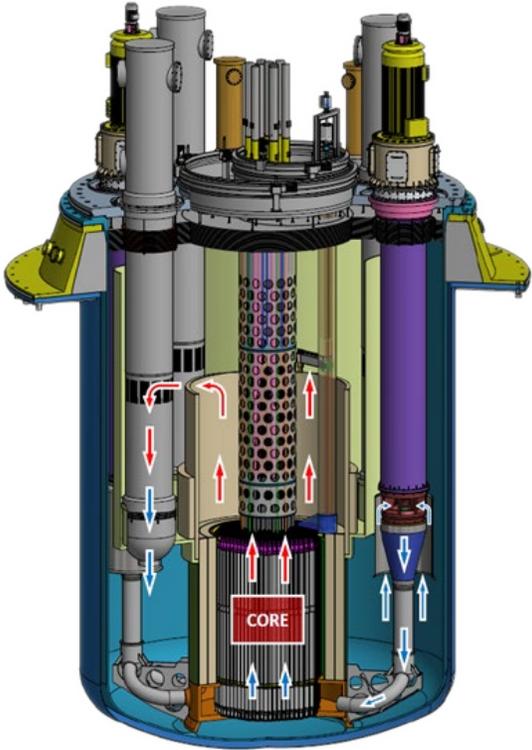
New:

- safety systems
 - including passive: hydraulically suspended control rods
- numerous other improvements



- Proven technologies based on BN-600/800 experience
- Safety: accidents that require public evacuation are practically eliminated
 - Additional passive high temperature actuated control rods system
- Fuel: uranium-plutonium nitride
- Lower power density
- Passive DHR systems
- Competitive with other advanced nuclear power plants and with power plants using fossil fuel

Sodium cooled Fast SMRs



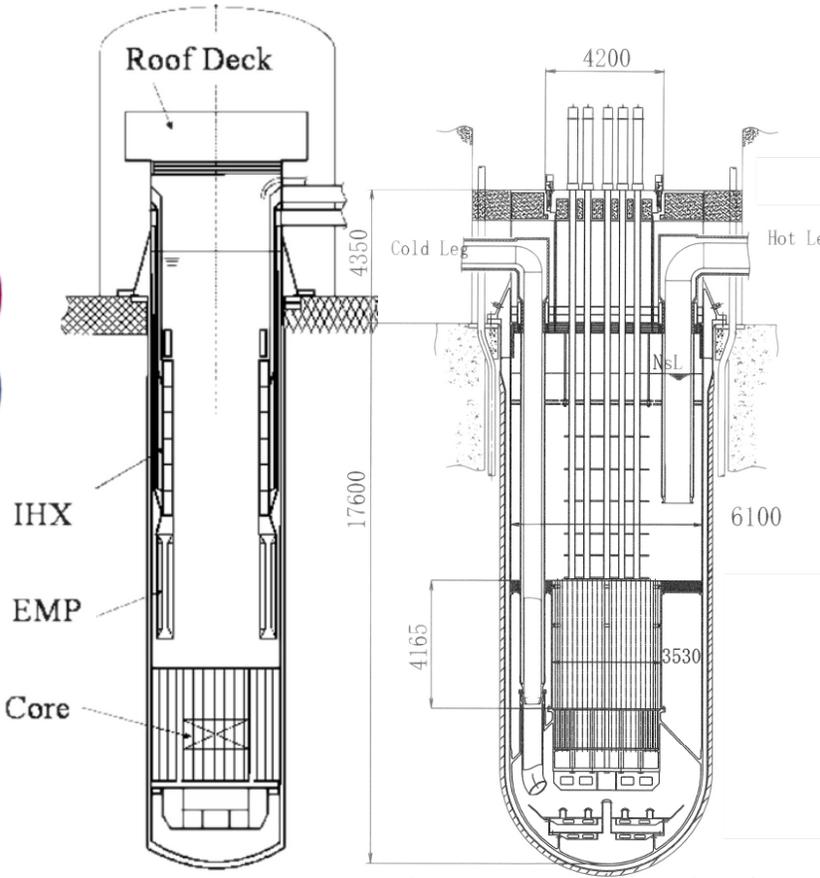
150 MW(e) PG-SFR
Rep. of Korea



400 MW(th) HEXANA
France



180 MW(th) + 110 MW(e)
OTRERA
France



Reactor Vessel

50 MW(e) SMFR
Japan

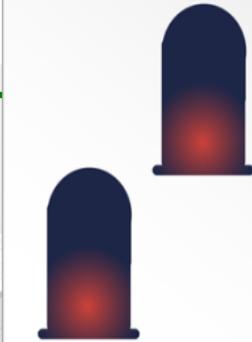
300 MW(e) SFR
Japan

HEXANA: Multi-Purpose SFR

HEXANA

2 modules nucléaires
de 400MW thermiques

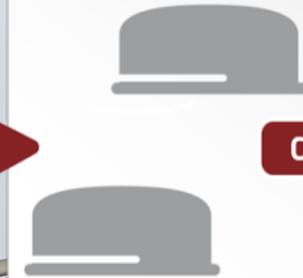
Puissance constante



Chaleur

Module de stockage
de chaleur

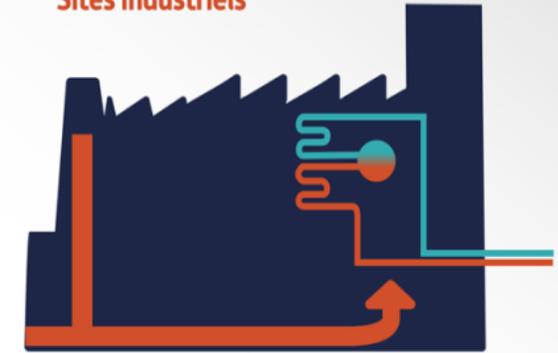
Variation de puissance assurée
par le stockage de la chaleur



Chaleur



Sites industriels



Production flexible d'électricité

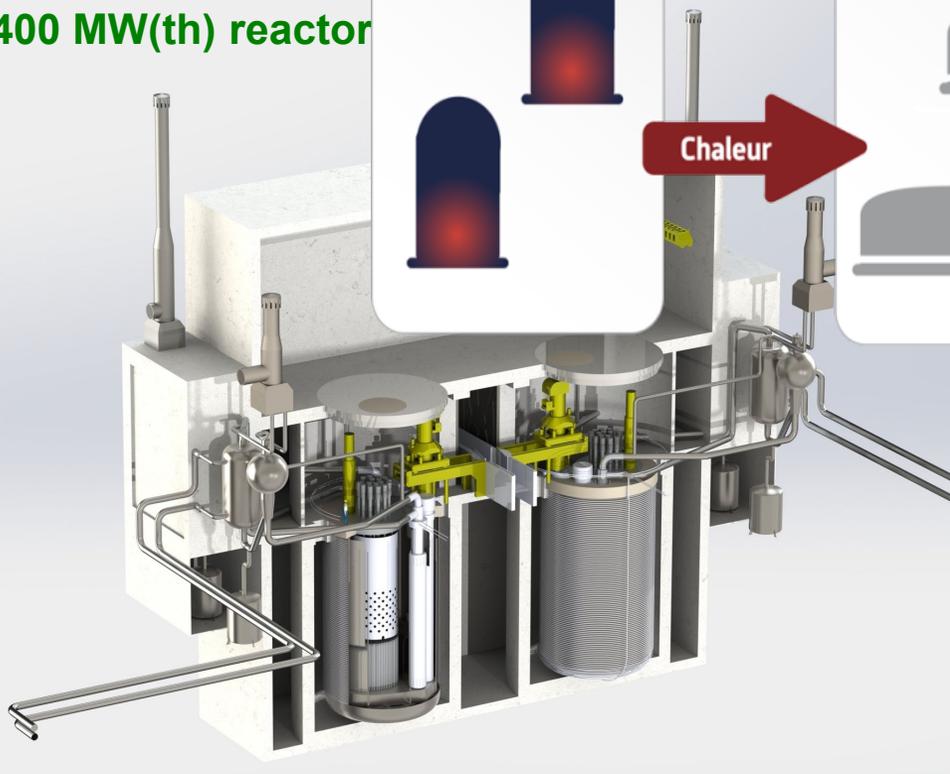
jusqu'à 20% P/min



Applications



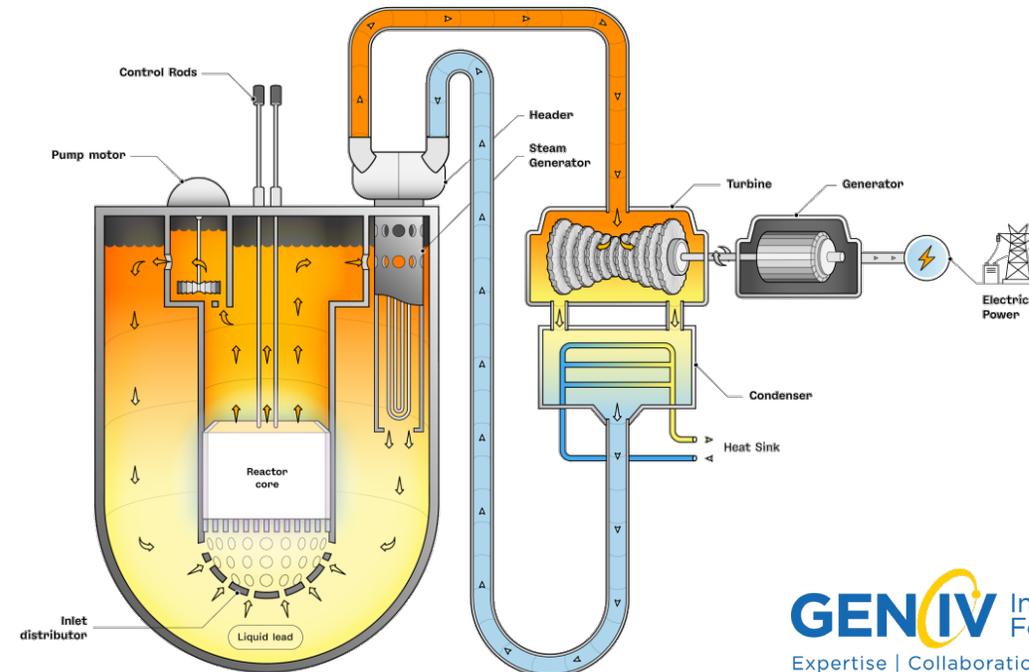
2x400 MW(th) reactor



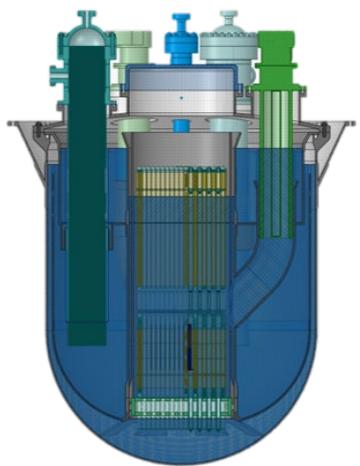
Heavy Liquid Metal cooled Fast Reactors

	WCR	SCWR	HTGR	GFR	SFR	LFR
coolant	H ₂ O	H ₂ O	He	He	Na	Pb/LBE
outlet T, C	288-329	500	750	750	550	500
efficiency, %	35	45	50	50	45	43
max P, MPa	17	25	7	7	~0.2	~0.5
spectrum	thermal	thermal/fast	thermal	fast	fast	fast

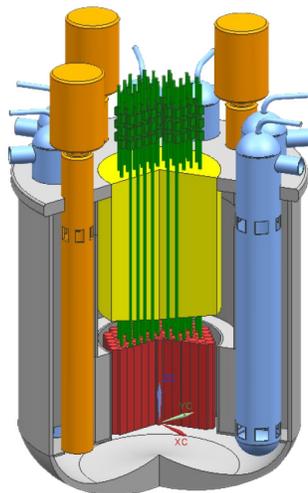
- *No intermediate circuit*
- *High coolant T => High Efficiency*
- *Low Pressure*
- *Fast spectrum*
- *New Technology*
- *Compatibility of Materials*
- *Pb/LBE O₂ Control*



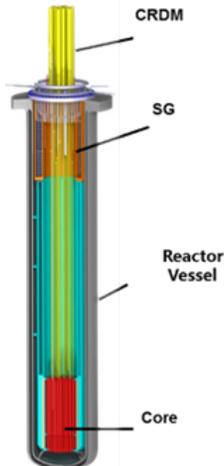
Heavy Liquid Metal cooled Fast Reactors



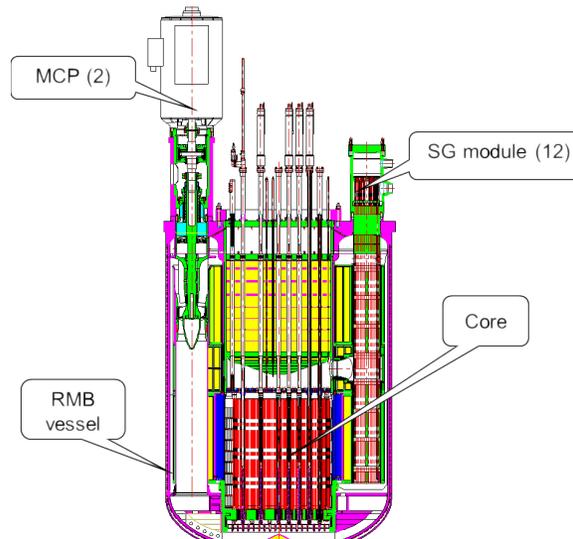
ALFRED
125-250 MW(e)
EU



CLFR-300
China



14 MW(e) CLEAR-M10d
China



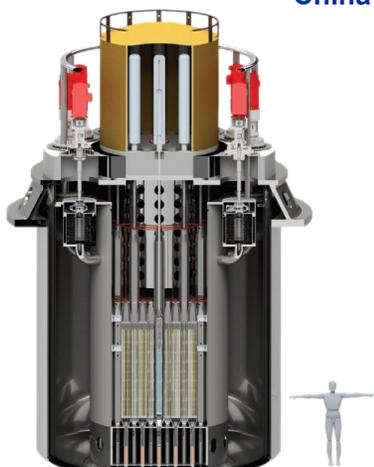
CBEP-100 (LBE)
Russia



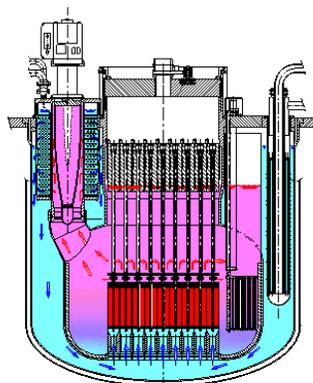
BREST-OD-300
Russia



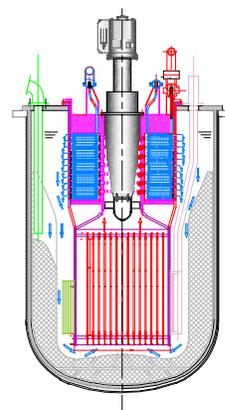
3-10 MW(e) SEALER
Sweden



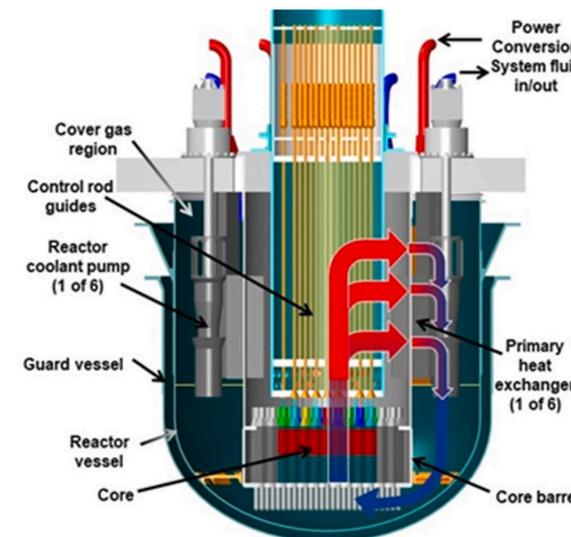
55 MW(e) SEALER
Sweden



LFR-AS-200 MW(e)
newcleo, Italy



Transportable LFR-TL-5 MW(e)
newcleo, Italy

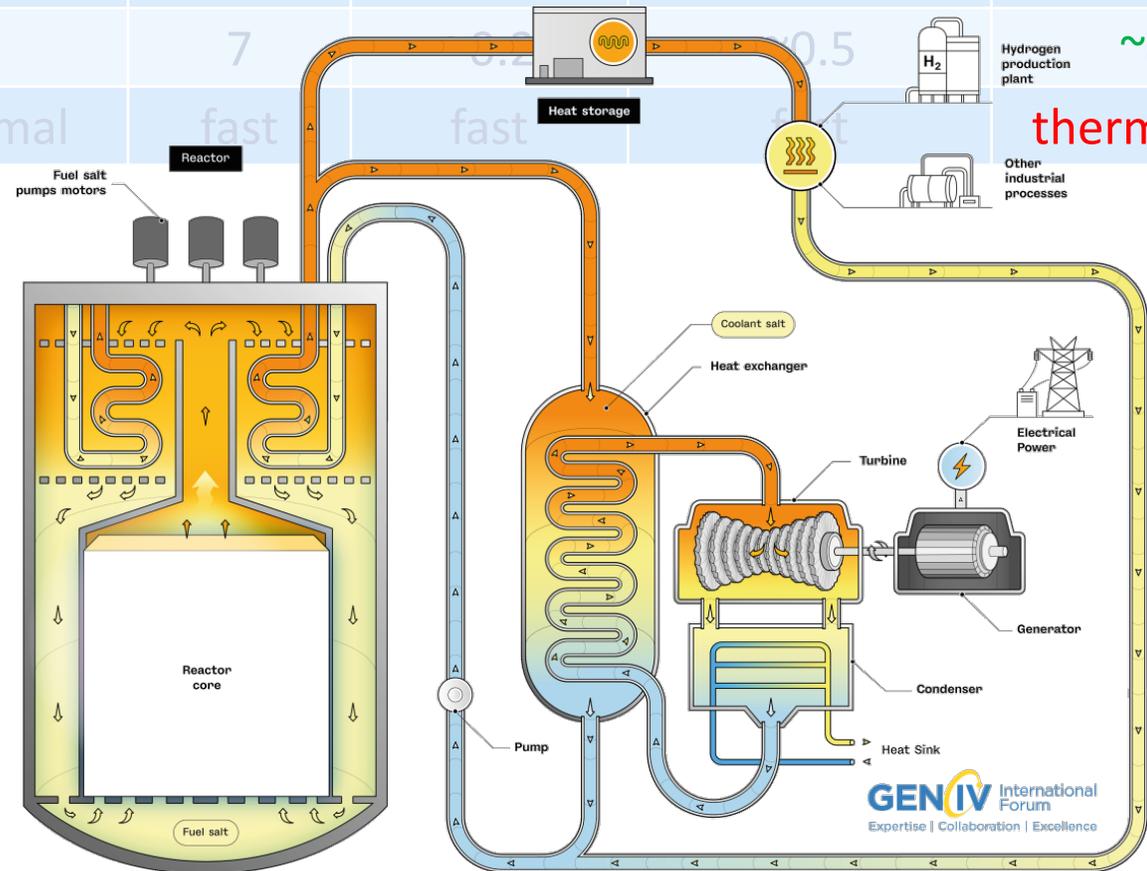


Westinghouse LFR 450 MW(e)
WEC, USA

Molten Salt Reactors

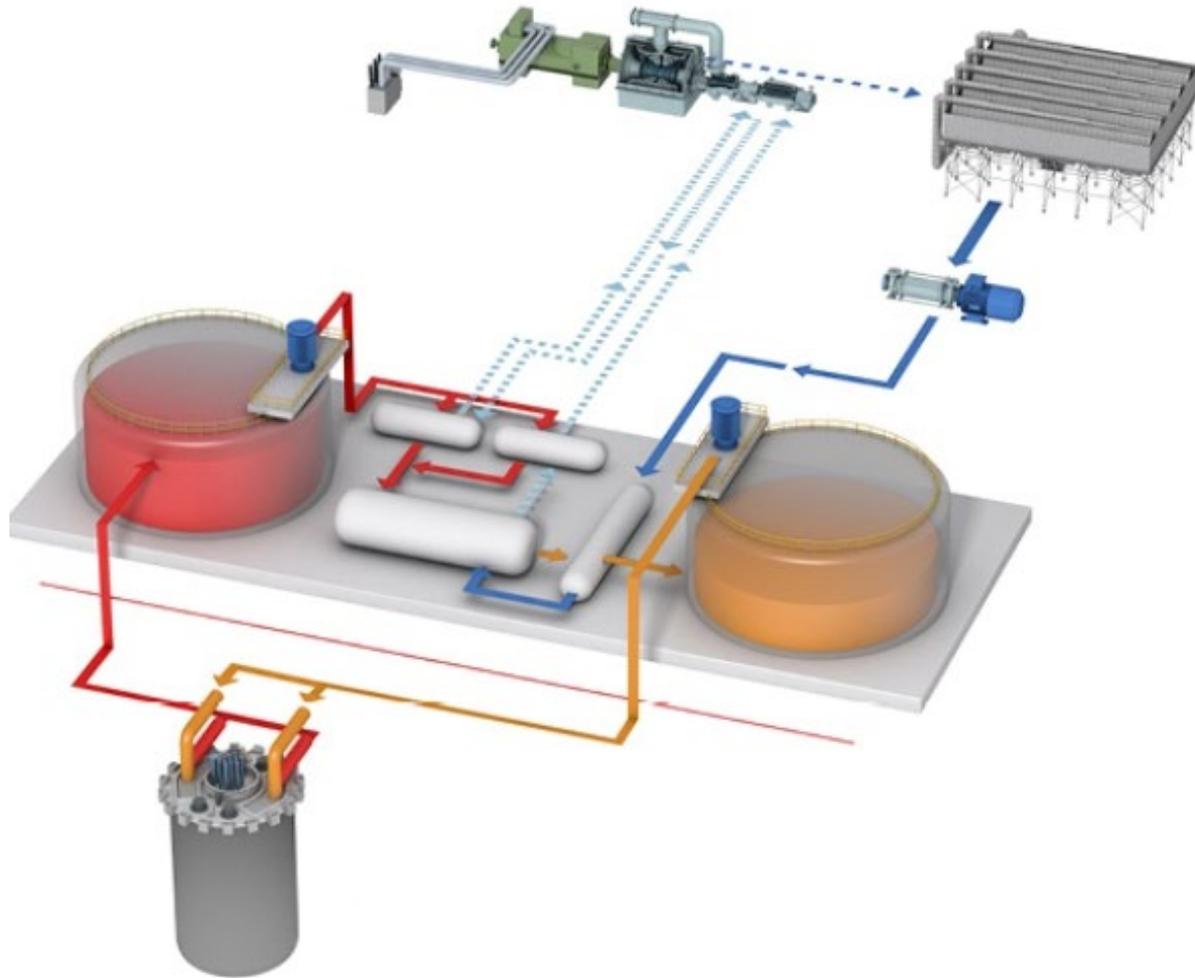
	WCR	SCWR	HTGR	GFR	SFR	LFR	MSR
coolant	H ₂ O	H ₂ O	He	He	Na	Pb/LBE	Fluoride/Chloride
outlet T, C	288-329	500	750	750	550	500	800
efficiency, %	35	45	50	50	45	43	48
max P, MPa	17	25	7	7	3.2	0.5	~0.2
spectrum	thermal	thermal/fast	thermal	fast	fast	fast	thermal/fast

- High coolant $T \Rightarrow$ High Efficiency
- Low Pressure
- Very safe (negative temperature reactivity)
- Online Waste/Fuel Management
- Thermal/Fast spectrum
- New Technology
- Compatibility of Materials



NATRIUM: SFR with Molten Salt Storage System

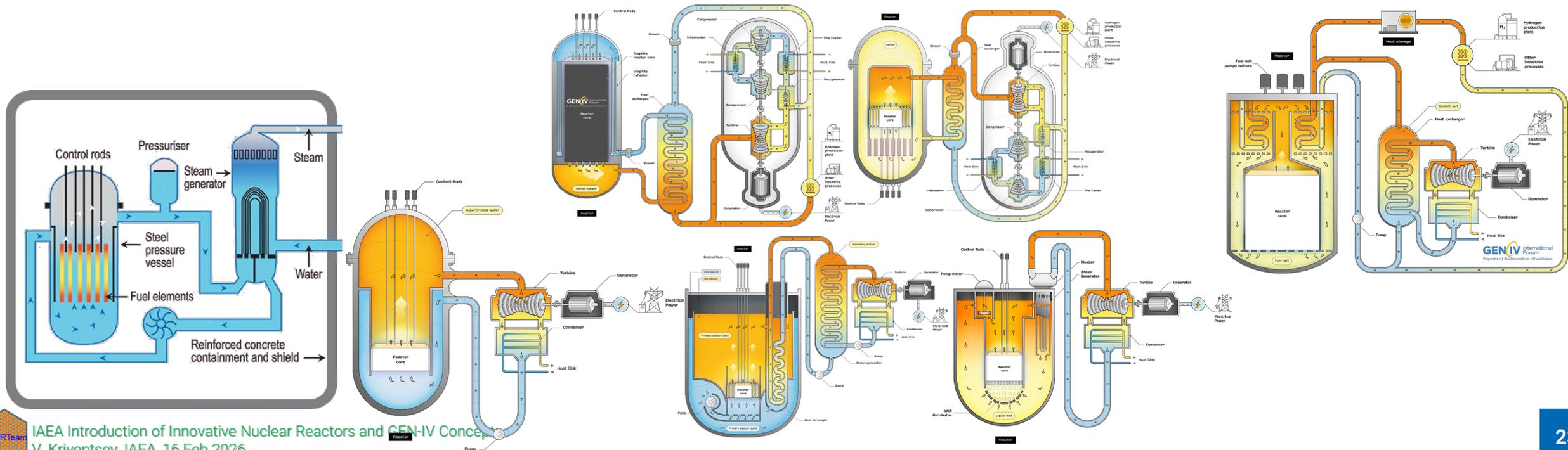
Build by Terrapower



- 345 MW(e) SFR combined with
- 1GW(th) Energy molten salt-based storage system
- Pick power can boost to 500 MW(e)
- Can be used for non-electrical applications
- Can work with renewables

Comparing Innovative Reactor Concepts

	WCR	SCWR	HTGR	GFR	SFR	LFR	MSR
coolant	H ₂ O	H ₂ O	He	He	Na	Pb/LBE	Fluoride/Chloride
outlet T, C	288-329	500	750	750	550	500	800
efficiency, %	35	45	50	50	45	43	48
max P, MPa	17	25	7	7	~0.2	~0.5	~0.2
spectrum	thermal	thermal/fast	thermal	fast	fast	fast	thermal/fast

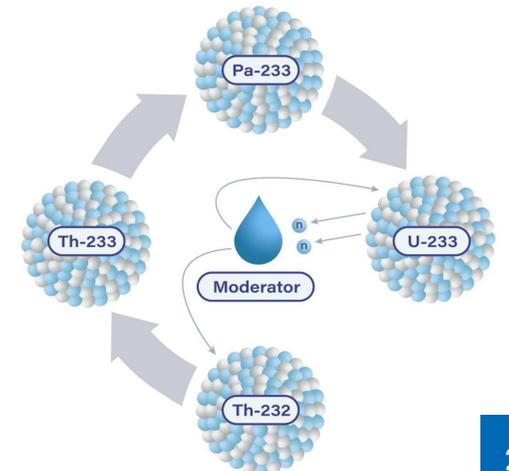
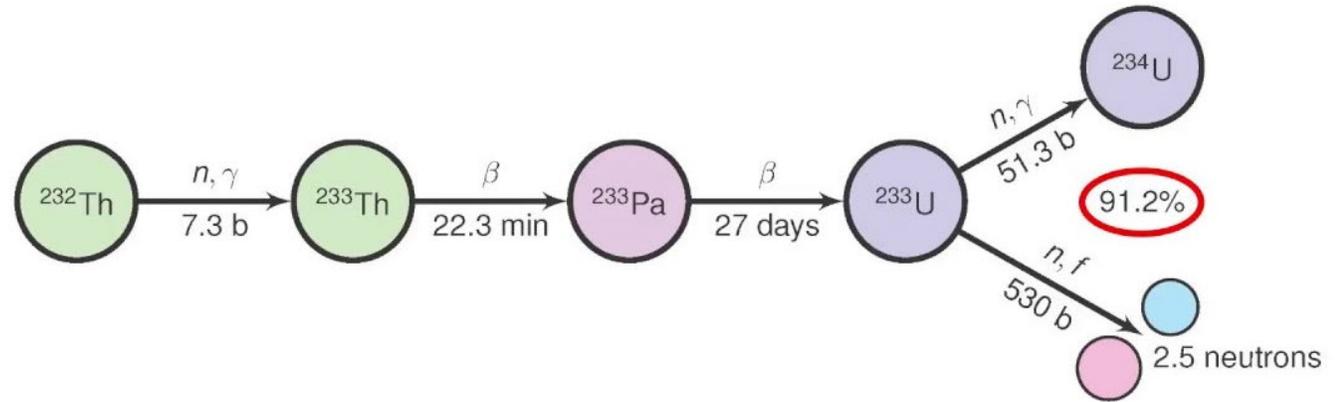
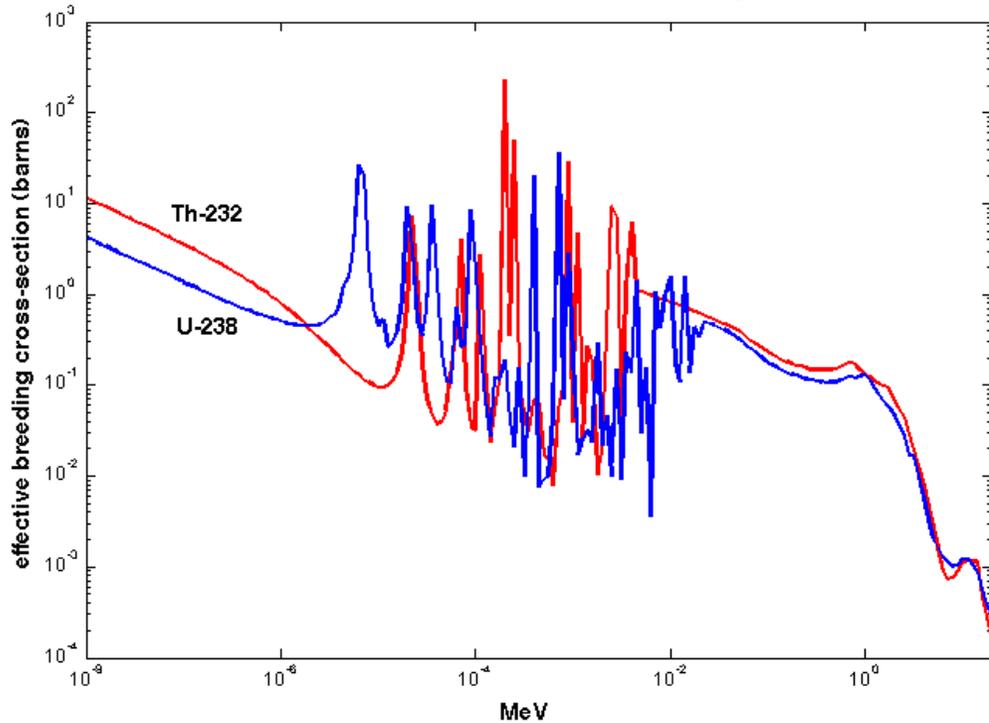


Innovative Reactors: Coolant Properties & More

	WCR	SCWR	HTGR	GFR	SFR	LFR	MSR
coolant	H ₂ O	H ₂ O	He	He	Na	Pb/LBE	Fluoride/Chloride
outlet T, C	329	500	750	750	550	500	800
efficiency, %	35	45	50	50	45	43	48
max P, MPa	17	25	7	7	0.2	0.5	0.2
n. spectrum	thermal	thermal/fast	thermal	fast	fast	fast	thermal/fast
ρ , kg/m ³	700	800/90	0.12/8.5		830	10000	3200
C_p , kJ/kg/K	5.7	5/4	5.2/5.2		1.3	0.15	1.4
ρC_p , MJ/m ³ /K	4	0.35	6x10 ⁻⁴ /0.4		1	1.5	4.5
k, W/m/K	0.6	0.1 - 0.4	0.15/0.24		70	18	0.01
boiling T, C	350				880	1700	1700
melting T, C					98	327/125	~500
CMI ¹	ok	ok	good	good	ok	?	?
enrichment, %	<5	<5/<20	<5	<20	<20	<20	<5/<20

Thorium Fuel Cycle

$^{232}\text{Th} \gg ^{233}\text{U}$: Th Cycle can operate in thermal spectrum

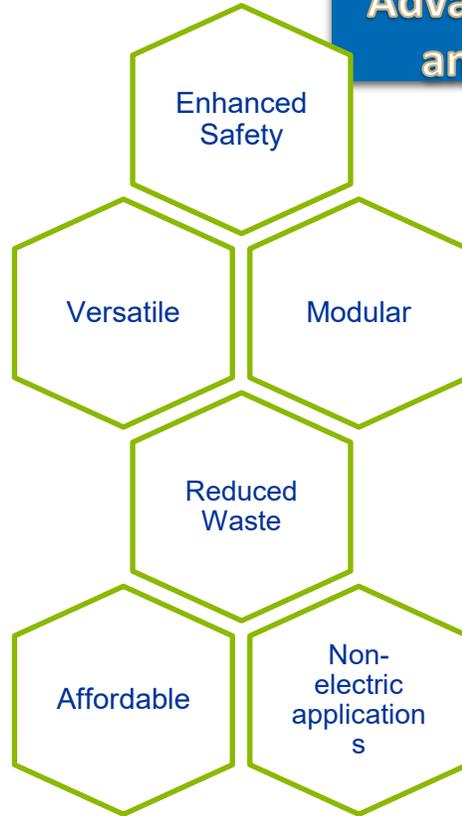


Absorption of neutrons by ^{232}Th initiates the series of transformations leading to the production of fissile ^{233}U that is by far the best 'fissile' isotope for thermal neutron spectrum and can be used for breeding in both thermal and fast reactors.

See IAEA e-Learning Module on Thorium-Cycle-Based Reactors

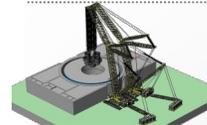
Small and Medium-sized or Modular Reactors (SMRs)

Advanced Reactors that produce typically up to 300 MWe, built in factories and transported as Modules to sites for Installation as demand arises.



Economic

- Lower Upfront capital cost
- Economy of serial production



Modularization

- Multi-module
- Modular Construction



Flexible Application

- Remote regions
- Small grids

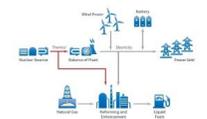


Smaller footprint

- Reduced Emergency planning zone



Replacement for aging fossil-fired plants



Potential Hybrid Energy System

Better Affordability

Shorter construction time

Wider range of Users

Site flexibility

Reduced CO₂ production

Integration with Renewables



Advanced Reactors Information System (ARIS)

Designs in ARIS

127

Design Organizations

> 75

Countries

~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

Small Modular Reactors



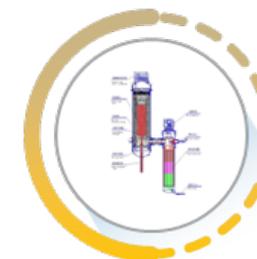
Liquid Metal Cooled Fast Reactors



Water Cooled (Land based)



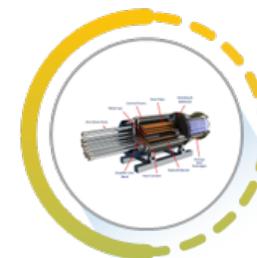
Gas Cooled Reactors



Molten Salt Reactors



Microreactors



Advanced Reactors

[Access online: Advanced Reactor Information System | Aris](#)

Outline: Introduction of Innovative Nuclear Reactors and GEN-IV Concepts

- Innovative Nuclear Energy Systems and Gen-IV Reactor Concepts
 - IAEA and GIF Terminology
 - Thermal vs. Fast Neutron Reactors
 - What is wrong with WCR? What about SWCR?
 - Gas cooled: HTGR and GFR
 - Liquid Metal cooled: SFR and LFR
 - Molten salt cooled: MSR
 - IAEA Advanced Reactors Information System (ARIS)
- **Fast Reactor Technology: World Status**
 - In Operation and Commissioning
 - Under Development and Design

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	60/10	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
	CFR600-1	sodium	UO ₂ /MOX	prototype	1500/650	2023	operating
India	FBTR	sodium	UO ₂ /UC	experimental	40/13	1985	operating
	PFBR	sodium	UO ₂ /MOX	prototype	1250/500	2026	commissioning
Japan	JOYO	sodium	UO ₂ /MOX	experimental	100/--	1978	lic renew (2026)



BN-600, Russia, 1980



BN-800
Russia, 2015



CEFR, 20 MW(e)
China, 2011



FBTR, 13 MW(e)
India, 1985

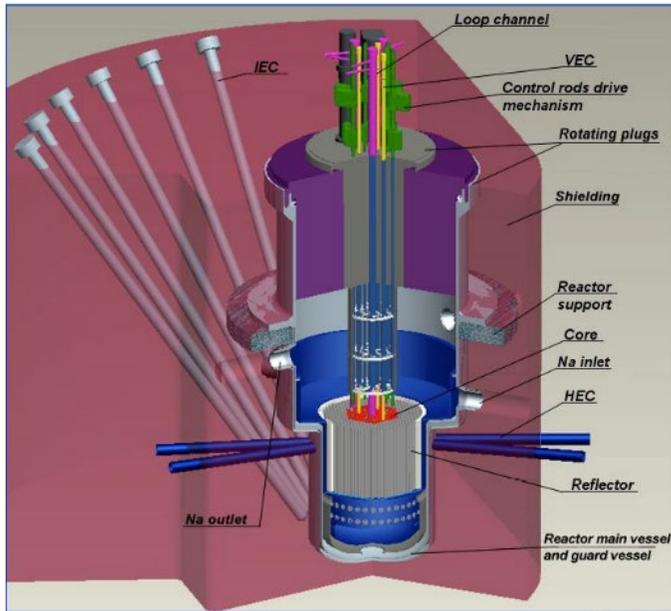


PFBR, 500 MW(e)
India, 2024

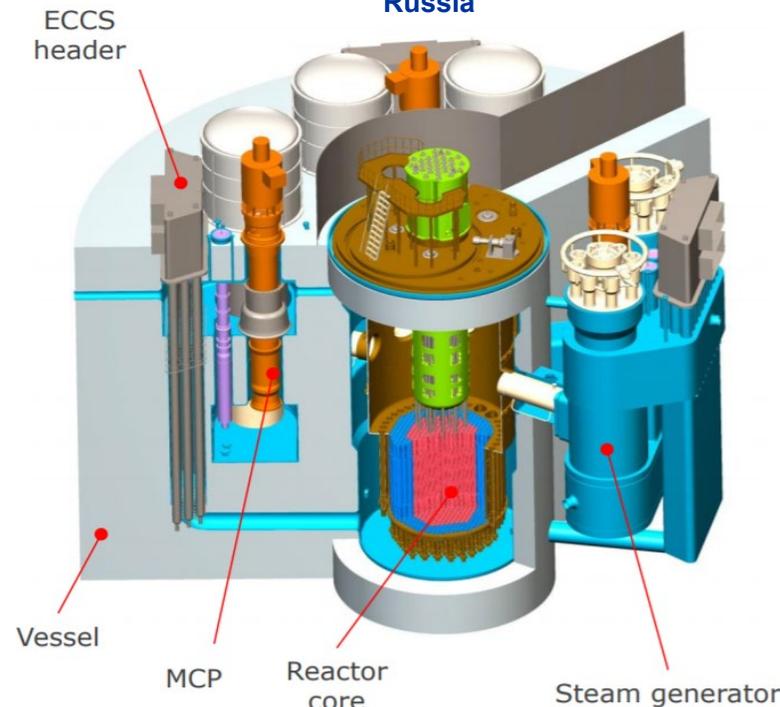
Fast Reactors under Construction

Country	Name	Coolant	Fuel	Purpose	Power, MW(th/e)	Year (Op.)	Status
Russia	MBIR	sodium	MOX	experimental	150/50	~2028	construction
	BREST-OD-300	lead	PuN/UN	demonstrator	700/300	~2028	construction
China	CFR600-2	sodium	UO ₂ /MOX	prototype	1500/650	~2028	construction

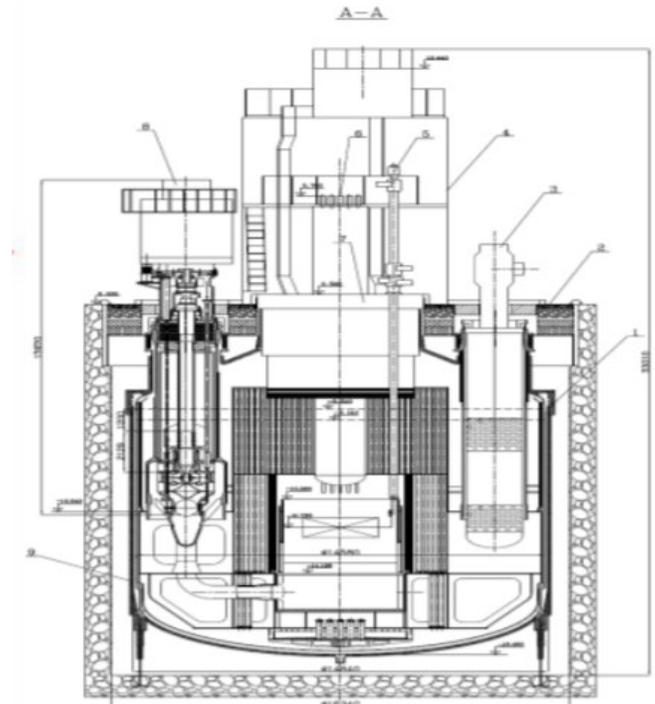
MBIR, Russia



BREST-OD-300
Russia



CFR600, China



Status of BREST-OD-300

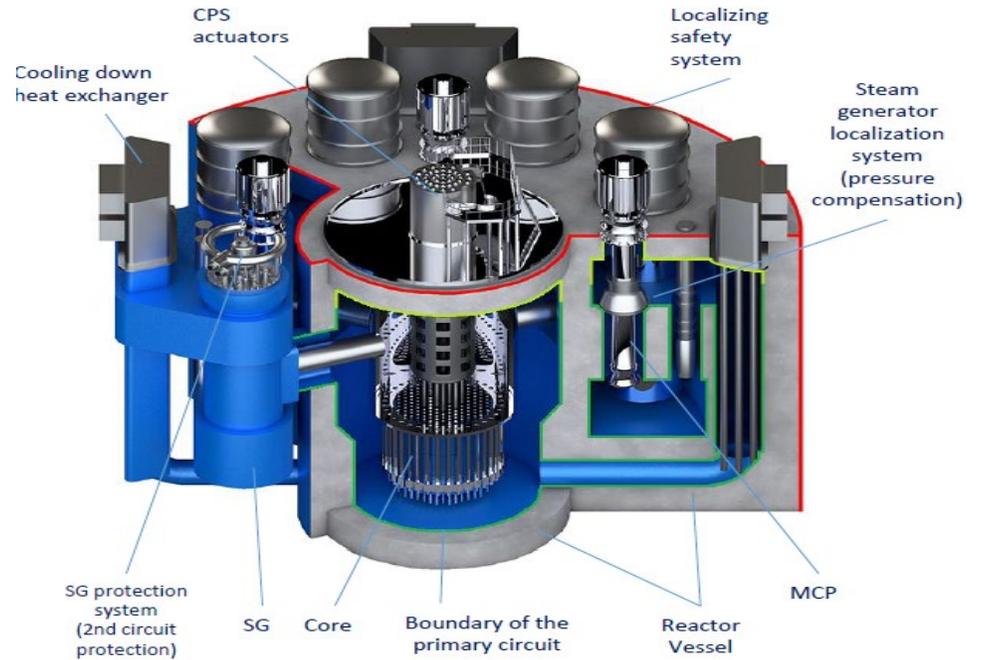
As presented by Ms Y. Kyzina at TWG-FR Meeting in June 2025



Construction status at PDEC site (December 2023)
Mounting of the BREST-OD-300 reactor began



The lower tier of the enclosing structure was immersed in the reactor shaft (December 2023)



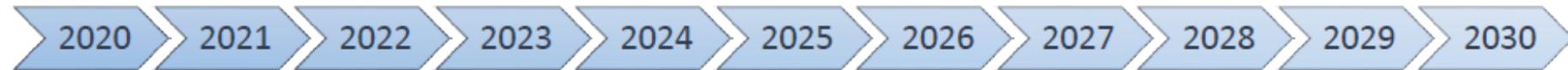
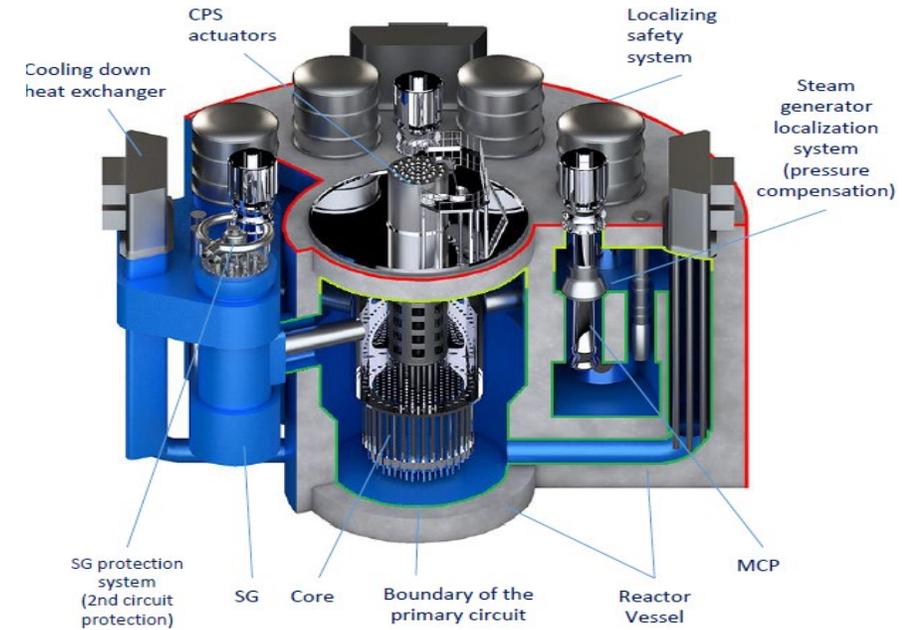
2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

Construction and commissioning of the Fuel (re-) fabrication module

Equipment manufacturing, construction of the nuclear power plant with the BREST-OD-300 lead-cooled fast reactor

Construction and commissioning of the Reprocessing module

BREST-OD-300 (April 2024)



Construction and commissioning of the **Fuel (re-) fabrication module**

Equipment manufacturing, construction of the nuclear power plant with the **BREST-OD-300 lead-cooled fast reactor**

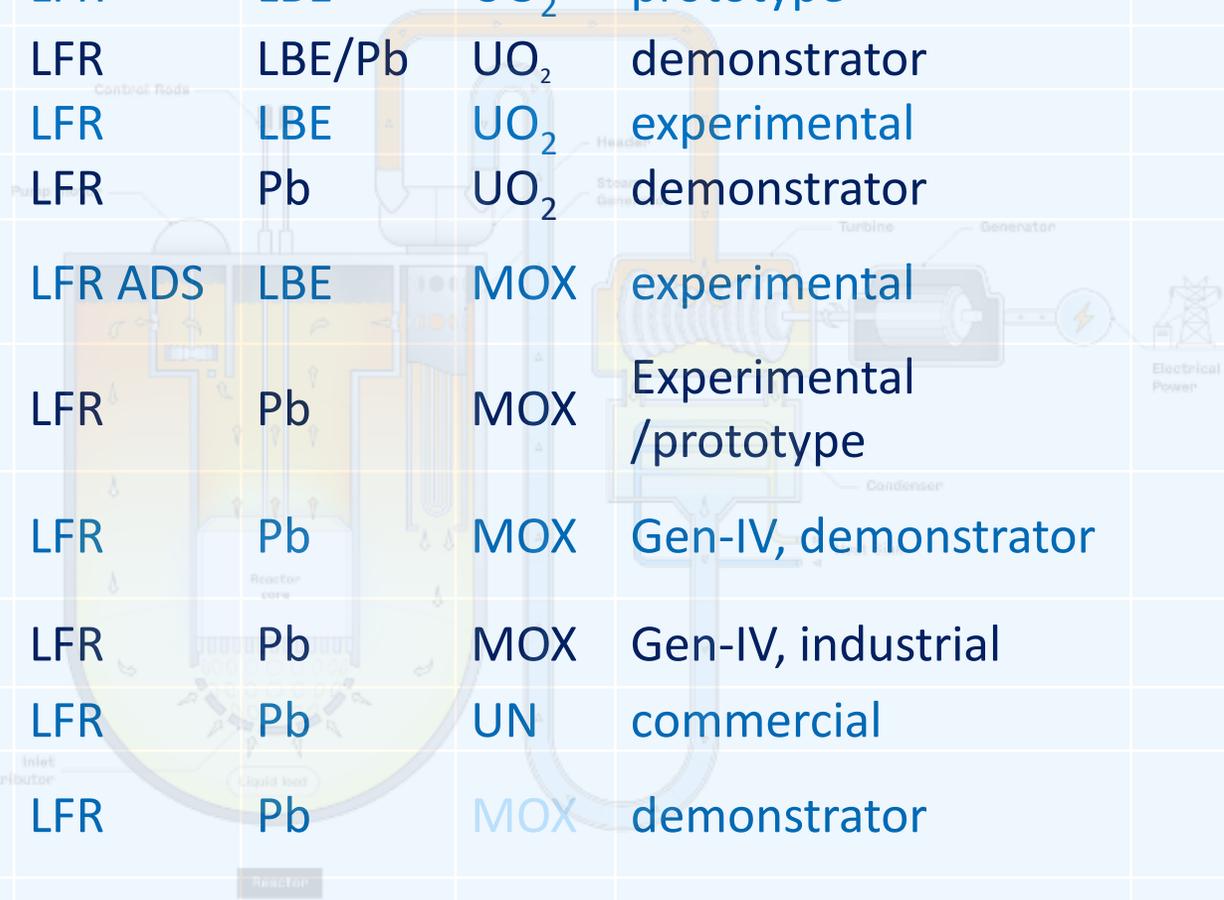
Construction and commissioning of the **Reprocessing module**

Innovative SFRs under Development and Design

Country	Name	Fuel	Purpose	Power (th/e), MW	Status
Russia	BN-1200	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	2800/1000-1200	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	FBTR-2	U-Zr	experimental/SMR	320/100	concept
	FBR 1&2	MOX	prototype	1250/500	design
R. of Korea	KALIMER-600	U-TRU-10%Z	GEN-IV, prototype	1523/600	design
	PGSFR	U-Zr/U-TRU-Zr	GEN-IV, prototype	400/150	suspended
	SALUS-100	U-10%Zr	AMR prototype	267/100	design
USA	NATRIUM	U-Zr	demonstrator	1000/345-500	design
	VTR	U-Pu-Zr?	experimental	300/-	design
	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	LFR ADS	LBE	MOX	experimental	100/-	design
Italy + EU	LFR-AS-30/200 (newcleo)	LFR	Pb	MOX	Experimental /prototype	/30 or /200	concept
Romania /Italy + EU	ALFRED	LFR	Pb	MOX	Gen-IV, demonstrator	300/120	design
EU	EAGLES-300	LFR	Pb	MOX	Gen-IV, industrial	900?/350	concept
Sweden	SEALER-55	LFR	Pb	UN	commercial	140/55	design
USA	Westinghouse LFR	LFR	Pb	MOX	demonstrator	950/450	design
USA	SSTAR	LFR	Pb		experimental	45/20	suspended



Joint Romania-Italy- Belgium EU-SMR-LFR

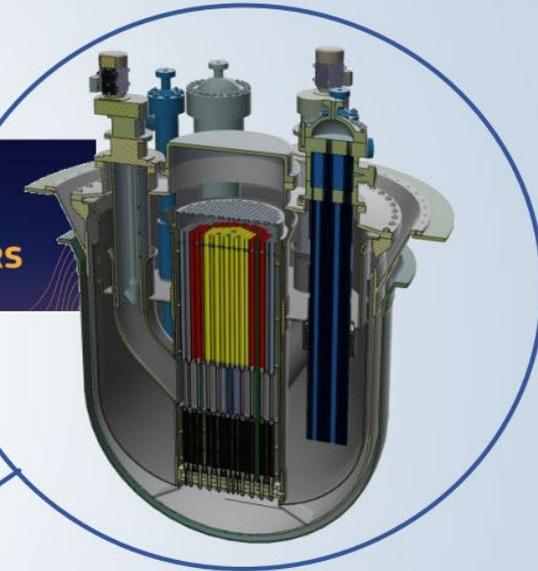
International collaborations

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



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 Program

Roadmap to commercial LFR



LEANDREA

Fast spectrum, technology viability demonstration and irradiation facility for qualification of materials/fuels

Objective: qualify fuel to be used in ALFRED



ALFRED

Representative of the commercial SMR-LFR, aiming to demonstrate capacity of operating over time while meeting expected availability

Objective: staged approach to ref. conditions



EU-SMR-LFR



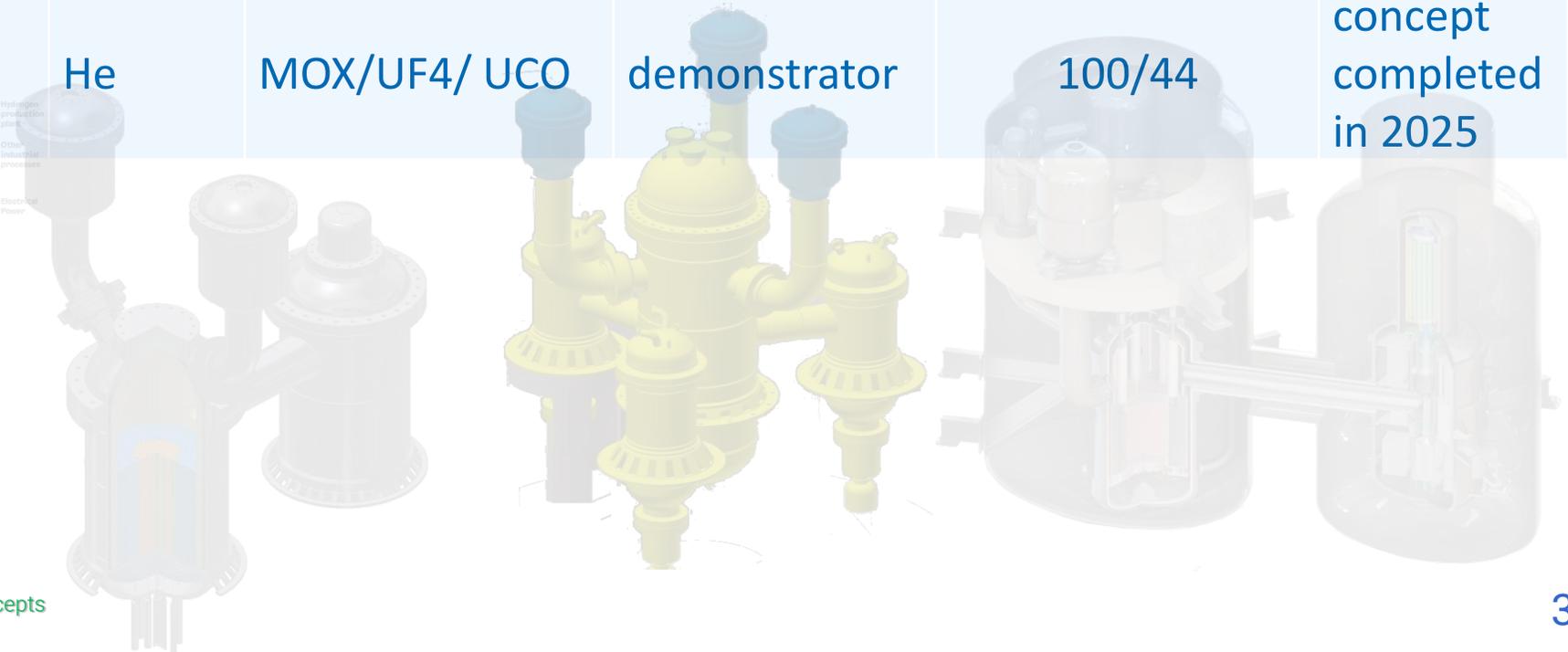
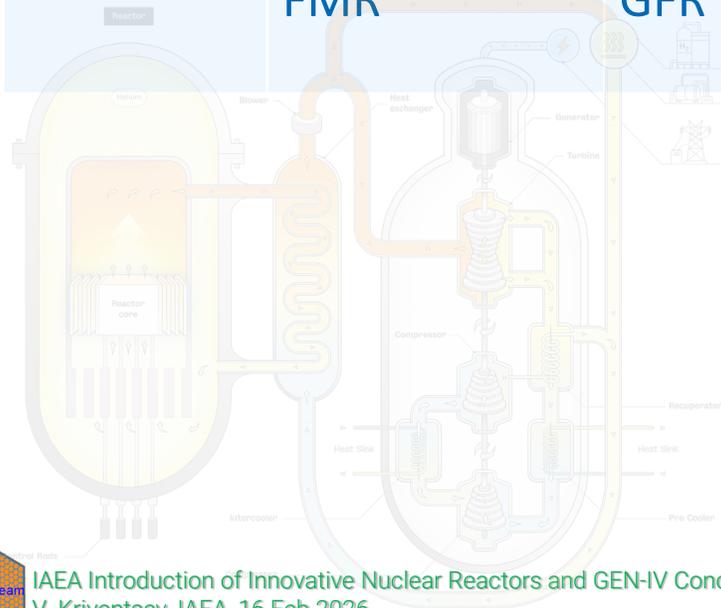
European commercial of SMR-LFR fleet

Investment decisions for commercial reactors no later than 2040 based on ALFRED

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 TREASURE	GFR	He	MOX	Gen-IV, demonstrator	75/- 200/	design
USA	EM ²	GFR	He	UC	demonstrator	500/265	concept
	FMR	GFR	He	MOX/UF ₄ / UCO	demonstrator	100/44	concept completed in 2025



Innovative Fast MSR 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	Thoron	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
R. of Korea	MARINA	MSR	molten salt	U/TRU	Commercial Shippropulsion & FNPP	100/35 per module	Concept



Atoms for Peace and Development...

Thank You!

email: FR@IAEA.ORG