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Consorzio Interuniversitario per la Ricerca TEcnologica Nucleare
INTERUNIVERSITY CONSORTIUM FOR TECHNOLOGICAL NUCLEAR RESEARCH

L'esperienza italiana nei piccoli reattori

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Presidente CIRTEN

Politecnico di Milano
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ASSOCIAZIONE ITALIANA NUCLEARE

AIN Webinar

2021.05.07

IL NUCLEARE NEL FUTURO
PROSSIMO DELLA TRANSIZIONE
ENERGETICA

L'esperienza italiana nei piccoli reattori

- «Una presenza costante, da lungo tempo»
- «Una collaborazione virtuosa accademia-ricerca-industria»
- «Un contributo importante per le strategie Europee»

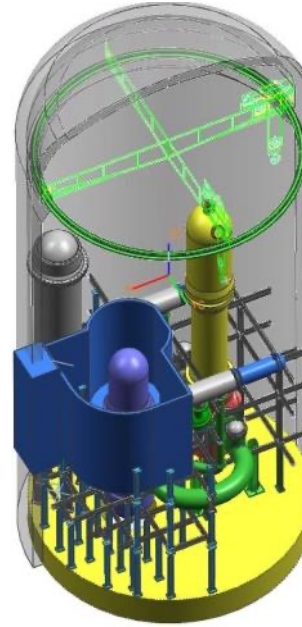
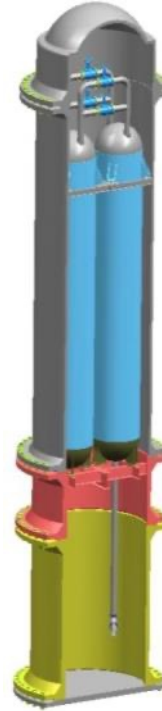


L'esperienza italiana nei piccoli reattori

«una presenza costante, da lungo tempo»



**Multipurpose
Advanced
Reactor,
inherently Safe**



1986



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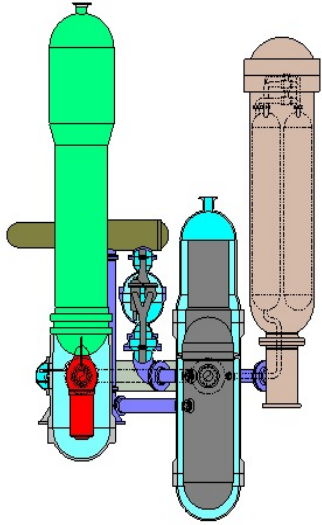


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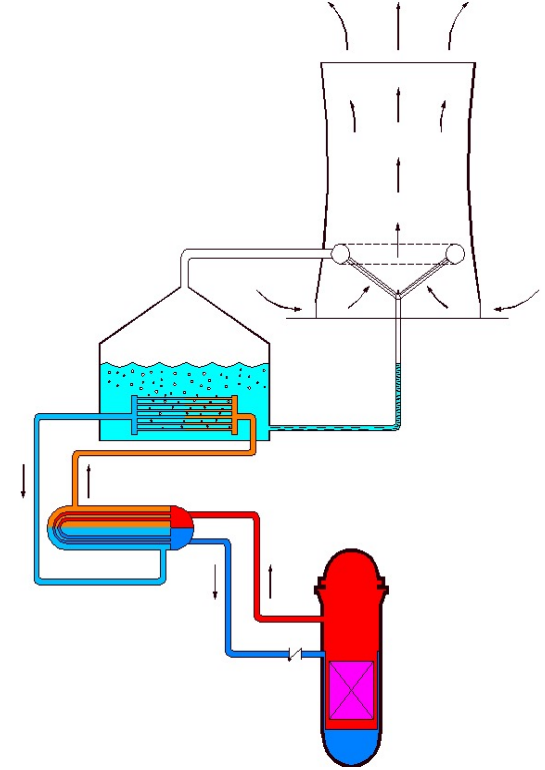
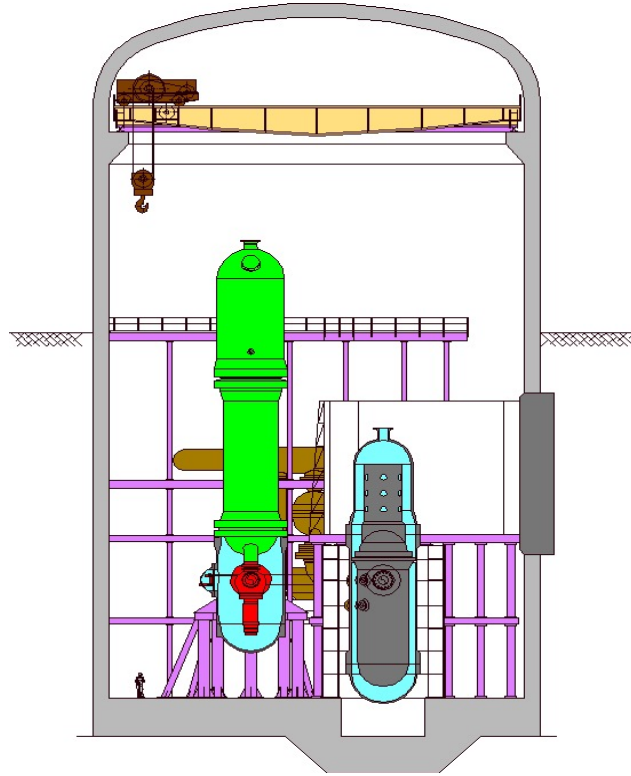
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«una presenza costante, da lungo tempo»

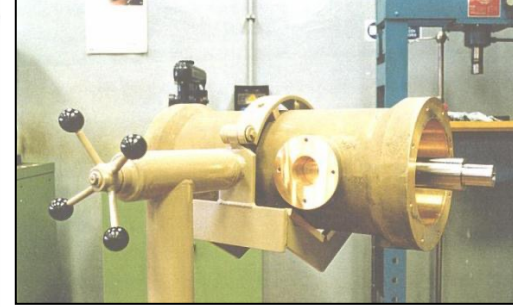
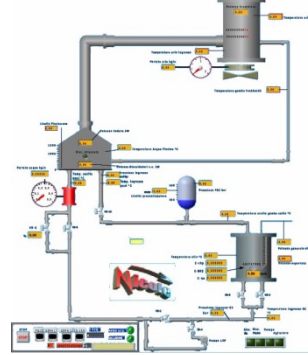
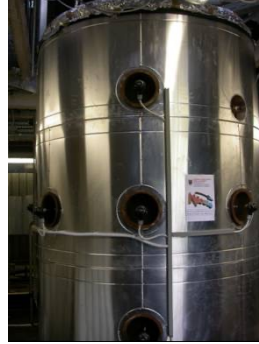
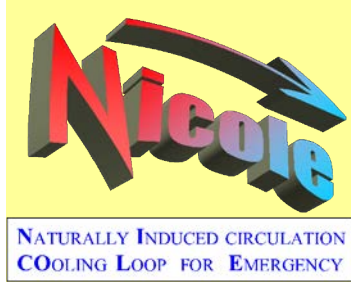


- Doppio involucro (no LOCA)
- Struttura semplificata
- Sistemi Passivi



L'esperienza italiana nei piccoli reattori

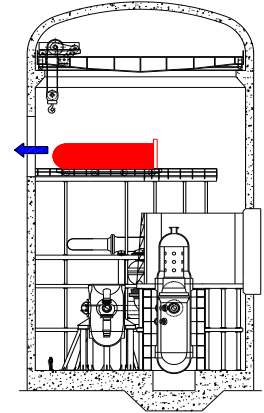
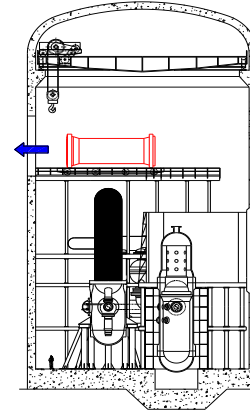
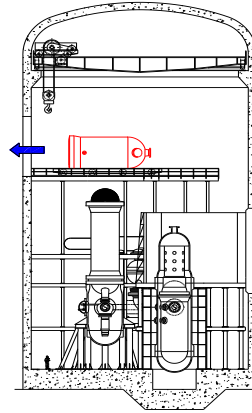
«una presenza costante, da lungo tempo»



Valvola completamente passiva



- Test sperimentali di componenti / sistemi
- Preliminary Safety Report a Autorità Sicurezza
- Studio del Decommissioning



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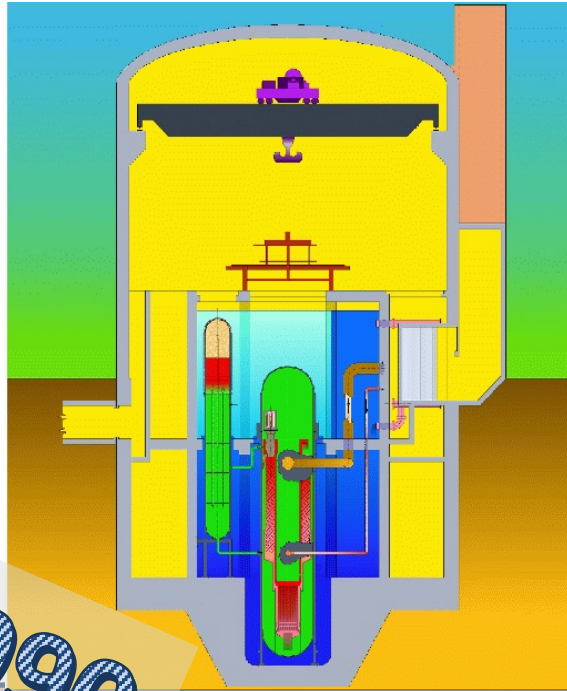
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AnsaldoEnergia

Ansaldo Nucleare
Divisione di ANSALDO ENERGIA S.p.A.



Inherently Safe Immersed
System (ISIS) reactor - 200
MWe

20 MW mock-up of the
helical-tube SGU
Test campaign at SIET
for ISIS



1990



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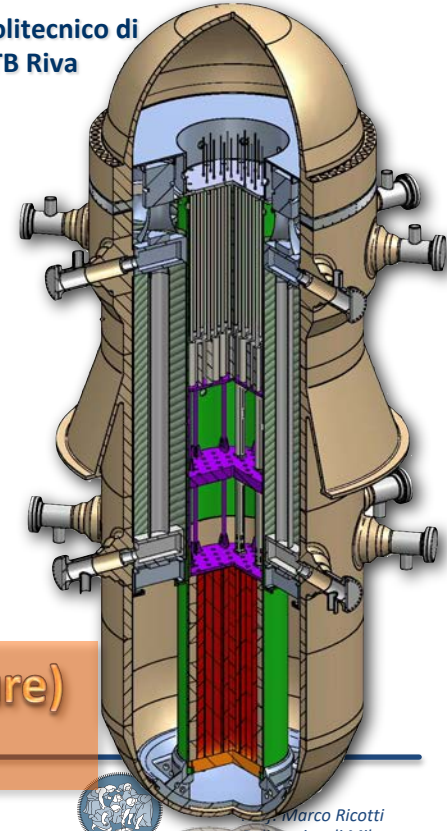
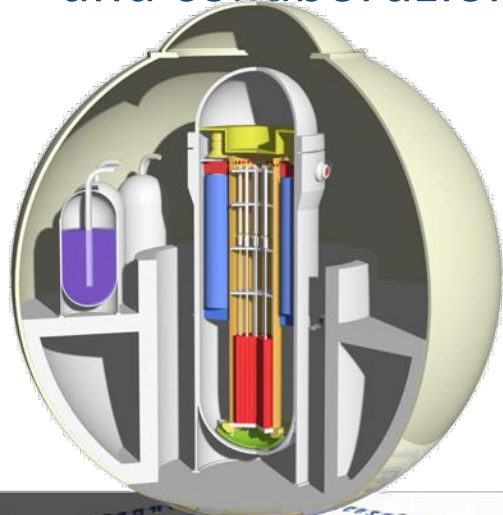


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The IRIS (International Reactor Innovative & Secure) project: 10 years of history & development



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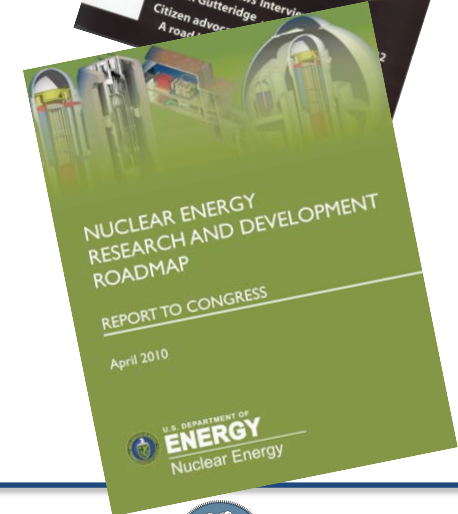
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2000

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INDUSTRY		
Westinghouse	USA	Overall coordination, core design, safety analyses, licensing, commercialization
BNFL*	UK	Fuel and fuel cycle
Ansaldo Energia / Ansaldo	Italy	Steam generators design
Ansaldo Nucleare / Camozzi / Mangiarotti	Italy	Steam generators fabrication
ENSA	Spain	Pressure vessel and internals
NUCLEP (Rolls Royce)	Brazil	Containment, pressurizer
LABORATORIES	UK	Control rod drive mechanisms
ORNL	USA	I&C, PRA, desalination, shielding, pressurizer
CNEN	Brazil	Pressurizer design, transient analyses, desalination
ININ	Mexico	PRA, neutronics support
LEI	Lithuania	PRA, district heating co-generation
ENEA	Italy	Testing, integral facility, seismic, shielding
UNIVERSITIES		
Polytechnic of Milan	Italy	Safety analyses, shielding, thermal hydraulics, steam generators design, internal CRDMs, economics, bio-fuel co-generation
MIT	USA	Advanced cores, maintenance
Tokyo Inst. of Technology	Japan	Advanced cores, PRA, seismic
University of Zagreb	Croatia	Neutronics, safety analyses
University of Pisa	Italy	Containment analyses, severe accident analyses, neutronics, CFD, seismic
Polytechnic of Turin	Italy	Source term, thermal hydraulics
(Georgia Institute of Technology)	USA	Advanced core designs; shielding; dose reduction
POWER PRODUCERS AND ARCHITECT ENGINEER COMPANIES		
(Bechtel)*	USA	BOP, AE
(TVA)*	USA	Maintenance, utility perspective
Eletronuclear	Brazil	Developing country utility perspective
(Empresarios Agrupados)	Spain	AE
(Esti Energia)	Estonia	Smaller country/grid utility perspective



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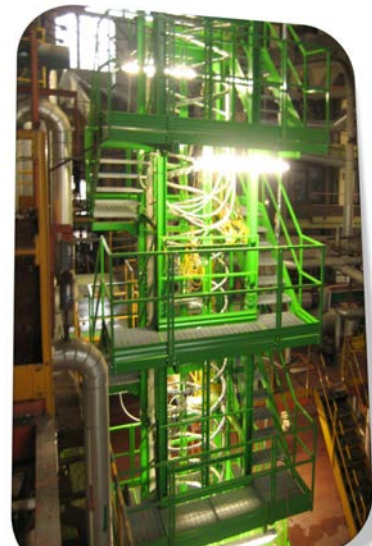
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SIET
sperimentiamo le tue idee



SPES3 side view



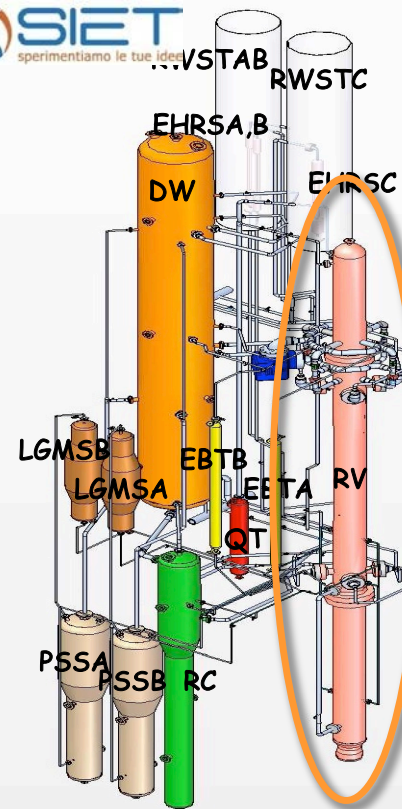
EHR pools and Drywell



Pressure Suppression pools

SPES3 iPWR Integral Test Facility (1:1 in height, 1:1 in P, T; 1:100 in power/volume)

Large Scale Facility (SIET) per
licensing IRIS



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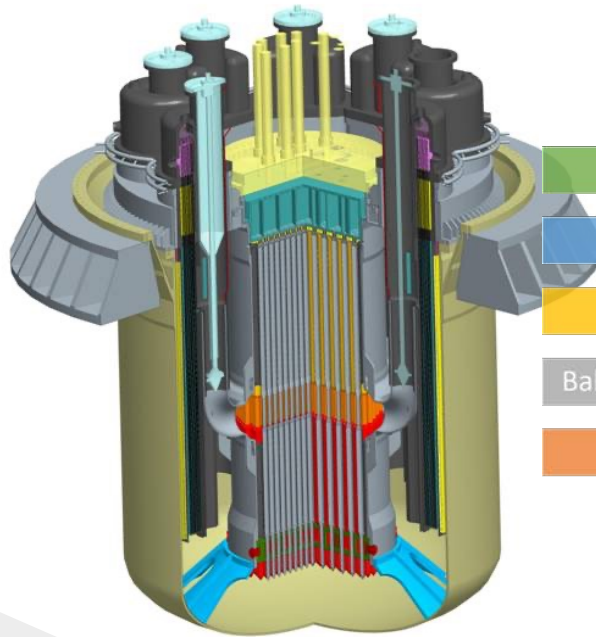


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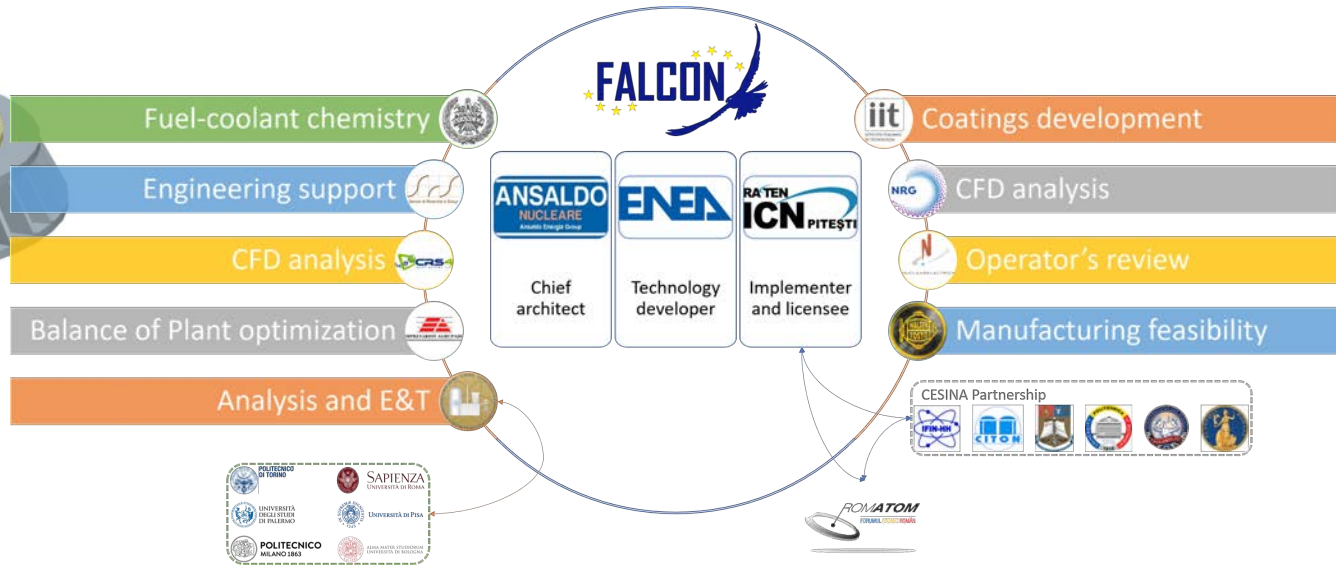
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ALFRED

Oggi



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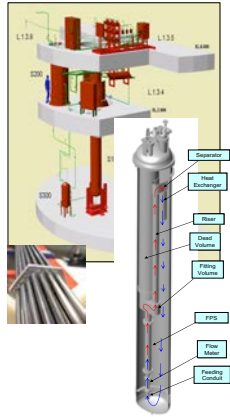


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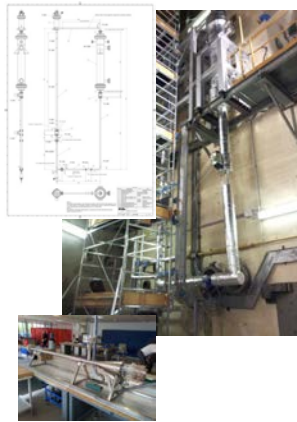
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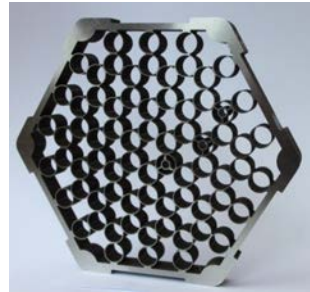
CIRCE



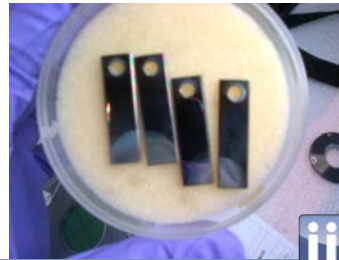
NACIE-UP



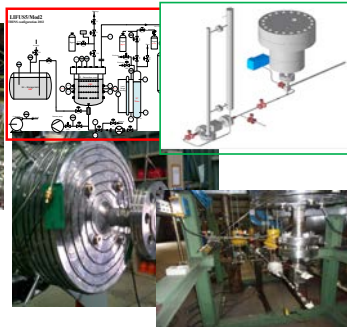
Meltin'Pot



HELENA-2



HELENA

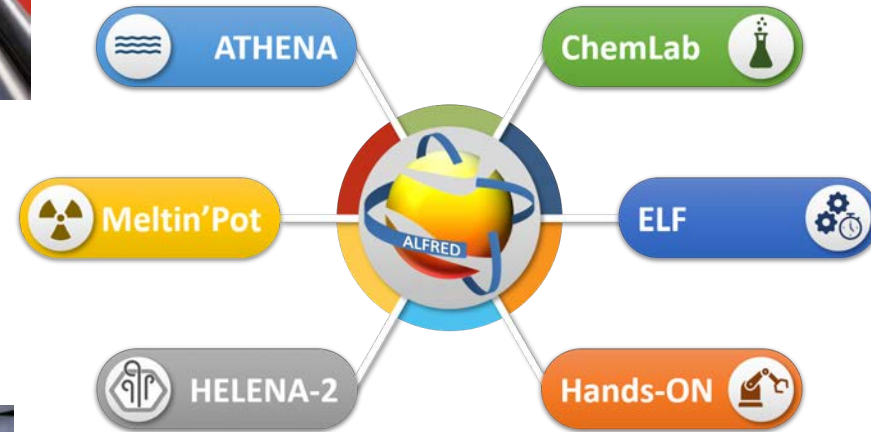


LIFUS5

Laboratori sperimentali (ENEA-Brasimone)



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Pan-European Centre of Excellence
(Romania)



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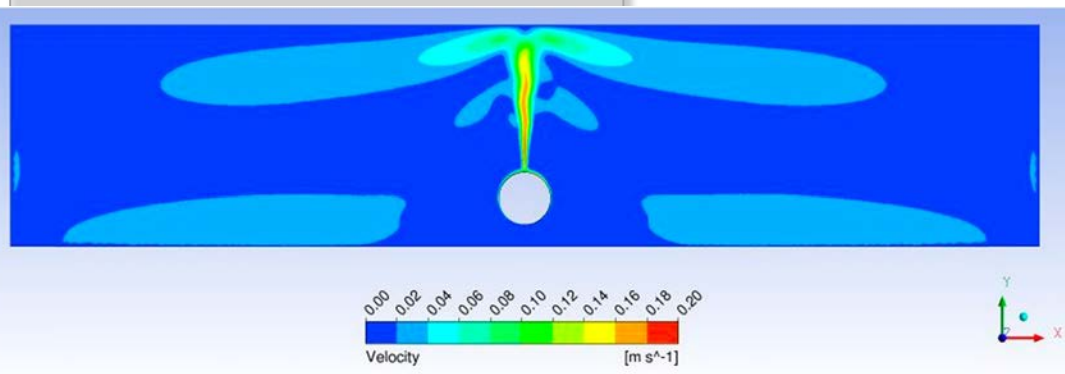
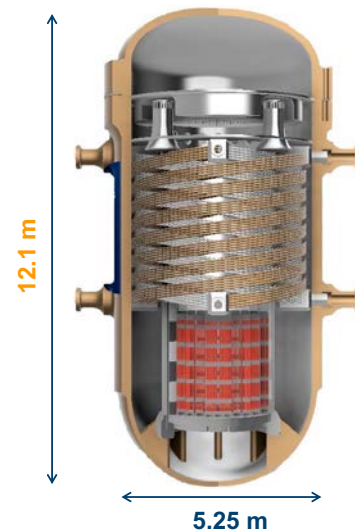
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- FlexBlue



- Studi: CFD performance del contenitore e sistemi passivi
- Configurazione SMR compatto per hull



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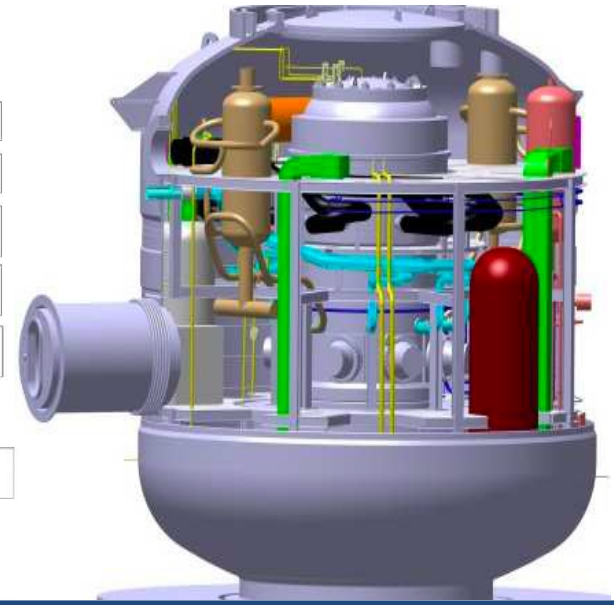
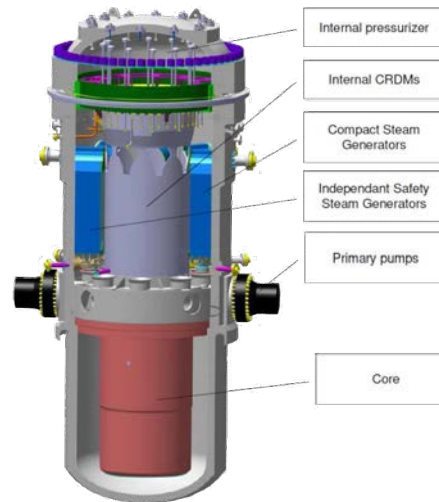
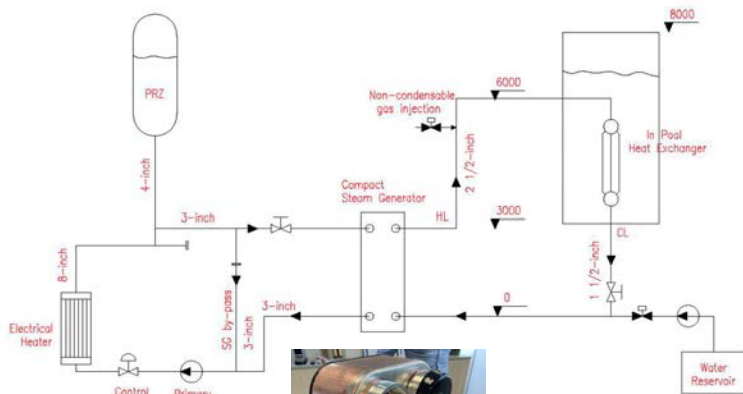
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ELSMOR – Nuward



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- SIET per NuScale



- Test su prototipo Helical Coil Steam Generator (prove termoidrauliche e meccaniche)

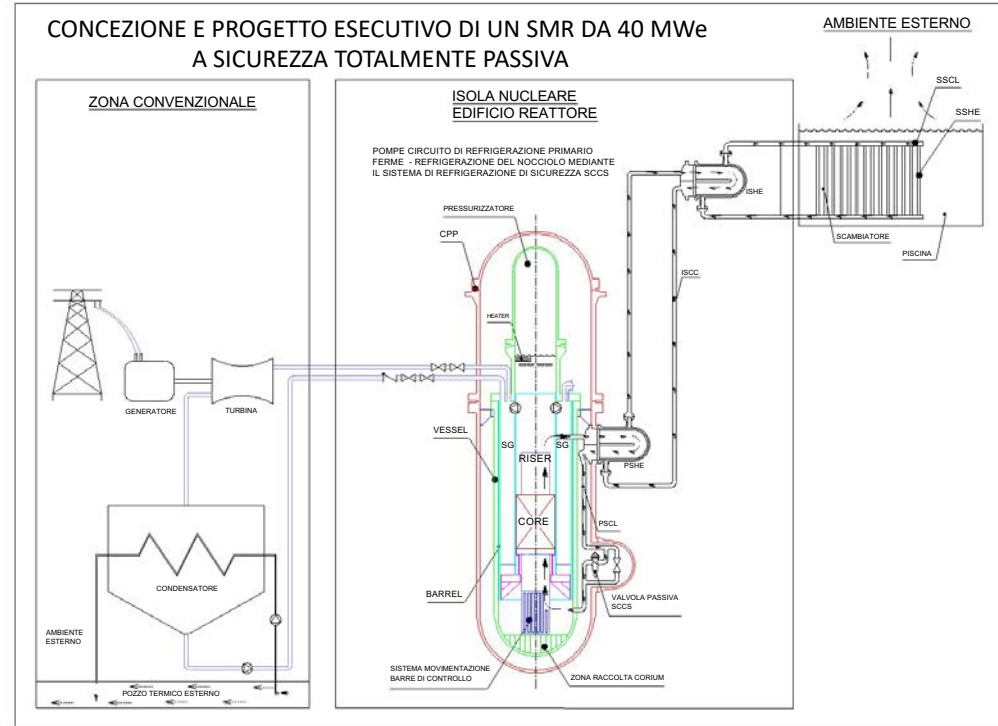
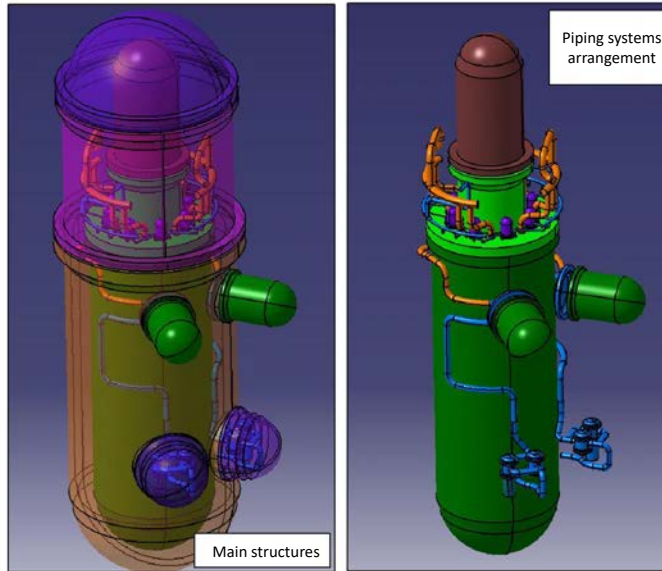


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- Studi SRS

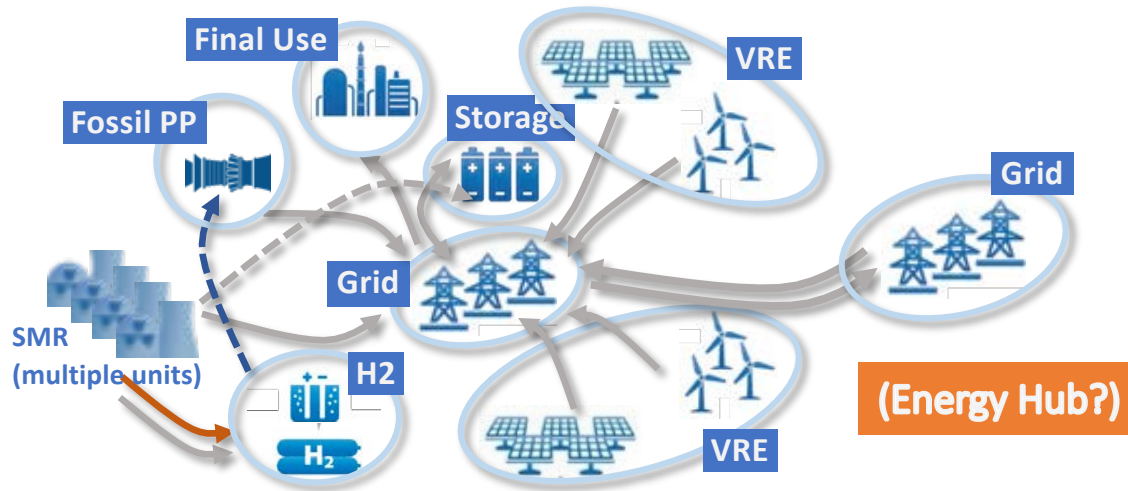
**INTEGRAL
SMALL SIZE
NUCLEAR
REACTOR**



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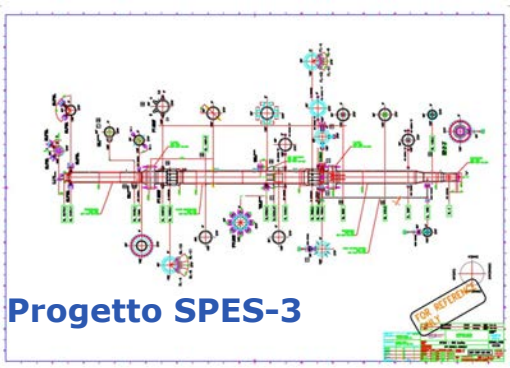
- TANDEM «Small Modular Reactor for a European safe and Decarbonized Energy Mix»



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- Potenziiale ruolo industrie italiane – **filiera di supporto al deployment internazionale di tecnologie SMR**



- Utilities
- SMR Developers
- Manufacturers
- System Integrators
- R&D Bodies and Testing Facilities



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