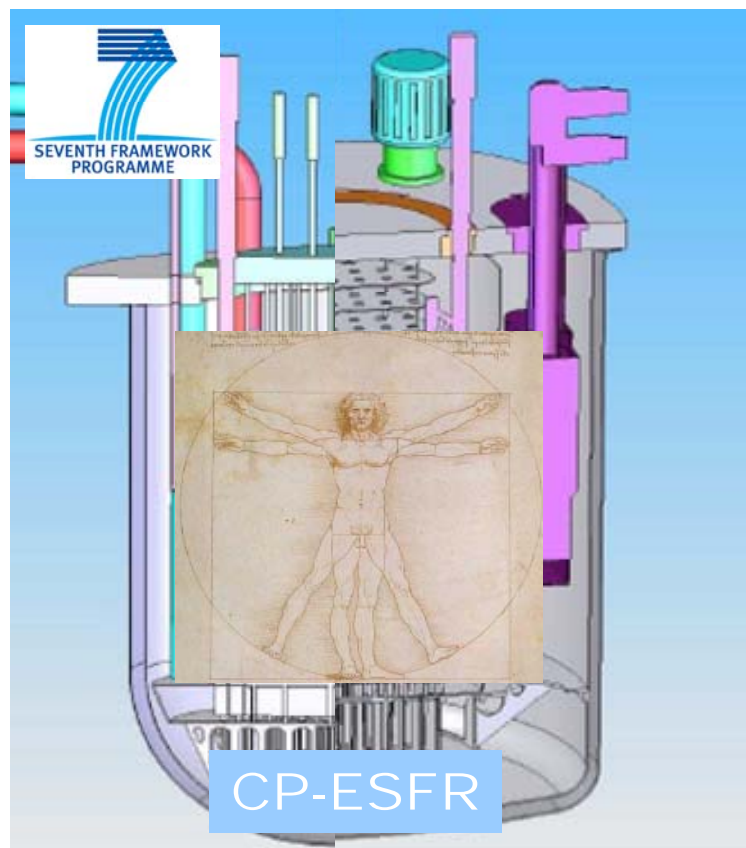




EUROPEAN
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Research Area

Collaborative Project for a European Sodium Fast Reactor **CP ESFR**



Introduction

CP ESFR is a four years large **Collaborative Project on European Sodium Fast Reactor (2009-2012)**; the CP ESFR follows the 6th FP project named “Roadmap for a European Innovative Sodium cooled Fast Reactor – EISOFR” further identifying, organizing and implementing a significant part of the needed R&D effort.

Nature and scope of the project

Fast Reactors have a unique capability as sustainable energy source; the closed fuel cycle allows significantly improving the usage of natural resources and the minimisation of volume and heat load of high-level waste. Among the fast reactor systems, the sodium-cooled fast reactor has the most comprehensive technological basis, thanks to the experience gained internationally from operating experimental, prototype and commercial size reactors.

The schedule for the CP ESFR fits with the principle of an industrial deployment of the ESFR technology around 2040 with the preliminary deployment of a demonstrator by 2020. With such a schedule it seems reasonable to fix the term of 2012 for having an assessment of the industrial perspectives susceptible to answer the objectives listed above.

The Project CP ESFR represents a unique opportunity to bring together countries experienced in sodium technology in order to meet the schedule. Some of these countries never stopped working on this technology, designing or operating plants. Others want to renew their competences engaging young engineers which will be trained to the whole nuclear system design. The important areas of expertises in SFR technology addressed by the project through the partner expertise are: Core design and neutronic performance analysis; Fuel behaviour and performance analysis, fuel manufacturing and fabrication; Mechanics and thermal-hydraulics; Reactor & Balance of Plant design; Risk and Safety analysis, PR&PP assessments and licensing; Economic assessments.

Activities

The key research goals for fourth generation of European sodium cooled fast reactors can be summarized as follow: 1) An improved safety with in particular the achievement of a robust architecture vis à vis of abnormal situations and the robustness of the safety demonstrations will materialize the safety improvement. 2) The guarantee of a financial risk comparable to that of the other means of energy production through the improvement of the economic competitiveness and the reliability of the system. 3) A flexible and robust management of the nuclear materials and especially the waste reduction through the MA burning (both homogeneous or heterogeneous).

The translation of these goals into detailed technical requirements has been done by the EISOFR exercise and they have been integrated within the CP ESFR. Through a four years programme, the CP ESFR wants to address key viability and performance issues to support the development of an ESFR.

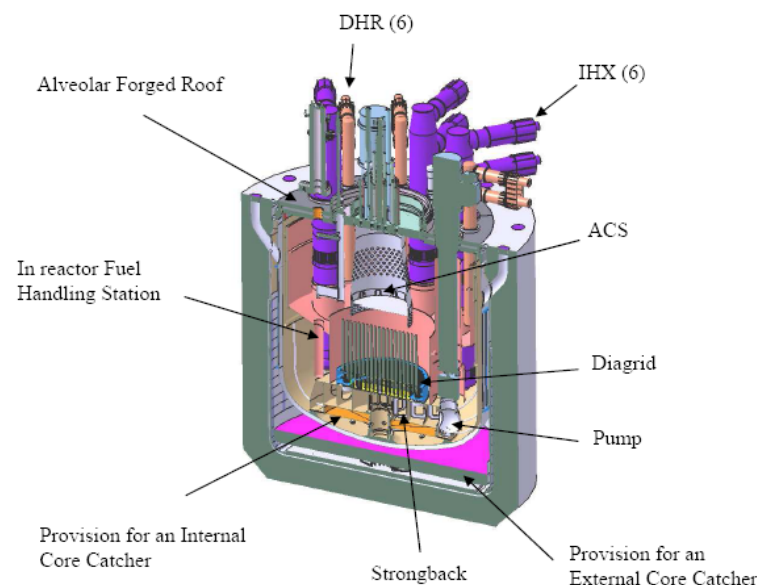
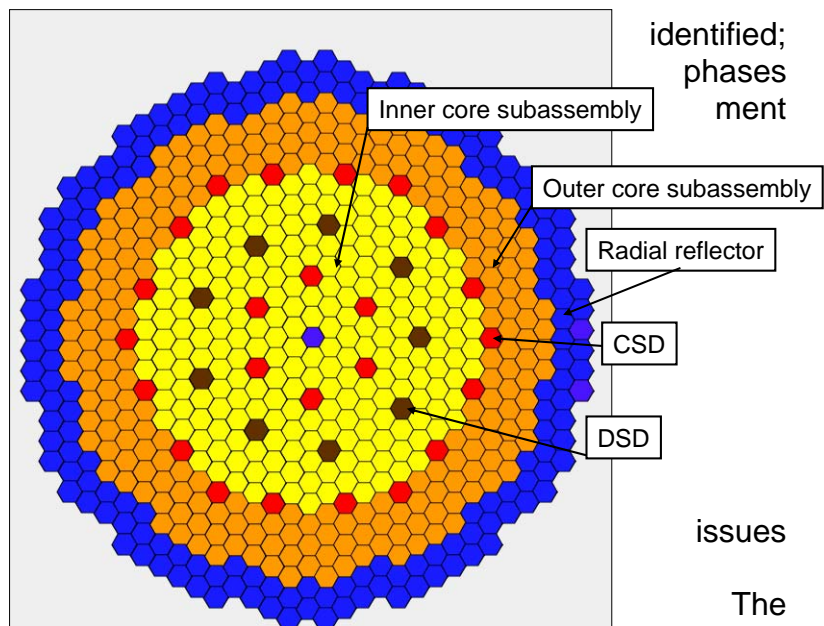
Starting “working horse” images on cores and Systems have already been provided by CEA (Fig. 1) and AREVA (Fig. 2). The CPESFR participants are presently working for their improvement and optimization.

The concern of Education & Training is explicitly addressed by the project through a specific Sub Project. Coherently with the EU recommendations, the CP ESFR foresees a dedicated budget (~5% of the total project budget) for the development and delivery of training courses in the subject matter of the project and some doctoral dissertations.

Expected results

Two main steps are they represent the very first of the whole ESFR development-program:

- A first period of 2 years (2009 – 2010/11) the objective of which will be to assess and down select innovative options susceptible to be introduced into the system solving, when needed, the corresponding viability or start confirming the expected performances. stage will end selecting a consistent set of ESFR pre-conceptual designs (reference(s) + variants, if justified).



- The following period (2010/11 – 2012/13), will be used to confirm the performances of the retained options and to deeply assess their interest and their aptness to fit the requirements. This will result in the endorsement of a set of consistent optimized options which could be implemented on the future ESFR.

Societal impact

Due to considerable economic effort which is needed to meet the extremely ambitious schedule, the development of an innovative sodium cooled fast reactor technology needs to join national efforts. The impact of these efforts takes place at various levels: on one hand at the national and European level for contributor's countries and, on the other hand, at the world level, with in particular its inscription within the frame of the activities of the Generation IV International Forum or of the IAEA / INPRO, and finally on European Education and Training.

As for the national and European impact the content of the CP ESFR is an important and even essential contribution to the Strategic Research Agenda (SRA) of the Sustainable Nuclear Energy Technology Platform (SNE-TP).

As for the worldwide level the CP ESFR represents first of all an opportunity for Europe to confirm its place within the framework of Generation IV with a contribution that widens significantly the covered domains. Secondly, the realization of activities which are implicitly motivated by the studies of the IAEA / INPRO, places Europe in the context of the activities recommended by the IAEA with the potential for a concrete contribution to these activities.

A third type of impact has finally to be underlined to remind its importance although, for this one, the contribution of the CP-ESFR can be only punctual. It is about the education & training of young generations of engineers and technicians for which the CP ESFR bring a new framework.

Project information

Project type: Collaborative project

Project start date: 01/01/2009

Duration: 48 months

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2.	AMEC NUCLEAR UK LIMITED	AMEC	United Kingdom
3.	ANSALDO	ANSALDO	Italy
4.	AREVA NP	AREVA NP	France
5.	CESI Ricerca	CESI-R	Italy
6.	CIEMAT	CIEMAT	Spain
7.	Del Fungo Giera Energia S.p.A.	DFGE	Italy
8.	Electricité de France	EDF	France
9.	Empresarios Agrupados	EA	Spain
10.	ENEA	ENEA	Italy
11.	Energovyzkum	EVM	Czech Rep.
12.	Forschungszentrum Karlsruhe	FZK	Germany
13.	Forschungszentrum Rossendorf	FZD	Germany
14.	Joint Research Centre	JRC - ITU	Europe
		JRC - IPSC	Europe
		JRC - IE	Europe
15.	Nuclear Research and Consultancy Group	NRG	Netherlands
16.	Nuclear Research Institute Rez plc	NRI	Czech Rep.
17.	Paul Scherrer Institute	PSI	Switzerland
18.	SENER	SENER	Spain
19.	University of Karlsruhe	Uni-Ka	Germany
20.	Università degli Studi di Roma "La Sapienza"	Uni-Rm	Italy
21.	Universidad Politécnica de Madrid	UPM	Spain
22.	Institute for Radiological Protection and Nuclear Safety	IRSN	France
23.	Equipos Nucleares SA	ENSA	Spain
24.	ACCIONA Infraestructuras	ACCIONA	Spain
25.	Institute of Physics of University of Latvia	IPUL	Latvia