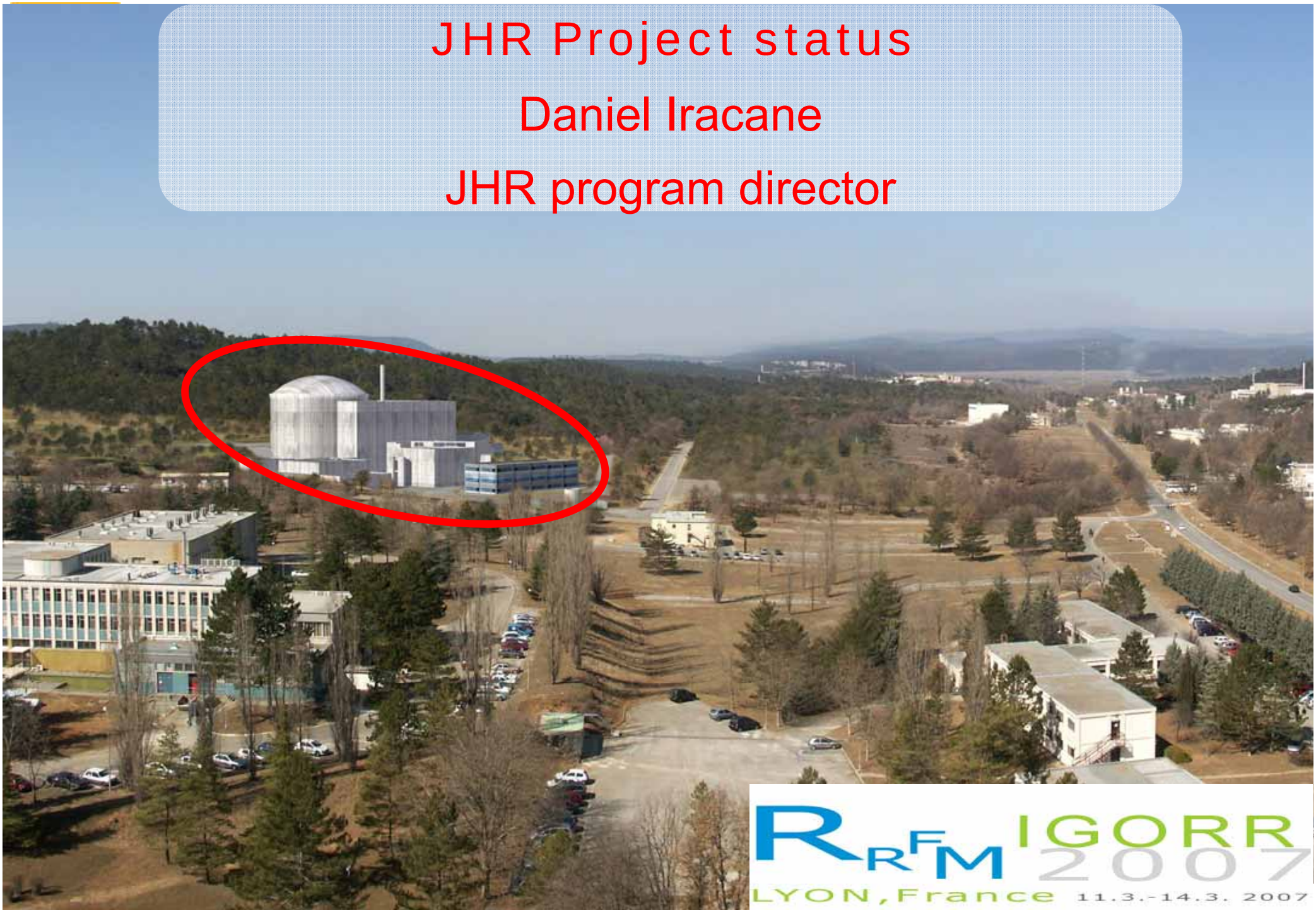
JHR Project status

Daniel Iracane

JHR program director



RRFM IGORR 2007

LYON, France 11.3.-14.3. 2007

2007, a major milestone for the JHR project

- Early in 2007
  - ✓ Signature of the JHR Consortium Agreement by 8 Partners
  - ✓ Formal decision to launch the construction
    - ☞ The site is being prepared
- In the coming months
  - ✓ Construction permit delivery
  - ✓ Assessment by the safety body of the Preliminary safety analysis report

JHR construction is launched

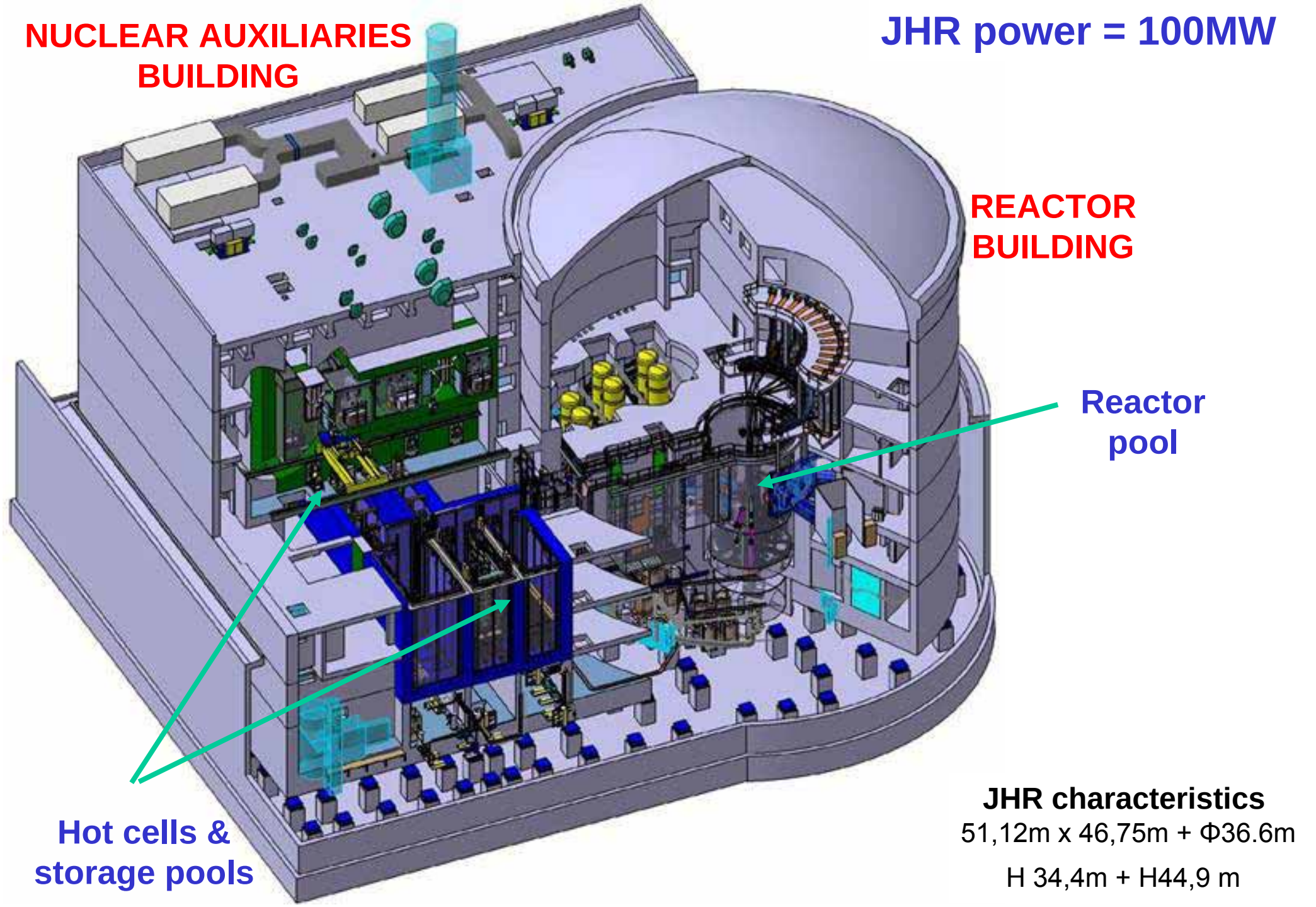
- Detailed design studies are completed — 2003-2005
  - ✓ ~ 300 persons.years from AREVA, EDF and CEA
  - ✓ Concluded by a large review
- Development studies — 2006- mid 08
  - ✓ launched in due time — January 2006
  - ✓ Content: site preparation, calls for tenders, qualifications …
- Good public acceptation
  - ✓ Public consultation completed in — April 2005
  - ✓ Public enquiry completed in — February 2007
- Regulation process
  - ✓ Preliminary safety analysis report, released in — March 2006
    - ☞ Preliminary safety options assessed by Regulatory Body — April 2003
  - ✓ Preliminary safety analysis report assessment — 2007
  - ✓ Construction permit delivery — 2007
- Construction phase & tests — 2008-2013
- Start of operations — 2014

Preparation of the site

Cadarache

Beginning of March:

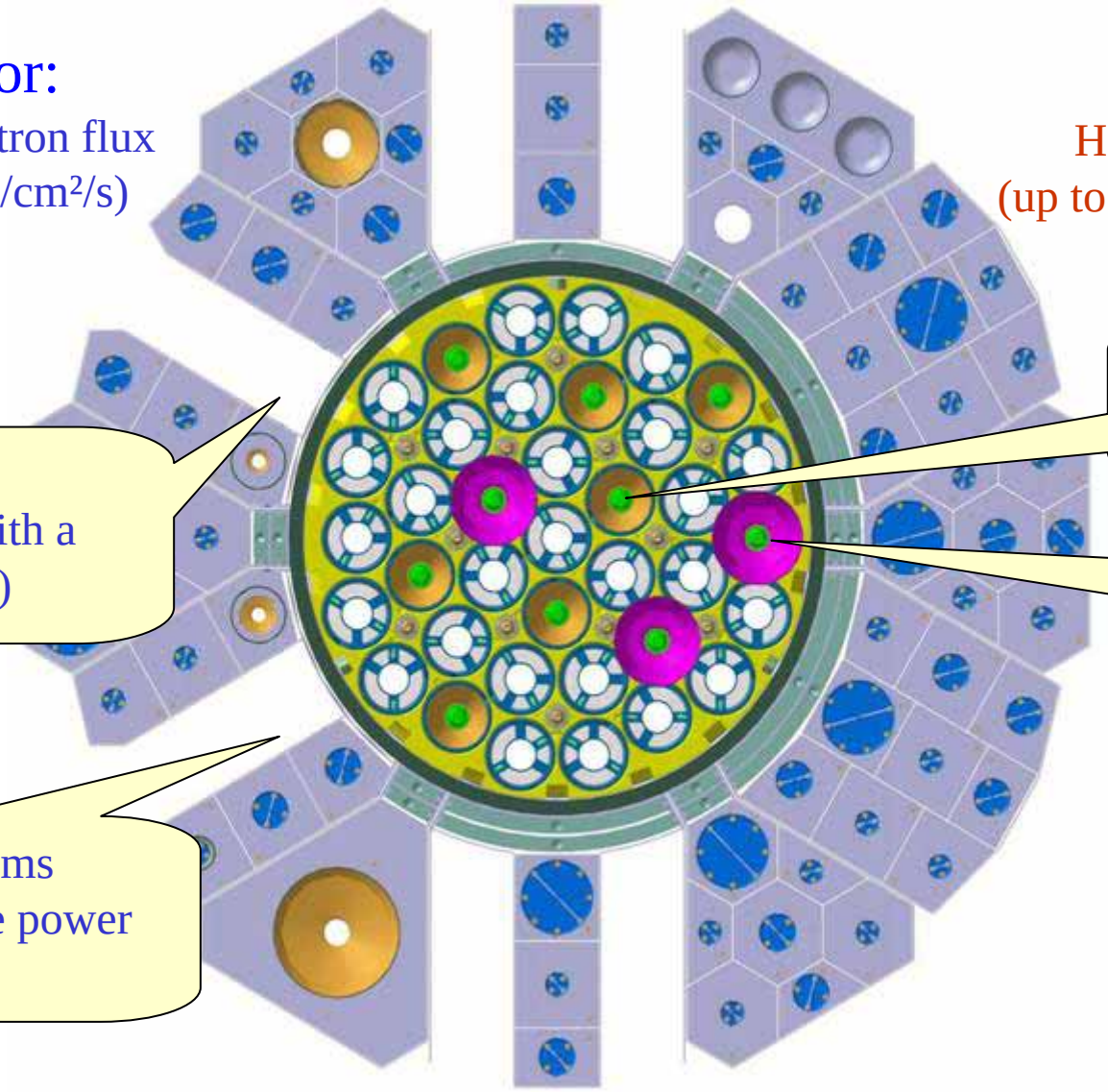
The main JHR characteristics have been confirmed


NUCLEAR AUXILIARIES BUILDING
JHR power = 100MW
REACTOR BUILDING
Reactor pool
Hot cells & storage pools
JHR characteristics
51,12m x 46,75m + Φ36.6m
H 34,4m + H44,9 m

20 simultaneous experiments
coupled with 4 cells, bunkers, fission product on line laboratory, ...

In reflector:
High thermal neutron flux
(up to 5.5 10^{14} n/cm²/s)

In core:
High fast neutron flux
(up to 10^{15} n/cm²/s > 0.1MeV)



Material ageing
(up to 16 dpa/y)

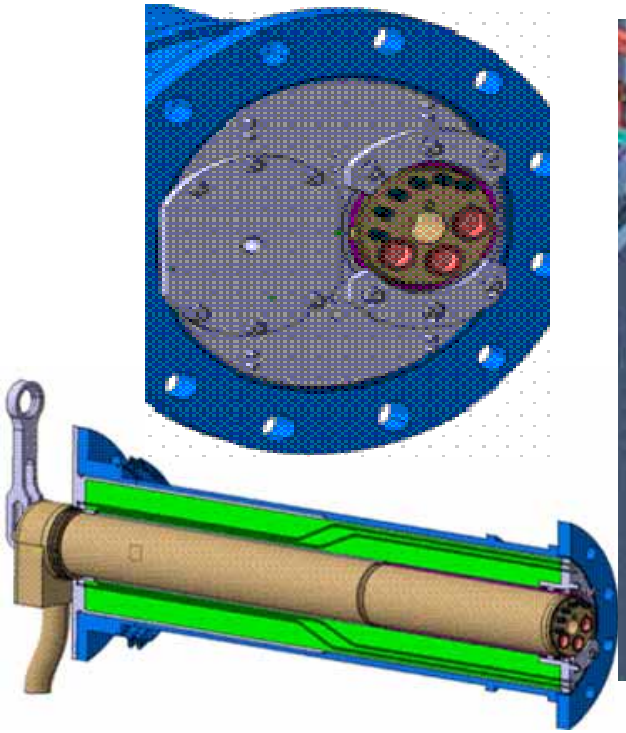
Gen IV fuels
(GFR, ..)

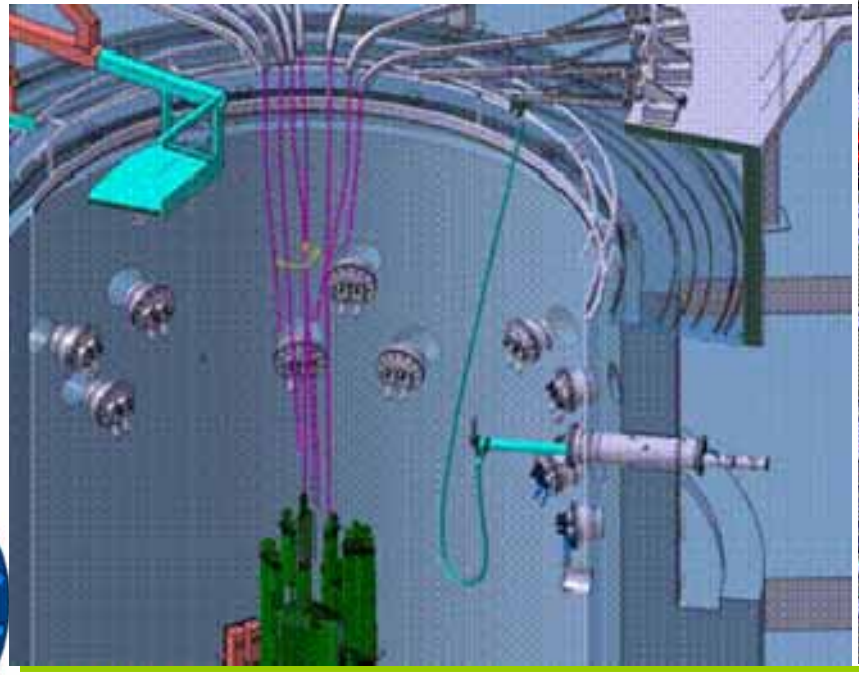
Fuel studies
(up to 600 W/cm with a
1% 235U PWR rod)

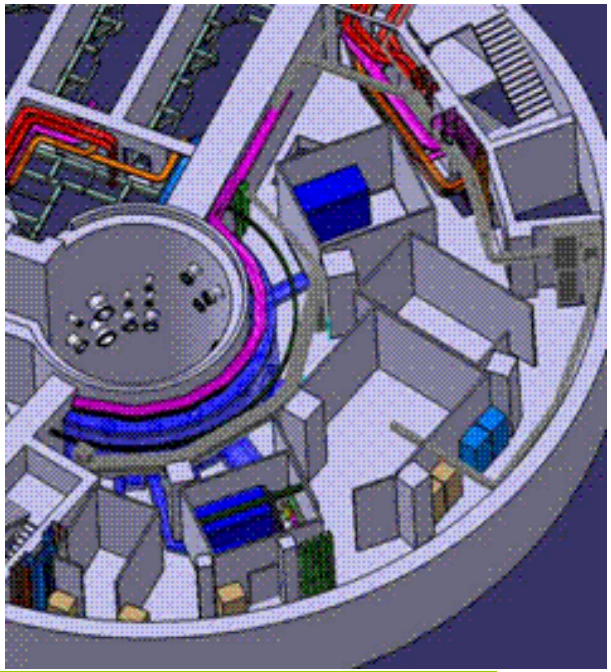
Displacement systems
To adjust the fissile power
To study transients

Loop accommodation capability

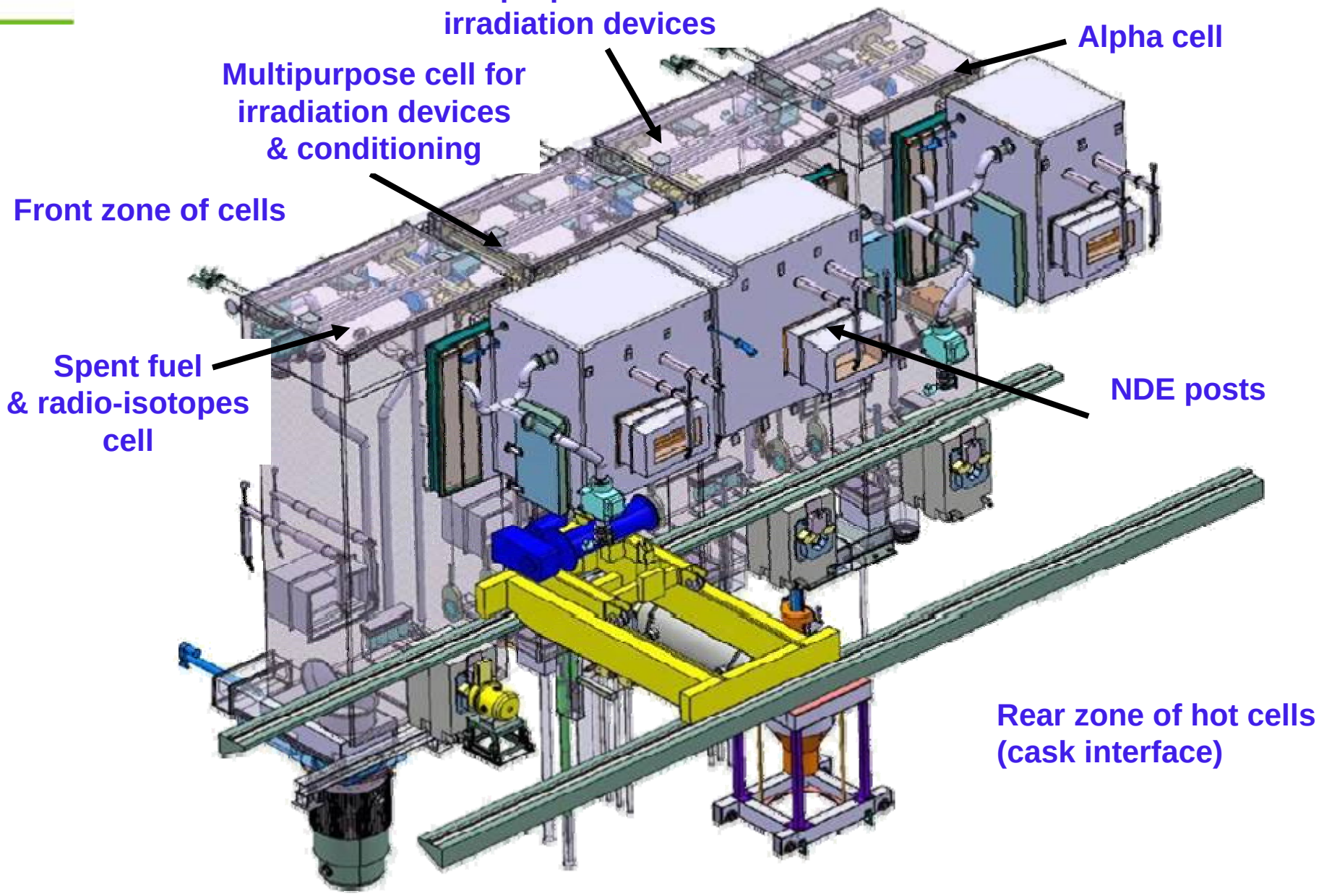
- Experimental area characteristics
  - ✓ Over 3 floors, technical rooms = 490 m2 ; experimental cubicle = 780 m2
  - ✓ Penetrations between reactor pool and experimental cubicles: 11 (2 for FP lab)
- 10 operating cubicles + 2 cubicles on standby
- More than 20 irradiation devices among which 10 connected to cubicles and 6 to Fission Product lab



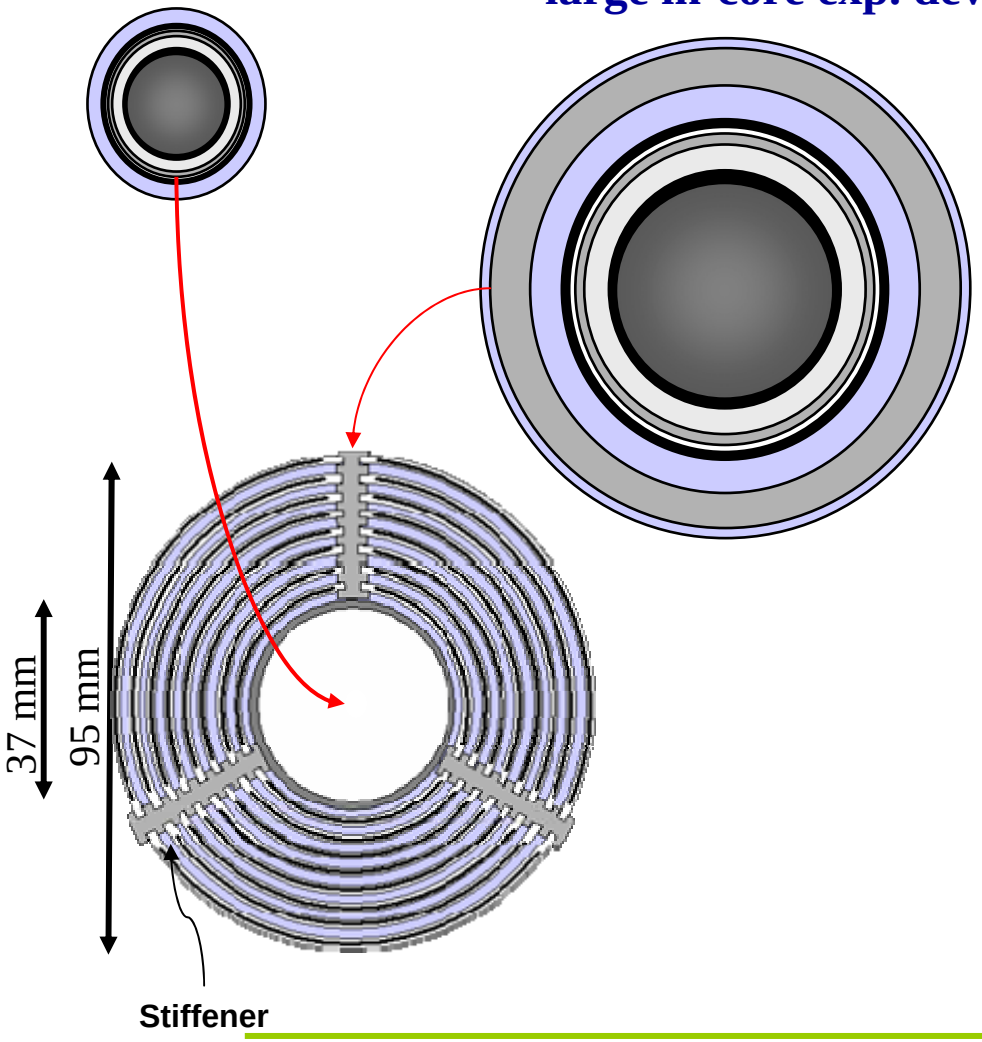




JHR hot cells



JHR designed for using High density reprocessable LEU fuel



Fuel element (3x8 plates), 600mm

aluminium alloy cladding

UMo/Al 19.75%, 8 gU/cm3

developed within

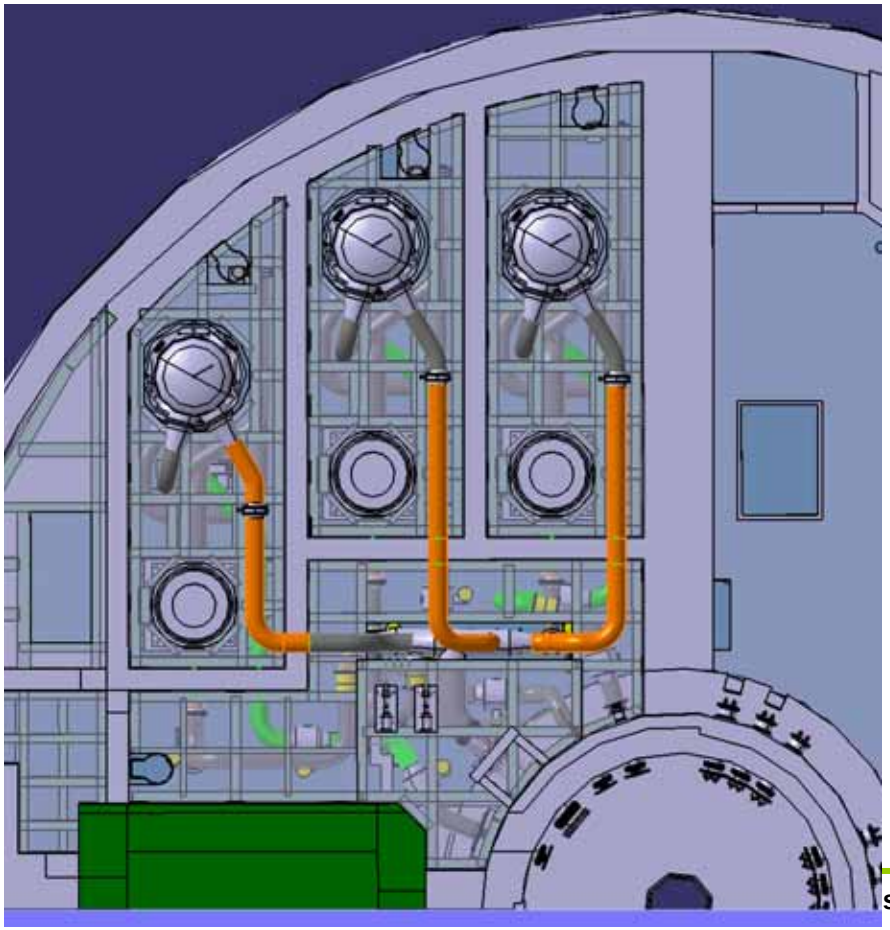
international collaboration

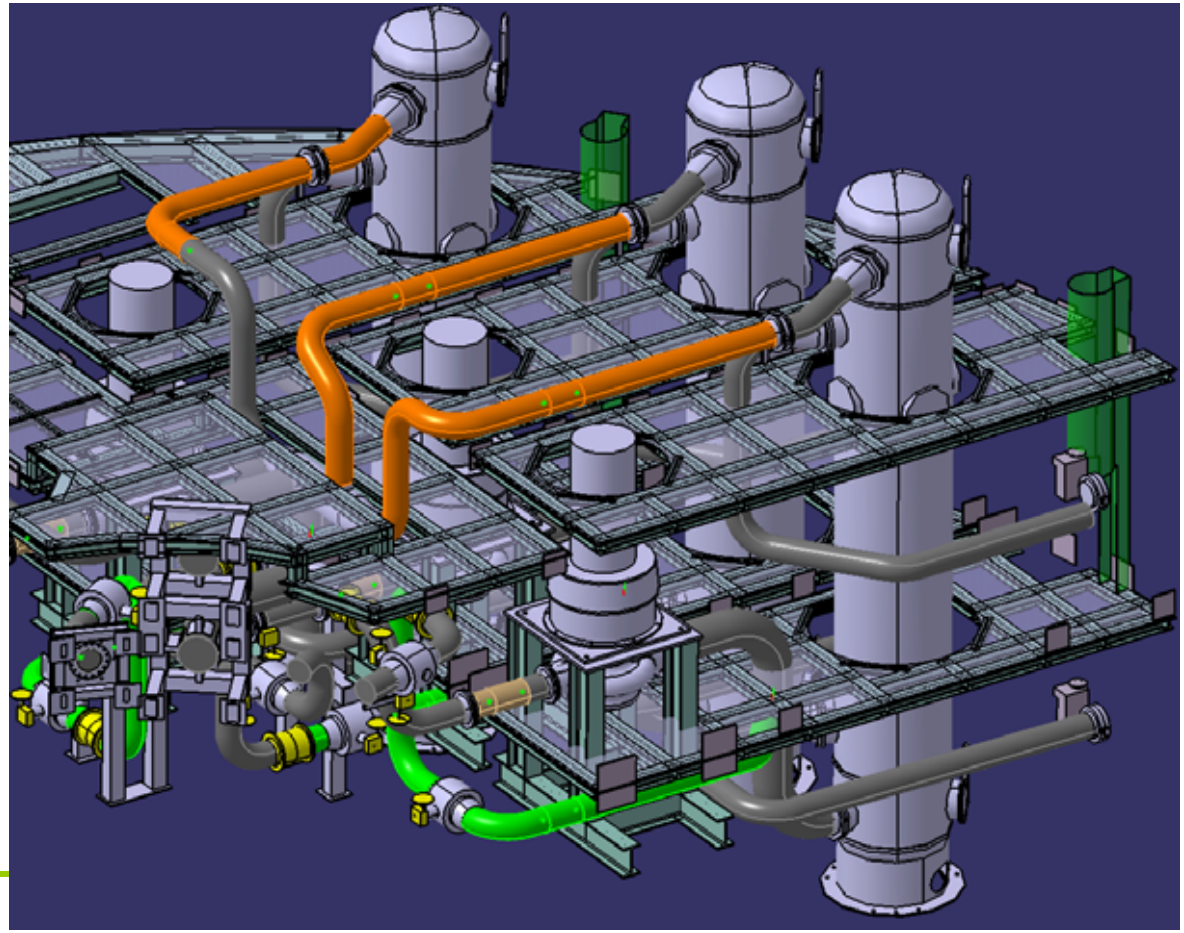
JHR fuel implementation strategy

- JHR is designed to be operated with high density LEU fuel, the UMo
- The UMo industrial agenda is not yet secured
- JHR may start operation in 2014 with a back-up fuel solution
- The back-up solution was optimised with an enrichment as low as reasonably achievable to avoid significant penalty to the JHR scientific and commercial performances : U3Si2, 4,8 g/cc, 27% enrichment
- This back-up solution will be implemented for a limited period
  - ✓ waiting for the industrial availability of a REPROCESSABLE & LEU Fuel
  - ✓ Conversion in the same agenda than other MTRs and Research Reactor currently using HEU
  - ✓ CEA is strongly committed in the international collaboration for the development of UMo

2006 optimisation

- Large review process at the end of the definition phase (end 2005)
- Purpose: decrease the technical risks with few % impact on the performance
  - ✓ ↘ primary circuit flow and ↘ velocity in the fuel assemblies
  - ✓ -40% on the pump power and 1 exchanger per file (compared to two initially)





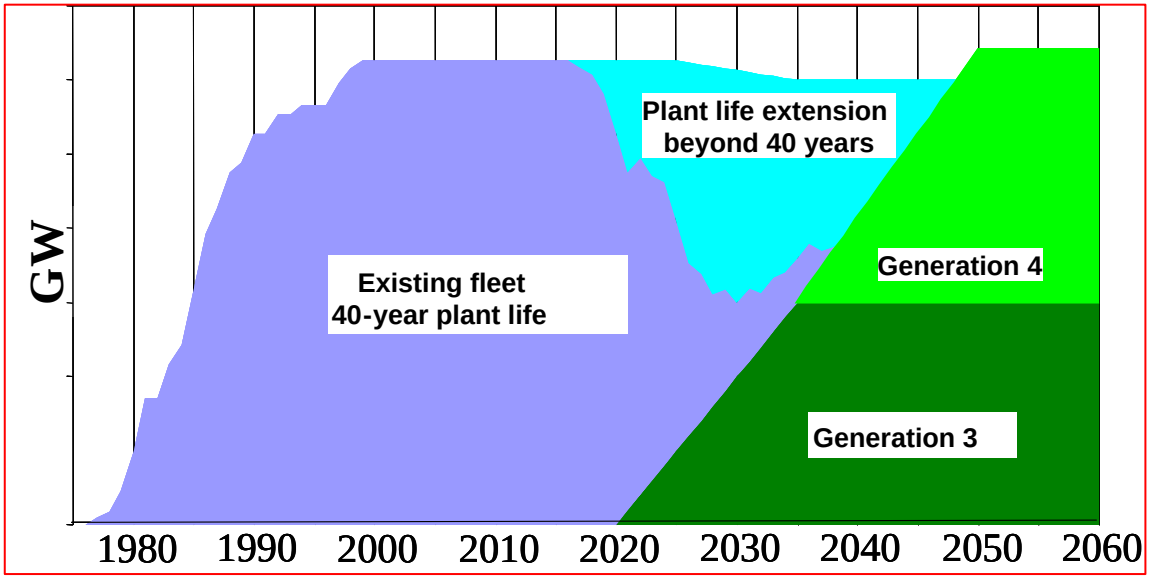
Decision (end 2006) to launch the JHR construction

The roadmap for implementing JHR, a new major research infrastructure

- The initial question
  - ✓ How to renew large research infrastructures facing the continuous industrial and public needs
- Sharing the strategy in the community
  - ✓ A comprehensive survey: FEUNMARR, Future European Union Needs in MAterial Research Reactors, 5th FP thematic network, Nov. 2001 – Oct 2002
  - ✓ Plus bilateral discussions to build up a common view
- Building the economy of the project
  - ✓ by a balanced contribution between Public and Private funding
  - ✓ By an important contribution from the hosting country
- Working out the legal structure
- Assessment
  - ✓ at the European level (European Strategic Forum for Research Infrastructure ESFRI)
  - ✓ and International level (OECD/NEA International Advisory Group)

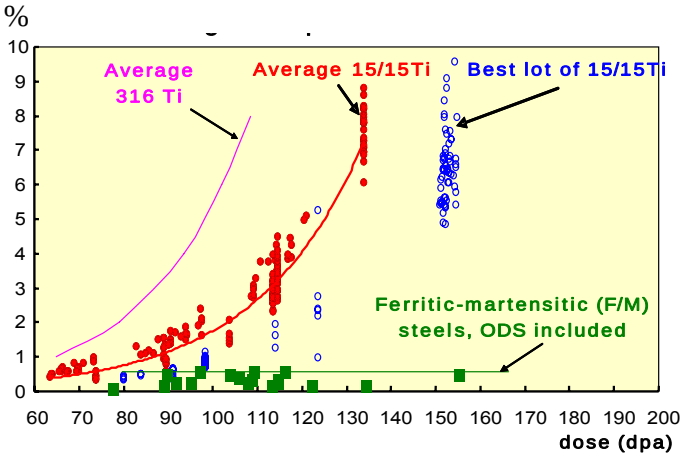
JHR is optimised for high performance material and fuel testing

- JHR support generation 2, 3, 4 power reactors
  - ✓ Safety and plant life time management (Gen 2 & 3)
  - ✓ Optimisation & safety for fuel technology and for Gen 3 reactors
  - ✓ Fuel & material innovation for future systems



New materials (SiC, ODS) under high flux and T

Hoop deformation of different grades of austenitic Phénix claddings and ferrito-martensitic materials versus dose



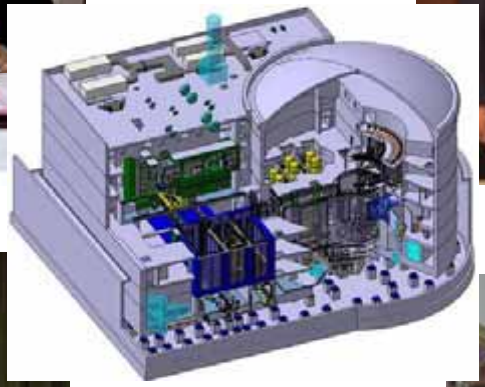
LWR Fuel tests in steady or transient regimes (optimisation, safety tests)

JHR Consortium status

- The JHR Consortium Agreement binds Members contributing to the financing of the JHR construction.
  - ✓ CEA, EDF, AREVA, SCK (Belgium), NRI (Czech Republic), VTT (Finland), CIEMAT (+ a pool of industries & public bodies, Spain), JAEA (Japan, under process)
  - ✓ CEA, still willing to enlarge the Consortium during the construction phase
    - ☞ Ongoing discussions with several other European and non-European countries
  - ✓ JHR will benefit from the EC support through the 7th + 8th FP
- CEA is the owner and nuclear operator of the JHR.
- Consortium Members have a secured and guaranteed access to experimental JHR locations to perform
  - ✓ Their Proprietary Experimental Programs
  - ✓ A Joint Program opened to international collaboration
  - ✓ Operation costs are paid only for utilised rights
- Non-Member: access under decision & commercial policy of the JHR Consortium Board

JHR Bilateral Agreements between CEA and

Mai 2006, NRI-Czech Rep.



August 2006 VTT-Finland

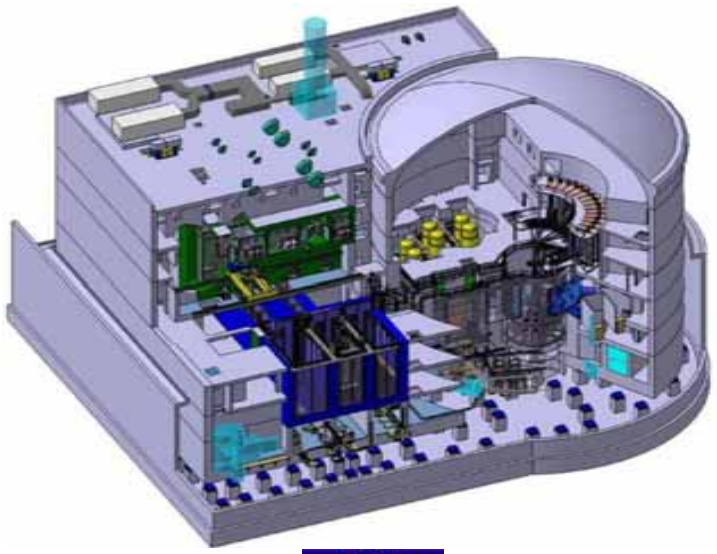
Jully 2006, CIEMAT-Spain

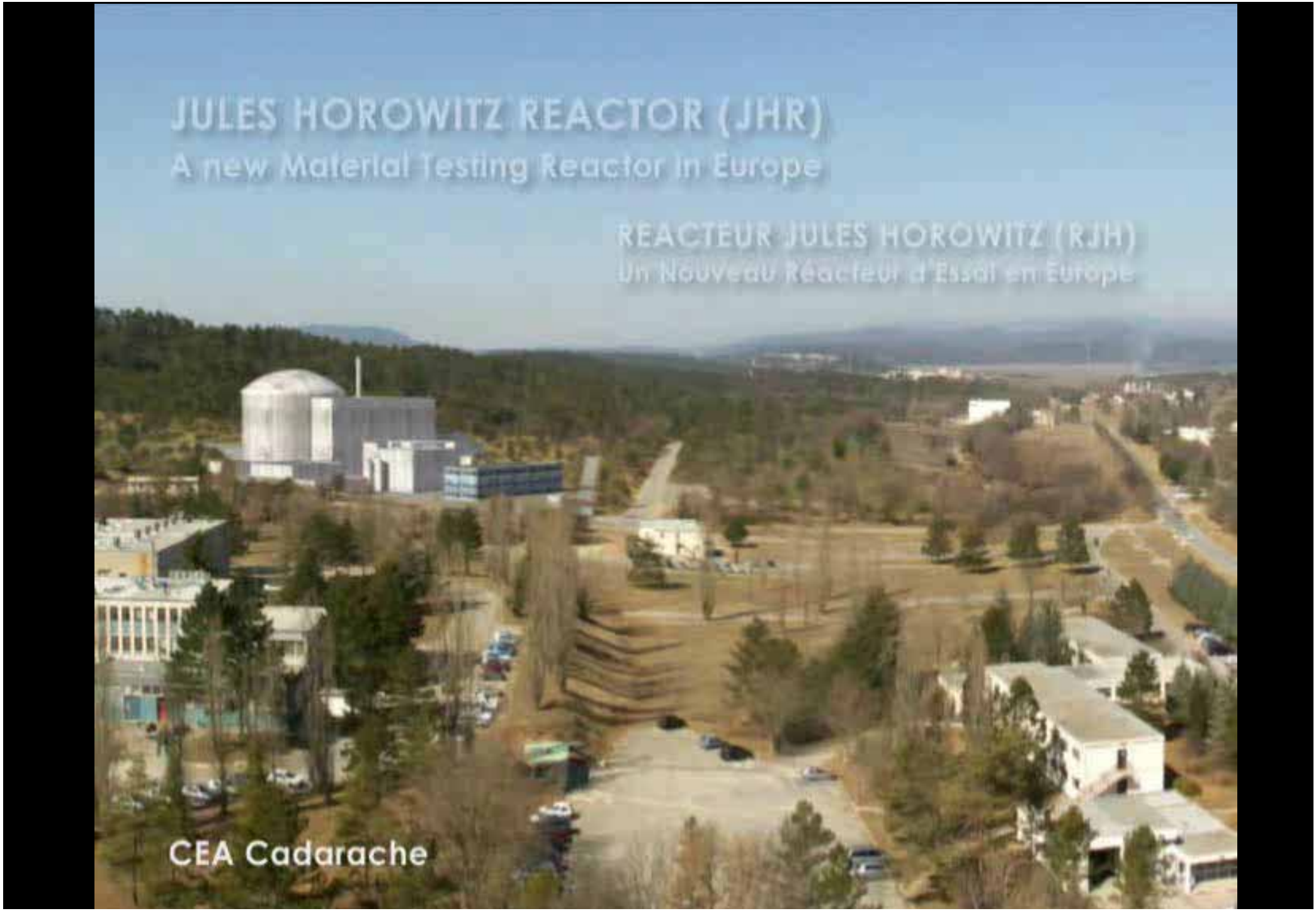
October 2006, SCK-CEN Belgium

Decemberr 2006, AREVA

October 2006, EDF

Signature of the JHR Consortium Agreement on the 19/03/2007




JULES HOROWITZ REACTOR (JHR)
A new Material Testing Reactor in Europe
REACTEUR JULES HOROWITZ (RJH)
Un Nouveau Réacteur d'Essai en Europe
CEA Cadarache