



JRC Institute for Energy Petten, The Netherlands

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*Annual Enlargement and Integration Workshop
20 April 2007*

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Petten History

- August 1957: the construction of the HFR started.
- November 1961: the HFR reached its first major milestone, the reactor was started for the first time and during 1962, the reactor came into full operation.
- 1962: In order to facilitate European usage of this unique facility, the Dutch authorities decided to transfer the ownership of the HFR to the Euratom, i.e. European Commission.





Petten History

- 70's: name changed from *Euratom* to the *Joint Research Centre, location Petten*.
- 80's: the institute received a name relevant to its specific expertise namely *The Institute for Advanced Materials (IAM)* and some activities in Ispra became part of the IAM (Ispra and Petten site).
- 90's: all activities were relocated in Petten and further developed.
- September 2001: the institute refocused its research towards purely energy related work and most materials research was phased out. Consequently the Institute became known as *The Institute for Energy (IE)*.





EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre



The Petten Site

Synergy in the Petten Dunes



Joint Research Centre



ECN
energy-innovation

Personnel:
650



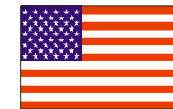
AN ECN KEMA COMPANY

Personnel:
250 (Petten)
70 (Arnhem)



Institute for Energy

Personnel:
250



Personnel:
270



Institute for Energy



Institute for Energy (IE)

The Institute provides scientific and technical support for the conception, development, implementation and monitoring of community policies related to energy.

Special emphasis is given on the security of energy supply and sustainable and safe energy production.

Institute for Energy



IE Activities

Nuclear Safety

- Making both existing and new designs of nuclear power plants even safer

In enlarged EU & CIS



Clean & Sustainable Energy

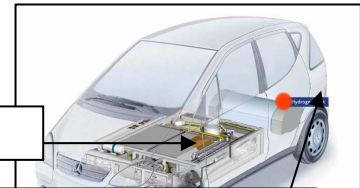
- Hydrogen production, storage, utilization
- Waste and biomass



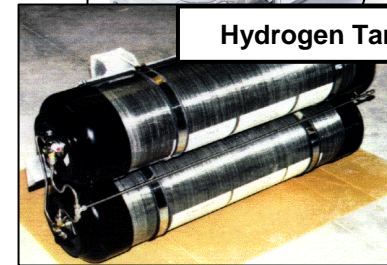
Energy Systems Evaluation

Evaluation, comparison, prediction of different energy sources /demand

Fuel Cell System



Hydrogen Tanks



The High Flux Reactor

- Nuclear Safety

Existing and innovative reactors

- Medical Applications
- Fundamental and applied research with beam tubes



Support to nuclear safety.



Nuclear Safety at IE

ACCIDENT PREVENTION:

Integrity of the Reactor Coolant System

ACCIDENT MITIGATION:

Integrity of the Confinement System

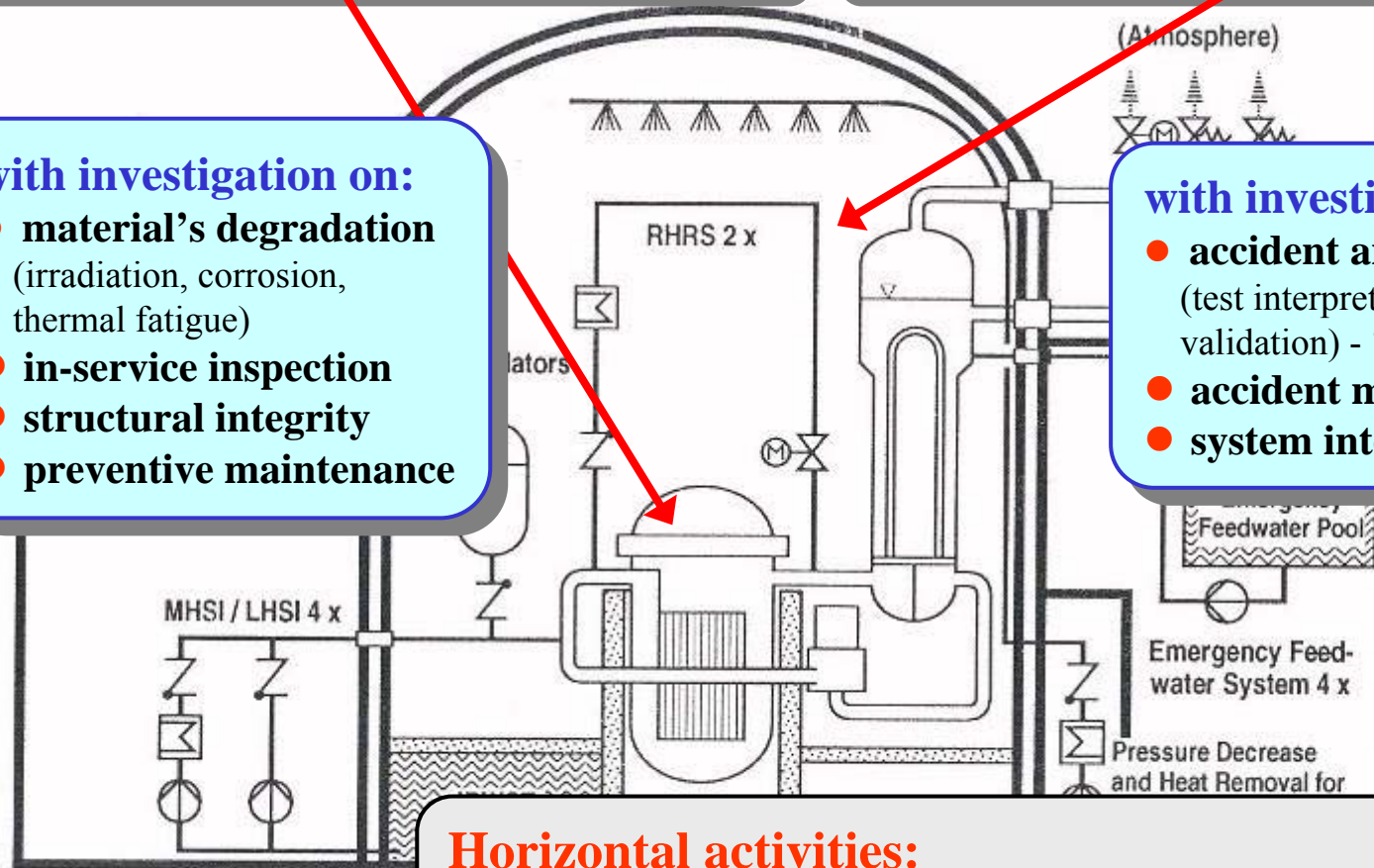
Joint Research Centre

with investigation on:

- **material's degradation**
(irradiation, corrosion, thermal fatigue)
- **in-service inspection**
- **structural integrity**
- **preventive maintenance**

with investigation on:

- **accident analysis**
(test interpretation, code validation) - 'severe accidents'
- **accident management**
- **system interaction**



Horizontal activities:

- **probabilistic & risk assessment methodologies**
- **data management & dissemination**
- **training**
- **Operating Experience Feedback**



Nuclear Plant LIFE Prediction - NULIFE Network of Excellence, co-financed by DG-RTD

- **NULIFE** will create a single **EU** organisational structure to provide harmonised R&D in the area of lifetime evaluation methods for structural components
- It addresses the need to maintaining the highest possible levels of safety in Europe's fleet of 150 nuclear power plants, by integrating European R&D efforts
- There are 10 core contractors (of which **JRC** is one) and 27 associate organisations; VTT is the coordinator
- Launch: 29th September 2006
- Its work programme is prioritised by a End-User Group, comprising plant operators and vendors.





The Generation IV International Forum (GIF)

- **International initiative (currently 11 members) to support R&D, within a time frame from 15 to 20 years and to reach technical maturity by 2030**
- **The 5 GIF fundamental criteria :**
 - Sustainability
 - Non-Proliferation and physical protection
 - **Safety** and reliability
 - Minimization of waste production
 - Economics
- **Designed for different applications**
 - Electricity, Hydrogen
 - Desalinated water, Heat
- **EU Coordination by JRC**



+ future new members
China and Russia





TACIS* and PHARE** nuclear safety

- JRC contribution to the safety improvement of operating NPPs of Russian design: scientific assistance to EC policy DGs External Relations and EuropeAid Cooperation Office (AIDCO) in charge of the TACIS programme in all phases from project preparation until completion
- Support to DG AIDCO in all areas of TACIS nuclear safety:
 - On-Site Assistance and operational safety
 - Design Safety, Off-Site Emergency Preparedness
 - Regulatory Authorities and their Technical Support Organisations
 - Industrial Radioactive Waste Management and Decommissioning
- Direct implementation of TACIS and PHARE projects:
 - Dissemination of TACIS and PHARE projects results
 - Embrittlement of Russian and Ukrainian VVER reactor pressure vessels



***to be replaced by INSC (Instrument for Nuclear Safety Cooperation) for 2007-2013**

****PHARE is replaced by IPA (Instrument for Pre-accession Assistance) for the period 2007-2013**



JRC – IE High Flux Reactor

Light water cooled and moderated 45 MWth tank-in-pool multi-purpose materials testing reactor

- 33 low enriched fuel elements
- 6 control rods
- 23 beryllium reflector elements
- 19 in-core irradiation positions
- 22 irradiation positions in pool-side facility
- 12 horizontal beam tubes
- > 280 full-power days of operation per year

$$\Phi_{\text{ThermalMax}} (E < 0.625 \text{ eV}) = 2.9 \cdot 10^{14} \text{ (n/cm}^2\text{/s)}$$

$$\Phi_{\text{FastMax}} (E > 1.0 \text{ MeV}) = 1.75 \cdot 10^{14} \text{ (n/cm}^2\text{/s)}$$

HFR Joint Undertaking:

- Enquiry to gauge interest of Member States/organizations is on-going.
- More than 10 expressions of interest.
- Target: submission for Council Decision and finalization in 2007.

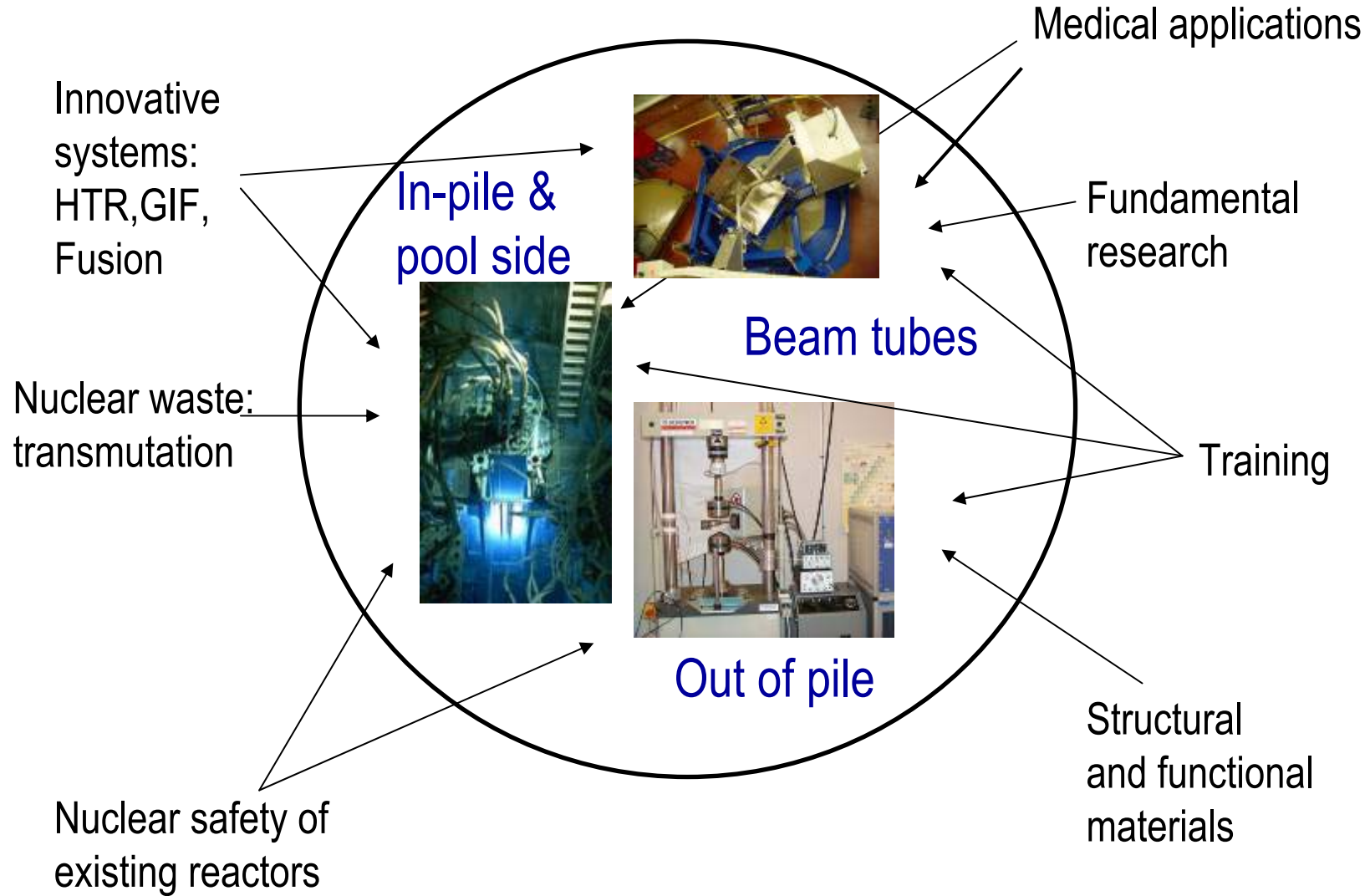




The HFR Scientific Strategy



Joint Research Centre





Support to the cleaner energies.



Energy & Biofuels from Waste and Biomass

- **Process conversion efficiency**
highest possible energy/biofuel yield with highest possible process reliability and minimum risk to the environment:
 - combustion & gasification/pyrolysis
 - sensor development for process monitoring
 - component reliability assessment
 - synthetic/alternative fuel production
 - definition of Best Available Techniques
- **PREWIN waste incineration network**
managing network of 75 organizations; technical support to industry; support to policy makers
- **Enlargement and Integration**
training workshops on energy and biofuels from waste and biomass

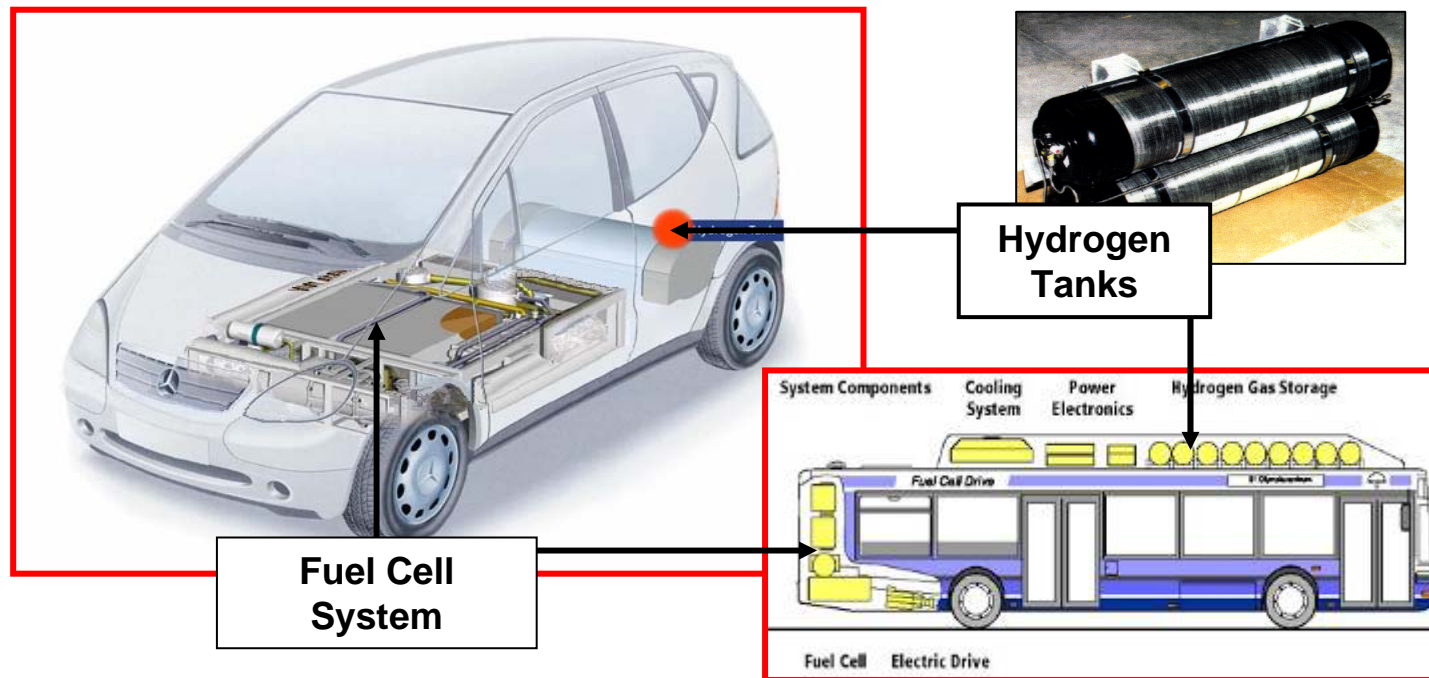




Testing of Alternative Fuel Tanks

Focus:

- Green paper “Towards a European Strategy for Security of Energy Supply” Reduce greenhouse gas emissions and reduce European Union’s energy dependency: introduce substitute fuels at Community level (20% by year 2020).
- EP and Council Directive on the promotion of alternative fuels for road transportation : short-term: Biofuels, middle-term: Natural Gas, long -term: Hydrogen





Hydrogen “Safety Cell”





Fuel Cell System Testing, Safety and Quality Assurance (FCTES^{QA})



Objectives:

- Validating and benchmarking - by means of experimental campaigns - the results of the FP5 funded RTN **FCTESTNET** (Fuel Cells Testing and Standardisation Network)
- Providing direct comparisons of competing fuel cell technologies in terms of performance and operational characteristics



25 EU partners + 6 INCO partners
(including US DOE, KIST, NEDO, DICP)

Results of FCTES^{QA} are being disseminated within the SSA FCTEDI (Fuel Cell Testing and Dissemination)

FCTEDI consortium is composed of 16 partners including BR, CN, RUS & KOR participants





The international dimension of hydrogen activities at IE

Hydrogen & Fuel Cell Technology platform

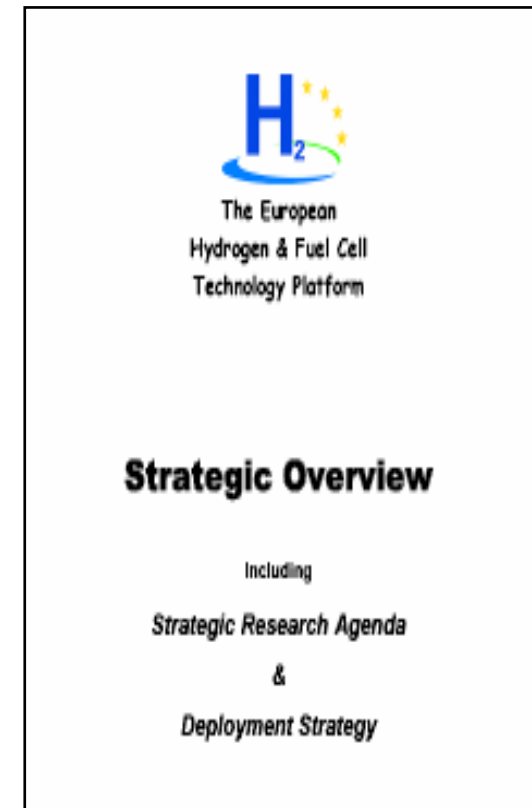
- Essential input to SRA, DS, IP documents
- Active participation (RCS, Education & Training)
- Active Participation in preparing the JTI proposal
- Secretariat

IPHE

- Author of the RCS scoping paper & contributor to the Fuel Cells and Hydrogen Storage scoping papers
- Representation of the Commission

IEA

- ExCo H2 and FC Implementing Agreements
- Contributing to 3 HIA Tasks

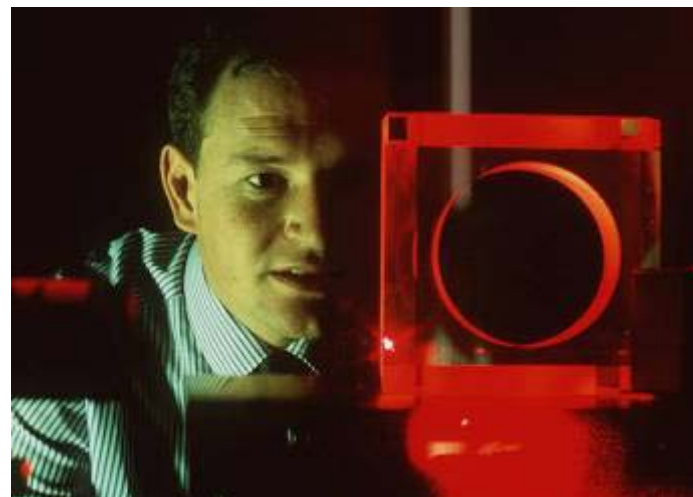




IE Key Figures 2007

Joint Research Centre

Staff: 250



Budget: 35 M€ (excl. HFR)





Joint Research Centre

The EC Reference for Safer and Cleaner Energy

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