



# Activities on H2 and FC at JRC Institute for Energy in FP6

HarmonHy Final Conference  
Brussels, 4 October 2006

[marc.steen@ec.europa.eu](mailto:marc.steen@ec.europa.eu)



# JRC Mission Statement

*to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies*

The JRC functions as a centre of science and technology (S&T) reference for the EU independent of commercial and national interests...





## Hydrogen-related efforts at JRC Institute for Energy, Petten (NL)

no development of new technologies, but

1) "enabling" activities in areas of:

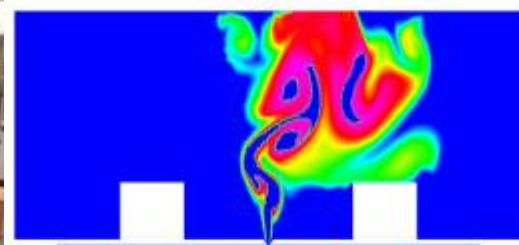
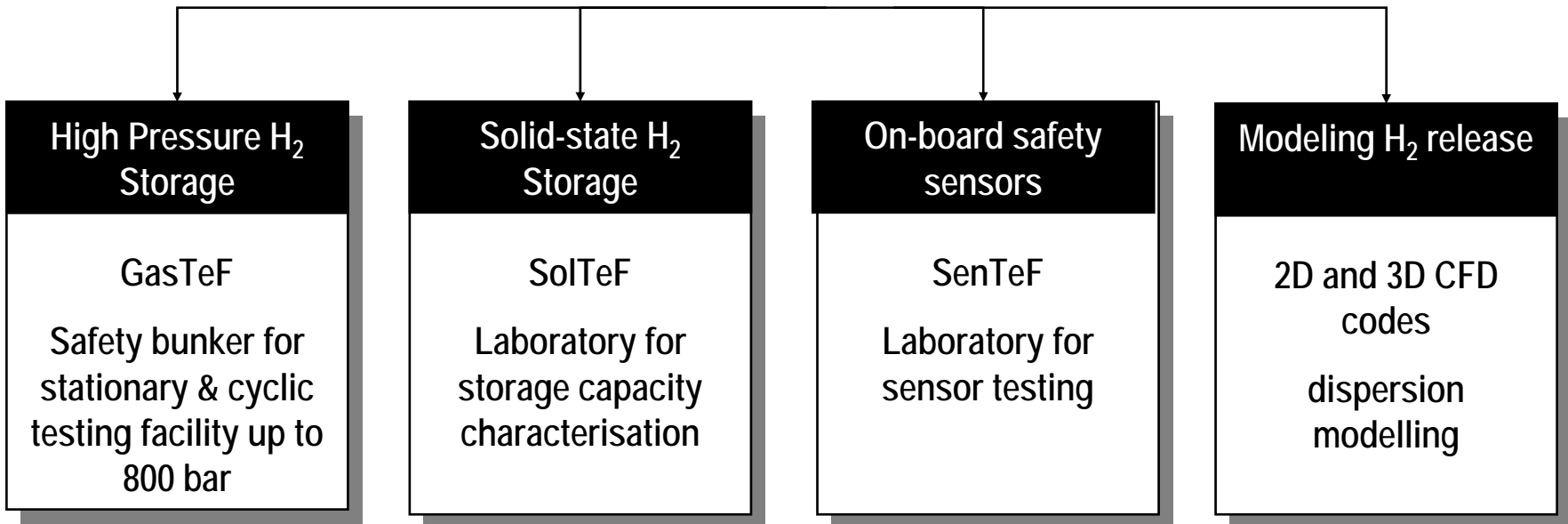
- process issues related to alternative fuels and hydrogen from biomass
- characterisation and performance assessment of
  - fuel cells, stacks and systems
  - hydrogen storage technologies
  - hydrogen sensors

2) techno-economic assessment of energy technology issues through own research and networking with EU stakeholders



# H2 Storage, Distribution and Safety Activities

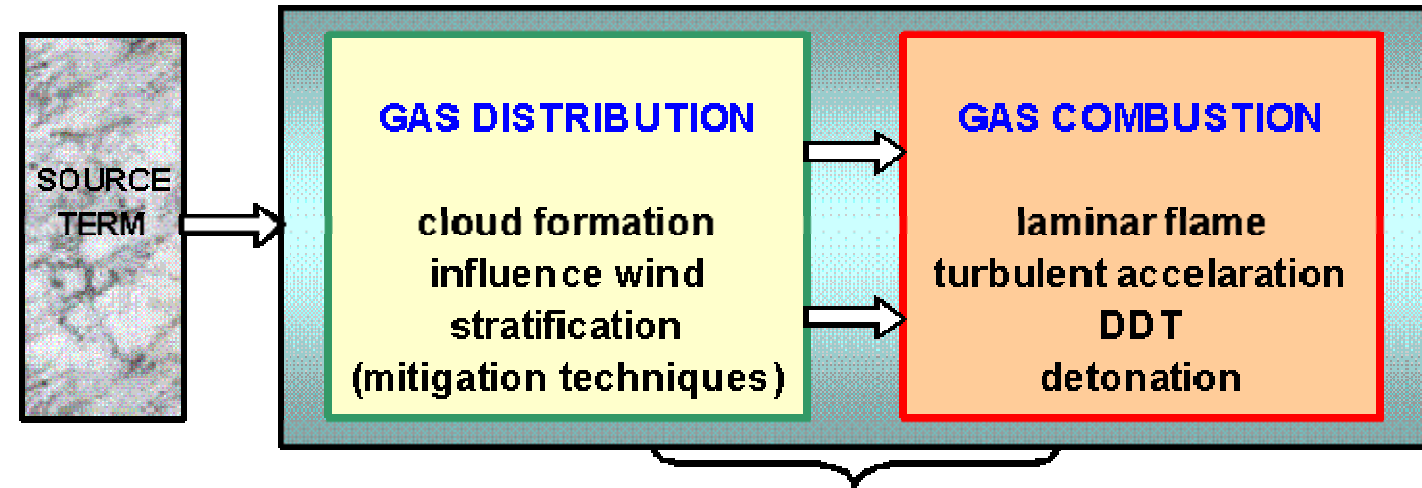
Joint Research Centre



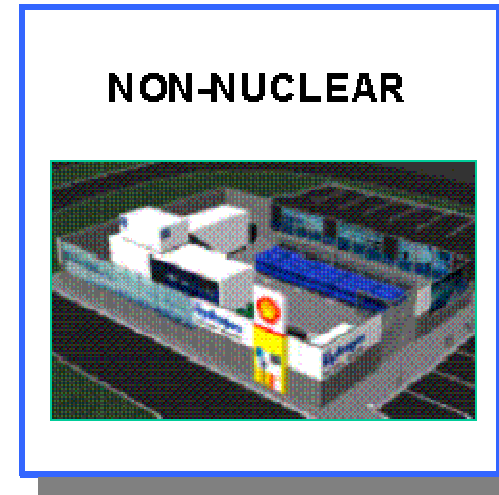
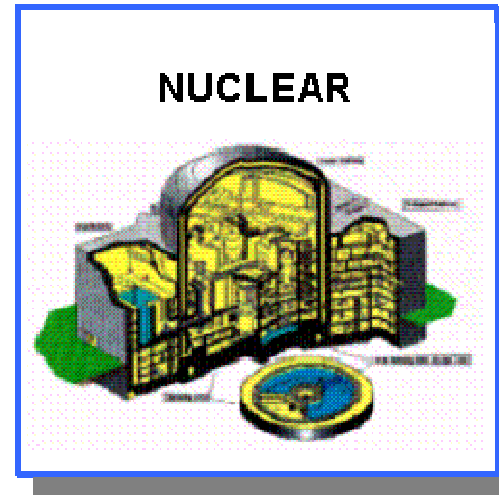


Application of expertise and tools developed and used in nuclear safety

Joint Research Centre

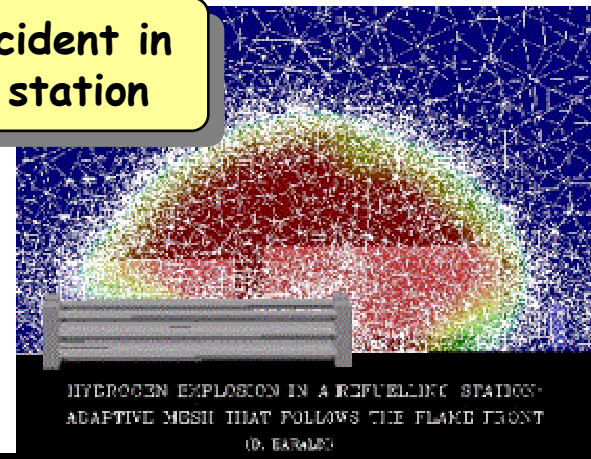
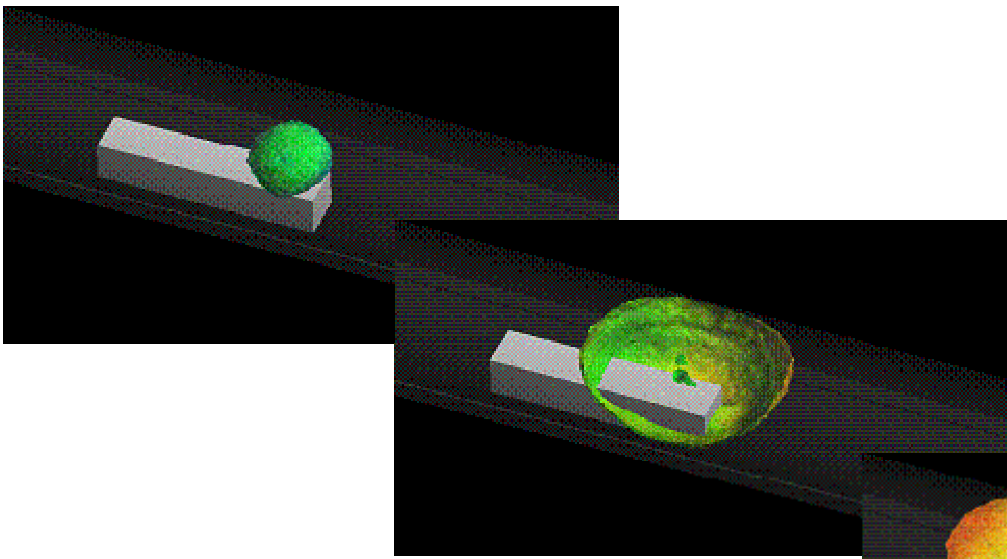


application to

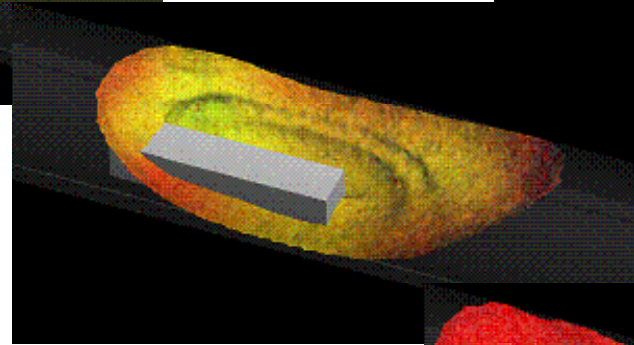
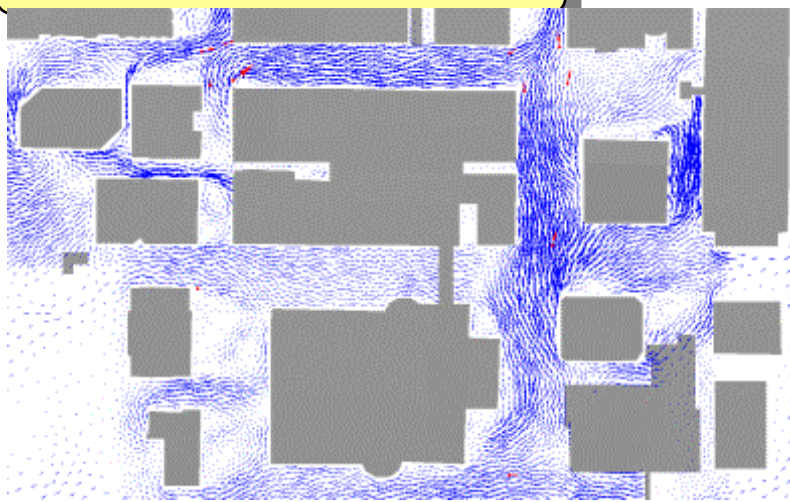




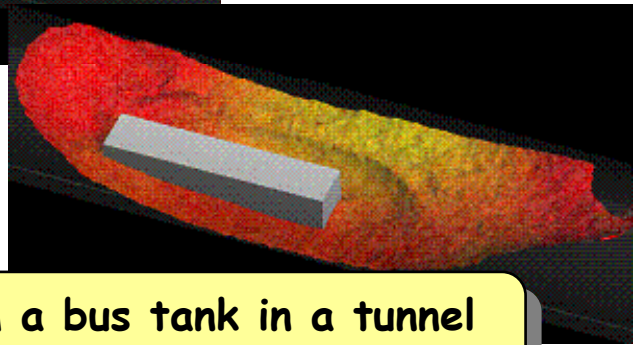
Explosion accident in a refueling station



Flow path in streets with South-West winds

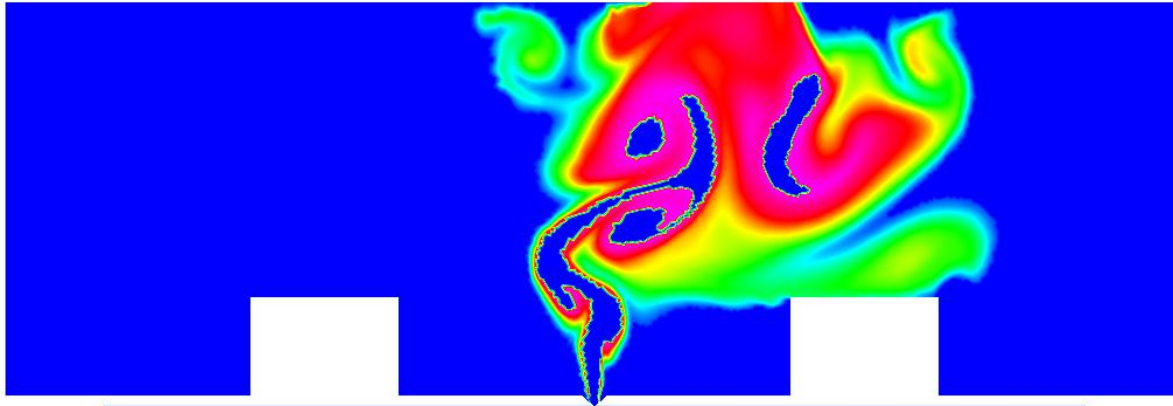


H<sub>2</sub> release from a bus tank in a tunnel - pressure distribution on an iso surface of 350 K

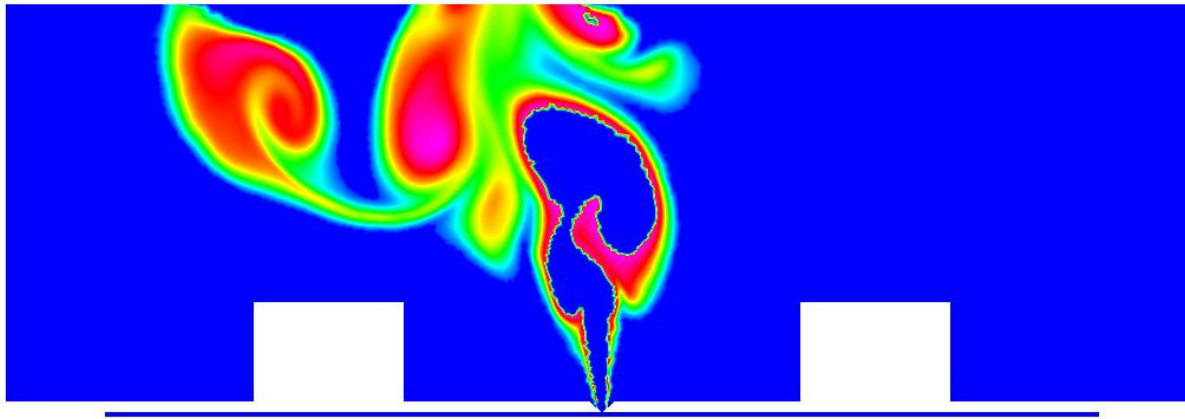




## Flammability limits in hydrogen gas dispersion



Hydrogen molar concentrations for wind (top) and no-wind (bottom) case.



Shown are only concentrations within the flammability limit between 4 % and 70 %, all other concentrations are set to 0%.



## Risk Assessment

- Development and operation of a **European Hydrogen Incident and Accident Database (HIAD)** - jointly performed by DNV and JRC
- Development of **methodologies for risk evaluation**, providing input for the definition of the HIAD database - together with DNV, Riso, TNO, Norsk Hydro (within HYSAFE)
- **Comparative studies** for different risk assessment methods

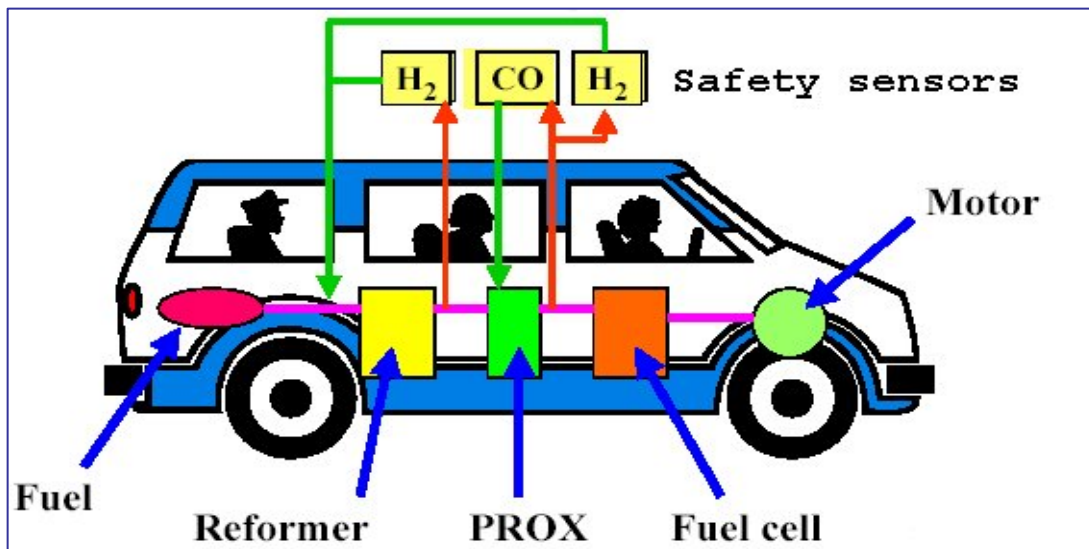




# On-board vehicle hydrogen safety sensors

The challenge: sensors that can sense leaks within the target timeframe at the desired detection level, assess the hazard, trigger an alarm or activate a protective device, and be priced reasonably.

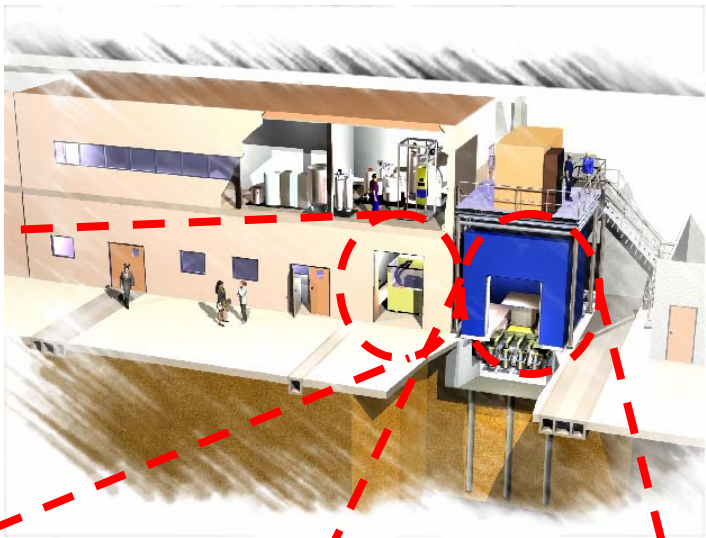
Objective: to establish testing procedures for Hydrogen safety sensor performance (lifetime, sensitivity, accuracy, reaction time, X-sensitivity,..) under real service life conditions



- Temperature:**  
-45 to 130°C
- Pressure:** 0.6 - 1.2 bar
- RH:** 0-100%
- Gas composition:** H<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>, CO, HCs, H<sub>2</sub>S, SO<sub>2</sub>, NH<sub>3</sub>, NO<sub>x</sub>, alcohols, petrol

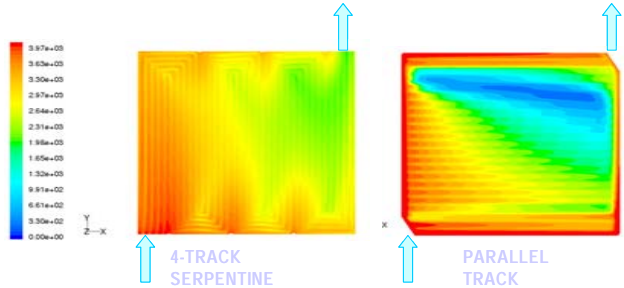
# Validation and Verification of Fuel Cell technologies

Environmental and vibration testing of FC systems and their performance



efficiency, engine and evaporative emission testing

Joint



CFD modelling of FC performance & modelling validation





## Involvement in H2&FC Indirect Actions

NoE HySafe  
IP StorHy  
STREP FCTESQA  
STREP HyApproval  
IP Nesshy  
SSA FCTEDI  
SSA HyCell-TPS



all RCS content

STREP FCAnode  
RTN HyTrain  
IP HyCom



## From FP6 to FP7

- institutional H2&FC activities as JTI-projects
- additional work as deriving from ongoing discussions on JTI and compatible with JRC mission statement, i.e. representing and serving the interests of EU citizens
- e.g.:
  - validation of achievement of "quality gates" and of tests results in JTI projects
  - repository of test results
  - operating agent of EU H2 safety centre network
  - RCS ?
  - technical interface of JTI with non-EU RD<sup>3</sup> activities
  - checking coherence and consistence with work of other Technology Platforms
  - ....

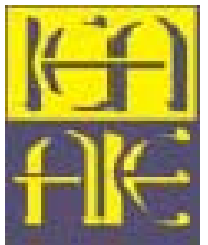




# International Outreach and Cooperation



- Implementation & Liaison Committee
- Scoping Paper on Regulations, Codes and Standards
- Education Task Force



- ExCo H<sub>2</sub> Implementing Agreement
- HIA Task 17 Solid and Liquid State Hydrogen Storage Materials
- HIA Task 18 Assessment of Integrated Systems
- HIA Task 19 Hydrogen Safety
- ExCo FC Implementing Agreement
- Bioenergy Task 37

## CEN/CENELEC

- CEN/BT/WG/ 149 "Liquid and Gaseous Alternative Fuels"
- CEN/CENELEC mandate

Others: IEC-TC 105, ISO TC 197, US Fuel Cell Council, ...







**ToR: facilitating progress towards common RCS**

## **Functions of the RCSWG:**

- analyse and develop recommendations on RCS for H2&FC technology development, demonstration and use
- identify and promulgate good practices between IPHE members
- in concertation with other international organisations:
  - reduce gap of international activities
  - encourage timely exchange of information on advancements
- establish and maintain network of IPHE experts and enlist expertise where needed for implementation of Action Plan



## Action Plan

- meta-gap analysis for furthering IPHE activities  
*included in work programme FCTEDI*
- activities Development Workshop  
*in connection with forthcoming ILC meeting*
- explore mechanisms to provide up-to-date resources on global RCS activities and decisions
- review IPHE projects for maximum exploitation of RCS components