

DE LA RECHERCHE À L'INDUSTRIE



IGORR 18th  
Conference in  
collaboration with  
the IAEA  
Sydney  
December 2017

**The CEA scientific and technical offer as a  
designated ICERR  
(International Center based on Research Reactor)  
by the IAEA: first feedback with the prime Affiliates  
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Commission (CEA)  
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# IAEA-ICERRS CONCEPT :

## INTERNATIONAL CENTERS BASED ON RESEARCH REACTORS

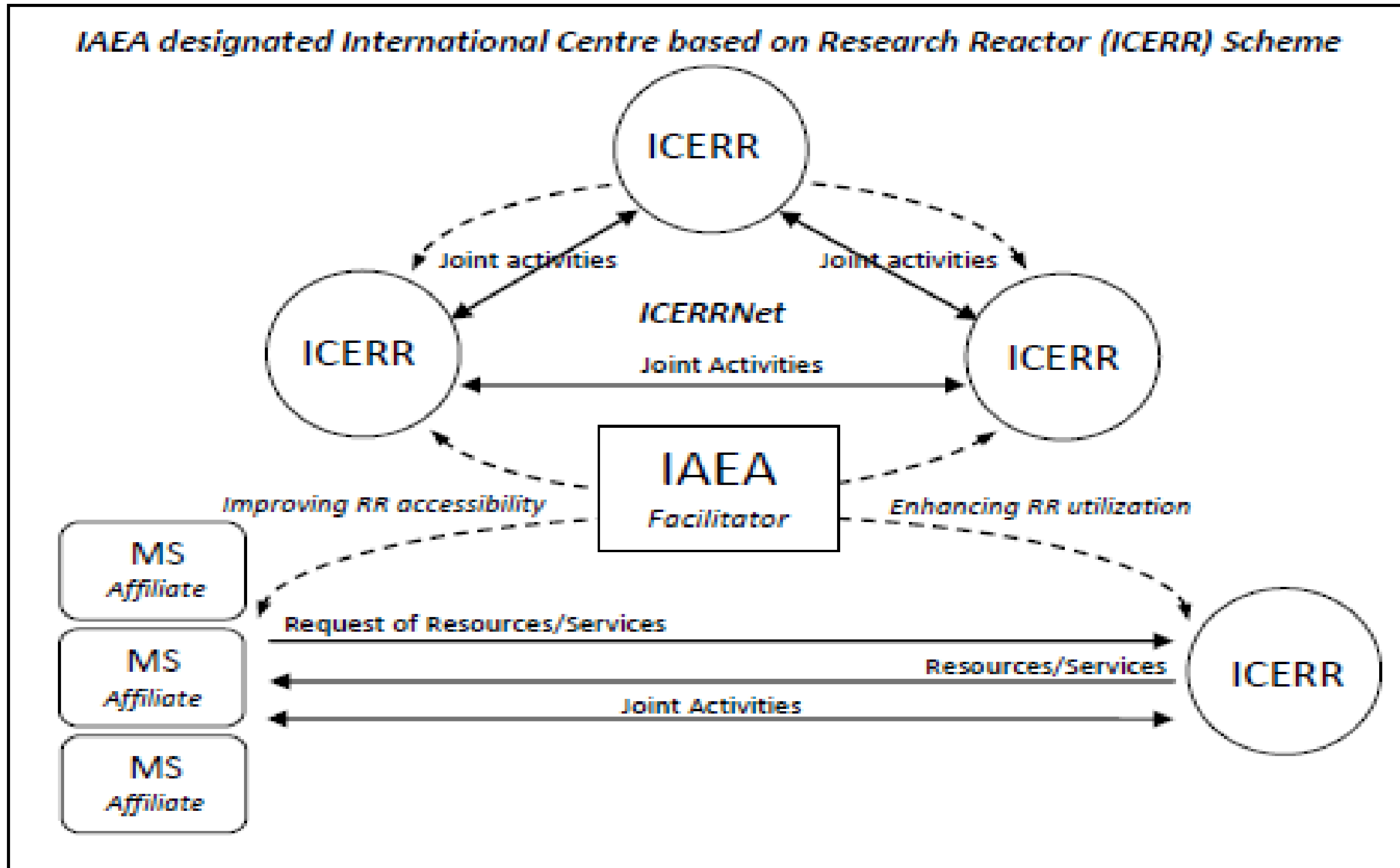
### CONTRIBUTION TO HRD (HUMAN RESOURCES DEVELOPMENT)

- ▶ Create international scientific networks
- ▶ Make available CEA facilities and experience to affiliates
- ▶ Lead innovative joint programs with shared results
- ▶ Enhance utilization of Research Reactors
- ▶ Host international scientists / engineers (visiting scientists, operators...)
- ▶ **Provide “hands on” nuclear education “in the field”**



# Role of the agency: a “facilitator”

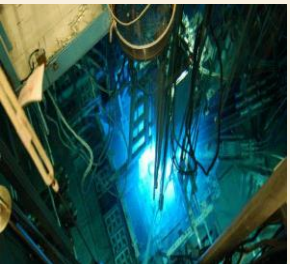
## Extracts from the IAEA Terms Of reference





# Criteria for Eligibility & Designation: Extracts from the IAEA Terms Of reference

- The Criteria for eligibility and designation address logistical capability, technical capability and sustainability:
- **Logistics criteria**
- *Having an established, demonstrated process, adequate infrastructure and internal organization and experience to host international/regional scientists, engineers, technicians and students*
- **Technical criteria**
- *Having demonstrated experience in promoting and participating in collaborations at international/regional level*
- **Sustainability criteria**
  - *Demonstrated mid-term commitment (3-5 years) in terms of financial and human resources availability to assure continuous and reliable support to Affiliates;*
  - *Demonstrated mid-term (3-5 years) capability to maintain sustainability for operation, training, licensing, waste management, etc.;*
  - *Continuous improvement plan in place to provide potential users with access to relevant technology, methodology and standards in the area(s) of the research reactor activities for which designation is requested.*



# THE JHR AND ITS ANCILLARY FACILITIES AS AN “ICERR”

Fully compliant with the  
**French Capacity Building Initiative**

based on 4 pillars:

- Human Resources Development
- Education & Training
- Knowledge Management
- **Knowledge Network**

IAEA ICERR labelling  
obtained  
on 14th September 2015  
for 5 years



**Strong CEA intention to welcome Junior and/or Senior Scientists, Nuclear Engineers, Operators, Safety Managers... within JHR teams for various topics (R&D programs, Hands-on training on equipments...)**

## French Nuclear Research Reactors to Become International Training and R&D Hubs Under IAEA Label

***“As the first designated International Centre based on Research Reactors (ICERR) under a new scheme launched by the IAEA last year, CEA’s research centres in Saclay and Cadarache will become international research hubs.***

***Such centres will enable researchers from IAEA Member States, especially developing states, to **gain access to research reactor capabilities and develop human resources efficiently**, effectively, and, probably, at a lower cost,” Mr Amano said at a ceremony at IAEA Headquarters in Vienna, during which he awarded the designation to the CEA.***

***“The ICERR scheme will also contribute to **enhanced utilization of existing research reactor facilities** and, by fostering cooperation, to the development and deployment of innovative nuclear technologies,” he added.***

# CEA multi-purposes offer within IAEA/ICERR, centered on future JHR and ancillary facilities

## LECI : Hot Lab on Materials

- Hands-On Training (Equipments)
- R&D Projects



## ISIS (IRL):

- Education & Training
- Hands-On Training

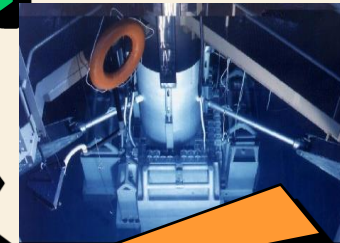


Saclay

Cadarache

## ORPHEE : Neutron beams

- Hands-On Training (Equipments)
- R&D Projects



## EOLE/MINERVE:

- Education & Training
- Hands-On Training
- R&D Projects

## JHR : MTR

- Hands-On Training
- R&D Projects



## LECA : Hot Lab on Fuel

- R&D Projects
- Hands-On Training (Equipments)



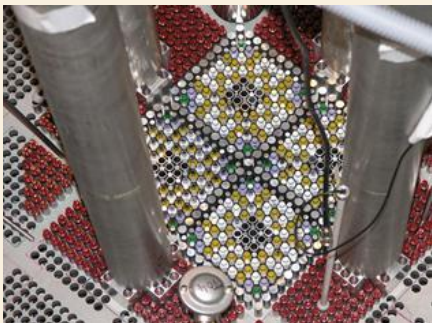
## ZEPHYR : LPR



New Projects

# CEA-ICERR Offer more in detail: Research Reactors

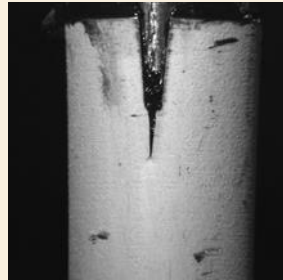
- **ORPHEE** a 14 MW<sub>th</sub> research to work in the field of neutron scattering diffraction and spectroscopy for condensed matter.
- **ISIS** Research Reactor was the neutron mock-up of the OSIRIS Material Testing Reactor, max power of 700 kW: today focused on E&T and instrument qualification (*Recently designated Internet Reactor Lab by the agency*)
- **EOLE/MINERVE** Zero Power Reactors for core physic studies:
  - The EOLE critical mock-up is a very low power experimental reactor designed to study the neutron behavior of moderated lattices. MINERVE is designed for neutron studies mainly aiming to improve the nuclear database for fuel systems representative of various nuclear reactor technologies.



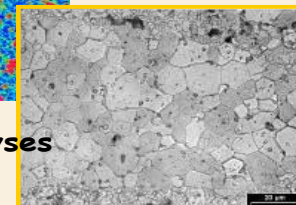
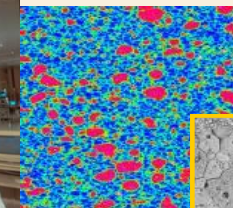
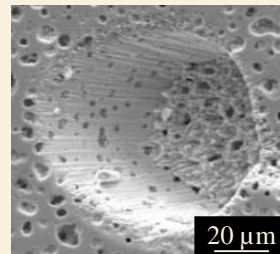


# CEA-ICERR Offer more in detail: Hot Laboratories

- **LECI Hot Laboratory**, is the CEA reference hot laboratory for Material testing. This laboratory is in charge of the characterization of irradiated non fissile materials. It includes about 50 hot cells, with up-to-date scientific equipments:



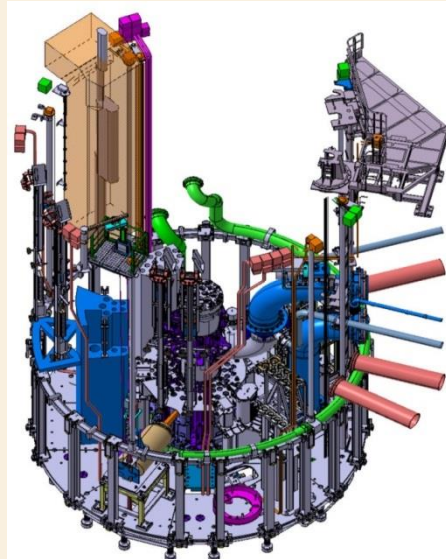
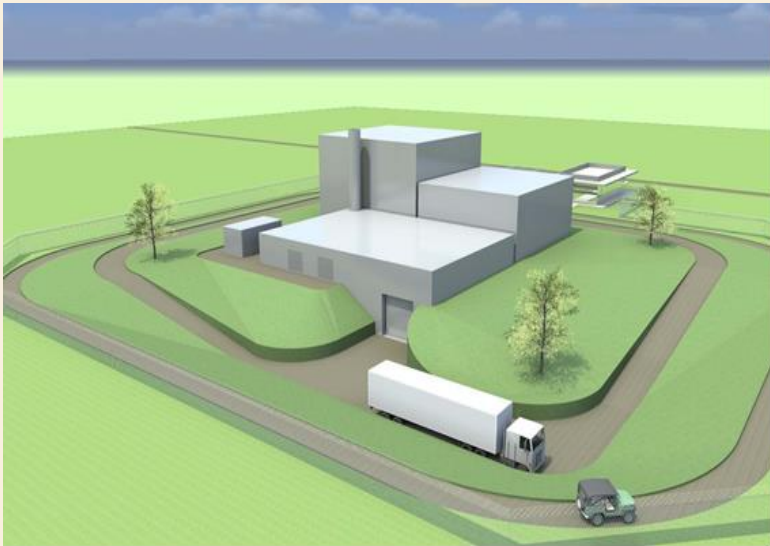
- **LECA-STAR Hot Laboratory** is the CEA hot laboratory in charge of the characterization of irradiated fuel materials. It includes about 20 hot cells (up to 9 m long), with all the equipments for a wide range of irradiated fuel rod examinations



Micro-analyses

# CEA-ICERR Offer more in detail: New Projects

- **JHR future Material Testing Reactor:** The Jules Horowitz Reactor (JHR) is a new Material Testing Reactor (MTR) currently under construction at CEA Cadarache. It will represent a major research infrastructure for scientific studies dealing with material and fuel behavior under irradiation. JHR is designed, built and will be operated as **an international user-facility** open to international collaboration → *see various updated presentations on JHR at this conference* .
- **ZEPHYR** project as reference platform for core physics studies (ZPR) to replace EOLE and MINERVE reactors



Fuel Issues

Reactor  
Operation

Safety studies

Material Issues

**CEA will welcome Junior and/or Senior Scientists, Nuclear Engineers, Operators, Safety Managers...on various technical topics**

Safety Culture

Core Physics

Radioprotection

Thermohydraulic

Nuclear Technology

Waste Management

**Formally how does it works ?**



# Formally how does it works ?

A generic CEA “template agreement” is finalized: it gives a general framework for collaboration between an Affiliate Organization and the CEA-ICERR

It is question here of a **Bilateral contract (the IAEA being only a facilitator)** between the Affiliate and the ICERR

The Agreement is signed by Chairmans of CEA and Affiliate

## Agreement for receiving Affiliate staff to CEA as a designated International Center based on Research Reactors, through its research centres of Saclay and Cadarache

The COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES, a French state-owned research entity with a scientific, technical or industrial activity duly organised under the laws of France and having its registered office located at Bâtiment Le Ponant D - 25, rue Leblanc - Paris 15ème (France) - and declared at the Paris Register of Commerce and Trade (“Registre du Commerce et des Sociétés de Paris”) under the registration number R.C.S. PARIS B 775 685 019,

Represented by (...) acting as (...) and duly authorised for the purposes hereof,

Hereinafter referred to as “CEA”

On the one hand,

AND

XXXX Institute Represented by XXXX, acting as (...) of the XXXX and duly authorised for the purposes hereof,

Hereinafter referred to as XXXX

On the other hand,

Hereinafter referred to individually or collectively as the Party or the Parties



# Formally how does it works ?

- For each collaborative topic (**Hands-On Training, Education & Training, R&D projects**), an annex is add to this template describing the objective of the project, its duration, Rights and Duties of each Parties, financial contribution of both parties...**Keeping in mind that the Secondee remains an employee of the Affiliate**
- The Annexes are signed by appropriate representatives
- The Affiliate, on a case by case basis (as Member State from the agency) can ask for some agency support via TC projects or other scheme.

## - Joint JHR- NUGENIA Forum April 2016- Marseille Key-note Speeches of:

- IAEA DDG-NE

- OECD/NEA

- European Commission DG Fission



## - Visit of IAEA DG to CEA Cadarache Center on 6<sup>th</sup> September 2016





- First Affiliates to CEA have signed this ICERR template during the 60<sup>th</sup> IAEA General Conference:

- Slovenia (JSI)
- Morocco (CNESTEN)
- Tunisia (CNSTN)

**New Affiliates to CEA first semester 2017:**

- Indonesia (signed 29<sup>th</sup> March 2017)
- Algeria (signed 21<sup>st</sup> April 2017)
- Jordan ( signed 23<sup>rd</sup> May 2017)

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**And in a concrete way  
what is going-on ?**

**First example with the 6 Affiliates**

## **Slovenia (JSI) :**

- **gamma heating measurements and calculation in a high dose-rate environment. Validation of measurements techniques and Monte Carlo calculation schemes in the irradiation channels of the JSI TRIGA reactor.**
- **Application of Developed Methods and Test in the Cadarache MINERVE reactor → lead to a robust calculation route to analyze gamma-heating and gamma-flux measurements (Secondment of a JSI scientist to Cadarache May-June 2017 in instrumentation lab)**
- **Calculation with CEA Monte-Carlo code TRIPOLI4 (Secondment of a JSI scientist to Saclay –November 2017)**





- **Morocco (CNESTEN) :**
- **Enhancement of the neutron Beam activities of the TRIGA research reactor from CNESTEN : Expert mission of ORPHEE team in Mamoura center –May 2017-** for the setting-up of a new beam on the TRIGA RR
- **Analysis by CEA of the first version of the Safety Report linked to this modification of the reactor (june 2017)**
- **Secondment of Safety Engineer from CNESTEN to Saclay for performing Safety Analysis of new reactor configuration and get appropriation of links between Safety Report and Operation procedures when having a new neutron beam (2018).**

- **Tunisia (CNSTN) :**
- **Secondment of Core Physics Scientists from CNSTN to Cadarache for design of sub-critical system able to become later on a critical mock-up**
- **Two experimental campaigns performed in 2017 on MINERVE reactor for irradiation of organic dosimeter developed by CNSTN (analysis in progress; workshop CEA-CNSTN foreseen next Spring in Tunis)**
- **A step by step approach to built first nuclear facility in Tunisia (see next slide from Hosni Faouzi)**

# Approche adoptée

- Développement de compétences, savoir et savoir-faire
- Réappropriation de compétences existantes
- Pratique des aspects de Radioprotection
- Instauration d'une culture de sûreté

Conception  
& construction  
Assemblage  
sous-critique  
(ASC)

Mutualisation  
des études  
(Approche  
intégrée)

Conception  
construction  
Réacteur de  
recherche  
(RR)

## Applications de l'ASC :

- Test des options de conception
- Qualification des outils
- Formation «*hands on training*» /Enseignement

## Applications étendues (avec le RR) :

- Pour les Universités
- Pour l'Industrie
- Pour l'environnement
- Pour la médecine

- **Algeria (COMENA):**
  - Support to update operation procedures associated to updated version of Safety Report following the on-going refurbishment of NUR and Es-Salaam Research Reactor → **Secondment of 2 Safety Engineers from COMENA to Saclay-OSIRIS team (first semester 2018)**
  - Development of nuclear instrumentation and dosimetry (exchanges on analysis techniques → **Secondment of 1 scientist from COMENA to Cadarache for hands-on training-2<sup>nd</sup> semester 2018**



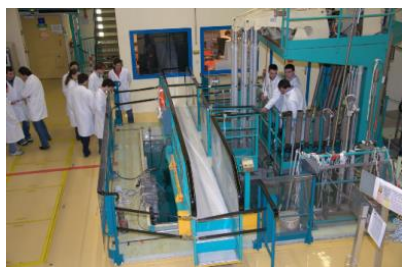
- **Indonesia (BATAN) :**
- **Support from CEA-ISIS team to establish an IRL in one of BATAN RRs: expert mission from CEA to Indonesia for establishing documentation and addressing technical issues.**
- **Secondment of scientists from BATAN to CEA-Saclay to witness an IRL workshop in ISIS (2018)**
- **Support for the reassessment of Bandung RR with new core configuration (thermohydraulic and core physic calculations)-  
Secondment of scientists from BATAN to Saclay ( 2018-2019)**





- **Jordan (JAEC):**
- **Support to Safety Engineers for performing core calculation of JRTR  
→ Secondment of JAEC staff to Saclay (thermo-hydraulic and core physic)- first semester 2018**
- **Exchange with ORPHEE RR for future Utilization of neutron beams of the JRTR (2018-2019)**





# Thanks for your attention