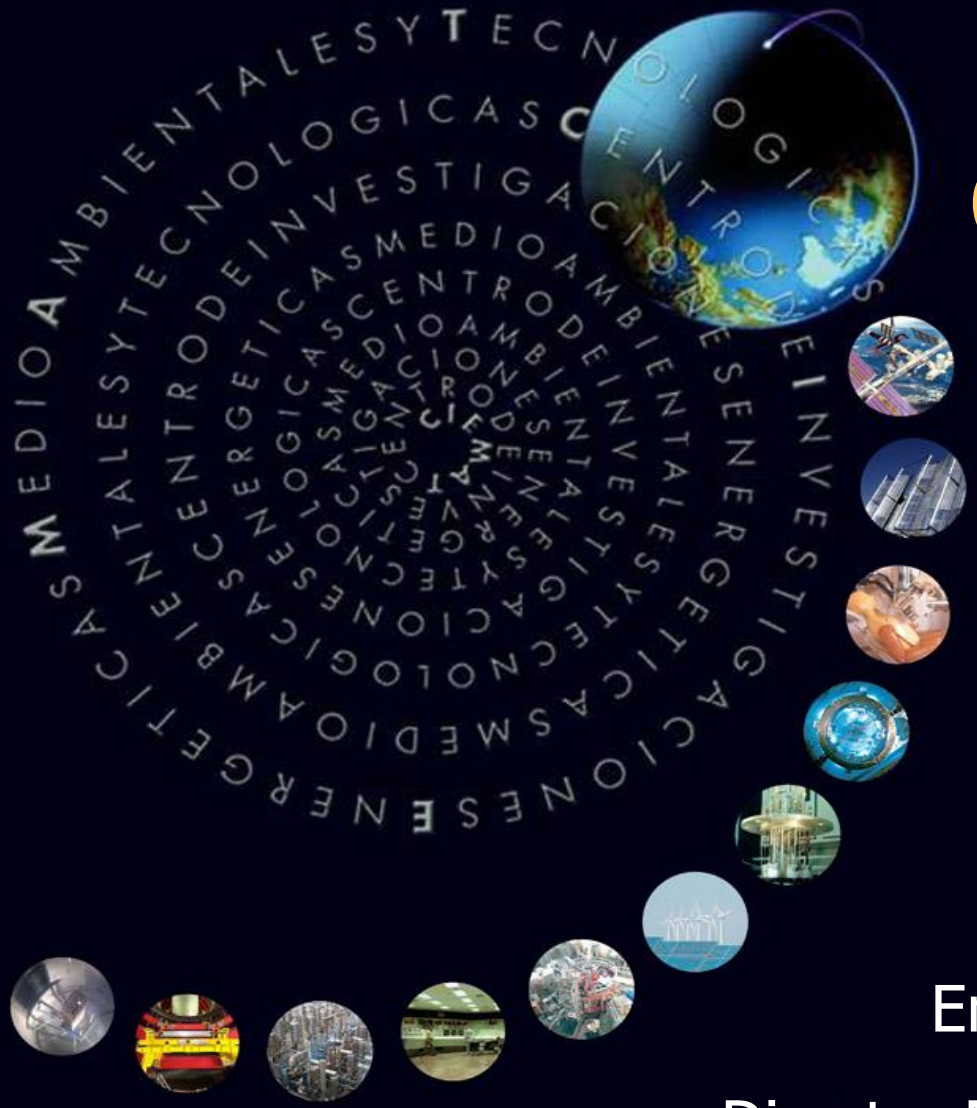


CIEMAT

(Nuclear R&D)

Enrique González

Director Nuclear Fission Division

January 2016

CIEMAT: Basic data

Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

Personnel (2015): 1.300 (including Ph. D. students)

Operational Budget (2012-2014 av.): 100 M€

External Income (2012-2014 av.): 39 M€

Objectives: Promote and execute R&D activities, in the fields of energy, environment and technology, including specific fields of basic research.

Center of reference in the areas of its expertise, collaborate with other national R&D centers, universities and enterprise.

R&D activities in the framework of the EU and cooperate with intergovernmental bodies and R&D centers from other countries, with special attention to Latin America and the Mediterranean.

CIEMAT sites

Estudios Socio-técnicos (CISOT)

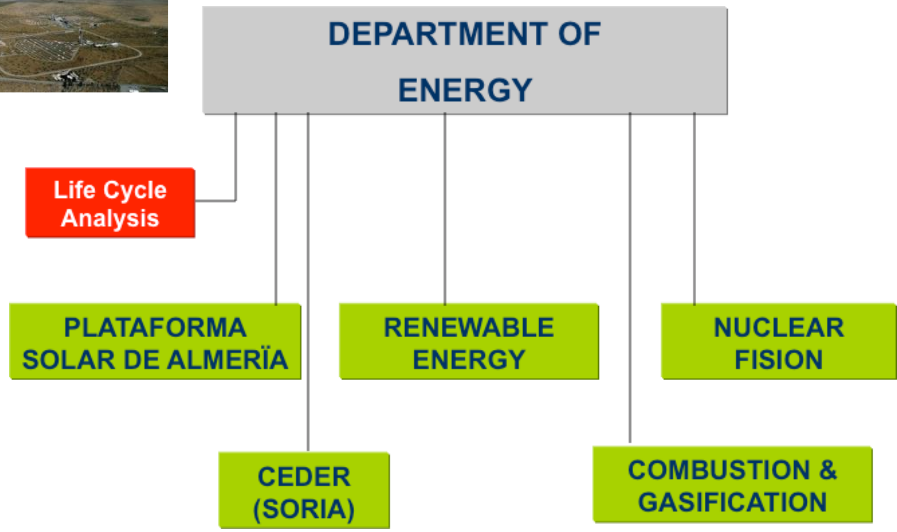
Energías Renovables (CEDER)

Derecho Ambiental (CIEDA)

CIEMAT (Madrid)

Plataforma Solar de Almería (PSA)

TIC (CETA – CIEMAT)



CIEMAT and the Spanish nuclear sector

ENRESA (80% CIEMAT)

Radioactive Waste Management

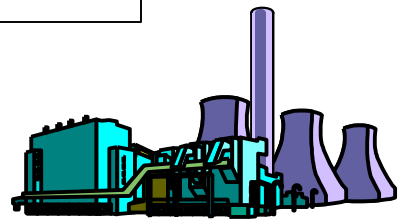
ENUSA (40% CIEMAT)

Nuclear Fuel Manufacturing

Ciemat

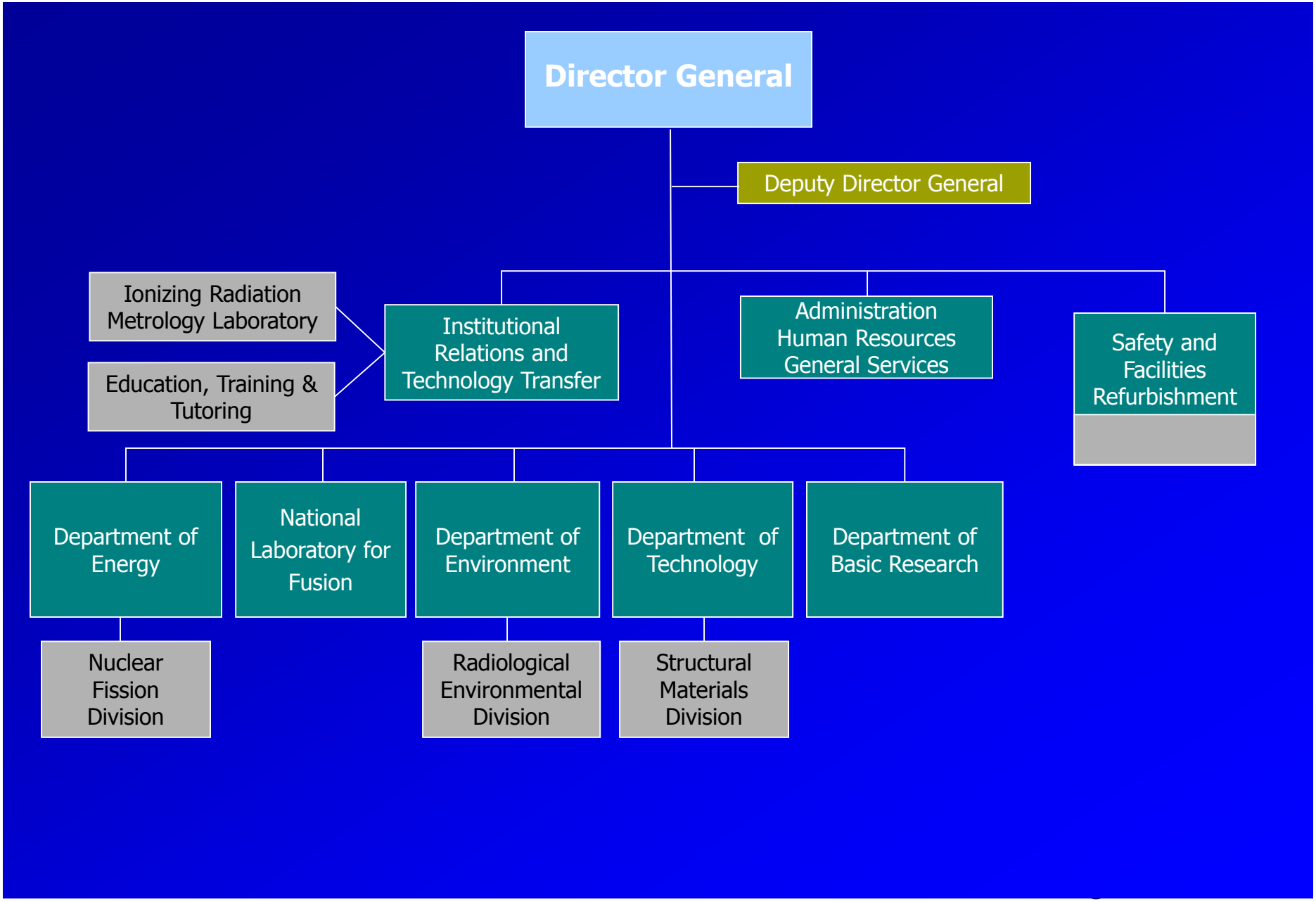
Research, Development, Innovation, Technical Services

CONSEJO DE SEGURIDAD NUCLEAR



NUCLEAR POWER PLANTS, INDUSTRIES, HOSPITALS, etc.

CIEMAT Nuclear activities



CIEMAT Nuclear Fission Division: Scope

- Provide Scientific and Technical Support to the Spanish Nuclear Waste agency (**ENRESA**), Nuclear Safety Council (**CSN**) and the **nuclear industry** as a whole.
- To **promote and participate on National and International R&D projects** for the development of and improvement of nuclear energy and the management of its environmental impact.

Present priorities
Safety, Waste Management
Advanced cycles & Reactors
Interim Dry Storage (ATC)

Technical Support & Global projects
- JHR construction
- HALDEN
- SNETP (ESNII, Nugenia)
- CEIDEN

High Level Radioactive Wastes
- Irradiated nuclear fuel behavior, characterization, treatment, conditioning
- Fuel reprocessing
- Hydro- and Pyro- metallurgical long lived nuclide partitioning.

Low & Intermediate Level Radioactive Wastes
- Characterization, treatment, conditioning, and clean-up of L&ILW
- Irradiated Graphite
- External services

NUCLEAR FISSION DIVISION

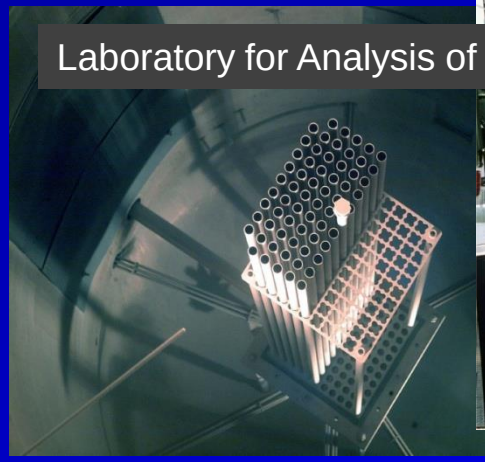
Nuclear Safety
- Severe accidents
- Safety of spent fuel
- High burn-up fuel
- Safety of future reactors
- Safety Fuel in ATC (interim storage)
- Fukushima accident

Nuclear Innovation
- Advanced nuclear fuel cycles
- Subcritical reactors for waste minimization
- Generation IV reactors
- Nuclear waste transmutation
- Nuclear data
- Integral experiments for transmutation systems

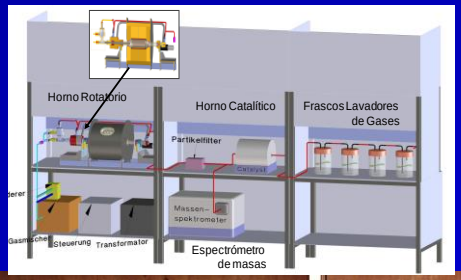
Nuclear Fission Division: Laboratories

Fuel & HLW laboratory gloves boxes

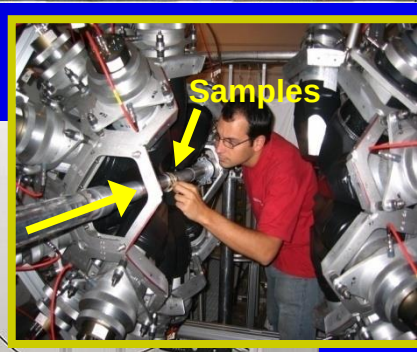
Laboratory for Analysis of Safety Systems



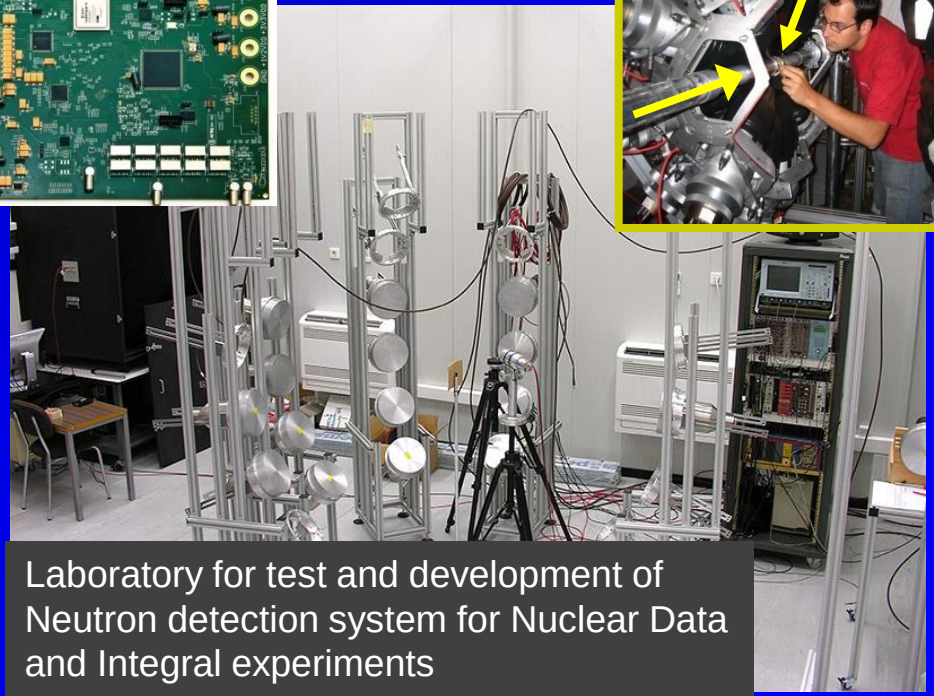
RMBA



CIEMAT
I.R.-15



LILW lab: Irradiated graphite treatment

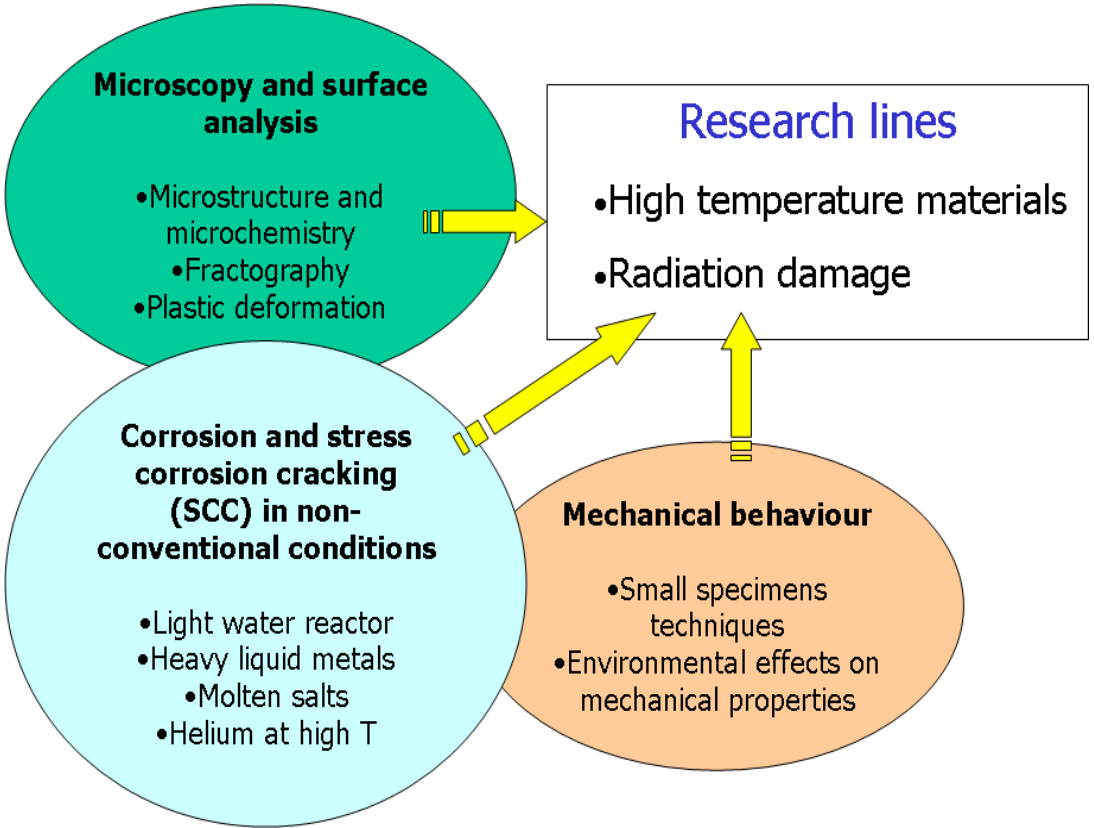


Laboratory for test and development of Neutron detection system for Nuclear Data and Integral experiments

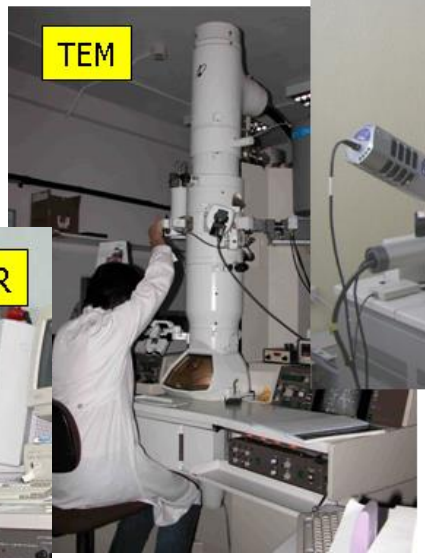
Structural Materials Division: Aim and scope

- ✓ The Structural Material Division is focused on the structural materials behaviour in energy production systems:
  - Nuclear power plant in operation (light water reactors)
  - Future nuclear power plant (Gen IV)
  - Renewable energies
    - o Concentrated thermal solar (CTS): Energy Storage
    - o Biomass
  - Coal fired power plant
    - o Advance materials

Structural materials:
-Reactor Pressure Vessel Steels
-Ferritic/Martensitic Steels
-Austenitic Stainless Steel
-Ni-based Alloys
-Oxide Dispersion Strengthened (ODS)



Structural Materials Division: Some facilities



TEM
FEGSEM-EBSD
SEM-EDX-EBSD
XPS
AUGER
Nanoindenter

Radiological Environmental Division: Scope

Radiological Protection of the Public and Environment

Development of criteria and evaluation methodologies of the radiological impact on the environment, due to the presence of radioactive materials.

- STAR.- **Network of Excellence in Radiocology**. FP7
- ERA.- **European Radiocology Alliance**
- **NERIS-TP** Platform.- European Platform

Physico-chemistry of Actinides and Fission Products

- **Including performance assessment of radioactive waste repositories**,
- **Storage and Geological Disposal** .

Radiation Dosimetry

Environmental Radioactivity and Radiological Surveillance

Internal Dosimetry

Whole body counter

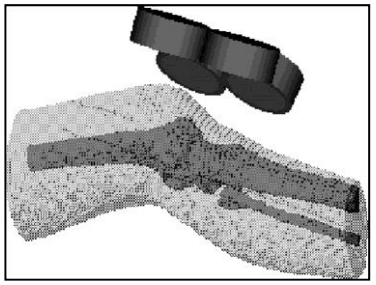
Bioassay

External Dosimetry

Environmental Dosimetry

Individual monitoring

R&D



Safety and Facilities Refurbishment

Radiation protection

(Workers, Public & Environment)

- Activities
  - Daily surveillance of radioactive
  - Monitoring at work place
  - Preparedness & response to radiological emergencies

    The measurements data are transmitted to SALEM (Emergency room of the Nuclear Safety Council)
    - Satellite and GSM connection technology + GPS
    - Capabilities:
      - Measurement of environmental radiation level
      - Monitoring of radio-nuclides in air
      - Gamma spectrometry for surface contamination measurements

- **CIEMAT**
  - Nuclear facility
  - 22 radioactive facilities + R&D Labs
- **Missions**
  - Radiological Protection
    - Workers
    - Environmental
  - Nuclear Security & Safety
  - Licensing
  - ***Decommissioning & Dismantling***

    PIMIC: Internal Plan for CIEMAT Facilities Refurbishment
  - Radioactive Waste Management

EDUCATION TRAINING & TUTORING

MODALITIES

Face to Face: Nuclear Technologies, Radiation Protection, R. Wastes Decontamination, Characterization,

E-learning & Virtual Centre

VIRTUAL CENTRE

- E-learning
- B-Learning
- Training support
- National & International Projects

EDUCATION & POSTGRADUATE PROGRAMS on Nuclear Technology

- Master program on en Nuclear Engineering and Applications MINA

SPECIALIZED PROGRAMS

- Dismantling and Decommissioning
- Nuclear Safety and Security
- Materials
- Fusion

SPECIALIZED PROGRAMS

- Radiation Measurement and Dosimetry
- Characterization and wastes management
- Safety Assessment Methodologies for Near Surface Radioactive Waste Disposal

OCUPATIONAL Training Programs

FP7 projects: P. DIANE, P. TIARA, P. ENETRAP, P. EUTERP
IAEA: S. C. Strategy on E&T in Radiation Protection and Waste Safety