

We build  
great moments...

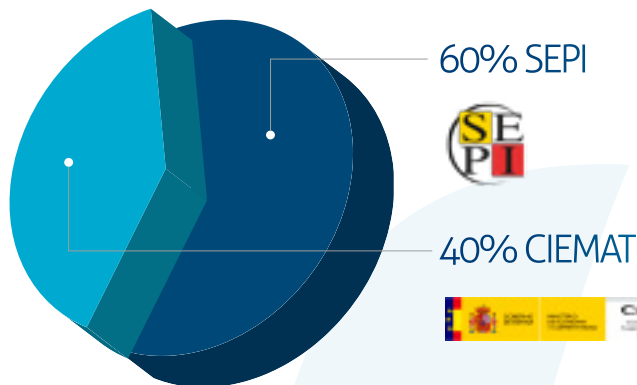


...out of small things

# Who are we?

ENUSA INDUSTRIAS AVANZADAS, S.A. (hereinafter, ENUSA) incorporated in 1972, focuses its activities in the nuclear fuel cycle and develops environmental services.

We are the parent company of the ENUSA GROUP, jointly with ETSA and EMGRISA



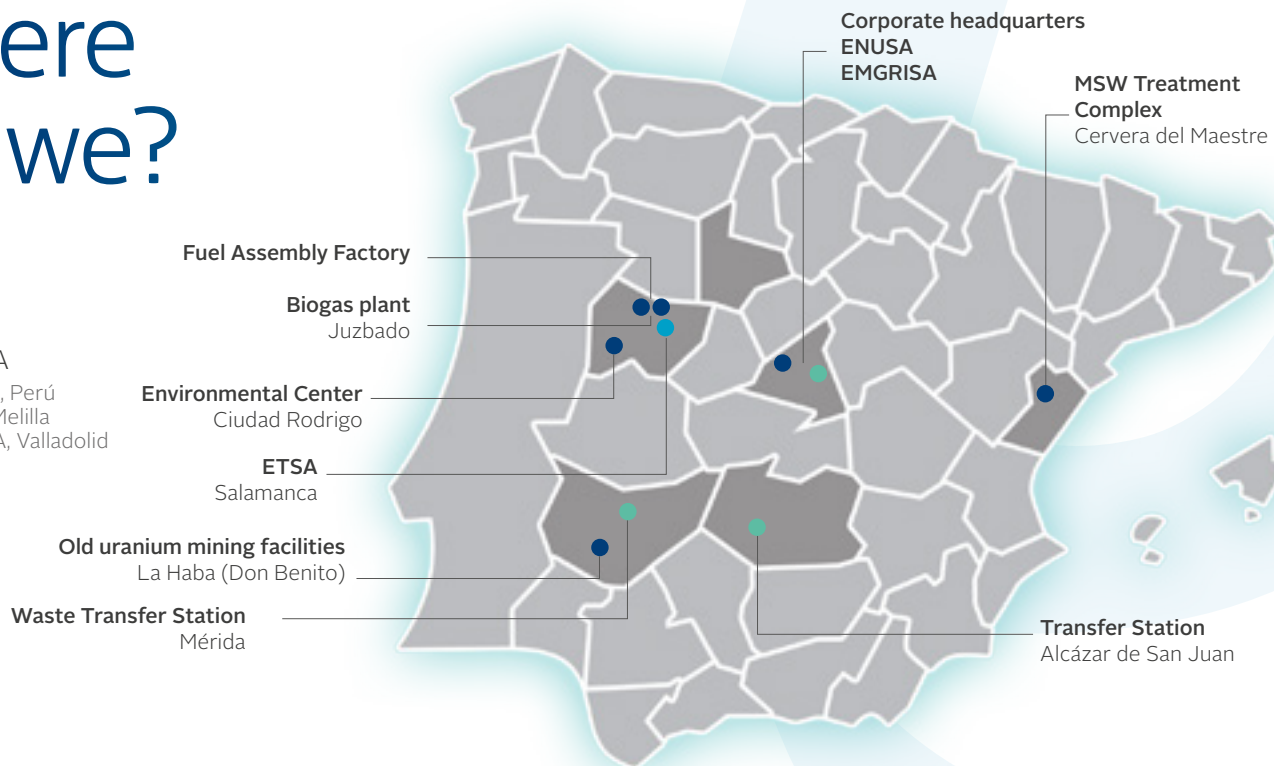
# Where are we?

● ENUSA

● ETSA

● EMGRISA

Delegación, Perú  
REMESA, Melilla  
CETRANSA, Valladolid



# What are our core values?

## **SECURITY**

Safety, a core value of our business. Firm commitment to the safety of the installation, our product, employees, society and environment.

## **QUALITY**

Strategic factor and key value in all our activities. Implementation and development of management systems and continuous improvement.

## **ENVIRONMENTAL PROTECTION**

We strictly control the impact that our activities have on the environment.

## **COMMITMENT TO PEOPLE**

ENUSA employees are our main asset.  
Responsible for business management: Care and respect for and implication with the worker.

## **SOCIAL DEVELOPMENT**

We contribute to the economic, social and cultural development of the communities where we operate.

## **INNOVATION AS A GENERATOR OF VALUE**

We integrate the most innovative technology into our products and services to stay competitive, develop new markets and build customer trust.



UO<sub>2</sub> Store



Design and Engineering

# What do we do?

## NUCLEAR BUSINESS

Our products and services are intended for light water reactors and other national and international fuel cycle facilities.

## URANIUM SUPPLY

We manage the supply of uranium to the Spanish nuclear power plants under the criteria of security and flexibility of supply.

## DESIGN AND ENGINEERING

We cover all the technical aspects of the nuclear fuel cycle, from its design and operation in the nuclear power plant up to its tenure as irradiated fuel for transport and dry storage.

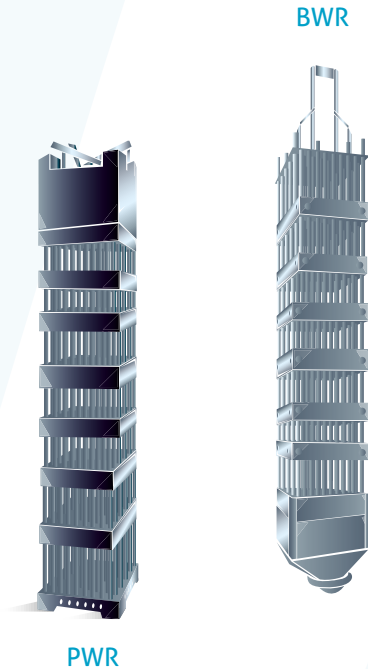
- Development and introduction of new products and design methodologies.
- Reload engineering and safety analysis.
- Product definition and manufacturing support.
- In-core fuel behavior follow-up.
- Operating experience analysis and feedback to design.
- Characterization and analysis for spent nuclear fuel classification, transport and dry storage.
- Radiological calculations (criticality, shielding and source term).
- Mechanical, thermal and thermalhydraulic calculations.
- Support to ATC (Centralized Temporary Storage Facility) design and licensing.

## MANUFACTURING

# What do we produce?

Light water fuel assemblies for:

- Pressurized water reactors (PWR) under Westinghouse license.
- Boiling water reactors (BWR) under General Electric license.
- Pressurized water reactors (VVER) in collaboration with Westinghouse.



# Where do we manufacture?

In the fuel assemblies factory in Juzbado (Salamanca)

1985 Commissioning  
Bellow 5 w/o U-235 Authorized enrichment  
500 tU/year Licensed capacity



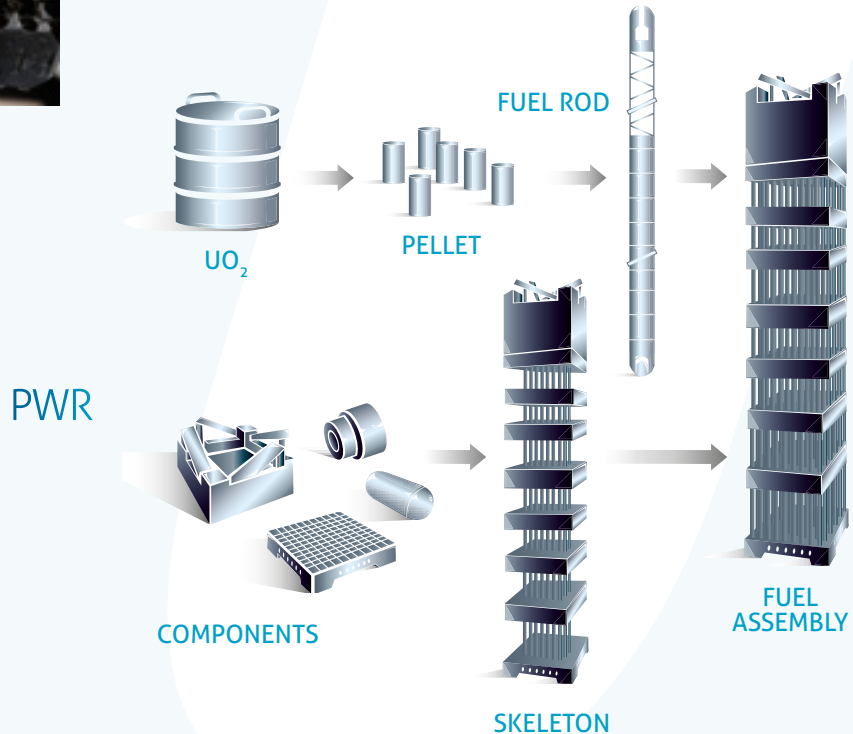
The Juzbado Fuel Assembly Factory



## How do we produce?

Fuel assembly manufacturing is divided into two processes:

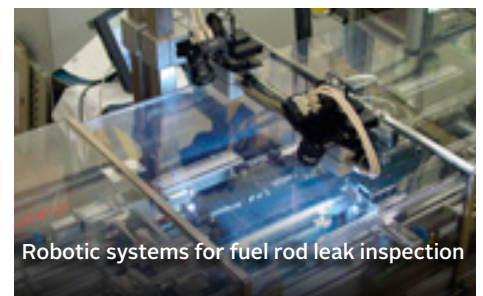
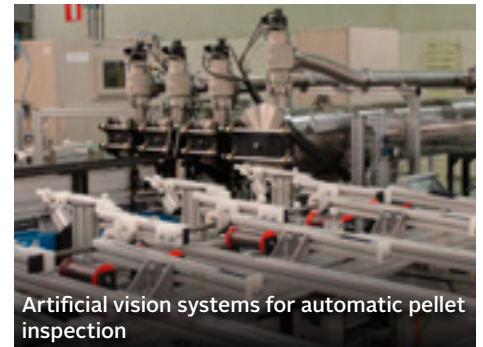
- Ceramic process in which uranium oxide powder is used to manufacture pellets; these pellets are inserted into zirconium alloy tubes which, once they are loaded and sealed, are called fuel rods.
- Mechanical process in which the fuel rods are assembled to form the fuel assemblies, which are sent to the power plants.



## What is our manufacturing technology?

We are committed to a continuous technological development of manufacture and inspection equipment, where the most important ones are currently the following:

- Artificial vision systems for automatic pellet inspection.
- Laser systems for measuring pellet diameters.
- Robots for handling green pellets.
- Ultrasonic inspection systems for plug to tube welds.
- Passive scanner for inspection of fuel rods of uranium and gadolinium oxide.
- Active scanner for inspection of fuel rods of uranium oxide.
- Eddy current inspection equipment for fuel tubes surface and inclusion defects.
- Robotic rod transport and positioning systems for final fuel assembling.
- Artificial vision systems for welding stations.
- Seal weld X-ray analysis systems.
- Robotic systems for fuel rod leak inspection.





## ON-SITE FUEL SERVICES

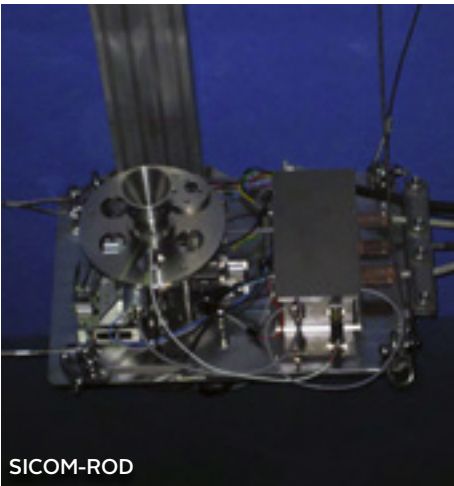
We coordinate the handling, inspection and repair campaigns that take place during the refueling programs, providing fresh fuel reception and irradiated fuel handling services and supervising the process during the reload:

- Fresh fuel handling
- Irradiated fuel and core components handling
- Leaking fuel inspection
- Fuel repair and reconstruction
- Fuel inspection and characterization
- High efficiency ultrasonic fuel cleaning

We have a wide range of spent fuel inspection equipment belonging to the SICOM\* family developed jointly with our partner Tecnatom:

- **COR**, for measuring the oxide layer thickness in peripheral fuel assembly rods.
- **ROD**, for fuel rod corrosion inspection and profilometry.
- **DIM**, for the dimensional control of fuel assemblies.
- **UT**, for detection of leaking rods in fuel assemblies.
- **NG-FA**, for measuring fuel assembly burn-up levels.
- **G-FR**, for measuring burn-up levels and internal pressure in fuel rods.
- **LEN**, for measuring fuel rod length.
- **LIM**, for cleaning fuel rod surface deposits.
- **SIPPING**, in the ON-LINE and IN-CAN versions, for detection of failed fuel assemblies by sipping technique.

\*SICOM: Sistemas de Inspección de Combustible (Fuel Inspection Equipment)





The logo for ETSA, consisting of the letters 'ETSA' in a bold, blue, sans-serif font, with a horizontal orange bar above and below the letters.

## TRANSPORT

ETSA (Express Truck, S.A.U.)

- Global operator of multimodal transport (land, sea and air) of all manner of hazardous goods, specializing in radioactive, nuclear and biofuels.
- It develops projects and it is specialized in national and international logistics development studies.
- It manages all transit permits, escorts and special authorizations in accordance to the requirements of the safety and security regulations of the countries of origin, transit and destination.



ETSA trucks

For more information [www.etsa.es](http://www.etsa.es)

# What do we do?

## ENVIRONMENTAL BUSINESS

Our subsidiary EMGRISA (Empresa para la Gestión de Residuos, S.A.) offers a wide range of services aimed at preserving the environment and ensuring an efficient use of energy.



## ENGINEERING AND ENVIRONMENTAL CONSULTANCY

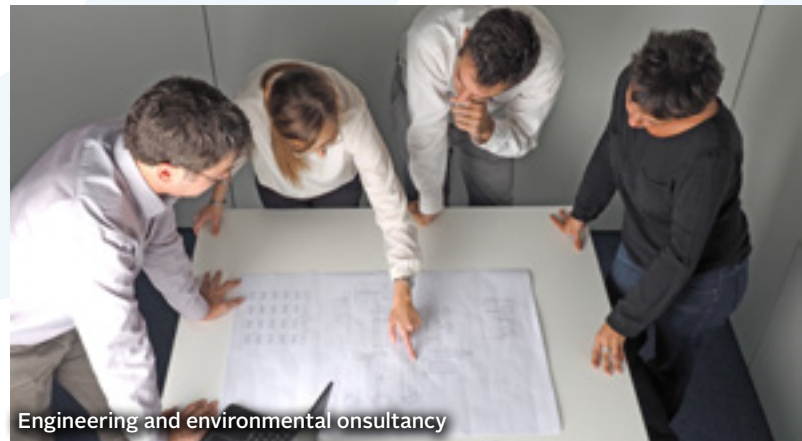
Technical support to all kinds of organizations and industries.

## CHARACTERIZATION AND TREATMENT OF CONTAMINATED SOILS AND GROUNDWATER

Performance of all kinds of environmental site assessment on soil and groundwater contamination.



Waste Management Industrial



Engineering and environmental consultancy

For more information [www.emgrisa.es](http://www.emgrisa.es)



Urban solid waste plant Cervera del Maestre (Castellón)

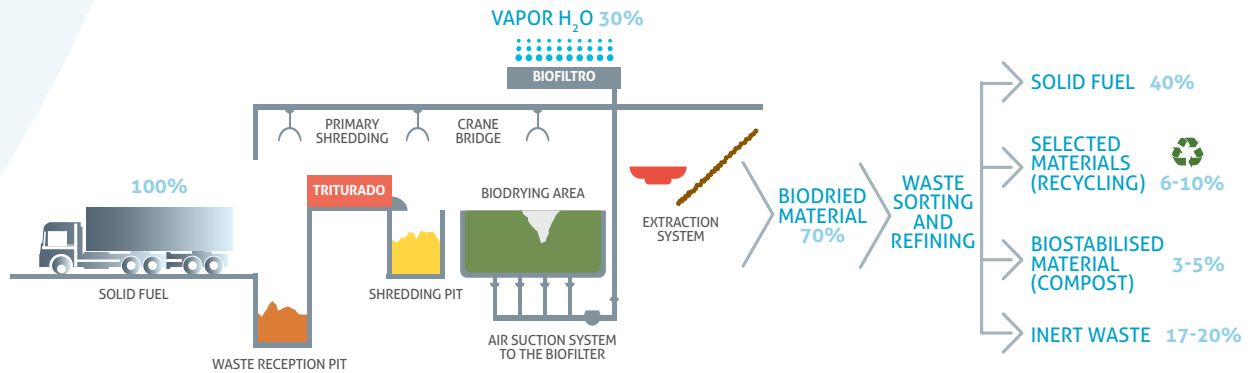
## WASTE MANAGEMENT:

### Hazardous and non-hazardous industrial waste .

Collection, transport and management of hazardous and non-hazardous industrial waste, prioritizing waste reuse and recovery.

### Municipal Solid Waste (MSW).

Design, construction and operation of MSW recovery facilities. Biodrying and accelerated oxidation technology using airflow. Odour free system and no contact with the waste.

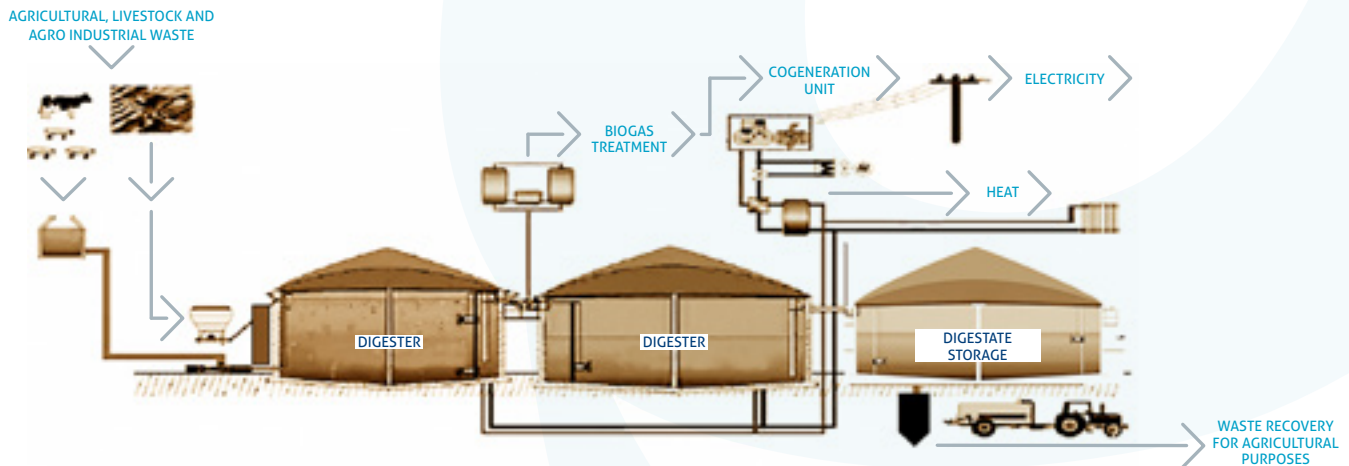




Biogas plant Juzbado (Salamanca)

**Agricultural, Livestock and Agro-industrial Waste** for agronomic valorization of digestate and energy (biogas).

- Ad hoc biogas plants design.
- Project management.
- Installation construction and commissioning support.
- Advice on operation and maintenance.



## RADIOLOGICAL STUDIES

- Site radiological assessments.
- Radon monitoring surveys.
- Radiological Environmental Impact Assessment of NORM industries.
- Design and performance of radiological environmental monitoring programmes.
- Performance of radiological and physicochemical tests in a wide variety of environmental matrixes (soil, water, sediments, biota, etc.).
- Complete radiation dose assessment, both individual (external) and environmental.

## DISMANTLING AND RECLAMATION OF FORMER MINING INSTALLATIONS

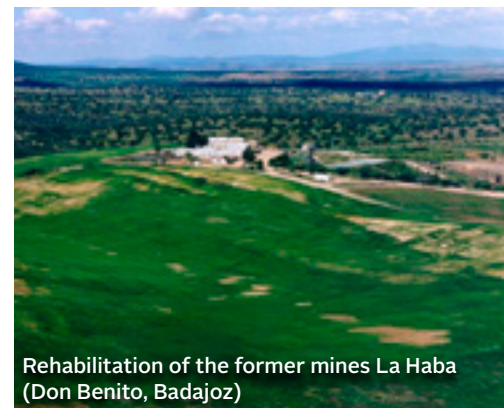
- Planning and execution of environmental rehabilitation activities in former opencast mines.
- Development of environmental monitoring programs.
- Implementation of emerging technologies for acid mine drainage treatment.



Radiological characterization in Palomares (Almería)



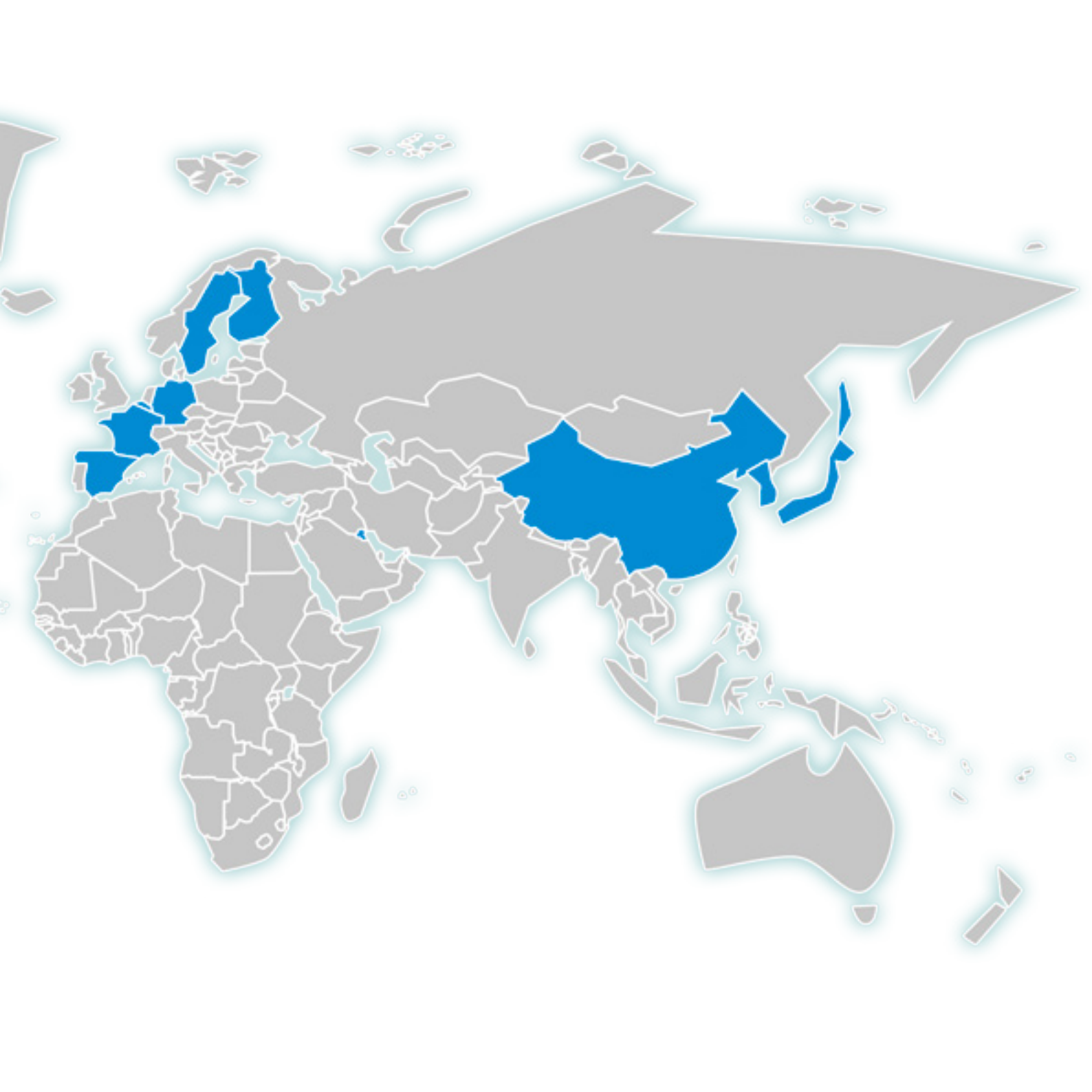
Rehabilitation of the former mines of Saelices el Chico (Ciudad Rodrigo, Salamanca)



Rehabilitation of the former mines La Haba (Don Benito, Badajoz)



In which countries  
are we located?





Santiago Rusiñol, 12 - 28040 Madrid (Spain)

Tel. + 34 913 474 200

Fax + 34 913 474 215

[www.enusa.es](http://www.enusa.es)

[relin@enusa.es](mailto:relin@enusa.es)

ENUSA belongs to SEPI Group, a corporate holding which includes a total of 16 state-owned companies in which it has direct, majority shareholding participations, with a final workforce of approximately 73,000 professionals in 2014; the Spanish state-owned television and radio corporation, Corporación Radiotelevisión Española, which is attached to SEPI, and one public foundation. Equally, SEPI has direct minority shareholdings in a further ten companies, and indirect shareholdings in more than one hundred companies.