

# CIEMAT

(Center for Energy,  
Environmental and  
Technological Research)



GDES Decommissioning  
Experience

## PROJECT DESCRIPTION

The project consisted of the dismantling of all the nuclear and radioactive facilities in the so called East Part of a Nuclear Research Centre (CIEMAT) in Spain.

The main facilities involved in this project were:

- Radioactive Liquid Waste Conditioning Building.
- Fuel Assembly Reprocessing Plant M-1.
- Radioactive Liquid Waste Storage Facility.

## SERVICES PROVIDED

- Pre-conditioning of working areas.
- Designing and construction of specific auxiliary facilities for decommissioning.
- Characterization of radiological areas.
- Dismantling works.
- Implementation of ALARA Programme.
- Management of solid and liquid radioactive waste.

## ADDED VALUE

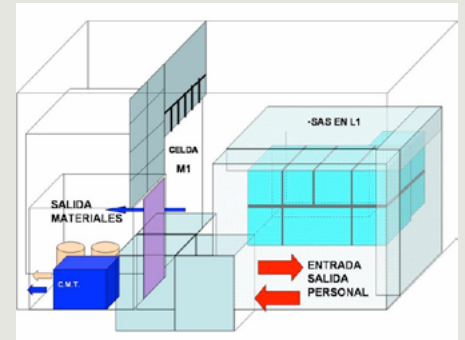
Unique work in Spain in a effective and efficient way, optimizing resources, equipment, wastes and doses according to the ALARA principle.

### Know-How:

- Paintings and cleaning inside in order to avoid the spread of contamination.
- Collected dust in shielded filters.
- Cutting and disassembling pipes Hydraulic shears.
- Removal of piping - Double bagging.

## RESULTS

- 4427 men x hours.
- 62 Tn treated materials.
- Neither external nor internal contamination detected.
- Collective Dose:
  - M1 Hot Cell: 6 manxmSv.
  - F-1 Hot Cell: 10 manxmSv.



# VANDELLOS I NPP



## GDES Decommissioning Experience

### PROJECT DESCRIPTION

It was a 508 MWe carbon dioxide gas cooled reactor modeled. It was shut down on July 31, 1990, following a fire in one of its two turbogenerators in October 1989.

Decommissioning description:

- Decommissioning of active parts (Thermal and mechanical cutting).
- Dismantling and demolition of building reactor and pools.
- Equipment, walls and singular elements "in situ" decontamination.
- Building the weather protection of the reactor and preparing the infrastructure for latency period.

### SERVICES PROVIDED

- Selection of different cutting techniques according to the radiological and physical conditions.
- Selection of different decontamination techniques according to the radiological and physical conditions.
- Segregation and conditioning of waste.
- Characterization of materials.
- New weather protection calculations.

### ADDED VALUE

- Detailed study before the beginning of the works.
- Split the project into measurable packages.
- Waste routes available all the time.
- Use of experienced and specialized personnel.
- Personnel with previous experience in decontamination.
- Use down times to do the specific works without interferences.
- Use of expansive foam before the pipe cutting.
- Use of specific filtration system (pre-concrete filters).
- Type of materials used:
  - Crane.
  - Pyramid bottle gas.

### RESULTS

Materials removed:

- Aluminium – 10 Tn
- Copper – 44 Tn
- Carbon steel– 14300 Tn
- Stainless steel – 149 Tn
- Lead – 41 Tn
- Wirings – 141 Tn
- Concrete – 7900 Tn
- Thermal coatings – 108 Tn
- Shieldings – 588 Tn
- Other – 100 Tn



# ARBI RESEARCH REACTOR



GDES Decommissioning Experience

## PROJECT DESCRIPTION

Decommissioning and waste management of the research reactor ARBI (Argonaut Type) 10 kW in Bilbao (Spain).

## SERVICES PROVIDED

- Design decommissioning document packages.
- Planning and scheduling.
- Implementation works.
  - Pre-decommissioning activities.
  - Disassembly of equipment and systems.
  - Decontamination.
  - Sampling and smear tests.
  - Characterization of radioactive waste.
  - Routes for disposal.
  - Packaging and shipment of radioactive waste.
  - Monitoring of radiological areas, personal and area dosimetry.
- Waste Management.

## ADDED VALUE

- In-time delivery of the entire nuclear decommissioning activity,
- Quality aspects of dismantling and radiological protection independently monitored by label and inspected by CSN with fully satisfactory results.

## RESULTS

- 100 % of the program implemented on time:
  - 4.062 men-hour.
  - 400 metallic components.
  - 618 concrete blocks.
  - 411 graphite blocks.
- Materials monitoring: 98.000 measures between dose rate and contamination.
- Site de-licensing achieved without any accident.



# CISAM RESEARCH REACTOR



GDES Decommissioning  
Experience

## PROJECT DESCRIPTION

Removal of the pool water nuclear reactor RTS-1 "G. Galilei" and storage tanks, and conditioning of radioactive material inside.

- Define a discharge formula for the reactor water.
- Treat the reactor pool water and other deposits.
- Discharge the water in the Canale dei Navicelli without any radiological restriction.
- Decommission the components existing inside the reactor pool and other places of the installation.
- Manage the waste according to their waste routes.
- Radiological characterization of the waste.

## SERVICES PROVIDED

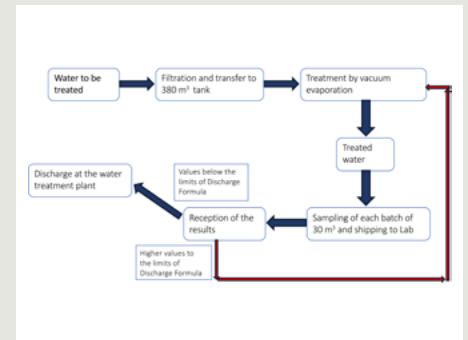
- Design decommissioning document packages.
- Definition of the discharge formula of liquid effluents and gaseous nuclear reactor.
- Treatment of the pool water and the storage tanks.
- Decommissioning of the mobile and fixed, activated and/or contaminated material in the pool of the reactor and in other locals of the Centre.
- Decontamination.
- Waste Separation and classification and characterization.
- Design and Control of radiological protection measurements. Radiation Monitoring of radioactive waste.
- Organization and implementation of ALARA.

## ADDED VALUE

- Whole project adapted to the legal and technical requirements of the country Italy.
- Design of the shielded containment for a **Ra-Be Source**.
- Use of tweezers and pneumatic tools designed to rescue objects from the pool floor.
- Re-use of the liquid waste from the evaporator for the concrete of CC500 drums.
- Necessary to study different scenarios to make the discharge in safety conditions, taking into account the dose limits legislated for the workers and the population, in order to obtain a discharge formula.

## RESULTS

- Achievement of the objectives of the project with a schedule reduction.
- Approximately 700 m3 of treated water discharged
- The discharge radionuclides concentration were lower than calculated.
- 24.268 Kg of materials were introduced inside the 80 drums of type CC500 and filled with concrete.
- The total amount of personnel hours for the development of the project were 23.026 men-hour:
  - Water Treatment Team: 5.986 men-hour.
  - Decommissioning Team: 9.336 men-hour.
  - RP Team: 7.704 men-hour.
- Non work accidents.
- Non internal/external contamination.



# TRINO NPP



GDES Decommissioning  
Experience

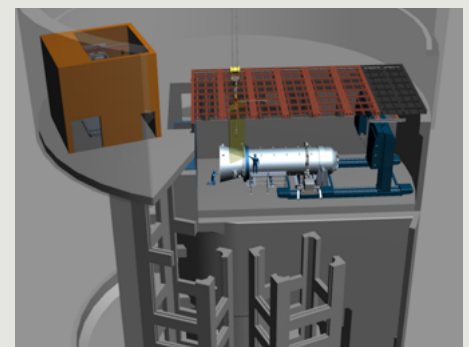
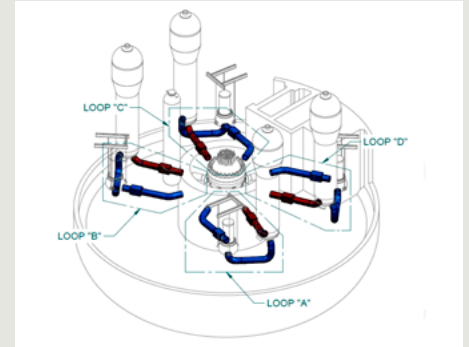
## PROJECT DESCRIPTION

Decommissioning of Big Components: Steam Generators, Pressurizer, Pumps, Primary Circuit, Auxiliary Systems...

Remote decommissioning of big components by means of Big band saw and robotised arms in a specific confinement.

## SERVICES PROVIDED

- Design decommissioning document packages.
- Planning and scheduling.
- Designing and construction of specific auxiliary facilities for decommissioning.
- Manual decommissioning.
- Remote decommissioning.
- Segregation and classification of waste.



# JOSE CABRERA NPP

[Internals and vessel reactor  
cutting project]



GDES Decommissioning  
Experience

## PROJECT DESCRIPTION

- The Project consisted of the support to **segmentation of the reactor vessel and internals** in José Cabrera NPP (Spain).

## SERVICES PROVIDED

- Cutting and removal of concrete walls between the Spent Fuel Pool and reactor cavity.
- Removal of the fuel racks from the SFP.
- Removal of upper and lower internals and Vessel.
- Cleaning and filtering of the SFP and reactor cavity.
- Decontamination of cutting tools.
- Removal concrete and steel parts from reactor cavity walls and floor.
- Construction of new concrete floor in reactor cavity.
- Cutting and segmentation reactor vessel head tubes.
- Large components underwater dose rate measurements.

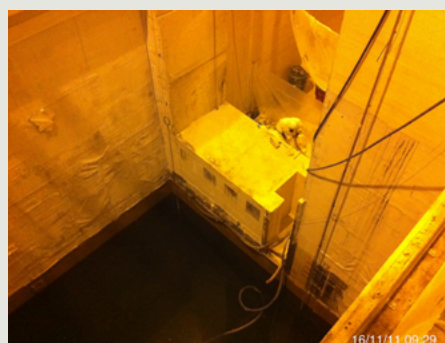
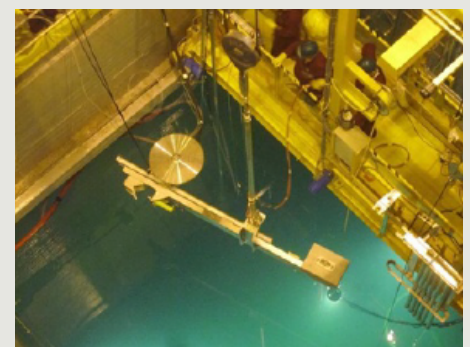
## ADDED VALUE

- Water recycling system based on a close circuit during diamond wire cutting.
- SFP Liner repair with divers and remote techniques.
- Thimble conduits cutting – resin injection.
- Design of lifting tool for the removal of fuel racks.
- Trails and mock-ups before the execution of the works.
- Design of a water distributor to avoid the environmental contamination during the drainage of pools.

## RESULTS

See videos and photos:

- Wall diamond wire cutting.
- SFP Internals segmentation & packaging.
- SFP Liner Repair.
- Vessel movement.



# JOSE CABRERA NPP [Cutting Workshop]



GDES Decommissioning  
Experience

## PROJECT DESCRIPTION

The Project consisted of the cutting of metals and decontamination of concrete blocks in a special enclosure.

The main activities were:

- Transport of the materials to be cut or decontaminated from the present storehouse to the enclosure.
- Cutting of metallic elements as: Racks, Old Pulley of Omega Crane, vessel top, Steam Generator model, biological shields.
- Decontamination of big pieces of concrete: concrete blocks from the cavity walls.

## SERVICES PROVIDED

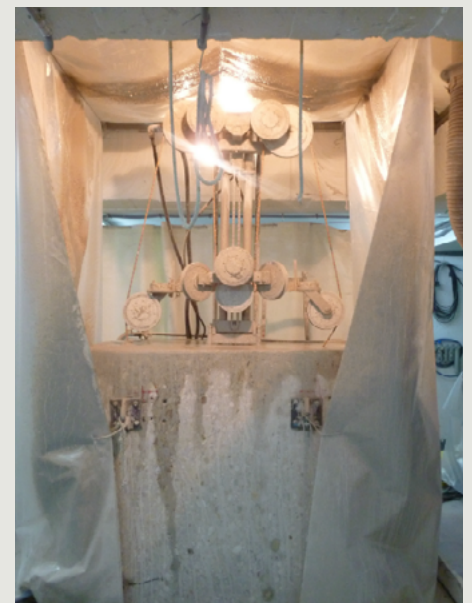
- Classification and segregation of the waste.
- Radiation and contamination control of materials and people.
- Execution of dismantling techniques as: mechanical and thermal cutting, diamond saw cutting, plasma cutting.
- Decontamination: mechanical decontamination.
- Transport the decontaminated concrete blocks to the specified location.
- ALARA studies.

## ADDED VALUE

- Install a specific enclosure with curtains inside the main enclosure to avoid the spread of contamination
- Filtration system in recirculation with self-cleaning filters
- Cutting expert to know the best technique to do the cut: plasma, oxy-propane...
- Elaboration of specific document to calculate the LDCA according to the contamination and type of cutting machine

## RESULTS

- 100 % decontamination of concrete blocks
- More than 100 Tn of metallic elements
- Non internal/external contamination



# JOSE CABRERA NPP

[Decontamination Workshop]



GDES Decommissioning  
Experience

## PROJECT DESCRIPTION

### Construction and operation of a decontamination workshop.

Propose the methodology to decontaminate and the technical solutions to carry out the main objective.

Design of the decontamination workshop, including the supply, mounting, tests and the start-up.

The decontamination workshop consist of:

- Chemical baths.
- Metal blasting cabin.
- Manual decontamination.
- Characterization area.
- Waste segregation area.

## SERVICES PROVIDED

### Chemical baths

- Metal blasting cabin.
- Manual decontamination.
- Characterization area.
- Waste segregation area.

### During Operation

- Classification and segregation of waste.
- Operation of the metal blasting cabin and chemical baths, and manual descontamination.
- Maintenance of the decontamination workshop.
- RP measures.

## ADDED VALUE

- Test in laboratory to identify the best techniques and amount of H<sub>2</sub>SO<sub>4</sub> decontamination.
- Reduction of the volume of medium and low activity materials, so it implies an economic save on waste management.
- Selection criteria on the kind of decontamination for different materials it's done with previous experience and tests in laboratory.

## RESULTS

- Treatment of 100 Tn of medium and low activity materials, reducing to a very low activity materials.





# JRC ISPRA RESEARCH CENTRE – RP



GDES Decommissioning  
Experience

## PROJECT DESCRIPTION

4 years as nominated subcontractor for Iberdrola Ingeniería y Construcción S.A. This project was awarded for 4 more years (2010-2014) with a bigger scope than the first one.

The project consists of providing Radiation Protection Assistance services in support to JRC-ISPRA's Radiation Protection Sector for its activities (mainly in support of the Nuclear Decommissioning and Waste Management Programme).

## SERVICES PROVIDED

- Dose and contamination measurements.
- Maintaining shutdown nuclear installations in a state of safe conservation.
- Management of radioactive waste: Segregation and classification of waste.
- Preparation of RP technical documentation (measurement reports, technical notes, etc.).
- Maintaining radiometric instruments used for Radiation Protection purposes in good operational conditions.
- Specific laboratory activities, related to external and internal dosimetry.
- ALARA organization and implementation of the ALARA approach.

## ADDED VALUE

- Support with experienced personnel and GDES know-how accumulated during 30 years in Nuclear Power Plants in Spain.
- Ability to develop all kind of RP tasks.
- Personnel with multidisciplinary abilities, languages and high level of education (University degree).
- Availability of qualified personnel in a short period of time.

## RESULTS

In the frame of the D&WM Programme, the goal of this project was the decommissioning of the RCHL up to the so-called "brown field" status without any radiological constraints:

- Physical and radiological characterization.
- Dismantling activities.
- Waste management activities.
- Final radiological survey.
- Final official release of the facility.



# JRC ISPRA RESEARCH CENTRE – A52



## GDES Decommissioning Experience

### PROJECT DESCRIPTION

Design an aerial transfer system for the transfer of 42 m<sup>3</sup> in the Ispra Joint Research Centre (JRC) in Italy.

The transfer system must ensure no uncontrolled spillage occurs in the event of the bursting of the pipe.

Decontamination of the tank interior to minimum levels of 0.4 Bq/cm<sup>2</sup> for alpha and 4 Bq/cm<sup>2</sup> for B and minimising liquid and solid waste.

### SERVICES PROVIDED

#### Design phase:

- A prior visit to the location and record of data.
- Design a technical solution and its structural calculation.
- Calculation of the estimated man-dose.

#### Execution stage:

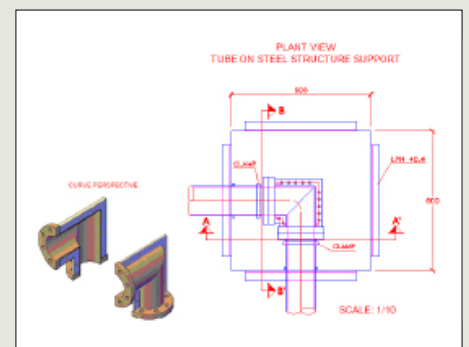
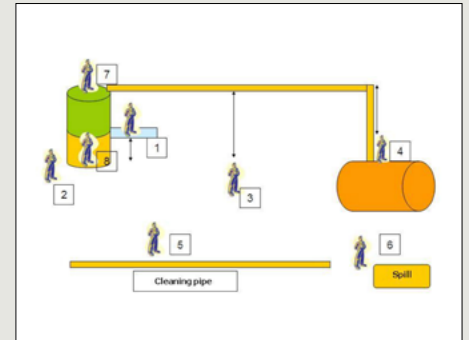
- System assembly: Enclosures and Transfer System.
- Sludge transfer through a double containment pipe.
- Decontamination of the tank using CO<sub>2</sub>.

### ADDED VALUE

- Decontamination by means of CO<sub>2</sub> pellets (No secondary waste generated).
- Aerial transfer system designed to avoid interferences.
- Double containment pipe to ensure that no uncontrolled spillage occurs.
- Leak detectors inside the double pipe, at the beginning and the end of the pipe.

### RESULTS

- Sludge transfer was done in 4 days (6 h working day) by means of a peristaltic pump.
- Decontamination process with CO<sub>2</sub> took 2 days, using 600 kg of CO<sub>2</sub> approx.
- Final liquid waste was 200 l. It was expected 500 l.
- Final solid waste was 90 kg. It was expected 100 kg.
- All the smear tests done to the tank to measure the removable contamination were below the established limits.



# COFRENTES NPP



GDES Decommissioning Experience

## PROJECT DESCRIPTION

- Cutting of 10 racks and waste management.
- Decontamination, dismantling and cutting of 2 turbine rotors, 72 diaphragms and 24 MSR's and waste management.

## SERVICES PROVIDED

- Thermal cutting:
  - Plasma cutting.
  - Thermal torch.
  - Oxy-cutting.
- Diamond wire cutting.
- Decontamination:
  - Metal blasting.
  - Chemical decontamination.
- Radiological control of materials for free release and waste management.

## ADDED VALUE

- Turbine rotors and MSR's to a radiological measurable elements.
- More than 95% of decontaminated material to free release.
- Water recycling system based on a close circuit during diamond wire cutting.
- Different decontamination techniques according to the element: turbine rotors or MSR's tubes.

## RESULTS

Materials removed:

- MSR's – 123 Tn
- Diaphragms – 320 Tn
- Turbine rotors – 350 Tn
- Racks's – 140 Tn

**Decontaminated material for free release: 800 Tn**

