SPANISH NUCLEAR INDUSTRY 2020

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To all the companies that make this catalogue real.
THE SPANISH NUCLEAR SECTOR

In Spain, nuclear energy has represented approximately 20% of the total production of electricity in recent years. On a world scale, nuclear generation represents almost 11% with 447 reactors in a position to operate in 31 countries and 52 new reactors in construction in 20 countries.

These data have meant that a large number of Spanish companies have focused their activity in the nuclear sector, based on the experience and thanks of their participation in the development of the Spanish nuclear programme since its beginnings and are present in the whole chain of value.

All of this industrial structure has evolved with the circumstances of each moment, incorporating new technologies adapted to current needs and requisites and making it possible that Spanish companies are present today in nuclear projects in more than 40 countries, in four of the five continents.

The Spanish nuclear industry also participates in international research and development projects for advanced nuclear reactors, in programmes based on nuclear fusion, such as the ITER International Project and in programmes related to high energy physics.

The companies that work in the nuclear sector are grouped in this catalogue according to the activity that they carry out.

The electrical companies focus their main activity on the production, transportation, distribution and commercialisation of electricity. The objective of these companies is to work permanently towards excellence in the management of nuclear power plants, with a commitment to continue to produce in a safe and reliable way and promoting growth in their areas of influence both from the social, economic and environmental point of view.

Since the construction of the first nuclear power plant they have extended their actions to the study of the optimization of the performance, maintenance, management of improvements in equipment and procedures, management of the fuel cycle and the development of new reactors.

The Spanish electrical companies are capable of participating in an efficient manner in international markets undergoing a process of growing integration, globalisation and increase in competition.

The international suppliers of nuclear systems provided the first “key in hand” nuclear power plants in Spain and the steam generation systems for the nuclear power plants that were built after that. This was due to the fact that, at the beginning of the Spanish nuclear programme, the decision was made not to constitute a company of systems linked by license to a foreign supplier, which would have meant having to choose a single type of reactor.
The suppliers of electrical systems currently provide support services to nuclear sites in operation and maintenance in more than 20 countries, such as for example, Germany, Belgium, Brazil, Bulgaria, China, Slovakia, Slovenia, United States, Finland, France, India, Japan, Mexico, United Kingdom, South Africa, Sweden, Taiwan, etc.

These companies work through agreements with Spanish companies with which they have developed strong technological links. This has led to a framework of mutual benefit, through which the Spanish industry has been able to participate in the development of nuclear projects all over the world.

The design, manufacture and supply of fuel to Spanish and international nuclear power plants is made by the public capital company ENUSA Industrias Avanzadas and is responsible for the supply of raw materials and their processing right through to the final elaboration of the product. It is the owner and operator of the fuel elements factory in Juzbado (Salamanca), one of the most innovative in Europe which, since the start of its operation in 1985, has manufactured more than 24,400 fuel elements for both Spanish and foreign nuclear power plants. Last year, around 50% of its production going overseas.

The manufacture of capital equipment is made by Spanish companies who cover the production of main equipment to turbine alternators, valves, cranes, piping, boilers or equipment for handling the storage of fuel for both Spanish and foreign nuclear power plants, with a recognized level of quality. At present more than 80% of their annual production is exported.

At present, the whole portfolio of orders for the supply of large components as well as a high percentage of the rest of components of this group of companies is for exports. The Spanish engineering and services companies have created an important engineering capacity for nuclear power plants, providing support in the management of the construction of new plants and in the operation and maintenance of the plants in operation, with a very diversified activity in which they export more than 60% of their annual production and in some cases up to 100%.

These companies have developed very specialised services such as the supply of simulators, training programmes for operators, in service inspection and the development of support and improvement systems in production. Their clients include all of the Spanish nuclear companies and a large number of foreign entities.

Some of these companies have laboratories for radiological analysis which offer an integral service that responds to all the needs of the sector and which are focused on the efficient and sustainable management of their activities.

Radwaste management in Spain is carried out by the National Radwaste Company, ENRESA. It is a public company and is an important international reference and example as its activities are studied and monitored by more than 15 countries around the world who have visited our site.

Very low, low and medium activity radwaste from nuclear sites, hospitals research centres and industry is managed in the Storage Centre in El Cabril, located in the province of Córdoba.

The fuel used in the nuclear power plants is kept in the onsite pools or in some cases, such as Trillo, Ascó, Almaraz or José Cabrera, in the Individual Temporary Storage Facilities, located onsite, until the future of the Centralised Temporary Storage (ATC) is clarified.

Among its activities it is also responsible for decommissioning nuclear and radioactive sites and was a pioneer in the decommissioning of the nuclear power plants of Vandellós I and José Cabrera.

Spanish Nuclear Industry Forum (Foro Nuclear) is a non-profit association which defends the Spanish nuclear sector and the continuity of the nuclear power plants and covers all of these companies and supports them in all the activities that they require.

Through their four phases of action, Support to the Industry, Technical Support, Communication and Education and Training it attends to the needs of the companies in the Spanish nuclear sector, at both a national and an international level.

In the area of Support to the Industry, Foro Nuclear coordinates the activities of the industry in different scenes, such as the participation in exhibitions with grouped pavilions, the organisation of business meetings among companies from different countries, the coordination of technical workshops in events of interest, etc.

For all of these activities it has the support of both national and international entities and institutions which gives it a greater diffusion and the possibility of reaching other companies that are not members of the Association.

Thanks to a collaboration agreement signed with ICEX Spain, Trade and Investment, Foro Nuclear is recognised as an agent responsible for providing services, in the name and representation of the entity, for the internationalisation of the nuclear sector companies, in the area of the management of aid relating to the promotion of internationalisation.

Through specific agreements with the commercial offices in Spain of those countries that are of interest for the companies in the nuclear sector, Foro Nuclear organises bilateral business meetings which make it possible to know the capacities of the participating companies and open up the possibility for collaboration among them, both in the countries that organise the meeting and in third countries.

Since 2014, Foro Nuclear and its associated companies have become part of “Brand Spain”, a recognition and prestige for the numerous companies in the nuclear sector which have extensive activities beyond our frontiers.

The figures of the activity of our nuclear industry and the degree of internationalisation of their companies are the best proof of the competitiveness of the sector and the capacity of our professionals. At present the nuclear sector is a consolidated, prestigious industry that generates wealth and employment.

The aim of the catalogue of the Spanish nuclear industry is to reflect the vitality of an open and dynamic sector in a growing international market.
Las empresas eléctricas españolas trabajan por la excelencia en la gestión de las centrales nucleares, comprometiéndose con su operación a largo plazo de forma segura.
In Spain, EDP is a group of companies that produce and distribute electricity, natural gas and energy services.

It is part of the EDP energy group, a world leader and one of the main operators on the Iberian Peninsula. The Group is present in 14 countries, has an installed capacity of 26.7 GW, 73% of which is renewable. It is the fourth major wind power operator worldwide.

The EDP Group has over 11 million customers and 12,000 employees representing 44 different nationalities.

It is a sustainable company that reinvests in society, creating value, committed to the environment and innovation, with a strong focus on social action through its Foundation.

**ELECTRICITY GENERATION**

EDP has diversified generation facilities in Spain that are noted for their efficiency, high availability and operating flexibility, underpinned by an ongoing commitment to investment. The stake in the Trillo Nuclear Power Plant is providing EDP with a first-rate nuclear experience.

**ELECTRICITY DISTRIBUTION**

E-Dedos Distracciones Eléctricas posted the best electricity supply quality in Spain, with an all-time record on the TIEPI (Equivalent interruption time of installed power) index. Apart from Asturias, where it is the benchmark operator, it has consolidated electrical distribution networks in Madrid, Valencia, Alicante, Barcelona, Huesca and Zaragoza.

**SERVICES**

The marketing of electricity and gas is complemented with a varied set of energy services for the different sectors. Special mention should be made of the “Funciona” maintenance service for the residential segment. As regards companies and industry, there are energy efficiency and consumption optimization services, along with electricity mobility and solar self-consumption services.

**RENEWABLES**

EDP Renovables is one of the leading wind power operators worldwide and is based in Spain, where its installed power is 1,974 MW. It operates in 14 countries and generated 30,041 GWh in 2019, 5,298 GWh of which were in Spain. It maintains its leadership position of the sector with a use factor of 28% and which reflects the quality of its wind farms.
Endesa, founded in 1944, is the leading company in the Spanish electricity sector and the second biggest operator in the Portuguese electricity market. The company, which belongs to the multinational energy group Enel, has around 10,000 employees and serves 10.6 million clients.

Endesa’s main business is the generation, distribution and sale of electricity. The company is also an important operator in the natural gas sector and provides other services related to energy.

**COMMITMENT TO DECARBONISATION**

Endesa, conscious of its role as a leading agent in the energy sector in Spain and its ability to contribute to achieving a low-carbon economy, places among its priorities the progressive reduction of greenhouse gas (GHG) emissions associated with the generation of electricity. It does this by giving a greater role to renewable energy and optimising the management of traditional technologies. Proof of this is the new update of the 2020-2022 Strategic Plan, with the company announcing a 70% reduction of specific emissions by 2030 and a complete decarbonisation of the energy mix by 2050. By 2019, 59% of its production was already free of CO₂ emissions. This is a plan that bets on a sustainable, dynamic, efficient business model aligned with the strategic vision in which Endesa leads the energy transformation of society.

The 2020-2022 Plan is organised around decarbonisation and the necessary process of electrification of demand, creating infrastructures to facilitate these processes and ecosystems and platforms to support them, such as the commitment to electric mobility. To this end, Endesa has also set itself the target of increasing installed renewables capacity by more than 38% by 2022, with an associated investment of €3.8 billion. Furthermore, as part of this commitment to decarbonisation, the 2020-2022 Plan includes the cessation of coal activity in the Iberian peninsula by 2022 and the total abandonment of coal activity by 2030, with a commitment to the long-term operation of the existing nuclear facilities.

**SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE**

Endesa carries out its activities in the electricity and gas business mainly in the Spanish, Portuguese and Moroccan markets. To a lesser extent, it markets electricity and gas in other European markets as well as other value-added products and services (VAPS) related to its core business.

In the generation activity, Endesa has a diversified energy mix. Nuclear energy is the main technology with an output of 26,276 GWh measured at the plant busbars, out of a total annual output of 61,402 GWh in 2019.

Endesa’s installed capacity in Spain amounted to 24,231 MW in December 2019, compared to 23,766 MW the previous year, mainly due to the growth in the development of renewable energy sources (wind and solar) through the construction and connection to the network of new facilities. Thus, Endesa’s generation plants, located in Spain, Portugal and Morocco, represent an installed capacity of 7,452 MW of renewable energy (hydro, solar and wind), 7,659 MW of traditional thermal power, 5,677 MW of combined cycles and 3,643 MW of nuclear origin.

- **In the Distribution activity,** Endesa distributes electricity in 27 Spanish provinces in 10 autonomous communities: Catalonia, Andalusia, the Balearic Islands, the Canary Islands, Aragon, Extremadura, Castile and León, Navarra, the Valencian Community and Galicia. With a total area of 195,500 km² and a population close to 21 million inhabitants.

Endesa constantly strives for excellence in the management of its nuclear power plants and in 2019, their efficiency was 35.3%, in line with 2018 values. The company is committed to the long-term operation of nuclear assets in a safe and reliable way, as set out in its nuclear policy approved in February 2011. This commitment also extends to the environment in which the plants are located, both from a social and environmental point of view, promoting economic growth.
After the last quarter of 2019, Iberdrola has 47,450 MW of installed capacity. Over 68% of it corresponds to greenhouse gases-free energy.

From the whole installed capacity, nearly 61% corresponds to renewable energies; 27% to combined-cycle gas plants; 7% to nuclear; 3% to cogeneration and the remaining 2% to coal.

Iberdrola’s 43% of nuclear capacity in Spain

NUCLEAR ENERGY IN IBERDROLA

From the whole electricity generated by Iberdrola in Spain, more than 60% comes from nuclear plants, with an installed capacity of 3,177 MW. For Iberdrola, the safety of its nuclear plants is the prime objective over other aspects such as economics, production or compliance of schedule. Likewise, Iberdrola is committed to generate electricity from nuclear plants in a respectful way with the environment, making rational use of natural resources, maintaining the best quality standards and excellence levels, and continuously carrying out the modernization of its plants according to the state of the art in this field.

IBERDROLA SHARE IN THE SPANISH NPP’S

<table>
<thead>
<tr>
<th>NPP</th>
<th>Capacity (MWe)</th>
<th>Share IBERDROLA</th>
<th>Capacity IBERDROLA (MWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cofrentes</td>
<td>1092</td>
<td>100%</td>
<td>1092</td>
</tr>
<tr>
<td>Almaraz I y II</td>
<td>2094</td>
<td>53%</td>
<td>1103</td>
</tr>
<tr>
<td>Trillo</td>
<td>1007</td>
<td>47%</td>
<td>523</td>
</tr>
<tr>
<td>Vandellós II</td>
<td>1087</td>
<td>28%</td>
<td>306</td>
</tr>
<tr>
<td>Ascó II</td>
<td>1022</td>
<td>15%</td>
<td>156</td>
</tr>
<tr>
<td>Total</td>
<td>3177</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OUTSTANDING NATIONAL AND INTERNATIONAL ACTIVITIES

Iberdrola has undergone a wide-ranging transformation over the last ten years which has enabled it to advance through the ranks to become the number one Spanish energy group, one of the Spanish main companies on the Ibex 35 by market capitalisation, the world leader in renewable energy, a pioneer in the deployment of smart grids and one of the world’s top power companies.

Nowadays, Iberdrola is working in the construction of new wind farms and regulated generation plants, to achieve a total capacity of 7,940 MW in 2020. In addition to consolidation in Spain, it has an international reference position, becoming one of the main operators of the United Kingdom, one of the largest producers of wind power and electricity networks in the United States, the main generator private Mexico and has strengthened its leadership as a distributor of electricity with more customers from Brazil.

Iberdrola is making a strong investment effort between 2018 and 2022, during which 36,000 million € will be invested in energetic projects and countries with an unstable and unpredictable regulation.

Iberdrola accelerates the creation of value through five strategic pillars: profitable growth, operational excellence, customer focus, capital optimization and digitalization and innovation.
Naturgy is a multinational energy group operating in 30 countries where it serves almost 18 million customers with a rated output of 16.9 GW. The basis of its business are in the regulated, liberalised gas and electricity markets.

The company is listed on the four Spanish stock exchanges via the continuous market and forms part of the select Ibex 35 index.

This Spanish multinational participates across the entire energy value chain, from generation and distribution to the commercialisation of natural gas and electricity. Its generation mix is diversified and includes renewable sources, combined-cycles, hydraulics, coal and nuclear.

Internationally, Naturgy has a capacity of 3.2 GW distributed in 2.4 GW from combined cycle plants (Mexico), 0.2 GW from fuel (Dominican Republic), 0.1 GW from hydroelectric (Costa Rica and Panamal) and 0.5 GW from renewable energy (Mexico, Australia and Brazil).

Naturgy is also the leading operator in the Atlantic and Mediterranean basins, managing an LNG supply portfolio of approximately 30 bcm.

**OUTSTANDING NATIONAL AND INTERNATIONAL ACTIVITIES**

Naturgy promotes best practices in energy infrastructure management, aligning its activities with its concern for the environment, the development of low-emission economies and sustainability. Moreover, as an energy operator, it seeks to achieve progress in the use of increasingly efficient and less polluting energies and is committed to attaining enhanced air quality for our urban environments.

In the electricity generation business, the group’s strategy focuses on having a balanced, competitive and environment-friendly generation mix, in keeping with the objectives and commitments of the COP 21 with regard to global warming and consolidation of its presence as one of the chief operators of the Spanish electricity sector.

Naturgy’s electricity generation capacity in Spain stands at 13.7 GW and is based on a balanced, competitive and environmentally-friendly generation mix with significant contributions from five technologies: 7.4 GW from combined cycle power plants, 2 GW from hydropower, 1.7 GW from coal, 2 GW from renewables and 0.6 GW from nuclear.

Regarding nuclear power generation, the company participates in the Almaraz (I and II) and Trillo nuclear power plants, with a percentage of 11.3% and 34.5%, respectively.

The group’s generation business outside Spain is managed by its subsidiary Global Power Generation (GPG), which groups together all the assets and holdings in international generation with a rated output that is currently 3,100 MW and projects awarded for 543 MW.

### Data 2019

<table>
<thead>
<tr>
<th></th>
<th>€ millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net turnover</td>
<td>23,035</td>
</tr>
<tr>
<td>Net profit</td>
<td>1,432</td>
</tr>
<tr>
<td>Consolidated EBITDA</td>
<td>4,668</td>
</tr>
<tr>
<td>Workforce</td>
<td>11,847</td>
</tr>
</tbody>
</table>

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Naturgy is also the leading operator in the Atlantic and Mediterranean basins, managing an LNG supply portfolio of approximately 30 bcm.
NUCLEAR SYSTEMS SUPPLIERS

GE-Hitachi
Westinghouse Electric Spain

Nuclear systems suppliers provide support and maintenance services to nuclear sites in operation across more than 20 countries.
SERVICES, PRODUCTS AND TECHNOLOGIES AVAILABLE

The GE and Hitachi alliance is recognized as the world’s foremost developer of boiling water reactors, robust fuel cycle products and highly valued nuclear plant services. Beginning in the 1950s, GE developed breakthrough light water technology with the Boiling Water Reactor (BWR). Since that time, GE has developed nine evolutions of BWR technology including the ABWR and the ESBWR, as well as PRISM and BWRX-300, within the segment of Modular reactors.

NUCLEAR PLANT PROJECTS

Advanced Boiling Water Reactor (ABWR)

The ABWR is the world’s first and only Generation III nuclear plant design in operation today, providing the benefit of a combined 25 reactor-years of operational experience. GEH’s first ABWR began commercial operation at Kashima-Kariwa in Japan, in 1996. The ABWR is licensed in the U.S., Japan, UK and Taiwan.

Economic and Simplified Boiling Water Reactor (ESBWR)

The ESBWR is a GEH-designed Gen III+ reactor currently in the U.S. Design Certification process. This simplified design provides improved safety, excellent economics, better plant security, a broad seismic design envelope and operational flexibility that increase plant availability. ESBWR employs passive safety design features. The reactor can cool itself for more than seven days with no on-site or off-site AC power or operator action, uses approximately 25 percent fewer pumps and mechanical drives than reactors with active safety systems and offers the lowest projected operating, maintenance and staffing costs in the nuclear industry on a per-kilowatt basis.

Power Reactor Innovative Small Modular (PRISM) and Versatile Test Reactor (VTR)

The PRISM design is a sodium-cooled modular reactor that is designed to recycle used nuclear fuel, generating low-carbon electricity. It is an inherently safe design that could help to close the nuclear fuel cycle, decrease the amount of waste and reduce the time that waste has to be stored in a repository to a few hundred years. It is based on proven sodium reactor technology, developed and tested over 30 years in the US. In 2018, DOE selected an adaptation of PRISM for its VTR (Versatile Test Reactor) program developed by Idaho National Laboratory. The first phase through 2020, will include the conceptual design, cost/schedule estimate and safety framework activities for a test reactor focused on the development of innovative nuclear fuels, materials, instrumentation and sensors.

BWRX-300

BWRX-300 is an evolution of the ESBWR design at reduced scale which saves 90% in volume with the goal of offering a major source of power generation able to complete with any other source in Capital Costs.

GLOBAL NUCLEAR FUEL (GNF)

GNF is a world-leading supplier of boiling water reactor fuel, including uranium dioxide and MOX fuel and fuel-related engineering services. GNF operates primarily through Global Nuclear Fuel Americas, LLC in Wilmington, N.C., and Global Nuclear Fuel-Japan Co. Ltd. in Kurehama, Japan. GNF continues to strategically expand the nuclear fuel cycle by offering customers an extensive portfolio, including fuel for PWR reactors.

NUCLEAR PLANT SERVICES

As nuclear plants get older and worldwide demand for cleaner energy increases, GEH offers a wide range of valuable services that can improve performance, increase power output and extend plant life. GEH provides the technical leadership and experience for all operational and expansion requirements for BWR and PWR reactors.

PERFORMANCE ENHANCEMENT PROGRAMS

Advanced products and services improving performance and safety, such as Plant Uprating and Optimization Programs, Lifetime Management, New Instrumentation and Control Platforms and Digital Solutions.

DECOMMISSIONING AND DISMANTLING (D&D)

On the D&D segment, GEH offers solutions in the field of emerging cutting tools, advanced imagery technologies, the latest radiation detection devices and brilliant machines such as autonomous & sorting robots to assess what is possible. Solutions that deliver significant improvement to resolve the biggest issues identified in the market: schedule, uncertainty and cost risk.

ACTIVITIES AND REFERENCES

Although GEH has no production centers in Spain, GE has based its strategy on alliances with national partners with whom it has developed strong technology links. This has led to a framework of mutual benefits through which the Spanish industry has been able to participate with GEH many projects throughout the world. The alliances with the following companies are particularly noteworthy:

Empresarios Agrupados has collaborated with GEH in proposals and projects for new plants in several countries, with a wide range of scopes and has been the main project engineering firm for the Cofrentes and Valsecabbaleiros plants. They also participated in the certification efforts for the new ABWR and ESBWR designs. As regard nuclear fuel, links with ENUSA date back to 1974 and since that time some 10,000 GEH design fuel assemblies have been manufactured for 13 BWR reactors in Europe. Since 1996, GEH has been commercializing fuel and associated services for Europe through the Spanish company GENUSA, held jointly by GNFA and ENUSA.
Westinghouse Electric Company is the world’s leading supplier of safe and innovative nuclear technology. We provide our utility customers around the world with the most reliable, dependable nuclear power plants, nuclear fuel, plant automation and operating plant products and services. We are driven by our powerful history and experience, ground-breaking ideas, focus on safety and sustainability, and our strong team of approximately 8,765 employees around the world.

Westinghouse’s presence in Spain began in the mid-sixties with the supply, under a turnkey contract, of the José Cabrera Nuclear Power Plant to the electric company Unión Eléctrica Madrileña. Already in 1972 Westinghouse had its own company Unión Eléctrica Madrileña. Nuclear Power Plant to the electric company Unión Eléctrica Madrileña. Among them are ENUSA, ENSA and TECNATOM.

ORGANIZATION

Westinghouse is worldly organized through Business Units: Plant Solutions: NPP (New Power Plants), D&D Solutions and Government Services. Operating Plant Services: NFEP (Nuclear Fuel, Engineering and Parts) and OMS (Outage and Maintenance Services) and Global Operations Services. Westinghouse is divided in three regions (America, EMEA (Europe/Middle-East and Africa) and Asia). This way it fulfills its vision of developing locally applied global solutions.

Several Spanish companies have purchased Westinghouse’s technology while at the same time becoming its associates both in Spain and in other European countries. Among them are ENUSA, ENSA and TECNATOM.

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

Westinghouse’s product lines are as follows:

ENGINEERING SERVICES

Westinghouse provides different types of solutions and services to practically all reactors in operation. It offers a compromise of safe and efficient operation of nuclear power plants throughout the world.

Some of the services it provides are:

- Reactor-related engineering, such as support to systems operation, safety evaluations, accident analysis or power uprates.
- BOP engineering.

MANUFACTURING & COMPONENTS

Westinghouse’s factories and spare parts supplies have been consolidated in a single business unit in order to cover the following processes:

- Design, supply and replacement of nuclear components.
- Supply of spare parts.

FUEL

Westinghouse provides nuclear fuel and all the engineering services related to operating nuclear power plants. From its factories in the United States, Sweden, United Kingdom and Japan, and its agreement with ENUSA, Westinghouse is capable of providing fuel to power plants of all commercial technologies in any country.

Furthermore, Westinghouse carries out all the necessary fuel inspection and repair services for their operation.

FIELD SERVICES & MODIFICATIONS

Regarding Outage & Maintenance services, such as reactor services, Fuel Handling or inspection, all of them are done locally in Spain. For very specialized services, our local team is supported by European or American organizations.

Also, this business unit has been unified with engineering support and Vessel and Internal segmentation capabilities, D&D business unit being remarkable: El Cabril and Radiana Waste Repository Design, Zorita and Barsebäck Internal and Vessel segmentation, as well as Vandellós I, Oskarshamn,Chin-Shan and JEN-1 Decommissioning Plans. Currently Westinghouse is working for ENRESA as part of the main engineering for the dismantling of Garoña and Zorita Projects.

DECOMMISSIONING & DECONTAMINATION (D&D)

Based on the successful experience of Westinghouse Electric Spain in Decommissioning Plans, Main Engineering; Site Remediation; Waste Storage Design; High, Medium and Low level; along with engineering support and Vessel and Internal segmentation capabilities, Westinghouse provides solutions for a wide range of Decommissioning, Dismantling, Remediation and Waste Management Projects.

More than 30 years of national and international experience endorsed the new D&D business unit being remarkable: El Cabril and Radiana Waste Repository Design, Zorita and Barsebäck Internal and Vessel segmentation, as well as Vandellós I, Oskarshamn,Chin-Shan and JEN-1 Decommissioning Plans. Currently Westinghouse is working for ENRESA as part of the main engineering for the dismantling of Garoña and Zorita Projects.

NEW PLANTS

Leveraging the accumulated experience gained by Initec in building Spanish plants, Westinghouse’s office in Madrid actively supports the detail engineering of the AP1000 reactor in USA.

In 2001, Westinghouse acquired Initec’s nuclear division, thus expanding its business in the country. Nowadays, Westinghouse has 244 employees in Spain across three locations: Madrid, Vandellós and Hospital del Infante (Tarragona).

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Spanish nuclear power plants operate in a continuous, reliable, safe and clean way, diverging growth in their zones of influence.
In 1998, as a result of a merger between the companies that independently managed the Ascó and Vandellós II nuclear power plants, an economic interest group known as Asociación Nuclear Ascó-Vandellós II (ANAV) was born. The rather similar technologies of both plants, and their relatively close locations, led their owner utilities to integrate them into a common management company.

This commitment is embodied both in the Group’s investments on the Plants to guarantee their safe and long-term operation, and in direct actions on the territory, with activities that foster economic, social and cultural development of the towns in the areas of influence of both Plants.

Through its day-to-day business, the staff at Ascó and Vandellós II NPPs have a fundamental role employing a total of 2,179 workers at the end of 2019 between the staff of ANAV and the stable contractor companies, which are one of the fundamental cornerstones for the safe operation of these plants. ANAV in this sense is an economic reference both in the province of Tarragona and in the whole of Catalonia.

One of the strategic communication tools that ANAV has is the Information Center. Since 2011, it has been hosting visits with the aim of giving response and, at the same time, generating new queries among all those who come with the curiosity of knowing what a nuclear power plant is and how it works. This project responds to the multiple objectives of ANAV to contribute to the approach of energy and the operation of the nuclear power plants, to generate an added value that complements the offer of the Ribera d’Ebre to attract visitors to the region and meet the existing demand to the nuclear power plant.

At the end of 2019, the ANAV Information Center incorporated a total of 14 elements from the visitor’s center of the Santa María de Garoña nuclear power plant, including modules, information panels and other materials, with the aim of maintaining, and even improving, a fluent speech throughout the entire visit.

### ASCÓ NPP GROSS ELECTRIC POWER PRODUCTION (GWh)

<table>
<thead>
<tr>
<th>Year</th>
<th>Ascó</th>
<th>Ascó II</th>
<th>Total Annual GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>16.280.53</td>
<td>8.151.61</td>
<td>24.432.14</td>
</tr>
<tr>
<td>2002</td>
<td>16.942.26</td>
<td>8.795.65</td>
<td>25.737.91</td>
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<tr>
<td>2003</td>
<td>16.814.71</td>
<td>8.238.10</td>
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<td>2004</td>
<td>15.312.78</td>
<td>8.762.06</td>
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<td>2005</td>
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<td>2006</td>
<td>16.105.75</td>
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### VANDELLÓS II NPP GROSS ELECTRIC POWER PRODUCTION (GWh)

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The Ascó Nuclear Power Plant is located on the right bank of the Ebro River in the district of Ribera d’Ebre, in the municipal area of Ascó in the province of Tarragona. Its construction began in 1972 and 81% of the construction and equipment assembly work was carried out by Spanish companies.

The Ascó Nuclear Power Plant has two pressurised water reactors (PWR), the cooling water for the two units is provided by the Ebro River.

Unit I of the Plant, with a thermal power of 2,940.6 MW and an electric output of 1,032.5 MWe, belongs to ENDESA and it initiated its commercial operation on December 10th, 1984.

Unit II, with a thermal power of 2,940.6 MW and an electrical output of 1,027.2 MWe, is jointly owned by ENDESA (85%) and IBERDROLA (15%), and it initiated its commercial operation on March 30th, 1986.

The Ascó Nuclear Power Plant employs 4,989 people, of which approximately half are university graduates. In addition, the Plant has over 669 staff members from stable contractor companies and that during refueling periods there is an addition 900 to 1,200 workers.

ANA has dedicated 84,281 employee hours to the training of Ascó NPP personnel with a total of 2,479 courses and 17,361 students, representing 5.2% of the hours worked.

After 34 years of operation in July 2018, Ascó reached 500,000 GWh of electricity production, a milestone achieved thanks to the professional performance of an outstanding human team.

The Vandellós II Nuclear Power Plant is located on the Mediterranean coast in the province of Tarragona, in the municipal area of Vandellòs i l’Hospitalet de l’Infant, being the only Spanish Plant that extracts the cooling water necessary for its operation from the sea.

National participation in the construction and supply of equipment for this Plant amounted to more than 89% of the total, the highest percentage achieved in Spain for this type of project.

The Plant has a Pressurized Water Reactor (PWR) with a thermal power of 2,940.6 MW and an electrical power of 1,087.1 MWe, and is jointly owned by ENDESA (72%) and IBERDROLA (28%).

The Plant launched its commercial operation on March 8th, 1988.

The Vandellós II Nuclear Power Plant houses ANAV’s corporate headquarters. Between the Plant and the corporate services, the site has a workforce of 1,041 people, of which 482 are ANAV employees and 559 come from stable local companies.

Currentry, the Vandellós II Nuclear Power Plant does not have an information center on site and all visitors are sent to the ANAV Information Center at the Ascó Nuclear Power Plant, except technical or institutional visitors to the Plant.

One of the challenges for next year is focused on the storage pool restructuring project, in order to expand its capacity.
CENTRALES NUCLEARES ALMARAZ-TRILLO, A.I.E.

Headquarters
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Edificio Delta Norte 3, 5º
28055 Madrid
Tel.: +34 915 599 111

In November 1999, the companies that owned the Nuclear Power Plants of Almaraz and Trillo constituted the Economic Interest Group Almaraz-Trillo Nuclear Power Plants (CNAT) for the operation, management and integrated administration of the two plants, without changing their participations in the property of each one of them.

With this decision, the owner companies Iberdrola Generacion Nuclear, Endesa Generacion, Gas Natural Fenosa Generacion, Iberenergia and Nuclenor reinforced their commitment to the safe and reliable operation of the two plants and their confidence in nuclear energy, in a diversified and environmentally free sector.

The Group has a staff over 850 employees, distributed in the headquarters in Madrid with more than 90 employees. Around 400 in CNA and around 345 in CNT.

The Almaraz Nuclear Power Plant is located in the village of Almaraz (province of Caceres). The land on which the plant stands occupies a surface of 1,683 hectares. It belongs to Iberdrola Generacion Nuclear (53%), Endesa Generacion (36%) and Gas Natural Fenosa Generacion (11%).

Construction started in 1972 and 81% of all the construction and assembly work was carried out by Spanish companies.

The Almaraz nuclear power plant has two pressurised light water reactors (PWR) with a thermal power of 2,947 MWt each, and an electrical power of 1,049.43 MWe in Unit I and 1,044.45 MWe in Unit II.

The steam from the generators is taken to the turbine buildings which houses the two turbogroups, in the same room, but separated. The cooling system (common for the two sites) is an open circuit from the cold spot which is the Arrocampo dam, constructed for this purpose.

Unit I started its commercial service on 1st September 1983 and Unit II did so on 1st July 1984. It is conceived to operate as a base plant, that is, with uninterrupted operation, and it is capable of guaranteeing an average annual supply of 16,000 million kWh.

The Almaraz Nuclear Power Plant has a staff around 400 people, of which 48% have a university degree, plus the collaboration of highly qualified personnel from contracting companies. Training is a key factor for the constant improvement of safety, quality, efficiency and competitiveness.

In order to let the public know about the reality of its activity, it has an Information Centre which started to receive visits in February 1977, years before the plant started its operation, allowing visitors to have a more direct knowledge of what a nuclear power plant is and how it works.

Since its opening the Information Centre has received more than 650,000 visitors. Most of them are students from institutes, schools and universities and mainly from the community of Extremadura.
The Trillo Nuclear Power Plant is located in the village of Trillo (province of Guadalajara). The land on which the plant is built occupies a surface of 545 hectares. It is the property of the following Spanish electrical companies: Iberdrola Generación Nuclear with a participation of 48%; Gas Natural Fenosa Generación, 34.5%; Iberenergía 15.5% and Nuclenor, 2%. Construction started in 1979 and 85% of the investment made is from Spanish origin. National engineering and equipment exceeded 80% and such important areas as civil engineering and assembly were all national.

The Trillo Nuclear Power Plant has a pressurised light water reactor (PWR) with a thermal power of 3,010 MWt and an electrical power of 1,066 MWe with a cooling circuit with three loops. Each loop in turn houses a cooling pump and a steam generator. This circuit is contained in the containment area of the reactor building. The steam from the generators is taken to the turbine building. The cooling system is a closed circuit with two natural draught towers.

It started its commercial operation on 6th August 1988. It is conceived to operate as a base plant, with uninterrupted operation and guarantees an average annual supply of 8,000 million kWh and is the most modern plant in the Spanish nuclear park.

The Trillo Nuclear Power Plant has a temporary dry warehouse which stores part of the spent fuel inside metal containers which are totally hermetic and shielded. With a surface of 2,280 square meters, this warehouse is designed to house 80 containers.

During its years of operation, the plant has obtained excellent results in its operation, with load factors, operation and availability of more than 90%. It is worth mentioning that in 2003 the plant reached 9,304,908 MWh (maximum production in a cycle).

The Trillo Nuclear Power Plant has a staff of 345 people, of which more than 48% have a university degree, plus the collaboration of highly qualified personnel from contracting companies.

Training is a key factor for the constant improvement of the levels of safety, quality, efficiency and competitiveness.
Cofrentes Nuclear Power Plant

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28033 Madrid
Tel.: +34 915 776 500

**Nuclear Power Plant**
44625 Cofrentes (Valencia)
Tel.: +34 961 894 300
E-mail: cncofrentes@iberdrola.es

**COFRENTES NUCLEAR POWER PLANT**

The construction permit was granted in 1975, being connected for the first time to the grid in October 1984. In 2019, the station had operated for 35 years, with an accumulated generation since commissioning until December 31, 2019 of 280,048 million kWh.

Cofrentes nuclear power plant is currently one of the main power generation facilities in Spain, contributing in 2019 some 3.2% of power within the regular energy production framework. In the Valencia Region, where the station is located, it supplies 34% of all power demand.

In addition to being a key power generation center in the country, Cofrentes is actively committed to the development of its social environment. In this regard, it is important to note that an average of 5,000 visitors yearly, including training centers and various associations, have passed through the Station’s Information Center.

The station currently has an Alternative Emergency Management Center (Spanish acronym: CAGE), a Safe Seismic Storage Area for portable equipment; Passive Autocatalytic Recombiners (PAR) in the Containment and Drywell; a new seismic fire protection system and the filtered containment ventilation system.

In terms of environmental contribution, the ongoing operation of Cofrentes nuclear power plant throughout the year saves the country the need to import some 14 million oil barrels annually and prevents the release of about 6.5 million Tn of CO₂ into the atmosphere.

As a highlighted fact, note that in 2019 the 22nd scheduled refueling was carried out, between November 3 and December 6, with a final duration of 34 days in which more than 11,000 scheduled jobs and 40 design modifications were completed. At the work level, the refueling meant the incorporation of 1,200 people temporarily, added to the nearly 800 who work permanently at the plant.

Furthermore, in late 2019 Cofrentes NPP had accumulated a period of over 10 years with no automatic scram, positioning itself as a top operational reliability station.

The existing Station Management Plan, in place until 2024, is intended to facilitate action implementation, especially in vital plant performance areas.

**GROSS ELECTRIC ENERGY PRODUCTION (GWh)**

This Plan currently includes 69 projects allocated to the areas of excellence and operational safety; technological update and reliability; radiation protection; major emergency management; organizational development and human resources; evaluation and ongoing improvement; and communication.

In short, all actions resulting from the Management Plan are aimed at reaching effectiveness and efficiency, prioritizing safety as an overriding priority in all business activities to ensure protection of both people and the Environment.

The key elements comprising the Management Plan are people, the organization and the facilities. Their constant interaction is paramount to reach the set objectives.

**Reactor type**
Boiling Water Reactor (BWR)

**Vendor**
General Electric

**Thermal power**
3,237 MWt

**Fuel**
Enriched Uranium Dioxide (UO₂)

**Number of fuel assemblies**
620

**Electric power**
1,092 MWe

**Cooling**
Closed-loop circuit with natural-draught cooling towers

**First electrical network connection**
October 1984

**Start of commercial operation**
March 1985

**Data of last Operating Permit**
Since 19th March 2011 for a period of 10 years

**Cycle duration**
26 months

**Photo provided by Cofrentes NPP.**
The conditioning of the medium
Collaborating in the drafting of the Management of the spent fuel,
electricity. The plant has not produced owned and run by NUCLENOR, S.A. (50%
upstream end of the Sobrón reservoir. It is in the river Ebro near the village of the
Burgos, on the right-hand bank of a curve Power Plant is located in the province of
activities in preparation for its eventual
began its phase of transition or pre-
Santa María de Garoña Nuclear Power Plant
Radioactive Installations (RINR), the Plant's
that established in article 28.2 of the
experience of the Plant's workforce to be put to

According to the projections of the 4th
General Radioactive Waste Plan, and as per
that established in article 28.2 of the
Regulations Governing Nuclear and Radioactive Installations (RINR), the Plant's
activities during this period are focused on the transfer of ownership to ENRESA in a
safe and efficient manner.

The singular nature of the closure of the Santa María de Garoña Nuclear Power Plant has led to ENRESA proposing a decommissioning process to be carried out over two phases, thereby ensuring its efficiency and enabling the experience of the Plant's workforce to be put to optimum use. Phase 1 will last for as long as it takes to remove the fuel rods stored in the spent fuel pool and move them to the Temporary Individualised Store (ATI) and to disassemble the equipment housed in the turbine building. Once the spent fuel pool has been emptied and all the fuel stored in the containers located in the ATI, phase 2 will consist of the entire dismantlement of the plant.

During 2019, the plant kept all the fuel stored in the reactor building pool, where it will be maintained in safe conditions until it is transferred to the ATI.

Nuclenor’s main priority in this phase of transition to decommissioning has been the safe operation and maintenance of the spent fuel and radwaste without operating incidents or industrial accidents and rigorous compliance with the standards and requisites established by the Spanish Regulator (CSN). Especially important in this phase is the dedication to the training and maintenance of the organisational capacities required for the new situation of the plant.

2019 saw the plant’s workforce involved in certain projects implemented in accordance with the new transition phase, always in close collaboration with ENRESA:

- The conditioning of the medium and low activity operational waste, which was completed in April 2019, and processing the last residual materials pending, both typified and non-typified. By said date, all the operational waste had either been conditioned or the associated management method had been defined together with ENRESA.

- The reconfiguration of the spent fuel pool cooling systems, the objective of which is the global optimisation of the Plant’s systems after more than 4 years cooling the irradiated fuel by maintaining the required safety functions with the following objectives: focusing monitoring on the important safety systems, reducing risks, facilitating the pre-decommissioning activities and adapting the Plant to international standards. In 2019 the CSN continued with its assessment of the modification proposals contained in the Official Stoppage Documents (DOPs) of this project.

- Management of the spent fuel, preparing the Temporary Individualised Store (ATI) in which the containers to be supplied by ENRESA will be housed to await the removal of all the fuel elements stored in the spent fuel pool, and preparing the refurbishing floor and the spent fuel pool for the loading and moving of the containers when they arrive at the Plant. During the year, the Plant worked with ENRESA on the drafting of the Spent Fuel Management Plan (PCG) Rev2 of December 2019, which defines the main aspects of the Plant’s fuel management procedure.

- Collaborating in the drafting of the Decommissioning Authorisation Application for phase 1, which was initiated by ENRESA in June 2019.

- Radiological characterisation of the turbine building. An activity requested by ENRESA for developing the safety studies for phase 1 of decommissioning. This involves evaluating the radiological impact of the works to be undertaken in this building (waste, dose to which the workforce is exposed, etc.). In 2019 the Plant worked with ENRESA on defining the scope of these activities, which involved the taking of measurements and samples in the field and sending these to the corresponding laboratories for analysis.

- Preparation for the decommissioning of the Plant, which involves collaborating with ENRESA in the specification, planning and development of other activities such as the physical inventory of structures, systems and components to be removed during decommissioning, the development of 3D models, the removal and disposal of all pipework and equipment that might contain asbestos, the preparation of warehouses for storing the waste generated by the decommissioning process, and the decontamination of equipment and systems to reduce the dose to which those involved in the works are exposed. The site renewed its environmental certification (IUNE-EN-ISO 14001:2015) in 2019.
FUEL

ENUSA Industrias Avanzadas, S.A., S.M.E.

A Spanish company is responsible for all stages of the nuclear fuel production process, from the delivery of raw materials, through to their processing and manufacturing.
ENUSA Industrias Avanzadas, S.A., S.M.E. (ENUSA) was founded in 1972 as the National Uranium Company. It was part of an initiative that intended to strengthen the importance of the nuclear component in Spain’s energy development. Today, ENUSA is a publicly owned company with a majority share by the Sociedad Estatal de Participaciones Industriales (SEPI), and the remaining 40% by the Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT). ENUSA is the parent company of the ENUSA Group, jointly with Express Truck, S.A.U., S.M.E. (ETSA), and Residuos Industriales S.A., S.M.E., M.P. (Emgisa), focusing its activities in the nuclear fuel cycle and develops environmental services.

BUSINESS OBJECTIVE

ENUSA’s business goal is to endeavor to improve its competitiveness, maintain the safety and quality of current production as well as the received recognition from regulators, institutions and clients, and contribute to the socioeconomic development of the communities where it operates.

ACTIVITIES AND REFERENCES

The nuclear business focuses on activities of the nuclear fuel cycle that are marketed both nationally and internationally and which services consist of:

- Manufacturing and fuel assemblies to national and foreign nuclear power plants for:
  - Pressurized water reactors (PWR), under Westinghouse license.
  - Boiling water reactors (BWR) under General Electric license.
  - Pressurized water reactors (VVER), in collaboration with Westinghouse.
- Coordination 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 (inspection, repair, characterization and cleaning).
- Transport of nuclear and radioactive materials through the subsidiary ETSA.

As part of the nuclear activities, we also develop technological capabilities for the second stage of the fuel cycle and the sale of fresh and irradiated fuel manufacturing and inspection equipment.

The subsidiary Emgisa is environmental Brand of the ENUSA Group and offers a wide range of services aimed at preserving the environment and ensuring an efficient use of energy.

- Manufacturing and fuel assemblies to national and foreign nuclear power plants for.
- Waste treat and management all kinds of waste.
- 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. Design, construction and operation of MSW recovery facilities with biodrying and accelerated oxidation technology using airflow. Odour-free system and no contact with the waste.
- Agricultural, Livestock and Agro-industrial Waste. Plants design for agronomic valorization of digestates and energy (biogas).
- Characterization and treatment of contaminated soils and groundwater. Performance of all kinds of environmental site assessment on soil and groundwater contamination.
- Radiological studies
- Engineering and environmental consultancy.

As a complement to these activities, the environmental area supervises the reclamation of former uranium mining facilities in Saelices el Chico and La Haba, the purpose of which is to try to restore the affected natural space to its original state, with environmental and radiological conditions as similar as possible to those existing before the mining operations.

Currently, ENUSA has three work centers. Two of them are industrial sites: a fuel assembly factory in Juzbado, and a center in Saelices el Chico (Ciudad Rodrigo). Both of these are in the province of Salamanca. The corporate headquarters are in Madrid. ENUSA also manages a biogas plant in Juzbado and a solid urban waste plant in Cervera del Maestre (Castellón).

Since 1985, the Juzbado factory manufactures uranium pellets, assembles fuel elements, and develops equipment for fuel assembly and inspection of fuel for PWR and BWR.

In 2019, ENUSA Industrias Avanzadas, S.A. supplied a total of 273.69 tonnes of uranium (tU) at different enrichment levels to the Spanish nuclear power plants Trillo, Almaraz I, Ascó I y Ascó II, and Cofrentes, which is equivalent to 1,851 tonnes of uranium concentrates (tU6), 1,562 tonnes of natural uranium as U6, and 1,313 thousand TSU (technological separation units), measure of the energy consumed in the separation of uranium in two parts, one enriched and one impoverished in the fissile isotope uranium-235. The number of TSU is proportional to the level of enrichment required.

The fuel assembly factory manufactured 276.35 tU, 51% of which were exported to France, Belgium and Finland.

In all, 615 fuel assemblies were assembled, 505 for PWR and 110 for BWR.
Equipment goods manufacturing companies export more than 80% of their output.
In 1980, after the creation of the Business Development & Field Services department, Ensa started performing works at the nuclear power plants such as installation, commissioning, fuel management, plant maintenance, decontamination and dismantling. Since 1986 Ensa has a majority ownership of ENWESA, a company mainly dedicated to provide services at nuclear power plants.

Since its beginning, Ensa has had the appropriate infrastructure, technology and human resources necessary to meet the highest standards in the areas of engineering, design, procurement, quality assurance, manufacturing, inspection and services. Ensa facility includes a workshop capable of manufacturing the biggest nuclear components and an Advanced Technology Centre for the development and qualification of innovative manufacturing and inspection techniques, which include accredited laboratories that can supply services both to Ensa and to external customers.

Known in the nuclear industry as a preferred manufacturer for the high quality of its products and the high technology of its manufacturing processes, Ensa fabrication specializes in components such as reactor vessels including internals, supports and cover heads, steam generators, primary circuit pipings, pressurizers, heat exchangers, fuel elements bundle heads, used fuel casks for storage and transport and fuel racks for both new and used fuel and components for the ITER project (International Thermonuclear Experimental Reactor).

Since its inception, Ensa has provided, following recognized international standards and meeting the most equipment operating with the required security in nuclear plants of multiple and varied designs located throughout the world. This has made Ensa a distinguished multimarket capable manufacturer, able to successfully provide the most demanding nuclear components based on continuous research and development of new and competitive manufacturing technologies for each of the different nuclear designs in the market.

The company has its operations center and its headquarters in Maliaño, Cantabria. It belongs to the SEPI Group, a business holding that owns directly or in majority a total of 15 public companies, with more than 74,000 professionals. It also has a tutelage public foundation and direct minority shareholdings in other nine companies and indirect in more than one hundred societies.

KENSA’S INTERNATIONALIZATION

With the technology and quality as the main pillars of the company, the successful orientation to the international market started in the late eighties and new accounts for over 90% of the manufacturing equipment and over 25% of the service provided to plants. Ensa is involved in demanding markets such as French, U.S., Belgium, Japan, Chinese, Taiwan, Slovak, Russian, English, etc. Currently, all major equipment portfolio and equipment being manufactured in Ensa have a destination for the international market.

Focusing only on the NSSS (Nuclear Steam Supply System) components, only three of the thirty-seven major components manufactured by Ensa until 1998 were made for the international market, a percentage lower than 10%. However, this situation changed significantly in the late eighties beginning a rapid increase in exports. Twenty-six large equipment were exported between 1988 and 1995. Although the Spanish market demand, a priority for Ensa, restarted in the mid-nineties due to the need of replacement of components in power plants in operation, only three components of a total of eighty-eight have been provided to this market since 1997. This means that the internationalization has represented about 96% of the portfolio of Ensa since 1997.

Within the line of Fuel Management, Ensa has also provided transport and storage casks for fresh and used fuel to countries like China, Japan and the U.S.A. as well as storage racks for fuel pools in Korea, Germany, South Africa, Taiwan, Finland and China. For both casks and racks the enterprise offers competitive designs in which have been incorporated lessons learned as an experienced manufacturer and operator of this equipment such as the ENUN 32P, ENUN 52B y ENUN 24P.

Ensa has maintained a constant activity in other areas such as design and services which have had also a strong internationalization. Examples of this internationalization include the outstanding participation of Ensa in the South African project PBMR (Pebble Bed Modular Reactor), participation in ITER (International Thermonuclear Experimental Reactor), ITER project and provision of services in NPPs in countries such as China, Bulgaria, France and Finland.

Another important market line is the dismantling of national and international nuclear power plants. It’s important to highlight the works carried out at José Cabrera (Guadalajara), Kozloduy (Bulgaria) plants.

Throughout its history, the nuclear activity in Ensa has also been reconciled with the manufacture of components for research institutes (CEIRN, UAAEA, EPRI, Max Plank etc.) and institutions (ITER, NASA, EURATOM), and the manufacture of offshore oil platforms, support services to other firms and the manufacture of pressure components for the chemical and petrochemical industry.
Ringo Válvulas S.L. (RV) was founded in 2000 with the aim of manufacturing high performance valves of all types along with operational spares for use in the nuclear industry. Thanks to a team of persons with over 35 years of experience in valve manufacturing for the nuclear industry, RV currently has over 90% market share for the Spanish nuclear power plants, along with numerous contracts to supply to more than 45 plants in 20 different countries: Spain, Sweden, Finland, Switzerland, Belgium, United Kingdom, Russia, Belarus, Bulgaria, Slovakia, Slovenia, Ukraine, Rumania, South Africa, China, India, Mexico, Argentina, Brazil and Canada.

BUSINESS OBJECTIVE
The business objective of RV has, and continues to be, to cover the demand of the Spanish nuclear industry for valves and spares, guaranteeing equipment supply and providing high levels of quality and reliability. RV is equipped with modern facilities adapted to the manufacturing needs of the Spanish nuclear market, and is capable of offering a rapid and satisfactory response to its clients’ demands.

Thanks to good supply experience and excellent technical references, RV has been able to access the nuclear valve export market, this having increased its backing and commitment to the nuclear sector and leading the company to consolidate a professional team with wide experience on the nuclear market.

The RV plant is a modern facility with the latest technology available for all manufacturing activities. Plant is located in the Empresariun industrial estate in Zaragoza’s most modern and logistically best located industrial zone. Production facility has a manufacturing area of 12,000 m² and office space of 2,500 m².

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE
RV manufactures all types of valves for the nuclear industry, both nuclear and non-nuclear class. Applicable design codes are ASME III, NB, NC and ND, AD-Maklatter and RCC-M.

Ringo portfolio includes:
- Gate valves: both manual, motor-operated and pneumatic.
- Globe valves for on/off services and regulation.
- Control valves.
- Check valves, including testable and assisted valves.
- Butterfly valves for applications such as containment and control room isolation.
- Diaphragm valves.
- Bellows seal type zero leakage valves.
- Ball valves, including top entry and in-line removable types.

RV also supplies operational spares for maintenance activities during refueling outages. One of the company’s most significant services offered to the NPPs is the performance of special calculations and tests for the qualification of designs, in collaboration with TECNATOM, S.A., and the dedication of conventional valves for use at nuclear power plants.

RV has a Quality system in accordance with ISO-9001-2015 and it is homologated in accordance with the European Pressure Vessels Directive 2014/68/UE for the manufacturing of valves and related spares. On the other hand, RV is a company qualified as ASME III N & NPT stamps holder, that allows RV to supply nuclear valves for the plants in USA and even has been recently approved by ASME as Material Organization.

Besides the main target of assuring the quality of its products, RV is fully committed to the environment, safety and corporate responsibility so, in order to fulfill all these aims, RV has an environmental program certified according to ISO 14001, a safety system qualified to the OSHAS 18001 and a corporate responsibility program certified as per SA8000.

RV is approved for some of the most relevant plant designers such as Westinghouse, Siemens, Areva, GE Hitachi, KHNP-Kepco, NIAEP, JSC Atomenergoexport or NIAEP-JSC Atomenergoexport. On the other hand, RV is also approved by the following end-users: Grupo de Propietarios del Centrales Nucleares Españolas, Comisión Federal de Electricidad (Mexico), NASA (Argentina), Electrobras (Brazil), Grupo de Propietarios de Centrales Nucleares, Sucesas, NOK (Suiza), Electrabel (Belgium), Fortum (Finlandia), Comisión Nuclear de Rumania, Rosenergoatom (Rusia), RUE Belarusan (Bielorrusia), TAEK (Turquia), NPC (India), CNNC (China) and KHNP in South Korea.

RV has the most advanced design software in both 2D and 3D, allowing calculation in all areas, mechanical, fluid and dynamic noise, ensuring the adequacy of the valves. This is very important, especially in control valve applications for critical services.

ACTIVITIES AND REFERENCES
Through 2019, Ringo Válvulas has consolidated its position in the Spanish Nuclear Market, completing the supply of all kind of valves and spare parts to all the active Spanish nuclear plants to keep the level of sales of the previous years.

Concerning the international market, Ringo Válvulas has kept its presence in the markets where has been already succeeding during the last years such as Belgium (with supplies to Doel NPP and Thiane NPP) and the Nordic countries (Forsmark, Ringhals and Oskarshamn in Sweden as well as Oskilto in Finland).

On the other hand, RV has continued its expansion to new markets: for instance, RV has supplied a contract for Energoatam in Ukraine, for the plants of Khrmelnitskaya and Rine III as well as another important order of butterfly and check valves for the MPCI cooling system for the Sizewell NPP in United Kingdom.

Furthermore, RV is currently holding a contract for the manufacturing of Ni-Stamp bellow sealed globe valves according to ASME III for the Pickering NPP in Canada.

Once again, one of the key market in terms of volume during 2019 has been the Russian one (Rosatom), where Ringo continues consolidating its sales with new contracts in Russia, for instance for Kursk NPP, but also in third countries such as India where RV has successfully completed the supply of several contracts including manual and fast acting gate valves, globe control and ball valves for Kudamkulam NPP, in Bangladesh (Roopur NPP) or Turkey (Aküyu, NNS), as RV is manufacturing several relevant contracts for these two plants.

All the achievements stated above are based on the Ringo philosophy, absolutely oriented to the design and manufacturing of the products in fully accordance with the requirements of codes and client specifications of each particular project. For that purpose, Ringo Válvulas has specific training programs for its staff, with special focus on nuclear safety culture, where the proper working procedures are established and personnel is motivated to be totally committed to that culture.
The Spanish engineering and services companies have and continue to be engaged in nuclear projects across more than 40 countries.

Amphos 21
CEN Solutions
Centro Tecnológico CTC
Coapsa Control S.L.
Empresarios Agrupados
Enwesa
Equimodal
GD Energy Services
Geotecnia y Cimientos, S.A.
Grupo Eulen
IDOM Consulting, Engineering, Architecture, S.A.U.
Newtesol, S.L.U.
Nusim, S.A.
Proinsa, S.A.U.
Taim Weser, S.A.
Tecnatom, S.A.
VIRLAB, Expertise in Vibrations and shocks. Testing Laboratory
Amphos 21 is a group offering an environmental consulting, technical and strategic consulting services in 5 main activity areas:

- Nuclear
- Mining
- Water
- Sustainability
- Oil and Gas

We develop nuclear activities since our inception in 1994. Our team is recognised at an international level in radioactive waste management. From our headquarters, we work for clients in the entire world, mainly for agencies implementers and regulators of radioactive waste issues, the European Commission, as well as for private clients needing assessment on issues related with the uranium cycle, such as legacy wastes and soils affected by the presence of radioactive materials.

Our activities are organized around three main axis:

- Consulting
- R+D+i
- Advanced modelling solutions

Which we apply to provide the best solutions to the following issues:

- High, Intermediate and Low level radioactive wastes.
- Radioactive waste repository performance assessment and siting.
- Environmental and radiological impact of radioactive waste storages and disposal facilities.
- Water, sites and soils affected by the presence of radioactivity.

Our distinctive trends as organization are based on:

- A highly qualified team, used to face complex technical and scientific challenges to help our clients find the best solutions.
- Highly skilled in-house conceptual and numerical capabilities.
- Innovative solutions, which we present in international conferences and publish in international scientific and technical journals.
- Our collaboration with Universities and Research Institutions Worldwide, which puts us in a unique position to find and develop the best solutions for every case. There is a constant pool of Ph.D students and engineers advised by our senior staff.
- Our international character: Most of our activities in Nuclear are developed outside the Spanish borders (a 95% in 2016).

CERTIFICATIONS:

- Amphos 21 is certified according on international standards ISO9001 and ISO14001 and European Regulation EMAS.
- Amphos 21 is a company certified by the French Ministry of Education and Research (MENESR) as R+D developer (CIR).
- Amphos 21 is the 1st COMSOL certified consulting in geosciences.
- Highly skilled in-house conceptual and numerical capabilities.
- Innovative solutions, which we present in international conferences and publish in international scientific and technical journals.

DEVELOPMENTS 2019

Throughout the year 2019, we have developed more than 100 projects. We provided services to our long-term clients, as well as, to the recently-incorporated clients by developing projects in Spain, Sweden, France, France, Finland, Belgium, Germany, the United Kingdom, Japan and South Korea. Below, we detail some of the activities of 2019 that we consider the most remarkable given their innovative contribution within the nuclear sector.

Within the framework program that we signed with the Swedish radioactive waste management agency (SKB), we have carried out numerous activities for the future repository of long-lived (low and intermediate radioactive waste (SFL repository). We can highlight our studies on the robustness of the underground repository structure, which were informed by performing advanced numerical modeling exercises. We calculated the geochemical stability of the engineered barriers, simulated underground water flow, developed a multiphase flow to evaluate the impact of hydrogen gas formation and transport within the repository. The geochemical models were set up to predict the transport of radionuclides and chemical degradation of materials. Amphos21 assisted SKB in issues associated with the license application for the final repository for short-lived radioactive waste. In 2018, SKB received different queries from the Swedish regulatory authorities and Amphos21 is helping to adequately tackle concerns that are critical for the sustainability of the country’s energy industry.

Within our framework agreement with ANDRA, the French radioactive waste management agency, the activities have continued as planned, through the development of both, experimental studies and numerical simulations. The projects have addressed problems related to the migration of radionuclides, the geochemical activity of saline media, chemical stability of engineered and natural barriers at high temperatures, and chemical-mechanical interactions between repository materials. The results of these studies contribute to the repository design as a long-term safe facility.

Amphos21 maintains regular employee trainings to promote R&D activities and improve overall team performance. During 2019, employees attended multiple international trainings that helped them to earn specific knowledge and enhance already acquired skills. We have extensive experience in supervising thesis programs. Currently, 3 doctoral dissertations are underway in Amphos21. By the end of 2019, our team produced 14 scientific manuscripts that were published in highly-ranked international journals.

Amphos 21 has a long history of contributing to the development of hydrogeological modelling of groundwaters surrounding the NPP of Ascó and Vandellós, in Spain.
BUSINESS OBJECTIVE

CEN Solutions develops its activity in the Energy, Oil & Gas, Industry and Transport sectors, in which it provides solutions in the field of equipment manufacturing and expert maintenance.

The manufacture of safety equipment is a key activity within the strategic development of the company, with capacity for the supply of control panels and consoles, auxiliary panels for reactor protection systems, sampling equipment, power centers and distribution switchboards, motor control centers, medium voltage switchgears, isolated phase busducts, dry transformers, and power electronics.

The design and manufacture of the equipment is carried out at the company’s premises in the free zone of Sevilla, with a total area of 60,000 m².

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

To ensure good performance in terms of quality, environment and safety, CEN Solutions has management systems in accordance with the requirements of ISO 9001, ISO 14001, PECAL 2120, NQA-1: 1994, 10CR90 Appendix B, UNE 73401:1995, ANSI Standards and ASME Codes, which are periodically audited allowing the homologation and accreditation as a supplier of Nuclear Safety equipment (Class 1E) at national and international level.

The use of the most advanced manufacturing processes and technology, including qualification tests in accordance with the applicable regulations in each case (IEC, IEEE) and compliance with the strictest requirements of control and quality assurance, allow us to offer the most appropriate equipment and assemblies that, in compliance with current standards and satisfaction of the customer needs.

We also have our own capacities for commercial dedication of electrical components, performed for the components of the products we manufacture or spare parts required by the different Nuclear Power Plants.

CEN Solutions maintains a highly specialized technical team and the qualifications required for the nuclear sector, which have allowed it to continue offering uninterrupted global solutions for the supply of safety and commercial equipment from the beginning of the industry.

The permanent contact with the most specialized companies in the nuclear field, makes CEN Solutions aware of the new technological advances and can be present in the nuclear power plants in Spain and abroad.

NATIONAL AND INTERNATIONAL OUTSTANDING ACTIVITIES

Among the most recent references for the nuclear sector are the following work and supplies:

NATIONAL NUCLEAR POWER PLANTS

- Supply of spare parts (Motor Control Center drawers, auxiliary material) [Almaraz NPP, Trillo NPP, Ascó NPP, Vandellós II NPP].
- Supply of 6.3 kV switchgears, transformation centers and MCC, train A, B and N for EJ project [Vandellós II NPP].
- Provision of labor for main site and centralization switchboards [Almaraz NPP].
- Supply of power centers and MCC for power increase [Almaraz NPP].
- Supply additional column CF 2B1A [Almaraz NPP].
- Design, manufacture and assembly of modular electric room for TC cooling towers system [Almaraz NPP].
- Design, manufacture and assembly of modular electric room for water treatment [Almaraz NPP].

INTERNATIONAL NUCLEAR POWER PLANTS

ABWR by GE Hitachi

- Main Control Room Panels and Remote Shutdown Panels [Simulator, Units 1 and 2].
- FMC/RD/REL logistic panels and self-finring solenoid fuse panels [units 1 and 2].
- HCU self-test panels [units 1 and 2].
- Systems of sampling and analysis of liquids of secondary systems.
- Meteorological control panels.
- NUMAG panels: NMS panels, optical fiber panels, ATIP & MRBM panels, PRM panels, RTIF panels [units 1 and 2].
- Provision of labor for review in plant and control room.

China Nuclear Power Engineering & China Techenergy Co. LTD.

- Main Control Room Panels and Remote Shutdown Panels for Fuqing NPP [Simulator, Units 1 and 2].
- Main Control Room Panels and Remote Shutdown Panels for Fangjiashan NPP [Simulator, Units 1 and 2].
- Main Control Room Panels and Remote Shutdown Panels for Hainan NPP [Simulator, Units 1 and 2].
- Provision of labor for supervision and modifications in the Fuqing and Fangjiashan NPPs.
- Instrumentation for the main control rooms for Hongyanhe NPP 5 & 6.

Nuclear Fusion Technology

Long-term projects in which the company participates

- Review of bars of 10 kV and low voltage and Metron switch replacement during recharges (2018-2022) for CN Trillo.
- Design and supply of the Safety Control System - Nuclear (SCS-N) for ITER.
CENTRO TECNOLÓGICO CTC

The Technological Centre CTC is a private foundation which is recognized as a Technology Centre by the Ministry of Science, Innovation and Universities.

Its main objective is to bring value to companies through research, development and innovation projects, contributing to the enhancement of their competitiveness and sustainability, and becoming its technology partner, by being the meeting point between their needs and research activities.

Within the various fields of knowledge, the CTC is positioned in Experimental Sciences and Engineering, driving the R&D activity into the following technology solutions:

- Advanced engineering.
- Advanced materials and nanomaterials.
- Predictive maintenance.
- Robotic systems and autonomous vehicles.
- Navigation systems.
- Smart offshore structures.
- Industry 4.0.
- Knowledge, the

The Centre has cooperation agreements with various institutions and companies. The purpose of these agreements is to establish the basis for joint and coordinated development of R&D in different fields of activity and thereby promote the culture of innovation and the enhancement of the technological collaboration. CTC is active partner of various platforms and associations. Among these associations’ highlights:

- Clúster de la Industria Nuclear de Cantabria (CINC). The objectives of the cluster are to strengthen the field of nuclear energy in Cantabria and act as a reference for all players in the sector and therefore represent the same interests as partners in the nuclear industry to the government or other decision-making bodies, as well as to increase competitiveness and business opportunities of the companies or entities in the field of nuclear industry market, combining synergies that allow access to major projects both national and international.
- CEIDEN. It was formed in 2007 and its purpose is to coordinate the different national and international plans and programs of innovation in the field of nuclear fission technology, as well as participate in international programs, ensuring consistently the efforts of the entities involved.

CTC is specialized in structural integrity analysis of first generation nuclear reactors under ASME design codes and design of components and tools for nuclear power stations according to ASME, RCC-M, Eurocode and FEM. Analyses consist of material resistance calculations and heat transfer calculations which require engineering expertise and strict compliance with the codes. Analyses have allowed the detailed design and the manufacturing en components for generation III and IV reactors and spare components for generation II reactors.

CTC performs the design of manipulation and test tools. The design consists of analysis, manufacturing drawings and definition of specifications.

The specialization lines and technologies are:

- Simulation of welding processes
- Decontamination of water by graphene
- Thermal and structural simulations (ANSYS)
- Thermo-hydraulic simulations by CFD codes (ANSYS CFX)
- Mechanical design and structural analysis

OUTSTANDING ACTIVITIES - NATIONAL

- Development of composite materials with barrier properties against radiation
- Research project about fatigue monitoring and the effects of the environmental effects on the fatigue of the nuclear reactors
- Definition of innovative manufacturing processes for ITER
- Research project about the application of the Master Curve on a nuclear reactor
- Analyses of reactors of generations III+ and IV: ABWR, ESBWR and PBBR
- Analyses of racks for new and spent fuel
- Analysis of tools for handling of fuel in nuclear power stations
- Thermo-hydraulic analysis of feed and recirculation pipes of a BWR reactor
- Thermo-hydraulic analysis of pools of spent fuel in nuclear power stations
- Seismic analysis of a fire-fighting pumps nuclear power station
- Thermal and structural analysis of heat exchangers
- Structural analysis of spent fuel storage casks

OUTSTANDING ACTIVITIES - INTERNATIONAL

CTC is a member of European Energy Research Alliance, EERA (http://www.eera-set.eu/) and the international association NUGENIA (http://www.nugenia.org/). Likewise, CTC regularly participates in the ITER BUSINESS FORUM. Finally, highlight the active participation in R&D proposals related to nuclear energy.

COUNTRIES IN WHICH THERE IS NUCLEAR ACTIVITY

Spain.
Coapsa controls handling of heavy loads in the nuclear market.

Delivery and even anticipating us to them.

The objective of Coapsa, which was set up in 1997, is to offer our clients the most complete service, addressing automation, equipment goods and in the nuclear industry.

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To achieve the growth that they have reached, they have based their work on three key principles:

• Offering quality and good service in every work we do.
• Counting on a professional and highly trained human team capable of offering quick solutions to any possible problems that may appear on the development of each project.
• Adapting to the new technologies that appear on the market, integrating them on the equipments supplied to our customers.

BUSINESS OBJECTIVE

Since our very beginning Coapsa has had the ability to carry out the design, assembly, installation and start-up, in addition to the compliance with all the applicable quality assurance requirements as regards the control and automation of industrial processes and systems.

From the very beginning, the orientation within the sector has traditionally been towards control systems for lifting and handling equipment of heavy and special loads, among others, high precision heavy duty gantry cranes: polar and turbine cranes... and for nuclear fuel handling systems: refueling machines, manipulators, gantry cranes for the handling of spent fuel casks, etc.

At present we have experience in the qualification of the Single Fault Criterion applied to gantry cranes (Nureg-0554 and Nureg-0612) and in the design, manufacturing and assembly of equipment with environmental seismic qualification 1E.

In addition, we have consolidated experience on the port and harbor machinery markets, for the handling of containers and merchandise, as well as on the equipment for other industrial processes in general: MOD’s Low Voltage Distribution Centers, control systems and monitoring of industrial processes, remote control systems for the handling of devices on underground rail networks, etc.

Coapsa’s objective is to extend and improve the services we offer on our consolidated market, for which we are improving and extending all our human and material resources in order to bring them into line at all times with the quality and service required by the type of work we perform.

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

ENGINEERING

We offer a complete integrated service adjusted to the client needs, supported by our qualified personnel and our experience.

• Wide experience in the design of conceptual, basic and detail engineering.
• The use of the principal technologies makes us to be able to give the best solution and assure the total integration of our client’s facilities.
• Economical and technical viability studies.
• Planning and monitoring.
• Comprehensive automation projects of industrial processes.
• Automation and improvement of existing processes.
• Migration of control systems, PLC’s and industrial communication from the main manufacturers.
• SCADA systems programming including prescriptions, reports, control charts, etc.
• Electronic design using the most avant-grade tools from the market (E-plan, Autocad, etc.).

MANUFACTURING

We are manufacturers of electrical equipment, low voltage distribution equipment, regulation equipment, Motor Control Centers, etc. applying the latest technologies existing on the market.

• Distribution and Power equipment.
• Automation and Control equipment.
• Motor Control Center with fixed and removable execution.
• Intelligent Motor Control Center. We offer solutions to any kind of industrial installation, adapting to any requirement of the sector and client.
• Supervision and Control Systems (SCADA) and Distributed Control Systems (DCS).
• Decks, consoles and conventional control ergo seat and by radio-control.
• Supply and installation of weighing systems for cranes.
• HIAC systems.

SERVICES ON PLANT

Our qualified technical team offers corrective maintenance service, preventive maintenance, repairs, start-up in the client facilities, adapting us to the client’s needs and requirements.

We offer our clients all kind of services in plant:

• Supervision of the assembly in plant.
• Execution of SAT tests and put into service.
• Preventive, predictive and corrective maintenance works in equipments.
• Diagnosis and solution to breakdowns.
• Modernization of existing equipments.
• Monitoring of equipments. Retrofitting.
• Training for the maintenance personnel.
• Post sales service.

ACTIVITIES AND REFERENCES

Coapsa has become an essential reference in the nuclear field, that is why most of Spain’s power plants and their service companies trust Coapsa as a provider of goods and services.

Works on nuclear field

• Trillo NPP: Completely remodelling the 404TN gantry crane in the turbine hall and undertaking a series of improvements to the polar crane. There is constant support work throughout the year, especially during recharge times.
• José Cabrera NPP: Complete reformation of the Omaga gantry crane in the containment building in order to meet the requirements established for the handling of the spent fuel casks.
• Vandellós NPP: Manufacturing of the local command cabinets for the new essential services water cold source. Continuous maintenance and enhancement work on the plant.

To carry out the design, assembly, installation and start-up, in addition to the compliance with all the applicable quality assurance requirements as regards the control and automation of industrial processes and systems.

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Empresarios Agrupados (EA) is a leading international engineering and construction management company with headquarters in Madrid (Spain). Founded in 1971, EA has a permanent multidisciplinary staff of over 900 persons, 80% of whom are university graduates.

EA’s main focus as an engineering and construction management company is to provide a full range of engineering services for nuclear, conventional, renewable energy and biomass power plant projects. In the Nuclear field, EA areas of activity are:

- New build nuclear power plant projects.
- Engineering support services to nuclear plants in operation.
- Decommissioning and radioactive waste management projects, including design of low and intermediate level waste and spent fuel storage facilities.
- Research reactors and GEN IV projects.
- Fusion technology (ITER project).

EA has carried out the engineering for electric power generating plants with a combined installed power of more than 52,000 MW, with projects in Spain and in over 50 other countries. EA is ranked among the Top 225 International Design Firms by the US magazine “Engineering News Record” (ENR).

EA is an independent engineering company, with quality services recognised by the market. Our clients include electric utilities, IPPs, reactor vendors, government agencies, EPC contractors, main equipment suppliers and numerous international organisations such as IAEA, EBRD, European Commission, ITER Organization, Fusion for Energy, etc.


SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

Services and products provided by EA include:
- Consulting, project management, engineering and design, licensing and permitting, procurement services, construction management, commissioning management, engineering support to plants in operation and quality management.
- Decommissioning and radioactive waste management projects, including design of low and intermediate level waste and spent fuel storage facilities.
- Research reactors and GEN IV projects.
- Fusion technology (ITER project).

EA has been the sole or main engineering contractor for six (6) 1,100 MW nuclear units in Spain, (PWRs and BWRs), being responsible for a full range of engineering, procurement, construction, plant testing and commissioning services.

Power Uprising Engineering for Almaraz NPP Units 1 and 2 (PWR, Westinghouse, 2 x 1044 MW),

Probabilistic Safety Analysis (PSA) for majority of the Spanish nuclear power plants,

Engineeringsupport services to the operation and refueling outage services for Almaraz 1 & 2, Trillo and Cofrentes NPPs.

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- Research reactors and GEN IV projects.
- Fusion technology (ITER project).

EA has carried out the engineering for electric power generating plants with a combined installed power of more than 52,000 MW, with projects in Spain and in over 50 other countries. EA is ranked among the Top 225 International Design Firms by the US magazine “Engineering News Record” (ENR).

EA is an independent engineering company, with quality services recognised by the market. Our clients include electric utilities, IPPs, reactor vendors, government agencies, EPC contractors, main equipment suppliers and numerous international organisations such as IAEA, EBRD, European Commission, ITER Organization, Fusion for Energy, etc.

The company is organized in five areas that collaborate closely, enabling the integration of different expertise and perspectives to face complex projects:

- Nuclear services of NSSS components such as reactor, fuel, steam generators and reactor coolant pumps. It also includes decommissioning of nuclear facilities.
- Valves and actuators maintenance, mainly nuclear related.
- Mechanical maintenance of turbines, pumps, motors, heat exchangers and other mechanical equipment.
- Robotics and automation & control.
- Manufacturing of mechanical components, mainly for the nuclear and shipbuilding industries.

ENWESA is a services company committed to the nuclear industry from its foundation. It accumulates several decades of experience in the sector. Its core business is specialized, high added value, maintenance and construction services for a range of industries. Its main activity is nuclear power plant maintenance, specially PWR technology. A deep knowledge of the energy business and the potential to adapt to increasingly demanding circumstances, are the key to achieve competitive project execution.

In the Spanish BWR Cofrentes, ENWESA routinely performs mechanical maintenance of valves, motors and pumps. ENWESA also has an active role in the spent fuel casks loading in Spanish NPPs.

ENWESA’s facilities are suitable for Nuclear components manufacturing, such as heat exchangers, tanks and spent fuel casks. This activity is often part of a bigger project that includes on-site installation along with component supply.

Other activities are:
- Maintenance of CCGTs
- Manufacturing and assembly projects for the shipbuilding industry (vessels and submarines)
- Robotics and process automation, specially in the automotive industry, providing turnkey projects that include engineering.


Several other certifications cover specific areas of the company.

OUTSTANDING ACTIVITIES - NATIONAL

As to PWR reactor services, Júarez, Ascó, Trillo and Vandellós II, ENWESA is involved in different activities, including:
- Mechanical maintenance (during plant cycles).
- Refuelling outages NSSS components maintenance.
- Fuel handling, inspection and repair.
- Valves maintenance.

ENWESA OPERACIONES, S.A.

Polígono Industrial Heras, nave 136
39792 Heras, Cantabria
Tel.: + 34 942 253 815
E-mail: comercial@enwesa.com

Polígono Industrial Les Tapies
C/ Gimbernat, 15
43890 Hospitalet del Infant, Tarragona
Tel.: + 34 977 172 702

Founded in 1997
Turnover 30 million €
Payroll 250

The main international activity is valve maintenance in France, where ENWESA is well established and holds a continuous workload all year round, with recent projects in Golfech, Gravelines, Bugey; Belleville, Chilton; Palau, Dampierre, Tricastin and St Alban.

Other international nuclear activities have been:
- Mechanical works, including manufacturing for the ITER project and the JHR reactor.
- Modification and upgrade projects in commercial nuclear power plants like KRSKO or Laguna Verde.

COUNTRIES IN WHICH THERE IS NUCLEAR ACTIVITY

The main international business area for ENWESA is France, where it has been growing throughout the last decade and currently has permanent resources.

Nowadays ENWESA is well known as a valve maintenance supplier in many of EDF’s power plants.

ENWESA also works in Belgium, Finland, Brazil, Mexico and Slovenia.

OBTANDING ACTIVITIES - INTERNATIONAL

ENWESA is growing into other countries.

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Equimodal is a company that deals in the development and manufacturing of containers, swap bodies and containerised solutions. Founded in 1992 and headed since then by Pedro Domínguez, Equimodal started out as a manufacturer of transport containers and subsequently, a specific Engineering department was created to offer permanent support for specific and customised projects for our client.

**INDUSTRIAL PROJECTS**

Our investment in I+D+I+H allows us to design, develop and produce the best quality containers and containerised solutions in Spain / Europe, for transport and industrial, energy or defense applications.

Development of sustainable solutions that improve the quality of life of all those who participate in the process and reduce the environmental impact.

Our flexibility also enables us to supply turnkey containers and products. We have the capacity to ensure the full integration of equipment and installations.

Thanks to the experience of its engineers, Equimodal adapts and generates innovative solutions at each stage of the process.

**DEFENSE PROJECTS**

Our capacity to generate technical solutions enables us to provide our military clients with products designed by and for a certain mission.

The experience of our engineering team includes specific projects for:

- Transport (ammunition, explosives, weapons, camp material)
- Everyday systems (stoves, fridges, laundries, toilets)
- Medical systems (X-ray, sterilization, morgues)
- Integration of large installations [camps, workshops, hangars]

**ENERGY PROJECTS**

Equimodal works in the wind and solar power sectors containerizing power transformer units, inverters, and switchgear.

This technical solution offers a reduction in costs and risks compared to other types of solution based on the on-site construction of installations.

**TRANSPORT PROJECTS**

Equimodal is the largest manufacturer in Spain and one of the largest in Europe of containers and swap bodies for intermodal transport.

**QUALITY ASSURANCE**

Equimodal acknowledges Quality, the Environment and Occupational Risk Prevention as the mainstay of its Business Management Policy and, therefore, is responsible for and committed to establishing and implementing a Comprehensive Management System.

**LABORATORY**

Equimodal has and ENAC accredited laboratory. Our laboratory has accreditation number 545_L1224 for the performing of tests on containers and swap bodies according to standards ISO 1496, EN 283, CSC and UIC 592.

**NUCLEAR ACTIVITY**

We have manufactured containers to transport containers with radioactive waste of low industrial activity. All these containers have been approved according to ISO standards and are classified as industrial package type 2 in accordance with ADR for transport of material classified as LAS-I.

**INVENTORIES**

Founded in
1992

Turnover (2019)
13.7 million €

International activity
70%

Staff
92 employees

Certifications
ISO 9001; ISO 17025, ISO 14001, ISO 3834 y OHSAS 18001
**GD ENERGY SERVICES**

**Headquarters**
Ronda Auguste y Louis Lumière 15.
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Tel. +34 963540300

**Madrid Delegation**
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GD Energy Services [GDDES] is a Spanish-based business group with over 85 years of experience providing industrial services for a wide range of customer profile needs: nuclear maintenance, surface treatments, decommissioning, services for the wind power industry, radiation protection services, radioactive waste management, logistics and emergency response.

Our broad diversification makes our group one of the most predominant and visible in the energy sector, giving the company a strong market presence. GDDES currently employs a staff of over 1,500 professionals actively working in 7 countries. An eminently qualified team, fully oriented toward our customers, providing high added-value solutions adapted to the specific requirements of each project.

**BUSINESS OBJECTIVE**

In recent years, the new challenges of an increasingly globalization industry and the high-growth strategy of the company have acted to greatly increase its international presence in global markets, with overseas business making up an increasingly important part of GDDES’ business activity and revenue. Currently, the Group is active in Spain, France, the United Kingdom, Portugal, Italy, Mexico, Panama, Brazil, and the United States, with projects in those and other potential markets gaining in importance.

**MAIN BUSINESS UNITS FOR THE GROUP**

**NUCLEAR SERVICES, SURFACE TREATMENT, DECOMMISSIONING, WIND, LOGISTICS, EMERGENCY RESPONSE**

**NUCLEAR SERVICES**

- O&M support
  - Maintenance services
  - Waste management
  - Fuel movement support
  - Support for refueling services
  - Radiological emergencies
  - Decommissioning
  - Hydrostatic testing
  - Sludge treatment
  - Biological disinfection

**Thermal protection**

- Passive fire protection
- Penetration seals (electrical and mechanical)
- Thermal insulation that is both reflective (with an option for radiation shielding) as well as Conventional
- Signage and identification of systems
- Design, calculation and assembly of scaffolding and permanent access ways
- BIM modelling

**Radiological protection**

- Radiological Protection Services
- Radiative waste management radiological characterisation of installations
- Official and ad hoc inspections readings
- Official and ad hoc courses for radiation facilities according to the customer type
- Support for refuelling services
- Radiation facilities supervision
- Detonation of radioactive and nuclear material
- Legalisation of facilities
- Radiological and Encapsulated Source Hermetic Sealing Verifications
- Radiological Emergency Services
- Biological decontamination consulting

**Long term operation**

- Structural analysis of systems and components
- Root-cause evaluation of failures
- Thermohydraulic and functional validation
- Critical components residual lifespan evaluation, assessment and management
- Commercial components third-party dedication to nuclear / harsh environment
- Reverse engineering of legacy components no longer supported by their OEMs

**SURFACES TREATMENTS**

- Surface preparation:
  - Abrasive blasting
  - Shot blasting
  - High-pressure water
- Surface Treatment by Sponge-Jet
- Corrosion protection:
  - Maintenance
  - Primers, paints and coatings
- Concretes treatments:
  - Repairs
  - Structural reinforcements
  - Passive fire protection
  - Aplication of pavements
  - Metalisation

**DECOMMISSIONING**

- Dismantling of radioactive and nuclear facilities:
  - Power Plants
  - Experimental reactors
  - Equipment and components (Globe boxes, hot cells, etc)
- Radioactive installations
- Technical Support
- Feasibility Studies
- Radiological Protection
- Waste Characterisation
- Decontamination services

**LOGISTICS**

- Warehouse management:
  - Reception and forwarding
  - Loading docks
  - Picking, labeling, handling
  - Internal transport
- Integrated “in-house” logistic management:
  - Handling of internal flows
  - Provisioning
  - Internal distribution
  - Manual finishing and packaging
  - Packing
- Equipment optimization

**WIND**

- Maintenance (preventive and corrective) in factory and field
- Retrofitting
- Technical assessment
- Periodic inspection (thermography and ultrasound)
- Technical consultancy
- Rotor balancing and vibration dampening
- Long-term operation

**EMERGENCY RESPONSE**

- Professional fire brigades
- Training of fire and emergency personnel
- Maintenance of fire suppression systems
- Consulting
- Emergency response plans and self-protection manuals
- Patient transportation (urgent or scheduled)

**PAST WORK AND REFERENCES**

**DECOMMISSIONING, CLEANING AND MAINTENANCE SERVICES IN:**

- Spain: Almaraz NPP, Cofrentes NPP, Santa María de Garoña NPP (recharge), Trillo NPP, Vandellós II NPP, Vandellós I NPP, El Cabril CIEMAT
- France: Fessenheim NPP, Bugey NPP, Civaux NPP, Golfech NPP, Chooz NPP, Chinon NPP, Blayais NPP, Itxar, St Laurent NPP, Nogent NPP, Tricastin NPP, Belleville NPP, Dravolines NPP, Cruas NPP.
- Mexico: Laguna Verdes NPP.

**REVENUES (FY 2019 aggregated)**

102.5 million €

**Workforce**

1,500 employees

**CHEMICAL CLEANING**

- Secondary side of Steam Generators for EDF in Dampierre 1 & 2 NPPs (France).

**TREATMENT OF EFFLUENTS FROM CHEMICAL CLEANING**

- Dampierre 1 (France).

**APPLICATION OF SPECIAL COATING [EXTRADOS] in Cassenom 3 and Flamanville 1 & 2 NPPs, Blayais NPP and ITER (France).**

**CROSS UNDER METALLIZATION for the Laguna Verdes NPP (Mexico), Vandellós II NPP and Cofrentes NPP (Spain), Dampierre NPP and Blayais NPP-U2 (France).**

**METALLIZATION OF GSS water boxes in Civaux NPP (France), Beliville NPP (France), Bugey NPP (France) and Nogent NPP (France).**

**Passive fire protection Vandellós II NPP, Almaraz NPP and Cofrentes NPP (Spain).**
GEOTECNIA Y CIMENTOS, S.A.

C/ Los Llanos de Jerez, 10-12
28232 Coslada, Madrid

Nuclear Area
Tel.: +34 91 6 00 046
E-mail: enavarron@geocisa.com

GEOCISA is a highly skilled company with expertise across a range of technical projects: Geology and Geotechnics, Instrumentation and Monitoring, Soil Investigation and Ground Treatments, Deep Foundations, Laboratories, Infrastructure Management and Highway Maintenance, Restoration and Rehabilitation of Monuments, Bridges and Singular Buildings and Environmental Protection. GEOCISA is a sister Company of DRAGADOS, an international contractor established in 1961 that specializes in major infrastructure projects worldwide. DRAGADOS is the construction arm of ACS Group, which is one of the leading infrastructure developers in the world with a presence in more than 40 countries.

In the nuclear field and involved in the conservation and protection of our environment, GEOCISA founded over 35 years ago, Environmental Testing Laboratory as a demonstration of environmental commitment, performing both chemical and radiochemical measurements in different matrices.

The experience gained over the years attached to both human and technological multidisciplinary team makes GEOCISA part, from the beginning, in the first decommissioning of a Spanish nuclear power plant, Vandellós I. Characterized by the constant pursuit of innovation and effort in research and development it means that, with the arrival of new phases in the life cycles of facilities, new challenges are taken: new matrices are tackled in all types of sites.

Quality is a constant reference in the pursuit of our activities so GEOCISA has an accredited system according to ISO-9001, ISO-14001 and DHSAS-18001 standards, and is also approved Evaluation Group Suppliers of the Spanish nuclear power plants.

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

Environmental Radiation Monitoring Programmes

Since its creation in 1978, the laboratory GEOCISA is positioned as a reference for the realization of Environmental Radiation Monitoring Programmes in the Spanish nuclear power plants. Experience allows us to manage all phases of the programs:

- Program Design, implementation of the land census.
- Run field: in situ measurements, sampling, storage and transportation to the laboratory.
- Implementation in the laboratory sample receipt and acceptance, processing, analysis and radiation measurement.
- Data and report management, analysis of results.

Technical support personnel to nuclear facilities

This is the case GEOCISA participation, since 1992, in Central Radioactive Waste Storage Medium and Low Activity El Cabril (Córdoba), where we have developed new methods and procedures for the set-up of Quality Verification of packages Laboratory.

RPTU Scope: Decommissioning nuclear facilities

Although the beginnings of the Radiological Protection Technical Units were in the hospital setting, GEOCISA broadens the scope to nuclear area adapting to the activities in which the laboratory has been involved in the field of decommissioning projects of nuclear facilities.

The other two main priorities of the RPTU are:

- Program Design, implementation of the land census.
- Run field: in situ measurements, sampling, storage and transportation to the laboratory.

The determinations made in this laboratory are:

- Determination of americium, uranium isotope, curium and plutonium in urine samples.
- Determination of strontium and tritium in urine samples.
- Determination of creatinine in urine samples.
- Determination of americium isotopes of uranium, plutonium in faecal samples.

NORM Studies

Since the publication of Royal Decree 1439/2010, the Regulation on Health Protection against Ionizing Radiation and the 11.2 Safety Guide on “Control of exposure to natural sources of radiation” of Nuclear Safety Council which recommended that these studies are conducted by the Radiological Protection Technical Units or laboratories with expertise in radiation protection as natural radioactivity, the Radiochemistry laboratory and RPTU of GEOCISA and incorporating such studies in its activities.

Determination and chemical tests

Taking as guarantee various accreditations, GEOCISA performs chemical analysis of multiple parameters in a variety of matrices by highly sensitive equipment and techniques (MS / GC / MS, GC / FID, ICP - AES, ICP - MS ).

His fields of activity are:

- Quality control and inland water consumption.
- Characterization of industrial wastes.
- Environmental monitoring programs.
- Characterization of waste landfill.
- Chemical characterization of soils and building materials.

OUTSTANDING ACTIVITIES - NATIONAL

- Environmental Radiation Surveillance Programs (ERSP), pre-Operational Stage at the Centralized Storage Facility (“ATC” in Spanish) as principal laboratory.
- Environmental Radiation Surveillance Programs (José Cabrera, Asco, Vandellós I and II and El Cabril).
- Internal Personal Dosimetry Service by bioelimination for the dismantling of the NPP Jose Cabrera.
- Radiological Protection Service for the proposed decommissioning and dismantling of the NPP Jose Cabrera.
- Radiological analysis of samples related to the CRI-9.
- Instrumentation and radiological measures PIMIC-CIEMAT project.
- Exploitation of the laboratory of Central Radioactive Waste Storage Medium and Low Activity El Cabril.
- Site release in the NPP Vandellós I.
- Characterization of land and buildings screens NPP Jose Cabrera.
- Monitoring of groundwater and contaminated land area SROA.
- Emergency Analysis Laboratory and radiological analysis of samples RPTU.
- Quality Control Process declassification of materials and surfaces characterization and decontamination workshop on NPP Jose Cabrera.
- Quality Control Process declassification of materials Montecillo (PIMIC Phase III).
- Analysis of samples of production process control, mining water, drinking water and disposal of sewage water (Justesa, Geodeser, Birtlimed, Gala Gourmet, Sepolisa, Toyotal).
- Waste characterization tests (Diviconte, Terragua engineers).

OUTSTANDING ACTIVITIES - INTERNATIONAL

Project technical advice and training of NPP Kudobud (Bulgaria) for physico-chemical solid and liquid samples within the Project Decommissioning of the facility characterization.
With its range of specialist companies, Grupo EULEN offers the following services to the Nuclear sector:

- Specialist technical cleaning
- Decontamination
- Security (EULEN SEGURIDAD)
- Radiation protection (PROINSA)
- Radioactive waste management
- Maintenance
- Environment and Gardening
- Radiation and environmental measures (ENVIRONMENTAL MEASURES)
- Conventional cleaning

The company has certificates that guarantee the quality of the services we undertake:

- ISO 9001:2008 quality standard
- UNE 73401:1995 quality standard
- ISO 14001:2004 environmental management standard
- OSHAS 18001:2007 risk prevention

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

Grupo EULEN has extensive presence and experience in providing all kinds of services to nuclear power stations and radioactive facilities:

- Technical cleaning and radioactive decontamination services
- Cleaning and decontamination of buildings, facilities and equipment in controlled areas
- Cleaning and decontamination of parts, tools, equipment, etc.
- Cleaning of vessel studs and nuts for the Rx and SGs
- Decontamination of material and scrap metal
- Classification and management of contaminated material
- Waste conditioning and containment
- Support (staff and equipment) during refueling and outages
- Installation and conditioning of SAS
- Filtration of refueling cavity water
- Establishing and logistics of transit points
- Hydrodynamic cleaning with pressure washing
- Cryogenic cleaning with CO2
- Cleaning of heat exchangers, condensers, water boxes, pumps, tanks, intakes and supplies, pools, cooling towers, etc.
- Scaffolding, logistics and industrial support
- Decontamination interventions in incidents with radioactive sources (recovery units, steel plants)
- Fire fighting services

EQUIPMENT

The company has access to the following wide range of equipment for services provided in the nuclear sector:

- Combined extraction and induction equipment
- Vacuum trucks
- High pressure hydrodynamic equipment (2000kg/cm²)
- Specific equipment for cleaning air pipes
- Cryogenic cleaning equipment
- Specific equipment for cleaning vessel studs and bearings, SG studs
- Etc.

ACTIVITIES AND REFERENCES

Grupo EULEN has been involved in the nuclear industry for more than 35 years, working for the following Nuclear Power Plants:

- Santa María de Garoña
- Ascó I & II
- Vandellós
- Almaraz
- Trillo
- José Cabrera
- Cofrentes

Grupo EULEN has also undertaken activities relating to the nuclear sector at the following facilities:

- Enresa
- Enusa
- Radioactive decontamination work in the Scrap Metal Recovery sector and at Steel Plants, in collaboration with PROINSA (radioactivity monitoring).
IDOM CONSULTING, ENGINEERING, ARCHITECTURE, S.A.U.

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Tel.: +34 934 092 222
No. 1 St Ann Street
Manchester M6 7LR, Manchester, UK.
Tel.: +44 161 302 0950

Founded in
1957
Turnover (2017)
320 million €
International Activity
100%
Projects developed in over 125 countries
45 offices
Superior degree holder employees
3,800 employees

The professional services offered by IDOM Consulting, Engineering, Architecture, S.A.U. (IDOM) cover most of the industrial and technological activities carried out in a nuclear installation, both in the fields of fusion and fusion and nuclear fuel cycle. The organizational structure of the company allows us to offer a wide range of technical solutions, assistance and management services.

IDOM distinguishes itself as a company that has the capacity to integrate the expertise and experience of the nuclear division and draw on the support of all the professionals of the group, responding efficiently and effectively to the requirements of each project and the needs of each client.

The integrated approach of IDOM involves multidisciplinary teams with expertise from the different technical areas of the Group: Consulting and Systems, Industry and Energy, Architecture and Building, Infrastructure and Nuclear Services. All these disciplines are coordinated using project management practices that guarantee the correct technical and economic outcomes of the projects.

Specifically in the field of Nuclear Services (NS), IDOM is an approved supplier of the quality assurance group of Spanish NPP’s, ENRESA, UNESA, FRAMATOME, NA-SA, Rolls Royce and FAE (ITER), and possesses certifications from ROSATOM’s contractors (TITAN2). In addition, IDOM has in place, a nuclear quality assurance system audited according to the standards NDA-1, 150-901, UNE-73401 and KTA 1401. Moreover, IDOM has successfully implemented the OHSAS 18001 Certification requirements (Health and Safety on working sites) as well as the Environmental Management System of UNE-EN-ISO 14001.

SERVICES, PROJECTS AND TECHNOLOGY AVAILABLE

PROJECT SERVICES
Integral Solutions from conceptual design to full integration into operation of nuclear facilities, both power and research. Those services can be provided individually or as an integrated package assuming the full responsibility, as per the specific client needs, covering all areas of engineering, project management, procurement and logistics, construction management, commissioning and start-up support, operational support and decommissioning. IDOM can participate as:
• EPCM
• Project Management (PMC)
• Owners’ Engineering
• Technical Assistance
• Design & Engineering (D&E)
• Advanced Analysis Studies
• Nuclear Consulting

And for some specific projects, assuming EPCM / EPC contracts.

NUCLEAR CONSULTANCY
IDOM independence, together with more than 40 years of nuclear expertise, provides us a global vision to support our clients on strategic, financial and technical nuclear industry challenges:
• Nuclear Strategic Consulting (Nuclear Programs, National Plans, Business Plans)
• Engineering of Safety-Cost-Benefit Solutions (Optimizing)
• Engineering of Digital Technologies and Industry 4.0 (Configuration Management, ICM)
• Support to the client in front of the regulator
• Safety and Licensing
• Asset management

DESIGN & ENGINEERING
Taking into consideration the unique requirements of each project, applicable regulations and the requirements of the Nuclear Regulator of each country, IDOM performs engineering in the fields of:
• Systems Conceptual, Basic and Detailed Design Engineering
• Specifications and Design Modification
• Components, Structures and Systems (SSCs) Analysis and Seismic Qualification
• Radiological Protection and Shielding.
• Back-end engineering (spent fuel storage, radioactive waste management, decommissioning).
• Support Engineering and Maintenance (Plant Engineering). IDOM carries out all the above activities in National and International Projects and in different nuclear technology applications such as power generation, health, environment, industry, defense or research.

In addition to the traditional Engineering services, IDOM NS has developed a multitude of special products related to safety and licensing:
• Lifetime Management.
• IPEEE and Stress Test.
• Fire Protection and Explosions.
• Ionizing Radiation Technology.
• Safety and Licensing.

ADVANCED ANALYSIS STUDIES
To develop the special analyses that are required for NPPs or nuclear fusion plants, IDOM offers the following activities:
• Fire simulations with FDS.
• Ionizing radiation calculations.
• Design Analysis of Nuclear Class SSCs and non-linear calculations.
• Gas Performance, mechanical and fluid dynamics simulations, CFD calculations.
• Thermo-hydraulic Analyses (MAAP, RELAP, MELCOR, SOTHIC).
• Advance mechanical calculations
• Software development (manipulation of radiation maps, scripts for the mapping of neutron damage, code coupling, mesh manipulation scripts).

OUTSTANDING ACTIVITIES - INTERNATIONAL
• Front-End Engineering (FEED) Services for Nuclear Health Centre DMP Production Building. Netherlands.
• Primary & Secondary Containment Barrier Thermohydraulic Calculations for Laguna Verde NPP, Mexico.
• Breeder Blanket Design STEP Project. UKAREA.
• Conceptual Design for Hot Cells. ITER.
• Owner Engineering Support to ITER, France.
• Dynamic Analyses (Framework contract) in ITER, France.
• Advanced Mechanical Analyses (Fast Blanket Modules) in ITER, France.
• Neutronics Analysis, thermo-hydraulic and fluid dynamics (Framework contract) analyses in ITER, France.
• Diagnostic Ports and Remote Handling in ITER, France.
• Nuclear Heating Impact on ITER of Vacuum Vessel, France.
• Decommissioning-related activities in Sellafield NPP, UK.
• Design of a collimator and a robotic arm for the Julis Horowitz Reactor, France.

• Emergency Control Room at Krsko NPP, Slovenia, in consortium with Tecatom.
• Improvement of national personnel training system in the field of radioactive wastes, decommissioning and remediation in Ukraine for the European Commission.
• Design and Analysis of main equipment for Hinkley Point C NPP, UK.
• Commissioning support and supervision at Taishan I NPP, China.
• Engineering associated to the Individual Spent Fuel Storage Facility (ISFSI) in Atucha I NPP, Argentina.
• RAW management for operation and decommissioning of Kozloduy NPP, Bulgaria.
• Strategic evaluation of the Chelan nuclear program, Chile.
• Technical Consultancy Services for the implementation of R&D nuclear centre, Bolivia.
• Technical expert services for the sensitivity study of seismic hazard prediction, for Finland NPP.
• Neutronic Studies (Framework contract) for IRSN, France.
• Molten Engineering services for SMR development in Canada.
• Heat Exchange design for Sziszvelő 8 NPP, UK.
• Installation and Commissioning of alternative refrigeration equipment at Krsko NPP, Slovenia.
• Engineering support on piping under RCC-M code for French NPP

COUNTRIES WHERE HAS NUCLEAR ACTIVITY
• Argentina
• Belgium
• Bolivia
• Brazil
• Bulgaria
• Canada
• Chile
• China
• Colombia
• Finland
• France
• Lithuania
• Mexico
• Netherlands
• Slovakia
• Slovenia
• Spain
• Turkey
• UK
• Ukraine
OUR ORIGIN COMES FROM THE CIVIL NUCLEAR INDUSTRY

Newtesol offers unrivalled quality and professional welding and weld overlay to clients WORLDWIDE from our main facilities and head quarter in Santander (Northern of Spain), where the company was born as a spin off from civil nuclear industry located in the region.

AFTER DECADES OF WELDING OUR KNOW-HOW IS HUGE

More than forty years of EXPERIENCE and the ability to solve all welding technical demands of the customers. Our close contact with them is the main source of knowledge on how pieces and equipment behaves along their working life. Thus, when your company faces an unusual need, you can rely on Newtesol as the best possible adviser.

OUR TECHNOLOGY

In 2001, Borja and Roberto Saiz faced a problem to solve. Why nuclear claddings and built up welding seemed to have always so bad quality that requiring a lot of repairs? Since then on they decide to study all the welding processes available to clad and weld with a clear goal: Quality has to be perfect while keeping the process competitive. Newtesol was born!

As a first analysis, the answer regarding poor quality of cladding processes was due to the size and relevancy of the parts to be cladded. Cladding was not part of the pressure boundaries in nuclear components so quality requirements were not the top priority; competitiveness was and tripie SAW process was the preferred solution.

They wondered what would happen if Automated GTAW welding process offering high-quality results could be economically competitive. At the time, this process had low deposit rates and was not the best one for competitiveness. Newtesol had to push it to its extreme technical limits to make it competitive.

In Newtesol we like our customers to rely in our accuracy when referred to the high standards we achieve in each of our jobs. Even though we are ISO 9001:2008 & ISO 14001 certified, our quality system complies with much more demanding NQA-1, 10CFR50 App. B and 10CFR21, whereas zero-defect mindset is tightly pursued, project documentation is issued in parallel with the manufacturing and tiny problems become a promising opportunity to improve in a never ending learning discipline, assuring always that the approved IPPs are the road map to excellency and that traceability is completely guaranteed.

Newtesol is fully aware of the increasing need to react quickly on the demanding schedule of the D&O, PowerGen, industrial or maritime & offshore projects nowadays and thus search the highest efficiency through fully AUTOMISED production along with continuous training of our staff on modern plant management and maintenance systems.

WELL TRAINED STAFF AND FULLY AUTOMATED MACHINES TO ENSURE FLEXIBILITY

Multipurpose of both programmable state of art machines and committed work force, makes Newtesol able to adapt its production planning to the changing needs of the customers so that required lead time is achieved.

THE FUTURE OF NUCLEAR INDUSTRY IS CLAIMING NEWTESOL TECHNOLOGY

Our competitiveness is becoming well-known in all the main component design companies. Main project for the use of this technology is for design-to-cost programs and there are two 2 principal innovative business lines:

Forging cost reduction is the first one. Complicated geometries of forgings can be avoided. Complex shapes and protuberance can be removed from the forging phases improving forging costs and be replaced by build-up welding and machining.

Materials cost reductions. Replace Inconel or stainless-steel forging, plates or fittings by carbon steel with Inconel or stainless-steel cladding is also cost effective.
NUSIM, S.A.

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Aravaca, 6-8, 3º
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Balbín Morron 8, 6º
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Tel.: +34 954 932 447
E-mail: ingenieria@nusim.com

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

RADWASTE TREATMENT DIVISION
The Radioactive Waste Division, with over 35 years of experience working with all the Nuclear Power Plants in Spain, carrying out the Engineering, Manufacturing, Commissioning, Operation and Maintenance of equipment for treatment, handling and transport of Radioactive Waste.

NUSIM has developed a significant number of equipment that are being used today in all the Spanish Nuclear Power Plants in operation or decommissioning and in the Official Spanish Agencies and disposal, like ENRESA (El Cabril) or research centers like CIEMAT.

NUSIM is also internationally present with equipment in main nuclear sites like Laguna Verde NPP (Mexico), Kozloduy NPP (Bulgaria), Karachi NPP (Pakistan), Chernobyl NPP (Ukraine), Atucha NPP (Argentina) or the NORM waste treatment plant (Abu Dhabi).

All the equipment developed by the Division are manufactured on the basis of own technology. The proposed solutions have been developed to meet the most demanding requirements, giving reliability and robustness, which is highly valued within the Nuclear Sector.

The products range covers the hole cycle of the Radioactive Waste from cradle to grave.

Equipment catalogue features:
- Handling Devices of Drums, HIC, Containers and special Handling with filling, capping, or nesting process.
- Inspection Equipment
  - X-Ray Drums Inspection.
  - Sampling systems.
  - Latency reactor Inspection equipment.

Radiological Characterization for radwaste packages (drums or containers) with accessories for capping, surface contamination test etc.

Processing Equipment for recovery and reconditioning Plant for Historical Wastes.

Volume Reduction Equipment
- Drying systems for sludge or miscellaneous waste by microwave or resistances.
- Pre-compacting equipment.
- HEPA filters Compactor

Grouting and cementation systems
- In situ Mixing System or premixed systems.
- Modular Blocking System, skid or ISO container mounted systems.
- Continuous or batching Mixers with cleaning system.
- Secondary waste recovery systems.

Cleaning and Decontamination Equipment for drums or containers in fully enclosed cabinet, on conveying line or in glove box.

Transport Equipment ADR (American Dispository Receipt) Vehicles and packaging ADR for radwaste land/air transportation.

Decommissioning equipment and Systems
- Cutting, confining handling, water treatment, processing.
- Waste recovery, Extraction cut and decontamination of tubular bundles of heat exchangers.
- NORM radwaste facilities with integral solution for processing, drum filling capping, nesting, cementation and grouting.

RADIOLOGICAL PROTECTION DIVISION
Since its creation, NUSIM is the exclusively distributor in Spain of equipment for contamination measuring, spectrometry systems, dosimetry systems and equipment, and electronic components for the detection and measurements of the ionizing Radiation from the main Companies: Mirion – Canberra and ORTEC among others.

This Division is not only in charge of distribution, but also of assembly and onsite commissioning to products for Nuclear Power Plants, Research Centers, Universities, etc. undertaking the subsequent maintenance to ensure proper functioning.

The catalogue features the following equipment:
- Radiation Dosimeters.
- Spectrometry Alfa and Gamma.
- Contamination Monitors equipment/ clothing.
- Personal Contamination Monitors.
- Radiometer/ Radiation Meters.
- Pyram monitors for trucks/vehicles.
- Nal y LaBr3 detectors.

AUTOMATION DIVISION
Carries out the study, the planning and the integrated global solutions for the automation systems covering the design, development, assembly and commissioning in all type of industry installations.

NUSIM carries out the PLC’s and SCADAS programming of the main manufacturers in the market. NUSIM is recognized integrator of Rockwell Automation even though also have tools and knowledge of the software of the main brand in remaining market shares such as Siemens, Schneider, Omron, ABB, etc.

NUSIM integrates complete automatic systems, both hardware and/or software from different manufacturers, interconnecting business systems (ERPs, Information Servers, etc.) with the manufacturing (Solutions MES).

OUTSTANDING NATIONAL AND INTERNATIONAL ACTIVITIES

RADWASTE TREATMENT DIVISION
Between main references, the major projects are the following:
- Container handling, nesting and capping equipment for the New Safe Confinement in the Chernobyl NPP, Ukraine (TAIM WESER).
- Stabilization and Solidification plant for NORM ashes. ADNOC Abu Dhabi National Oil Company (TAIREER).
- ISO container SAS confinement with control room for the José Cabrera NPP reactor vessel lid cutting.
- Drums and HC handling and compaction equipment for Laguna Verde NPP (Mexico).
- Reprocessing Plant for Historical Waste, for the Santa María de Garoña NPP.
- In drum Microwave Drying Facility, for Ascó and Cofrentes NPP.
- Equipment for Casting Collection and Cooling for a Plasma Oven Facility for Kozloduy NPP (Bulgaria).
- Miscellaneous drum drying facility by heating resistors for Asian NPP.
- In addition, drum and container handling devices, waste solidification plants, package radiological characterization systems, compactors, etc. are in-operation in all the Spanish nuclear emplacements.
- NUSIM has developed new equipments for tilting of drums, automatic manipulators for forklifts, in-drum precompaction with recoverable sleeve, radiological inspection system of roads all with the new technology of augmented reality.

RADIOLOGICAL PROTECTION DIVISION
Main supplies during recent years:
- Body Count Contamination Monitors: Mirion Technologies and RADOS with proportional and scintillation detectors for Almaraz, Trillo and Asco NPP and El Cabril.
- HandFoot RADOS contamination with proportional and scintillation monitors for Almaraz, Trillo and Asco NPP and El Cabril.
- Laundry RADOS monitor for NPPs: Ascó, Almaraz, Vandellos II and Santa María de Garoña and for tools for Vandellos II.
- TLD RADOS dosimetry systems: Almaraz, and Trillo NPPs and Dosymetry center.
- Gamma Spectrometry Systems ORTEC with germanium detectors and Alpha Spectrometry Spectrometers ORTEC for Polytechnic Universities of Valencia, Cáceres, Basque country, Barcelona; Catalan Government, CIEMAT and CSIC.
- Portable Gamma Spectrometry Equipment ORTEC for ENRESA, Customs Algierias and Catalan Government.
- BrLa y NaI detectors for environmental network of the Catalan Government.
- Integral radiological protection equipment for the NORM wastes treatment plant. Takreeb, Abu Dhabi.
PROINSA, S.A.U.

C/ Gobelas, 29
28023, Madrid
Tel.: +34 916 310 433
E-mail: proinsa@eulen.com

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

PROINSA is authorised by the Spanish Nuclear Safety Council as a Radiological Protection Technical Unit against ionising radiation.

This permit has allowed it over the years to become specialised in offering radiological protection and environmental services, which can be classified as follows:

Radiological protection in nuclear power plants.
• Services in normal production.
• Services in refuelling outages.
• Services during decommissioning.

Control and radiological protection of radioactive sites.
• Radiological control.
• Elaboration and processing of documentation.
• Advice and management with respect to public entities.

Training in radiological protection.
• Supervisors and operators of radioactive installations.
• Directing and operating medical and/or dental radiodiagnosis.
• Other specific radiological protection courses.

Protection services against exposure to natural radiation in NORM Industries.

Management of radioactive materials in operation and decommissioning.

Nuclear and radiological emergencies.

Environmental radiological surveillance services.

Environmental studies and projects.

Protocol and collaboration on the monitoring of metallic materials.

Firefighting squads and services.

Industrial waste management.

All of the activities carried out are included in the Quality Management System, certified by Det Norske Veritas (D.N.V.) in accordance with ISO Standard ISO-19011:2015 and in the Environmental Management System, also certified by D.N.V. in accordance with ISO Standard ISO-14001:2015.

ACTIVITIES AND REFERENCES

Throughout its course, PROINSA has provided permanent support to the radiological protection services of the nuclear power plants of Asco I and II, Vandellós II and Santa María de Garoña, during their normal operation (closed radiological protection shifts, instrumentation, etc.) as well as in support in radiological protection during refueling outages in the same plants and in the nuclear power plants of Jose Cabrera, Cofrentes and Trillo.

It also provides several specific radiological protection services for other clients such as ENRESA, CIEMAT and AGENCIA TRIBUTARIA.

Since it was founded PROINSA has also provided services to both medical and non medical radioactive installations, offering the maximum scope and guidance in radiological protection. Clients include Siemens, Smurfit, Unión Española de Explosivos, etc.

PROINSA has also delivered courses related with radiological protection, including, official courses for personnel in radioactive installations, as well as other specific courses for nuclear power plants and courses on radiological protection for different official in titutions.

It is a leading company in services in nuclear and radiological emergencies since it was contracted by the CSN in 1998 until 2016. It has participated actively in all of the important incidents that have occurred in the country, before and after signing the protocol of collaboration on the monitoring of metallic materials. Clients include Egmasa, Siderúrgica Sevillana, Arcelor, Nervion, etc.

It has collaborated with all the Spanish nuclear power plants in matters relating to environmental radiological surveillance plans and with Trillo nuclear power plant as well in monitoring the ecosystems surrounding it.

Services during Vandellós I Nuclear Power Plant dismantling and PIMIC Project have been carried out.

Services against natural sources of radiation have been carried out for GAS NATURAL FENOSA.

Management of radioactive material have been carried out for NUCLENOR and ENRESA.
TAIM WESER, S.A.

Carrereta de Castellnú, km. 6,3
50013, Zaragoza
Tel.: +34 976 500 006
E-mail: info@taimweser.com

At TAIM WESER we have 120 years experience in the supply of tailor made EOT and gantry cranes as well as turnkey bulk materials handling installations for the main industrial sectors, according to the specific requirements demanded by our customers and always based on the principles of safety, high performance, precision of movements, low maintenance and operation costs and maximum availability of our products.

We are a major solutions provider for the nuclear industry supplying tailor made equipment for the handling of low and intermediate active nuclear waste and nuclear fuel in New Build as well as Decommissioning projects of Nuclear Plants.

In addition, we have also supplied high precision cranes to the most prestigious research experiments in the world, CERN and CELLS studying the relation between mass and energy.

We are qualified supplier of ENRESA, IHI, ELECTRABEL and SELLAFIELD among others and we are certified ISO 9001, ISO 14001 y OHSAS 18001.

SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE

Turnkey supply of cranes and bulk materials handling installations

We specialize in the supply high integrity in cell and out cell EOT cranes, gantry cranes and trolleys as well as single failure proof (SFP) equipment to perform critical load-lifting applications as the handling of low and intermediate active nuclear waste as well as nuclear fuel. In addition, we also supply high performance stackyard machinery and conveyor system for the handling of raw materials as uranium one. For this purpose we have the most suitable resources and the most advanced techniques. Our scope of supply includes the whole project cycle, design, manufacturing, assembly and test at our facilities, final assembly at site and commissioning of the equipment.

All essential processes of design and fabrication are carried out and supervised in our installations and additionally all the cranes are assembled and tested in our factory, generally without load, or with load if required by the customer. This process leads us to the achievement of a high quality final product and an absolute assurance that no major unforeseen problems will happen during site’s installation.

After sales and spare parts

Our after sales service provide our customers with its extensive experience and know-how in maintenance service, improvement and revamping of equipment and complete facilities.

Our high-qualified staff is able to provide the optimal solution to the client’s requirements. For this purpose, we have the suitable resources and the most advanced techniques through our specialized team in engineering development, erection and commissioning.

On demand, our customers can hire us to enjoy a wide range of services, shaping up the pattern that fits best their needs. These services focus on different areas, as follows:

- Ad hoc maintenance and service works.
- Inspection of TAIM WESER or third parties equipment.
- NDT: Non Destructive Tests.
- Reverse engineering.
- Structural analysis.
- Customized solutions.
- Facilities revamping.
- Specific purpose training.
- SWP (Safe Working Period) and Exceptional Inspections, fulfilling the UNE 58144-5:2015 standard

In addition, besides supplying top quality commercial parts made by first class suppliers, we manufacture in house in our hi-tech facilities a wide range of components, thus ensuring the best product to our customers.

We secure all components interchangeability, according to client’s strictest integration requirements.

Maintenance services and technical assistance

More than a service, we provide security, reliability and protection to our customer’s assets. A well-managed, planned and executed maintenance is essential to optimize resources:

- Extension of equipment operation life.
- Reduction of down-times and their associated costs because of the non-production.
- General OPEX reduction.
- Improvement of equipment performance.
- Fulfillment of targets set in the operation plans.

COUNTRIES IN WHICH THERE IS NUCLEAR ACTIVITY

Technical assistance contracts in several countries in Europe and Asia and commercial activity in Europe, America and Asia.

OTHER DATA OF INTEREST

In addition to the nuclear sector, at TAIM WESER we have a wide experience in the global mining, ports and metallurgical industries as well as oil & gas and fertilizers sectors, where we provide customized integrated high-tech solutions for bulk solids handling and special lifting projects.

OUTSTANDING ACTIVITIES- NATIONAL

- Supply of EOT cranes to the first Nuclear Power Plant installed in Spain, José Cabrera NPP.
- Supply of EOT and gantry cranes to Vandellòs I NPP.
- Supply of EOT and gantry cranes to Ascúl I NPP.
- Supply of EOT cranes to Trillo NPP.
- Supply of EOT and gantry cranes to El Cabril low and intermediate active nuclear waste repository.

OUTSTANDING ACTIVITIES- INTERNATIONAL

- Supply of EOT crane to Atucha NPP, Argentina.
- Supply of EOT crane to HABOG repository for high-level nuclear fuel disposal, located in the Netherlands.
- Supply of EOT and gantry cranes for the assembly and lowering of the CERN’s LHC particle accelerator in Switzerland.
- Supply of EOT crane to Berkeley NPP, UK.
With more than 40 years of know-how, Tecnatom has made quality one of the main principles of its activity, competing with its experience and contributing with innovative solutions to the global nuclear challenge.

**BUSINESS OBJECTIVE**

Tecnatom was created in 1957 as a Spanish engineering company specialised in guaranteeing the operation and maintenance of nuclear power plants with the highest levels of security.

The main activities are focused on services to inspect components and structural integrity, the training of personnel in advanced training environments and support engineering to the operation of plants. Today it is a business group with subsidiaries in France, Brazil, China, United States of America, United Kindom, Finland, Belgium, France, Switzerland, Slovenia, Romania, Russia, United Arab Emirates, China, Taiwan and South Korea.

The company is also deeply involved in future developments, consolidating its participation in advanced projects for nuclear energy plants, such as the construction of the new AP1000, ESBWR, ABWR, APR-1400 or PHWR plants around the world.

Tecnatom participates actively in fusion reactors and research reactors such as the great international ITER project in France, the International Facility of Material Irradiation (IFMIF) in Japan and the Jules Horowitz Research reactor (JHR) in France.

Tecnatom has provided advanced and sophisticated technology for the nuclear sector for almost six decades. Its role within the international nuclear projects in this period has allowed the company to adapt its technological capacities to a very demanding environment, providing innovative solutions to the global nuclear and technological challenge.

**SERVICES, PRODUCTS AND TECHNOLOGY AVAILABLE**

Tecnatom provides services and products with their own design and manufacture in order to continuously adapt to the needs and requisites of the different clients and markets and possessing mechanical, electronic and data processing resources in the state of the art of technological development.

Tecnatom develops projects in 40 countries worldwide and its methodology and equipment have been validated by clients and regulatory authorities at an international level.

Its inspection and testing services have been approved and certified by many organisations and international clients. Its basic capacities include:

- **Inspection services:** complete capacities to perform an automated inspection using NDT of all the areas of the reactor pressure vessel, fuel assemblies, steam generators, heat exchangers and other relevant components such as piping and turbines.
- **Testing services:** a wide range of advanced tests for the evaluation of the status of the different components of the site.
- **Engineering services:** in the areas of life management, codes and standards, implementation of inspection programmes, maintenance and reliability of equipment, management of parts and components with special emphasis on the support of plant asset management and the long term operating programmes.

Using the technological development and the application of its services, Tecnatom contributes to improving the training and efficiency of the personnel of the plants, as well as implementing the best resources to facilitate the operation of the sites, thus guaranteeing improvements in safety, availability and economic efficiency.

**NUCLEAR ACTIVITY**

- **Emergencies and Operational Support:** operating procedures and severe accident procedures assistance in the field of nuclear emergencies, specialised services to support start up, operational experience, radiological protection and dosimetry.
- **Control Rooms and Simulation:** using in-house technology, Tecnatom provides the best solutions in the areas of training and engineering assisted by simulation in the design and supply of new control rooms, as well as their modernisation.
- **Safety Management:** providing high added value services that reinforce the management of the sites and the development of additional competences in matters of safety culture and leadership.

Tecnatom has developed its own technology of automated inspection systems and, as a result, has become a provider of high level technological services and products, with the support of the companies in the Tecnatom group to guarantee global and reliable solutions for any need.

- **NDT Inspection systems:** Tecnatom designs and manufactures complete inspection systems for a wide range of applications tailored adapted to the specific requisites of the client.

**COUNTRIES IN WHICH THERE IS NUCLEAR ACTIVITY**

Argentina, Brazil, Mexico, The United States of America, United Kindom, Finland, Belgium, France, Switzerland, Slovenia, Romania, Russia, United Arab Emirates, China, Taiwan and South Korea.
VIRLAB, Expertise in Vibrations and shocks. Testing Laboratory

An Urbar Ingenieros Group Company
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Tel.: +34 943 691 500
E-mail: laboratorio@virlab.es

INSTRUMENTATION

VIRLAB systems data and measure elements allow us to analyze all kinds of variables: accelerations, displacements, deformations, strains, etc. Then, the instruments available to the laboratory.

Vibration Controllers
• Sine, random and shock controller: Eight input channels and one output channel [3].
• Random, shock and SRS controller: Four input channels and two output channels [1].
• Sixteen input channels and two output [1].

Sensors of vibration
• 32 piezoelectric accelerometers.
• 6 four channel amplifiers.
• 8 single channel amplifiers.
• 2 laser sensors ± 1 and ± 50 mm.

Signal monitoring
• Discontinuity Detectors, 12 channels, (0.5-20 m/s²), [2].
• A data acquisition and processing system, 31 channels, 200 kHz [1].
• A data acquisition and processing system, 24 channels, 1 MHz [2].

Signal analyzers
• 16 channels.
• 8 channels.
• 4 channels.

Signal recorders
• 24 input channels and 24 output channels [1].
• 24 input channels and 12 output channels [1].

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Radioactive waste management and decommissioning of nuclear installations in Spain has acquired international prestige.
ENRESA is also in charge of dismantling the nuclear power plants whose activity has come to an end and of the environmental restoration of mines and uranium related installations, when so required by the authorities.

At present, ENRESA has a definitive radioactive waste storage site for very low, low and average activity, in El Cabril located in the town of Hornachuelos in Cordoba.

The General Radioactive Waste Plan (PGRR) includes, as an objective for the management of Spent Fuel (CG) and High Level Waste (RAA), a Centralized Interim Storage Facility (ATC).

Regarding the dismantling projects, ENRESA is in charge of managing the Mestral Technological Centre, located in the old nuclear power plant of Vandellós I (Tarragona). Vandellós I is currently at the latent period, having completed its dismantling process to level 2. ENRESA is as well the Responsible Operator of the Jose Cabrera nuclear power plant in Guadalajara, during its dismantling process.

ENRESA is also involved, in coordination with Nuclenor, in the preliminary actions of the dismantling of Santa María de Garoña nuclear power plant, located in Burgos.

The National Radwaste Company, ENRESA, is a public Company, created by Parliament in 1984 with state capital that plays an essential public service. Its mission is to collect, condition and store all the radwaste that is produced in Spain.

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C/ Emilio Vargas, 7
28065, Madrid
Tel.: +34 915 668 100
E-mail: registro@enresa.es

EL CABRIL STORAGE CENTRE
Ctra. A-447 Km 17.8 (dirección Fuenteobrera-Cazalla de la Sierra)
14740 Hornachuelos (Córdoba)
Tel.: +34 957 575 100 Fax.: +34 957 575 130

ENRESA is also involved, in coordination with Nuclenor, in the preliminary actions of the dismantling of Santa María de Garoña nuclear power plant, located in Burgos.

The total is included, also those generated in operation from the Centralized Interim Storage Facility (ATC) and Deep Geological Repository (AGP).

**Total waste that will be managed**

<table>
<thead>
<tr>
<th>Type of reactor and power</th>
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**Centralised Temporary Storage Site**

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WEB DIRECTORY

A
- Almaraz I and II Nuclear Power Plant
  - www.cnat.es
  - www.amphos21.com
  - www.anav.es
- Naturgy
  - www.naturgy.com
  - www.newtesol.com
  - www.nusim.com

C
- CEN Solutions
  - www.censolutions.es
  - www.centrotecnologicoctc.com
  - www.coapsa.com
- Centro Tecnológico CTC
- Cofráneas Nuclear Power Plant
- Coapsa Control, S.L.

E
- EDP
  - www.empresariosagrupados.es
  - www.enresa.com
  - www.enwesa.com
  - www.equimodal.es
  - www.equimodal.com
- Enresa
- ENUSA, Industrias Avanzadas S.A., S.M.E.
- Enwesa
- Equimodal
- Equipos Nucleares, S.A., S.M.E.
  - www.censolutions.es
  - www.centrotecnologicoctc.com
  - www.cncofrentes.es
  - www.coapsa.com
  - www.iberdrola.es
  - www.idom.com

G
- GD Energy Services
  - www.gdes.com
  - www.ge-energy.com
  - www.geocisa.com
  - www.eulen.com
- GE-Hitachi
- Geotecnia y Cimientos
- Grupo Eulen

I
- Iberdrola
  - www.iberdrola.es
  - www.idom.com
  - www.eulen.com

N
- Naturgy
  - www.naturgy.com
  - www.newtesol.com
  - www.nusim.com

P
- Proinsa
  - www.proinsa.eulen.com

R
- Ringo Válvulas, S.L.
  - www.ringospain.com

S
- Santa María de Garoña Nuclear Power Plant
- Spanish Nuclear Industry Forum
  - www.nuclenor.org
  - www.foronuclear.org

T
- Taim Weser
  - www.taimweser.com
  - www.tecnatom.es
  - www.tecnicasreunidas.es
- Tecruatom
- Trillo Nuclear Power Plant
  - www.cnat.es

V
- Vandellós II Nuclear Power Plant
  - www.cnat.es
  - www.virlab.es
- VIRLAB, Expertise in Vibrations and shocks. Testing Laboratory

W
- Westinghouse Electric Spain
  - www.westinghousenuclear.com