ENUSA renews its visual identity

The Nuclear Fuel Sector is facing new times, with more competition, in the middle of European Nuclear Power Plants shut down, which means less offer and more pressure to be a reliable supplier that provides solutions to the Utilities. Therefore, ENUSA is in the midst of these changing times, that we are confronting with the commitment and enthusiasm of those who are willing to continue playing an important role in this challenging sector.

During 2015, the company embarks on a new phase in which has focused its activities on two business areas – nuclear and environmental – and it is adapting to these changes with a sense of immediacy and modernity, where one of the main exponents is the change of the visual identity and the launch of a new website.

The company anagram is the image exposed day after day in a Society in constant change, which has been concentrating the values that differentiate the product, company or services that ENUSA serves. Now, there comes a time in which aesthetics needs to be renovated since the trends have evolved.

Thus, ENUSA has the pleasure to present the new visual identity. This new image had to keep the “U”, which is its hallmark and important key of recognition of the “ENUSA” brand.

The new visual identity offers an evolved image that has been updated to the present times, keeping the current trends and revisiting the company values. All this has been done without disconnecting from the company stakeholders, as the imagetype and its blue color from the old image have been maintained.

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Continue from front page

Digital Revolution and Interactivity

The other part of active external communication is the Website. Today a website is a company's letter of introduction to the online world. Therefore, it is essential to have a well cared and updated website. Along with the new identity, ENUSA presents a new website with a modern and functional graphic appearance, which is much more dynamic and accessible to all potential visitors. The new website is intuitive and more in tune with the times, and from the first glance it helps the user to find the required information.

www.enusa.es offers information on the new activities, products and services that the company is developing in its two business areas – nuclear and environmental – at both the national and international levels.

Sustainability and compliance with the Transparency Act as a public enterprise are also included in the new site. These sections contain information on good governance and the commitment to safety, the environment, quality and corporate responsibility.

The website include a Press Room to help journalists with their work, allowing them to download press releases, images, videos, infographics and publications on the different activities and processes they undertake. Also an agenda section to report on the events, congresses and conferences in which our representatives take part, as well as the visits to theirs facilities.

Communication Strategy at the Service of the Business Strategy

ENUSA has been undertaking changes in its business strategy that are necessary to maintain its market competitiveness. The most significant decision, and the one that guides the development of projects and activities, is to definitively focus on its two business areas: nuclear and environmental. As a result, the disinvestment of its subsidiary Molypharma has been concluded, and the companies left in the ENUSA Group are ETSA in the nuclear business and EMGRISA as the group's environmental brand.

On the other hand, the company continues to enthusiastically pursue the process of internationalization. As a result of this effort, in 2014 it made its first sale of inspection equipment to China and Brazil, operations that will be followed by many others in the current and coming years.

ENUSA also continues to work actively to increase its technological capabilities in the second part of the fuel cycle, and the Juzbado Factory is still implementing continuous improvement in the manufacturing process with a heavy investment in the upgrading of equipment and systems.

All these changes in the visual identity are only to reinforce the message of the ENUSA commitment to the future, being closer to their customers and trying to provide the best response to their needs. This is the message that is embedded in the ENUSA culture, in which ENUSA works every day.

For further information, please contact sst@enusa.es or rmr@fab.enusa.es

ENUSA new in-can sipping equipment

ENUSA and TECNATOM are operating, among the SICOM equipment family, a new In-can sipping equipment, devoted to identify leaking fuel assemblies that have been stored for many years in the spent fuel pool.

Due to the ENUSA commitment with their customers spent fuel management, the equipment has been developed with the main goal of classifying the integrity of spent nuclear fuel currently stored in spent fuel pools.

The SICOM IN-CAN SIPPING equipment has been developed by ENUSA with the collaboration of Dominion Engineering. Under the basic principles of sipping technology, thus is a decrease in ambient pressure that causes fission gasses to escape from a fuel assembly (Fig.1) and indicates a leaking assembly, this new equipment offers advanced capabilities over other Vacuum Sipping systems available in the industry, in both fuel safety and detection effectiveness due to its double vacuum capability.

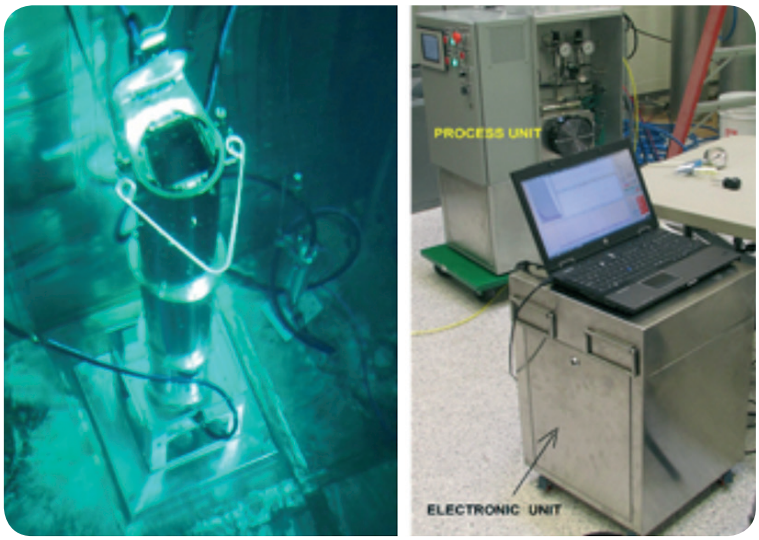


Fig.2 Underwater and topside components of the equipment

The SICOM IN-CAN SIPPING is a portable system, intended for different PWR and BWR fuel assemblies design and easily adaptable to any nuclear power plant configuration. It consists of a modular Stainless Steel Canister sized to enclose a fuel assembly and a pump station, both installed underwater. Outside the water, there is a topside process and a detection cabinet. The fuel assembly is inserted into the underwater canister and a liquid sample is pumped up to the process unit. The process of pumping water from the canister generates a high efficiency vacuum inside of the canister, encouraging a great volume of fission gases to escape from leak sites. A topside process unit contains all of the instrumentation

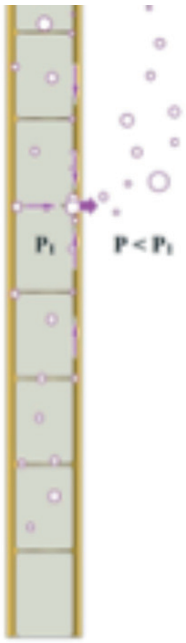


Fig.1 Illustration of fission gas escaping fuel rod defect

and de-gassing capability used to monitor the process and extract dissolved gases from the liquid stream. The gas stream is then sent to a detection unit that determines whether radioactive isotopes are present. The optimized detection configuration maximizes the response making use of an innovative digital processing system. A specific software has been developed to monitor the operational parameters and to process the radiation measurements information with advanced spectrometric determination for the detection of fuel failures. (Fig. 2)

The development began on 2013 and during April 2015 it has been completed the qualification of the new equipment with a campaign in Almaraz Nuclear Power Plant (Figure 3). The system has been tested verifying the compatibility with the plant and the fuel assemblies, checking the safety features and showing the capability of detecting failed fuel assemblies already classified as leakers. As a main results of the tests, the developed In-can sipping system has shown a high sensitivity and accuracy in detecting leaking fuel assembly due to the detector effectiveness and the increased drop in external pressure around the assembly.

After accomplishing all the requisites of the tests, the system is ready for a commercial use assuring a safe, reliable and accurate fuel inspection.

The successful development has taken place due to the effort of all the participants during the project. Special acknowledgement should be given to Almaraz NPP for their support and collaboration in the final qualification of the equipment.

With the SICOM IN-CAN SIPPING, ENUSA and TECNATOM make available to their customers the best technology to identify fuel assemblies leaking, increasing their nuclear fuel assemblies' on-site inspection capabilities.

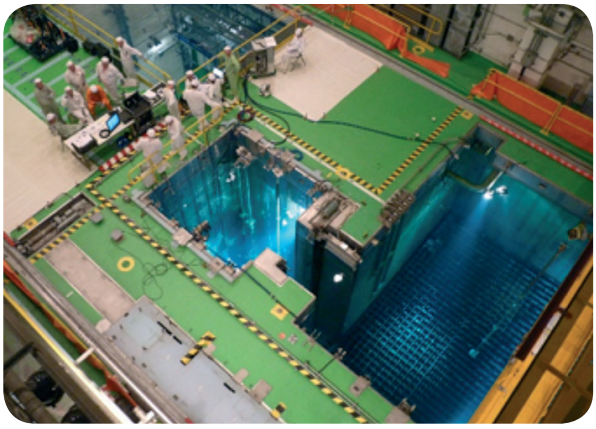


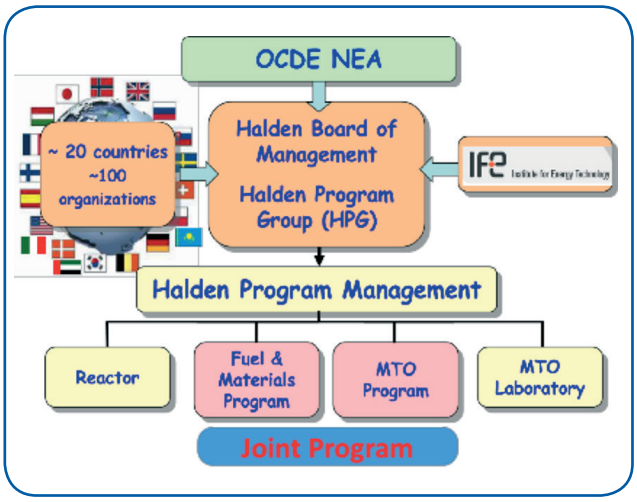
Fig.3 General view. Final qualification campaign

For further information, please contact ptd@enusa.es or ssa@enusa.es

25 years of cooperation with the Halden Project

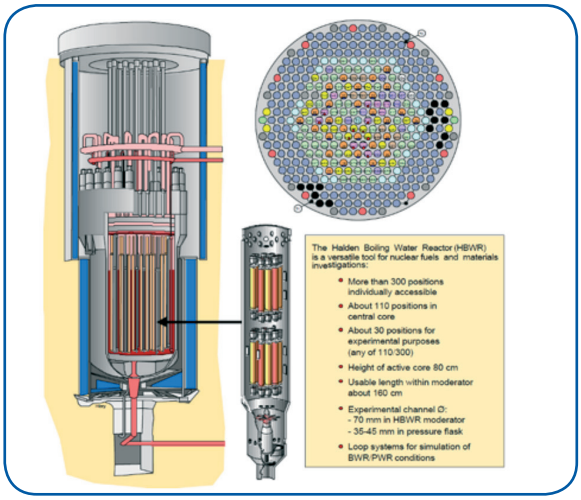
The Halden Project is a collaborative research initiative, under OCDE-NEA framework, to develop essential knowledge and key information for a safe, reliable and efficient operation of nuclear reactors. The Project is financed by the participating organizations from near 20 countries, and is renewed every three years by defining a scope of experiments and research objectives, the "**Joint Program**", in the following fields:

- Nuclear Fuel performance
- Degradation of core materials
- Man-Machine Systems



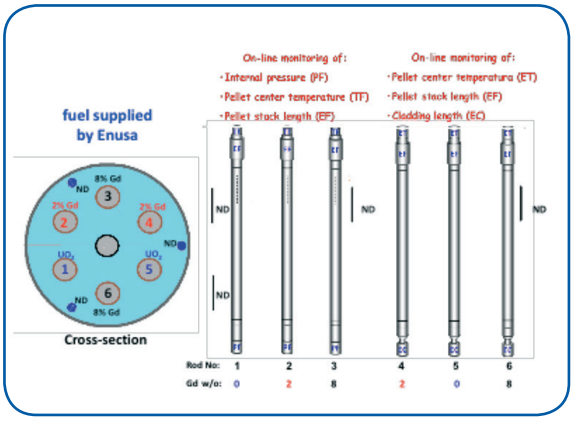
Spain is part of the Halden Project since 1991, being the continuation for the 2015-2017 period about to be formalized. That membership has been arranged thru a Spanish Consortium, managed by Ciemat, which coordinates the collaboration and facilitates adequate feedback within the Spanish parties. Since the beginning, ENUSA has been holding the Spanish representation on nuclear fuel matters at the **Halden Program Group** (HPG), the technical body supervising the experimental activities.

For ENUSA, the foremost appeal and advantage is the availability of the 25MW Halden BWR Reactor for testing fuel and reactor components, where highly instrumented fuel rods are irradiated and subjected to a wide range of conditions. In that manner, while the fuel rods are operated, a set of significant fuel performance parameters are on-line monitored, so that a very valuable and unique data for understanding fundamental behavior is attained. Thanks to the ability for ascertaining the industry needs, and the talent and expertise developed along the years, an amazing capability to simulate a wide and complex range of fuel designs, environments, operating parameters and overall boundary conditions have been shown. It has to be also underlined that realistic commercial fuel operating conditions can be reasonably simulated in most of the experiments, and, in many cases, test fuel rods are built by special re-fabrication of fuel rods previously operated in commercial power reactors.



Applications of the results of those type of experiments are manifold:

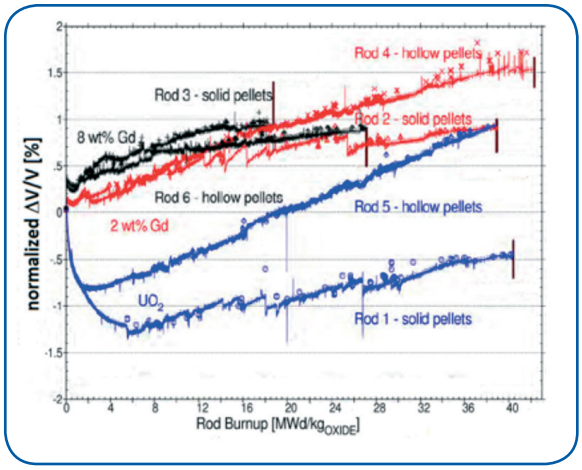
- Improving knowledge on a specific effect, physical mechanism or phenomenon
- Understanding performance under limiting conditions which are assumed or postulated for the design of the fuel, but that are not easily tested elsewhere
- To produce reliable test data for nuclear fuel modeling
- To assess the advantages of given design changes, remedies or improvements
- To determine thresholds, limits or any other type of circumstances which may provide a reliable safe boundary for the operation of the fuel



A close, satisfactory and rewarding cooperation has been developed along these 25 years. During the early times, young ENUSA engineers were assigned as secondees at Halden Project offices for the follow up and evaluation of specific tests; later on, temporary stays of experts on a particular topic were arranged, facilitating and enhancing personal relationship and networking within the nuclear fuel community. In 1998, ENUSA honored to chair the HPG.

Most of the fuel related activities in the Halden Program have been followed with high interest by ENUSA, like the determination of the burnup effect on fuel thermal conductivity, the creep properties of modern claddings like Zirlo, or the lift-off margin when the internal pressure is higher than the system pressure. However, one of the fields where ENUSA has played a major role is on the promotion of well-defined research on Gadolinium doped fuel for enhancing understanding of its behavior, and to assess the main differences with the regular UO_2 fuel. A number of different experimental rigs were built and several combinations of test rods were irradiated bearing fuel pellets manufactured by ENUSA, and, in some cases, refabricated rods made of irradiated commercial fuel rods supplied by ENUSA were also applied:

- **IFA-636** UO_2-Gd_2O_3 fuel performance test
- **IFA-681** Comparative Integral Irradiation Test on **Gd** Fuel
- **IFA-720** FGR and PCMI on commercially irradiated **Gd** Fuel



As a result, valuable data has been gained concerning the performance of the Gd fuel on significant aspects, like: dimensional changes, fuel thermal conductivity, fission gas release threshold, or PCMI. More tests are being envisaged and under discussion within HPG to further continuing this investigation.

Now that the new three year Program is starting, we bet for maintaining and reinforcing this lasting relationship.

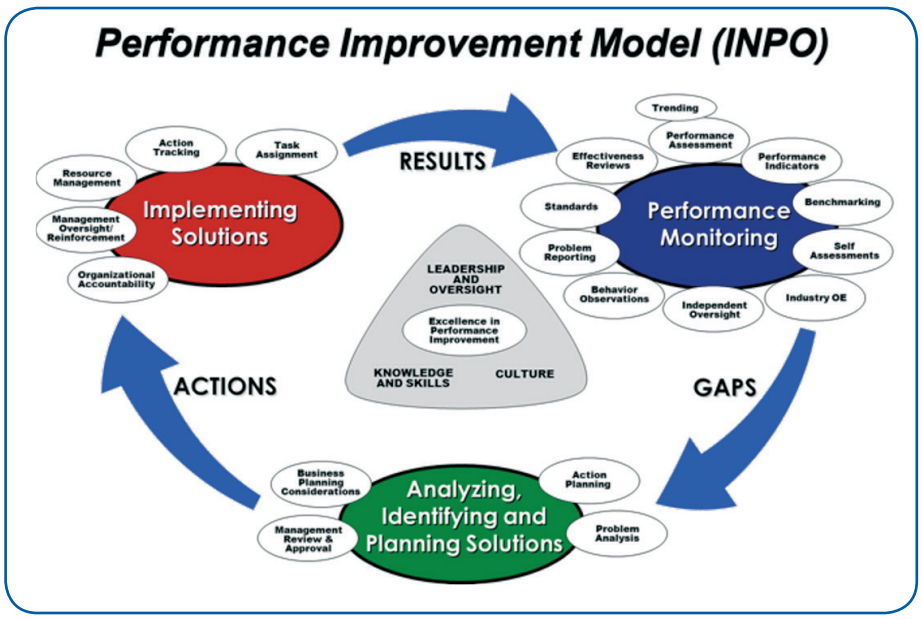
For further information, please contact jap@enusa.es

Human Performance Program of the Juzbado Fuel Assembly Factory

The human reliability is taking more and more importance and relevance in organizations with high safety requirements. The reason is very simple: as technological aspects are evolving and their failures decrease, the organizational aspects (leadership, resources, training, organization chart, communications, identification and external resolution of problems, influences, etc.) and as well as human ones (knowledge, skills, attitudes, motivation, performances, etc.) are taking more relevance because the management is becoming more complex and there is an impact of the technological aspects on the operational results.

The conclusions of the analysis of incident reports from organizations with high reliability standards (Challenger, Columbia, Bhopal, TMI, Chernobyl, Tokai Mura) stress that the Safety Culture is a critical element in the Safety Management of organizations.

For these reasons, among others, an Organizational and Human Performance Program is being developed at the Juzbado Manufacturing Plant, in order to improve through a series of activities and projects those areas that influence safety and quality, in its interaction with technological and organizational systems, through what is known as Man-Technology-Organization (MTO) system.



Within the framework of action described above, projects and activities necessary for implementation and development are associated with the following areas that are described below:

1. *Organizational efficiency:* it is important to have a clearly defined organizational structure. It is also necessary to know how to manage the organizational changes and to reassign correctly responsibilities and functions without compromising the safe and reliable operation of the facility.

2. *Safety Culture:* all personnel in Juzbado factory must have a clear awareness of the type of facility in which they are working, for which the safety of the installation should be a constant and a priority in the daily work. It is also important to ensure knowledge and understanding of safety standards. This requires promoting global policies that reinforce behaviors associated with a healthy and strong Safety Culture.

3. *Human behavior:* the correct performance of all personnel results in a safe and reliable operation of the facility. Participation in working groups dedicated to continuous improvement actions, especially those that are related to safety and quality and the implementation of human performance tools for the prevention of errors is used as a way for improvement of human behavior.

4. *Evaluation and Knowledge Management:* the correct operation of the facility is assessed by the analysis of the workers' own operative experience, as well as the feedback received from the various training courses carried out throughout the plant.

5. *Control of Factory settings:* changes in manufacturing equipment and existing safety systems, and new acquisitions are done by carrying out checks to ensure that the facility remains under the operating conditions approved by the Spanish Nuclear Safety Council.

6. *Work Management:* any activity at the facility conducted by employees must ensure that the requirements of Nuclear Safety and Radiation Protection established in official documents and procedures are followed during its development. To ensure compliance, observations must be made by managers and supervisors of the installation.

7. *Equipment condition and performance:* the control over production equipment and safety systems that support the operation of the installation is critical because is necessary a rapid response system against failures that jeopardize the security installation.

Many are the milestones that have been achieved through the consolidation of the Human Performance program in the factory Juzbado, but where must we go in the coming years?

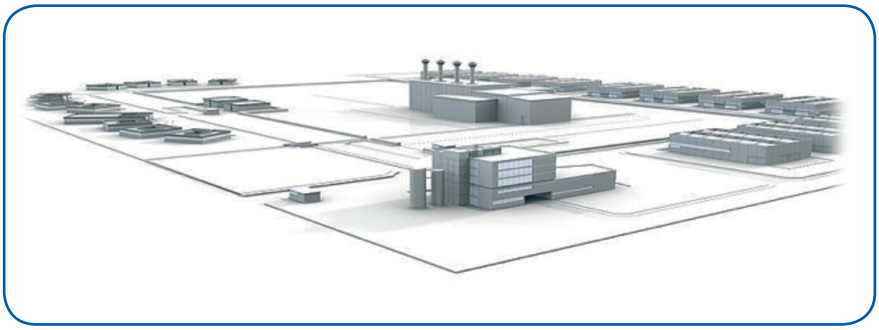
The challenge is to strengthen the results of projects and activities developed during these years. The high standards of performance required by the different sectors (customers, society, organizations, etc.) do that we have to keep working on identifying new actions to be developed through continuous improvement, self and independent assessments, being particularly relevant those related to safety culture, quality and manufacturing of the nuclear fuel elements of all our customers.

For further information, please contact dem@fab.enusa.es

ENUSA ongoing activities for future ATC

The Centralized Temporary Storage (ATC, as it stands in Spanish) is a facility designed to store the spent fuel and the high-level waste generated by Spanish Nuclear Power Plants, for a period of minimum 60 years. The high level waste will be stored under dry conditions in surface, in capsules that will have around eight spent fuel bundles each. In this way, the management and supervision of all high-level waste will be centralized in a single installation.

Since the end of 2011, when the village of Villar de Cañas was officially designated as the place chosen for the construction of the ATC, ENRESA - the public company responsible for the management of radioactive waste in Spain - has been working on the development of the engineering project required by the Spanish legislation for the facility construction and licensing. This process will be completed with the commissioning of the ATC, foreseen in the first half of 2018.

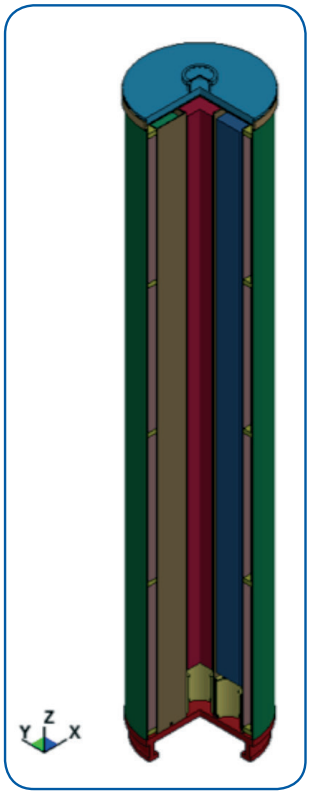


These activities started at a time when ENUSA already had a significant experience in the activities of the second part of the nuclear fuel cycle. ENUSA has a deep knowledge on spent fuel management and it is very close to the operators of the nuclear power plants. With all this in mind, ENUSA is a reference in numerous activities related to the management of spent fuel for ENRESA and also for the Spanish utilities.

Since the design activities of ATC Project started, ENUSA has actively collaborated with ENRESA in many different areas. ENUSA is currently working with ENRESA, among others, in the following activities.

- *Nuclear engineering service support to the ATC engineering department.*
  ENUSA is providing a consultancy support to the ATC Engineering Department of ENRESA. This activity is related to reviewing the nuclear and radiological facility design. These tasks mainly include the revision of the licensing documentation prepared by the different engineering companies responsible for the different ATC areas design. ENUSA is carrying out calculations to check those areas or processes of the ATC with special importance to the nuclear safety.

- *Project of designing optimization for capsules and racks of future ATC.*
  Based on the generic design already available, the scope of this I+D+i project consists on the design optimization of the storage capsules, that will place the different fuel designs existing in Spain, coming from the nine commercial nuclear power reactors.

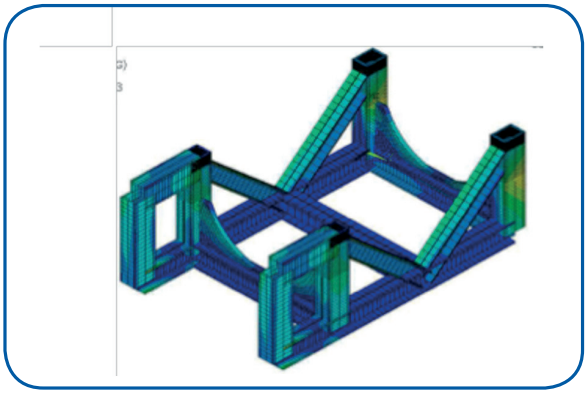


The total number of capsules that the ATC will have is around 2.500. It is a high technologic component that incorporates important values in the innovation and development area. It is emerging as essential in the management of radioactive waste from the point of view of nuclear safety and radiation protection because it is the first containment barrier of the storage system.

This activity, which began in 2013, will last until the first quarter of 2016.

– *Feasibility study of a unique cradle of transport for the transport of spent fuel from the Nuclear Power Plants to ATC.*
Today the high level waste is not transported in Spain and remains in pools or in storage casks at the power plant sites. The storage casks currently used or planned in the Spanish nuclear power plants for the temporary dry storage of spent fuel are of different types, HI-STAR from Holtec, and ENSA designs DPT, ENUN 32P, ENUN 52B.

When the ATC begins its activities, the high level waste would have to be shipped from the different interim storage at the NPPs to the ATC. In order to optimize the logistics associated with the transport of different types of containers to the ATC, ENRESA contracted ENUSA for the realization of a feasibility study for the design of a unique cradle of transport capable of carrying the different types of containers. This cradle would allow the coupling, by moving parts, of the different types of transport cask for spent nuclear fuel. This activity has been done together with ETSA, the ENUSA subsidiary for global and multimodal transport operator for radioactive goods, and with the support of ENSA, the Spanish public company for reactor big components manufacturing and specialist in cask design and manufacturing.



In addition to these projects currently, ENUSA is working close to ENRESA to offer its capabilities in other different areas, as training of ATC staff and the development of specific equipment for the operation of the ATC.

Furthermore, ENUSA, through its subsidiary ETSA, is working to provide an integrated solution for the logistics and transport services of the spent fuel from nuclear power plant to the ATC.

In summary, ENUSA is ready to provide the Spanish Industry and ENRESA support to help in the spent fuel management, area where ENUSA has been working very hard in the last years, and is becoming an international reference.

For further information, please contact esb@enusa.es

ENUSA at the 11th China International Exhibition on Nuclear Power Industry

Following its presence in past international conferences about nuclear energy in China, ENUSA has been participating in this exhibition in Beijing as part of the Spanish Pavillion, jointly with the companies Tecnatom, Ringo Valves, ENSA and Técnicas Reunidas. The overall coordination of the Spanish delegation was led by the Spanish Nuclear Forum. The Managing Director of the SNGC, Mr. Carmelo Palacios, and the SNGC engineer in Beijing Ms. Amy Hu represented the SNGC in the exhibition.

New corporate identity at the ENUSA booth

For this event ENUSA has presented its new corporate identity by showing the new logo in the information panels as well as in the new marketing brochures. The new identity has been very well received by the public because of its modern appearance in accordance with the new trends in corporate design.

The nuclear exhibition in Beijing is an important meeting point for the companies with interests in the Chinese nuclear market. It is also a great occasion for establishing commercial contacts with the most important stakeholders in the nuclear sector. This year the ENUSA booth has received visitors from representatives of the Yibin and Baotou fuel factories as well as representatives from the CGN group and its subsidiaries.

In addition to these business-related visits, the Spanish Pavillion was honoured with the presence of the Economic and Commercial Counsellor of the Spanish Embassy in Beijing, Mr. Serra. From the Chinese Government it is remarkable the visit paid by Mr. Ma Kai, one of the four Chinese Vice-Premier who showed interest for the activities of the Spanish companies in the Chinese nuclear sector.

Since ENUSA entered the Chinese market back in 2007, it has gradually positioned itself as a supplier of nuclear fuel equipment, either for manufacturing or inspection, an important business niche in which the equipment manufactured and delivered jointly by ENUSA and its partner Tecnatom enjoy good prestige and growing demand among the fuel manufacturers and service companies in China.

Front view of the Spanish Pavillion

ENUSA KEEPS THE MAXIMUM SCORE IN THE 2014 EDF/CEIDRE EVALUATION.

On April 7th 2015, the CEIDRE (organization which performs the surveillance for the EDF fuel manufacturing projects) presented the results of the annual evaluation corresponding to 2014 and gave for a second consecutive year the maximum score "A" (very satisfactory). The customer valued in a very positive way, among others, the measures adopted by ENUSA in the Juzbado risks analysis to guarantee the safety of the EDF inspectors. The ENUSA proactivity in setting up an action plan right after the EDF/CEIDRE annual assessment presentation that is put in place to ensure that the customer expectations will be fulfilled is also highly appreciated. ENUSA was congratulated by EDF for the good results and was also encouraged to continue in the same path making us aware of the inherent difficulty to keep this good score. Getting such important degree of recognition from the customer is only possible through the highest level of engagement of the ENUSA personnel involved in the EDF projects.

ENUSA & GNF-A sign an amendment to the GENUSA Joint Venture Agreement

As an step forward in the relationship between GNF-A and ENUSA, both companies have signed and amendment to the current GENUSA Joint Venture Agreement. In this amendment the scope and business assignment for the supply of fuel manufacturing and services for Gundremmingen NPP and Cofrentes NPP is formalized.

The signature of this amendment is another symbol of the strong relationship between GNF-A and ENUSA to provide reliable, high performance fuel solutions, engineering, and on-site services for GENUSA customers throughout Europe.

Factory acceptance test of the SICOM-UT equipment for Suzhou Nuclear Power Research Institute

The SICOM-UT equipment for the Suzhou Nuclear Power Research Institute (SNPI) has passed the acceptance test at Tecnatom under the witnessing of SNPI and CNPRI (China Nuclear Power Research Institute) representatives, both companies belonging to the China General Nuclear Power Group (CGN.)

During the tests the SICOM-UT has proven the maturity of its technology, jointly developed by ENUSA and Tecnatom. The SICOM-UT equipment met all the requirements of the test protocol satisfactorily.

After the training sessions for the customer, the equipment was shipped for final acceptance tests at the Daya Bay complex, close to the city of Shenzhen in the Chinese province of Guangdong.

SICOM-UT Factory Acceptance Test. From left to right: Mariano Toral (TECNATOM), Wang Guohe (CNPRI), Francisco Vidal (ENUSA), Yu Tong (SNPI), David Morales (TECNATOM), Zhou Guozheng (SNPI) and Rubén Villanueva (ENUSA)

Co-ordination: Institutional Relations relin@enusa.es

Enusa belongs to Grupo SEPI, a corporate holding which includes a total of 16 state-owned companies in which it has direct, majority shareholding participations, with a workforce of more than 75,000 professionals; it also includes the Spanish state-owned television and radio corporation, Corporación Radiotelevisión Española, which is attached to SEPI, and one public foundation. Equally, SEPI has direct minority shareholdings in a further nine companies, and indirect shareholdings in more than one hundred companies.