December 2024

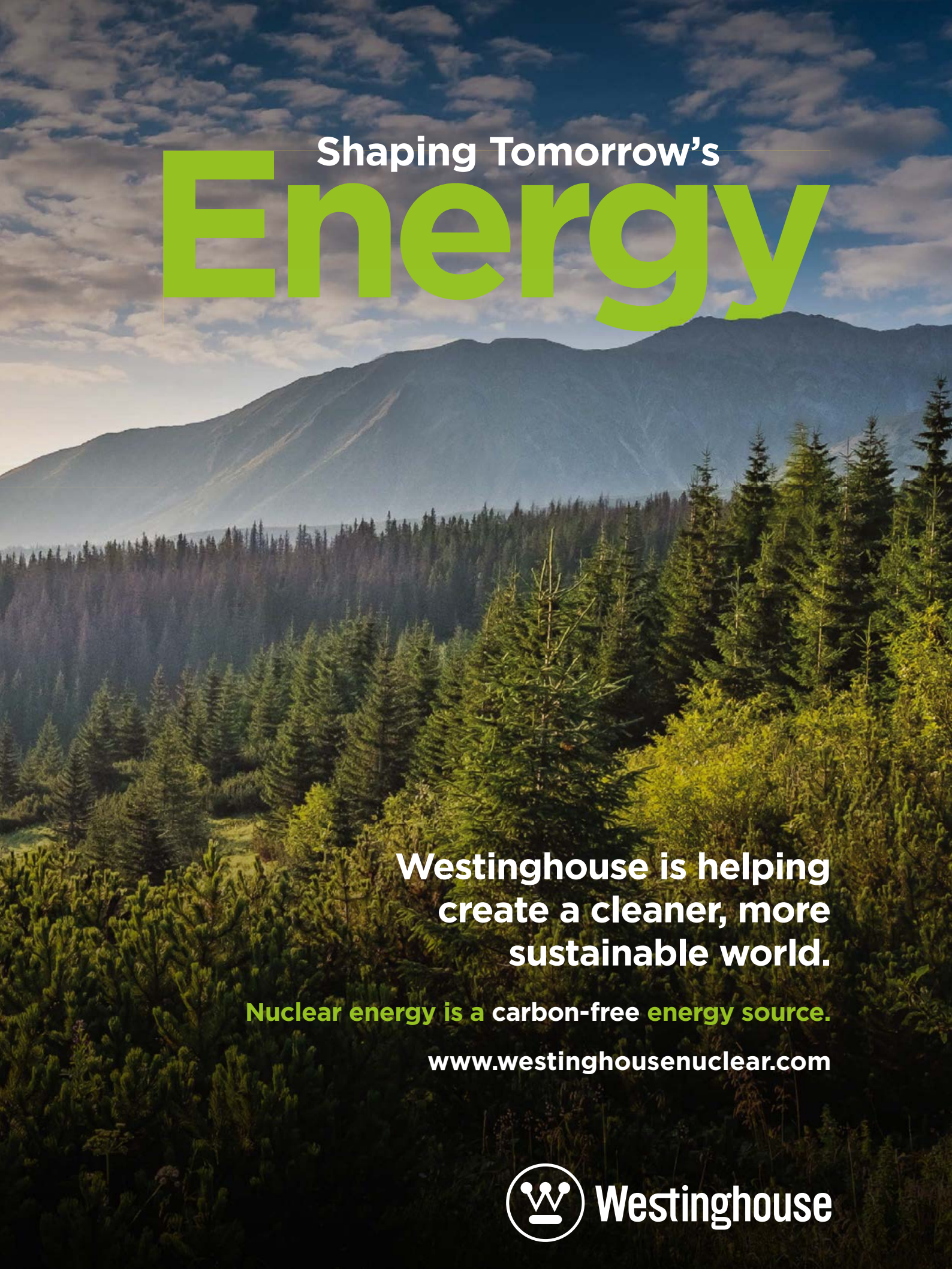
Nuclear España

LA REVISTA DE LOS PROFESIONALES DEL SECTOR NUCLEAR

sne

NUCLEAR DIRECTORY

INTERVIEW:
Manuel Leal and Luis Felipe DURÁN, Chairmen of the Organizing Committee and Technical Committee of the 50th Annual Meeting of the SNE.


Shaping Tomorrow's
Energy
Westinghouse is helping create a cleaner, more sustainable world.
Nuclear energy is a carbon-free energy source.
www.westinghousenuclear.com
Westinghouse

Nuclear España

LA REVISTA DE LOS PROFESIONALES DEL SECTOR NUCLEAR

50th ANNUAL MEETING OF SNE

EDITORIAL 5

INTERVIEW 7

Manuel Leal and Luis Felipe Durán.
Chairmen of the Organizing Committee and the Technical Committee

SOCIAL EVENTS 16

COMPLEMENTARY ACTIVITIES 26

OPENING SESSION 32

INAUGURAL CONFERENCE 36

MONOGRAPHIC SESSION 40

PLENARY SESSIONS 42

CLOSING SESSION 46

TECHNICAL AND POSTER SESSIONS 56

WOMEN IN NUCLEAR and YOUNG NUCLEARS 88

COMMUNICATION 92

BEST PAPERS 93

COMMERCIAL EXHIBITION 95

PUBLIC UTILITY ENTITY

www.sne.es

SNE GENERAL PARTNERS

ACSA OBRAS E INFRAESTRUCTURAS, SAU
AHLBERG CAMERAS AB
AMARA, S.A..
APPLUS NORCONTROL, S.L.U.
ASOC. NUCLEAR ASCO - VANDELLOS II
CC.NN. ALMARAZ - TRILLO AIE
CEGELEC, S.A.
CIC CONSULTING INFORMÁTICO DE CANTABRIA S.L.
CIEMAT
CLÚSTER DE LA INDUSTRIA NUCLEAR DE CANTABRIA (CINC)
COAPSA CONTROL, S.L.
COLEGIO DE INGENIEROS DEL ICAI
CUADROS ELÉCTRICOS NAZARENOS, S.L.
DRACE GEOCISA, S.A.
EDP ESPAÑA, S.A.U.
EMPRESARIOS AGRUPADOS AIE
ENDESA GENERACION, S.A.
ENUSA INDUSTRIAS AVANZADAS S.A.
ENWESA OPERACIONES
EPRI
EQUIPOS NUCLEARES, S.A.
EULEN, S.A.
EXPRESS TRUCK S.A.U.
FRAMATOME
GAMESA ELECTRIC S.A.U.
GD ENERGY SERVICES, S.A.U.
GE - HITACHI NUCLEAR ENERGY INTERNACIONAL
GENERAL ELECTRIC STEAM POWER
IBERDROLA GENERACION NUCLEAR S.A.U.
IDOM CONSULTING, ENGINEERING, ARCHITECTURE, S.A.U.
INGECID, INVESTIGACIÓN Y DESARROLLO DE PROYECTOS, S.L.
MANSERVA, S.L.
MANTENIMIENTOS, AYUDA A LA EXPLOTACION Y SERVICIOS, S.A.
MARSEIN, S.A.
MEDIDAS AMBIENTALES S.L.
MOMPRESA
MONCOBRA
NATURGY INGENIERÍA NUCLEAR, S.L.
NATURGY GENERACION TERMICA, S.L.U.
NUCLENOR, S.A.
NUCLEONOVA S.L.
ORANO CYCLE
PREVENCIÓN DE INCENDIOS SEGURIDAD APLICADA, S.L.
PROINSA
PRYSMIAN CABLES SPAIN
RINGO VALVULAS S.L.
SERVEO SERVICIOS, S.A.U.
SGS TECNOS, S.A.U.
SIEMSA INDUSTRIA, S.A.
TECNASA
TECNATOM, S.A.
WESTINGHOUSE ELECTRIC SPAIN
WESTINGHOUSE TECHNOLOGY SERVICES, S.A.

Edita Senda Editorial, SA

Directora: Matilde PELEGRÍ
Consejo de Redacción: Comisión de Redacción de la Revista de la SNE.
Diseño y Maqueta: Clara TRIGO

C/ Poeta Joan Maragall, 56. 7º D. 28020 MADRID - Tel: (34) 91 373 47 50 • email: nuclear@gruposenda.es

Depósito legal: M-22.829/1982 - ISSN: 1137-2885

Esta publicación está asociada a CLABE (que a su vez es miembro de CEOE, CEPYME, EMMA y FIPP) y a CEDRO

ALL OUR PUBLICATIONS ARE PRINTED ON ENVIRONMENTALLY FRIENDLY CHLORINE FREE PAPER

The SNE allows the reproduction in other media of the abstracts of the articles published in NUCLEAR ESPAÑA, provided that their source is mentioned at the beginning of the text of the reproduced abstract and a link to the home page of the website www.revistanuclear.es is attached, as well as the name of the author and the date of publication. Any reproduction or copy, distribution or publication of any kind of the content of the information published in the journal is forbidden without prior written authorization from the SNE.
The reproduction, copying, distribution, transformation, making available to the public, and any other activity that may be carried out with the information contained in the magazine, as well as with its design and the selection and form of presentation of the materials included therein, for whatever purpose and by whatever means, without the express authorization of the SNE is prohibited.
NUCLEAR SPAIN is not responsible for the opinions expressed by the authors.

NUCLEAR SERVICES

GDES

We add value
to provide ***energy*** to the world

- O&M Support
- Decommissioning & Waste Management
- Long-Term Operation
- Thermal Protection
- Radiological Protection
- Surface Treatment
- Logistics

GDES BUSINESS UNITS

NUCLEAR SERVICES | DECOMMISSIONING | SURFACE TREATMENT
WIND | EFFICIENCY | DIGITAL TRANSFORMATION | LOGISTICS

Ronda Auguste y Louis Lumière, 15
Parque Tecnológico
46980 Paterna, Valencia (Spain)
Tel. +34 963 540 300
www.gdes.com · Info@gdes.com

BOARD OF DIRECTORS

Presidente: Emilio MÍNGUEZ TORRES
Vicepresidente: Paulo DOMINGUES SANTOS
Secretario General: Julio BLANCO ZURRO
Tesorero: Pablo T. LEÓN LÓPEZ
Vocales: Angela CORTÉS MARTÍN, Oscar LARROSA PERUGA, Adrian GONZALVO MANOVEL, Lourdes GUZMAN GÓMEZ-SELLES, Pablo MARTÍNEZ LEVY, Susana FALCÓN CABRERA, César QUERAL SALAZAR, José TOMÁS RUIZ MARTÍNEZ.

COMMUNICATION COMMITTEE

Presidenta: Montse GODALL VIUDEZ
Vicepresidente: Manuel FERNÁNDEZ ORDOÑEZ
Vocales: Amalia BALTAR ESTÉVEZ, Alfonso BARBAS ESPA, Miriam DÍAZ HERNÁNDEZ, Laura ESCRIBANO UCAR, Lucia GÓMEZ SANCHIS, Beatriz LIEBANA MARTÍNEZ, Iratxe MANCHOBAS FERNÁNDEZ, Olga MARCOS CORTÉS, Carmen MORENO SANTIAGO, Laura ORTEGA PASTOR, Carmelo PALACIOS ESTEBAN, Teresa PALACIO ALLER, Carlos VÁZQUEZ RODRÍGUEZ.

PROGRAM COMMISSION

Presidenta: ARANZAZU RÍSQUEZ BAILON
Secretario: CÉSAR DE LA CAL LOSADA
Vocales: Barbara CULEBRAS VILLALBA, Pino DÍEZ ÁLVAREZ-BUYLLA, Jesus FORNIELES REYES, David GARCÍA COBOS, Angel GARCÍA BUENO, Eva Mª CELMA GONZÁLEZ-NICOLÁS, Francisco JAVIER HERNÁEZ DELGADO, Nicolás OLMO JUAN, José ORDOÑEZ RODENAS, Irene RAMÍREZ MARTÍNEZ, Carmen VALLEJO DESVIAT.

TECHNICAL COMMISSION

Presidente: Marta Baladía Olmedo
Vocales: Ramon BARTOLOMÉ REGUÉ, Francisco JOSÉ BENÍTEZ GONZÁLEZ, Gabriel PIÑA LUCAS, Ignacio ARANA FERRÁNDEZ, Irene RAMIREZ MARTÍNEZ, Jorge JIMÉNEZ RODRÍGUEZ, José Maria FIGUERAS CLAVIJO, Juan Antonio MUÑOZ SÁNCHEZ, Juan Antonio MUÑOZ TIRADO, Juan DE LA CRUZ MARTÍNEZ ROBUSTILLO, Luis OSORIO PEREIRA, Marisa GONZÁLEZ GONZÁLEZ, Miguel Angel GONZÁLEZ NAVARRO, Xavier JARDI CUERDA, Telmo GABARAIN.

EDITORIAL COMMITTEE OF THE MAGAZINE

Presidenta: Beatriz LAMELA PASCUA
Vicepresidente: Miguel BARREIRO BUGALLO
Vocales: Elvira BLAZQUEZ, Ignacio ETXEGUREN GONZÁLEZ, Andres FELIPE MARTÍNEZ, Karen GUZMAN, Gonzalo JIMÉNEZ VARAS, Karina MARTÍNEZ PÉREZ, Luis SERRA LÓPEZ, Matilde PELEGRÍ TORRES, Gema ORTÍZ, Miguel Angel RODRÍGUEZ GÓMEZ, Marta VERDUGO DEL POZO.

TERMINOLOGY COMMITTEE

Presidente: Pedro Luis GONZÁLEZ ARJONA
Vocales: Carolina ANHERT IGLESIAS, Leopoldo ANTOLÍN ÁLVAREZ, Manuel COTELO FERREIRO, César DE LA CAL LOSADA, Alfonso DE LA TORRE FERNÁNDEZ DEL POZO, Gonzalo F. GARCÍA FERNÁNDEZ, Eugenio GIL, Ramón REVUELTA LAPIQUE.

EMPLOYMENT AND PROFESSIONAL DEVELOPMENT COMMITTEE

Presidenta: Laura MARTÍN HUETE
Vocales: Francisco SÁNCHEZ ALVAREZ, Sara BLANCO RUIZ, Tania CARREIRA COUTO, Miriam DÍAZ HERNÁNDEZ, Javier DIES LLOVERA, Cristina ROSARIO DOMINGO JIMENEZ, Inés GALLEGO CABEZÓN, Elisa GIL CRESPO, Mario GONZÁLEZ ALVAREZ, Alberto GUILLEN MARCOS, Borja HERVÁS MARTÍN, César HEVIA LOREDO, Víctor HUERTAS RAMI, Eva JABALOYAS CASES, Antonio JIMÉNEZ CARRASCOSA, Rabel LEONARDO MAES, Clara MONTALVO OCEJA, Alejandro PALACIO ALONSO, Rocio RODRÍGUEZ RUBIO, Jesús SAIZ DE OMEÑACA, Guillem SANCHIS RAMIREZ, Federico DE TORRES GUERRERO.

NUCLEAR YOUTH COMMISSION

Presidente: Alejandro CARRASCO SÁNCHEZ
Vicepresidente: Pau ARAGÓN GRABIEL
Vocales: David ÁLVAREZ ROMERO, Azucena BELLO FERNÁNDEZ, Samir BOULANNOUAR AL MASSATI, Miriam DÍAZ HERNÁNDEZ, Cristina R. DOMINGO JIMENEZ, Ana GONZÁLEZ FELGUEROSO, Juan Carlos GUILLAMOT RUANO, Laura MARTÍN HUETE, Francisco MORALES PÉREZ, Laura ORTEGA PASTOR, Jesús SAIZ DE OMEÑACA TIJERO, Luis SERRA LÓPEZ, Cristina TRULL HERNÁNDEZ.

WIN COMMISSION

Presidenta: Amparo SOLER MARTÍNEZ
Vicepresidenta: Rosa GONZÁLEZ GANDAL, Mª Luz TEJEDA ARROYO
Secretaria General: Stella ZAMUDIO DE LA VARGA
Resp. Comunicación: Marina GARCÍA FENOL
Tesorera: Ana GONZÁLEZ FELGUEROSO
Vocales: Elisa Gil CRESPO, Adoración ARNALDOS GONZÁLVEZ, Eva Mª CELMA, Pedro ORTEGA PRIETO, Patricia CUADRADO GARCÍA, Miriam DÍAZ HERNÁNDEZ, Maria José REBOLLO MENA, Alice CUNHA DA SILVA.

ORGANIZING COMMITTEE 50th ANNUAL MEETING

Presidenta: Rosalia TENA TOBAJAS
Vicepresidenta: David MARTÍN
Secretario: Francisco GONZÁLEZ DE LA PEÑA
Tesorero: Manuel LEAL GONZÁLEZ
Secretario General SNE: Julio BLANCO ZURRO
Presidente del Comité Técnico: Luis Felipe DURAN VINUESA
Vocales: Vocal: Belén DÍAZ DE LA CRUZ, Amparo SOLER MARTÍNEZ, Elisa GIL CRESPO, Montse GODALL VIUDEZ, Teresa PALACIO ALLER, Alessandra DE PIETTO, Pedro ORTEGA PRIETO, Lola PATIÑO RAMOS, Matilde PELEGRÍ TORRES , Isabel PASTOR GARCÍA, Francisco Javier VILLAR VERA, Yulay PÉREZ RIPOLL, Cristina DOMINGO, Álvaro ROJO BLAS, Rafael SÁNCHEZ FERNÁNDEZ, Javier GUTIERREZ VARELA.

TECHNICAL COMMITTEE 50th ANNUAL MEETING

Presidenta: Luis Felipe DURÁN VINUESA
Vicepresidente: Alberto GUILLEN MARCOS
Secretaria Técnica: Gabriela DAZA
Vocales: Carlos AGUADO BASABE, David ÁLVAREZ ROMERO, Andrea M. CADENAS MENDICOA, Angel DE BLAS, Alberto ESCRIVÁ CASTELLS, Domingo GARCÍA CARDENAS, Javier GARCÍA RODRÍGUEZ, Oscar MARTÍNEZ CABALEIRO, Elisa SAJARDO JIMENEZ, Isabel VINIEGRA CABELLO, Sofia CORINO DIAZ, Patricia CUADRADO GARCÍA.

EDITORIAL

50 YEARS OF NUCLEAR ENERGY IN SPAIN AND A FUTURE TO BE DEBATED

The Annual Meeting of the Spanish Nuclear Society reached its 50th edition this year—50 years of history, 50 years as part of Spain's electricity generation, making a highly valuable contribution to our country. Despite being an asset with an imposed expiration date, condemned to disappear, the annual gathering of nuclear professionals once again demonstrated the strength and capability that Spain has when it comes to nuclear energy. We have technological capacity, research, companies, and, of course, highly qualified and trained individuals.

In Córdoba, the host city of this year's meeting, the president of the SNE called for a reflection that all professionals in the sector endorse: "Spain is being left completely alone in its policy of closing nuclear power plants." Time is running out, and it seems we have settled into a fruitless debate over blame, but those of us who truly belong to this sector are people who work to be a strategic asset—a powerful and capable resource that is ready to continue. That is why we advocate for the need to sit down at the table and discuss, with technical and solid arguments, the future of an energy source that is increasingly being recognized as sustainable and green.

Ensuring supply security at a competitive price while respecting emission reduction agreements to contribute to the fight against climate change is synonymous with nuclear energy—if we leave behind prejudices and outdated perspectives.

Recognizing nuclear power plants as the valuable resource they are in the design of the energy mix our country needs in the short and medium term is essential to guaranteeing both well-being and respect for the planet that sustains us. Nuclear professionals train and work to improve every day as part of our commitment to defending facilities that are a highly valuable asset to be preserved.

Energía de futuro

anav
energía positiva

Interview

MANUEL LEAL & LUIS FELIPE DURÁN

CHAIRMEN OF THE ORGANIZING COMMITTEE AND OF THE TECHNICAL COMMITTEE OF THE 50th ANNUAL MEETING OF THE SNE

The Spanish Nuclear Society (SNE) celebrated its half-century of history with the 50th Annual Meeting, a milestone that once again highlighted the sector's commitment to innovation, safety and the future of energy. Cordoba, host city for the second time, welcomed more than 750 congress participants, consolidating its position as an unmissable meeting point for professionals, companies and young talents. Manuel Leal and Luis Felipe Durán, chairmen of the Organizing Committee and the Technical Committee, respectively, of the 50th Annual Meeting of the SNE, reveal in this interview the challenges overcome, the successes achieved and the vision for the future that guides the SNE at a crucial time for nuclear energy.

The year 2024 is a celebration for the Spanish Nuclear Society (SNE), which commemorates its 50th anniversary. However, the 2023 Annual Meeting was the 48th. Why did it go from the 48th AM to the 50th AM?

Manuel Leal: Fundamentally due to COVID-19, which prevented the 46th Annual Meeting from being held in Granada in September 2020. However, in order to continue with the objective of sharing knowledge, improving outreach, and exchanging experiences, the Board of Directors launched the first Virtual Meeting of the SNE, which was held in November of that same year.
By calling it a Virtual Meeting, the corresponding numbering was lost for that edition, creating a one-number gap between the numbering and the actual number of meetings held. Finally, the Board of Directors decided to restore the previous concordance since, even if it was virtual, the Annual Meeting did take place. And what better moment to do so than on the 50th Anniversary of the Spanish Nuclear Society: 50 years, 50 meetings.

The city of Córdoba hosted the 20th Annual Meeting in 1994. Thirty years later, the Society returns to one of the most emblematic cities of Andalusia, with renovated infrastructures. What led the SNE to choose this city as the venue for the Annual Meeting?

"In the 50th Anniversary of the SNE we have exceeded 750 congress attendees, specifically 761. To which we have to add a total of 23 exhibiting companies and 26 sponsors."

M.L.: The requirements to carry out our Annual Meeting are becoming increasingly demanding, and we need a pavilion or congress center that meets a series of special characteristics. On the other hand, it is also important that the host city has what is needed to carry out our social and outreach programs, as well as that there is good coordination between the Spanish Nuclear Society and the local administration, something that was demonstrated during the first meeting with the City Council. Córdoba had it all.

What has been the response of regional and local authorities and institutions such as the University?

M.L.: From the very first day, everything was made easy for us; both the City Council and the University were fully committed to our congress and really made things very easy for us. We maintained constant communication with the City Council throughout the year through its representative, Estefanía Montes, who responded quickly and effectively to all our requests, which were not few. As for the University, through its Rector, Manuel Torralbo, and its Vice-Rector, Rafael Solana, it contributed to the successful execution of the STEM and WiN workshops by providing us with its facilities.

How did the media respond to the SNE's invitation to cover the congress?

M.L.: We also had a good reception from the media in Córdoba; they were present at the two press conferences we held before the meeting and also at the meeting itself, covering the attendance of local institutions. I know that the outcome was very positive, and the coverage was extensive.

What are the general attendance figures?

M.L.: In recent years, we have always been close to 700 attendees, and this year, on the 50th Anniversary of the SNE, we have surpassed 750, specifically 761. Additionally, we had a total of 23 exhibiting companies and 26 sponsors.

THE TECHNICAL CONTENT

The technical program is the backbone of the Annual Meetings. What are the technical areas that have generated the most interest among attendees?

Luis Felipe Durán: This year, the areas of Engineering, Innovation and Design; Nuclear Safety; and Decommissioning and Waste Management have drawn special at-

PROFESSIONAL PROFILE

Manuel Leal holds a degree in Public Works Engineering from the Polytechnic University of Madrid and a Master's Degree in Nuclear Engineering from CIEMAT.

He works at Endesa in the management of nuclear generation operations. He joined the SNE in 2023 as President of the Organizing Committee of the 50th Annual Meeting and currently remains linked to the Society as treasurer of the same committee.

PROFESSIONAL PROFILE

Luis Felipe Durán is an energy engineer and Master in Nuclear Science and Technology from the Polytechnic University of Madrid.

He works as a nuclear engineer at IDOM Nuclear Services, where he is based in Italy working for the Joint Research Centre since 2023.

In 2019 he joined the CTRA as a member representing the Young Nuclear Board, where he also participated in the organization of the ENYGF 2021 in Tarragona as Communications Chair and as a representative in the SNE Communication Commission. After two years as Vice-President, since the end of 2023 he has been President of CTRA.

tention. These three alone accounted for 50% of the presentations submitted, which speaks to their relevance and the interest they generate in the sector. Among attendees, the undisputed favorite was Engineering, Innovation, and Design, with an average attendance of 50 people per session and peaks of up to 63 attendees. To put this into perspective, the general average attendance is between 35 and 40 people, so it clearly made a difference.

Where is the technical program heading?

L.F.D.: In recent years, the Technical Committee has put great effort into offering renewed formats and participation modalities for our attendees.
Examples such as the Nuclear Technology workshop, the interactive poster session, or the young professionals' session are a good indication of the direction we are taking: we want a more innovative, more dynamic program, and above all, with a participatory approach. We seek to give more prominence to the creative side of the sector, betting on an interactive space and on young talent that is shaping the future of the industry.

Plenary sessions allow for the analysis of current topics in the sector. This edition focused on the role of nuclear energy in the 2020 horizon and the European Union's growing commitment to nuclear energy. What aspects do you highlight from these sessions?

L.F.D.: This year, the choice of these topics could not have been more appropriate. In Europe, we are at a crucial moment in energy policy.

We have been experiencing a trend toward closure, led by Germany and followed by our country, among others. However, the COVID-19 pandemic and the crisis derived from the war in Ukraine have radically changed the landscape, reversing in many cases that closure trend. The first plenary session addressed the challenges of following the PNIEC path from different perspectives: the market operator, electricity companies, and an independent consultant. Meanwhile, in the second plenary, we had speakers from countries that have made a 180-degree shift in their policies and are preparing new nuclear programs, either by building new plants or maintaining their existing fleets. It was truly interesting to compare these two realities: the current challenges in Spain, which follows the PNIEC's path, and the international scenarios that show what could happen if we change course in our energy planning. In

"We seek to give more prominence to the creative side of the sector, betting on an interactive space and the young talent that is shaping the future of the industry."

summary, it was an enriching debate full of contrasting perspectives.

How do you assess the participation of international speakers?

L.F.D.: To discuss the topics mentioned above, having international speakers was essential. It is quite a challenge to organize a technical program that contrasts two such different realities, depending on where we stand. If we want to anticipate a different scenario, we must gather that experience from abroad, in countries such as Sweden, the Netherlands, or Belgium, which represent different plausible realities (in both senses of the word). We had top-level guests, and who better to help us achieve the objectives set for the program's design? I would also like to highlight the role of the moderators, Ramón Roca and Berta Picamal, who, thanks to their deep knowledge of the sector, maximized the value of the sessions and greatly facilitated our organizational work.

A MEETING FOCUSED ON SOCIETY

For the first time, this edition highlighted the outreach program within the set of activities planned for the Annual Meeting week. This program includes activities organized by Young Nuclear Professionals and WiN Spain, aimed at the society hosting the Annual Meeting. What aspects do you highlight about these initiatives?

M.L.: The outreach program is fundamental during the week in which the Annual Meeting is held; that is why we wanted to highlight and differentiate it from the rest of the activities. Professionals in the sector are already aware of the importance of nuclear energy generation and the key role it plays in society. However, the general public is not as aware, which is why the work carried out by the WiN and Young Nuclear Professionals commissions is so relevant. Their efforts in organizing courses, workshops, and conferences in the same host city throughout the week are crucial.

So, do you believe these types of activities should be encouraged in annual meetings?

M.L.: Without a doubt, year after year, these activities should be established as an important part of our Annual Meeting. The challenge will be to make them increasingly attractive to the general public, but especially to younger audiences. We must be able to change the existing narrative that portrays nuclear energy as bad and dangerous, showing that the reality is quite the opposite.

What relevance do events such as the STEM workshops and mentoring sessions have in achieving this communication goal with society?

DATA

- Attendees (congress participants + accompanying persons): **761.**
- Number of presentations: Oral: **266**, Young: **16**, Poster: **20**.
- Exhibitors: **23**.
- Participation in the sessions: average **40**. Maximum: **63**.
- Sponsoring and collaborating companies: **31**.

M.L.: As I mentioned earlier, both the STEM workshops organized by Young Nuclear Professionals and the mentoring workshop organized by WiN are targeted at a very young audience. This is fundamental for ensuring that the message we want to convey is effective in the short and medium term.

Some of these initiatives also have a technological component for congress attendees, such as the Nuclear Technology workshop or the young professionals' networking session. How does the CTRA evaluate these activities?

L.F.D.: After analyzing the results, we highly value these formats, which we have promoted to offer a more dynamic, participatory, and technology-driven technical program. In the past decade, technologies such as virtual reality, augmented reality, machine learning, and artificial intelligence have changed the rules of the game, and the sector is investing heavily in them. These activities are key to maintaining attendees' interest and providing real value. However, we must not settle. Although we have consolidated certain formats, continuous innovation is essential to keep companies and participants engaged each year.

Do these initiatives help introduce young professionals to the sector?

L.F.D.: We believe they do. Throughout my experience, I have met many young people who are unfamiliar with the sector or do not know how to access it. Additionally, over the past three years, we have seen significant workforce movement, and many companies are actively searching for young talent. Our young professionals' session aims precisely to connect companies with interested young people—not as a job fair, but as a space for conversations and, why not, potential career "matches." The feedback has been very positive. This format, along with the reduced registration fee for students, helps integrate new generations into the nuclear sector.

THE SUPPORT OF COMPANIES

The commercial exhibition at the 50th Annual Meeting is one of the main networking points for companies and professionals. How have companies responded in this edition?

M.L.: As in previous editions, very well. Despite not having the presence of some regular companies, we managed to attract others that had either not participated for a long time or were joining for the first time, such as ENRESA and KOTRA.

What do you highlight about the support of sponsoring and collaborating companies and entities?

M.L.: Their commitment—commitment to the Annual Meeting and, consequently, to the Spanish Nuclear Society. It is vitally important that companies in the sector continue to support and contribute to organizing the Annual Meeting. The majority of congress attendees belong to or work for these companies, so without them, we would lose attendees and, therefore, the meeting itself.

COMMUNICATION

The Annual Meeting activities have an increasing presence in the host society. What aspects stand out in terms of the communication efforts carried out during the Meeting?

M.L.: Among the communication actions, I would undoubtedly highlight the "Save Almaraz" campaign. It was present throughout the congress in various and numerous formats, such as the witty and clever short phrases we printed on posters inside the venue. I remember one in particular: "Defending Almaraz is a task for ecologists and pro-nuclear advocates alike—redundancy intended." It was a complete success.

What was the response from the media?

M.L.: Overall, I would say it was good, both in terms of the headlines obtained and external impact. There are always areas for improvement, but the work done this year by the Communication Commission has been commendable.

A SOCIAL GATHERING POINT

Beyond its high-level technical content, the annual meetings also serve as a gathering place for professionals in the sector, particularly through the social program. Córdoba was a perfect setting for these activities. What is your assessment of the social program?

M.L.: If we consider both the results of the satisfaction survey conducted a few days after the Meeting and the feedback received from attendees, the overall social program was very well received. An important aspect I would like to highlight is that during neither the Official Dinner on Thursday nor the cocktail receptions from Wednesday to Friday did anyone report illness due to allergies or intolerances. This indicates that beyond the program being enjoyable, the organization in this regard was flawless.

What about the activities organized for accompanying guests?

M.L.: I understand that these activities were a great success, which is not surprising given that they took place in a UNESCO World Heritage city like Córdoba. That undoubtedly makes everything easier.

A TEAMWORK EFFORT

The figures from the 50th RA are significant. More than 700 people have gathered in Córdoba. Leading the organization of an event of this magnitude, where over 300 technical papers have been presented, is no easy task. How has the work of the Organizing and Technical Committees developed?

M.L.: This year, CORA has been something special since both its president and some of its members were participating for the first time. The mix between the eagerness and freshness of the newcomers and the experience of the veterans has worked perfectly. And if we add to this the great work and expertise of the Technical Committee, the ingredients were already on the table—the only thing missing was good coordination between both presidents to ensure the final result pleased everyone or, at least, most of the congress attendees. This coordination has worked perfectly. From the very first conversation with Luis Felipe, the president of CTRA, we sensed the good rapport that we have demonstrated throughout the year.

L.F.D.: From the Technical Committee, our goal has been to innovate in the technical program and make participation in the organization more appealing. Organizing over 300 presentations, structuring special sessions, and creating formats from scratch—aligning speakers, moderators, and logistics—is a complex challenge, but one we took on with enthusiasm. To make this task more engaging and enjoyable, we started to "step outside" by organizing technical visits, which have undoubtedly helped improve the organizational experience. I take this opportunity to thank Enresa and the Cofrentes Nuclear Power Plant for the warm welcome we received. A motivated, capable, practical, and creative team has driven the technical program of the 50th Annual Meeting. The results are also due to the excellent communication and continuous coordination with Manuel and the members of CORA and CTRA. The agility to manage resources, set priorities, and handle uncertain scenarios has been key. Trust and teamwork are, without a doubt, the driving force of this edition.

How has the relationship with the Board of Directors been?

M.L.: From what I have observed, just like in previous years, it has been very smooth. I believe that over the course of so many editions of the SNE Annual Meeting, the Board of Directors is aware of the good work of CORA, CTRA, and the Commissions in organizing the event. Therefore, they leave it entirely in our hands, only stepping in for exceptional cases that require significant changes.

L.F.D.: From my point of view, the relationship with the Board of Directors has been very efficient, full of support, and has added great value, especially to the technical program of the Meeting. The board members always have good advice and help us mediate with the necessary contacts to carry out our work. This work by the Board of Directors is invisible to the congress attendees but constitutes another fundamental pillar. Particularly relevant has been the role of the Secretary-General, Julio Blanco, who has greatly facilitated the organizational work and supported us in all major decisions.

CÁCERES FOR THE 51st ANNUAL MEETING

According to the results of the survey conducted among attendees, a vast majority of congress participants rated the 50th Annual Meeting as good or very good. The bar has been set high, but there are always improvements to be made. What are the most important lessons learned that should be passed on to the Committees of 2025?

M.L.: I would highlight one strength and one area for improvement, as these have been the most frequently mentioned since the conclusion of the 50th Annual Meeting. The strength is the SNE stand for the 50th Anniversary. Everything—from its location to its design and the work of each committee involved—was excellent. This should definitely be taken into account for the next edition and, if possible, further improved.

As for an area for improvement, the closing session is a sensitive topic, but more and more voices are calling for an enhancement in its format.

L.F.D.: In terms of lessons learned, we have taken note of the feedback from the speakers, and we will strive to improve certain aspects they have suggested. However, it is important to be aware of the inherent limitations of each conference venue, particularly regarding technical rooms. From the Technical Committee, we will make an effort to continue improving the format of the Nuclear Technology workshop, document management, and ensuring that the best resources are available to congress participants for conducting technical sessions.■

endesa 80 AÑOS

Making history together.

In 1944, we took our first steps by your side.
Now we support a just energy transition and supply power to more than 10 million homes.

80 years creating the future by your side.

endesa.com

Social Events

CÓCTEL

Sponsored by: Westinghouse

CULTURAL EVENT

Sponsored by: EAG EMPRESARIOS AGRUPADOS · GHESA, enusa, Westinghouse

The Royal Stables of Cordoba were the cultural event of this year, the poet and playwright Federico García Lorca from Granada called them the “cathedral of horses”.

RINGO VALVULAS

SAMSON

Líderes en la fabricación de **válvulas** para **Centrales Nucleares**

Cultura Nuclear

Ingeniería

Fiabilidad

Innovación

Experiencia

RINGO VALVULAS **en el mundo**

Europa

Beznau, Suiza
Ringhals I, II, III, IV, Suecia
OKG I, II, III / Forsmark I, II, III Suecia
DOEL, Thiange, Bélgica
Loviisa, Olkiluoto, Finlandia
Mochovce, Eslovaquia
Beloyarskaya, Leningrad, Novovoronezh Rusia
Baltic,Kalininskaya,Kolsk, Kursk Rusia
Belarus, Bielorusia

Wylfa, Gran Bretaña
Kozloduy, Bulgaria
Cernavoda, Rumanía
Krsko, Eslovenia
Trillo, España
Almaraz I & II, España
Vandellos II, Asco I & II, España
Zorita, Garoña, Cofrentes, España

América

Watts Bar Nuclear, USA
Pickering, Darlington, Canada
CFE Laguna Verde I & II, México
Atucha, Argentina
Embalse, Argentina
Angra I, Brasil

Asia

Qinshan I & II, China
Tianwan, China
Kaiga, India
Kakrapar, India
Kudankulan, India

África

Koeberg, Sudáfrica

En Ringo Válvulas somos especialistas en diseñar válvulas para aplicaciones críticas y aportar soluciones de ingeniería a problemas muy específicos.

_Driving Energy

www.ringospain.com

Polígono Industrial Empresarium - C/ Romero 6 - 50720, Zaragoza

Social Events

COCKTAIL AND OFFICIAL DINNER

Cocktail sponsored by: coapsa

The official dinner of the 50th Annual Meeting was held at "Torre de la Barca" and was preceded by a cocktail, sponsored by Coapsa. The Official Dinner is the most important social event of the SNE Annual Meeting, where congress participants and companions enjoyed the gastronomic excellence of Cordoba.

Social

Social

Social

Social

ANNUAL SNE AWARDS

The gala dinner of the 50th Annual Meeting of the Spanish Nuclear Society (SNE) was, once again, a night full of emotions and recognition. This event marked a key moment in the meeting, paying tribute to those who have made outstanding contributions to the field of nuclear energy in Spain. The presentation of the SNE Annual Awards highlighted the excellence, commitment and innovation of professionals and entities linked to the sector. These awards recognize both individual talent and collective work in different areas.

Carlos Sánchez del Río Award

With this award the Society wants to recognize the work of internationally recognized personalities of the nuclear world with an unquestionable technical contribution, scientific merit or work in favor of the peaceful use of nuclear energy. This year the Board of Directors of the SNE has agreed that the award will be presented to **BERTA PICAMAL**

Honorable Mention SNE

It recognizes the personal dedication to the Spanish Nuclear Society to people who have been part of its government or commissions and have contributed in this way to achieve the objectives of our Society. This year 2024, it has been agreed to award the Mention of Honor to **ENRIQUE GONZÁLEZ. Susana Falcón receives the award on his behalf.**

SNE Diploma

It rewards a personal work continued in favor of the Spanish Nuclear Society, forming part of the commissions or the general operation of the same. This year's Diploma, by agreement of the Board of Directors of the SNE, is awarded to **FRANCISCO SÁNCHEZ**

José María Otero Navascués Award

Distinction that recognizes a communication work in the nuclear field, or a special dissemination of the peaceful use of nuclear energy in the media. The Board of Directors of the SNE has decided that this award will be given to the **VOLUNTARIOS DE MADRID ES CIENCIA**. **LAURA ORTEGA receives the award on behalf of all of them.**

SNE Medal

The SNE Medal is a distinction that recognizes a continuous and extraordinary work in favor of our Society and the development of nuclear energy. This year 2024 the Board of Directors of the Spanish Nuclear Society has agreed to give this award to two beloved former presidents:

LUCILA IZQUIERDO ROCHA.
President in 2001-2002

LUIS YAGÜE DE ÁLVARO.
President in 2007-2008

WiN Spain Award to LOLA PATIÑO, for its work in the dissemination of nuclear energy and its continuous support to WiN Spain's initiatives.

Juan Alberto González Garrido" Nuclear Youth Award, to EVA MARÍA CELMA for the support to the PROCAT team of the Nuclear Youth in Cataluña.

CÓCTEL Sponsored by: GE VERNOVA

PHOTO COMPETITION

BEST PHOTOGRAPHS GENERAL CATEGORY

First Award:
SENTADA EN UN BANCO DE NYBODER
Manuel Muñoz García

Second Award:
WALKING
Jaime Andrés Sante

Third Award:
ATARDECER EN MONT SAINT MICHEL
Carlos Martínez Martínez

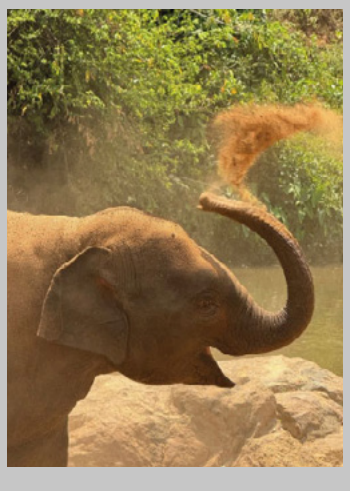
BEST PHOTOGRAPHS ENERGY CATEGORY

First Award:
BLANCO Y ROJO - *Iván Sánchez Hernández*

Second Award:
SPRING PERFUME- *Josep Miquel Biarnés Sanz*

Third Award:
RECARGANDO COMBUSTIBLE
Montserrat Fernández de la Casa

BEST PHOTOGRAPHS POPULAR JURY



First Award:
BAÑO DE ARENA
Mario Gómez Villa

Second Award:
INTERCEPCIONES
Francisco Javier Hernáez Delgado

Third Award:
NOSTALGIA DEL AYER
Eva María Celma González-Nicolás

In Cofrentes,
our ongoing expectation is to further improve what we are doing well

centrales nucleares no emiten CO_2

COFRENTES
NUCLEAR POWER PLANT

Safe, reliable and efficient

IBERDROLA
Generación Nuclear

www.cncofrentes.es

Complemento

SPACE #NUCLEAR

The 50th Annual Meeting was a moment to celebrate the 50th Anniversary. The SNE stand, under the name #NUCLEARES, was the meeting point for the congress participants, where the different Commissions of the Society promoted initiatives to disseminate their activities, having as a background the timeline that runs through the history of the Society.

In this space took place the presentation of the children's story “Alara and the light factory”, edited to make the youngest reach the role played by nuclear power plants in a world that we wish clean.

For its part, the Editorial Committee of the Magazine organized an interactive game, in which the participants recalled personal moments linked to the history of the SNE and of the magazine itself. ■

Likewise, WiN Spain showed its STEM models and promoted the development of soft skills, while the Communication Commission and Nuclear Youth reinforced the campaign #SalvemosAlmaraz, handing out badges and T-shirts in support of the continuity of the nuclear power plant. ■

The Programs Commission, with a quiz game; the Terminology Commission, with a poster on its history and the importance of the SNE Dictionary, and the Employment and Professional Development Commission were also present in this area of the Society. ■

RESTAURATION

Within the framework of the 50RA of Cordoba, the SNE has sponsored the restoration of two paintings of the church of San Francisco de Córdoba, an action that has the sponsorship of Endesa and IDOM.

Agustín del Castillo, and "El milagro de la Porciúncula", a work of 1650 by D. Antonio del Castillo, son of the former, precursor and greatest exponent of the Cordovan school of painting.

During the meeting, the president handed the book commemorating the 50th anniversary of the Society to the parish priest. ■

Present at the signing of the agreement were the president of the SNE, Emilio Mínguez; the nuclear director of Endesa, Gonzalo Carbó; the director of Idom, Óscar Larosa, and the parish priest, Joaquin Alberto Nieva.

Complementary Activities

WORKSHOP **NUCLEAR TECHNOLOGY**

Workshop organized by Jóvenes Nucleares where leading companies of the nuclear sector allowed to see and touch the latest technologies.

Coordinated by Pau Aragonés (ENUSA and JJNN/CTRA) and Laura Martín Huete (IDOM and JJNN).

Workshop organized by Jóvenes Nucleares where leading companies At the workshop "Nuclear Technology," which took place during the 50th Annual Meeting of the Spanish Nuclear Society (SNE), several of the main companies of the nuclear industry presented their most recent products and innovations. Among the participating companies were **ENSA, Framatome, Boost4Pro, Westinghouse and Empresarios Agrupados**, all of them leaders in different areas of nuclear technology and known for their contributions to the industry.The event stood out for its interactive format, allowing the attendees not only to observe, but also to have the opportunity of touching and testing the exhibited products. This hands-on experience was key for attendees to better understand the capabilities of each technology and evaluate their potential application in real working environments. The workshop focused on showcasing advances that contribute to improving safety, efficiency and sustainability in nuclear energy, addressing current issues of great relevance to the industry. Representatives from each company provided live demonstrations and explained the features of their products in a manner accessible to participants. Through this direct interaction, attendees were able to gain a comprehensive view of how the latest technologies can optimize processes, increase operational reliability and minimize the risks associated with nuclear power production. This hands-on approach resulted in a dynamic exchange of knowledge and experience, generating a collaborative environment in which current challenges and opportunities in the nuclear sector were addressed.

The **"Nuclear Technology"** workshop provided an enriching space for learning and networking among industry professionals and experts.

It was an event that reflected the commitment of the Spanish Nuclear Society and participating companies to drive innovation and adapt to the demands of an ever-changing world. With a focus on sustainability and efficiency, the workshop highlighted how nuclear technology continues to advance to meet the highest safety standards and contribute to sustainable energy development. ■

Soluciones de software, servicios y productos tecnológicos

¡Más de 30 años de experiencia y tecnología en el sector Nuclear!

Compromiso, profesionalidad, excelencia, garantía y visión de futuro.

¡Conócenos!

Visita nuestra web:

https://www.cic.es/productos-grupo-cic/

- Monitorización
- Ciberseguridad
- Movilidad
- Desarrollos a medida

Gestión

- Gestión documental, firma digital, portal del empleado, integración de sistemas, automatización de procesos e informes, Business Intelligence, control de presencia, aprovisionamientos, efluentes...
- O/M: MISI, regla de mantenimiento, programa de acciones correctoras, requisitos de vigilancia...

Procesos

Integra, procesa y analiza datos.
Seguridad documental con transparencia y garantía.
Gestión, visibilidad y control de tus procesos de negocio.

Miembros del Cluster de la Industria Nuclear Cantabria (CINC).

Certificados para garantizar la seguridad e integridad de nuestros desarrollos.

CIC Consulting Informático +34 942 269 017 marketing@cic.es PCTCAN, Isabel Torres 3, **Santander** Orense 68 Planta 6, **Madrid** Melquíades Álvarez 26, Planta 1A, **Oviedo**

Opening session

MANUEL LEAL
PRESIDENT OF THE ORGANIZING COMMITTEE

"Up to 300 presentations distributed across seven technical sessions, more than 700 congress attendees, 23 stands, about thirty collaborating companies. There are many figures, but only one word: thank you." This is how the president of the Organizing Committee of the 50th Annual Meeting of the Spanish Nuclear Society began his speech.

Manuel Leal

"Thank you to everyone who has made it possible for us to be gathered today for this 50th edition of the Annual Meeting of the Spanish Nuclear Society (SNE). To my colleagues from the Technical and Organizing Committees, the communication and 50th Anniversary commissions, JJNN and WiN, from the bottom of my heart, thank you. With your effort and dedication, you have made this important event for all of us a reality. Thanks to all the companies that have collaborated over the years, the members, the cities that have hosted us, the sponsors. Let us continue moving forward together along the historical path of the Spanish Nuclear Society. Allow me to extend this gratitude to my company, Endesa, the host of this meeting, and to the Spanish Nuclear Society itself for trusting me to preside over the organization of this edition. And thanks to the city of Córdoba. The annual meetings take place with the support of the cities that host us. The involvement of the city and its university allows us to leave not only an economic legacy but also an important informative and cultural one."

Almost at the moment of the inauguration of this 50th edition, Leal wanted to emphasize that "it is time to learn, to get to know, to exchange, to experiment, to debate, to chat, to work, and, of course, to enjoy... Because that is also what this Annual Meeting is about, making these days pleasant and unforgettable moments in every sense, both professionally and personally. Let us begin now, and let us start capturing the first images in our memory."

RAFAEL SÁNCHEZ
GENERAL DIRECTOR OF ENDESA IN ANDALUSIA, EXTREMADURA, CEUTA, AND MELILLA

The General Director of Endesa in Andalusia, Extremadura, Ceuta, and Melilla, Rafael Sánchez,

Rafael Sánchez

began his speech by expressing his satisfaction at being one of those welcoming this important Congress, highlighting the city of Córdoba as an "unparalleled setting for the inspirational stage our sector needs" and linking it, at the same time, to the future of the energy transition.

Sánchez stated that "it is time to reindustrialize Europe. The global scenario is changing. Countries such as the United States, France, Sweden, or Belgium have extended the operational life of their plants, in some cases beyond 60 years, even doubling the lifespan of Spanish plants. This commitment is crucial in a context where renewable energies will undoubtedly replace fossil fuels, although they have not yet reached their maximum technological development. Worldwide, we are witnessing a push as new plants under construction continue to emerge, reinforcing how this technology must be part of that decarbonized future."

As Sánchez emphasized, "nuclear energy is clean, emission-free, and an essential component for achieving global climate goals. It not only ensures a constant electricity supply but also stabilizes prices."

Furthermore, he added, "we need, through the cooperation of all of you here, with your talent, for the planet to triple nuclear production by 2050 because it can and must, so that we can safely accompany this transition." In summary, "nuclear energy is more alive than ever to achieve climate neutrality, with our commitment to continue advancing in innovation, safety, and sustainability."

Finally, he did not miss the opportunity to congratulate the Spanish Nuclear Society on its 50th anniversary, an important milestone in the life of organizations. "Fifty is the new thirty," he quipped, before thanking the attendees and wishing the congress participants a conference full of "camaraderie, learning, and collaboration."

MANUEL TORRALBO
RECTOR OF THE UNIVERSITY OF CÓRDOBA

At the inaugural event, the rector of the University of Córdoba, Manuel Torralbo, also spoke, beginning his welcome by congratulating the Spanish Nuclear Society on its 50th anniversary and thanking them for involving the University of Córdoba in jointly organizing various activities in favor of education and youth training. "Celebrating 50 meetings says a lot about the persistence, intensity of work, and the interest in everything discussed in these meetings."

Using an analogy between the debate on nuclear energy and the rivalry between football teams—"one must be for one or the other"—Torralbo stated that "this is not the right approach to a problem as complex as energy, as well as a country's energy sustainability. We are all aware of the need to reduce greenhouse gas emissions, and nuclear energy achieves this, offering high energy efficiency. Nuclear plants operate 24 hours a day, seven days a week, throughout the year, except for necessary technical shutdowns. Nuclear energy also contributes to a territory's energy independence, which is undoubtedly very important. As we all know, it does not rely on fossil fuels. And, without a doubt, it also contributes to the economy, employment, and technological innovation."

Manuel Torralbo

Furthermore, the rector of the University of Córdoba highlighted that "the society to which you belong, bringing together the sectors in which you work and sharing their opinions, along with scientific collaboration for training people, is the way forward. Knowledge must contribute to providing us with security. Both science and scientific societies have the right to express their opinions and submit their reports to those responsible for decision-making."

Returning to the football analogy and referring to the complexity of the nuclear energy debate, Torralbo concluded his speech by stating that one can be a Barcelona supporter without being anti-Madrid, just as one can support nuclear energy without being anti-nuclear. "Let us be a little more open-minded, let us be capable of seeing what is in the best interest of a country," he concluded.

EMILIO MÍNGUEZ
PRESIDENT OF THE SPANISH NUCLEAR SOCIETY

"Dear local and academic authorities, sector companies, dear congress participants, welcome to the fiftieth Annual Meeting of the Spanish Nuclear Society.

Emilio Mínguez

On behalf of the Board of Directors, I want to thank the organizing and technical committees, the sponsors, exhibitors, speakers, all congress participants, and the SNE commissions: WIN, JJNN, and the 50th Anniversary working group, for their work in bringing together nuclear sector professionals once again in this magnificent city. We return to Córdoba, where we already held the Twentieth Annual Meeting in 1994, and surely, some of you still remember it.

Thanks to the City Council, the university, and all local and regional institutions that have provided all the necessary support to the Organizing Committee during the preparation period. And of course, thanks to our host company, ENDESA.

We are experiencing a historic moment that should be a source of pride and motivation for all of us, for Spanish nuclear professionals, but instead, we find ourselves facing a scheduled shutdown. We have been left completely alone on this path. We are the only country in the European Union and the world that, despite having operational nuclear power plants, insists on closing them. We are heading in the opposite direction of everyone else, and that is why we demand an urgent change in Spain's energy policy. We want the nuclear power plants in our country to continue operating for many more years.

To demand, ask, and desire are verbs that must be substantiated, but there are many arguments for this, and I will share just a few recent developments that support this urgent demand and highlight the importance of this moment:
One of the key proposals of the Draghi Report: The Future of European Competitiveness, recently published, is to develop and maintain the nuclear capacity of countries. This is one of the 22 key measures to reduce energy costs, ensure supply sustainability, and accelerate decarbonization.

Nuclear power plants have already positioned themselves as a strategic resource for large consumers, such as data centers. Just a few weeks ago, Microsoft announced an agreement to resume operations at Unit 1 of the Three Mile Island nuclear plant. This aims to meet the company's growing energy demand while keeping its carbon emissions low.

Another important message comes from global banking: fourteen of the world's largest financial companies recently announced their intention to expand support for nuclear projects being developed worldwide. This is a result of the agreement signed by 33 countries at COP28 in Dubai to triple nuclear capacity as a necessary measure to achieve decarbonization.

Just a few days ago, the new French Prime Minister, Michel Barnier, reaffirmed in his speech at the National Assembly in Paris the country's commitment to nuclear energy by planning the construction of new reactors. Countries like the Netherlands, Switzerland, Italy, and Belgium have changed their stance and now support the continuity of their plants or the launch of new projects.

This is what we see happening outside Spain, in energy strategy discussions worldwide. We see nuclear energy in every future plan—except in Spain's. We have become an outlier where technical expertise is disregarded, and we continue rushing headlong in the opposite direction toward nuclear plant closures.

As I said at the beginning, and I want to emphasize again: Spain is completely alone in its nuclear plant closure policy. Look outside, let us abandon this absurd race toward shutting down our plants. The facilities and professionals are more than prepared and capable. Stop putting obstacles in our way, and we will do what we have been proving we know how to do for decades: operate our nuclear plants safely and efficiently.

José María Bellido

The general public, citizens, are concerned about climate issues, energy costs, and the future we are leaving for the next generations. That is why I urge those responsible to reflect from a technical, not political, perspective on what our energy policy should be. The younger generations—many of whom are here today—deserve that future. We want Spain to have a nuclear future. We want the energy from Almaraz I and II, Ascó I and II, Cofrentes, Vandellós II, and Trillo to continue being our energy and that of our children because it is clean, safe, reliable, and competitive.

We have 50 years of history, and we are very proud not only of our present but also of our past. We remember those who started building and operating the plants, those who followed in their footsteps, and those who believe in the future of this sector.

If we shut down the seven remaining nuclear reactors in Spain, we will lose a lot: a green, sustainable, and affordable energy source, high technological knowledge, the development of our own technology, an industry that contributes to the GDP and has international projection, quality jobs, and in exchange, we will leave a void that will be difficult to recover.

For all these reasons, I want to send a message to our policymakers on behalf of all professionals in the sector: we are here to help; we are not the problem. We are part of the solution. In fact, without us, there will be no solution.

We are very proud of the path we have taken, and let's gain momentum for the road ahead. Let's not be defeated. Thank you very much."

JOSÉ MARÍA BELLIDO
MAYOR OF CÓRDOBA

José María Bellido, mayor of Córdoba, began his speech by thanking the president of the SNE, Emilio Mínguez, for his well-received speech and congratulating the president of the Organizing Committee, Manuel Leal, on the celebration of the 50th Annual Meeting. His congratulations extended to the rector of the University of Córdoba, Manuel Torralbo, the general director of Endesa in Andalusia, Extremadura, Ceuta, and Melilla, Rafael Sánchez, and everyone involved in organizing the Annual Meeting.

The mayor of Córdoba emphasized that "you have come at the right time and to the right place. It is evident that the situation of our energy sources, the energy model we want for the future, is on the table in Spanish society as a whole." He then posed the main questions to be addressed throughout the different sessions: What energy sources will we use? and What is their relationship with sustainability, climate change, energy poverty, and our economic development?

Referring to the previous speeches at the opening of the Annual Meeting, Bellido warned that "decisions cannot be made solely for political or ideological reasons, especially on a matter as serious as the one you are analyzing here. We all have too much at stake. We are talking about the economic future of our society. We want a cleaner, safer society. That is why I hope and wish that this Annual Meeting, the work of your society, and the outreach you conduct throughout the year, will be fruitful in the coming days."

Furthermore, he stressed that everything analyzed "should not be just words lost in the desert; it should be heard, acknowledged, and lead to meaningful debates and conclusions. Your mission is to help Spanish society, ensuring that decision-making, which ultimately falls on political leaders, is based on knowledge, science, experience, and what international organizations are saying—not on prejudices or ideas that are completely disconnected from the real needs of Spanish society."

Finally, the mayor of Córdoba expressed his gratitude for the outreach work carried out by the SNE, "especially for the involvement this Congress has also had with Córdoba's society. If we want things to improve in the future, it is essential to start with education, training, and dissemination," he remarked, before once again congratulating and thanking all those involved in this 50th Annual Meeting. ■

Inaugural Conference

50 YEARS OF ANNUAL MEETINGS (1975-2024)

Miguel Barreiro Bugallo was involved in organizing six Annual Meetings (AMs), serving as Chairman of the Organizing Committee for the 46th AM in Granada and Treasurer for the 47th AM in Cartagena, 48th AM in Toledo, and 50th AM in Córdoba.

Teresa Jiménez is an internationally recognized guitar figure with great prestige in the world of flamenco.

For this 50th edition of the Annual Meeting, the organization planned an Opening Conference that would showcase how the congress has evolved and highlight the most significant events of the past five decades. It was deemed appropriate that this year, the connection with the host city and its cultural and historical ties would be made through music and the art of Teresa Jiménez.

Miguel Barreiro Bugallo structured his presentation around six elements that best define the Annual Meeting, starting with a brief review of the Social Events that each year represent the most festive side of the congress. A video was projected showing images of visits to cathedrals, choral concerts, visits to Roman ruins, golf matches, dramatized urban routes, equestrian shows, and fireworks displays. This video also served as a well-deserved tribute to the 45 Chairmen of the Organizing Committee and the 22 Chairmen of the Technical Committee, as well as an acknowledgment extended to the more than 900 members who have been part of both Committees over the 50 years. This projection was accompanied by Teresa's art, who captivated the congress attendees from the very first chord.

Miguel Barreiro Bugallo and Teresa Jiménez, protagonists of the Inaugural Conference.

The next highlight of this Opening Conference was the cities that have hosted the 50 editions of the congress. This ongoing journey began in Madrid, where six of the first seven AMs were held, with a departure to Barcelona for the fifth edition. From there, the congress embarked on a route throughout the Iberian Peninsula, with Santander being the first stop at the 8th AM. Since then, another twenty-nine cities have hosted the Annual Meeting, a journey summarized in the 27,083 km traveled between different venues.

As interesting facts, ten cities (Seville, Córdoba, Granada, Salamanca, A Coruña, Tarragona, Reus, Valencia, Alicante, and Cáceres) have been selected twice as host cities, while Santander is the only city to have hosted three AM editions. Only three regions have never hosted an AM (the Basque Country, Navarra, and the Canary Islands). The only time an AM was held outside the Peninsula was in Mallorca during the 17th AM in 1991.

Following this review of host cities, a second video was projected to show

the evolution of the AM's image. In the early editions, there was neither a logo nor a brand image for the congress, which was an area that improved significantly over time. From the initial scarce graphic resources allocated to this task, the design gradually evolved to incorporate more modern elements adapted to the regions and cities where each AM was held. The aim was to create a visual nod to the hosting region through the AM logo, as evidenced in the review from the first logo at the 9th AM in Seville in 1983 to the 36th AM in Santiago de Compostela. During those twenty-seven editions, the logos primarily featured images of the main historical monuments of the host cities, complemented by additional elements such as color, typography, or other recognizable regional symbols.

This approach to designing the Annual Meeting logo remained unchanged until the early 2000s when the focus shifted to highlighting the name of the host cities as the main design element. In recent years, a standardized logo has been proposed for all AMs to strengthen the congress's identity, a decision that remains in place for future editions.

Ángel Pascual (right) and José María Ryan (left).

The central theme of the conference revolved around the configuration of the Technical Program of the Annual Meetings. Miguel Barreiro emphasized the pattern that has been repeated since the inception of the congress, highlighting the SNE's ability to react and identify current issues to incorporate them into Plenaries, Monographic Sessions, or Workshops. In this way, congress attendees have spent five decades listening to experts discuss the latest developments in the national and international nuclear sector.

With this concept in mind, the presentation reviewed the most significant events of the 50 years of the Annual Meeting, beginning with a description of the favorable situation for nuclear energy during the 1950s and 60s, which led to the construction and operation of Spain's first nuclear power plants. This was made possible through various National Energy Plans that strongly promoted the development of a Spanish nuclear sector. These ideas were reflected in the programs of the first annual meetings until the revision of the 1983 National Energy Plan, which halted the Lemóniz I and II, Valdecaballeros I and II, and Trillo II projects in the well-known "Nuclear Shutdown."

One of the most emotional moments in the history of the Annual Meetings occurred at the 8th AM in Santander in 1982, when the Society decided

Teresa Jiménez during the screening of the video of the evolution of the RA image.

Secuencia del incidente

21h 39m 28s	Grupo 2. Vibraciones superiores a 180 μ.
21h 39m 28s	Grupo 2. Válvulas de parada no abiertas.
21h 39m 28s	Grupo 2. Excitación fuera de servicio.
21h 39m 28s	Grupo 2. Solicitado el disparo por defecto.
21h 39m 28s	Grupo 2. Osciloperturbógrafo en servicio.
21h 39m 28s	Grupo 2. Válvulas de parada cerradas.
21h 39m 29s	Válvula de seguridad (venteo) abierta.
21h 39m 29s	Grupo 2. Falta presión de aceite de engrase.
21h 39m 29s	Reactor. Bajada rápida de potencia en servicio.
21h 39m 32s	Grupo 1. Bajada rápida de potencia en servicio.
21h 40m 01s	Reactor. Relé de seguridad desexcitado (caída de barras).
21h 46m 47s	TS 4. Válvula auxiliar de parada no abierta.
21h 49m 39s	TS 3. Válvula auxiliar de parada no abierta.

Sequence of the CN Vandellós I incident that took place on 19/10/1989.

Social Event of the 46th RA of Granada in La Chumbera.

to award the Society Medal to Ángel Pascual, the director of the Lemóniz project, who had recently been assassinated by ETA, just months after his colleague and friend José María Ryan suffered the same fate. The SNE had another opportunity to show its support and solidarity with their families at the 34th AM in Murcia twenty-six years later, where their widows and children were once again present. One of the most touching acknowledgments in the history of the Annual Meetings took place there, when Íñigo, Ángel Pascual's son, recalled the moment his father showed him the threatening letters from the terrorist group and his firm response—refusing to give up what had cost him so much effort to achieve and standing by what he firmly believed in.

The Chernobyl accident was also given due attention in a panel discussion led by Agustín Alonso at the 12th AM in Salamanca, where other examples of industrial accidents (Titanic, Challenger, or Hindenburg) were discussed, showing how they did not mean the end of those sectors but instead strengthened weak points and served as learning opportunities for the future. The 14th AM in Marbella marked a historic moment for the Spanish nuclear sector, as it saw the commercial operation of the Trillo I and Vandellós II units, bringing the number of operating nuclear plants in Spain to ten. However, the sector was still pushing strongly to complete the Valdecaballeros project due to its significant progress at the time.

When the 1990s were just around the corner, the Vandellós I nuclear plant incident occurred on October 19, 1989. Just four days later, the SNE held its 15th AM in Alicante, and from the outset, it was evident that congress attendees' thoughts were with their colleagues at the plant. There were multiple expressions of support and solidarity. Yet again, rather than ignoring the situation, the SNE organized a special intervention by the Vandellós I deputy director, who provided a detailed breakdown of the fire's progression and the systems most affected, including a second-by-second sequence of the incident.

Other significant events mentioned in the conference included the impact of the Fukushima accident on the nuclear sector, addressed in the 37th AM in Burgos, and the COVID-19 pandemic, which led the SNE to adapt to a vir-

SOCIEDAD NUCLEAR ESPAÑOLA
REUNIÓN VIRTUAL - 2020

2020 Virtual Meeting logo.

Teresa Jiménez in her speech closing the Inaugural Conference.

Moment of the Inaugural Conference dedicated to the Trade Show.

tual meeting format in 2020. Despite the challenges, the 2021 congress returned to an in-person format, restoring all the activities that had been missed the previous year.

The last key element of the Annual Meetings mentioned was the Commercial Exhibition. This highly valued space for companies and attendees has evolved significantly since the first exhibition at the 11th AM in Barcelona in 1985. Initially featuring 13 companies, participation grew in subsequent editions, peaking at 41 exhibitors at the 21st AM in Tarragona in 1995. Notably, only one company has participated in every Commercial Exhibition since 1985, earning well-deserved recognition: Empresarios Agrupados.

As a closing remark, the conference presented key figures from the five decades of Annual Meetings, showcasing the immense efforts of countless professionals who dedicated time to successfully organizing this congress and passing its values on to new generations in the nuclear sector.

Finally, after Miguel Barreiro's presentation, Teresa Jiménez took over, captivating the congress attendees with three pieces from her repertoire, demonstrating her innate talent on the guitar. ■

Monographic Session

EL CABRIL: CHALLENGES OF YESTERDAY, TODAY AND TOMORROW

The venue of the annual meeting required a deeper understanding of the medium- and low-level waste storage facility that Enresa operates at El Cabril.

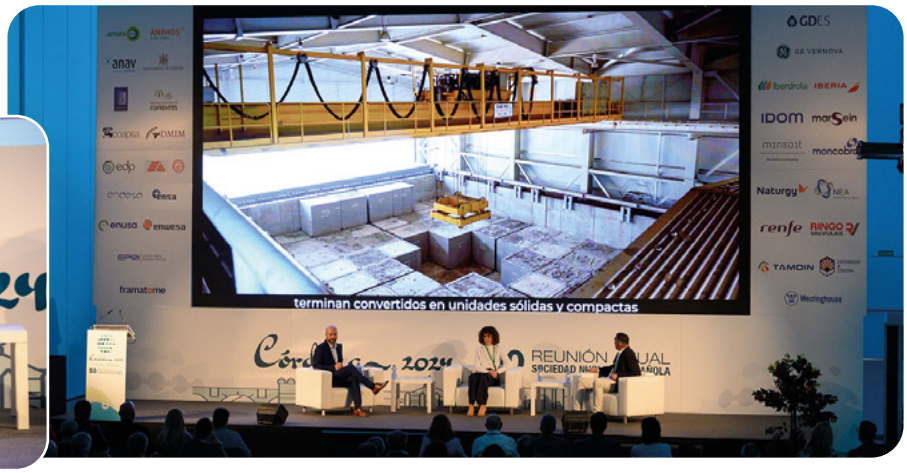
To this end, we were joined by Víctor Manuel Rivas, deputy director of the facility, and Patricia María Gallego, head of Enresa's waste engineering department. Both provided us with a comprehensive review of the facility's history, its present state, and the future challenges already underway at the site.

With Álvaro Rojo, from Enresa's communications department, acting as session moderator, Víctor Rivas recounted the origins of El Cabril in the Albarrana mountains of Córdoba. Initially a mining site operated by the Junta de Energía Nuclear (JEN) between 1945 and 1961, the mine's galleries were later repurposed into a radioactive waste storage facility until the mid-1980s.

On January 1, 1986, Enresa took over the facility, initiating its modernization. This included constructing new modules and auxiliary facilities, creating a radiation protection service, and establishing a medical service, among other improvements. On October 9, 1992, the facility received provisional operating authorization, and the first radioactive waste was transferred to the storage platforms in April 1993.

As of December 31, 2023, more than 60,000 m³ of radioactive material has been stored, two-thirds of which is medium-low activity waste and one-third low-low activity waste. 90% of this waste comes from nuclear facilities.

The current facility for medium-low waste consists of 28 modules, of which 22 are complete and sealed, 2 are in operation, and the remaining 4



are empty. For low-low activity waste, there are currently 2 cells, both with less than 30% occupancy.

The center has an environmental radiological monitoring system with 126 sampling points for air, water (surface and groundwater), soil, vegetation, food, and fauna. These monitoring efforts confirm that the facility has no radiological impact on its surroundings.

However, El Cabril looks to the future, as evidenced by projects such as the construction of Cell 31, the Southeast Platform with 21 modules, the definitive coverage project, and the technological renewal of treatment, conditioning, and storage systems.

Patricia Gallego took the floor and detailed all these projects, covering geological, radiological, safety, erosion, drainage, instrumentation, and control aspects.

The first project presented was the construction of the Southeast Platform for medium-low activity waste, consisting of 27 cells arranged in three rows, following the same concept as the existing North and South platforms. This project is being carried out in five phases from 2020 to 2028, including terrain characterization, construction of access roads, rainwater drainage networks, fire protection systems, surplus disposal areas, and all the necessary equipment and systems for operation, which is expected to begin in 2028.

Patricia Gallego

Víctor Manuel Rivas

The second expansion project is the construction of Cell 31 for low-low activity waste, following the same concept as Cells 29 and 30, with a storage capacity of 36,000 m³. It follows a similar phased approach, including terrain characterization, construction, and commissioning of equipment and systems, with operations set to start in 2028.

The third major project is the Definitive Coverage, which begins with an R&D pilot coverage project that will generate a thermohydraulic model to control parameters such as temperature, thermal gradient, water content, capillary pressure, and soil erosion.

This thermohydraulic model includes the CARCOB project, which characterizes the physical, hydraulic, thermal, mineralogical, geochemical, and mechanical properties of all coverage materials (soil, gravel, sand, and clay). A scale model will be created to reproduce the behavior of the different coverage layers in terms of infiltration, evaporation, and erosion. Additionally, the VEBIOCA project is being developed to analyze the influence of vegetation on the overall performance of the coverage.

Once the model is defined, the first milestone of the project will be the construction of the coverage for Cell 5.

Additionally, a process has begun to renew and update the technological systems for treatment, conditioning, and storage. This process is based on a study of the existing systems, an analysis of new needs, and prioritization of planned activities. Key initiatives include the technological renovation of the control room and the replacement of PCI equipment, among others.

To conclude the session, a project was presented to optimize stored volume, addressing various aspects such as on-site monitoring of waste generation, volume reduction programs at nuclear power plants, increased decontamination and declassification processes, minimization of secondary waste generation, and the development of new technologies for characterization and declassification.

The session ended with the screening of a video about the facility, broadcast on Canal Sur, followed by a Q&A session attended by a large audience. ■

Plenary Session 1

THE ROLE OF NUCLEAR ENERGY ON THE 2030 HORIZON

The session was held on October 9 at the auditorium of the Córdoba Exhibition, Fair, and Convention Center (CEFC), with a large audience in attendance. It featured the participation of Ramón Roca, Director of *El Periódico de la Energía*, as coordinator, and the following speakers:

- **José Luis Rapún:** Director of Energy Management for Spain and Portugal at Iberdrola
- **Juan Bogas:** Market Monitoring Director, Iberian Energy Market Operator
- **Javier Revuelta:** Senior Principal, AFRY Management Consulting
- **Juan María Moreno:** General Director of Energy and Commodities Management, ENDESA

During the session, the following topics of interest and current relevance in the national energy landscape were discussed, generating an engaging debate among the speakers and strong audience participation through questions.

Integrated National Energy and Climate Plan (PNIEC)

The PNIEC is an ambitious plan aimed at doubling Spain's installed renewable capacity. To achieve this, combined cycle power capacity will be maintained, albeit with a low utilization factor. Additionally, a significant increase in energy storage is expected, reaching 12 GW, along with extensive development of electrolyzers for green hydrogen production. Despite these advancements, the plan maintains the nuclear plant closure protocol as agreed, with nuclear capacity projected at 3 GW by 2030.

Demand and Generation

A downward trend in energy demand was presented, while installed capacity has increased by 20% in recent years. National demand is expected to increase by 32% due to factors such as the adoption of electric vehicles and the implementation of hydrogen electrolyzers. However, it was highlighted that current demand levels are similar to those of 20 years ago, posing challenges for integrating new renewable energy sources.

José Luis Rapún

Price Projections and Energy Mix

Projections indicate that the PNIEC faces significant challenges in meeting its objectives. Electricity consumption is expected to remain flat or slightly decline, with demand increasing towards 2050-2060 due to the electrification of transportation and heating. Additionally, photovoltaic energy growth may slow due to market saturation and low prices during solar

Juan Bogas

hours. On the other hand, wind energy development could be hindered by permitting issues.

Industry Perspective
The industry shares the view that grid development is key to the energy transition. It was mentioned that the baseline scenario of the PNIEC is the nuclear plant closure protocol, though other scenarios involving partial or total maintenance of the nuclear fleet could be considered. The importance of considering the location of nuclear plants and the grid's capacity to support their closure was also emphasized.

Operational Flexibility and Long-Term Shutdowns
The discussion covered the operational flexibility of nuclear plants and the possibility of long-term shutdowns in response to low market prices. The need for a regulatory framework allowing the extension of nuclear plants' lifespan was mentioned, considering necessary investments and current tax burdens. Additionally, the possibility of adjusting refueling periods to align with spring months—expected to experience the most frequent low-price episodes—was proposed.

Debate on the Future of Nuclear Plants
The session concluded with a debate on the future of nuclear plants in Spain. The importance of nuclear energy for supply security and grid stability was highlighted. The need for a clear and stable regulatory framework allowing companies to make informed decisions on the operation and closure of nuclear plants was also emphasized. Finally, it was noted that inflexible nuclear generation could be at odds with renewable energy utilization goals and the energy transition itself.

Questions and Answers
During the debate, questions were raised about whether nuclear plant owners were preparing to enhance the flexibility of their facilities in the remaining years of operation. The feasibility of covering the costs associated with operational flexibility was discussed, with the observation that current flexible operations may not be sufficient in the future. The possibility of long-term shutdowns or adjustments to refueling schedules to address market challenges was suggested.

Ramón Roca

Impact of Low Market Prices
The impact of low market prices on nuclear plant operations was analyzed. It was noted that low prices could lead to shutdown or load reduction decisions, especially during the spring months. The possibility of negative prices becoming more common was also discussed, which could influence nuclear plants' operational strategies.

Extension of Nuclear Plants' Lifespan
A question was raised about whether plant owners actually want to close nuclear plants or if they are working to keep them operational beyond the

Javier Revuelta

agreed schedule. It was mentioned that, technically, plants can extend their lifespan, but under current conditions, this is not economically viable. The need for a regulatory framework allowing investment recovery and the removal of tax burdens was emphasized to consider extending operations.

Final Reflections
The session concluded with reflections on the importance of nuclear energy in Spain's energy mix. It was highlighted that nuclear energy is essential for supply security and grid stability. The necessity of a regulatory framework that enables informed decision-making regarding nuclear plant operation and closure was reiterated. Finally, there was a call to consider the economic impact on consumers and the need for grid investment when making decisions about the future of nuclear energy in Spain. ■

Juan María Moreno

Plenary Session 2

THE GLOBAL DRIVE TOWARDS NUCLEAR ENERGY: PROSPECTS AND IMPLICATIONS

Plenary Session 2 of the 50th Annual Meeting of the Spanish Nuclear Society, titled "The global push for nuclear energy: insights and implications", was held on October 11 at the auditorium of the Córdoba Exhibition, Fair, and Convention Center.

During the session, the European Union's growing commitment to nuclear energy was explored from the perspective of various countries. The reasons for investing in this energy source and how they plan to integrate it into their future energy mix were analyzed.

The historic agreement reached at the recent United Nations Climate Change Conference (COP28) to triple installed nuclear capacity by 2050 was addressed, along with the proposed roadmap for reviving nuclear energy in Europe, presented by the Nuclear Alliance. The session examined how this consensus was reached, identifying the leading countries in this initiative, their motivations, and the implications of the agreement, particularly in terms of energy security and emissions reduction. Additionally, incentives and mechanisms proposed by public administrations to encourage private sector investment in nuclear energy were discussed.

The session was moderated by Berta Picamal, Director of Legal Affairs and International Relations at Nucleareurope, and featured speakers from various countries:

- **Alberto Fernández.** Director of Nuclear Applications at the Ministry of Energy and Economy of Belgium.
- **Carl Berglöf.** National Coordinator for New Nuclear Construction, Swedish Government.
- **Bram-Paul Jobse.** Chief Financial Officer (CFO) of EPZ.
- **Ximena Vásquez-Maignan.** Lawyer, White & Case LLP.

The session began with an introduction by the moderator, who highlighted the importance of nuclear energy in the European Union (EU). Currently, 90 reactors are in operation, producing 24% of the EU's electricity and generating significant business volume. Additionally, the role of nuclear energy in decarbonization and low-carbon electricity production was emphasized.

Sweden's Perspective:
Carl Berglöf, Sweden's National Coordinator for Nuclear Energy, pre-

Bram-Paul Jobse

Carl Berglöf

Alberto Fernández

Ximena Vásquez-Maignan

sented the country's plan for nuclear energy development. Sweden has undergone a political shift toward supporting nuclear energy, and the Swedish Parliament is largely in favor of nuclear development. Berglöf explained that they are working on the preparation phase of the nuclear program, including supply chain assessment and skills management. The goal is to reach up to 10,000 megawatts of new nuclear capacity, with a minimum of 2,500 megawattsconsidered a safe bet.

The Netherlands' Perspective:
Bram-Paul Jobse, CFO of EPZ, the company operating the Borssele nuclear plant, discussed the plant's 50-year history and its future. The plant has an unlimited license, and an extension of its lifespan to 80 years is being considered. Additionally, the Dutch government is investigating the possibility of building two new nuclear plants at the Borssele site. Jobse mentioned that the government is working on changing the law to allow this expansion and that feasibility studies are being conducted.

Belgium's Perspective:
Alberto Fernández discussed the recent agreement to extend the operation of two nuclear units in Belgium. He explained that the agreement is a commercial contract between the state and the nuclear operator, while maintaining the independence of the nuclear regulatory authority. Fernández also mentioned that Belgium is working on waste management and knowledge preservation for future generations, which is crucial for the long-term sustainability of nuclear energy.

Nuclear Energy Financing:
Ximena Vásquez-Maignan addressed the topic of nuclear project financing and how banks perceive the nuclear sector. She explained that banks are interested in bankable projects with good risk allocation and that there is a growing focus on small modular reactors (SMRs). Vásquez-Maignan also mentioned that the EU taxonomy classifies nuclear energy as green, which could facilitate financing for nuclear projects.

Conclusions and Final Reflections:
The session moderator, **Berta Picamal**, concluded by emphasizing the importance of regional cooperation and the need to work with other industrial sectors that depend on electricity. She also mentioned that the **EU Nuclear Alliance** is a significant step toward developing new nuclear technologies and expanding nuclear capacity in Europe. ■

Closing Session

Yolanda Benito

Dear colleagues and friends of the Spanish Nuclear Society,

It is an honor for me to participate in this significant gathering, especially this year as we celebrate the 50th anniversary of the society, bringing together experts, researchers, and professionals passionate about the present and future of nuclear energy in our country. I sincerely appreciate your presence and participation over these days.

Throughout this event, we have had the opportunity to delve into various crucial aspects of the nuclear sector. From the latest advances in nuclear technology to safety and sustainability considerations, each presentation has provided valuable insights that help us better understand the challenges and opportunities we face.

At a time when we are seeking viable alternatives to mitigate climate change and ensure energy security, it is essential to recognize the contribution of nuclear energy. Not only is it a low-emission energy source, but it also provides stability to our electrical grids. Research and innovation remain necessary, and we must continue investing in projects that drive the development of safer and more efficient technologies.

Collaboration between institutions is vital to advance these objectives. Together, we can create synergies that allow us to address current and future challenges. Partnerships between academia, industry, and government are key to strengthening research and promoting the training of new generations of scientists and engineers. We must encourage interest in nuclear energy in classrooms and foster scientific outreach so that young people understand the importance of this energy source.

Looking at the current situation of the sector, we continue, as in recent years, to experience a period of contrasts, opening an interesting phase for nuclear research at the European and global levels. There are countries where nuclear technology for electricity generation is being proposed as a fundamental element for baseload generation without increasing greenhouse gas emissions during the transition to more sustainable energy generation.

On the other hand, the consolidation and development of support programs for the design and implementation of different Small Modular Reactor (SMR) technologies are becoming evident, with various tools depending on world regions to promote the development of the first SMR prototypes.

In the case of the EU, an Industrial Alliance for SMR Development has just been established and launched. The different work packages and project leaders are meeting these days to launch their respective activities and confirm their objectives and structures. Although several Spanish institutions are already part of the Alliance, it is important that all interested parties formally integrate into it as soon as possible.

We are witnessing the launch of EURATOM projects from the latest call (2023-2025), where, alongside traditional elements such as support for nuclear safety, waste management, radiation protection, and fusion, new elements are emerging. Among these, AI applications are consolidating as a new tool that not only achieves more effective solutions in multiple aspects and areas of nuclear research but also makes this R&D more attractive to younger generations of researchers.

The significant role of large European partnerships (CEP) is also noteworthy, alongside competitive projects. These partnerships will manage a large portion of EURATOM funding, working collaboratively and striving to include institutions representing all interested member states with an inclusive policy. Additionally, these projects, with longer durations and a goal of continuity, enable the coordination of long-term R&D programming. However, their real implementation is facing difficulties in aligning long-term programming with EURATOM's funding allocation instruments and schedules for each initiative and program.

- In Fission, three partnerships stand out:
- In Radiation Protection (PR) (PIANOFORTE),
- In Waste Management (EURAD-2), and
- In Materials (ORIENT), coordinated by CIEMAT.

Another important aspect is recognizing and leveraging the global implementation of access instruments to infrastructures in any discipline useful for nuclear R&D, through the OFFERR project. Managed by a group of institutions on behalf of SNETP, this initiative provides more than 150 facilities open to receiving proposals and over 7 million euros from EURATOM for these experiments.

Finally, alongside ITER, nuclear fusion research is concentrating efforts and objectives around the DONES project, led by Spain, with significant national, regional, and EURATOM financial contributions, along with major scientific and technical development efforts from regions worldwide.

Finding ways to facilitate and enable high participation levels in these R&D opportunities is essential to maintain the competitiveness and capabilities of the Spanish nuclear sector, attracting new talent. At CIEMAT, we strive to be involved and informed in all these initiatives, and in collaboration with CEIDEN, we support other national R&D stakeholders to facilitate their access to them.

Before concluding, I would like to express my sincere gratitude to all the event organizers, the speakers who shared their time and knowledge, and all of you, participants, for your commitment and enthusiasm. I hope this gathering has been enriching for everyone.

The goals we share are ambitious, but I am convinced that by working together, we can achieve great things.

Thank you all very much, and I wish you success in your future projects and activities. ■

Juan Carlos Lentijo

Good morning,
On behalf of the Plenary of the Nuclear Safety Council, I would like to thank you for the invitation to this closing ceremony of the Annual Meeting of the Spanish Nuclear Society. It is a pleasure for me to join you in the wonderful city of Córdoba, one of the Spanish cities with the most World Heritage designations.

That is why I find it very appropriate to hold such a special meeting here, where you celebrate your golden anniversary (50 years!).

Although it may sound like a cliché, it remains true that this annual gathering is a classic in the sector, a benchmark for the industry and for the entire nuclear energy community in our country. And as Paulo mentioned in his presentation, the technical program—with 43 sessions and nearly 300 communications—represents a great contribution to research and knowledge in our field of work.

Because, as Richard Phillips Feynman, Nobel Prize winner in Physics in 1965, but also a pioneer in the field of quantum computing and nanotechnology, once said: "We should not fear nuclear energy. We should fear ignorance about nuclear energy."

Friends,
In Spain, as you well know, the development of this technology for electricity production took place between the 1960s and 1980s. And it has always been accompanied by regulation, be-

cause nuclear energy regulation has been and continues to be a necessary asset for the safe operation of facilities and for social acceptance.

This exercise of responsibility has been carried out by the Nuclear Safety Council (CSN) since 1980, ensuring that nuclear power plants and radioactive facilities operate safely.

However, as we all know, this mission is a shared responsibility, which will only succeed if we take responsibility and work together. It should not be forgotten that the license holders of the facilities bear the primary responsibility for ensuring their safe operation.

You know, just as I do, that in recent years we have made a tremendous effort to review and adapt our regulations, following international standards. Thus, last year the Plenary issued a favorable report on the draft Royal Decree approving the modification of the Regulation on Nuclear and Radioactive Installations and other activities related to exposure to ionizing radiation. This was due to the partial transposition of the European Directive, which establishes the basic safety standards for protection against radiation exposure risks.

And this year, at the request of MITERD (Ministry for the Ecological Transition and Demographic Challenge), we issued a second report on this project, as it had been modified following the ministerial department consultation process.

Additionally, derived from the Euratom Treaty, the Council of the European Union has issued successive binding provisions for Member States, resulting in, for example, the Royal Decree approving the Regulation on Health Protection Against Ionizing Radiation Risks, the new version of which was approved in December 2022 and is currently in full implementation phase.

On the other hand, last July, we favorably reported the renewal of the operating license for the Trillo nuclear power plant for ten more years, until November 16, 2034.

We are also working on authorization for execution and assembly of the ATI (Individualized Temporary Storage) at the Vandellós II, Ascó, Almaraz, and Cofrentes nuclear power plants, which is a priority for us.

In May of this year, we issued Supplementary Technical Instructions regarding the requirements applicable to flexible operation strategies for nuclear power plants. This was an issue we had been working on with the sector for some time, but given the changes in operational strategies, we decided to issue the ITCs. And although we still have some differences of opinion, we understand that it is necessary to clearly establish all the conditions that could affect the systematic and frequent implementation of flexible operation strategies, from the perspective of nuclear safety. As a regulatory body, we believe that proper regulation of these operational practices will allow them to be deployed with maximum safety guarantees within the context of transparency in which we operate.

Regarding the Santa María de Garoña nuclear power plant, last year we favorably reported on the authorization requests for the ownership transfer from Nuclenor to Enresa, as well as the first phase of its dismantling.

In 2025, we will receive a follow-up mission of the IRRS (Integrated Regulatory Review Service), which we are already preparing for. As you may recall, the last time an IRRS Mission reviewed Spain's nuclear safety regulatory framework was in 2018. That year, for the first time, the IAEA conducted two separate peer reviews combined into a single mission: the aforementioned IRRS and ARTEMIS, which provides an independent assessment of Spain's radioactive waste management program.

This time, the follow-up missions will be carried out separately, in January and October. And although the original mission results were good, there is always room for improvement because we strive for excellence.

Speaking of excellence, I want to highlight the high level of professionalism of the staff operating nuclear power plants and those working at the CSN. Without a doubt, they are our most valuable asset.

We all know that the subject of our work has enormous repercussions, both immediate and future, for citizens. The future we face is being built now, and it will largely depend on the decisions we make.
Over the past few days, at this Córdoba Exhibition, Fair, and Convention Center, we have discussed very important topics for the future of nuclear energy, such as: The challenges of El Cabril; The role of nuclear energy in the 2030 horizon, amid the transformation of the energy model outlined by the PNIEC (Integrated National Energy and Climate Plan 2021-2030); The European Union's commitment to nuclear energy.
This is what we must do: face our challenges head-on, with maximum transparency, and work together to improve both the present and the future. In this regard, I would like to share with you that at the CSN, we continue to work on developing a formal internal nuclear safety culture plan, which pursues excellence in all our actions.

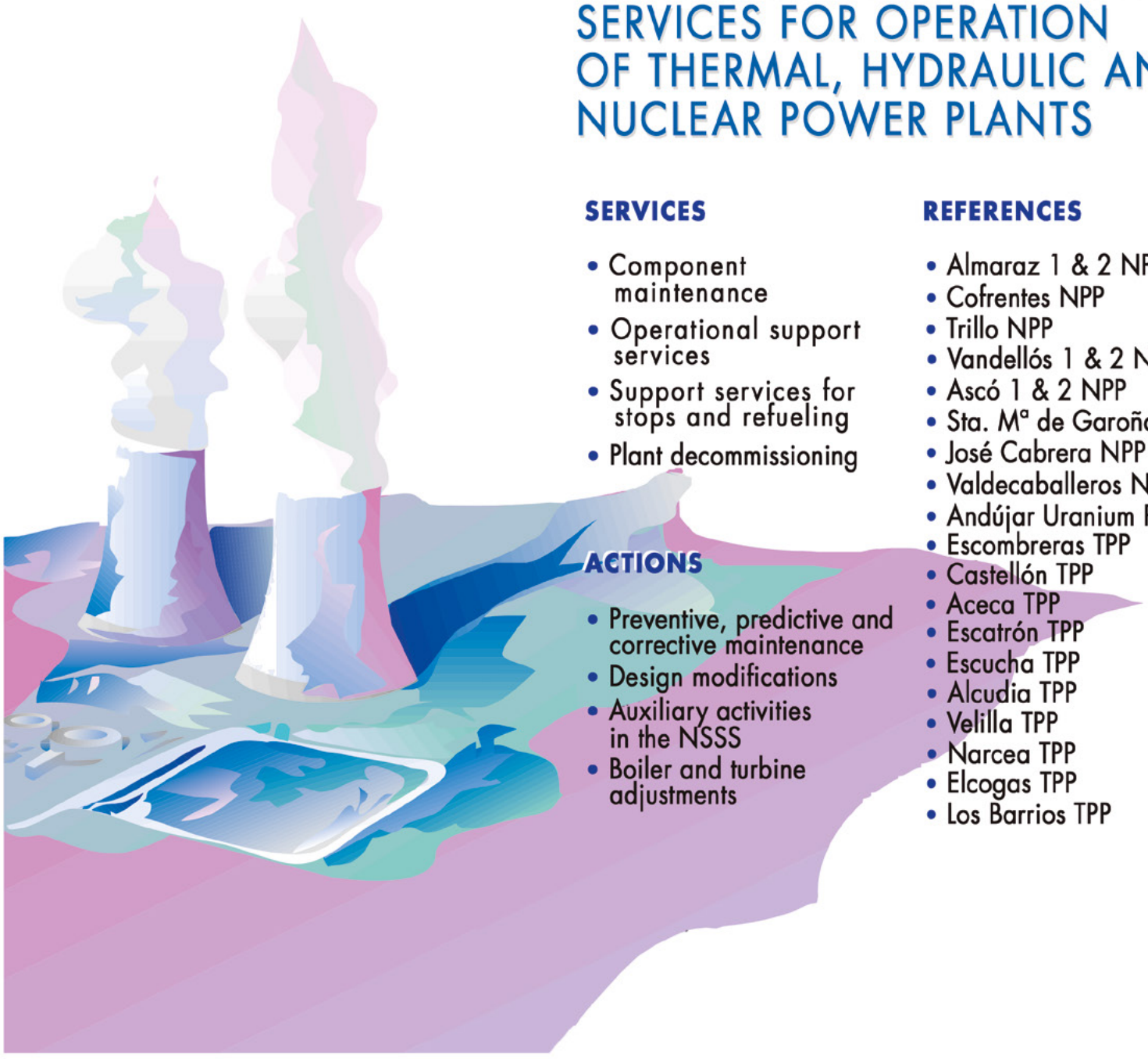
This plan recognizes the central role of nuclear safety and radiological protection in the facilities and activities we regulate, while also preparing us to manage the constant changes in our field of action.

I have nothing left to do but congratulate you once again on the success of this 50th Annual Meeting. And of course, happy birthday!

Thank you all very much. And congratulations on the great work you have done this week in Córdoba. ■

moncobra

MAINTENANCE AND SUPPORT SERVICES FOR OPERATION OF THERMAL, HYDRAULIC AND NUCLEAR POWER PLANTS



SERVICES

- Component maintenance
- Operational support services
- Support services for stops and refueling
- Plant decommissioning

ACTIONS

- Preventive, predictive and corrective maintenance
- Design modifications
- Auxiliary activities in the NSSS
- Boiler and turbine adjustments

REFERENCES

- Almaraz 1 & 2 NPP
- Cofrentes NPP
- Trillo NPP
- Vandellós 1 & 2 NPP
- Ascó 1 & 2 NPP
- Sta. Mª de Garoña NPP
- José Cabrera NPP
- Valdecaballeros NPP
- Andújar Uranium Plant
- Escombreras TPP
- Castellón TPP
- Aceca TPP
- Escatrón TPP
- Escucha TPP
- Alcudia TPP
- Velilla TPP
- Narcea TPP
- Elcogas TPP
- Los Barrios TPP

cobra

Cardenal Marcelo Spínola, 10 • 28016 MADRID • Tel.: +34 91 456 95 00
www.grupocobra.com • e-mail: moncobra@central.grupocobra.com

GRUPO SENDA

José Manuel Redondo

First of all, I would like to thank the Spanish Nuclear Society, through its President Emilio Mínguez, for the invitation to participate once again in the Closing Session of this Annual Meeting, which, besides giving me the opportunity to inform such a relevant group as the one you represent about what we have been doing in the Deputy Directorate General for Nuclear Energy since the last Annual Meeting, is always an honor for me.

Secondly, I would like to congratulate the Spanish Nuclear Society on its fiftieth anniversary. 50 years in which this association has been fulfilling its objective of promoting knowledge about nuclear technology and has become a reference, both for professionals in the sector and for the general public.

Likewise, as has once again been demonstrated in the Annual Meeting that we are now closing, the Spanish Nuclear Society has become a meeting point for all professionals in the nuclear sector and a forum in which to share and transmit knowledge in a rigorous manner.

Developed Actions

Regarding the actions carried out, I must first mention the approval by the Government of the 7th General Radioactive Waste Plan in the Council of Ministers on December 27th of last year. As you know, the PGRR is the document in which the Government establishes its policy on the management of radioactive waste, including spent nuclear fuel, as well as the dismantling and closure of nuclear facilities.

With the approval of this 7th PGRR, compliance is ensured with Directive 2011/70/Euratom, which establishes a Community framework for the responsible and safe management of spent nuclear fuel and radioactive waste, stipulating that each Member State must notify the European Commission of its National Program for the implementation of its waste management policy, adjusting its content to what is required in this Directive.

Since the 6th PGRR was approved in June 2006, it did not comply with this Directive, meaning that Spain should have submitted a new Plan to the Commission before August 23, 2015. Having failed to do so, in 2018 the Commission initiated an infringement procedure against us.

The 7th PGRR, whose first proposal was submitted by Enresa to the Ministry in March 2020, has been the first Plan to undergo a Strategic Environmental Assessment. This assessment included the corresponding procedures for public information and consultations, both for the 7th PGRR and its Strategic Environmental Study, which were carried out from April 12 to June 16, 2022.

Once these procedures were completed, in November 2022, a second version of the 7th PGRR was drafted, which, in accordance with the provisions of Law 25/1964 on nuclear energy, was sent to the Nuclear Safety Council for its report and to the autonomous communities for their report on land-use planning and environmental matters.

Subsequently, in July 2023, the Directorate General for Environmental Quality and Assessment issued the Strategic Environmental Declaration, after which the final version of the 7th PGRR was drafted and submitted to the Government for approval, which took place through an Agreement of the Council of Ministers on December 27, 2023.

Regarding the reference scenario of the 7th PGRR, the key points to highlight are the following:

The planning horizon extends from 2023 to 2100.

In accordance with the provisions of the National Integrated Energy and Climate Plan 2021-2030 and the Protocol signed by Enresa and the owners of the nuclear power plants in March 2019, the orderly shutdown of the seven currently operating nuclear reactors is planned between 2027 and 2035.

Regarding the temporary management of spent nuclear fuel, high-level waste, and special waste, the implementation of a Decentralized Temporary Storage (ATD) facility is planned at each nuclear power plant with spent nuclear fuel [Almaraz (Units I and II), Ascó I and Ascó II, Cofrentes, Trillo, Vandellós II, Santa María de Garoña, and José Cabrera].

- The ATD of each plant will consist of its ATI, plus a new complementary facility that will allow maintenance and repair operations on its containers, to ensure the recoverability function at the container level.
- The ATDs, including their complementary facilities, will be operational before the dismantling of the plant's spent fuel pool begins and will have all the safety and auxiliary systems necessary to operate as an independent nuclear facility once the plant's closure has been declared. The ATDs will remain operational until the spent nuclear fuel, high-level waste, and special waste are transferred to a Deep Geological Repository (AGP).
- In 2031, one of the plant sites will be equipped with the means to ensure the recoverability function at the fuel element level throughout the entire operational period of the ATDs. To achieve this, this facility will include a hot cell for handling spent nuclear fuel and radioactive waste, as well as a storage capacity for containers to address potential contingencies in the ATDs throughout their operational life. Additionally, it will have a laboratory equipped with the necessary means to verify and inspect the condition of the fuel and waste if needed.
- Commissioning in 2027 of a temporary storage facility at the Vandellós I site to house the radioactive waste

resulting from the reprocessing of spent nuclear fuel from this plant and, if applicable, the special waste from its dismantling, which will remain operational until all radioactive waste is transferred to the AGP.

- Commissioning of the AGP for the final storage of spent nuclear fuel, high-level waste, and special waste in 2073.

Immediate total dismantling of light water reactor plants (all except Vandellós I). Preliminary work will begin between three and, preferably, five years before the final shutdown date, so that the transfer of ownership and the start of dismantling work can take place within a period not exceeding three years after the shutdown.

During these years, activities will be carried out for the emptying of pools, preparatory tasks for dismantling, and obtaining the dismantling authorization and the transfer of ownership to Enresa.

Once this authorization is obtained, dismantling works will begin, with an estimated duration of ten years. In the case of Vandellós I, the final phase of its dismantling will be carried out starting in 2030, with an estimated duration of fifteen years. The monitoring period, once the works are completed, is estimated at a maximum of ten years before the closure declaration.

- The total cost of the activities contemplated in the 7th PGRR amounts to €28,155M (2023).

Taking into account the provisions of the 7th PGRR, on December 27, 2023, the Council of Ministers approved an Agreement adopting the necessary instructions for abandoning the project to host a Centralized Temporary Storage facility in the municipality of Villar de Cañas (Cuenca) and urged Enresa to carry out the necessary actions for the orderly termination of the procedures initiated for its implementation. In this Agreement:

- The content of the Council of Ministers Agreement of December 30, 2011, which approved the designation of the site for the Centralized Temporary Storage of spent nuclear fuel and high-level waste and its Associated Technology Center, is rendered ineffective.
- Enresa is urged to withdraw from all procedures initiated and linked to the ATC construction project in Villar de Cañas, particularly those related to prior authorization, construction authorization, and the environmental impact assessment of the project, to proceed with their orderly termination.
- Enresa is also urged to take the appropriate measures to carry out the free transfer of ownership of the land and buildings it owns in the municipality of Villar de Cañas linked to the ATC project, as they are no longer necessary for the public service purposes entrusted to this entity.

This transfer may only be made in favor of the General State Administration, the Autonomous Community of Castilla-La Mancha, local entities in the province of Cuenca, or public foundations of these administrations, exclusively for the fulfillment of public utility or social interest purposes within their respective competencies.

Approved Regulations

Once the 7th PGRR was approved, the process for Royal Decree 589/2024, of June 25, was initiated. This decree modifies the fixed unitary tariff related to the non-tax public financial contribution that funds Enresa's service for operating nuclear power plants. The costs of the activities financed by what has traditionally been known as "Enresa's Fee 2" are included in this Plan, and this fee currently holds the legal nature of a non-tax public financial contribution.

The need to modify this fixed unitary tariff arises from the fact that the costs outlined in the 7th PGRR have increased compared to those considered in the 6th PGRR. This increase is particularly significant in terms of the temporary management of spent nuclear fuel, given that the 7th PGRR's reference scenario includes the establishment of seven Decentralized Temporary Storage facilities (ATD), one at each plant with spent fuel, instead of managing the waste in a single centralized facility (ATC) as planned in the 6th PGRR's reference scenario.

Through this royal decree, the value of this tariff is set at €10.36/MWh, which represents an approximate 30% increase compared to the previous tariff of €7.98/MWh, established by Royal Decree 750/2019, of December 27.

Regulations in Progress

On August 7, the Third Vice President and Minister for the Ecological Transition and the Demographic Challenge submitted a request to the Council of State for the issuance of its mandatory opinion regarding the draft Royal Decree that approves the Regulation on Nuclear and Radioactive Installations, as well as other activities related to exposure to ionizing radiation.

Once this opinion is available, the observations made within it will be reviewed, and a final revision of the draft text will be conducted. Subsequently, it will be submitted to the Council of Ministers for approval.

The approval of this new RINR (Regulation on Nuclear and Radioactive Installations) is necessary following the 2022 approval of the Regulation on Health Protection Against the Risks Derived from Exposure to Ionizing Radiation and the 2018 approval of the Regulation on Nuclear Safety in Nuclear Installations, in order to coherently complete the regulatory framework related to nuclear energy.

A draft Royal Decree is also in progress for the approval of the Regulation on Radiologically Contaminated Soils. The purpose of this royal decree is to address the issue posed by the existence of radiologically contaminated soils resulting from past industrial activities or incidents, as well as those that may occur in the future.

The preliminary public consultation for this draft royal decree took place between April 3 and April 17, and the draft text is expected to be available for the public hearing and information procedure in the second half of this year.

Other Actions

The 7th PGRR includes plans to equip the nuclear power plant sites of Vandellós II, Ascó I and Ascó II, Cofrentes, and Almaraz (Units I and II) with a temporary storage capacity for spent fuel that will allow them to store all the fuel generated by these plants, a project referred to as "ATI-100 Project". It should be noted that Trillo already has this capacity.

For these new ATIs, a storage system based on welded metal capsules with a concrete enclosure has been selected, similar to the current ATI systems at Ascó and José Cabrera.

Currently, the ATIs at Vandellós II and Cofrentes already have an Environmental Impact Declaration, while the environmental impact assessments for the other two projects are in an advanced stage of processing.

Expansion of El Cabril

The 7th PGRR also considers that, in order to avoid impacting the operational and dismantling schedule of nuclear power plants and to continue the normal storage of low and intermediate-level radioactive waste, it is necessary to expand the storage capacity of El Cabril through the construction of new cells. This involves building a new platform (Southeast Platform) for the final disposal of low and intermediate-level radioactive waste.

These cells must be operational by 2028, and their construction will be carried out in phases. The first phase includes the construction of 12 cells, with up to 15 additional cells to be built as needed. This project already has an Environmental Impact Declaration, and once the CSN (Nuclear Safety Council) issues its favorable report, it will be authorized by a Resolution from DGPLACE.

Renewal of Trillo's Authorization

Regarding the renewal of Trillo's authorization, which expires on November 17, its operator (CNAT) submitted a renewal request on March 27, 2023, for a period of ten years. On July 26, the Ministry received the mandatory report from the Nuclear Safety Council (CSN). Once the draft Ministerial Order is prepared, it will be submitted for review by the State Attorney's Office, before being signed by the Secretary of State for Energy, by delegation of the Minister, to formalize the renewal of the authorization.

Spain's Ratification of the Common Protocol on the Application of the Vienna Convention and the Paris Convention on Civil Liability in Nuclear Energy.

At the request of Enusa, in February, the General Subdirectorate of Nuclear Energy prepared a report-proposal, which was submitted to the Ministry of Foreign Affairs, EU, and Cooperation, initiating the ratification process for the Common Protocol on the Application of the Vienna Convention and the Paris Convention on Civil Liability in Nuclear Energy.

As you know, Spain is a party to the 1960 Paris Convention on civil liability in nuclear energy, as well as its complementary convention, the 1963 Brussels Convention, both developed within the framework of the OECD Nuclear Energy Agency. These conventions establish the legal framework that governs civil liability for damages caused by a nuclear accident in Spain. On the other hand, there is the 1963 Vienna Convention on Civil Liability for Nuclear Damage, whose depositary is the IAEA. This Convention is widely adopted among Eastern European countries and the nations of the former Soviet Union. Spain signed this Convention in 1963 but never ratified it.

Although both conventions share the same general principles, they do not interact with each other. This means that nuclear damage occurring in the territory of a Contracting Party to one convention, caused by an operator responsible for a facility or transport within the scope of the other convention, is generally not covered by the latter.

However, this Common Protocol allows the Contracting Parties to the Paris Convention and the Contracting Parties to the Vienna Convention to treat each other "as if" they were Contracting Parties to their own convention. The ratification of this Common Protocol would bring several advantages, including:

- Facilitating Enusa's ability to secure nuclear fuel supply contracts with Eastern European countries—such as Hungary, the Czech Republic, and Slovakia—where it is well positioned. If Spain does not ratify this Protocol, Enusa would be at a competitive disadvantage compared to companies from neighboring countries such as France, Germany, or Sweden, which are also Contracting Parties to the Paris Convention and have already ratified it.
- Protecting Enusa's interests and limiting its risk exposure, ensuring that its liability remains within the limits and conditions set by the Paris Convention, in the event of potential claims filed in courts of countries subject to the Vienna Convention.

Additionally, Spain's ratification of the Common Protocol would represent a significant strategic contribution to the European objective of reducing energy dependence on Russia.

marSein

SERVICIOS NUCLEARES

- Descontaminación
- Gestión de lavanderías
- Tratamiento de residuos
- Desclasificación de materiales y terrenos
- Servicio Técnico de Protección Radiológica
- Unidad Técnica de Protección Radiológica (UTPR)

MANTENIMIENTO

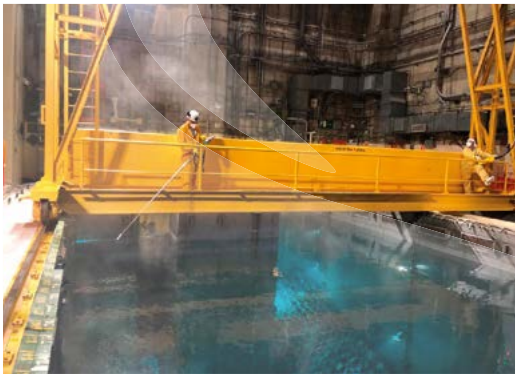
- Limpieza industrial y servicios auxiliares
- Mant. mecánico
- Mant. de obra civil
- Mant. de pintura industrial
- Montaje de andamios y plataformas de trabajo
- Mant. de inspecciones de barreras contraincendios

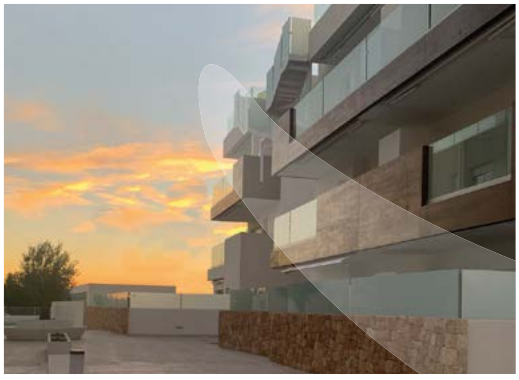
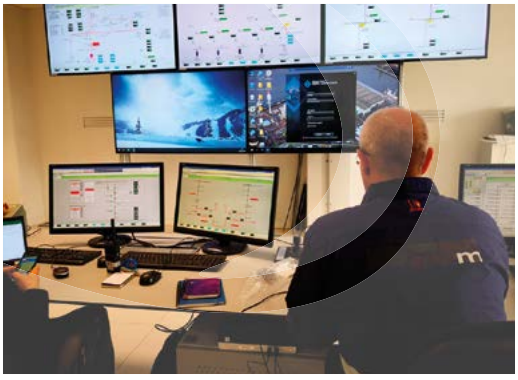
CONSTRUCCIÓN

- Obra civil
- Edificación
- Promoción

TELECOMUNICACIONES

- Diseño
- Ingeniería de detalle
- Suministro
- Pruebas FAT y SAS de sistemas
- Procedimientos y supervisión
- Cursos de formación O&M



TÜVRheinland CERT ISO 9001 ISO 14001 BS OHSAS 18001 · IAF · ENAC CERTIFICACIÓN

Beethoven, 10 · 43007 Tarragona (España) · 977 245 880 · marsein@marsein.com · www.marsein.com

On October 1, the Council of Ministers agreed to submit this Common Protocol to the Spanish Parliament and to authorize Spain's formal consent to be bound by it.

I am coming to the end of my speech, but before concluding, I would like to mention that, as has likely been discussed throughout this Annual Meeting, last year, nuclear energy generated 20.3% of the electricity produced in Spain.

As of August 31, this figure has been 19.7%, showing a slight decrease due to the electricity market conditions that occurred this spring, when a series of storms led to a surge in wind and hydroelectric generation, causing electricity prices to plummet to historic lows and, at times, even to negative levels, as happened during the storm that hit Spain over Easter.

There is no doubt that the massive deployment of renewable energy has introduced a new dynamic in the energy market, making the traditional reference to the capacity factor as a measure of nuclear power plants' efficiency increasingly obsolete.

It would be fantastic if the day comes when all, or at least most, of the energy we need can be obtained from inexhaustible sources, at least as long as humans inhabit this planet. However, until that happens, and with the technology available today, nuclear energy remains a cornerstone of our electricity supply.

I do not want to finish without once again expressing my appreciation for the professionals in the Spanish nuclear sector, who, year after year—and this marks the 50th—continue to contribute, through their work, knowledge, and dedication, to ensuring that nuclear energy maintains its important role in our society. This role is not only crucial in a strategic sector like energy, where we heavily rely on foreign sources, but also in other key areas, such as healthcare, industry, and research.

I conclude by congratulating the Organizing Committee, the Technical Committee, and everyone who has participated in the various sessions over these three days. Through their effort and dedication, they have contributed to the success of this 50th Annual Meeting of the Spanish Nuclear Society.

Thank you very much.

Paulo Domingues

Dear congress attendees, distinguished guests, friends, and colleagues, It is a great honor for me to be here this morning, sharing the stage with three distinguished individuals—far more distinguished than myself: Yolanda Benito, Director General of CIEMAT; José Manuel Redondo, Deputy Director General for Nuclear Energy at the Ministry for the Ecological Transition and the Demographic Challenge; and Juan Carlos Lentijo, President of the Nuclear Safety Council.

I would like to start with a video that highlights the main activities of our meeting, following three days of intense work and special moments shared together.

I believe we can confidently say that the 50th Annual Meeting of the Spanish Nuclear Society has been a great success, bringing together more than 750 participants, who attended 270 presentations organized into 46 sessions, complemented by one poster session and one session on nuclear technology and innovation, organized by our dear Young Nuclear Professionals. All of this was made possible thanks to the support of 31 sponsors and partners.

Our meeting also featured 23 exhibitors, who contributed through their stands, information, products, and solutions, playing a key role in the success of the event.

For this, I would like to express my deepest gratitude to everyone involved—especially to our President, Emilio; our Secretary-General, Julio; our Treasurer, Pablo; all the members of the Board of Directors; the Organizing and Technical Committees; and to every person who, whether visibly or behind the scenes, contributed with their effort—some for many months—to ensure that everything ran smoothly throughout this intense week.

I would now like to present the nine winners in the three categories of the SNE Photography Contest, sponsored by Framatome, to whom we extend our thanks once again this year.

A big thank you to all participants and congratulations to the winners!

I would now like to present the winner and the two finalists for the best master's theses and final projects, as well as the winners of the best presentations in the 10 defined technical categories, along with the Young Professionals session and the poster session.

The high quality of all presentations has become a hallmark of our Annual Meetings. For this reason, I want to thank all the authors who presented their work during these three days and to congratulate those whose presentations were selected, as they are a true reflection of their outstanding work.

As is tradition, these awards will be presented during the Operational Experiences Day, which we expect to hold on March 6 of next year. I would now like to share with you the group photo from the official dinner, as we are undoubtedly one big family, and this year, we have also been in celebration.

I would also like to remind you that our Society's 50th anniversary does not end today but will conclude with the social event we are organizing on Friday, November 15, at Espacio Ibiza in the Mirador de Cuatro Vientos, Madrid, at 7:00 PM.

Thank you very much for your attention! ■

enusa

A company for the future

enusa.es

Desarrollamos soluciones innovadoras nucleares y mediambientales a nivel global, contribuyendo al progreso sostenible de la sociedad.

Technical Sessions

SESSION 1 THERMOHYDRAULICS AND NEUTRONICS: SIMULATION AND EXPERIMENTATION (I)

In the first technical session dedicated to the "Thermohydraulics and Neutronics" area, a total of five presentations were given, focusing primarily on neutron-related aspects. The speakers adhered strictly to the allotted time, allowing for a Q&A session after each presentation.

The first presentation was delivered by **Alejandro Marro** from UPM, who showcased a 3D model of the MCNP code to analyze the dosimetric responses of various nuclear reactions, both inside and outside the vessel. This study included a sensitivity analysis of the model against different nuclear data libraries, as well as considering various definitions for the neutron source term.

Next, **Emilio Castro**, also from UPM, presented a neutronic analysis of different routes for producing Lutetium-177 in a PWR reactor. In his presentation, he explored variations in target enrichment and irradiation times to optimize the production of this isotope.

Vicente Bécares from CIEMAT delivered the third presentation of the session, discussing the role of Zero Power Reactors (ZPR) in the development of advanced nuclear systems. He paid special attention to the activities of the ZPR working group established within the framework of the Working Party on Scientific Issues and Uncertainty Analysis of Reactor Systems (WPRS) of the OECD Nuclear Energy Agency (NEA).

Following this, **Nuria García** from UPM presented a comparison of methodologies for determining experimental correlations between criticality experiments. Her objective was to establish a robust method for incorporating correlations into data assimilation techniques. Through this comparative analysis, she aimed to identify the most effective approach for evaluating these correlations.

Alberto Escrivá
PRESIDENT

Patricia Cuadrado
COORDINATOR

Finally, **David Álvarez** from Westinghouse concluded the session with a presentation on a neutronic benchmark conducted with the ALFRED reactor (Advanced LFR European Demonstrator), a 300 MWth reactor using MOX fuel. To carry out the simulations, he employed the Monte Carlo transport code Serpent 2.2.0.

Despite being the first session of the Annual Meeting, it attracted a large and engaged audience, leading to interesting discussions and exchanges that made the session a dynamic and enriching experience.

SESSION 2 NUCLEAR MEDICINE AND RADIATION PROTECTION (I)

Monte Carlo Simulations Study of the Neutron Spectrum in a Proton Therapy Treatment Room
Presented by **Adrián Díaz Comeche**, Polytechnic University of Valencia

This presentation focused on evaluating the dose generated by proton therapy during tumor treatment. As a result of (p, n) reactions, neutrons are produced, which are often not considered in the absorbed dose calculations for patients. This study, specifically conducted for a particular installation (accelerator head), uses Monte Carlo simulations and an MLEM algorithm to simulate neutron spectra and assess their contribution to the total dose. The research will continue with simulations of a real treatment room based on its design plans.

Mª Luisa Estupiñán
PRESIDENT

Gonzalo García
COORDINATOR

Comparison of MCNP6.3 Physical Models in an Extended-Range Bonner Sphere Spectrometer
Presented by **Adrián Díaz Comeche**, Polytechnic University of Valencia
This presentation complemented the previous study. Given the high energies used in proton therapy (up to 250 MeV), it is necessary to calibrate Bonner sphere spectrometers, which, according to literature, typically have an energy limit of around 20 MeV. This extended energy range, required for proton therapy (70–250 MeV), is achieved using the MCNP6.3 simulation code, which employs the Monte Carlo method for radiation transport simulations.

3D Filtering on GPU for Computed Tomography (F3D-FGI)
Presented by **Celia Tendero Delicado**, Polytechnic University of Valencia
This presentation showcased the results of a study on noise reduction in medical images obtained through computed tomography. The research demonstrated that less noisy images can be achieved without increasing the patient's radiation dose by using a three-dimensional Gaussian-Impulse filtering method based on fuzzy logic (F3D-FGI).

Dose Reduction by Integrating the F3D-FGI Filter in Computed Tomography Reconstruction
Presented by **Celia Tendero Delicado**, Polytechnic University of Valencia
This study complemented the previous one, evaluating the improvement in image quality when incorporating the F3D-FGI filter within the image reconstruction process. The integration of this filtering method does not significantly impact the reconstruction time, making it a viable option for practical implementation.

Study on Dose Reduction Using Fuzzy Logic-Based Filtering in Computed Radiography
Presented by **Josep Arnal García**, University of Alicante
In an effort to reduce patient dose in computed radiography, the goal is to minimize the voltage and intensity of the X-ray source as much as possible without compromising image quality. However, lowering the energy of the source introduces Gaussian noise in the images. This study analyzed the efficiency of fuzzy logic-based noise filtering techniques compared to other filtering methods. The results confirmed that reducing the X-ray tube current, followed by post-processing with the FGI filter, is an effective method for dose reduction.
The presentations were of high technical interest, and each was followed by questions and discussions among attendees, fostering an engaging exchange of ideas.

SESSION 3 ENGINEERING, DESIGN, AND INNOVATION (I)

The Engineering, Design, and Innovation (I) session was attended by more than 20 participants and featured seven presentations covering various aspects of nuclear engineering and technology. The session included speakers from ANAV, Westinghouse, Amphos 21, ENSA, and Iberdrola Generación Nuclear.
The first presentation from **ANAV** outlined the inspection program conducted on the reactor vessel and its internal components in both units of the Ascó Nuclear Power Plant. The purpose of these inspections was to ensure the design function of the reactor during its Long-Term Operation (LTO) period, incorporating lessons learned from the H. B. Robinson 2 nuclear plant. The results confirmed that no additional actions would be required until the dates established by PNIEC.
The second presentation from ANAV focused on resolving a significant technical challenge related to the installation of a large underground pipeline for the effluents from the neutralization pond at Ascó NPP. The project faced risks of interference with other underground utilities, so various alternatives were analyzed to find the most optimal solution in terms of risk reduction and implementation time.
Westinghouse's first presentation introduced the methodology applied in the APAL project (Advanced PTS Analysis for LTO), funded by Euratom, aimed at developing advanced probabilistic methods for quantifying safety margins regarding reactor vessel failure risk. The results

Ferran Tarrasa Blanes
PRESIDENT

Ana María Hernández
COORDINATOR

were compared with deterministic methods, concluding that both approaches are reliable.
In its second presentation, Westinghouse presented findings from a comparative study between the IEEE 485 standard calculation method and the ETAP V.19 analytical method for Class 1E batteries. The study concluded that both methods are equivalent, provided that specific precautions are followed.
The presentation by **Amphos 21** focused on the results of simulations performed for the closure system of the future high-level radioactive waste repository in Cigéo, France. The study examined the interactions between bentonite blocks, concrete plugs, and their hydrogeochemical and mechanical environments, concluding that the sealing sys-

tems can maintain their properties over extended periods. **ENSA's** presentation detailed the design and manufacturing specifications for spent fuel containers, a meticulous process involving design, material supply, manufacturing, inspections, and testing. The process must strictly comply with the requirements set forth in Section III, Division 3 of the ASME Code.

Lastly, **Iberdrola Generación Nuclear** presented the implementation of new sampling and monitoring equipment for the standby gas treatment system at Cofrentes NPP. These new systems, required for both normal operation and emergency situations, are designed to monitor noble gases, particles, and iodine, while improving human-machine interface, measurement accuracy, and sample conditioning and representation.

At the end of each presentation, questions and clarifications were addressed, leading to deeper discussions on various aspects of the topics presented.

SESSION 4 NUCLEAR SAFETY AND LICENSING (I)

Session 4 of the 50th Annual Meeting of the SNE was dedicated to the topic of nuclear safety and licensing. The session featured the participation of the following five speakers: **Rafael Caro,** principal engineer at Westinghouse, explained to us the most recent advances they are making within the framework of the ASSAS project in the application of Artificial Intelligence methodologies for the development of certain plant system models in the proof-of-concept simulator for Severe Accidents (SA) training in the operation and functioning of nuclear power plants.

Sara Carrasco, head of the Safety Review group of the Ascó - Vandellós II Nuclear Association (ANAV), explained to us the differences that currently exist in the treatment of anomalous conditions between ANAV (following the sectoral guide CEN-22) and the USA (following IMC0326 and NEI 18-03), highlighting the increasingly greater divergence between both processes, even more so considering that the Spanish framework maintains as a reference the previous revisions of the NRC IMC-0326 document.

Mónica García, researcher at CIEMAT, shared with us the adaptation of the PIRT methodology to the field of SA. This methodology, more commonly used in the analysis of design basis accidents, allows for the identification of all relevant SA phenomena as well as their prioritization, and lays the groundwork for launching new lines of work and research for those knowledge gaps identified through this tool.

For his part, **Kevin Fernández,** professor of Nuclear Engineering at the Polytechnic University of Madrid, presented in a very comprehensive manner the beneficial impact on safety, evaluated through simulations with the TRACE thermohydraulic code, that would result from current VVER-1000 plants implementing the new passive safety systems, which do not require human actions or external power sources, developed for these same reactors in their next-generation Gen III/III+.

Raúl Orive Moreno
PRESIDENT

Víctor Modino
COORDINATOR

Finally, but no less interesting or important, **Héctor Hernández,** Head of Risk Analysis at ANAV, informed us about the progress they are making in developing a seismic PSA at C.N. Vandellós II. The need to conduct this seismic PSA has arisen from the reassessment undertaken by all Spanish nuclear power plants of the seismic hazard of their sites through probabilistic analyses. Specifically, the presentation focused on the selection of seismic equipment, presenting the methodological lines followed. The definition of this equipment will subsequently allow for the initiation of work to define the applicable seismic fragilities.

The questions asked at the end of each presentation allowed for a deeper understanding of the development of each work, as well as providing insight into its relevance and contribution to nuclear safety. It is important to highlight and appreciate that all speakers scrupulously adhered to the allotted time. The session concluded with gratitude expressed to the speakers for their participation and to the attendees for their presence and attention during the event.

SESSION 5 OPERATION AND MAINTENANCE (I)

The session begins with Joan Pau Barrios from CN Vandellós II, presenting on the Evaluation of the Chemical Treatment Applied to the Primary and Secondary Circuit of the Vandellós II Nuclear Power Plant. Joan Pau outlines

the desired objectives of each chemical treatment parameter and provides a comparison between the objectives and the actual plant results. Following this, he analyzes the deviations, the causes that provoke them, and the corrective actions. Joan Pau concludes that the long-term objectives are satisfactory for the safe and reliable operation of the plant and that it will be necessary to evaluate actions for a potential increase in Flexible Operation maneuvers.

Next, **Yolanda Tofiño** from Iberdrola presents on the Impact of Flexible Operation on the Operation Cycle, where she discusses the studies conducted by the Nuclear Fuel unit of Iberdrola Generación Nuclear to assess the impact of different flexible operation scenarios on various operational, design, and fuel reliability parameters. The study results allow for the definition of optimal boundary conditions to provide the greatest possible flexibility in the management of CN Cofrentes' operation.

Following this, **Olga Riba** from Amphos 21 Consulting S.L. presents a study in collaboration with the CSN on the state of the art of experimental designs for intergranular stress corrosion cracking processes in austenitic stainless steels and carbon steels. She indicates that a database has been developed to establish operational guidelines and relevant conditions that enable the proposal of new strategies to mitigate stress corrosion phenomena by optimizing the Water Chemistry of the cooling circuits of BWR reactors.

The next presentation is delivered by **Alfonso Laín** from Westinghouse, describing innovative improvements implemented in a control rod inspection system by introducing a new data acquisition system. This system enables a reduction in inspection times, eliminates risks, and lowers costs in inspection tasks.

Antonio Martinavarro
PRESIDENT

Maria Asunción Gálvez
COORDINATOR

Subsequently, **Jesús Prieto** from CN Trillo presents a talk related to the impact of Flexible Operation at CN Trillo on Chemical and Radiochemical Control in the primary and secondary circuits. Jesús concludes that CN Trillo is capable of operating at reduced loads while maintaining the same safety and reliability standards under the necessary chemical and radiochemical controls.

Finally, **Ana Media** from CN Trillo delivers a presentation on the impact of CN Trillo's water intake and discharge needs. Ana argues that the necessary permits impact the plant's operation, making it essential to adapt operational conditions to the different flow rates of the Tajo River.

SESSION 6 DISMANTLING AND WASTE MANAGEMENT (I)

The session gathered various presentations on the management of radioactive waste and spent fuel. Luis Moreno Pombo, from Equipos Nucleares S.A. SME, presented response strategies for leaks in bolted nuclear fuel containers, developed by Equipos Nucleares S.A. (ENSA) in collaboration with the Electric Power Research Institute (EPRI). The limitations of spent fuel pools for repairs were discussed, and four solutions were proposed for potential containment failures, focusing on the importance of the inner lid gasket as the main critical safety point.

Karen A. Guzmán-García, from ENUSA, addressed neutron activation in cyclotron bunkers, optimizing monitoring and sample extraction. Miguel A. Rodríguez, from Naturgy, proposed a modified cellulose for water decontamination in Fukushima, focusing his study on tritium adsorption. Sergio Fernández-Carretero, from CIEMAT, explored the relationship between surface area and particle size distribution in nuclear fuel, crucial for its oxidation and stability.

Lorea Aresti Allende, from Iberdrola Generación Nuclear, analyzed alternatives for the management of tubular bundles at the Cofrentes Nuclear Power Plant, optimizing cutting and decontamination processes. María Criado, from CSIC, presented new protection methods for sludge conditioning drums, highlighting epoxy-polyamide paints that

José Antonio Herrera
PRESIDENT

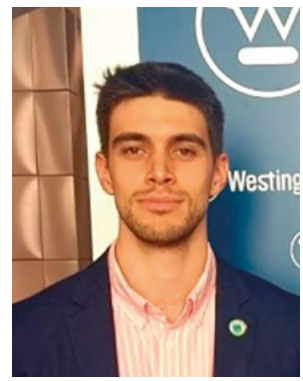
Tomas Recio
COORDINATOR

improve corrosion resistance. Finally, David García, from Amphos21, described the development of a sorption database for radionuclides on solid supports, essential for assessing migration in deep geological repositories.
The session, which was notably successful in attendance, at times exceeding the room's capacity, addressed crucial topics in nuclear waste management. The speakers shared significant advances in monitoring techniques, decontamination, and waste management, emphasizing the importance of optimizing processes to ensure the safety and efficiency of handling these materials. The diversity of approaches and the quality of the presentations reflect the sector's commitment to innovation and continuous improvement in nuclear waste management.

SESSION 7 THERMOHYDRAULICS AND NEUTRONICS: SIMULATION AND EXPERIMENTATION (II)

The first presentation in Session 7, focused on thermohydraulics and neutronics, was delivered jointly by **Isaac González Sevillano,** project manager of the ITER simulator, and **Mª José Rebollo Mena**, project manager for thermohydraulics at NFQ.
The presentation, titled "Modernization of the MSRS and turbine models in the Cofrentes simulator", showcased the work carried out by both companies to update and improve the thermohydraulic models developed for the TRAC_RT code included in the full-scope simulator of the Cofrentes nuclear power plant.
This work will enable more realistic system responses, as well as the simulation of instrumentation failures or leaks in the simulated systems.
The second presentation in the session was given by **Francisco Javier Hernández,** from Naturgy Nuclear Engineering, who presented the results of a thermohydraulic study on the impact of a 1ºC increase in the operating temperature of the Trillo nuclear power plant.
This study, conducted using the plant analyzer of the Trillo plant with the RELAP5 code, incorporates important judgment elements when undertaking the project, highlighting the pros and cons of the operation and its impact on design margins.
The third presentation, delivered by **Carlos Vázquez-Rodríguez,** a researcher at the Julich Research Center in Germany, analyzed the capabilities of the containmentFOAM code, an open-source CFD code, for simulating the dry containment of a light water SMR reactor. The study's results concluded that the code is suitable for reproducing the physical phenomena influencing the system's response.
Next, **Andrés Hernández,** a nuclear safety engineer at EAG, gave a presentation on the impact analysis of the headers in a spent nuclear fuel container model using the ANSYS CFX code. His presentation analyzed various aspects related to the scope of the models used for

Alberto Concejal
PRESIDENT



David Álvarez
COORDINATOR

simulating spent fuel containers. The study results demonstrated the adequacy of current fuel models but pointed out the need for proper modeling of the container's natural circulation.
The penultimate presentation, delivered by **Ismael Hernández,** head of the thermohydraulics and simulation section at EAG, analyzed the impact of reverse flow in the pressure suppression system of the ITER vessel. This study, a clear example of the significant contribution of simulation to engineering, led to the modification of the initial design of the steam suppression system to install non-damped valves as close as possible to the ITER steam distributor.
Finally, **Ignacio López Entrena,** a mechanical engineer at EAG, presented an analysis and monitoring study on power cycle performance using ECOSIMPRO. This study highlights the capabilities of ECOSIMPRO and the THERMAL_BALANCE module to model power blocks with different configurations and operating modes. The models, properly fed with real data, allow for improved preventive maintenance of equipment and, therefore, better cycle performance.

SESSION 8 COMMUNICATION AND TRAINING: COMMUNICATION (I)

In the context of the planned closure schedule for the Spanish nuclear fleet established in the PNIEC, Cristina Domingo, from the Board of Directors of Jóvenes Nucleares, presented the campaign "Save Almaraz", which aims to raise awareness about the need to extend the operation of this plant beyond the currently scheduled period. 2024 is a key year, and Jóvenes Nucleares has an inherent interest in the long-term future. This initiative includes a wide range of activities aimed at the general public and key stakeholders, with a special focus on those in the plant's surrounding area.

Christian Schönfelder leads the European Union's ENEN2plus project, which aims to develop and strengthen nuclear competencies through education and training initiatives. To support these activities, NUCLEATION was created—a professional training community aimed at educational institution leaders and Human Resources professionals. Its main goal is to quickly and effectively collect and disseminate competencies, experiences, and challenges related to professional training through joint activities, discussions, information sharing, and relationship building.

The fight against climate change and the growing demand for energy pose a great challenge for humanity and require coordinated action from all organizations. This challenge cannot be addressed from a reductionist perspective, as it is a multifactorial and highly complex issue. In our sector, ensuring that nuclear energy secures the place it deserves in the future energy mix—as a technology that guarantees supply and does not emit atmospheric pollutants—will be crucial. GD Energy Services, as a service company for the energy sector, has historically sought to integrate these criteria into its growth plan. **Julián Mendoza** presented the model and process they have used to align their business strategy with the United Nations' Sustainable Development Goals (SDGs).

Vanessa García
PRESIDENT

Laura Gala
COORDINATOR

Alicia López, from Foro Nuclear, introduced us to the world of Artificial Intelligence and its various applications in the field of communication. This "silent revolution" is transforming how messages are constructed and transmitted by organizations, bringing great opportunities as well as ethical and legal challenges. Personalized content generation and sentiment analysis are just some of the many tools that generative Artificial Intelligence, in its latest evolution, offers, making it a powerful ally in improving understanding and acceptance of a highly topical and controversial issue like nuclear energy.

Pau Aragón, vice president of Jóvenes Nucleares, reviewed the recent intense activity of this group of enthusiastic volunteers. Another year of breathing science and nuclear technology, unraveling their complexity to make them understandable and accessible to all, always with full transparency and rigor. Another year of meeting and far exceeding their goals, attracting an increasingly broad and diverse audience. They have achieved this thanks to the quantity and quality of the activities organized, as well as the effort, commitment, and involvement of all those who are part of this movement.

SESSION 9 NUCLEAR MEDICINE AND RADIOLOGICAL PROTECTION (II)

The second session dedicated to NUCLEAR MEDICINE AND RADIOLOGICAL PROTECTION featured six presentations, covering a broad range of topics.

The first presentation was titled "ARCON vs. PAVAN: Application of Regulatory Guide 1.249 for Realistic Calculation of Atmospheric Dispersion Factors in Accidents", presented by **Belén Martínez Carmona** from EAG (Empresarios Agrupados - GHESA). The objective of this presentation was to conduct a comparative study between ARCON96 and PAVAN to assess the conservatism of PAVAN, as previously suggested by the NRC. This analysis evaluates the impact on doses in design-basis accidents depending on which code is used based on the distance to the receptor.

Andrés Felipe Martínez
PRESIDENT

Elisa Gil
COORDINATOR

Next, **Karen A. Guzmán-García** from ENUSA presented "Radiological Characterization of Operational Waste from a PETtrace Cyclotron", which outlines the methodology for radiological characterization of cyclotron waste. Given the limited references available on this topic, this presentation was of great interest.

The third presentation, titled "Effect of Using ICRP116 Effective Dose Rate Conversion Factors on Dose Rates Calculated for the Individualized Temporary Storage Facilities (ATI) of Almaraz and Trillo NPPs", was delivered by **José Luis Cormenzana** from Empresarios Agrupados Internacional. This presentation addressed the differences between particle flux-to-dose rate conversion factors from ICRP Publication 74 and ICRP116, as well as their implications for the Individualized Temporary Storage Facilities (ATI) at Almaraz and Trillo.

The next presentation was given by **José Francisco Benavente Cuevas** from CIEMAT and was titled "Correlation Between Optically Stimulated Luminescence Response and a Monochromatic Beam: Preliminary Results via the Photo-Stimulation Cross Section". This presentation studied the photo-stimulation cross-section as a significant variable for characterizing the luminescence response in crystalline materials, analyzing its correlation with OSL response modulation under the influence of a monochromatic light beam.

The fifth presentation, titled "Determination of 226Ra Activity Concentration Using Gamma Spectrometry from the 186 keV Peak with a Neural Network Developed in Python", was again presented by **José Francisco Benavente Cuevas.** This study proposed the direct determination of 226Ra activity concentration from the 186 keV peak using gamma spectrometry, correcting for 235U interference through mathematical methods based on neural networks.

Concluding the session, **Mireia Pérez-Baeza** from the Environmental Radioactivity Laboratory at the Universitat Politècnica de València presented "Static or Personal Air Filters in the Ceramic Industry? Determination of Uranium and Thorium in Air Filters and Comparison with Activities Found in Raw Materials". The objective of this study was to compare activity levels in raw materials and intermediate products with airborne dust captured using two different types of filters: static pump air filters and personal pump air filters, to determine the best estimation of internal dose to workers based on the calculation hypotheses used.

In summary, the session was well attended, with the room nearly full. All speakers presented within their allotted time and at a high didactic level, making each presentation highly interesting. As a result, multiple questions and debates arose among the attendees.

SESSION 10 ENGINEERING, DESIGN AND INNOVATION (II)

Session 10, "Engineering, Design, and Innovation (II)", featured six engaging presentations related to engineering and innovation applied to nuclear power plants, covering various aspects of electrical and instrumentation and control installations.

The session began with a presentation by **Francisco Jesús Rey Fandiño** from Westinghouse, titled "BARRIERS BETWEEN ELECTRICAL CIRCUITS TO ENSURE INDEPENDENCE THROUGH PHYSICAL SEPARATION REQUIRED BY IEEE 384." The presentation detailed the design criteria for physical barriers to meet the independence requirements for circuits and electrical equipment as defined in IEEE 384, developing standardized conduit and support designs.

Next, **Carlos Martín Gutiérrez** from Hitachi Energy presented a talk titled "LIFE CYCLE ASSESSMENT AND SUSTAINABILITY OF GENERATOR STEP-UP TRANSFORMERS." The presentation examined the global warming potential (GWP) of GSU transformers under different usage scenarios and throughout their entire lifespan. Various strategies were also presented to reduce the carbon footprint, enhance circularity, and improve the safety of these components.

The next presentation, titled "ELECTROMAGNETIC IMPACT OF MOBILE COMMUNICATION EQUIPMENT

Vicente Alvarado
PRESIDENT

Ana Belén Saez
COORDINATOR

IN NUCLEAR POWER PLANTS," was given by **Diego Fernández Olombrada** from EAG (Empresarios Agrupados - GHESA). His presentation highlighted the electromagnetic impact caused by mobile communication equipment, determining the exclusion distances that must be maintained to prevent interference between mobile devices and the plant's safety equipment susceptible to such impact. The analysis considered the limits set by Spanish and European regulations for WiFi and Bluetooth protocols.

Following this, **Alejandro González Martín** from EAG (Empresarios Agrupados - GHESA) presented a talk titled "REDUCING UNCERTAINTY IN LEVEL MEASUREMENT IN THE REFUELING CAVITY OF THE ALMARAZ NUCLEAR POWER PLANT." The presentation covered design modifications made to the instrumentation controlling the reactor cavity level at Almaraz Nuclear Power Plant during refueling outages to achieve lower measurement uncertainty. The new differential pressure level transmitter, which measures level in the upper narrow range, significantly reduced the uncertainty associated with the measurement compared to the existing transmitter.

The fifth presentation was delivered by **Cristina Corrales** Quirós from EPRI and titled "ANNUAL REVIEW OF OPERATING EXPERIENCE IN THE INSTRUMENTATION AND CONTROL AREA." This presentation described the methodology EPRI used to prepare new industry guidelines based on operational experience to help manage the lifecycle of Instrumentation and Control (I&C) systems. The project team analyzed over 2,300 plant events and operational experiences related to failures in digital instrumentation and control systems. Trends, key aspects, lessons learned, and best practices were identified and will be included in an upcoming publication.

Finally, **Luis Rejas López** from Westinghouse presented a talk titled "REVERSE ENGINEERING FOR VOLTAGE CONDITIONERS AT TEMELÍN NUCLEAR POWER PLANT." The presentation described solutions implemented to address the challenge of finding replacement parts for voltage conditioners at Temelín Nuclear Power Plant Units 1 and 2, following the manufacturer's disappearance. The reverse engineering process was outlined, along with the validation methodology used for these new components.

The presentations were of high quality and interest, adhering to the scheduled time. A Q&A session was held, allowing all participants to engage in discussions.

SESSION 11 NUCLEAR SAFETY AND LICENSING (II)

In this session, the speakers presented seven talks, all related to nuclear safety, covering activities carried out in our sector to ensure increasingly safer installations through a continuous approach to defense in depth, a questioning attitude, and ongoing improvement.

The first presentation focused on the systematic update, verification, and validation of time-critical human actions according to the TCA/TSA (time critical actions / time sensitive actions) program described in PWROG-16030 at ANAV nuclear power plants.

The next presentation discussed the classification of SSCs (structures, systems, and components) of Spanish nuclear power plants according to the Nuclear Safety Regulation (RSN). This classification takes into account their role in nuclear safety based on their function, integrity, and the consequences of their failure or damage.

Next, a collaboration between the OECD/NEA and TVA-WATTS BAR UNIT 1 was presented, which aims to generate valuable information on the impact of the neutron fission source in fluence analysis. This research could help the international community adopt best practices for fluence assessment in reactor vessels.

The fourth presentation focused on the treatment of initiating events caused by spurious equipment actions induced by fire within the scope of fire PSA (Probabilistic Safety Assessment). Specifically, it described how these events are addressed in the fire PSA of the Ascó NPP, based on the methodology outlined in NEI 00-01 and NUREG/CR-6850, and using, for specific cases, scenario simulation in the full-scope simulator of Ascó NPP.

The fifth presentation, also within the context of the fire PSA at Ascó NPP, focused on handling one of the failure mechanisms of associated cables and circuits—hot

Rafael Martín
PRESIDENT

Mónica García
COORDINATOR

shorts. This analysis was conducted following the methodology described in NEI 00-01 and NUREG/CR-7150.

The next presentation illustrated the methodology for analyzing electrical circuits and its importance in identifying the main failure modes that could occur in the equipment responsible for ensuring plant safety due to fire-induced damage, again based on the methodology outlined in NEI 00-01 and NUREG/CR-6850.

Finally, the session concluded with an interesting presentation on Ukraine's Zaporizhzhia Nuclear Power Plant (ZNPP), which was militarily occupied by Russia in March 2022 and remains a military target in the ongoing war in Ukraine—an unprecedented situation for which the international community was unprepared. This new reality presents both technical and legal challenges on a global scale.

Attendance was excellent, and I would like to highlight the strong participation of attendees, who contributed to generating interesting debates and questions that further enriched the session.

SESSION 12 QUALITY AND HUMAN FACTORS (I)

Pilar Almeida
PRESIDENT

Joaquín Hernández
COORDINATOR

During the first technical session dedicated to Quality and Human Factors, which was attended by 25 people, a total of six presentations were given.

Montserrat Fernández (CNAT) presented "Leadership, a Key Lever to Advance Towards Constructive Organizational Cultures". In her presentation, she explained one of the work lines resulting from the analysis of a series of incidents that occurred at CN Trillo, conducted by a multidisciplinary team, which focused on leadership reinforcement: the LICO Leadership Improvement Program (Constructive Leadership). This program is based on the premise that the most powerful lever to improve an organization's culture is leadership. She detailed the improvement activities carried out in this program, which develop the most important selected skills through engaging materials. These include short training capsules, a recognition app, discussion groups, daily motivational quotes, and other ongoing micro-learning activities that facilitate a sustained change over time.

The second presentation, "Conducting Simultaneous Audits Between Nuclear Power Plants for Quality Functions: Benefits and Comparison of Best Practices", was delivered by **Juan Manuel Ávila** (CN Cofrentes) and Xavier Codina (ANAV). They explained a pilot experience conducted in 2023, which involved the simultaneous and reciprocal execution of independent internal audits of the Quality functions of their own organizations (ANAV and CNC). This initiative provided a more critical and independent perspective on the audited areas. The participation of managers from each plant as part of the audit team allowed them to understand different working methodologies, compare areas for improvement, and establish best practices, thus strengthening synergies during the evaluation process. The results of both audits were presented to the Nuclear Safety Committees of both plants, receiving very positive feedback.

Marta García (ENUSA Industrias Avanzadas) presented "The Quality of Pellets: A Critical Factor in Fuel Performance". She explained the certification process for uranium oxide pellets, which are a crucial component of nuclear fuel, focusing on the physicochemical analyses performed on the product. To conduct these tests, ENUSA has laboratories equipped with state-of-the-art analysis technology, covering spectrometry, materialography, and elemental analysis. The accuracy and traceability of the results are ensured by strict compliance with quality regulations. The pellet certification process is based on the comprehensive evaluation of laboratory data, production line inspections, and full traceability of each pellet batch's manufacturing process.

Following this, **Javier Cámara** (ENUSA Industrias Avanzadas) explained "Process Optimization for Improving the Quality of Uranium Pellets: Implementation of NO-CODE Development Tools". He detailed that the Juzbado Fuel Assembly Factory manages a large amount of computerized data, which had not been migrated into an analyzable format due to technical challenges. The goal of this project was to create an automated data flow using NO-CODE development tools and artificial intelligence, allowing the compilation of all historical and current parameters from the UO2 powder certificates—the primary component in uranium pellet manufacturing. This development has enabled applications such as trend analysis of physicochemical properties of uranium pellets, cross-data analysis between raw material parameters and final performance, and early detection of potential anomalies that could affect quality and production yields.

Eva Orejuela (SGS Tecnos) delivered the fifth presentation, "Application of Dashboards in Data Analysis for the Nuclear Industry", explaining how companies can transform raw data into meaningful information and actionable insights. The objective of her presentation was to demonstrate how these visual control panels can be applied in the nuclear industry, particularly in Quality Assurance. She presented results from monitoring inspections carried out by Quality Assurance personnel during a refueling outage, tracking deviation types, supervised units, inspection ratios, and deviations per supervisor. The presentation demonstrated how, once the data is collected, dashboards allow real-time data analysis and decision-making, making them a powerful tool for improving safety, efficiency, and reliability in nuclear facilities.

Finally, **Julen Arteaga** (ANAV) presented "Digitization of the Historical Archive: A Success Story". He detailed the process conducted between 2019 and 2024 at ANAV, which involved the digitization of historical paper-based archives and other formats from various sources and time periods. The project was completed at the beginning of 2024, providing valuable insights and conclusions for organizations with large historical archives that may undertake similar initiatives.

MANSERVA
TECNOLOGÍA

CALIDAD Y EXPERIENCIA AL SERVICIO DEL SECTOR NUCLEAR

Automatización de sistemas de elevación

Ingeniería inversa, fabricación de equipos a medida

Laboratorio electrónico propio

MANTENIMIENTO DE MÁQUINAS ROTATIVAS

MANTENIMIENTO DE ELECTRÓNICA DE POTENCIA

DEDICACIÓN DE COMPONENTES DE GRADO COMERCIAL

www.manserva.com

manserva@manserva.com

983 208 722

CERTIFICATION SYSTEM ISO 45001 · CERTIFICATION SYSTEM ISO 14001 · CERTIFICATION SYSTEM ISO 9001

SESSION 13 APPLICATION OF ADVANCED ULTRASONIC FOCUSING TECHNIQUES (FMC-TFM) FOR NON-DESTRUCTIVE EVALUATION

Advanced focusing techniques, such as Full Matrix Capture (FMC) and Total Focusing Method (TFM), process ultrasonic signals after acquisition using image reconstruction algorithms, allowing focusing on the entire volume of interest rather than just a single focal point, as in conventional inspection techniques or Phased Array.
Through this technology, inspection techniques are obtained with less complex calibration processes (compared to Phased Array), improving the resolution of detected indications.
Due to the large amount of data processed, detailed information about the nature, size, and position of indications is obtained.

Jorge Martínez
PRESIDENT

David Soro
COORDINATOR

IMPROVEMENT AND OPTIMIZATION OF THE EXTRACTION DUCT CLEANING PROCESS

Developed by a Quality Operational Group (GOC) composed of experts in nuclear safety, radiation protection, and equipment maintenance, an improvement and optimization of the cleaning process for the extraction system ducts in the ceramic zone of the manufacturing process has been achieved.
The new method for defining the cleaning plan is based on the use of predictive calculations based on real historical data, reducing the number of planned cleanings by 53% over a 10-year period.
The data collected during the cleanings will be used to empirically optimize subsequent cleaning plans, ensuring that the plan remains dynamic and adapted to real conditions.
Additionally, the cleaning equipment nozzle has been redesigned to be more effective in the areas with the highest accumulation.

LIMITS TO FLEXIBLE OPERATION DERIVED FROM AEFT DURING LONG-TERM OPERATION

The transition of nuclear power plants into the Long-Term Operation (LTO) period requires, among other analyses, the identification and resolution of Time-Dependent Aging Analyses (AEFT).
These AEFTs, many related to fatigue or neutron embrittlement, are design calculations originally intended to cover the 40-year design life of the plant and must now be evaluated and revalidated for the new 60-year LTO period, taking into account the plant's operating conditions.
The current circumstances of the electricity market lead plants to consider modifications in their usual mode of operation, implementing Flexible Operation, which involves load reductions outside of refueling shutdown periods. These reductions may vary in load levels and frequencies, ranging from daily partial load reductions to cold or hot shutdowns for a specific period, which can last for weeks or even months.
For this reason, it is necessary to verify whether the previously resolved AEFTs remain valid, considering that the operation modes will change, leading to variations in the conditions initially considered.

PLANNING AND WORK MANAGEMENT PROCESS AT VANDELLÒS II NUCLEAR POWER PLANT: DEVELOPMENT OF THE CYCLE PROGRAM (ANAV)

At ANAV, a document called the "Cycle Program" has been developed, which allocates work activities over an 18-month operation cycle.
This program includes: Preventive maintenance tasks, Surveillance tests, Design modification activities to be executed during the entire operation cycle.
This document is vital for work management within ANAV and serves as an essential tool for the effectiveness of the 13-week management process, ensuring reliability and compliance.

DIGITAL TRANSFORMATION: APPLICATION OF AI IN CONCRETE STRUCTURE INSPECTION

As part of ANAV's Digital Transformation Project, work has been done on the integration of Artificial Intelligence (AI) applied to the inspection of concrete structures, using remote inspection methods (drones) and data processing, replacing traditional direct visual inspection.
The Proof of Concept was conducted at CN Ascó 2, inspecting the containment wall, as required by the Technical Operating Specifications.
The evaluation consists of three phases: Data collection using drones as a remote visual inspection tool. Classification and filtering of indications (spalling, breaks, flaking, cracks, length, etc.) using AI techniques. Data processing for evaluation and reporting on the structure.

SESSION 14 DECOMMISSIONING AND WASTE MANAGEMENT (II)

In this session, interesting presentations were given related to alternatives for the conditioning of problematic radioactive waste, factors affecting the long-term behavior of radionuclides in bentonite repositories, carbon steel corrosion in bentonite, the revalorization of materials recovered from fuel reprocessing, and the management of large metallic components from decommissioning, among others.

The presentations are summarized below:

Óscar González
PRESIDENT

Esperanza Lara
COORDINATOR

Íñigo Vildosola Hernández *(ANV). Solidification of Wet Sludge in CN Vandellós II.*
Maintenance activities in radiological areas generate wet sludge that cannot be processed through the plant's system. These wastes, stored in drums, lack a defined management strategy. Three alternatives are proposed: solidification with mortar, polymerization for incineration, or storage. Although the use of flocculants was considered, their effectiveness was limited, leading to the choice of polymerization after a preliminary treatment. Results of tests with absorbent polymers are presented.

Manuel Mingarro Sainz-Ezquerra *(CIEMAT). Influence of EDTA and Citric Acid on the Adsorption and Diffusion of Sr, Co, and Eu in Compacted Bentonite.*
Adsorption in radioactive waste storage barriers is crucial to delay radionuclide migration. Organic ligands such as EDTA and citric acid affect their mobility. This study analyzes the adsorption and diffusion of 85Sr, 60Co, and 152Eu in FEBEX bentonite. It was observed that EDTA significantly reduces the adsorption of 60Co and 152Eu, increasing their diffusion coefficient.

Álvaro Romero Salido *(CIEMAT)*. Diffusive Behavior of Anionic Radionuclides in *FEBEX* Compacted Bentonite.
The barrier of a Deep Geological Repository (DGR) consists of compacted bentonite, which has low permeability, allowing radionuclide transport only by diffusion. This study analyzes the diffusion of anions compared to HTO, using two methodologies. It was found that the apparent diffusion coefficient (Da) increases with saturation and temperature and decreases with compaction density.

Marta López García *(Amphos 21). Geochemical, Experimental, and Modelling Study of Aptian Sands Under Natural and Alkaline Conditions.*
This study investigates the influence of a hyperalkaline plume on Aptian sands, used in the Low-Level Radioactive Waste Storage Center (CSA). The sands were characterized under natural conditions and simulated alkaline environments due to cement barriers. Short- and long-term experiments were conducted, concluding that the hyperalkaline plume primarily alters clay phases, affecting quartz to a lesser extent. Additionally, the retention of Sr, Ni, and U was studied.

Olga Riba Tort *(Amphos 21)*. Reactive Transport Model of Carbon Steel Corrosion Under Compacted Bentonite Conditions.
Geological nuclear waste repositories use the "multiple barrier principle" to ensure long-term safety, employing carbon steel containers for spent nuclear fuel. Corrosion processes such as mechanical failure due to hydrogen gas and degradation from chemical changes are studied. Gamma radiation also affects the container's surface, generating oxidants that may accelerate corrosion.

Marc Altes i Soler *(IDOM)*. *Capture, Segregation, and Revalorization of Radioactive Waste During Pyrometallurgical Reprocessing.*
The reprocessing of irradiated nuclear fuel with molten salts is under development, along with new techniques for radioactive waste management. IDOM presents systems for capturing and revalorizing these wastes, analyzing management strategies for gases, liquids, and solids. The goal is to minimize emissions and recover valuable elements, with significant economic potential, reaching up to $85,000 per ton of processed fuel.

Hugo Mejía *(Cyclife Group EDF). Waste Management Facilities for Large Components Dismantling.*
Cyclife, a subsidiary of EDF Group, has developed the Technocentre in France for the dismantling and recycling of large nuclear components, such as steam generators. This facility, equipped with advanced technology, can process 12 to 18 generators per year, minimizing waste and radiation exposure. Additionally, it enables the recycling of more than 400,000 tons of steel, significantly reducing energy consumption and carbon emissions.

SESSION 15 THERMOHYDRAULICS AND NEUTRONICS: SIMULATION AND EXPERIMENTATION (III)

The session started punctually at 17:00 and lasted until 18:15 with the presentation of five papers.

Attendees and speakers were informed at the beginning of the session about the order and format, as well as the applicable regulations for scoring and selecting the best thematic presentation.

The order and content of the presentations during the session were as follows:

Sofía Arfinengo del Carpio, from the Polytechnic University of Madrid (UPM), presented "Analysis of Main Steam Line Break Using the 3D Containment Model of the Almaraz Nuclear Power Plant in GOTHIC 8.3 (QA)."
Numerous studies have been conducted on thermal hydraulics in accidental scenarios, particularly on the Main Steam Line Break (MSLB) and Loss of Coolant Accident (LOCA) events. However, literature on MSLB is scarce, especially in 3D analysis. MSLB sequences can generate critical temperature conditions due to superheated steam. This study analyzes an MSLB event using a 3D containment model of the Almaraz plant, focusing on thermal and hydraulic parameters to evaluate its behavior.

Carlota Gabicagogeascoa Cuesta, from the Polytechnic University of Madrid (UPM), presented "Analysis of a Polydisperse Droplet Size Distribution in a Sprinkler System Using the GOTHIC Code."
During a severe accident in a nuclear plant, the oxidation of fuel cladding can generate hydrogen, which, when mixed with steam and air, can form a flammable mixture. The activation of the containment spray system can mitigate this risk by enhancing gas mixing, although in certain conditions, it can reduce steam, favoring combustible mixture formation. Therefore, it is crucial to study spray system performance to assess hydrogen combustion risk. The efficiency of the spray system depends on the size of the injected droplets, which can be monodisperse or polydisperse. In the GO-MERES 2 project, the GOTHIC code was used to simulate the spray system, comparing both size distributions and validating the code's ability to replicate experiments conducted at the PANDA facility.

Alberto García Herranz, from the Polytechnic University of Madrid (UPM), presented "Analysis of the Implementation of an Air Cooling System in a 3D Containment Model of a PWR-W Using the GOTHIC 8.3 (QA) Code."
In severe accident scenarios, conditions within containment may compromise its integrity as a barrier against the release of radioactive material. To prevent this, cooling and depressurization systems, such as fans and sprays, are integrated

Carlos Gómez
PRESIDENT

Ismael Hernández
COORDINATOR

and analyzed through simulations with thermal-hydraulic codes like GOTHIC. This project evaluates thermal-hydraulic conditions in a PWR-W containment design, introducing a preliminary fan-based cooling design and analyzing its impact on flammable gas distribution.

Luis Serra López, from the Polytechnic University of Madrid, presented "STUDY OF CONTAINMENT ATMOSPHERE UNDER SEVERE ACCIDENT CONDITIONS IN A PWR-KWU 3D MODEL WITH GOTHIC 8.3 FOR COMBUSTION RISK ASSESSMENT."
During a severe accident in a nuclear plant, complex phenomena occur that may threaten the integrity of the containment building, particularly due to hydrogen generation. This project focuses on assessing the combustion risk in a PWR containment, developing a full-scale 3D model for the PWR-KWU design, and simulating an SBO (Station Blackout) scenario with hydrogen generation. The results revealed hydrogen accumulations in isolated compartments that were not predicted by previous simulations, highlighting the importance of detailed analysis to identify hotspots and mitigate combustion risk.

Araceli Domínguez Bugarín, from the Polytechnic University of Madrid, presented "Validation of the PARUPM-GOTHIC 8.3(QA) Code Coupling Against PAR Recombination Experiments HR-2 and HR-12 Performed in the THAI Facility."
In the event of a severe accident in a nuclear plant, large amounts of hydrogen can be generated, potentially leading to combustion events if flammable concentrations are reached. To mitigate this risk, many containments are equipped with Passive Autocatalytic Recombiners (PARs), which combine hydrogen with oxygen, producing steam and thereby reducing the combustion risk. This project aims to enhance experimental understanding and simulation capabilities for managing H2/CO combustion risk by developing a coupling between the PARUPM code and GOTHIC. This coupling allows for analyzing the interaction between PAR

operation and containment atmosphere, with simulations validating the coupling's ability to reproduce observed recombiner behavior.
The session proceeded smoothly, with a brief Q&A session (5 minutes) after each presentation. The speakers adhered to the 10-minute presentation time, and the audience followed the session with great interest, engaging in lively discussions after the presentations. Attendance varied throughout the session, with an estimated average of 25 attendees.
The equipment and facilities were adequate, and the technical level of the session was high, with all speakers meeting the expected quality standards for the presented works.

SESSION 16 ADVANCED REACTORS AND NUCLEAR FUSION (I)

The first session on Advanced Reactors and Nuclear Fusion brought together four prominent speakers who addressed innovative and critical topics for the future of nuclear energy.
Gamón Navarro presented a comprehensive study on the "Neutron Transport Equation in Small Modular Molten Salt Reactors." In his presentation, he compared the results obtained from the transport equation with diffusion and simplified spherical harmonics approximations in a hexagonal small modular molten salt reactor (SMR), demonstrating how these approximations affect the accuracy and reliability of calculations in this advanced technology.
Elena Fernández continued the discussion on molten salt reactors by detailing the activities of the safety department in the design of the THORCON 500 reactor. She presented the safety studies conducted to consolidate its systems, highlighting the inherent challenges of ensuring the stability and safety of this innovative reactor technology under extreme conditions. These safety studies are fundamental for advancing toward the commercialization of molten salt reactors, which promise greater efficiency and lower environmental risks.
David Álvarez discussed the development of Westinghouse's eVinci microreactor, the first commercial application of the heat pipe reactor concept. He provided a detailed explanation of the technological innovations implemented to overcome the design challenges of this compact reactor, which integrates an advanced core, passive safety systems, high-efficiency heat pipes, and an innovative fuel.

Marta Vázquez
PRESIDENT

Rubén Moreno
COORDINATOR

He also highlighted the construction of its first test facility at the Idaho National Laboratory (USA), a key milestone in the development of this technology, which offers a modular and autonomous nuclear option for remote locations.
Finally, **Javier Gallo** presented the talk "The Contribution of Fusion Energy to Medicine: Medical Radioisotopes," where he explored the potential of fusion energy for producing radioisotopes for the medical sector. He specifically focused on radioisotopes obtained at the IFMIF-DONES facility, such as molybdenum-99 (Mo-99), which is essential in nuclear medicine. Javier Gallo detailed the conceptual designs for the production of these isotopes, demonstrating how advances in nuclear energy can have crucial applications beyond power generation, opening new avenues for medical treatment and diagnostics.

SESSION 17 ENGINEERING, DESIGN AND INNOVATION (III)

Room 4 of the Córdoba Convention Center hosted Technical Session 17, dedicated to Engineering, Design, and Innovation. Four presentations were scheduled for this session, each contributing improvements and innovations implemented in nuclear facilities such as ANAV and ITER.
The session began with a presentation by **David Martínez Veciana,** who introduced his "Action Plan for Improving the Management and Reliability of SPV in ANAV." With clarity and precision, David described the importance of proper management of Single Point Vulnerability (SPV) components for the safety and efficiency of the plant. Specifically, he emphasized the need to identify, reference,

Manuel Sáinz
PRESIDENT

Lustolde Martínez
COORDINATOR

and assess these components to determine whether they should be eliminated or mitigated. He concluded his presentation, within the allotted time, by describing the current state of the strategy being implemented at ANAV, which is expected to further minimize reactor trips. The presentation was followed by several interesting questions from the audience, which allowed for a deeper discussion on the importance and safety of SPVs.

Next, **Javier Peláez Moreno** took the floor with his presentation on "Economic Management of Investment Projects in ANAV: A Systematic Approach for Coordination and Efficiency." Javier highlighted the need for a centralized economic management system within ANAV's Organizational Planning Unit, which would allow better coordination among the various departments involved in projects. Using practical examples, he demonstrated how transparency with project management and a well-structured financial planning platform can be the determining factor in the success or failure of an investment. As with the first presentation, attendees asked several questions and shared their own experiences.

The third presenter, **Antonio Fernández San Martín,** was unable to attend the session, but his colleague **Javier Peláez Moreno** presented his talk titled "CM Process in ANAV: Monitoring and Control Indicators." Javier provided insights into Configuration Management (CM) at ANAV, emphasizing the importance of establishing clear quality, deadline compliance, and efficiency indicators for tracking the process. His proposal was not only theoretical but also included practical tools implemented at ANAV to facilitate adaptation to changes and continuous improvements.

Finally, **Miguel Allegue Arcones,** who was scheduled to present "Overview of the Qualification Programs for ITER Emergency Power Supply Systems - TB13," was also unable to attend the session. His presentation was reassigned to a later technical session.

SESSION 18 NUCLEAR SAFETY AND LICENSING (III)

The session began with a presentation by Belén Martínez (EAG), where she described the update to the new revision of Regulatory Guide 1.78 for the analysis of control room habitability in the event of the accidental release of toxic products using HABIT. The latest updates for evaluating the release of hazardous chemicals with the HABIT 2.2 code were presented, particularly focusing on the capabilities of its EXTRAN and CHEM modules.

The next presentation was delivered by **Rafel Miró** (Polytechnic University of Valencia), describing the 3D modeling of a KWU-Konvoi nuclear reactor for criticality analysis using KENO VI. The generated model allows for Monte Carlo simulations to analyze reactor criticality and neutron flux at the rod level, as well as fuel burnup calculations.

Following this, **Cristina Domingo** (Westinghouse) provided a significant update on the current development status of a Probabilistic Safety Assessment (PSA) for an AP300 SMR. This design benefits from extensive operational experience, as it is fundamentally based on the AP1000® plant. The presentation covered the work done so far and the next steps in the PSA development.

Raquel Velasco (ANAV) presented the X-ray backscatter seal inspection system and the injection of silicone foam for filling identified gaps. The tests conducted at GDES

Vicente Nos
PRESIDENT

Alberto Guillén
COORDINATOR

facilities in Valencia, using mock-ups, were detailed, as well as subsequent applications on several seals in both units of the Ascó Nuclear Power Plant. The planned action roadmap was also presented, following the favorable results of the conducted tests.

Finally, the session concluded with a presentation by **Mónica García** (CIEMAT), which described how the availability of different passive safety systems would influence the accident progression in an iPWR (300 MWe) reactor design.

SESSION 19 FUEL (I)

This first session on fuel focused on spent fuel, addressing various aspects of its characterization, management, handling, and storage.

The first presentation was delivered by **Ibón Suárez** and **Cristian Garrido** from IDOM, titled "NEUROFUEL: The Use of Artificial Intelligence in Criticality Calculations for Spent Fuel." The objective is to design a neural network that accelerates the process of criticality calculations for

containers and, alongside an optimization algorithm, optimizes the loading of capsules for final storage.
The second presentation was given by **Rafael Sánchez** from NATURGY, titled "USE OF THE HCC TOOL IN THE CONFIGURATION OF LOADING PLANS FOR THE ENUN32P CONTAINER." He introduced the tool, which simulates and executes different spent fuel (SF) loading proposals in various licensed containers, based on the characteristics of the SF, container limitations, the Individualized Temporary Storage Facilities (ATI), and loading schedules.
Mario Gómez from ENUSA presented the third talk, titled "CONDITIONING OF SPENT FUEL WITH A DEFORMED SPRING AT VANDELLÒS II NPP." After an exhaustive technical evaluation to enable the handling of the spent fuel, a solution based on shearing was developed. This involved designing a set of specific tools and adapting a hydraulic shear to perform an underwater cut of the spring. After cutting the spring, the spent fuel regained its fully manageable condition without restrictions.
Lastly, **Lluis Batet,** professor of nuclear engineering at UPC, presented the study "OPTIMIZATION OF SPENT FUEL POOL EMPTYING." The research investigates the optimization problem of emptying the spent fuel pool (SFP) after plant shutdown, taking into account container loading campaigns during plant operation.
The session had a large audience and an interesting question and answer session.

Pablo León
PRESIDENT

Francisco Feria
COORDINATOR

SESSION 20 DISMANTLING AND WASTE MANAGEMENT (III)

Eva María Márquez Franco (CIEMAT) - GRACO Project: Conditioning and Treatment of Irradiated Graphite for Storage in El Cabril Facility Cells.
The objective of this work is to study different treatment and conditioning options for graphite from Vandellós-1. Various matrices (cement and geopolymers) are examined to determine which provides the best structural integrity in the future, ensuring that the graphite remains encapsulated and preventing radionuclide release.
Alejandro Araujo Uzabal (WESTINGHOUSE) - Aluminum Interaction Mechanisms Related to the Storage of Low and Intermediate-Level Waste (LILW).
The hydraulic binder used for immobilizing radioactive waste contains alkaline pores, which, when in contact with aluminum (present in heterogeneous, non-compactable radioactive waste), can generate hydrogen within containers and storage units. Corrosion tests, weight loss measurements, and hydrogen generation studies were conducted on samples with different mortar types. The analysis of aluminum corrosion rates will help establish restrictive criteria and recommendations.
Carlos Jesús Gálea Barrena (WESTINGHOUSE) - Storage of Very Low-Level Waste (VLLW): Equipment and Components (E&C).
This presentation describes the documentary process for the acceptance of equipment and components (E&C) generated in nuclear facilities and managed as radioactive waste, which cannot be stored using standard packaging due to their size and weight. The methodology was applied to E&C from the ARBI research reactor, concluding that they meet acceptance criteria for storage in dedicated facility cells.
Esperanza Lara Robustillo (CIEMAT) - Results Obtained by CIEMAT in the PREDIS Project on the Immobilization of Organic Liquid Waste.
The PREDIS project aims to develop and improve treatment and conditioning options for low and intermediate-level radioactive waste for which no industrially developed solutions exist. These include metallic waste, organic liquid waste, and organic solid waste. CIEMAT presented results on mechanical resistance and leaching studies with geopolymers, using metakaolin as a precursor and potas-

Manuel Ondaro
PRESIDENT

Eduardo Serra
COORDINATOR

sium silicate solutions as an activator, applied to scintillation liquids and industrial oil.
Marc Altés i Soler (IDOM) - Operational Decontamination of a Neutron Irradiation Facility.

This presentation described new techniques and strategies for decontaminating a neutron irradiation facility during its operation, facilitating decision-making processes for decontamination tasks.

SESSION 21 THERMOHYDRAULICS AND NEUTRONICS: SIMULATION AND EXPERIMENTATION (IV)

This session, focused on simulation and experimentation in the field of thermohydraulics and neutronics, brought together both renowned experts in the sector and young talents. In the short time available for their presentations, the participants clearly and concisely shared their knowledge and the results of the work they and their collaborators had carried out over a long period. The session provided an opportunity to learn about the latest developments and research related to simulation codes and technologies applied to the complex thermohydraulic and neutronic processes inherent in nuclear power reactors.
Here, we explored advancements in topics as diverse as: The application of artificial intelligence to the design and validation of reactor core loading patterns in light water reactors. The use of neural networks for optimizing reactor core configurations. The implementation of tools that optimize calculation times in core design. Various modeling techniques for Small Modular Reactors (SMRs). The use of reduced-order models in nuclear reactor design processes.
The high level of audience engagement and participation during the Q&A sessions demonstrated the strong interest generated by the presentations. The open debate format allowed for clarifications and additional contributions.

Pablo Rey
PRESIDENT

Rafael Sánchez
COORDINATOR

From the session organizers, we would like to thank the speakers and the audience for their participation. Their contributions enhanced the dissemination and consolidation of knowledge within the Spanish nuclear sector, an area that demands a high level of specialization.
Currently, there is high demand for qualified professionals in this field, which is crucial for the development of commercial nuclear power reactors, a sector that is expanding globally. Without a doubt, this expansion will play a key role in the decarbonization of the planet, which is essential to tackle the increasingly evident challenges of climate change.

SESSION 22 ADVANCED REACTORS AND NUCLEAR FUSION (II)

The second session on Advanced Reactors and Nuclear Fusion focused on nuclear fusion and maintained a balanced mix between engineering presentations for ITER (most speakers were from Empresarios Agrupados) and research-based presentations.
Beatriz Martínez Manzanares, from Empresarios Agrupados, opened the session with "Hydrogen Monitoring System in the ITER Project", describing a critical system for detecting leaks in buildings relevant to ITER's fuel cycle. The second presentation, "Application of Surrogate Models with Deep Learning for Neutronic Simulation - DONES-FLUX Project", was given by **Nikita Khvatkin Petrovsky,** from HI-Iberia. This presentation proposed the use of such models as an alternative to Monte Carlo codes for characterizing material damage.

Lluís Batet
PRESIDENT

Luis Cerrada Duque
COORDINATOR

Next, **Gema Donoso Rosa** (Empresarios Agrupados Internacional) presented the methodology and results of performance testing in static magnetic fields and functional acceptance testing of various instrumentation and control, electrical, and pneumatic devices for ITER.

Ana María Hernández Almería, from Empresarios Agrupados, delivered the fourth presentation, "Safety I&C Regulations in Nuclear Power Plants Implemented in ITER", where she explained the analyses conducted to ensure that the central nuclear safety control system design for ITER meets both regulatory standards and ITER requirements.

Pablo Guillén Lázaro, also from Empresarios Agrupados, described the impact of static magnetic fields on the design and functionality of electrical equipment located within ITER's Tokamak complex.

The sixth speaker, **Juan Torrella Rivero,** from Empresarios Agrupados-GHESA, presented "Experience in the Qualification Process of I&C Cubicles for ITER", describing the strategy and qualification tests. This experience provides valuable insights for future qualification processes.

When it was time for universities and research centers to present, **Ronny Rives Sanz,** from Universitat Politècnica de Catalunya, showcased developments in accurate simulation of bubble movement in liquid metals, which is relevant for fusion reactors and fast reactors alike.

The next speaker, **Sebastian Hendricks,** from CIEMAT, highlighted the objectives and findings of his recent doctoral thesis (Universidad Carlos III de Madrid), titled "Modeling and Experimental Design for Characterizing Permeation and Retention of Hydrogen Isotopes in Fusion Materials".

The final presentation was delivered by **José Ángel Capitán García,** who presented his Master's Thesis, "The Role of Plasma Pressure in Electrostatic Turbulence Governed by Density Gradient in Stellarators", from the Master's in Nuclear Physics at the Universidad Autónoma de Madrid. The research was conducted in collaboration with CIEMAT.

The session flowed smoothly thanks to the excellent work of the session and topic coordinators. The presenters' strict adherence to time limits allowed for a lively discussion with the audience. Despite this, the session ended punctually, concluding with words of appreciation from the chairperson.

SESSION 23 ENGINEERING, DESIGN, AND INNOVATION (IV)

The session started and ended on schedule. All speakers had a few minutes to answer questions from the audience. Nine presentations on various topics were given, as shown below.

First, the three presentations by representatives from ANAV were delivered:

Fatigue analysis in the design of the reactor coolant pumps for CN Ascó 1 and 2. Using a 3D model and finite element analysis, discrepancies between the current state of the pump and the original design calculations were resolved.

Implementation of new ventilation and filtration equipment in certain non-safety-related systems at CN Vandellós II. A complex project due to the large air volumes to be filtered, in which various engineering firms and local subcontractors contributed to its success.

Foundation project for the new recharge water tank at CN Vandellós II, with greater seismic capacity than the current one to comply with the CSN ITC regulation.

The following presentations were by Empresarios Agrupados: A validation method for the simulation of high-energy impacts on concrete structures, based on comparative studies obtained from experimental data, such as those from the IRIS 2010 program.

Analysis of the effects of creep on the behavior of materials subjected to high temperatures.

The complex qualification process of an emergency power-related component in ITER, based on RCC-E.

Next, three presentations from CIEMAT, Amphos 21, and ETSI at UPM were given:

A new software developed in Python integrates the signal from thermoluminescent dosimeters in mixed radiation fields (photons + neutrons) from CLPU, in a variable region of interest that is not predefined and is estimated through new numerical analysis methods.

José Tomás Ruiz
PRESIDENT

Sergio Gómez
COORDINATOR

The WT (Wireless Transmission) project was presented, based on an innovative idea for data transmission in enclosed spaces, with direct application in nuclear waste storage.

An innovative solution for utilizing Sr-90 from spent nuclear fuel to power a betavoltaic battery called Strattery. This solution won third place in Innovatom 2024.

The session had high attendance and an engaging Q&A session, allowing for an in-depth discussion on all presented topics.

SESSION 24 NUCLEAR SAFETY AND LICENSING (IV)

Lourdes Borondo
PRESIDENT

Francisco Osorio de Rebellón COORDINATOR

The session began with the presentation by **Rafael Iglesias** (CIEMAT), which described a study on the effectiveness of PARs in severe accident scenarios with the activation of the containment spray system, evaluating the mitigation of deflagration risk through the action of PARs.

The next presentation was delivered by **César Serrano** (Iberdrola Generación), describing how C.N. Cofrentes has updated its emergency operating procedures and severe accident guides (POE/GAS) to adapt them to the generic equivalents developed by the BWROG Owners Group, integrating new capabilities available after the Fukushima Daiichi accident and an optimization of mitigation strategies.

Subsequently, **Eduardo Gallego** (UPM) provided important information on the current status of the short courses on severe accident phenomenology, "Severe Accident Phenomenology" (SAP), reviewing the milestones and evolution of these courses, highlighting that the latest course was held in Madrid from June 19 to 23, 2023, at ETSII-UPM, as part of the SEAKNOT project.

The fourth speaker, **María Iglesias** (EAG), presented how the ECOSIMPRO equation-solving software is used to analyze internal flooding in various nuclear power plants. Through a simple graphical interface, it allows obtaining the dynamic evolution of flooding inside buildings, enabling the determination of maximum flood heights reached in each area.

Miguel Sánchez (Iberdrola Generación) provided a historical overview of major licensing milestones in the 40 years of operation of C.N. Cofrentes, while also reviewing major historical events worldwide that occurred as the Valencian plant continued to improve its operation under optimal safety conditions.

The sixth speaker, **Antonio Roig** (Westinghouse), described probabilistic seismic safety assessment (SAPS) work related to relay chattering analysis, which consists of identifying and subsequently evaluating the potential impact on plant mitigation equipment due to relay contact vibrations during an earthquake. The presentation focused on the methodology followed for relay chattering analysis for the SAPS of CN Vandellòs II, aiming to identify relays whose functional failure could lead to unintended operation or equipment blockage.

Ramón Casanovas (CNAT) described the integrated scope exercises conducted in September 2023 between the Emergency Response Organization (ORE) of CN Trillo and the Military Emergency Unit (UME). The objective was to test their support capabilities and validate the proper integration of their personnel and resources in emergency management and mitigation tasks across two different scenarios: an earthquake with loss of external power supply and the crash of a helicopter onto the transformers.

Finally, the session concluded with a presentation by **Margarita Herranz** (UPV-EHU), in which she described the review process of CSN procedures for environmental radioactivity sampling (CSN INT-04-07).

SESSION 25 SUMMARY OF SESSION FUEL (II)

Emilio Bobo
PRESIDENT

Juan Carlos Martínez
COORDINATOR

Technical Session 25, under the heading Fuel II, brought together a diverse range of topics related to nuclear fuel, covering aspects from fuel pellets and cladding to the design of the fuel assembly, in both its experimental and analytical aspects.

Focusing first on the presentations related to fuel pellets, notable experimental studies were presented by CIEMAT [25-1], which analyzed the oxidation of non-irradiated UO_2 to U3O8 as a function of t-T-O_2 parameters, and by ENUSA [25-2], which examined irradiated material with burnups between 26 and 62 GWD/MTU. Both studies aimed to reproduce dry storage conditions for spent fuel in non-inert atmospheres with cladding leakage.

The analytical counterpart to this pellet oxidation issue, also presented by CIEMAT [25-3], was based on the use of an adapted version of FRAPCON-xt, applying the t-T curve concept.
Continuing with the fuel pellet, SEA delivered three presentations: The first [25-4] covered the historical perspective in Spain on burnup credit in fuel isotopy calculations for criticality analysis of spent fuel containers.
The other two, part of NEA Benchmarks [25-7 and 25-8], addressed: Criticality curve calculations for a spent fuel container with 17x17 fuel and burnup credit.
Calculation methodologies for residual heat, using CLAB spent fuel storage measurements as a reference.
Moving to the fuel rod level, in [25-5] CIEMAT presented an experimental study analyzing pellet-cladding interaction mechanisms using UO_2 doped with ZrO_2, assessing its behavior in environments representative of spent fuel container loading conditions.
Finally, at the fuel assembly level, in [25-6] IBERDROLA presented the thermohydraulic and neutronic modeling of SVEA-96 Optima 3 fuel for its licensing at C.N. Cofrentes, within the framework of their GIRALDA methodology.

SESSION 26 OPERATION AND MAINTENANCE (III)

The session consisted of seven presentations. The presentations were conducted smoothly and normally, and after each one, attendees had the opportunity to ask questions to clarify their content. It was a dynamic and participatory session, given the interest and depth of the topics discussed.
Efrén León (Westinghouse) shared the development carried out for the characterization of a crack in the seat of a valve using induced currents, a technique in which they are experts.
Javier de la Morena (Westinghouse), taking advantage of the 50th anniversary of SNE, provided a retrospective on the evolution of ultrasound for component inspection in nuclear power plants, including an interesting reflection on its future outlook with new technologies.
Mª Aranzazu Díez (Tecnatom) presented the challenges that plants face in acquiring spare parts due to obsolescence and how, through reverse engineering, applying different techniques, it is possible to manufacture the necessary replacement that meets the required function.
Enrique Navarro (Universitat Politècnica de València - MEDASEGI Group) explained how the use of machine learning models can improve equipment reliability and maintenance programs, applying artificial intelligence techniques in the context of long-term nuclear plant operation.
Gonzalo de Diego (CIEMAT - Division of Materials for Energy Applications) presented the work developed in collaboration with ANAV, using advanced optical and electron microscopy techniques to analyze possible anomalies in the wires of the prestressing tendons of the containment building.

Carlos Iturregui
PRESIDENT

Luis Vega Cosio
COORDINATOR

Susana Merino (CIEMAT - Division of Materials for Energy Applications) presented real cases of crack propagation in different components due to stress corrosion and their analysis through fractography and microstructural studies.
Álvaro Rodríguez (SGS Tecnos) demonstrated in his presentation how a risk-based inspection strategy is more cost-effective in terms of time and economics compared to a traditional time-based inspection strategy.
In general, the speakers presented their work with great clarity, order, and strictly adhering to the assigned times.
The coordinator and the chairperson thanked the speakers for their participation, as well as the attendees of the session.

SESSION 27 DECOMMISSIONING AND WASTE MANAGEMENT (IV)

Session 27, DECOMMISSIONING AND WASTE MANAGEMENT (IV), had a total of nine presentations that generated great interest, confirmed by both the large attendance and the questions from the audience.
In general, it can be said that the presentations focused on information management and knowledge management related to decommissioning projects, as well as their application to resource management.
Jose Ridao (KIT Karlsruhe) presented a training program for decommissioning projects aimed at professionals in the sector.
Raul Monterroso (Westinghouse) presented the digital application developed for managing the available information in a decommissioning project. & 4. **Luis Felipe Durán** (IDOM) presented his experience in information management as well as the added value of being able to share it effectively.

Gonzalo Medinilla (Westinghouse) presented how an exhaustive analysis of the operational history of Vandellós I was conducted and its application in the decommissioning of the facility.
Enrique Benavides (Independent Consultant) presented a set of experiences and lessons learned with the purpose that they may serve as a basis for the development of a decommissioning project.
Miguel Rey (Medidas Ambientales) presented the differences between environmental radiological surveillance plans in the operational phase and the decommissioning phase of a nuclear power plant and their application to the Garoña plant.
Vanesa Muñoz (Empresarios Agrupados) presented the work carried out to prepare a preliminary physical inventory and an initial BIM model of CN Almaraz as a preliminary step for the decommissioning of CN Almaraz.
Finally, in the ninth presentation, **Francisco Ruiz** (Westinghouse) presented the model developed for the management and application of employee qualifications within Westinghouse's global environment.
The session proceeded smoothly, with active participation from the audience, reinforcing the importance of structured knowledge management and digital tools in decommissioning projects.

Juan José Serna
PRESIDENT

Leandro Sánchez
COORDINATOR

SESSION 28 THERMOHYDRAULICS AND NEUTRONICS: SIMULATION AND EXPERIMENTATION (V)

This session featured six presentations from Empresarios Agrupados, Universitat Politècnica de Catalunya in collaboration with Energy Software Ltd., Universidad Politécnica de Madrid in collaboration with NFQ Advisory Services, and the last three from the MEDASEGI group and the ISIRYM institute, both from the Universitat Politècnica de València, with the final presentation conducted in collaboration with CNAT.
The first presentation showcased the application of a detailed MAAP model for C.N. Cofrentes, simulating various accident scenarios under shutdown conditions. The results were compared with those obtained using the classic primary system model, evaluating the implementation of the detailed model.
The second presentation covered the development and implementation of an oxidation model for RELAP/SCDAPSIM/MOD3.4, applied to accident-tolerant fuel (ATF) with Zr cladding coated with Cr. The model was developed and validated for high-temperature steam environments using experimental data.
The third presentation introduced a study to validate a model developed for the TRACE system code, comparing its results with experimental data obtained from the MOTEL experimental facility, which features steam generator configurations similar to the NuScale SMR reactor design.
The fourth presentation discussed simulation results using a TRACE model, compared with experimental results from the PKL facility for an extended SBO accident (station blackout) without power recovery, but with cooling through the secondary system of a single steam generator using a mobile pump as an alternative.

Sebastian Martorell
PRESIDENT

Leopoldo Prieto
COORDINATOR

The fifth presentation covered simulation results using a TRACE model, compared with experimental results from the ATLAS facility, studying a steam line break (SLB) scenario with additional failure and total loss of accumulator injection, but with the activation of a passive auxiliary water feed system for the steam generator.
The sixth presentation analyzed xenon transients during flexible operation of PWR-KWU reactors, using a core model generated with the coupled RELAP5/PARCSv3.2 code. The results included an analysis of xenon-135 and boron concentrations in the core, as well as the Axial Offset (AO) parameter, which indicates spatial power distortions.
The session provided valuable insights into advanced modeling techniques and experimental validations, with engaging discussions and audience participation, reinforcing the importance of simulation in nuclear safety and reactor performance optimization.

SESSION 29 COMMUNICATION AND TRAINING: TRAINING (II)

In this edition of the Technical Training Session, the presentations were divided into two topics that generated great interest.

On one hand, the training within nuclear sector companies, with different goals and tools related to facility operation or phases such as decommissioning. On the other hand, some of the master's programs oriented toward the nuclear sector, which are proving to be a link between the academic and professional fields.

Corporate Training in the Nuclear Sector **Emma Merino** (ENSA) gave a presentation on the use of virtual reality as a training tool in the nuclear industry, highlighting the benefits it brings and the challenges, both physical and technological, encountered during its implementation.

Eva Jabaloyas (Iberdrola) precisely explained how the Integrated Scope Exercises, being carried out at Cofrentes Nuclear Power Plant, are becoming a fundamental instrument for evaluating and improving staff preparedness for potential events at the facility.

Montserrat Pérez (Enresa) detailed to attendees how they are implementing the initial training plan for personnel without an operating license, particularly in the first phase of the decommissioning project at Santa María de Garoña Nuclear Power Plant (Burgos).

Master's Programs in the Nuclear Sector **José Francisco Benavente** (University of Córdoba), **Eduardo Gallego** (Universidad Politécnica de Madrid), and **Lluis Batet** (Universitat Politècnica de Catalunya) gave a detailed presentation on their respective master's programs, focusing on their evolution, content, and organization, as well as the various collaborations with institutions and organizations.

Laura Gala
PRESIDENT

Francisco Javier Hernáez COORDINATOR

They also emphasized the importance of internships, as they provide real-world experience and allow students to acquire practical skills and knowledge, which will undoubtedly benefit them in their future professional careers.

The Need for Stronger Academia-Industry Collaboration

One of the points on which all the speakers agreed was that, although the two topics may seem independent, it is widely recognized that the relationship between universities and the nuclear industry must be close and necessary. At this point, **Amparo Giner** (Westinghouse) specified that one of the main objectives must be to ensure that training is adapted to the reality of the sector and that it is necessary to increase outreach efforts, which have the virtue of breaking down myths and barriers and presenting the nuclear industry as an innovative, dynamic, skilled, and technological sector where there is an opportunity for a successful professional future.

SESSION 30 ADVANCED REACTORS AND NUCLEAR FUSION (III)

The technical session "Advanced Reactors and Nuclear Fusion (III)" focused on research in materials and innovative techniques for the development of nuclear fusion, emphasizing the importance of material characterization and artificial intelligence in the safe operation of reactors.

María Urrestizala (UPV/EHU) opened the session with a study on the isotopic relationship between protium and deuterium in materials such as Eurofer-97 and AISI 316, which is essential for predicting tritium permeability. Her experiments conducted under controlled conditions provide valuable data to improve the understanding of this process in future reactors.

Empar Navarro (ISIRYM, UPV) followed with a proposal to detect anomalies in reactors using convolutional neural networks. This research, linked to the CORTEX project,

Luis Felipe Duran
PRESIDENT

Patricia Cuadrado
COORDINATOR

demonstrates the effectiveness of artificial intelligence in identifying and locating disturbances with a minimal num-

ber of detectors, contributing to reactor operational safety.
Igor Peñalva (UPV/EHU) presented advances in measuring the solubility of hydrogen in Pb-Li alloys, which are crucial for the DCLL and WCLL breeding blankets. His experimental studies aim to reduce uncertainty in existing values, which is critical for the efficient design of these systems.
Jon Azkurreta (UPV/EHU) introduced a mathematical model for inverse permeation, a technique used to study hydrogen permeation at low pressures, relevant for high-permeability materials such as vanadium. His approach contributes to improving material characterization under fusion conditions.
Abdulrahman Al Awad (UPC, BarcelonaTECH) concluded the session with a study on the behavior of helium nanobubbles in Pb-Li alloys, a key issue for the Breeding Blanket design in the DEMO project. Using advanced simulations, Al Awad presented a framework for predicting the equilibrium state of these nanobubbles, which is essential for the feasibility of tritium breeding systems.
The session ended with a stimulating exchange of ideas on the challenges and potential of fusion reactors, highlighting interdisciplinary collaboration as a key factor in advancing research and ensuring the sustainability of nuclear fusion.

SESSION 31 ENGINEERING, DESIGN, AND INNOVATION (V)

Technical Session 31 on Engineering, Design, and Innovation in the Nuclear Industry was well received by the audience and featured seven insightful presentations by experts in the field. The topics covered were diverse and highly relevant, reflecting a continued commitment to excellence and technological advancement.
Rocío Cachero Crespo (Dogram Ingeniería de Documentación Tridimensional S.L.) opened the session with a detailed analysis of the geometric and positional variations of the pressurizer safety valves at Vandellós II Nuclear Power Plant. Her presentation emphasized the importance of precision in nuclear safety and how three-dimensional documentation can play a crucial role in plant maintenance and operation.
Raquel Liaño Gutiérrez (Westinghouse) followed with a presentation on the early incorporation of the updated electrohydraulic control system into the Vandellós simulator. This upgrade aims to enhance operational efficiency and safety, allowing operators to familiarize themselves with the new systems effectively.
Carlos Julián Gavilán Moreno (Cofrentes Nuclear Power Plant – Iberdrola Generación Nuclear) shared insights on the use of AVEVA Predictive Analytics for fault detection, using Cofrentes' circulation pumps as a case study. His focus on online monitoring and predictive analytics highlighted the industry's shift toward predictive maintenance and resource optimization.
Jordi Carrera Badia (Asociación Nuclear Ascó Vandellós, ANAV) presented digitalization initiatives implemented at Vandellós II Nuclear Power Plant. His talk explored how digitalization is transforming project management and operations, improving efficiency and communication among teams.
Domingo Lima (ENSA) provided insights into advanced manufacturing techniques for key components in both fusion and fission nuclear plants. His presentation showcased advancements in fabrication technologies and

Manuel Prieto
PRESIDENT

Xavier Jardí
COORDINATOR

their impact on nuclear plant safety and longevity.
Elena Abarca Cameo (Amphos 21 Consulting) illustrated the multiphysics modeling of a vegetative cover over a low- and intermediate-level waste storage site. Her work highlighted the intersection of technology and environmental sustainability, demonstrating how engineering can contribute to responsible waste management solutions.
Ignacio Sabater Sancho (GD Energy Services SAU) closed the session with a simulation of maneuvers for replacing heaters 2A/B at Cofrentes Nuclear Power Plant, showcasing the practical application of simulation in complex operations.
Overall, the session was a testament to the dynamism and innovation within the nuclear industry, with presentations that not only informed but also inspired attendees to explore new ways to improve and advance their respective fields. The session was highly appreciated by the audience, leaving participants with an updated perspective on some of the latest developments in nuclear engineering.

SESSION 32 NUCLEAR SAFETY AND LICENSING (V)

Amparo Soler
PRESIDENT

Cristina Rosario Domingo
COORDINATOR

The session began with the presentation by **Rafael Iglesias** (CIEMAT), describing work under the FADE project, which focuses in part on finding better decommissioning techniques and processes to minimize radiological impact. The study evaluates the absorption of radioactive material in water during underwater laser cutting. Preliminary results suggest that the diameter of the injection point and the mass flow rate of injected gas lead to higher decontamination factor (DF) values. Other parameters, such as pool temperature, particle concentration, and immersion depth, have an insignificant effect.
The next presentation was given by **Carlos Vázquez Rodríguez** (UPM), who described a model using GOTHIC 3D to analyze how spray system activation affects hydrogen explosion risk in a series of postulated severe accidents. In addition to the spray system, the model also examined accident progression for scenarios with and without passive autocatalytic recombiners (PARs).
The third presentation, by **Francisco Javier Sánchez Velasco** (UP Cartagena), provided significant insight into advancements in the development and validation of computational fluid dynamics (CFD) models capable of simulating accident sequences involving hydrogen and carbon monoxide combustion in containment. These late-phase accident sequences are critical for reactor safety. Therefore, 3D modeling of hydrogen and carbon monoxide combustion and its application to LWR containment is a key aspect in improving the understanding of relevant safety phenomena.
Subsequently, **Alva Galán** (Westinghouse) focused on support tasks for License Renewal activities at Laguna Verde Nuclear Power Plant.
Diego Caro (Westinghouse) then discussed the regulatory framework for U.S. nuclear power plants requesting long-term operation up to 80 years. License renewals follow lessons learned from aging management (NUREG-1801, NUREG-2191) and comply with Title 10, Part 54 of the Code of Federal Regulations (CFR). Since IS-22 gives credit to both this regulation and its associated guidelines, it is possible to apply lessons learned from U.S. nuclear plant license renewals to the Spanish regulatory process.
Finally, the session concluded with a presentation by **Tomás Villar** (Iberdrola Generación), who introduced the development of alternative fire progression calculations that go beyond semi-empirical models, using the bi-zone computational tool MAGIC. The objective is to determine the potential damage caused by high-temperature gas layers on instrumentation and tubing, which could lead to spurious signals affecting mitigation capability. The study also explores fire scenarios involving interconnected rooms through stairwell openings, as well as the potential for atypical damage sequences where fires trigger unexpected pump startups, causing additional hazards.
The session ended with an engaging discussion on nuclear safety advancements, regulatory compliance, and fire risk mitigation strategies, reinforcing the importance of continuous innovation in safety analysis and accident prevention methodologies.

SESSION 33 FUEL (III)

In this technical session, six high-quality presentations were delivered, all based on advanced fuels.
The session began with the presentation by **Carlos Aguado** (CIEMAT), titled "PREDICTIVE CAPACITY OF FRAPCON-4.0 IN POWER RAMPS." This presentation focused on the validation of the FRAPCON-4.0 code, where the simulation of four integral experiments obtained from the IFPE database (HATAC-C2, REGATE, AN-3, and AN-10) was presented.
Antonio R. Espejo Lozano (ENUSA), in his presentation "THERMOHYDRAULIC ANALYSIS OF CHROMIUM-COATED FUEL FOR TESTS IN A NUCLEAR POWER PLANT," discussed that, based on verification tests of the nucleate boiling limit specifically conducted for chromium-coated rods, an estimation of the thermohydraulic impact of changes in the fuel was carried out based on theoretical foundations.
Emilio Castro González (UPM) presented "IMPACT OF ATF FUELS ON THE NEUTRONIC PROPERTIES OF NUCLEAR FUEL," analyzing the impact on neutronics due to the replacement of traditional fuel materials with ATF materials, such as FeCrAl, chromium-coated Zircaloy, or SiC

for the cladding, and Cr2O3-doped UO_2 for the pellets. To achieve this, calculations were presented using the open-source simulation tool OpenMC.

Pau Aragón Grabiel (CIEMAT) presented "EVALUATION OF CR-COATED ZIRCALOY CLADDING UNDER ACCIDENT CONDITIONS WITH FRAPTRAN-TUMECH," introducing the FRAPTRAN-TUmech tool, which results from the coupling of the TRANSURANUS mechanical model with FRAPTRAN-2.0. This tool has been extended to simulate chromium-coated Zircaloy and was subsequently used to evaluate its thermomechanical response under DBA (large-break LOCA) and DEC-A (small-break LOCA with safety injection failure) conditions.

Miguel Cristóbal Beneyto (UPM) presented "STRUCTURAL INTEGRITY OF ATF FUEL CLADDINGS." This presentation was part of the IAEA's CRP ATF-TS program, in which different research groups worldwide investigate ATF fuels under both normal operating conditions and severe accident scenarios. To this end, isothermal burst tests were conducted—consisting of introducing pressurized gas into the cladding at a constant temperature until rupture occurs—on chromium-coated ATF fuel claddings as well as uncoated claddings.

Finally, **Jorge Sánchez Torrijos** (NFQ) presented "SIMULATION OF THE HALDEN IFA 650.10 LOCA TEST WITH TRACE AND TRANSURANUS CODES: APPLICATION TO e-ATF MATERIALS," showcasing the simulation of the Halden IFA 650.10 LOCA test with different fuels and cladding materials. Specifically, the conventional fuel rod material UO_2/Zr-4 was used as a reference, followed by simulations of ATF-doped materials with FeCrAl and Cr. To achieve this, the TRACE system code was used to calculate the thermohydraulic boundary conditions (considering Zr-4 and FeCrAl materials), which were then input into the fuel rod performance code TRANSURANUS to perform the final simulation of the test.

The session proceeded smoothly with the presentations, and a brief Q&A session followed each presentation.

Adrián Gonzalvo
PRESIDENT

Maria José Rebollo
COORDINATOR

SESSION 34 OPERATION AND MAINTENANCE (IV)

In this session, different topics related to the operation and maintenance of nuclear power plants were discussed, including the use and categorization of valves, non-destructive testing for cleaning and maintenance of components, inspection methodologies, and applications of artificial intelligence.

Pino Díez, from Iberdrola Generación Nuclear (Cofrentes NPP), explained the importance of valves in a nuclear power plant, as they are crucial for controlling many systems such as water supply, cooling, and chemical treatment. Considering that a plant like Cofrentes has more than 35,000 valves, special attention must be paid to their maintenance and care, since a malfunction can seriously affect the plant and the safety of personnel.

Mario Redondo, from Empresarios Agrupados, presented the Risk-Informed In-Service Inspection program to update plant maintenance and inspection programs, using results provided by the Probabilistic Safety Assessment (PSA) to improve component reliability. The objective of the presented work was to update the categorization of check valves based on their importance to risk, according to the PSA of the Ascó NPP.

Elías Gosálbez, from Cofrentes NPP, explained the significant advancements that can be achieved in maintenance, operation, and safety of nuclear power plants through the implementation of solutions based on Artificial Intelligence. Notable applications include the use of advanced machine learning systems, neural networks that facilitate the interpretation of large volumes of data for better decision-making, and predictive models for defect or anomaly detection. All these applications will serve to transform various areas of the nuclear industry.

Maita Morales, from Nucleonova, presented the advantages of non-destructive ultrasound technology for clean-

Antonio González
PRESIDENT

Patricia González Ayestaran COORDINATOR

ing and decontaminating areas with difficult-to-remove encrustations in inaccessible zones, without the need to introduce transducers. This technology helps reduce radiation doses, eliminate hot spots, and clean radioactive waste safely and efficiently, offering a cost-effective and sustainable alternative to traditional cleaning methods.

Rafael-Bibiano Torrealba, from Empresarios Agrupados, demonstrated the inspection methodology developed and implemented for the monitoring and control of the components that make up the Arrocampo Dam at Almaraz NPP, focusing on aspects such as material, exposure, and intrinsic importance. The dam, along with other equipment and facilities, is responsible for maintaining the water reserve used for cooling the plant, making it one of the most significant and unique components.

It is important to highlight that **Elías Gosálbez Guijarro,** control room supervisor license holder at Cofrentes NPP, was awarded the Best Presentation in the Technical Area of Operation and Maintenance for his work "Applications of Artificial Intelligence in Cofrentes Nuclear Power Plant."

SESSION 35 THERMOHYDRAULICS AND NEUTRONICS: SIMULATION AND EXPERIMENTATION (VI)

In this technical session dedicated to the "Thermohydraulics and Neutronics" area, a total of four papers out of the five initially planned were presented, all of them related to thermohydraulics, with and without uncertainty and sensitivity analysis. Due to the absence of one of the speakers, the time allocated for presentations and the Q&A session could be extended slightly; even so, the session concluded on time and as planned.

The first presentation, delivered by María Molina from ENUSA, focused on the comparison of different thermohydraulic models, such as heat transfer coefficients, between two best-estimate system codes and their impact on the calculation of critical power.

Professor Kevin Fernández, from the ETSI de Minas of UPM, presented his work on the user effect in thermohydraulic and severe accident system codes, for example, with different reactor core nodalizations and a sensitivity analysis.

The third presentation, on linear error propagation and the Wilks method applied to a LBLOCA using the TRACE system code, was given by Professor **José Felipe Villanueva** from the Universitat Politècnica de València.

The final presentation was delivered by PhD student **Bàrbara Navarro,** also from UPV, on an approach to uncertainty and sensitivity analysis using the polynomial chaos expansion method in a LB-LOCA accident in a BWR, utilizing the TRACE computational code and the DAKOTA statistical package.

Despite being the last session of the day, it had a large and engaged audience, with contributions both from attendees and coordinators, shaping a high-level scientific session.

Rafael Miró
PRESIDENT

Oliver Marcos
COORDINATOR

SESSION 36 ENGINEERING, DESIGN AND INNOVATION (VI)

The "Engineering, Design, and Innovation" session featured six presentations that addressed various challenges and innovative solutions in the nuclear sector.

Juan José Jaimot Jiménez, from ANAV, opened the session with a presentation on the gradual strategy for defining and developing alternative spare parts, thus preventing the obsolescence of critical components. ANAV uses tools such as OVR (Obsolescence Value Ranking) and POMS (Proactive Obsolescence Management System) to prioritize and manage obsolescence, ensuring long-term safety and reliability.

Miriam Díaz
PRESIDENT

Daniel Sampedro
COORDINATOR

Álvaro Iniesta López, from Empresarios Agrupados - GHESA, analyzed the impact of hot spots on environmentally qualified equipment in nuclear power plants. Using thermographic photos and sensitivity analysis, the safe distance was determined to prevent equipment deterioration due to thermal radiation, thus ensuring its service life and proper operation.

Alejandro Palacio, from ENSA, presented the renewal process of the ASME N seal, which certifies ENSA's capability to design and manufacture nuclear components according to the ASME code. Through a demonstration project, ENSA proved compliance with the strict requirements of the code, reaffirming its leadership in nuclear component manufacturing.

Juan Antonio Muñoz, from Nucleonova, presented the Item Equivalence Evaluation (IEE). This tool is key to managing obsolescence in the nuclear sector, ensuring the suitability of alternative obsolete items. The presentation highlighted the development of a shareable IEE, facilitating the application of alternative items in different plants, optimizing resources and improving obsolescence management.

Antonio José Martínez Pérez, from Empresarios Agrupados, addressed the issue of moisture in the sampling lines of radiation monitors at Almaraz Nuclear Power Plant. Engineering solutions were presented to prevent moisture accumulation and ensure the proper functioning of the monitors, which are crucial for the safety of the facility and its environment.

Finally, **Diego Cayón Terán,** from ENSA and the University of Cantabria, introduced a virtual model to simulate post-weld heat treatment (PWHT) by induction in nuclear components. Using ANSYS Mechanical APDL software, the model provides accurate temperature distributions, validating its effectiveness through comparisons with real treatments performed in ENSA's workshop.

These presentations emphasized the importance of obsolescence management, quality certification, and resource optimization in the nuclear sector. The session showcased innovative solutions and practical approaches necessary to successfully overcome industry challenges.

SESSION 37 NUCLEAR SAFETY AND LICENSING (VI)

The session began with the presentation by Julia Herrero (EAG). Within the scope of Probabilistic Safety Assessments (PSA), for the characterization of human actions, a simple methodology has been implemented that complements the analysis performed by the human reliability software (HRA-C), facilitating the estimation of available and delay times associated with each action. The results obtained show that considering overlaps with other actions increases the probability of human error, which is a logical and expected outcome, but at the same time, makes the model more realistic and the sequence of human actions more traceable. Moreover, this analysis also represents an improvement in determining the contribution of dependencies between human actions based on their actual execution windows.

The next presentation was delivered by **Álvaro Fernández Romero** (Westinghouse), also within the Probabilistic Safety Assessment (PSA) field, but in this case, fire PSA. His work analyzes failures related to instrumentation credited in fire analyses, both deterministic and probabilistic, carried out for a nuclear power plant, which could be caused by the impact on its associated tubing in the event that it is considered fire-sensitive. The results obtained allow for the integration of strictly mechanical failures related to the impact on the instrumentation tubing itself (or its internal fluid) with electrical failures caused by the degradation of cables associated with the transmitter, since in practice, their consequences are similar.

Gonzalo Jiménez
PRESIDENT

Javier Gutiérrez
COORDINATOR

Rafael Bocanegra (ENSO), with the idea of addressing the inherent uncertainties in severe accident codes used in nuclear accident analysis, presented an innovative project aimed at developing a gradual methodology to analyze these uncertainties. The results obtained from two international projects, IAEA CRP I31033 and HORIZON-2020 MUSA, have provided ENSO with a solid foundation for identifying and quantifying sources of uncertainty in severe accident analyses.

Finally, the session concluded with the presentation by **Javier Pelegrina** (Westinghouse), which provided a general description of the **AP300™** SMR reactor, including key areas of interest such as fuel, the reactor cooling system, passive safety systems, and its current licensing process. The current status of the project and various business opportunities were also described.

SESSION 38 QUALITY AND HUMAN FACTORS (III)

The session day was focused on human factors, emphasizing human error and an evaluation of mental overload in the nuclear sector, aimed at demonstrating the impact of physiological signals to minimize human error.

A computer tool was presented, developed in collaboration with the manufacturer, for measuring radioactivity in samples and external discharges in gamma spectrometry, detecting discrepancies and suggesting corrections, preventing and minimizing human errors during its use.

From the perspective of collaboration and people's involvement, a Master Plan for human error prevention in refueling was presented. This plan was developed within the framework of critical work areas, ensuring communication between the direct workers and their supervisors. The plan was carried out by independent personnel, providing support in supervision and advice on error prevention, analyzing data to take action and address deviations from expected behavioral expectations, thereby strengthening Safety Culture aspects.

Later, a project supporting ANAV's results and human factors area was presented, showing how the integrated management system monitoring, process coordination, dashboard, as well as self-assessments and external evaluations are carried out, considering the management of activities related to WANO. The project focused on continuous improvement areas and human factors improvement programs, promoting Safety Culture and field command and observation programs.

Juan Antonio Muñoz
PRESIDENT

Cristina Pablos
COORDINATOR

The final session presented an experimental study to evaluate the mental overload of personnel in the nuclear sector, through the analysis of physiological signals to minimize human error. The behavior of individuals with high and low workload in different situations was studied, demonstrating the predictive model at different moments and preventive measures to anticipate human error.

During the session, the sector's concern about human factors was highlighted, analyzing different aspects and behaviors, providing solutions to motivate personnel in the facilities.

SESSION 39 DISMANTLING AND WASTE MANAGEMENT (V)

In the Technical Session on DISMANTLING AND WASTE MANAGEMENT (V), there were five presentations.

Andrés Felipe, from TECNASA, presented a study on a Continuous Automated Measurement System (SAMC) for the declassification of radiological material in CMD containers at Vandellós (I). Each part of the SAMC and its integration was analyzed to achieve an effective detection solution using a single ultra-pure Ge detector. This system allows avoiding the use of multi-detector systems, automating the measurement sequence, increasing speed, and maintaining quality standards.

Marta López-García, from Amphos21, presented a study on a methodology designed to accelerate the degradation and carbonation of Portland cement and its characterization. It was concluded that the degradation process is faster in tests with low cement/water ratios, and it was demonstrated that, in the degraded material, the major hydrated phases of cement, such as CSH and portlandite, had disappeared, while the calcite content had significantly increased.

Gregorio Socorro García, from Naturgy Ingeniería Nuclear, presented a study on the dosimetry analysis of the eye lens, as the new Health Protection Regulation against Risks from Ionizing Radiation Exposure establishes a modification in dose limits for the lens of the eye, reducing exposure from 150 mSv per year to 20 mSv per year. Therefore, different aspects were analyzed to determine the type of eye lens monitoring required to comply with the new dose limits, concluding that the implementation of individ-

Tiziana Missana
PRESIDENT

Adoración Arnaldos
COORDINATOR

ual eye lens dosimetry during the dismantling activities of a nuclear power plant is not necessary.

José Enrique Martín, from Izharia, presented a study on the development of a computer application (FGDE) for calculating external doses due to radioactive effluent emissions through air and water pathways and for generating tables with global dose factors (Effective Doses) for three population groups (infants, children, and adults) and for the two emission pathways (liquids and gases). This application has been developed in Visual Fortran for use in dismantling projects of Spanish nuclear power plants.

Álvaro Fenoy Cruz, from Naturgy, presented a study on the dose determination methodology due to residual activity concentration in the subsoil during the site release process, based on the definition of limiting scenarios, source characterization, and the exposure model and pathways considered in the RESRAD code, which is used for dose calculations.

SESSION 40 ENGINEERING, DESIGN AND INNOVATION (VII)

Advances in Infrastructure and Technologies for the Nuclear Sector

On October 10, as part of the 50th Annual Meeting of the Spanish Nuclear Society, held in Córdoba, the Engineering, Design, and Innovation technical session took place, where innovative projects in the nuclear field were presented. These include the creation of equipment maintenance centers, the implementation of Industry 4.0, air-drying technologies, solutions for radioactive water decontamination, and the design of HVAC systems.

Technology and Equipment Maintenance Center (CTME)

Patricia Isla Martínez presented the CTME of ENUSA, a Category 2 radioactive facility dedicated to the management of potentially contaminated equipment, located near the Fuel Elements Factory in Juzbado, Salamanca. It will offer logistics, maintenance, and testing services for new equipment, as well as training and qualification of personnel. It will have areas for working with non-contaminated equipment and advanced technologies such as robotics and 3D prototyping. It is expected to begin operation in early 2025.

Industry 4.0 at ENUSA

Mario Gómez Villa explained the application of Industry 4.0 technologies at ENUSA, such as additive manufacturing and reverse engineering, which optimize the production of components and allow for digitalization of parts. Additionally, artificial intelligence projects will improve visual inspection of fuel elements, reducing time and potential errors. BIM models have also been integrated into the CTME design.

Dehumidification at IFMIF-DONES

Ana Peña Chavarino presented air dehumidification technologies for IFMIF-DONES, a particle accelerator in Granada, where the presence of liquid lithium requires extreme measures due to the risk of explosion. Two alternatives have been proposed: the desiccant rotor and the refrigeration coil to prevent humidity in the rooms.

Adrián Jaime Custodio PRESIDENT

Juan Antonio Muñoz T COORDINATOR

Tritium Water Decontamination in Fukushima

Jesús del Castillo and Sergio Tuset, from the ENSA-NATURGY-SEYS-NUCLEANTECH consortium, presented a Spanish solution for tritium-contaminated water decontamination in Fukushima. This project, one of the seven selected worldwide, is currently in the conceptual design phase, in collaboration with TEPCO and the Mitsubishi Research Institute.

HVAC System at ITREM, Cofrentes NPP

Beatriz Alonso Serrano leads the HVAC system design for the ITREM project at Cofrentes Nuclear Power Plant, focused on contaminated metallic waste. The system includes serial filtration in compliance with ISO 16647 and frequency converters to maintain pressure hierarchy.

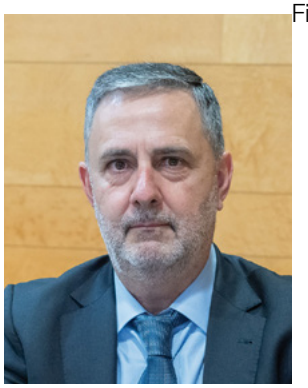
These projects highlight the continuous commitment of the nuclear sector to innovation and safety, addressing key technical and operational challenges in the handling of materials and equipment in radiologically sensitive environments. Furthermore, they underscore the importance of collaboration between companies to achieve better solutions to emerging challenges.

SESSION 41 ADVANCED REACTORS AND NUCLEAR FUSION (IV)

In the first presentation, **Daniel Moya Alonso** from IDOM analyzed the risks of the helium cooling system (HCS) in the ceramic breeder cooling test system of the ITER project (HCCP-TBS), focused on achieving tritium self-sufficiency in fusion reactors. The HCS controls the reactor temperature and ensures helium purity through heat ex-

changers, circulators, and pressure systems. Using the HAZOP methodology, approximately 2,000 deviations were identified, of which half were discarded for being unlikely. Critical deviations include "system unavailability" and the risk of confinement loss, which could affect both workers and the environment. To mitigate these risks, relief valves and additional accident studies are recommended. The RAMI analysis, focused on improving availability and reliability, suggests that by optimizing spare parts logistics and predictive maintenance, the availability of the HCS could increase from 88.02% to 98.59%, identifying helium compressors and circulators as critical components.

Next, **Jaime Valverde Hernández,** from the Polytechnic University of Madrid, presented a safety study on cryogenic helium leaks at the IFMIF-DONES experimental center, which collaborates in the European fusion roadmap alongside ITER and DEMO. In these facilities, low-temperature helium cooling is crucial, but it poses asphyxiation risks in case of leaks. For this study, UPM and CIEMAT combine the MELCOR thermohydraulic code and the CFD ContainmentFoam code, from OpenFoam, which together allow for the evaluation of multi-species transport and helium evaporation. First, helium evaporation is simulated in MELCOR, and then the results are introduced into ContainmentFoam. This work aims to develop safety protocols for operators in the event of leaks.



José Manuel G. Cerecedo PRESIDENT

Cristian Garrido COORDINATOR

Finally, Sonia Panizo Prieto, from CIEMAT, addressed the fuel transition in Generation IV fission reactors, which is key to improving nuclear safety and efficiency, but limited by the scarcity of plutonium. This study utilizes the EVOLCODE simulation system and the design of the European sodium reactor (ESFR), using HALEU as the initial fuel and later MOX, once sufficient plutonium is produced in a closed fuel cycle. Additionally, safety parameters were evaluated to ensure the feasibility of this transition, which, according to preliminary results, is viable, allowing for the planning of the time required to complete it safely.

SESSION 42 ENGINEERING, DESIGN AND INNOVATION (VIII)

The Technical Session 42 (Engineering, Design, and Innovation), held during the SNE in Córdoba on Friday, October 11 at 10:00 a.m., took place with the presence of a significant number of attendees, approximately 50 congress participants. During the session, five presentations were delivered.

The first presentation addressed the detection of anomalies in BWR reactor vessel internals using neutron noise analysis, with an example in a slow rod. The presentation demonstrated how the use of noise analysis allows for better plant management prediction. Notably, this was a real-life example of the application of this analysis rather than a theoretical study.

The second presentation discussed flexible generation in nuclear power plants through hydrogen production. The presentation examined, from an economic perspective, the feasibility of hydrogen production as a solution for flexible operation and renewable energy integration. Economic models were presented for different scenarios and reactor types to identify the conditions that would justify investment.

The third presentation focused on the feasibility of nuclear hydrogen: ongoing projects. Closely linked to the second presentation, it also addressed hydrogen production as a solution for flexible operation. Two projects supporting this research were presented:

Eduard Llibre PRESIDENT

Juan Azcue COORDINATOR

The Nuclear Powered Hydrogen Cogeneration (NPHyCo) project, conducted under the EURATOM research program, focuses on studying the technical and economic feasibility of hydrogen production from existing nuclear power plants. The HydroGen Sim project, where an electric consumption and extraction process was validated for the evaporation of demineralized water, which would later be used in a hydrogen plant with a SOEC (Solid Oxide Electrolyser Cell) electrolyzer. For validation, a generic PWR glass-top simulator was used as a test platform at the Idaho National Laboratory (INL).

The fourth presentation addressed fuel management in new nuclear power plant designs: cross-border issues. The presentation discussed how the fuel used in new reactors, with a diversification of fuels such as depleted uranium or thorium, complicates standardization practices and requires specific infrastructure for transport, storage, and processing. This lack of uniformity poses safety risks and challenges in international cooperation. A lively discussion followed on whether regulatory bodies from different countries will be able to keep pace with the industry's developments in legislation regarding fuel transport.

The fifth presentation focused on a flexible nuclear power generation system using crypto-assets as enablers: economic evaluation. The presentation analyzed the potential of nuclear power plants to play a load regulation role by coupling them with a cryptocurrency mining facility, which allows for quick adaptation to load-following requirements. Additionally, a comprehensive economic evaluation of the coupled system was conducted, showing various scenarios based on factors such as energy costs, crypto-asset prices, equipment investment, and lifespan. At the end of the presentation, a debate was held on how the public might perceive the connection between nuclear power plants and crypto-assets.

SESSION 43 DISMANTLING AND WASTE MANAGEMENT (VI)

In this session, five studies related to the dismantling of facilities, radiological characterization, and site restoration were presented. The session was lively, and there was an opportunity to ask questions to each speaker.

First, Laura Vicente Martín (ENUSA) presented the Site Restoration Plan (PRE), which accompanies the application for dismantling and closure authorization of the Quercus plant of ENUSA in Saelices el Chico (Salamanca). The objective of this Plan is to describe the planned actions for the restoration of areas affected by the dismantling of structures and facilities included in Phase I, in order to achieve the final physical and radiological state foreseen after the dismantling activities, based on the initial physical and radiological conditions, as well as ensuring that the residual radioactivity is indistinguishable from background levels. The radiological criteria established by the CSN for the unrestricted release of the restored site were presented, considering radioactivity content in groundwater, radon exhalation, Ra-226 content in soils, and environmental gamma radiation, with the goal of ensuring that the maximum dose to the average individual of the critical group does not exceed 0.25 mSv/year.

Next, **Jonatan Navarrete Martí** (Seirma Servicios Integrados, S. L.) discussed some methodological elements used in various projects for the characterization of materials containing radioactive content in nuclear facilities, both during their operation and in the planning of their dismantling. He presented the phases of the MARSSIM methodology, along with the necessary elements for its proper application, including non-parametric statistical methods, and demonstrated its application in a practical case for the radiological analysis of feedwater heaters in a BWR nuclear power plant.

José Enrique Martín García (Izharia Ingeniería, in collaboration with Naturgy) presented a computer application for estimating the radiological inventory of nuclear power plants undergoing dismantling (called INVENTARIO v1.0), developed in Visual Fortran. Its main objective is to calculate and classify the radiological inventory of contaminated systems and components. Each component is classified into categories such as clean material, declassifiable Level 1 and 2, RBBA waste, RBMA waste, and Special waste, according

Eduardo Gallego
PRESIDENT

Susana Gutierrez
COORDINATOR

to their contamination levels by radionuclide. The application features a user-friendly interface, based on menus, which facilitates data entry and management by the user. The application has been validated against another twin tool developed in Excel.

There was also a presentation on the optimization of environmental management in the rehabilitation of lands contaminated with natural radionuclides, delivered by **Alicia Álvarez García** (CIEMAT). To this end, a transportable laboratory, URACAM, was designed, which enables the radiological classification of soils, in accordance with the radiological criteria established for site release. Its specific application was presented for an isotopic mixture-type derived from processed uranium, in a CIEMAT area where radioactive and nuclear facilities were previously used for the pilot-scale production of uranium concentrates for their subsequent use in nuclear fuel manufacturing.

Finally, **Víctor Rojas Moreno** (CNAT) presented the Dismantling Transition Plan for Almaraz NPP, aimed at identifying, defining, and scheduling all activities and aspects to be considered, both technical and organizational, leading up to the dismantling authorization and transfer of ownership to ENRESA. The goal is to carry out the process in the shortest possible time and at the lowest cost, advancing as many dismantling activities as possible that CNAT can undertake in advance. Key aspects include the adaptation

of the plant to the permanent cessation of commercial operation, the completion of operational waste management, as well as that of spent fuel, and preparing for dismantling, carrying out preparatory activities that are compatible with the operating license and shutdown declaration.

The session concluded with a unanimous wish among attendees for Almaraz NPP to continue operating for many more years.

SESSION 44 POSTER SESSION

Sponsored by: AMPHOS 21 an RSK company

The poster session of the 50th Annual Meeting of the Spanish Nuclear Society (SNE) featured 15 research studies, although two of the authors were unable to attend to present their posters. The event was sponsored by Amphos21 and presented by **Eliana Guillén Espinosa** from Westinghouse.

Using an innovative digital format, the session allowed authors to present their studies concisely to a group of around 30 attendees, and the posters remained visible on four screens throughout the three days of the congress.

The research topics covered a wide range of areas of interest for the nuclear sector, including nuclear plant modeling, experimental safety studies, the ISO 19443 standard as a bridge between general industry and the nuclear sector, and the growing digitalization of the industry through digital twins applied to the dismantling phase. Other studies addressed the development of lithium-lead alloys, engineering design for energy conversion in nuclear fusion, and the evaluation of sealing systems for the safe storage of waste.

A highlight of the session was the voting for the favorite

poster, which was won by **Tiziana Misala** from CIEMAT with her study on "Effect of the presence of superplasticizers on the adsorption of radionuclides in cements and hydrated phases."

For those who participated in the voting, a raffle was held for an El Corte Inglés gift voucher, which was won by **Vicente Bécares,** also from CIEMAT.

During the session, a light breakfast was served, creating a relaxed atmosphere that undoubtedly facilitated the exchange of ideas and comments between attendees and presenters.

SESSION 45 YOUNG SESSION WITH NETWORKING

Sponsored by: IDOM

The Young Session has established itself as a key space for connecting young professionals with companies in the nuclear sector, aiming to showcase their work beyond traditional technical sessions and to foster a forum for exchanging concerns and interests with industry representatives.

The second edition of this event, held on Friday, October 11, as part of the 50th Annual Meeting of the Spanish Nuclear Society, was once again a success in terms of participation and attendance.

The event was structured into two well-defined parts. In the first part, students and young professionals from universities, research centers, and companies had the opportunity to deliver up to 14 brief oral presentations, distributed across two rooms. What sets the Young Session apart from conventional technical sessions is its multidisciplinary nature: the presentations do not focus on a specific area, such as operation, fuel, or dismantling, but instead cover a wide range of topics. This, along with the brief pitch-style format, adds dynamism and maintains audience engagement.

The second part consisted of a networking breakfast, designed to encourage the exchange of ideas and the creation of professional connections. This space allowed attendees to capitalize on the effort put into their presentations by es-

Pau Aragonés
COORDINADOR

Laura Martín Huete
COORDINADORA

tablishing new connections and engaging in an enriching exchange of perspectives with experienced professionals.

The presence of major companies such as Empresarios Agrupados, Marsein, ENUSA, ENSA, Nucleonova, Naturgy, and Iberdrola, along with sponsorship from IDOM, highlighted the importance and reach of this event. The young participants were able to position themselves as key players, taking advantage of the opportunity to learn from industry representatives' experience and to enhance their professional profiles in an environment of growing collaboration and innovation.

Women in Nuclear

WIN ACTIVITIES AT THE 50th RA SNE IN CORDOBA

During the 50th anniversary of the Spanish Nuclear Society (SNE), held in Cordoba in October, Women in Nuclear (WiN) Spain participated with a focus on outreach and training, attracting the attention of professionals, students and citizens interested in nuclear science and technology. Throughout the event, WiN presented initiatives that combine hands-on education, professional development and people-to-people connection, contributing to the advancement towards a more diverse and inclusive sector.

The 50th anniversary commissioning booth was a key space for WiN during the event, where STEM models were highlighted as fundamental tools to bring science closer to the public. This space allowed showcasing educational projects and highlighting the importance of networking and mentoring in the development of careers within the nuclear sector, underlining the value of personal and professional connections.

WiN's participation in the 50th RA SNE stood out for its balanced approach between scientific dissemination, practical training and professional networking. Through initiatives such as the STEM workshop, mentoring and energy education, WiN Spain continues to work to build a more inclusive, diverse and future-proof nuclear sector.

STEM Inspiration "EnergyLab: Create your own energy!"

One of the most outstanding workshops was **"EnergyLab: Create your own energy!"**, where participants had the opportunity to build a manual electric generator. This hands-on exercise allowed them to explore the principle of Faraday's law in an accessible way, showing how motion is transformed into electrical energy. The workshop inspired attendees to delve into the world of electricity, highlighting creativity and collaboration as key tools for learning. This approach reinforces WiN's commitment to promoting STEM disciplines, especially encouraging young women to explore these areas and overcome traditional barriers.

MENTORING: "The adventure of discovering the scientist in you"

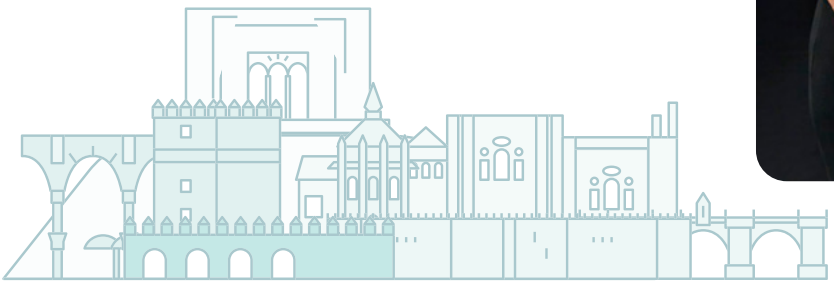
Another highlight was the mentoring workshop "The adventure of discovering the scientist in you", organized in collaboration with the NEA and sponsored by EPRI. In this workshop, participants toured different stations guided by leading female mentors in the nuclear sector, where they were able to discover the impact of women in science and the multiple possibilities of STEM careers. The close and interactive approach fostered the confidence and interest of the young women, turning this activity into an enriching experience for their personal and professional development. This workshop consolidated its position as an essential part of the RASNE program.

CONFERENCE Education for all: "Electricity bill optimization and saving tips"

WiN also organized a conference on "Optimization of the electric bill and saving tips", aimed at both citizens and congress participants. With the participation of Pablo Vázquez Toscano and Dolores Ibáñez, from ENDESA, practical tools were offered to better understand the electric bill, reduce costs and explore alternatives such as self-consumption.The conference addressed complex issues in a simple and accessible way, allowing attendees to acquire knowledge applicable to their daily lives. This activity underlined WiN's commitment to energy education and sustainability, providing value both at a personal and collective level.

GALA DINNER RECOGNITION
WiN Award to Lola Patiño

During the Gala Dinner held within the framework of the 50th RASNE, WiN Spain granted its prestigious award to **Lola Patiño**, recognizing her outstanding professional career and her contribution to the nuclear sector. This award valued her dedication, her commitment to excellence and her constant work in the promotion of female talent in a field as relevant as nuclear energy. ■



Nuclear Youth

NUCLEAR YOUTH: ACTIVITIES DURING THE 50th ANNUAL MEETING

STEM WORKSHOPS

The two days prior to the 50th Annual Meeting, Jóvenes Nucleares (JJNN) started with its science outreach activities in collaboration with the Organizing Committee of the Annual Meeting (CORA), coordinating the STEM (Science, Technology, Engineering and Mathematics) workshops. These workshops, organized by **Cristina Domingo** and **Francisco Morales,** were held at the Rabanales Campus of the University of Cordoba. They were aimed at students in the last two years of Compulsory Secondary Education (ESO), aged between 14 and 16. This year, six companies participated, distributed in two itineraries: **WESTINGHOUSE** (Nuclear Energy in Wesville), **FORO NUCLEAR** (Magic to spread science), **ENDESA** (Sustainable Chemistry), **ENRESA** (Explore El Cabril), **WOMEN IN NUCLEAR** (EnergyLab: Create your own energy!), and **JÓVENES NUCLEARES** (Programming without computers). JJNN introduced a new programming workshop led by **Javier Pelegrina**, in which students delved into the world of programming, learning how to give instructions to the computer and keep logic to the letter. Throughout both days, approximately 300 students and teachers from six schools and institutes in the province of Cordoba participated and enjoyed a day full of science and technology.

SCIENCE IS THE REED

Under the name "La Ciencia es la Caña", JJNN managed, once again this year, to gather more than one hundred people in a bar to spread knowledge about science and nuclear technology. On Tuesday, October 8, the Long Rock room was the setting for three short talks, whose objective was to arouse the curiosity of the Cordovan public about nuclear energy in a relaxed and enjoyable atmosphere.The event began with Paco Morales and his presentation entitled "The 3R rule: reduce, reuse and recycle", in which he stressed the importance of including nuclear energy as part of a clean, safe, affordable and sustainable energy mix. Later, Miriam Díaz and Ana González offered a global perspective in their talk "Nuclear energy in the world", covering from the beginnings of this technology to the future of new reactors. Finally, Pau Aragón took us into space with "The origin of uranium", exploring the fascinating neutron star fusion, the cosmic event that gave rise to this element. Many thanks to all the attendees who contributed to making this event a success!

PRESENTATION OF THE BOOK OF THE BASIC COURSE ON NUCLEAR SCIENCE AND TECHNOLOGY

At the end of the Inaugural Conference on the first day of the Annual Meeting, a short video was shown in which JJNN presented the new edition of the book of the Basic Course in Nuclear Science and Technology, with the hope that this updated version will bring a breath of fresh air. This edition would not have been possible without the previous version, published in 2013, which has served as a guide and reference for its development. The new edition is published in a very special year: the 50th anniversary of the Spanish Nuclear Society (1974-2024), as part of the activities to celebrate this significant event. It is hoped that the contents of the book will be useful not only for students and young people, but also for the general public and for future Young Nuclear Scientists interested in teaching Basic Courses on Nuclear Science and Technology at university centers. 700 copies have been printed and will be distributed free of charge during the 50th Anniversary Social Event to all members of the Spanish Nuclear Society. We hope you enjoy it!

NUCLEAR TECHNOLOGY WORKSHOP

During the Nuclear Technology Workshop, held at the 50th Annual Meeting of the Spanish Nuclear Society, several leading companies in the nuclear sector presented their latest products and innovations.

Among the participating companies were **ENSA, FRAMATOME, BOOST4PRO, WESTINGHOUSE, AND EMPRESARIOS AGRUPADOS,** all of which are leaders in different areas of nuclear technology and are well known for their contributions to the industry.

The event stood out for its interactive format, allowing attendees not only to observe but also to touch and test the displayed products. This hands-on experience was key in helping congress participants better understand the capabilities of each technology and assess their potential application in real work environments. The workshop focused on showcasing advancements that enhance safety, efficiency, and sustainability in nuclear energy, addressing current and highly relevant topics for the sector.

BASIC COURSE IN NUCLEAR SCIENCE AND TECHNOLOGY

The Aula Magna of the Rabanales Campus at the University of Cordoba was also the setting chosen for the traditional **Basic Course on Nuclear Science and Technology.** This year, more than one hundred students, mostly from the Physics Degree, received the basic concepts of the technology of our sector from nine young professionals. In addition, three of them were authors of the brand new book of the Basic Course, while three other speakers made their debut this year in the dissemination to the general public. The students showed great interest, which was reflected in a question-and-answer session lasting more than 45 minutes, after which a variety of merchandising was distributed. The activity was coordinated by **Luis Serra**.

#SALVEMOSALMARAZ

To put the finishing touch on the 50th Annual Meeting, Young Nuclear Professionals (JJNN) participated in the 50th Anniversary Stand on the last day of the congress.

This space was decorated with the logo of the "Save Almaraz" initiative, serving as a meeting point where T-shirts were distributed and the initiative's stance was shared, with the goal of spreading the message and raising awareness among professionals in the sector.

JJNN wanted to commemorate the 50 years of the SNE with the slogan **"From 5 to 0 Nuclear Power Plants,"** highlighting the critical situation faced by nuclear power plants in Spain due to the closure plan, which will begin with the shutdown of Almaraz Nuclear Power Plant. After the closing ceremony, all congress attendees who wished to do so were invited to take a group photo in support of the plant's continued operation. It was an unforgettable image. It was a memorable and emotional moment in which the entire JJNN Board of Directors, along with close collaborators, came together to distribute T-shirts to the more than 600 congress attendees present. ■

Communication Committee Activities

PRESS CONFERENCE WITH THE MAYOR OF CÓRDOBA

The 50th Annual Meeting of the Spanish Nuclear Society (SNE), held in Córdoba from October 9 to 11, 2024, gathered around 750 experts from the national and international nuclear sector.

This event, in addition to being a leading technical forum, became a key platform for disseminating the SNE's strategic messages.

The Communication Committee played an essential role in contributing to this objective, leading a comprehensive communication plan to enhance the promotion of the program and the content of the sessions.

During the months leading up to the meeting, this Committee worked intensively to define a communication plan aligned with the strategic priorities of the SNE.

Among the organized actions, a meeting with local journalists before the summer stands out, as well as a press conference in July that marked the beginning of media coverage. Additionally, the messaging framework was updated, and coordination with external communication teams was strengthened.

A collaborative team made up of communication professionals from the nuclear sector and external professionals in communication, social media, and audiovisual production worked together to highlight, now more than ever, the fundamental role that nuclear energy plays in our future.

In this edition, the usual press conference was also held, along with a brief media meeting on the opening day, taking advantage of the visit of the city's mayor, **José María Bellido,** to the Congress, alongside the president of the SNE, **Emilio Mínguez.**

Additionally, collaborative tools were implemented, allowing the team to share information in real-time, ensuring effectiveness and cohesion in all activities.

The meeting's website and app served as dynamic channels to keep attendees informed.

The communication efforts had a notable impact on regional and specialized media.

More than 40 appearances were recorded in press, radio, and television, with headlines such as:

"Spain has been left completely alone in its policy of closing nuclear power plants."

This message, along with the role of nuclear energy as a clean and safe solution, was widely disseminated and echoed by the media.

Additionally, the **#SaveAlmaraz** campaign, focused on raising awareness about the importance of this nuclear power plant, was visible both on social media and in the spaces of the Congress Palace, generating reflection and support among attendees.

The activity on social media exceeded expectations, with Instagram consolidating itself as the platform with the greatest impact.

Under the hashtag **#NuclearesEnCórdoba,** notable results were achieved, such as significant follower growth and a high level of interaction.

Meanwhile, LinkedIn reaffirmed its relevance in professional communication, while the SNE stand, designed to maximize the visibility of the committees, received great reception.

Among the most notable achievements, it is worth highlighting the effectiveness of teamwork, the improvement in coordination, and the positive impact of communication strategies.

The overall balance of this edition has been very positive, positioning the SNE as a benchmark in communication within the nuclear sector. From the Communication Committee, the commitment remains clear: to move towards an increasingly innovative and effective strategy for future editions.

See you in Cáceres! ■

BEST PRESENTATIONS AT THE 50th ANNUAL MEETING

Best Papers Presented at the 50th Annual MeetingAccording to the criteria established for the selection of the best paper, the best papers and posters presented at the 50th Annual Meeting were determined to be the following:

QUALITY AND HUMAN FACTORS AREA

COFRENTES N.P.C. 24 RECHARGE ERROR PREVENTION TECHNICAL PLAN
Joaquín Hernández Ortega y Andrés Hernández Lorente
Iberdrola Generación Nuclear

COMBUSTIBLE AREA

EVALUATION OF CR-COATED ZIRCALOY CLADDING UNDER ACCIDENT CONDITIONS WITH FRAPTRANTUMECH
Pau Aragón, Francisco Feria y Luis E. Herranz - *CIEMAT*

DISMANTLING AND WASTE MANAGEMENT AREA

ANALYSIS OF THE OPERATING HISTORY OF VANDELLOS I FOR THE COMPLETE DECOMMISSIONING OF THE FACILITY
Gonzalo Medinilla Téllez[1], Pablo Carrasco[1] y María Elisa Gimeno[2]
[1] Westinghouse Electric Spain SAU - [2] Enresa

ALMARAZ N.P.C. DECOMMISSIONING TRANSITION PLAN
Víctor Rojas Moreno - *Centrales Nucleares Almaraz-Trillo*

COMMUNICATION AND TRAINING AREA

LOOKING BEYOND THE GOGGLES: CHALLENGES AND REFLECTIONS ON VIRTUAL REALITY AS A TRAINING TOOL IN THE NUCLEAR INDUSTRY
Emma Merino Cue - *Equipos Nucleares S.A., S.M.E*

ENGINEERING, DESIGN AND INNOVATION AREAS

REVERSE ENGINEERING FOR TEMELIN NUCLEAR POWER PLANT VOLTAGE CONDITIONING SYSTEMS
Luis Rejas López y Daniel Adrados Espada - *Westinghouse*

DESIGN OF HIGH-TEMPERATURE NUCLEAR COMPONENTS: EFFECT OF CREEP ON MATERIALS AND APPLICATION OF ASME BOILER AND PRESSURE VESSEL CODE SECTION III DIV. 5
Fernando Oleo Blanco - *EAG EA-GHESA*

NUCLEAR MEDICINE AND RADIOLOGICAL PROTECTION AREAS

STUDY WITH MONTE CARLO SIMULATIONS OF THE NEUTRON SPECTRUM IN A PROTON THERAPY TREATMENT ROOM
Adrián Díaz Comeche, S. Oliver, B. Juste, R. Miró y G. Verdú
Instituto de Seguridad Industrial, Radiofísica y Medioambiental. UPV

OPERATION AND MAINTENANCE AREA

ARTIFICIAL INTELLIGENCE APPLICATIONS AT COFRENTES NUCLEAR POWER PLANT
Elías Gosalbez Guijarro - *Iberdrola Generación Nuclear*

ADVANCED REACTORS AND NUCLEAR FUSION AREA

SIC-1 HYDROGEN MONITORING SYSTEM IN THE ITER PROJECT
Beatriz Martinez Manzanares - *EAG (EA-GHESA)*

NUCLEAR SAFETY AND LICENSING AREA

WHERE WERE YOU THEN? BIG LICENSING MILESTONES IN 40 YEARS OF COFRENDS
Miguel Sánchez López y Miguel Ángel del Barrio - *Iberdrola Generación Nuclear*

ANALYS IS OF THE PASSIVE SAFETY SYSTEMS IMPACT IN WER-1000 REACTORS
Elena Redondo Valero[1], César Queral[1], Kevin Fernández Cosials[1] y Víctor Hugo Sánchez Espinoza[2]
[1] Universidad Politécnica de Madrid
[2] Karlsruhe Institute of Technology (KIT).

THERMOHYDRAULICS AND NEUTRONICS AREA: SIMULATION AND EXPERIMENTATION

FLEXIBLE OPERATION IN PWR-KWU REACTORS: SIMULATION OF XENON TRANSIENTS WITH RELAPS/PARCS
Bárbara Navarro Mas[1], T. Barrachina[1], R. Miró1, G. Verdú[1], M. García-Fenoll[2] y J. M. Posada[2]
[1] Instituto de Seguridad Industrial Radiofísic Medioambieltal. UPV
[2] Centrales Nucleares Almaraz-Trillo (CNAT)

VALIDATION OF THE PARUPM-GOTHIC 8.3(QA) CODE COUPLING AGAINST PAR RECOMBINATION EXPERIMENTS HR-2 AND HR-12 PERFORMED IN THE THAI FACILITY
Araceli Domínguez Bugarín[1], Ernst-Arndt Reinecke[2], Gonzalo Jiménez[1], Miguel-Ángel Jiménez[1,3] y Sanjeev Gupta[4]
[1] Universidad Politécnica de Madrid, ETSI Industriales Madrid
[2] Forschungszentrum Jülich GmbH
[3] Consejo de Seguridad Nuclear
[4] Becker Technologies GmbH

POSTER SESSION

EFFECT OF THE PRESENCE OF SUPERPLASTICIZERS ON RADIONUCLIDE ADSORPTION IN CEMENTS AND HYDRATED PHASES
Tiziana Missana, O. Almendros-Ginestá, M. Mingarro y M. García-Gutiérrez - *CIEMAT*

YOUTH SESSION

OVERCOMING PLUTONIUM DEPENDENCY: PRELIMINARY RESULTS ON THE MANAGEMENT OF PU IN HALEU-FED FAST REACTORS
Sonia Panizo Prieto y F. Álvarez-Velarde - *CIEMAT*

ALMARAZ TRILLO

Una alternativa limpia, segura y competitiva

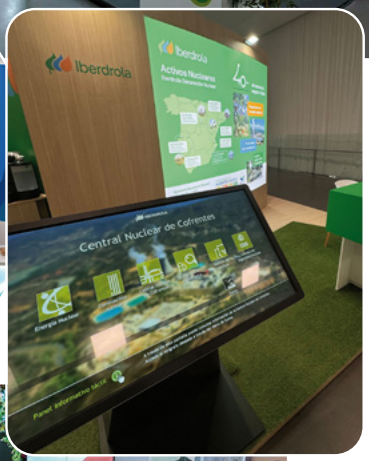
En continuo proceso de mejora, actualización y modernización

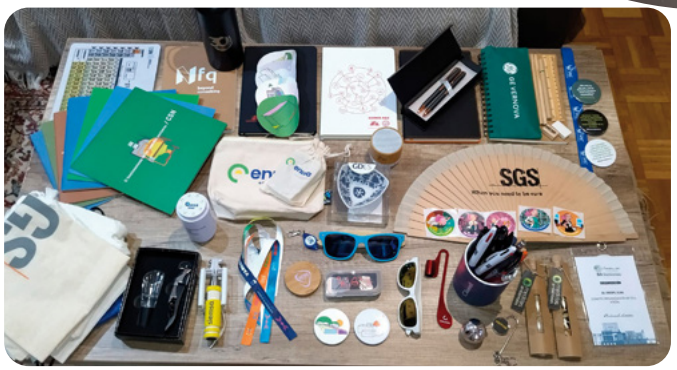
Commercial exhibition

Once again this year, the commercial exhibition brought together the most representative companies of the sector, which had the opportunity to present their products and services to the congress participants.for three days, the exhibition area was a professional meeting point, as well as a place for personal encounters that are renewed every year.the 50th Annual Meeting was attended by the following exhibiting companies:

IBERDROLA
ENDESA
WESTINGHOUSE
KOTRA
KONECRANES
CSN
EUROFINS
SGS - TECNOS
MEDIDAS AMBIENTALES
AMPHOS21
RINGO VÁLVULAS
ADEMI

Amara NZero
ENRESA
EMPRESARIOS AGRUPADOS
AHLBERG CAMERAS
CINC
ENSA
ENWESA
GD ENERGY SERVICES
FRAMATOME
CIEMAT
NATURGY
ENUSA





EAG // EMPRESARIOS AGRUPADOS · GHESA

At the 50th Annual Meeting of the Spanish Nuclear Society, EAG (Empresarios Agrupados – GHESA) reaffirmed its commitment to nuclear energy and its dedication to young talent through its active participation in the various technical and informative sessions held in Córdoba.

Out of the 60 EAG representatives present, 30 delivered presentations, and two of them were awarded:

- **Award for the best presentation in "Advanced Reactors and Nuclear Fusion"**: Beatriz Martínez Manzanares, for her work on the SIC-1 hydrogen monitoring system in the ITER project.
- **Award for the best presentation in "Engineering, Design, and Innovation"**: Fernando Oleo Blanco, for his presentation on Design of High-Temperature Nuclear Components: Effect of Creep in Materials and Application of ASME Boiler and Pressure Vessel Code Section III Div. 5.

Additionally, Juan García Rendón participated in the "Nuclear Technology" workshop, presenting Wally, an advanced search engine for technical documentation developed by EAG, which allows for quick and efficient searches within a project's documentation.

The directors of various engineering departments, Olga Asuar Alonso, Mónica Moreno Asenjo, Luis Cerrada Duque, and Luis Chiva Robles, had the pleasure of participating in the Young Session, a unique opportunity to attract talent and enable these young professionals to share their work and promote knowledge transfer.

EAG also took part in several mentoring workshops, aiming to offer young people the opportunity to integrate into the companies that make up the SNE through internships and job opportunities. Notable contributions included those of Belén Martínez Manzanares and Ricardo Moreno Escudero, as well as Pilar López in the workshop conducted by Women in Nuclear (WiN). ■

endesa

ENDESA, HOST OF THE 50th ANNUAL MEETING OF THE SNE

ENDESA, Spain's leading nuclear operator, had the privilege this year of hosting the Annual Meeting of the SNE held in Córdoba, a very special gathering where more than 700 attending congress participants were able to celebrate the first half-century of the Spanish Nuclear Society (SNE), recall the key milestones of these 50 years of progress, and analyze the future challenges for the sector.

Manuel Leal led the event's Organizing Committee, accompanied by a broad representation of Endesa's Nuclear General Directorate, headed by General Director Gonzalo Carbó. Miguel Barreiro was in charge of reviewing the great moments experienced over half a century of SNE annual meetings, evoking memorable memories for all professionals in the sector.

But this year, Endesa's "nuclear team" was also joined by other key company representatives, such as Rafael Sánchez Durán, Endesa's director for Andalusia, Extremadura, Ceuta, and Melilla, who participated in the Opening Session, where he thanked the SNE for choosing Andalusia as the venue for the event. Additionally, Juan María Moreno, Endesa's General Director of Energy Management and one of the speakers in the plenary session on "The Future of Nuclear Energy on the Horizon 2030", fondly recalled his years at the helm of the company's Nuclear General Directorate.

Endesa was also present at the Congress's commercial exhibition through a booth, where it highlighted the fundamental role of nuclear energy in the energy transition as a clean, safe, and essential source for ensuring the stability of the electrical system and emphasized the contribution of the nuclear power plants it participates in to Spain's electricity supply. ■

A NOTABLE ENUSA DELEGATION ATTENDS THE ANNUAL SNE MEETING

As in every edition, Enusa attended the 50th Annual Meeting of the Spanish Nuclear Society (SNE) with a distinguished representation of its professionals. This year, the event was held in Córdoba and brought together nearly 750 nuclear experts.

The Enusa delegation that traveled to Córdoba showcased its experience, talent, and professionalism by participating in various technical sessions and different areas of knowledge.

Own Stand in the Commercial Exhibition

Enusa once again participated in the commercial exhibition with its own corporate stand, which was inaugurated by the Mayor of Córdoba, José María Bellido, and the President of the SNE, Emilio Mínguez.

This type of collaboration facilitates meetings with companies and institutions in the sector that are of interest to our company, making the stands the best meeting point for exchanging experiences and discussing topics of mutual interest.

Enusa in the Technical Sessions

A fundamental pillar for sharing the work we do in the sector, as well as the knowledge, experience, and innovation within it, are the technical sessions.

Enusa has great professionals who participate in this part of the event every year. On this occasion, 12 experts from different areas of the company presented the projects that Enusa is working on.

With their presentations, they once again demonstrated that Enusa is a company full of talent and commitment.

Additionally, our colleague, José Ángel Capitán García, presented his Master's Thesis on "The Role of Plasma Pressure in Electrostatic Turbulence in Stellarators". His work won the Best Master's Thesis Award of the SNE.

SNE-Framatome 2024 Photography Contest

But Enusa is not only about scientific and technological talent. Artistic talent also has its place, and a great example of this is that two of our colleagues won awards in the SNE-Framatome 2024 Photography Contest.

Mario Gómez Villa took home the First Prize in the General Category with his snapshot “Baño de arena” (Sand Bath). Iván Sánchez won the First Prize in the Energy Category with his photograph “Blanco y rojo” (White and Red).

Córdoba was the setting for a series of sessions in which nuclear sector professionals highlighted the importance of nuclear energy in both the present and future worldwide. ■

GDES participated once again in the 50th Annual Meeting of the Spanish Nuclear Society, which was attended by more than 750 professionals from the nuclear sector at both the national and international levels.

For three days, in addition to having a stand showcasing the latest innovations and international projects, featuring a video wall displaying projects and strategic services for the sector, GDES took part in presentations and technical sessions on engineering, R&D+i, quality, and CSR.

This year’s presentations were as follows:

“Simulation of maneuvers for changing heaters 2A/B at CN Cofrentes”, presented by the Thermal Protections Department of the company.

“Integration of environmental sustainability criteria into business strategy: the GD Energy Services model”, presented by the Quality, Safety, and CSR (QHSE/CSR) Department, in collaboration with the Communication Department.

Additionally, collaborations were made in the following presentations:

“Evaluation of the mental workload in the nuclear sector with physiological signals to minimize human error”, designed together with the Valencia Institute of Biomechanics (IBV).

“Tests conducted at C.N. Ascó on the inspection system using X-ray backscatter to identify voids in silicone foam seals and their filling. Planned actions”, designed in collaboration with ANAV.

The new purpose of our company served as the guiding theme of our presence at this event: the formal presentation of our renewed commitment to engineering, digitalization, talent, and innovation in the provision of services for the industry that contributes most to the decarbonization of our electrical system—the Spanish nuclear industry. ■

OUR GREATEST ASSET: PEOPLE

Iberdrola Generación Nuclear participated in the 50th Annual Meeting of the Spanish Nuclear Society (SNE) held in Córdoba, once again with a broad representation of professionals, led by its director, Tomás Lozano, and the director of the Cofrentes Nuclear Power Plant, Javier Sala.

As in previous editions, Iberdrola's personnel actively participated in the Annual Meeting, chairing and coordinating various technical sessions, as well as presenting papers on topics of interest to the sector.

During the event, Iberdrola reaffirmed its commitment to innovation and sustainability in the nuclear field, presenting several innovative projects aimed at improving the efficiency and safety of nuclear power plants.

Throughout the Congress, Iberdrola Generación Nuclear once again highlighted the value of its professionals and the leadership it holds in the nuclear sector.

The company has achieved excellent operational results at its plants, coinciding with the 40th anniversary of safe and reliable operation at the Cofrentes Nuclear Power Plant.

Iberdrola Generación Nuclear maintains a permanent commitment to nuclear technology to ensure a safe, reliable, and environmentally friendly electricity supply.

Additionally, the company is firmly committed, both socially and economically, to the communities surrounding its facilities.

The motto **"Our greatest asset: people",** which presided over Iberdrola's stand at the Congress, clearly highlights the talent and recognition of its professionals, who represent the company's greatest value. ■

Once again, **Naturgy** has participated in the Annual Meeting of the SNE, held in Córdoba, presenting various technical papers in the thematic areas of thermal-hydraulics and neutronics, fuel, decommissioning, and waste management, as well as chairing and coordinating five technical panels.

We also participated with a stand in the commercial exhibition, providing an opportunity to interact with visitors, customers, and partners, communicating knowledge and expertise in the nuclear field, and reflecting the company's commitment and values.

Additionally, Naturgy contributed to the success of this Annual Meeting through its presence and high level of involvement in the organizing and technical committees, among others, that are part of the SNE.

Committed to promoting technological vocations, we organized, as part of the WiN committee, along with the Nuclear Energy Agency (NEA) of the OECD, the workshop "The Adventure of Discovering the Scientist Within You", held at the University of Córdoba.

In this event, 35 female students participated in a fun journey through different stations, where mentors and role models from the scientific and nuclear sector showcased the important role of women in STEM careers.

Through this, Naturgy continues to demonstrate its commitment to the safe and efficient generation of energy, reaffirming its dedication to reducing climate impact with the goal of achieving a more sustainable future that ensures the well-being of people, business and societal progress, and the sustainability of the planet. ■

SAMSON RINGO

This year, as usual, **Ringo Válvulas** was honored to participate in the 50th Annual Meeting of the Spanish Nuclear Society, a special commemoration held in the historic city of Cordoba. This emblematic event brought together the main players in the Spanish nuclear industry, providing a valuable opportunity to share advances and innovations in the sector.Ringo Válvulas was present with its stand, a space for exchange and dialogue with

customers and collaborators. During the event, the company highlighted its recent projects and solutions designed to meet the current needs of the nuclear market, reaffirming its role as a reference supplier in the industry. Participation in this annual meeting continues to be fundamental for Ringo, not only to showcase its cutting-edge technology and products, but also to strengthen relationships with customers and gain a close understanding of their challenges and objectives. This year, as usual, Ringo Válvulas was honored to participate in the 50th Annual Meeting of the Nuclear Society. This year, Ringo has supplied valves and spare parts to all the nuclear power plants in Spain. These supplies include large valves, such as DN600 and DN700 check valves for the Trillo nuclear power plant, and 32" butterfly valves for the Almaraz nuclear power plant. In addition, we have supplied nuclear class 1 valves for the primary system of the Ascó and Vandellós plants. At the Cofrentes nuclear power plant, several orders have been placed, including supplies of gate valves and nuclear class 2 and 3 balloons, reaffirming our commitment to the highest standards of nuclear engineering and safety. At the international level, the consolidation and growth of Ringo Válvulas in the North American markets, both in the United States and Canada, as well as in the already consolidated markets of Europe, where we continue to be a benchmark of quality and reliability in the supply of valves for the nuclear industry, is noteworthy. ■

Westinghouse

Westinghouse was proud to sponsor the 50th Annual Meeting of the Spanish Nuclear Society, which convened nearly 750 nuclear industry professionals to present the most current and innovative projects, products and services related to nuclear energy.Westinghouse had an outstanding turnout with employees representing multiple business units and organizations. Our team had the opportunity to showcase our solutions for long-term operations and demonstrate how we can extend the life of existing plants at our trade booth. In addition, we shared our expertise through 33 technical presentations, highlighting topics such as the eVinci™ microreactor, nuclear safety and licensing, operation and maintenance, and decommissioning and waste management. We also presented our new Nuclear Industry Specific Artificial Intelligence system, HIVE™, during a workshop on nuclear technology. An important aspect of the Annual Meetings is the tradition of engaging with the community of the event's host city each year. Westinghouse teams interacted with more than 280 local high school students, leading one of the Science, Technology, Engineering and Math (STEM) workshops. During the session, students were able to deepen their understanding of the nuclear industry through a variety of experiences, including collaboration on a simulated nuclear power plant project. In addition, our teams participated in two events organized by Women in Nuclear (WIN), which were part of our community outreach activities. These events included a mentoring workshop in Cordoba for students and a WIN conference focused on understanding electricity bills and ways to reduce their costs. During the gala dinner, SNE President Emilio Mínguez awarded Francisco Sánchez, VP of Training, Simulation and Control Rooms Operation, with the SNE 2024 Diploma, in recognition of his work for the development of nuclear energy and his contribution to the Spanish Nuclear Association. Thank you to all the team members who attended and represented Westinghouse. Your dedication allows us to continue to have a positive impact on the nuclear industry and the future generations who will work alongside us to achieve a better tomorrow. ■

SPONSORS AND COLLABORATORS

amaranzero
AMPHOS 21 an RSK company
anav energía positiva
AYUNTAMIENTO DE CÓRDOBA
ALMARAZ TRILLO
CENTRAL NUCLEAR DE COFRENTES
coapsa
DMIM
edp
EAG EMPRESARIOS AGRUPADOS · GHESA
endesa
ENS EUROPEAN NUCLEAR SOCIETY
enusa
ensa
enwesa
EPRI ELECTRIC POWER RESEARCH INSTITUTE
Foro Nuclear Foro de la Industria Nuclear Española
framatome
GDES
GE VERNOVA
Iberdrola
IBERIA
IDOM
marSein
minsait An Indra company
moncobra
Naturgy
NEA Nuclear Energy Agency
renfe
RINGO VALVULAS
TAMOIN
UCLM UNIVERSIDAD DE CASTILLA-LA MANCHA
Westinghouse

EXHIBITORS

ademi
AHLBERG CAMERAS
amaranzero
AMPHOS 21 an RSK company
Ciemat
CSN CONSEJO DE SEGURIDAD NUCLEAR
EAG EMPRESARIOS AGRUPADOS · GHESA
endesa
enusa
enresa
ensa
enwesa
eurofins
framatome
KONECRANES Lifting Businesses
kotra
GDES
Iberdrola
medidas ambientales
Naturgy
RINGO VALVULAS
SGS
Westinghouse

HITACHI

Net zero needs nuclear

Learn more about the BWRX-300 small modular reactor at **www.gevemova.com/nuclear**

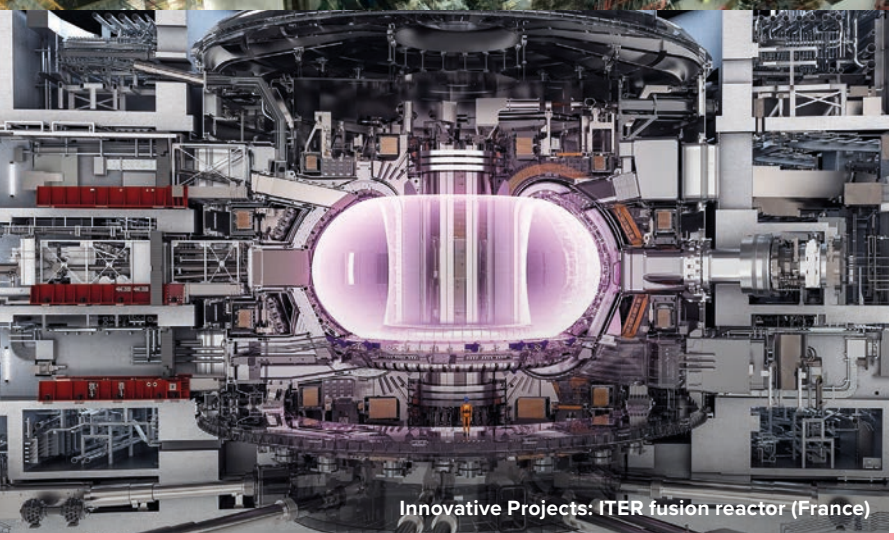
EAG (EMPRESARIOS AGRUPADOS - GHESA)

TECHNOLOGICAL CAPABILITIES FOR THE DEVELOPMENT OF COMPLEX PROJECTS

Operating Plants: Almaraz Nuclear Power Plant (Spain)

EAG generates quality and development through our engineering services in all phases of the life cycle of power generation projects:

- **Nuclear:** Fission and fusion.
- **Conventional Thermal:** Coal, fuel oil, gas in open or combined cycles.
- **Renewable energies:** Parabolic solar, concentrating tower solar, photovoltaic solar and wind power.



Innovative Projects: ITER fusion reactor (France)

+65,000 MEGAWATTS

+250 PROJECTS

+1,400 PEOPLE

80 COUNTRIES

EAG (EMPRESARIOS AGRUPADOS - GHESA) - Magallanes, 3. 28015 Madrid, Spain.

Telephone: 91 309 80 00 - FAX: 91 591 26 55 - **www.empresariosagrupados.es - www.ghesa.es**