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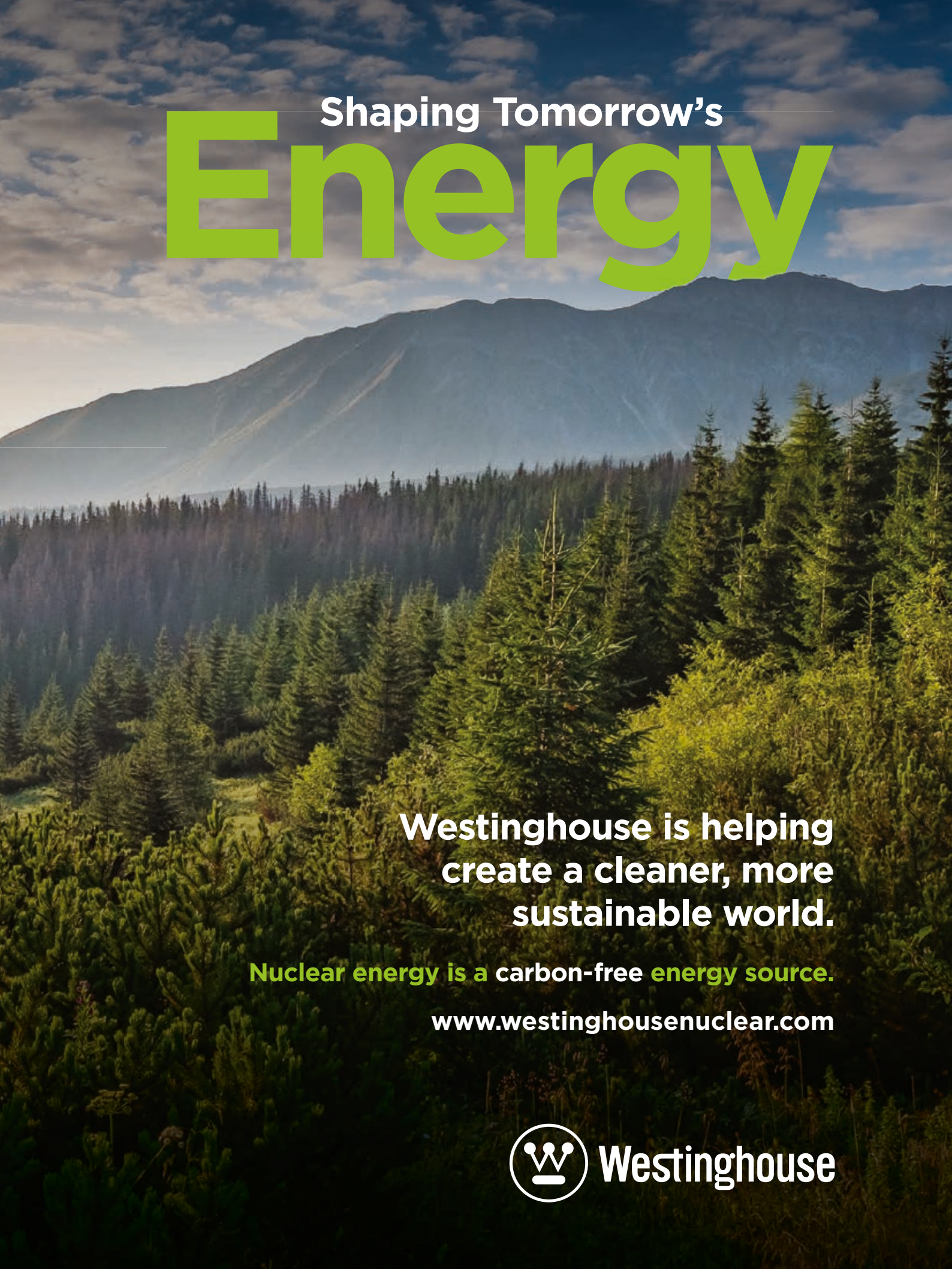
NUCLEAR POWER PLANTS 2023

Experiences & prospects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NUCLEAR POWER PLANTS 2022
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YEAR OF CELEBRATIONS

In a special anniversary year celebrating its 50 years of existence, the Spanish Nuclear Society celebrated yet another edition, the 35th, of its traditional Operational Experiences Day in the assembly hall of the Higher Technical School of Industrial Engineers of the Polytechnic University of Madrid.

Under the motto "Spanish nuclear power plants in 2023, experiences and perspectives", the event, a reference in the Spanish nuclear sector since 1989, once again served as a meeting point where the directors of the nuclear power plants in our country analyzed the most relevant aspects of their operation during the past year. Their speeches confirmed the excellent performance of the nuclear fleet during that period.

The day included a special session that, as required by the occasion and in the form of an entertaining discussion among some sector leaders, had as its leitmotif the "50th Anniversary of SNE: our next 50 years". Without a doubt, it was a well-deserved tribute to the committed work of the Spanish Nuclear Society over the past five decades.

The event once again highlighted how nuclear energy is the only technology in the Spanish electricity system that has been producing more than a fifth of the electricity consumed in Spain for over a decade. Specifically, in 2023 it produced 20.34%, with overall performance indicators around 90%, demonstrating its reliability and contribution to meeting the challenges of supply guarantee, competitiveness, and reducing greenhouse gas emissions.

This was reported by the directors of the Spanish plants presenting the results of their facilities and who, once again, conveyed to the attendees various messages of overcoming, continuous improvement, and the need to persist in the effort to change the social perception of nuclear energy.

Likewise, as the president of the SNE wanted to highlight, "when we talk about supply guarantee, we must also add that Spanish nuclear power plants have been available practically 90% of the hours of the year. Nuclear is a base, stable, and constant production energy".

For his part, at the closing of this 35th edition, the president of the Nuclear Safety Council emphasized that "the Spanish Nuclear Society is a fundamental agent in our country for the promotion of knowledge of nuclear science and technology". ■

EDITORIAL COMMITTEE

ÓSCAR GARCÍA

Director of the Higher Technical School of Industrial Engineers of the Polytechnic University of Madrid

Text: MATILDE PELEGRÍ Photographs: GRUPO SENDA

The collaboration between the Higher Technical School of Industrial Engineers of the Polytechnic University of Madrid (ETSII) and the Spanish Nuclear Society (SNE) has become a fundamental pillar for the promotion of the energy sector. Óscar García, who assumed the direction of the School in 2018, highlights in this interview the key role of the School in training leaders in the nuclear sector, emphasizing its commitment to academic excellence and the employability of its students. With a distinguished trajectory of 180 years, the School offers solid training in Industrial Engineering, backed by cutting-edge research programs and a wide network of international collaborations.

A traditional collaboration

The Spanish Nuclear Society's (SNE) Operational Experiences Day is one of the most relevant institutional events in the industry and energy sector. Each year, since 2002, the School's assembly hall hosts speakers and attendees, nearly 300 executives and professionals in the sector, many of whom were students and fondly remember their student days.

What does this collaboration with the Spanish Nuclear Society (SNE) represent for you, as director, and for the School?

It is very important to support the nuclear sector due to the relevance of the nuclear energy sector in our country and in the world. The School will always support the SNE. Furthermore, this School has played a fundamental role in the history of nuclear energy in Spain and also as an institution training students. These students have reached very important positions of responsibility and we are very proud. Now we have the Guillermo Velarde Nuclear Fusion Institute, but let's say that the people who have been part of this School working in the nuclear sector have had that relevant and very important role. We are a training center that produces many students with a nuclear profile who end up working in the sector. For them, it is very important to bring them closer to this world and give them an opportunity.

The School

With nearly 180 years of history, the School can boast very relevant figures: more than 4,500 students, 300 teachers, 790 researchers in R&D pro-

jects, exchange agreements with more than 140 universities worldwide.

You were elected director of the School in 2018. Six years and a pandemic later, what is your assessment of the institution and this period?

The School is at a peak moment. We have a large number of student applications to enter, as well as a high demand for graduates from companies. The training given here is highly valued and there is a very high employability rate. The School is doing very well globally. In addition, we have a strong international program and very powerful research programs. We usually say that we are a School of opportunities for students. And we strive every day to give them various possibilities. It is true that the COVID period, which caught us in the middle of a course and the next one, was very difficult to manage because we have a high number of students, 4,500, along with another 500 people, including teachers, support staff, etc. But the truth is that everything worked correctly. Both the students and the teachers responded very well, and we managed to move forward. There is also something I really like to highlight about the School, which is the good working environment. There is a lot of cordiality with the students. This is very appreciated when you come to work every day.

The School offers degrees in Industrial Technologies Engineering, Organization Engineering, and Chemical Engineering, the qualifying Master's in Industrial Engineering, and 13 other Postgraduate Master's degrees. Which of these are the most requested fields of study by students?

It is difficult to compare. Indeed, there is a generalist degree, which is Industrial Technologies, and then there is the Organization Engineering degree and the Chemical Engineering degree, along with part of the Energy Engineering degree, which we offer with the School of Mines. The latter has a pathway in which students enter through the School of Mines and Energy, while the last two years are done here. That is to say, we do not own the degree, but we do participate in it up to 50%. All degrees are in high demand. Which one stands out? Industrial Technologies, clearly. But why do I say they are not comparable? Because each one has a different quota, a maximum number of admitted students. The Organization Engineering degree appears with a higher cut-off grade because there are many fewer places than in Industrial Technologies. The number of applications we receive for the Industrial Technologies degree exceeds all the others.

You mention that the quota is exceeded, that is, there is more demand than supply, so for the School, the number of applications is not decreasing. Is there no less interest from young people in the world of Industrial Engineering?

> **"The training we give at the ETSII is very highly valued and there is a very high employability rate"**

No. The School has more applications than places, so we are doing very well in that aspect. Another thing is what will happen in the future because, obviously, we are all fighting to encourage STEM professions so that young people choose Engineering in particular, but it is also true that years with a lower overall number of students are coming due to a demographic issue. Therefore, in the not-too-distant future, it will have to be seen. In this School, we are in a good situation, but there will be universities in Spain that will start to clearly suffer from this issue.

In this sense, is there a plan, or is it still too early to start planning for the promotion of Engineering? Or is it complicated at a time when studying Engineering requires an effort that other careers may not require?

We have been promoting for many years, not only us but also associations, companies, all kinds of universities, and some Administrations. It is important for students to discover what Engineering is because it is not well known in depth; young people do not know exactly what it consists of. They may know very well what Medicine is, for example, but they usually do not know what Engineering is, and even less so Industrial Engineering. Because if we talk about aerospace or naval engineers, just the name gives them more or less an idea. But industrial engineering remains in a diffuse boundary of not really knowing what it is dedicated to. We all promote it; we go to schools a lot, we participate in some promotion activities with other institutions, and we also have an initiative which is a contest aimed at high school students to do their first Engineering project. It is called "Engineering in your hands" and it is a project that is being very well received. This year, there are more than 600 participants, of which 45% are women. Therefore, promotion is essential. Another thing is what will happen when there are fewer students. It is a demographic issue; we have been seeing a decrease in the number of births for years, but looking at those entering university, that is, 18 years ago, we are still at a point where it may be rising slightly. But from 2008 onwards, births started to fall drastically. So, in 2026, the number of students will start to decrease.

What percentage of students are women? How has it evolved?

We are very happy because, although the numbers could be better, they are not bad at all. Right now, averaging all our degrees, we have 38% female students. There are degrees where we reach almost 50% and others 30%, but overall it is 38%, which is great news. This number has been growing in recent years little by little, around a point or point and a half each year.

> **This School has played a fundamental role in the history of nuclear energy in Spain and also as a student training institution**

Following what you mentioned, what message would you send to students to convey the importance of Industrial Engineering in society?

This question is very difficult. We have to make them discover the importance of Engineering and what it allows to be done. Make them see that there is a lot of Engineering behind everything they use in their daily lives so that they reflect on it and become aware. They have to see that a person who studies Engineering will likely have many opportunities to work in almost any sector they want. Just like if they want to dedicate themselves to research, they will also have many opportunities. Engineering positions the student with many possibilities for the future, but to encourage them, we have to make them see what they are capable of doing, instill in them the desire to understand how things work or to design something. "

What is the employment rate of graduates?

I cannot know exactly, but it is very close to 100%, there is almost total employment. When we track graduates, we always get ninety-something percent. And it is not 100% because there are always students who decide to pursue a doctorate, study another Master's, or dedicate themselves to a freelance profession, which leaves us with little capacity to know if they are working or not. But really, the follow-up we do is very satisfactory. It can never be 100%, but it is very high, and more now that we are in a moment of high demand for engineers in society, not just industrial engineers. If it is always close to 100%, now it will be much closer. But, in general, Industrial Engineering, due to its multidisciplinary nature, always has many possibilities to be very well positioned in employability rankings.

What is the profile of hiring companies and what relationships do they maintain with the School?

The profile is very broad. It is so multidisciplinary that we have classic engineering companies, technological companies, small SMEs, consultancies, logistics companies... Now the banking sector, for example, has entered strongly to recruit engineers. This multidisciplinarity is what gives us the ability to be positioned in very varied companies.

What employment promotion initiatives are most valued by students?

There is an employment fair held at the School, organized by the students themselves, called Induforum. It is an annual fair that is filled with companies for two days to recruit engineers. But it is true that this recruitment does not only happen on that date but throughout the year. We also have an employment office, Induempleo, whose goal is to help students find their first job, their first job, their first internships... Then it is true that there are many companies that have a presence at the School and try to attract students.

Complementing studies at foreign universities is an increasingly appreciated option by students. The School has the International Relations Office, which coordinates the international mobility of students, how does it work and what agreements does the School maintain with similar entities in other countries?

We boast of having a very good international program. Approximately 80% of our students go abroad for part of their degree, a percentage that is not higher, not because there are no possibilities for them to go, but because they decide not to, which is also a very reasonable personal choice. Where do they go? How do they go? And in what format? There are three modalities: those who go for a semester, those who go for an entire course, which is usually the majority, and those who go for a course or a little more to a place to pursue a

double degree. Obtaining a double degree consists of the student doing part of the studies here and another part, which must have a certain duration, at another destination. Once completed, they obtain the diploma from the place where they went and the one from here. Adding these three modalities, we have around 300 students who go abroad each year. It is also true that we receive about 300 other students, which are also very interesting numbers. We are a very international School.

And what destinations are most chosen by students?

Traditionally, we have had many agreements with the major European engineering universities in France, Germany, Italy, Sweden, even the United Kingdom. These are our strongest allies, as we continue to have many students going to these countries. However, in recent years, some double-degree agreements we have with the United States, Japan, and China have grown significantly. We really do have the possibility for students to go abroad to study. And speaking of trends, it is true that interest in going to the United States is growing. Also for Japan, although we do not have as much capacity to send students there due to the number of places offered. Because agreements are linked to the number of places. With China, we have made a big bet, the UPM in general, and we, in particular, have an agreement signed with a very good university, but when COVID came, the movement of students was cut off and now it has started to resume. We have some students from that university here and some who will go there next year. But it is much more difficult because China has been closed for four years.

What common aspects would you highlight with engineering universities in other countries regarding current issues and challenges?

The lack of engineers is common worldwide; it is not a Spanish or European problem. The decline in vocations is something we all fight against. It is also true that creating a strong international program is attractive for students because it can partly help them feel interested in studying Engineering by sharing studies in several countries. There is a European Union project for European universities through consortia, and practically all Spanish universities are present in one of them. We lead one, as part of the UPM, focused on Engineering called EELISA (European Engineering Learning Innovation and Science Alliance), and we are trying to promote student exchange, generating joint programs, etc. The European Union is granting funds for university consortia to work together on various lines, both professors and students. Ideally, joint degrees should eventually exist. What happens is that at this point, there is a legislative problem that needs to be resolved, which is not easy at all, to homologate them all. Someone does a course in Madrid and then goes to Paris to finish it in Germany. What degrees do we give them? They must be recognized by all countries. This needs to be worked on, not so much by the University, but by legislators. In Europe, if we want to compete with the United States and Asia, we cannot act as individual countries; we have to come together.

Professional profile

Óscar García holds a PhD in Industrial Engineering and has been a University Professor in the area of Electronic Technology since 2011, both from the Polytechnic University of Madrid.

He has participated in over 90 research projects, holds 7 patents, and has published more than 250 technical articles in international journals and conferences. He has supervised 10 doctoral theses and 70 master's theses and final projects. He has been awarded 4 research evaluation periods and one technology transfer evaluation period.

He has received several awards, including the UPM research award for professors under 35 in 2003, the educational innovation award in 2005, the technology transfer award in 2006, and the Semikron innovation award in 2012.

He has also served as the director of the Master's in Industrial Electronics and the Deputy Director of Research, Doctorate, and Companies at the ETSII of the UPM. Currently, he has been the director of the Higher Technical School of Industrial Engineers of UPM since April 2018. Since June 2021, he has been the president of the Conference of Directors of Industrial Engineering.

Research is one of the foundations of the University. The School has 29 research groups working on more than 300 international, European, and private industry projects. How is all this research activity coordinated internally and with the involved partners?

The coordination of research is handled directly from the Rectorate, because a research project is signed by

"We have an international program and very powerful research programs. We often say that we are a School of opportunities for the students"

the rector or the vice-rector of Research with the company, just as if it is a National Plan project or a European project. Therefore, research activity is coordinated from the University. What do we do at the School? Support our research groups and researchers as much as we can. How do we do it? Through dissemination days and events to attract students to research activity. We also have a modest support program, funded by the School, to try to improve the research capacities of these groups and, in particular, to provide young researchers, the newly incorporated professors who are starting their careers, with the possibility to undertake their first research project so that they gain experience and can later have more options when applying for a National Plan project or participating in a larger project.

What lines of collaboration do you maintain with the business world for R&D&I developments?

We want more. There are companies that understand the importance of being involved in the University to help train engineers, to help with some projects, so that some research activities in innovation can be transferred and end up in new products. There are companies that do come to the University, but this is not the norm. The norm is that, if they participate, they do so through some type of consortium or project. But they do not trust the University too much, or at least, they do not bet too much on it. We would also need much more support in terms of research funding from the Administrations. The University allocates part of its budget to research, but it is a very modest part. Practically all the research done is either by talking to companies and having them hire researchers to do a project or by applying to the large national or European calls. There is money for research, they are competitive funds, and that is how it should be, but more is needed. In reality, research is not so supported by the Administrations. And the same can be said about companies.

The School is a reference point in the industrial world and maintains collaboration agreements with companies and institutions in both the public and private sectors. In this sense, what role should the School and the UPM as a whole play to support the necessary reindustrialization of Spain, in order to achieve a strong and competitive industry?

The role of the School is fundamental. We cannot rely solely on tourism. As a country, we are strong in some sectors, but certainly, in industry, we were stronger a few years ago than now, and we are losing ground little by little. There are sectors in which we are very good, such as automotive, aerospace..., but we are gradually losing competitiveness, especially with Asia. A commitment to industry in general is needed. In the end, industry, besides wealth, brings quality employment and stability for the country.

The School is located in what was the Palace of Arts and Industry and is surely one of the most emblematic and unique sites in the Spanish academic world. In 2018, the ETSII Heritage Platform was created to recover and maintain the School's technical-historical heritage. The engine room and the dome are two of the most important hallmarks. What activities does this Platform carry out?

Indeed, we have created a Heritage Commission at the School to take care of our heritage. It sounds very redundant, but it is so. We carry out, from cataloging pieces, and making pieces visible, to a virtual museum and a very interesting website with a lot of information and old photographs. In this heritage section, two things stand out. The first, obviously, is the building itself with its dome, and the second is the steam engine. Among the things we are developing in the Heritage Commission are guided tours of interesting parts of the School. Some are not visible to the public and others are, but maybe you do not notice them because you pass by every day. We have started doing these tours, first for the staff and students, and they are very well received because we believe it is important to know the richness here, beyond coming to class or doing research. And speaking of the building, it is from 1887 and is a cultural heritage site. It is a jewel, almost the most unique building, possibly, in the entire Spanish University. It is true that there are also some interesting ones at the Polytechnic University of Madrid, such as the School of Mines. We came to this School in 1906. For many years it shared a building, not only with the Natural Sciences Museum, which also came at the same time, but with some other institutions. It has been a hospital, a Costume Museum, a Civil Guard barracks... Everything has happened here and now the building is shared with the Natural Sciences Museum. Regarding the dome, there was a major restructuring around the year 2000, and now we can also see it from the inside. It is true that from the outside it is very visible; it is one of the highest in Madrid, 28 meters high, but it can also be seen from the inside, from below. We always say it is a luxury to be here in this building and location. It also has its problems, because the age of the building and the old facilities generate many problems. But of course, it is a building that will be 150 years old. The training we provide at the ETSII is highly valued and there is a very high employability rate This School has played a fundamental role in the history of nuclear energy in Spain and also as an institution training students We have a strong international program and powerful research programs. We usually say that we are a School of opportunities for students. ■

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OPENING SESSION

ÓSCAR GARCÍA

DIRECTOR OF THE HIGHER TECHNICAL SCHOOL OF INDUSTRIAL ENGINEERS OF THE POLYTECHNIC UNIVERSITY OF MADRID

It is a pleasure to welcome you to our home, the Higher Technical School of Industrial Engineers of the Polytechnic University of Madrid, which once again hosts these sessions "Spanish nuclear power plants in 2023. Experiences and perspectives". It is a pleasure to see the auditorium almost full. Joining me at the table are José Manuel Redondo, Deputy General Director of Nuclear Energy at the Ministry for Ecological Transition and Demographic Challenge, and Emilio Mínguez, President of the Spanish Nuclear Society (SNE). I just wanted to convey the message that, obviously from my perspective, I see the nuclear sector, as it should be, of great importance. Know that in this house we have a specialty where nuclear studies with a high demand from the business sector are covered. We would

like to have more students, but the truth is that the school is full, there is no room for more. And the truth is that we are always very willing to collaborate with the sector, and I also take this opportunity to tell all the people coming from the sector to count on the university for anything they deem necessary.

EMILIO MÍNGUEZ

PRESIDENT OF THE SNE

Welcome to the thirty-fifth Session of Operational Experiences, a classic meeting of the SNE, where we will have the opportunity to learn about the excellent operation of our plants during 2023.

On my own behalf and on behalf of the Board of the Spanish Nuclear Society, I want to thank everyone who has made this event possible. Especially to all the members of our Programs Committee.

I also want to thank the School of Industrial Engineers, my home for so many years, and its director and friend, Prof. Oscar García, who joins us in this opening ceremony, for the wonderful welcome and all the facilities that, once again, they have provided us to hold this important Session.

My thanks also to José Manuel Redondo, Deputy General Director of Nuclear Energy at the Ministry for the Ecological Transition and Demographic Challenge, for joining us in this opening ceremony.

And of course, thanks to all the plant managers who are participating today as the main protagonists of this meeting, as well as the session moderators, and a special thanks to those who will participate in the next session: Montse Godall, Hector Dominguis, José Ramón Torralbo, Laura Martín, and Luis Enrique Herranz, with the title "50th Anniversary SNE: Our next 50 years", paying tribute in this Session to what the SNE has contributed and can contribute to the development of nuclear energy in the country.

Finally, thank you to the members and other attendees for their commitment and participation in this Session, and a special welcome to the students from various degrees, master's, and doctoral programs attending for the first time.

Before handing over to Jose Manuel Redondo, let me share some reflections that, although probably on the minds of many of you, it is important to also voice them through the Spanish Nuclear Society.

Let's start with the beginning... The contribution of nuclear power plants to the Spanish electrical system in 2023 clearly demonstrates, once again, their indispensable role in ensuring electrical supply. Almaraz I and Almaraz II, Ascó I and Ascó II, Cofrentes, Trillo, and Vandellós II contributed 54,275.01 GWh to the system, an amount representing 20.34% of the total net electricity production. With just an installed capacity of 7,117MW, 5.71% of the total, it has continuously provided over 20% of the electricity produced in Spain, just like in the last decade.

And it's not just the total production; when we talk about supply security, we must also mention that Spanish nuclear power plants were available for almost 90% of the hours in the year. Nuclear energy is a base, stable, and constant production source.

And I will reiterate, we contribute 20% to electricity production, operate 90% of the time, and last year, we also prevented the emission of around 20 million tons of CO2. Its role is crucial in achieving the Net-Zero goal.

I emphasize, we are essential to achieving the decarbonization goals by 2050 as already stated at COP28.

This is our reality, this is what we bring, and this is what we will lose in just over 10 years if there is no change in direction.

Let's continue with examples and data: Almaraz I will definitively shut down in 2027, which is in four years, but despite this, in 2023, it had a gross production of 16,927 GWh, its third best historical figure since starting commercial operation in 1983. This plant, one of the seven we have, covers 7% of the annual electricity demand, generating each year the equivalent of the consumption of 4 million Spanish households. Why do we want to do away with that?

Today in this room, there are many nuclear professionals and it is necessary to highlight the facilities, human resources, and our entire industry.

At this point, and as president of the Spanish Nuclear Society, I want to emphasize the intangible but invaluable value of nuclear professionals.

If we shut down nuclear power plants, we will also lose that talent, preparation, and highly trained human capital of professionals that are a key piece sought by countries that are beginning to develop their nuclear projects and that look at us as a reference.

Developing and consolidating this highly specialized industry requires a lot of investment and specialization, and Spain has managed to create a highly qualified sector that has an incalculable value and we must fight to preserve it.

And if we not only look within our country, but also look outside, we see that nuclear energy in Europe and the world is being considered as a strategic element in energy design for its competitiveness, supply guarantee, and contribution to decarbonization.

In the last year, we have even seen headlines talking about "massive" development. At COP 28, twenty countries made a call to triple, by 2050, the nuclear generation capacity in relation to 2020. France leads in Europe a Nuclear Alliance that includes 15 countries: Belgium, Bulgaria, Croatia, Estonia, Finland, Hungary, Netherlands, Poland, Czech Republic, Romania, Slovenia, Slovakia, and Sweden.

Meanwhile, we are going in the opposite direction and finding ourselves very isolated. Nuclear energy is gaining momentum while Spain insists on going in the opposite direction.

Europe is clear that we "cannot afford to continue leaving nuclear energy out of the solution," according to the words of the European Commissioner for Climate Action and the global discourse of

"We contribute 20% to electricity generation, operate 90% of the time, and last year, we avoided emitting around 20 million tons of CO_2. We are essential to achieve decarbonization goals by 2050"

the entire European Commission on the subject. The EU Council of Member States and the European Parliament recently agreed to label nuclear energy as a strategic technology for decarbonization of the EU and to meet that demand, after months of intense negotiations in Brussels on the Net-Zero Industry Act (NZIA).

The EIB (European Investment Bank) in the words of its new president, the Spaniard Nadia Calviño, has shown its willingness to finance new nuclear projects and increase investments.

In this context, the Spanish Nuclear Society will not stop insisting on demanding a sensible review of the PNIEC, which should be reevaluated with technical and realistic criteria, adjusted to current needs and the moment we are living. Reality is not the same as in 2019, the development of renewables that it was focusing on is far behind schedule and we should not find ourselves in a situation where political decision-making poses a risk to this country.

Switching off nuclear power plants means losing 20% of the electricity consumed within 11 years (by 2035). Do we really have a clear plan on how we are going to replace this 20%?

A few weeks ago, Faith Birol, the director general of the International Energy Agency, stated that nuclear energy is returning with force and said that he would "think twice" before giving up on a technology that works flawlessly, regarding the future plans that Spain currently has to close all its plants. We, as SNE, also ask for that reflection and request that it be considered, at least once again.

We have a well-maintained nuclear park, and therefore, we defend and will continue to defend the continuity of the operation of nuclear power plants as a source of strategic energy in Spain, requesting, among other things:

- That the contribution of nuclear energy to the PNIEC be reviewed.
- That an economic, fiscal, and regulatory framework be established that is stable and adequate to allow the continuity of the nuclear park in Spain.
- That the key role of nuclear power plants in the production of base energy that complements and supports the growth of renewables be recognized.
- That opposition to nuclear power plants on the grounds of radioactive waste generation be ended, when there are proven technological solutions for both temporary and final management.
- That the public and political role played by Spanish nuclear power plants in providing stable, necessary, and strategic electricity be recognized.

It is our wish that this message is heard, and that the necessary measures are taken to comply with it, as we consider the continuity of the Spanish nuclear park as a future bet for Spain.

Let's stop going against the current. Nuclear energy has more than 50 years of history in Spain, as you know, the SNE has reached 50 years, and we hope to have, at a minimum, 50 more years of stable, clean, and sustainable energy. Thank you very much.

And now I pass the word to Jose Manuel Redondo, who once again honors us with his presence at this Operational Experiences Day.

JOSÉ MANUEL REDONDO

DEPUTY GENERAL DIRECTOR OF NUCLEAR ENERGY AT THE MINISTRY FOR THE ECOLOGICAL TRANSITION AND DEMOGRAPHIC CHALLENGE

First of all, I would like to thank the Spanish Nuclear Society and, particularly, its president Emilio Mínguez, for the invitation to participate once again, representing the Ministry for the Ecological Transition and the Demographic Challenge, in this Day on experiences and perspectives of Spanish nuclear power plants, as it is always an honor for me to share this podium with professionals whose excellent work makes it possible for Spain to have a supply source like nuclear energy.

Once again, with its contribution of 20.34% of the electricity generated, in 2023 Spanish nuclear power plants played a fundamental role in the Spanish electrical supply. It is evident that these production levels are the result of the excellent work carried out by the professionals who are part of the Spanish nuclear industry, particularly when considering that, as we are seeing these days, the power plants are increasingly asked to reduce load due to operational issues in the network.

As usual, I will try to inform about the actions that have been recently developed in the Subdirectorate General of Nuclear Energy and those currently in progress.

PGRR

Firstly, I will refer to the approval by the Council of Ministers on December 27 of the 7th General Plan for Radioactive Waste (PGRR).

The PGRR is the document in which the Government establishes the policy regarding the management of spent nuclear fuel and radioactive waste, and the dismantling and closure of nuclear facilities. Spain has had a PGRR since 1987, and until the approval of this 7th PGRR, the 6th PGRR, approved on June 23, 2006, was in effect.

Regarding the reference scenario of this 7th PGRR, it is important to note that the planning horizon considered ranges from 2023 to 2100, including, between 2027 and 2035, the orderly cessation of operation of the 7 nuclear reactors currently in operation. This is 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.

DECENTRALIZED TEMPORARY STORAGE (ATD) (ATD)

Regarding the temporary management of spent fuel, the implementation of a Decentralized Temporary Storage (ATD) for spent nuclear fuel, high-activity waste, and special waste is planned at the 7 sites where spent fuel exists, at each nuclear power plant with spent nuclear fuel [Almaraz (Units I and II), Ascó I and Ascó II, Cofrentes, Santa María de Garoña, José Cabrera, Trillo, and Vandellós II].

The concept of ATC is discarded, considering the difficulties to achieve the necessary social, political, and institutional consensus for its construction. Therefore, the installation of such a facility is deemed unfeasible as envisaged in the 6th PGRR.

Each plant's ATD will consist of its Integrated Temporary Store, plus a new complementary installation or additional measures to carry out maintenance and repair operations on the containers to ensure container retrievability. These ATDs, including their complementary installations, will be operational before starting the dismantling of the fuel pool at the plant and will have all the necessary safety and auxiliary systems to operate as an independent nuclear facility. They will remain operational until the transfer of spent nuclear fuel, high-activity waste, and special waste to a Deep Geological Repository (AGP).

Additionally, by 2031, one of the plant sites will have the means to ensure retrievability of fuel elements throughout the operational life of the ATDs, with a hot cell for handling spent nuclear fuel and radioactive waste, as well as storage capacity for containers to address potential contingencies throughout their operational life.

As for the waste resulting from the reprocessing in France of spent fuel from CN Vandellós I, which we have to receive from that country, a temporary storage facility will be established at the site of that plant in 2027.

Regarding the DGP, aimed at the final storage of spent nuclear fuel, high-activity waste, and special waste, the installation is planned to be operational by 2073. I want to remind you that, at the initiative of the Nuclear Safety Council and Enresa, a three-day Seminar with international participation was held in this Auditorium in November 2022. This Seminar allowed a review of the actions carried out in Spain related to this facility and the state of development in the European and global context of geological repositories, considering all their aspects.

DECOMMISSIONING

Regarding the dismantling of the

plants, their immediate dismantling is planned to start pre-work between three and preferably five years before the definitive cessation date, so that the transfer of ownership and start of dismantling works can be completed within three years after that cessation.

During these years, activities will include emptying pools, preparatory tasks for dismantling, obtaining dismantling authorization and ownership transfer to Enresa.

Once this authorization is obtained, dismantling works with an estimated duration of ten years will begin. After completion of these works, an estimated surveillance period of up to ten years is envisaged before closure is declared. For CN Vandellós I, the final phase of its dismantling will commence in 2030, with an estimated duration of fifteen years.

Regarding costs, the 7th PGRR indicates that the incurred cost between 1985 and 2023 is €7,935,881 (thousand €2023); the projected cost between 2024 and 2100 is €20,219,933 (thousand €2023); and the total cost between 1985 and 2100 is €28,155,815 (thousand €2023).

After the approval of the 7th PGRR, the processing of a Royal Decree to modify the fixed unit rate related to the non-tax public financial provision through which Enresa's service to operating nuclear power plants is financed has started. As seen on the Ministry's website, this procedure is currently in the prior public consultation process to allow stakeholders to submit comments until March 18.

EL CABRIL EXPANSION

Regarding the Center for storage of medium and low-level radioactive waste at El Cabril, it is noted that due to the current insufficient capacity of the facility to store the intended waste types generated in Spain, new cells are needed by 2028. This is to ensure no disruption to the operation and dismantling planning of nuclear power plants and to continue normal storage of these radioactive wastes.

The expansion project - for which the corresponding Environmental Impact Statement was issued on February 19 - includes the construction of a new platform (Southeast Platform) for the final storage of low and medium-level waste in 27 storage cells. The project will be carried out in two phases: 12 cells will be built in the first phase and 15 in the second.

ATI-100 PROJECT

Regarding what could be called the ATI-100 project, procedures are underway for the authorization of the construction of an Individualized Temporary Storage with total capacity (ATI-100) at the Vandellós II, Ascó, Cofrentes, and Almaraz nuclear power plants. We are currently in the process of conducting the environmental impact assessments for these projects.

In terms of regulatory framework, a Royal Decree approving the Regulation on nuclear and radioactive installations and other activities related to exposure to ionizing radiations is currently in the final stages of processing. This new RINR (Regulation on Ionizing Radiation) partially transposes Directive 2013/59/Euratom, which establishes basic safety standards for protection against the dangers arising from exposure to ionizing radiations, concerning authorization procedures for both nuclear and radioactive installations as well as other specific activities related to ionizing radiations.

Given that the scope of the aforementioned Directive —mostly transposed by the Regulation on health protection against risks arising from exposure to ionizing radiations, approved by Royal Decree 1029/2022, of December 20— exceeds that of nuclear and radioactive installations, also including other activities that involve the presence of natural radiation sources that cause a significant increase in exposure of workers or the public, this Regulation establishes a regulatory control regime not only for nuclear and radioactive installations but also for other specific activities related to ionizing radiations, such as labor activities that involve exposure to natural radiation.

Regarding this type of radiation, the administrative regime for labor activities with special exposure to natural radiation is also incorporated into this Regulation. These include the industrial processing of naturally occurring radioactive materials; labor activities carried out in areas with radon concentrations exceeding the reference level of 300 Bq/m^3; and the radiological protection programs applicable to aircraft crews due to their exposure to cosmic radiation.

Furthermore, this Regulation establishes the regulatory regime for exposures to ionizing radiations for obtaining non-medical images. Activities included in this regime are radiological examinations to determine age or the use of ionizing radiations to detect objects hidden within the human body. It is expected that this new RINR (Regulation of Ionizing Radiation) will be approved during the first half of this year.

REGULATION ON RADIOLOGICALLY CONTAMINATED SOIL

Furthermore, the processing of a Royal Decree approving the Regulation on radiologically contaminated soils is set to commence soon. This regulation aims to address the challenges posed by radiologically contaminated soils resulting from industrial activities or incidents in the past.

In 2022, a modification of the 1964 Energy Nuclear Law was implemented through the first final provision of Royal Decree-law 6/2022 to establish the applicable regime for radiologically contaminated soils. This partial transposition of Directive

2013/59/Euratom includes definitions of radiologically contaminated soil and soil with usage restrictions.

By means of this modification, which partially transposes the aforementioned Directive 2013/59/Euratom concerning so-called "existing exposure situations," definitions of radiologically contaminated soil and soil with use restrictions are included. It is established that the owners of properties on which potentially contaminating activities with radionuclides have been carried out will be obliged to declare this circumstance in the public deeds documenting the transfer of rights over those properties, and this declaration will be recorded in the Property Registry. Additionally, non-compliance by the holders of the activities or by the property owners with the notification, registration, and environmental restoration obligations provided for in said law concerning contaminated or potentially contaminated soils is classified as an infringement.

The draft text of the project is expected to be available in the first half of this year for a corresponding public consultation process, aiming for approval in the second semester of 2024.

COMMON PROTOCOL

Another key focus of the Subdirectorate General of Nuclear Energy is Spain's ratification of the Common Protocol regarding the application

"Currently, a Royal Decree approving the Regulation on nuclear and radioactive installations, and other activities related to exposure to ionizing radiation, is in the final stages of processing"

of the Vienna Convention and the Paris Convention on civil liability in the nuclear energy sector.

This ratification aims to enable Enusa to supply Russian technology nuclear fuel (VVER-400) to Eastern European countries like Slovakia, Hungary, Bulgaria, and the Czech Republic, currently reliant on Russia. This would also contribute to reducing the European energy dependency on that country.

Ratification faces challenges due to the mismatch between Spain being a Contracting Party to the Paris Convention while these countries adhere to the Vienna Convention.

It is about two international regimes that, even sharing the same principles, do not interact with each other, which means that nuclear damage caused on the territory of one Contracting Party to one Convention by an operator responsible for an installation or a transport from a country that is a Contracting Party to the other Convention, is not generally covered by the latter.

However, there is a Common Protocol, concerning the application of the Vienna Convention and the Paris Convention, which serves as a bridge between both conventions, and aims for the Parties of one and the other Convention to treat the others "as if" they were Contracting Parties to their own. Spain signed this Common Protocol in 1988, but later did not ratify it, as it has not seen the need to do so to date, as Enusa carries out most of the fuel element transports in countries within the scope of the Paris Convention. Other countries in our environment, such as France, Germany, and Sweden, have ratified it, so if this issue is not resolved, the mentioned Eastern European countries could eventually opt to purchase their fuel at the Westinghouse plant in Västerås (Sweden), precisely because this country has ratified the Protocol.

TRILLO RENOVATION

Lastly, the renewal of the authorization for the Trillo nuclear power plant is under consideration, as its current authorization expires on November 17. On March 27, 2023, CNAT submitted a renewal request to the Ministry, forwarded to the Nuclear Safety Council for assessment. The Council's report must be sent to the Ministry at least one month before the authorization's expiration date.

CLOSING REMARKS

Reviewing last year's electricity generation percentages in Spain, over 50% came from renewable sources, a trend expected to continue rising.

This underscores the shift towards renewable energy in energy policies. Yet, a balance remains crucial in ensuring supply security, market competitiveness, and environmental protection—a balance where source diversification plays a pivotal role.

In conclusion, I extend my appreciation to the Spanish nuclear sector employees who, with their expertise, dedication, and professionalism, have contributed to nuclear energy's continued vital role in ensuring electricity supply for Spaniards. Thank you very much.

SPECIAL SESSION

SNE 50th Anniversary: our next 50 years

MODERADORA

MONTSE GODALL

PRESIDENTA DE LA COMISIÓN DE COMUNICACIÓN DE LA SNE

A Special Session "50s Anniversary SNE: our next 50 years" aimed to pay tribute to the 50 years of the Spanish Nuclear Society. Montse Godall, the Chair of the Communication Committee, expressed her gratitude to the four speakers: Héctor Dominguis, CEO of GDES; Luis E. Herranz, Research Manager in Nuclear Safety (Ciemat); Laura Martín, Project Manager at IDOM Consulting; and José Ramón Torralbo, former president of Nuclenor.

"Preparing this panel has been truly a team effort that I must thank the four of them for. We are going to talk about our next 50 years because that is our way of paying tribute to the 50 years of history that have preceded us. And yes, we want to talk about the future because while we prepared this session, if there was something that the four participants agreed on, it was an optimistic attitude and outlook. But we will talk ahead while looking back because if there is something the nuclear sector has, it is the ability to learn, from both its own experiences and those of others. In this session, we will talk about experiences because the future is built upon them.

These are four very representative profiles of our sector and, at the

same time, closely linked to the Society, and this is also our way of paying tribute and thanking all the individuals who are the engine and soul of the Spanish Nuclear Society. The SNE would not be what it is without all its members of the committees, the Board of Directors, and all those who dedicate a lot of time and affection to work from a different perspective for the nuclear sector. It is about valuing people."

MUTUAL TRUST

What can professionals contribute to ensure the future of nuclear energy in Spain?

José Ramón Torralbo: Professionals can contribute significantly to the future of nuclear energy in our country. It has always been a debated topic. In '83, we were already closing plants. However, forty years later, the sector and industry are well-positioned nationally and internationally. The performance of nuclear plants is excellent, leading globally. We have overcome crises like Chernobyl, Fukushima, etc., that seemed catastrophic.

JOSÉ RAMÓN TORRALBO

EX PRESIDENT OF NUCLENOR

We have accomplished a lot and have learned valuable lessons that could help us sustain this high level of plants and industry.

I want to discuss two aspects. One relates to "software" - people, and public opinion, and the other to "hardware" - facilities.

Regarding the "software," I want to highlight aspects that worked well during challenging times. It's about the human element. Spain is going against the international trend of nuclear growth.

We are facing a national crisis, and the solution is not apparent so far. We need motivated, well-prepared staff with a positive attitude, both in plants and companies. We cannot be weak. This drive is essential to overcome crises. The tools that supported us in the past include job stability. People and their families need to see a future with reasonable stability to focus on their work and overcome crises effectively. This stability is ensured through reasonable, agreed-upon collective agreements.

Secondly, there needs to be unity of action among all involved actors - employees, middle management, leadership, companies, and the sector - a consolidated front. This unity can only be achieved through a high-performance team effort. Everyone must participate with mutual trust, which must be earned. Communication, particularly open and direct communication, and exemplary behavior are crucial for fostering mutual trust. Without these, trust is unachievable.

Lastly, readiness is crucial. We possess knowledge, but during crises, we might face knowledge loss. Anticipation and prevention of knowledge loss are essential for sustained success.

In terms of the 'hardware,' we need to demonstrate our claims through actions, as seen in the past with excellent plant operation and performance ranking at the top globally. The behavior of nuclear plants must remain excellent. Life management plans, analyzing short, medium, and long-term plant hardware, investment plans, optimization, and cost management have all played crucial roles. The balance between cost optimization and investment must be maintained. Technical and economic analyses of investments are essential to ensure reasonableness during crises. Nuclear energy cannot continue at any cost. Expectations from companies and society demand competitive energy, necessitating optimization efforts.

Motivated, well-prepared staff with a positive attitude is essential, along with external communication, excellent plant operation, and efficient management.

INFORMATION DISSEMINATION AND SOCIAL ACCEPTANCE

Do you think there are changes in the social perception of nuclear energy? Have you observed this change?

Héctor Dominguis: Undoubtedly, I believe so. Especially on the international stage, very obvious changes can be observed. As a good engineer, I love data and have researched surveys conducted in Europe in recent years, with 2023 being a pivotal year for surveys. For example, in Belgium, 58% of the population supports extending the lifespan of reactors. In Estonia, 75% support building a new reactor, and in Sweden, 56% want to

HÉCTOR DOMINGUIS
CEO DE GDES

continue using nuclear energy. In Poland, 75% support the nuclear program, a tremendous 36% increase from 2021. In Finland, 68% favor nuclear energy, with even the Green Party backing it. In Germany, a survey in 2023 showed that 59% were against abandoning nuclear energy, a significant shift from 12 years ago when 54% supported nuclear phase-out. This global trend underlines the increasing recognition of the value of nuclear energy.

Recently, a study by the Real Elcano Institute in Spain showed a significant shift from 2019. In 2019, 24% of Spanish respondents supported nuclear energy, whereas in 2023, this figure rose to 43%. Those against it dropped from 61% to 41%. This indicates a substantial change, with the trend upward. If we survey again in the coming years, the support for nuclear energy is likely to grow.

Several factors have influenced this change: the energy crisis, negative press about gas due to the Ukraine crisis, and growing concern about dependence on third-party countries that are not always friendly. For instance, Germany invested substantial sums yet continued to burn coal. In contrast, Sweden's energy mix of 40% nuclear and 60% renewables mitigated price increases post-COVID. The inclusion of nuclear energy in the EU's green taxonomy also contributes to this shift. But I also believe that, as a very relevant point in this shift in trend and social acceptance, is dissemination. Effective dissemination, including efforts by organizations like the International Atomic Energy Agency and European nuclear societies, especially the Spanish Nuclear Society, has played a crucial role. The Society has worked on communication and promotion for many years, which is making an impact. The crucial role of the SNE in disseminating messages to society is significant. Professionals must defend our industry proudly and work towards future progress.

Many years ago, the director of the French Nuclear Society told us that communication takes about five years to permeate society. At the end of these five years, society becomes aware of the messages we convey. That's why I want to highlight the significant role of the SNE as a dissemination and transmission body to society for all the messages we want to convey from the SNE. Furthermore, beyond the Society, I want to emphasize the role of all nuclear professionals, who within our circle must defend our industry. For decades, we were hesitant to say that we were nuclear professionals in our social circles. This has changed significantly. Nowadays, it is a pride to say that we are nuclear professionals, and we should not be afraid to defend our industry in all circles. I believe that this role is something we all must take on and continue to work on in the future.

COMMUNICATION AND RIGOR

How should the transmission of information and knowledge to the public be handled effectively?

Luis E. Herranz: While others here are more involved in professional communication than I am, I'll share a reflection. We are a technically highly qualified society, enabling us to provide strong and convincing messages which are essential. However, we should ensure these messages are not buried under excessive data. While data is crucial, the focus should be on our approach and reasoning. We should not overwhelm with too much information. We shouldn't fret over what to communicate but focus on our message, as we know it well. We should aim for simplicity while maintaining rigor. Visual communication, avoiding abstract and complex formulations in favor of simplicity, is essential. Sometimes, our high qualifications make it challenging to deliver simple communication. The challenge lies in the current environment. With a multitude of media and communication channels, the SNE should analyze where, who, how, and when to communicate. These are the challenges communication will face at the SNE in the future.

LUIS ENRIQUE HERRANZ
RESPONSABLE INVESTIGACIÓN EN SEGURIDAD NUCLEAR CIEMAT

NEW GENERATIONS

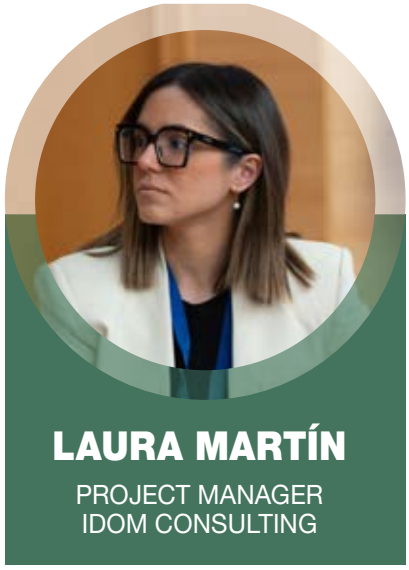
How would you differentiate a nuclear professional from the second generation from one of the first, and how are they similar? How do you perceive the evolution you have learned about? Where do we come from, and how do you believe we have progressed towards the future?

Laura Martín: Starting with the premise that a nuclear professional has well-defined behavioral criteria shaped by our sector's unique characteristics and the defense-in-depth approach to safety, there should not be differences. However, if there are any, they may be attributed to changes in the geopolitical, educational, and technological environment. Concepts such as effort capacity, rights vs. duties, and immediacy of results come into play. Are these realities or stereotypes? What I would like to highlight is the sector's operational experience and the pride we take in recording this operational experience, learning, and passing it on. This process enriches knowledge from one generation to the next. I also want to highlight the robustness of succession management processes and succession planning in organizations within the nuclear sector. Young professionals should make the most of these processes, learn from preceding generations, not just technically.

FUTURE CHALLENGES

How do you believe we should face the future from the present, considering the need for reliability and readiness?

Luis E. Herranz: I believe the key for us, as a society, is to ensure that Spanish society perceives our presence with unquestionable expertise in nuclear science and technology. Looking towards the future poses several challenges and aspirations. Our expertise has



LAURA MARTÍN

PROJECT MANAGER
IDOM CONSULTING

not been built over the last two decades but spans a longer period. We may not fully appreciate its value due to our familiarity. The SNE should emphasize preserving the accumulated experience over time and create spaces for communicating this experience across different generations. Additionally, the SNE should be agile. In the present diverse environment, numerous opportunities arise in training, action, and expansion. The SNE should have instruments to capitalize on these opportunities to affirm itself as a leading entity for nuclear-related issues in society. And finally, let me refer to something related to the question Laura answered. Everyone in our environment is accustomed to the concept of the workforce. Honestly, it's a concept that concerns me a lot because, immediately, we translate it as the number of people involved in any task. From the SNE, we should not be concerned about the number of people, but about the responsiveness to the challenges that society may pose in the nuclear field. Lastly, I want to address the concept of a workforce. This should be the articulation of all our resources, aimed at preserving and communicating our expertise to identify ourselves clearly within the SNE.

As a representative of the industry sector, is the international market the strategic objective of Spanish companies given the future scenario in Spain?

Héctor Dominguis: The internationalization strategy of the nuclear industry in Spain did not start as a result of the possible closure of reactors; it began much earlier. If we go back to the 1980s, when it started to take shape, and then in the early 1990s when the nuclear moratorium was confirmed, the nuclear industry in Spain was already being developed. Moreover, with much larger market prospects than what eventually materialized. At that point, when companies realized that their potential market, which had already been planned as such, was being reduced by half, they realized that the only way to grow was to start working in international markets. Over these 40 years, the Spanish nuclear industry has been internationalizing, establishing itself in other countries, and currently, fortunately, it is an industry with a lot of prestige, present in more than 40 countries and widely recognized. This has been a value for the entire industry in Spain, for the power plants, and for the companies. Companies have been able to continue growing and expanding their businesses beyond borders, and the nuclear industry in Spain has also been able to benefit from the knowledge acquired by companies working in other countries. I believe this has been very positive.

What doubts do you think professionals, new generations, and those entering this sector may have in feeling it is an attractive and promising field to work in?

Laura Martín: I would divide it into three main groups. The first is professional development, the second is mobility, and the third is concern for climate change. Starting with

the first group of professional development, young professionals aim to enhance their skills and knowledge. This is why the nuclear sector should offer training programs and continuous learning opportunities to help advance our professional careers. It is also essential to address opportunities for career advancement, as a lack of it can lead to demotivation among young professionals. When talking about advancement opportunities, it refers to defining pathways for development and promotion. Moving on to the second group, the mobility group, I would like to discuss global job opportunities because young professionals often seek international job prospects. Additionally, highlighting the importance of job flexibility in terms of working remotely, telecommuting, and flexible schedules is crucial to make the sector more appealing. Lastly, but not least, the concern for climate change. In this regard, two concepts stand out. Firstly, environmental transparency, as young professionals are concerned about the environmental impact of the industry they work in. The nuclear sector can transparently demonstrate its commitment to reducing the effects of climate change and highlight the benefits of nuclear energy in reducing carbon emissions. Secondly, sustainable innovation, referring to the investments in new technologies that enhance the safety and sustainability of nuclear facilities.

MOTIVATION AND COMMITMENT

How can nuclear professionals maintain motivation and commitment when the future seems uncertain due to potential plant closures? How should nuclear professionals approach their work?

José Ramón Torralbo: I have to allude to the things that have worked for us, because in complex situations you have to survive. And it is true that we must be able to overcome them through some series of levers. What is certain is that no one is going to help us, we have to be ourselves, we have to trust ourselves to convince society in this geopolitical context. Remember that we have to be able to convey to public opinion that we have professionals with high technological capacity. We know the level of qualification of our nuclear youth. We have a consolidated safety culture. We are committed to the search for excellence in our work. Is a reality. The thing is that we are being examined internationally on this factor, and look at the results that our plants are having. We have operating systems, unique protocols. We are proud to belong to our sector. Knowledge, commitment, responsibility... are our operating standards. Where do we find that in the industry? We have to transfer that to society and we have to do it ourselves. Nobody is going to help us. How do we ensure that our people, so that the entire sector, mobilizes, as we have done on some occasions, to transfer this to society and that it is Spanish society, which is the only one that goes against the current, that recognizes and the one that demands from the Administration a change and recognition of the advantages of nuclear electricity supply.

It has worked well for us to have a project, a clear project in which we have always involved all interested actors. A project in which, with realism, and in parallel with continuing to work with the regulation we have, preparing ourselves if necessary for a possible dismantling of a plant, we continue working for that nuclear future and let the geopolitical context and society itself help us . You have to have the entire sector, staff, companies and organizations involved in that project. And we have to define that project. I would advocate for this realistic nuclear future project, taking into account the surrounding conditions. And advocate that the future helps us get out of this new crisis. That generates motivation in all those involved, without a doubt. At least it has helped us in the past.

FUTURE WISHES

One last question to the four of you, a wish, a projection for the future in case in 50 years we celebrate the 100th anniversary of SNE here. What would be your wish for that table and that auditorium in 50 years?

Luis E. Herranz: My wish is straightforward, that the nuclear debate goes beyond the political sphere.

Héctor Dominguis: Within 50 years, I hope that society continues with the same enthusiasm that all the professionals who lead it have now. That the spirit of the society is maintained, which I think is great.

José Ramón Torralbo: I would like to see the recognition of society towards the nuclear sector in this auditorium in 50 years, and that those sitting at this table are evaluating the operation of the new modular reactors that will be functioning with excellent performance, as they are now.

Laura Martín: For me, activities like this continue and that more young professionals join SNE and Young Nuclears. ■

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FIRST SESSION

JAVIER SALA

DIRECTOR OF THE COFRENTES NUCLEAR POWER PLANT

THE IMPORTANCE OF EDUCATION

I want to begin my participation in this Conference by mentioning an exceptional event that we recently experienced at the Cofrentes nuclear power plant, which reminds us of the importance of education in our sector, especially in first aid training, including the Heimlich maneuver to prevent choking incidents, as happened recently at the plant when a civil guard from the Response Unit assigned to the plant experienced this type of accident. Fortunately, the training and willingness of people like Antonio García Barranco, who we are fortunate to have at Cofrentes as a member of the firefighting brigade, was able to effectively perform the Heimlich maneuver on the colleague, successfully dislodging the piece of food that was obstructing his airway and saving his life.

Whenever we undergo this training, we hope that we never have to use these maneuvers, but without a doubt, if we ever need them, we would want someone like Antonio G. Barranco by our side, to whom we want to publicly thank and recognize for his actions.

NUCLEAR SAFETY

Referring to nuclear safety data, I am pleased to report that CN Cofrentes remains in the green in the CSN's SISC matrix, meaning it is in the best condition for the owner's response. The indicators (published up to the third quarter) all remain in the green and we do not expect any changes in the fourth quarter.

The incidents reported by CN Cofrentes in 2023 have been eight. The important thing about all of them is that they have all been level zero on the INES scale and therefore have no significance for safety.

Of these, I highlight two that resulted in automatic reactor shutdowns: one in September, due to the failure of an electronic card during work being carried out on the distributed control system, which closed some valves in the heater drain system causing a transient event that led to the automatic shutdown of the plant. And the other in November, while repairing a turbine speed sensor linked to the over-speed protection system, which triggered a protection action leading to the shutdown of the plant.

"The production data transferred to the national level represents 3.2% of all the electricity demanded in the country, and 30% of the demand in the Valencian Community, where CN Cofrentes also represents 44% of the production"

An automatic shutdown is a significant transient event that we aim to avoid in nuclear plants. Both incidents have a common thread that we want to address, as they are both related to work in the I&C area of digital platforms, and although we have human error prevention programs and risk reduction in the activities we carry out, it is important to remember that risks are inherent.

Therefore, in seeking solutions, we have wanted to strengthen and prevent these situations this year through actions that we have called BacktoZeroScrams at CN Cofrentes, looking at what is being done in other plants and the rest of the nuclear industry to focus and improve our practices.

WORKPLACE SAFETY

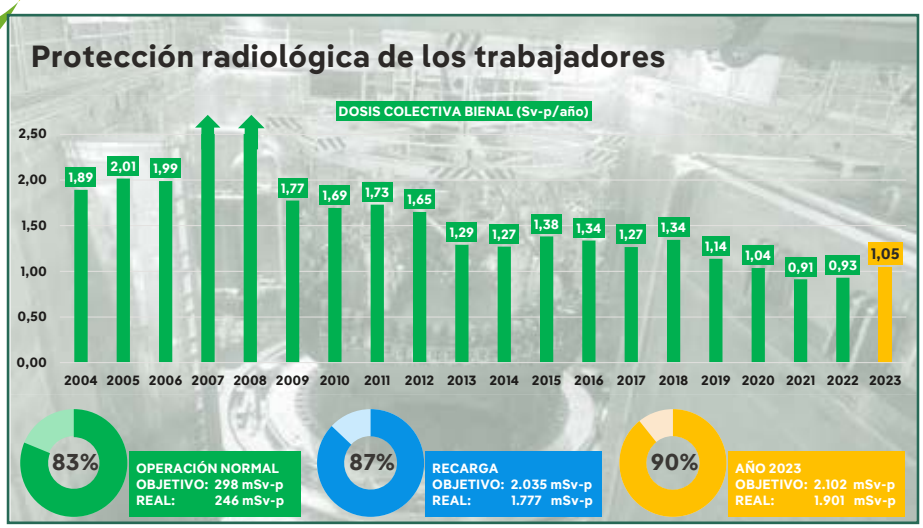
Referring to workplace safety, in 2023 we had one accident with time off work and two without time off work. The accident with time off work was due to an unexpected attack by a security service dog that caused injuries to a security guard, fortunately already recovered with no major consequences.

During the 24th refueling cycle, for the first time, there were no accidents with or without time off work, both among the staff and contracted personnel, which has been considered a significant success in prevention.

Several initiatives were adopted in line with seeking individual and collective commitment to safety and raising awareness among the staff about the importance of monitoring workplace safety in all tasks.

RADIOLOGICAL PROTECTION

In the chapter on Workers' Radiological Protection, we can see that the historical trend in the biennial collective dose is maintained, and although there is a slight increase, there is a substantial improvement trend over the years. The data on



radiological protection is very good, both in normal operation and during refueling, as we managed to meet objectives, initially set at 2,102 mSv-p and ended below the planned target at 1,901 mSv-p.

The 2023 Environmental Radiological Surveillance Program (PVRA) took and analyzed samples within a 30 km radius and compared the data with the historical data series before the plant started operations, demonstrating that CN Cofrentes has no significant radiological impact on the surrounding environment.

CONTINUOUS IMPROVEMENT

In March 2023, we held a new WANO Peer Review, which involved an international expert visit where observations were made in different areas of the plant over three weeks, identifying four strengths and five areas for improvement.

"Cofrentes CN remains in green in the CSN SISC matrix, that is, in the best condition of the owner's response"

SPENT FUEL MANAGEMENT

At CN Cofrentes, we continue with this important activity. Currently, we have loaded nine containers (five in 2021 and four in 2023), and we have initiated a third campaign in which we plan to load six more containers, allowing us more space in the pools for future refueling operations.

24TH FUEL RELOADING

Between October and November, we carried out the 24th Fuel Reloading, conducting over 12,000 activities and numerous projects. Among other actions, we installed a new generation switch, performed chemical decontamination, inspected the turbine group, conducted a containment integrated test, and made a series of design modifications aimed at the technological modernization of the facility.

As in all reloads, we prioritized safety and quality objectives, perfectly complying by not experiencing any accidents with or without time off work during the reloading process and managing to reduce radiation doses below the expected levels, completing all activities within a 38-day timeframe.

ELECTRICITY GENERATION

In 2023, we generated 7,948 GWh, providing 46 GWh of flexibility to allow renewable energy to enter the grid at specific times of the year. We ended the year with excellent operational factors, with a Capacity Factor of 87.76% and a Forced Unavailability Factor of 0.84%, ensuring that the plant's energy is always available when needed.

The production data, in the national context, represent 3.2% of all electricity demanded in the country, and 30% of the demand in the Valencian Community, where CN Cofrentes represents 44% of production. ■

MODERATOR

EDUARDO GALLEGO

BOARD MEMBER
SNE DIRECTIVE

SECOND SESSION

SECOND SESSION

ALBERTO PORRAS

DIRECTOR OF THE TRILLO NUCLEAR POWER PLANT

In 2023, the gross electricity production generated by the Trillo Nuclear Power Plant was 8,294.7 GWh, with a net production of 7,734.7 GWh.

C.N. Trillo contributed 4.3% of the CO2 emissions-free energy produced in Spain during 2023, according to official data published by Red Eléctrica Española (REE).

From May 23, 1988, to December 31, 2023, the accumulated gross electricity production is 288,472.7 GWh, with a total of 276,473.7 hours connected to the Spanish electrical grid.

The Trillo Nuclear Power Plant operated steadily throughout 2023 except during the Refueling period (May 24 - June 23) and load dispatch requests.

OTHER INTERESTING DATA

There were no automatic reactor shutdowns in 2023.

1,207,845 accident-free work hours were completed in 2023.

During 2023, 4 containers were transferred to the ATI, resulting in 413 tons of total uranium stored as of December 31 distributed among the 40 containers containing a total of 928 elements: 32 DPT containers and 8 ENUN32P.

35TH FUEL RELOADING

The thirty-fifth refueling and general maintenance shutdown of C.N.

Trillo started on Wednesday, May 24, and ended on June 23, 2023.

During this period, over forty specialized companies and more than a thousand workers were involved in the scheduled activities.

The most notable aspects of this refueling were the successful execution of the tasks, the shortened duration that was 54 hours ahead of the initial schedule, and the achievement of dose objectives. Key statistics of the refueling include the completion of 3,646 activities, with the most notable being:

- Replacement of 36 fuel elements.
- Inspection of a main reactor cooling pump.
- Capacity test on redundancy batteries 3/7.
- Electrical and mechanical review of redundancy 2/6.
- Preventive replacement of the main transformer AT03.
- Inspection of a pilot valve train in the Main Steam system.
- Low-pressure turbine 3 inspection.
- Cleaning of an essential cooling water system pool.

Design modifications were implemented to complete work programs started in previous years, adapt facilities to new industrial requirements, or enhance installation availability.

RELATION WITH CSN

The Integrated System of SISC (Integrated Supervision System of Power Plants) data indicates that the Trillo Plant has all indicators in green with no findings above green.

In 2023, three events (INES 0) were reported to the regulatory body (Nuclear Safety Council).

INTERNATIONAL MISSIONS

In 2023, there were no Peer Reviews or Follow-ups by WANO at CN Trillo.

CHALLENGES 2024

- Renewal of the Exploitation Authorization permit
- Work safety: 0 accidents.
- Recharge reliability plan.
- Recharge number 36.
- Action plan for large equipment: diesel, main pumps and turbogroup.
- EPM and WANO Follow Up.- EPM y WANO Follow Up.

All of this is intended to be achieved thanks to the work and commitment of the excellent team of professionals that make up the Trillo Nuclear Power Plant and CNAT.

RAFAEL CAMPOS

DIRECTOR OF THE ALMARAZ NUCLEAR POWER PLANT

In 2023, the combined gross electricity production generated by the two units of the Almaraz Nuclear Power Plant was 16,928 GWh (CNA1: 8,024.5 GWh; CNA II: 8,903.5 GWh), with a net production of 16,252 GWh (CNA I: 7,735.1 GWh; CNA II: 8,517.3 GWh).

C.N. Almaraz contributed 7% of the CO_2 emissions-free energy produced in Spain during 2023, according to official data published by Red Eléctrica Española (REE).

From September 1, 1983, to December 31, 2023, the accumulated gross electricity production is 610,976 GWh.

Unit I operated steadily throughout 2023 except for early January and November when the load was reduced at the request of the Central Operations Dispatch for flexible operation. Additionally, power was decreased for turbine valve tests and the 29th refueling from April 16 to May 25.

Unit II operated steadily throughout 2023 except for minor load reductions for turbine valve tests, two reductions in January and March to 68.5% on the indication of the Central Operations Dispatch, and an automatic reactor shutdown on May 16 due to an electrical anomaly in relay cabinets.

OTHER INTERESTING DATA

- No accidents with time off work were reported in 2023, and 2,139,776 accident-free work hours were completed.
- During 2023, 4 containers were transferred to the ATI, resulting in a total of 12 containers stored as of December 31 with 384 fuel elements: 5 from CNA I and 7 from CNA II. The ATI is 60% full. There are 1,600 fuel elements from Unit 1 and 1,468 from Unit 2 stored in the pool.

29th FUEL RELOADING OF CNA I

The works for the 29th refueling of CNA I began on April 16 at 23:59 hours and concluded with the plant being connected to the electrical grid on May 20 at 20:38 hours, marking the start of the 18-month operating cycle.

This refueling was completed 63 hours ahead of schedule, setting a record for the lowest collective dose in CNA history.

More than 13,000 maintenance activities were carried out, with 30 design modifications implemented, including those related to requirements and commitments with the Nuclear Safety Council.

During this period of peak activity at the plant, over 1,200 additional professionals from about 70 specialized collaborating companies were added to the regular workforce.

RELATIONSHIP WITH CSN

The Integrated System of SISC data shows that the Almaraz Plant has all indicators in green with no findings above green.

In 2023, four events (INES 0) were reported to the regulatory body (Nuclear Safety Council), two for each unit.

INTERNATIONAL MISSIONS

There were no Peer Reviews or Follow-ups by WANO at CN Almaraz in 2023.

CHALLENGES FOR 2024

- Workplace safety: 0 accidents.
- Refueling reliability plan.
- 28th refueling in CNA II and 30th refueling in CNA I.
- Move To Zero Scrams Program.
- Improvement in work practices and supervision
- WANO Peer Review 2025.
- Transition to decommissioning

All these goals are aimed to be achieved thanks to the work and commitment of the excellent team of professionals at the Almaraz Nuclear Power Plant and CNAT. ■

THIRD SESSION

ANTONIO MARTINAVARRO

DIRECTOR OF THE VANDELLÓS II NUCLEAR POWER PLANT

SECURITY

In 2023, the Vandellos II nuclear plant reported 5 reportable events to the Nuclear Safety Council (CSN) following IS-10 Security Instruction protocols. The plant maintained all indicators in green in the SISC, with no major issues in the owner's response column.

The overall incident frequency index remained below the 2023 target.

PRODUCTION

The plant achieved a load factor of 93.73% in 2023, producing 8,671 GWh of electricity, resulting in a CO_2 emissions savings of 3.16 Mton.

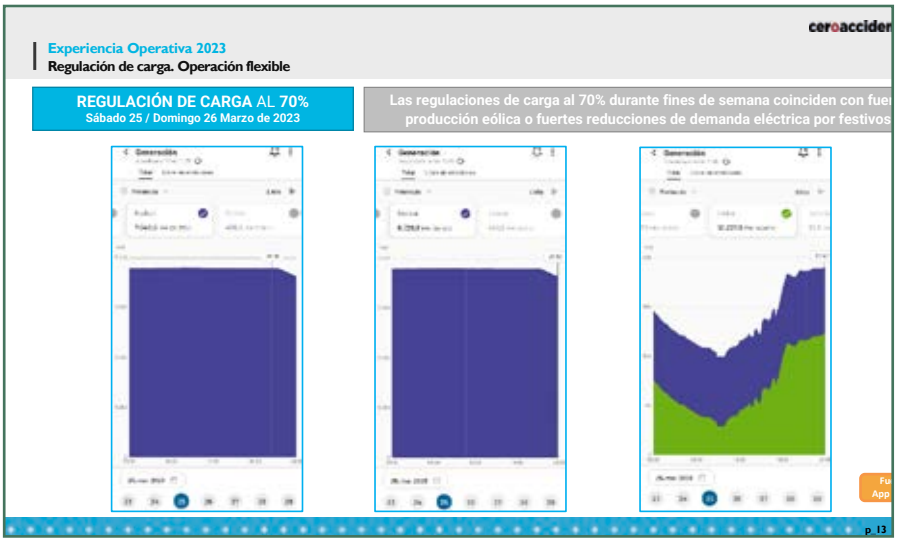
OPERATIONAL EXPERIENCE

In 2023 there were two automatic reactor shutdowns. The first of them, in the month of August, due to a high level in GV due to the opening of the Bar 4 switch (non-security). The second occurred in the month of September due to a defect in the diode bridge of the Main Generator exciter.

On the other hand, during 2023, within the so-called flexible operation, various cargo regulations have been carried out at the request of cargo dispatch, at 70% and 90%.

CHALLENGES FOR 2024

The main challenges for the year



JORGE MARTÍNEZ
DIRECTOR OF THE ASCÓ NUCLEAR POWER PLANT

2024 at the Vandellós II nuclear power plant take shape in the preparation and execution of the work corresponding to the 26th recharge that will take place starting on April 27; progress in the project of the new ATI100 spent fuel warehouse and in the implementation of the recommendations received from the team that carried out the WANO Peer Review mission in 2023.

Likewise, the plant continues working to improve its operational reliability with specific plans aimed at detecting and solving equipment obsolescence problems and strict compliance with the facility's maintenance plan with an eye toward its path toward long-term operation.

MODERATOR
ENRIQUE GONZÁLEZ
BOARD MEMBER
SNE DIRECTIVE

SECURITY

During the year 2023, the Ascó nuclear power plant has reported to the Nuclear Safety Council (CSN), following the protocols established in Safety Instruction IS-10, a total of 12 notifiable events for group 1 and 7, for group 2. , all of them classified at level 0 of the INES Scale, except one of them that was classified as level 1. Regarding stops, during 2023 there were 4 unscheduled stops in group 1 to carry out different reviews and interventions in the plant and 1 unscheduled stop due to alterations in the 380KV park network. On the other hand, on April 29, the scheduled stoppage was carried out to carry out the work corresponding to the 29th Refueling.

Regarding group 2, there was an unscheduled stop caused by alterations in the 380KV park network. On the other hand, on October 23, the plant was scheduled to be disconnected to carry out its 28th refueling work.

In 2023, both units have remained in the “Owner's Response” column with all indicators in green in the SISC indicators.

In terms of accidents, the total frequency rate of events (including ANAV and partner companies)

has remained below the target set throughout 2023.

Regarding radiological protection, the evolution of the individual dose shows that good ALARA management of the activities carried out is consolidated.Respecto a la protección radiológica, La evolución de la dosis individual pone de manifiesto que se consolida una buena gestión ALARA de las actividades que se realizan.

PRODUCTION

During 2023, Ascó I has registered a load factor of 76.69%, with a total of 6,936.290 gross GWh produced, which has represented 20.4% of the total energy generated in Catalonia and a saving of CO_2 emissions of 2.4 Mton.

For its part, Ascó II has registered a load factor of 83.64% during 2023, with a total of 7,525,800 gross GWh produced, which has accounted for 18.2% of the total energy generated in Catalonia. and a CO_2 emissions saving of 2.6 Mton.

29th FUEL REFUELING AT ASCO I, 28TH REFUELING AT ASCO II, AND OPERATIONAL EXPERIENCE

During the 29th fuel shutdown, 60 fuel elements of the Ascó I reactor were renewed. In total, more than 13 thousand work orders have been executed and 32 design modifications have been carried out aimed at improving reliability and plant safety. Among the works carried out, the inspections required in the Primary system included in the Periodic Safety Review (RPS) to enter the Long-Term Operation, the inspections of the reactor internals or the Implementation of MD in the Polar Crane (control system) stand out. weighing and control and regulation system), among others.

Likewise, unit 2 carried out the work corresponding to its 28th refueling from October 23 to December 9. In total, 60 reactor fuel elements have been renewed, more than 17 thousand work orders have been executed and 37 design modifications have been carried out aimed at improving the reliability and safety of the plant. In this case, as in group 1, the inspections in the Primary system involved in the Periodic Safety Review (RPS) to enter the Long-Term Operation, as well as the inspections, were also carried out as notable works. inside the reactor and the work on the Polar Crane, among others.

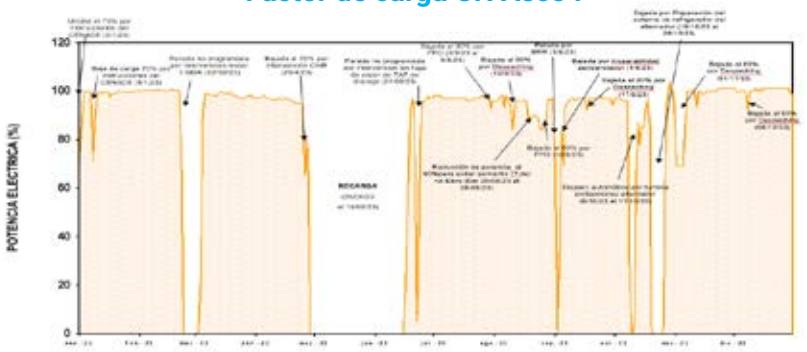
On the other hand, in 2023 the IAEA SALTO mission at Ascó NPP concluded after the Follow-up carried out from September 5 to 8, during which the team reviewed the implementation of the recommendations made during the SALTO review mission in July of 2021 and based on the previous initial mission in 2019. Of the total of 11 recommendations and 3 suggestions proposed in 2021, the IAEA team confirmed the implementation of all of them, in the absence of one, two suggestions. Thus, in the presentation of results, the mission leader stated that the plant has defined and implemented an adequate methodology to identify the components and structures to manage for a secure LTO.

OUTLOOK FOR 2024

Key challenges include the execution of the 30th refueling at Asco I, WANO Peer Review mission, and the implementation of Enhanced Technical Specifications (MERITS).

Additionally, the plant will continue to transfer spent fuel and progress in constructing the new ATI100 facility. ■

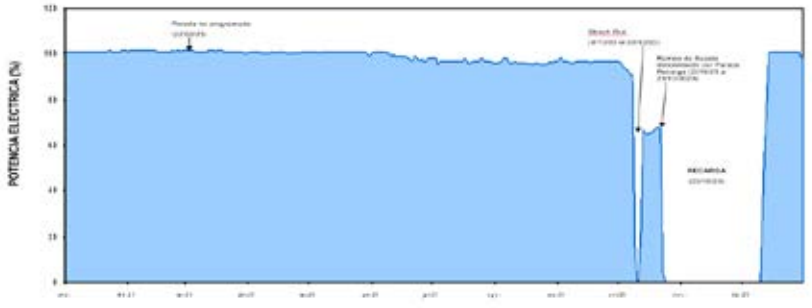
Factor de carga CN Ascó I



PRODUCCIÓN BRUTA: 6.936,290 GWh
FACTOR DE CARGA: 76,69%
FACTOR INDISP. NO PROG.: 8,80%

ENERGÍA GENERADA SEP: 2,61%
ENERGÍA GENERADA CAT: 17,49%
AHORRO EMISIONES: 2,44 Mton CO_2

Factor de carga CN Ascó II

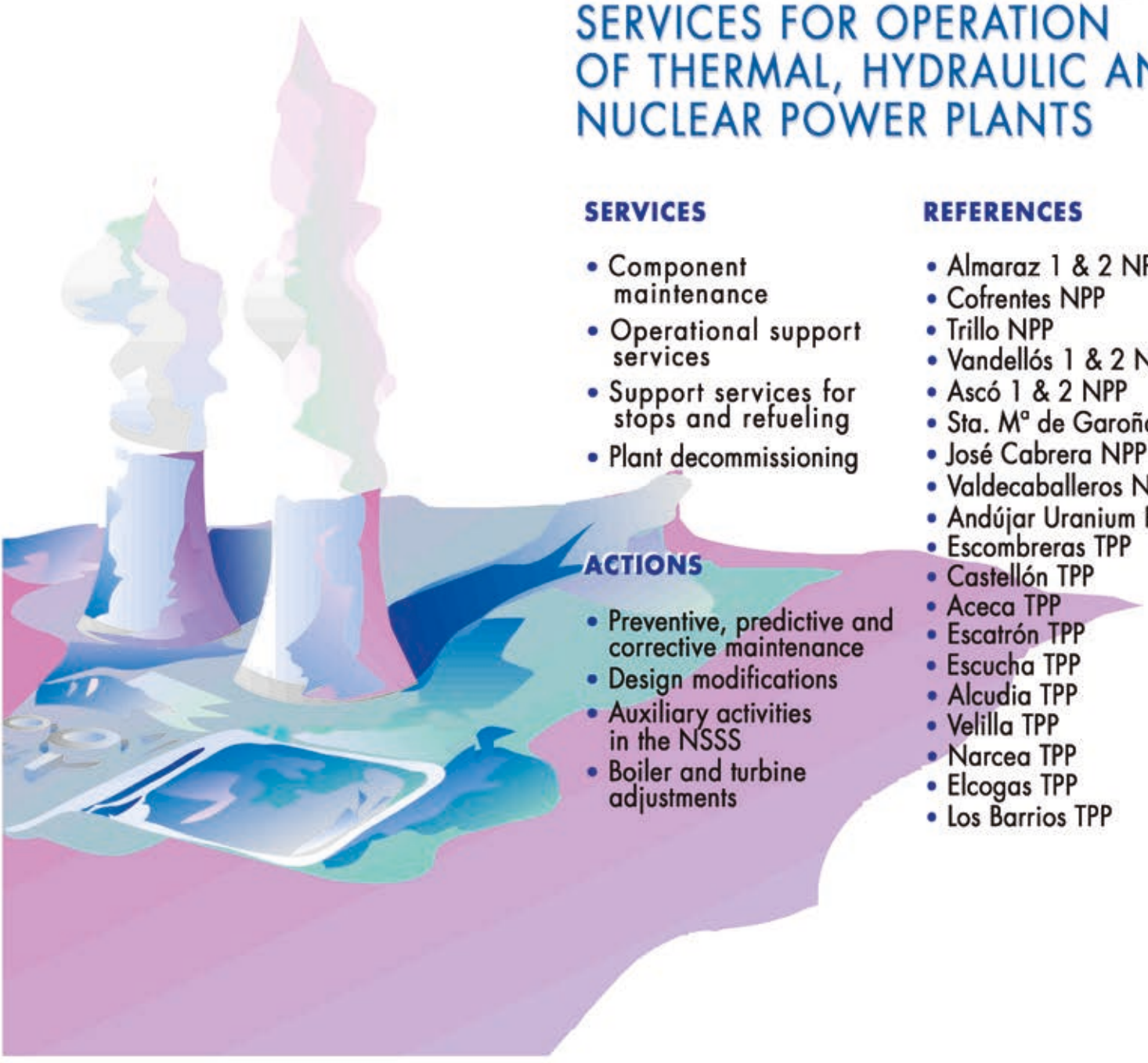


PRODUCCIÓN BRUTA: 7.525,800 GWh
FACTOR DE CARGA: 83,64%
FACTOR INDISP. NO PROG.: 0,75%

ENERGÍA GENERADA SEP: 2,83%
ENERGÍA GENERADA CAT: 18,98%
AHORRO EMISIONES: 2,66 Mton CO_2

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

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CLOSING SESSION

EMILIO MÍNGUEZ

PRESIDENT OF THE SPANISH NUCLEAR SOCIETY

We are now concluding our Operational Experiences Conference. I would like to emphasize how interesting all the sessions have been, with valuable messages and outstanding results from our nuclear power plants. Allow me to introduce the individuals accompanying me at the table. Firstly, the President of the Nuclear Safety Council (CSN), Juan Carlos Lentijo, who honors us with his presence in what was once his alma mater. I must say I was his teacher, but now I learn so much more from him. Joining us for the closure is the Vice President of the Spanish Nuclear Society, Tomás Lozano, who will present the summary of the conference. Tomás, over to you.

TOMÁS LOZANO

VICEPRESIDENT OF THE SPANISH NUCLEAR SOCIETY

Thank you very much. Firstly, as a former plant director for many years, I would like to request a round of applause for our plant directors. I extend my gratitude to the Technical School of Industrial Engineers. I mentioned to Emilio Mínguez that I am probably one of the few who didn't pass through his hands. I didn't study at this school, but for me, and I believe for all nuclear professionals, this is our school. It's a pleasure to be here.

Juan Carlos, President of the Nuclear Safety Council, consistently demonstrates commitment to the Spanish Nuclear Society. It's always an honor to have you here, a true privilege. I want to acknowledge our nuclear plant directors Javier Sala, Rafael Campos, the newcomer Alberto Porras, Antonio Martinavarro, and Jorge Martínez. Your leadership is essential to the excellent operation of our plants. You are the true architects of what we have seen in this Conference. A 90% operational factor is truly remarkable. You always deliver excellent results. It's not easy, but you make it seem effortless. Above all, I want to highlight your spirit of continuous improvement. A safety culture and a spirit of continuous improvement are the key messages I take from these conferences, which I thoroughly enjoy. I learn so much from them. They are the key to the present and the future.

I want to link this with the conference. We had an outstanding Special Session with extraordinary speakers who made us reflect on the present and future. You haven't dwelled too much on history, but rather on the essential aspects of the present and future. You have done fundamentally interesting things with the positivity I've observed. Look at what

> **"Overcoming difficulties, and doing so as competent nuclear professionals, is the key"**

Héctor Dominguis said, society is in excellent health, and I believe better than ever. And José Ramón Torralbo emphasized the positive leadership essential for facing challenging situations, situations that the nuclear sector has always encountered. Overcoming difficulties, and doing so as nuclear professionals with expertise, is the key. It has been a truly successful event. I would also like to request a round of applause for our esteemed ex-presidents who honor us with their presence today, a delight. A big round of applause. That's all from me. I believe we have all experienced this excellent conference. Lastly, I want to acknowledge Eva Celma, who has led the Programs Committee and all the supporting committees for this event. Organizing and delivering everything flawlessly is no easy task, so congratulations once again for preparing this conference excellently. Thank you very much. Juan Carlos, over to you.

JUAN CARLOS LENTIJO

PRESIDENT OF THE NUCLEAR SAFETY COUNCIL

On behalf of the Nuclear Safety Council, I express my gratitude for the invitation to the closing ceremony of the 35th Conference on the Experiences and Perspectives of Nuclear Power Plants in 2023 organized by the Spanish Nuclear Society. It is a pleasure to be here; the words fall short as I am truly delighted to be surrounded by these colleagues, friends, and companions. Being in the Technical School of Industrial Engineers, my alma mater, brings back wonderful memories of youth.

With 35 editions already, this year is special as it marks the 50th anniversary of the Society. I understand there is a commemorative event planned for June, but I didn't want to miss this opportunity to congratulate you on this first official event I attend in your anniversary year.

The conference we are closing is not only an opportunity for directors of different plants to present the most relevant aspects of their operation during the past year but also a great venue for information exchange and a review of nuclear plant activities over the last year. Undoubtedly, an essential event in the sector's calendar.

Therefore, I would like my brief intervention to complete this overview by discussing the role played by the regulatory body I chair last year.

I would like to touch on what occurred in the Council during 2023 and some of the projects we have for the current year. Our routine activities of inspection, evaluation, among others, were executed in 2023. Regarding nuclear plant operation, it is easy to convey the Council's conclusions or thoughts by visiting the website and consulting the Integrated Supervision System of Nuclear Plants (SISC), a recognizable tool projecting easily digestible information, even for non-experts, which has been the Council's primary area of activity.

In addition to routine inspection

work, compliance reports, design modifications, technical specifications, drills, etc., we provided a favorable report for the first phase of the dismantling of the Garoña Santa María Nuclear Power Plant in Burgos.

We also provided a favorable report for the modification of the Regulation on nuclear and radioactive installations and other activities related to ionizing radiation exposure (RINR) derived from the partial transposition of Directive 2013/59/Euratom establishing basic safety standards for protection against dangers arising from exposure to ionizing radiation.

Moreover, we approved the first Gender Equality Plan of the CSN, complying with national regulations and the international frameworks. This topic is not trivial but central, as talent attraction and retention in the sector, including the Council, is crucial. Recruiting and retaining all available talent in the country is vital, and the Council wants to pioneer, comply with norms, and demonstrate a clear commitment to gender diversity.

Internationally, following the approval of the 2020-2025 International Relations Strategy, we signed a Memorandum of Understanding (MoU) with Saudi Arabia and a Letter of Intent with Peru. We also held a bilateral meeting with the ASN of France at our headquarters. These actions serve not only to break isolation as a regulator but can indirectly act as a magnet for other industry agents to work with these countries. We also participated in the 8th and 9th Nuclear Safety Convention review cycles in Vienna, demonstrating Spain's serious commitment to nuclear safety in power plants.

From an institutional perspective, we had an active year. Engaging with territorial entities is essential, as nuclear facilities are within territories. Informing and involving local administrative and political entities ensures they are well-informed to have a knowledgeable opinion. In our visits to regions with nuclear power plants, we met with the Generalitat of Catalonia, representatives of the Parliament, and the Government Sub-delegation in Tarragona. One of the most significant points of interest was the status of the Ascó and Vandellós II nuclear power plants.

In continuation, we strengthened relationships with civil society by signing 17 new agreements and 5 extension addendums. We organized activities with the Spanish Association of Municipalities in Nuclear Areas and Radioactive Waste Storage (AMAC) and participated in Local Information Committees in areas with nuclear facilities. In the 2023-2024 academic year, we celebrated the 25th anniversary of our Information Center, welcoming over 160,000 diverse visitors, which I invite you to explore.

As we enter the new year, the key activities we have planned, alongside the routine tasks of our regulatory body, are significant. Primarily, we will assess the request for the extension of the operating authorization of the Trillo Nuclear Power Plant in Guadalajara, including the analysis of its periodic safety review, potentially moving towards long-term operation. This marks the final plant that had not yet received authorization to operate beyond 40 years, completing a significant cycle. We have a demanding schedule ahead.

"The Spanish Nuclear Society is a fundamental agent in our country for the promotion of knowledge of nuclear science and technology. And this day is a magnificent example of this"

Given the planned orderly and phased closure of the nuclear park in the Integrated National Energy and Climate Plan (PNIEC) between 2025 and 2035, specific efforts are required not only for operating authorization renewals but also for the dismantling and closure of nuclear plants.

Until 2027, we plan to continue the dismantling works of the José Cabrera (Guadalajara) and Santa María de Garoña (Burgos) nuclear plants, and maintain Vandellós I (Tarragona) in a "latency" state. The initial phase of Garoña's dismantling is already underway, with the loading of five containers of spent fuel.

The José Cabrera nuclear plant has almost completed all demolition operations and is entering a crucial phase of implementing the site restoration plan. I highlight this because I believe it is a collective understanding that true value can be derived from nuclear energy when closure and decommissioning are executed respectfully and effectively, demonstrating environmental and human safety considerations. I anticipate that the activities at José Cabrera will serve as an exemplary case of sustainable and effective nuclear energy production.

Regarding the management of spent fuel (temporal or definitive), to ensure responsible and safe handling of these materials and radioactive waste, in 2024 we will undertake the following tasks:

- Implementation and assembly authorizations for expansions of the ATI at the Ascó, Almaraz, and Cofrentes plants. Additio-

nally, a new one at Vandellós II, which, from what we know, holds the highest priority in terms of scheduling. The new ATIs will be designed for the new single storage and transport container encompassing all fuels from the plants. We anticipate receiving the licensing request for this container in the upcoming days or weeks.

- Resolving the licensing request for the construction and assembly modification design of the El Cabril waste storage facility (envisaging the installation of new cells for definitive storage by 2028), presenting a challenge due to the relatively tight evaluation and administrative processing timelines.
- The recent approval of the 7th General Plan for Radioactive Waste (PGRR), outlining the national strategy for managing radioactive waste and spent fuel. This includes various activities for the CSN, notably the potential safety evaluation (site, design, regulations) and the requisite report issuance for the authorization of the Deep Geological Repository (DGR). This monumental national project cannot be delayed and needs initiation at the earliest opportunity.

One of the key responsibilities of the CSN is to propose and formulate regulations and norms. Therefore, for this year, our regulatory plan includes the development of three new Safety Instructions and a revision:

- Revision of IS-11 on licenses for nuclear plant operation personnel.
- Instruction on managing operational experience in nuclear plants.
- Instruction establishing the list of priority action municipalities against radon and providing guidelines for radon measurements in the indoor air of workplaces located in these municipalities.
- Instruction on physical security requirements in the transport of nuclear materials and radioactive sources.

I would like to pause here as we are at a pivotal moment. The operational mode of nuclear power plants is evolving, with more frequent and prolonged load reductions observed. We are witnessing a shift from the traditional paradigm of stable 100% operation without disturbances to a more flexible approach that effectively contributes to electricity generation. It is essential for both operators and regulators to analyze this shift meticulously to ensure that, from a safety perspective, everything can be done effectively and securely. To address this changing landscape, we are developing a complementary technical instruction to establish regulatory fundamentals in this area. While this is a complex task due to the lack of global benchmarks, we are committed to crafting precise and clear regulations.

Regarding international activities, in addition to our engagements in international conventions, the European Union, and multilateral and bilateral relations, I am pleased to inform you that we have commenced preparations for the Follow-Up Integrated Regulatory Review Service (IRRS), scheduled for January 2025.

Our year started busily with visits from William Magwood, Director-General of the NEA, in January, and Christopher Hanson, Chair of the United States Nuclear Regulatory Commission, last week.

In conclusion, I would like to address one of our top concerns – talent acquisition. This is not only a challenge for the Nuclear Safety Council but for the entire nuclear sector. Identifying issues is the first step towards finding solutions. As a regulatory body, it is crucial to have a competent workforce equipped with the necessary tools for retaining and en-

hancing technical knowledge and experience, ensuring the safety of workers, the environment, and the general population.

As I am speaking at a university campus, I invite those contemplating their future to consider joining the Senior Scale of the Nuclear Safety and Radiological Protection Corps of the Nuclear Safety Council. We announce public employment positions annually (12 each in the previous and current years) to accommodate upcoming retirements and ensure a smooth transition while maintaining regulatory functions. This aims to facilitate adequate knowledge transfer between generations, safeguarding our regulatory mission.

"Given the scenario of orderly and phased closure of the nuclear park contemplated in the PNIEC throughout the decade between 2025 and 2035, specific efforts are not only required related to the renewal of exploitation authorizations, but also with the dismantling of the plants. and its closure"

The Spanish Nuclear Society plays a critical role in promoting nuclear science and technology knowledge within our country. This conference is a prime example of that. Therefore, I express my gratitude for its organization, congratulate you on this new edition, and officially close the event. I am confident that you have acquired valuable insights. Now, it is your responsibility to implement these lessons in practice and further strengthen the path of excellence in nuclear power plant operations. Thank you very much.

ALMARAZ TRILLO

Una alternativa limpia, segura y competitiva

En continuo proceso de mejora, actualización y modernización

SNE AWARDS 2023

SNE AWARDS 2023

At the end of the Operational Experiences Day, the 2023 SNE awards were presented, which on this occasion were:

- **SPAIN NUCLEAR PRIZE FOR THE 50TH ANNIVERSARY LOGO**
  David Francés
- **SPAIN NUCLEAR PRIZE FOR THE BEST TECHNICAL ARTICLE IN NUCLEAR ESPAÑA MAGAZINE**
  "The career of a shift manager at a nuclear power plant, told in the first person", **Ana Landete**
- **SPAIN NUCLEAR PRIZE FOR THE BEST DISCLOSURE ARTICLE** "The architecture of the first Spanish nuclear power plants", **Carlos Gonzalvo Salas**

BEST PAPERS FROM THE 48TH ANNUAL MEETING

- **QUALITY AND HUMAN FACTORS:** "Organization and sizing for the operation of an AP1000TM reactor", **Jesús Iglesias Morán, Laura Puigdollers Pladevall, Miguel Ángel Gil Rodríguez y Ricardo Llovet.**
- **FUEL:** "Progress in modelling advances technology fuels: the Ciemat footprint", **Pau Aragón, Francisco Feria, Luis E. Herranz.**
- **COMMUNICATION AND TRAINING:** "Reimagining Nuclear Energy", **Olga Marcos Cortés.**
- **DISMANTLING:**
  1. "Effect of liquid/solid ratio on sludge immobilization in alkaline activated slag cements", **De Hita M.J., Marugán E.I., Torres E., Criado M.**

  2."Volume reduction of spent cation exchange resins through heat treatment", **Marugán E.I., Torres E., Bahillo A., Piña, G.**
- **ENGINEERING, DESIGN AND INNOVATION:**
  1. "Temperature transients in nuclear power plant enclosures", **Jorge López Tanco.**

  2. "Estimation of the minimum DNBR for the verification of axial shapes using machine learning techniques", **Isabel Esteban Pascual, Rubén Matías Martínez.**

  3. "Using the point cloud for CCNN design modifications", **Vanesa Muñoz Portela, Roque Gámez Montoro, Jesús Fernández Rodríguez.**
- **NUCLEAR MEDICINE AND RADIOLOGICAL PROTECTION:** "Study of dose distribution in treatments with Lu-177 using Monte Carlo simulation", **Ribes V., Oliver S., Juste B., Miró R, Verdú G.**
- **OPERATION AND MAINTENANCE:** "Sensors for monitoring electrical distribution", **Dolado Téllez, O., Molina Gabriel and Galán, C.**
- **ADVANCED REACTORS AND NUCLEAR FUSION:** "CSS-N Project specific SW performance process", **Ana Mª Hernández Almería.**
- **NUCLEAR SAFETY AND LICENSING:**
  1. "Management of SBLOCA sequences with HPIS failure in VVER-1000/V-320 reactors", **Elena Redondo Valero, César Queral, Javier Gómez Magán, Víctor Hugo Sánchez Espinoza.**

  2. "Pulsar project: capabilities and limitations of support systems in the preparation and response to nuclear emergencies. National experience within the framework of the IAEA coordinated research project CRPJ15002", **Rafael J. Caro, José Ignacio Serrano, Milagros Montero.**
- **THERMOHYDRAULICS AND NEUTRONICS: SIMULATION AND EXPERIMENTATION:**
  1. "Virtual control room panels and local panels using Glasstop and Kiosks for training", **Guillermo Vidal Lahera, Pablo Rey Alonso, Guillermo Vidal Lahera.**

  2. "Validation of containmentfoam-9 using thau experiments on hydrogen recombination", **Luis Serra, Stephan Kelm, Araceli Domínguez-Bugarín, Carlos Vázquez-Rodríguez, Gonzalo Jiménez.**
- **POSTER SESSION:** "Monitoring of the CROSBY 6M6 model PSVs in the pressers of Westinghouse type plants", **César Alvarado García, José Miguel Gallego Montero, Cosme Muñoz Morejon, José Carlos Gómez Nistal.**
- **YOUNG SESSION:** "Analysis of the liquid transfer in the vertical 3D connectors of a multi-zone model using the gothic code", **Carlota Gabicagogeascoa, Sofía Arfinengo-del-Carpio, Gonzalo Jiménez, Luis Rey, Juan Carlos Martínez-Murillo**.

BEST DOCTORAL THESIS ON NUCLEAR SCIENCE AND TECHNOLOGY 2023 TECHNICAL COMMITTEE

"Modeling and experimental design to characterize permeation and gettering of hydrogen isotopes in fusion materials", **Sebastian Johannes Hendricks.**

BEST MASTER'S END THERM COMMISSION EMPLOYMENT AND PROFESSIONAL DEVELOPMENT

Winner: Cristina Trull Hernandis."Study of radon gas measurement techniques in volcanoes: characterization of the bioavailability of radon in volcanic areas".

Finalists: Jorge Segado Fernández. "Analysis and design of the central stack for the smart Tokamak"**. Ciro Alfonso Cerviño.** "Target accuracy requirements for Myrrha".

TALENT ATTRACTION COMPETITION 2023::

- **First prize - CORE TEAM**
  Simone Albanese, Camilla Castaldo, Luis de Juan Carbonell and Francisco Hernán Justel Pizarro
- **Second prize - BINDING ENERGY**
  Santiago López García, Sofía Arfinengo del Carpio
- **Third prize - N.A.F.**
  Jaime Andrés Santé, Jaime Valverde Hernández, Nikita Khvatkin and Alejandro Taboada Asensio
- **Third prize - ION SHELL.**
  Alberto Gil Cordero, Miguel Jiménez Sarria

BEST FILES

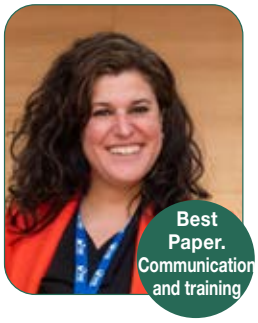
Andrea Serrano Costafreda, Pol Guijosa Araez, Santiago López García, Marvin Pau Axness Ferrando, Sara Asensio Falagan

Prize for the 50th anniversary logo°

Best technical article

Best Paper. Quality

Best Paper. Fuel


Best Paper. Communication and training

Best Paper. Dismantling

Best Paper. Dismantling

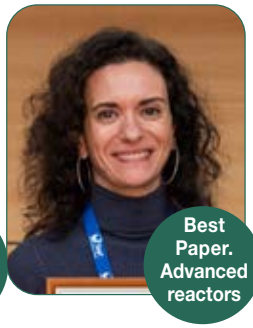
Best Paper. Engineering, design

Best Paper. Engineering, design

Best Paper. Engineering, design

Best Paper. Nuclear medicine

Best Paper. Operation

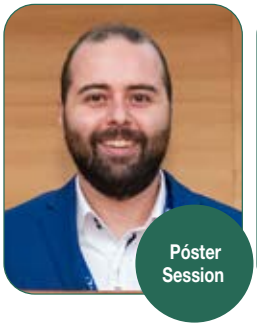

Best Paper. Advanced reactors

Best Paper. Nuclear safety

Best Paper. Nuclear safety

Best Paper. Thermohydraulics

Best Paper. Thermohydraulics


Póster Session

Young Session

Best Doctoral Thesis

Best master's end Therm. Winner

Best master's end Therm. Finalist

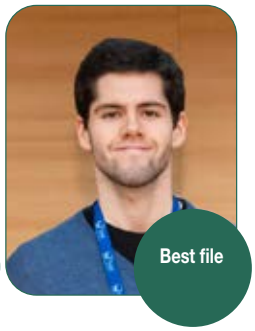
Talent Attraction. Core Team

Talent Attraction. Binding Energy

Talent Attraction. NAF

Talent Attraction. NAF

Best file


Best file

PHOTOGRAPHY CONTEST

sne 2023 framatome

BEST PHOTOGRAPHS GENERAL CATEGORY

First Prize:
LOOK - Marc Altés Soler

Manuel Fernandez Ordóñez collect on behalf of the winner

Second Prize:
SPIRAL STAIRCASE, FROM THE 16TH CENTURY, IN THE CISTERCIAN MONASTERY OF SAN PEDRO DE CARDEÑA - Manuel Muñoz García

Third Prize:
SAND STAR - Juan Oliden Gómez

BEST PHOTOGRAPHS ENERGY CATEGORY

First Prize:
BALL AND LIGHT
Ricardo Luna López

Patricia Cuadrado collect on behalf of the winner

Second Prize:
THE SUN ON EARTH
Enrique de la Fuente Prieto

Third Prize:
RUNNING THROUGH LIVING NATURE
Juan Antonio Muñoz Muñoz

BEST PHOTOGRAPHS POPULAR JURY

First Prize:
WE ARE ELEMENTS
Saroa Rozas Guinea

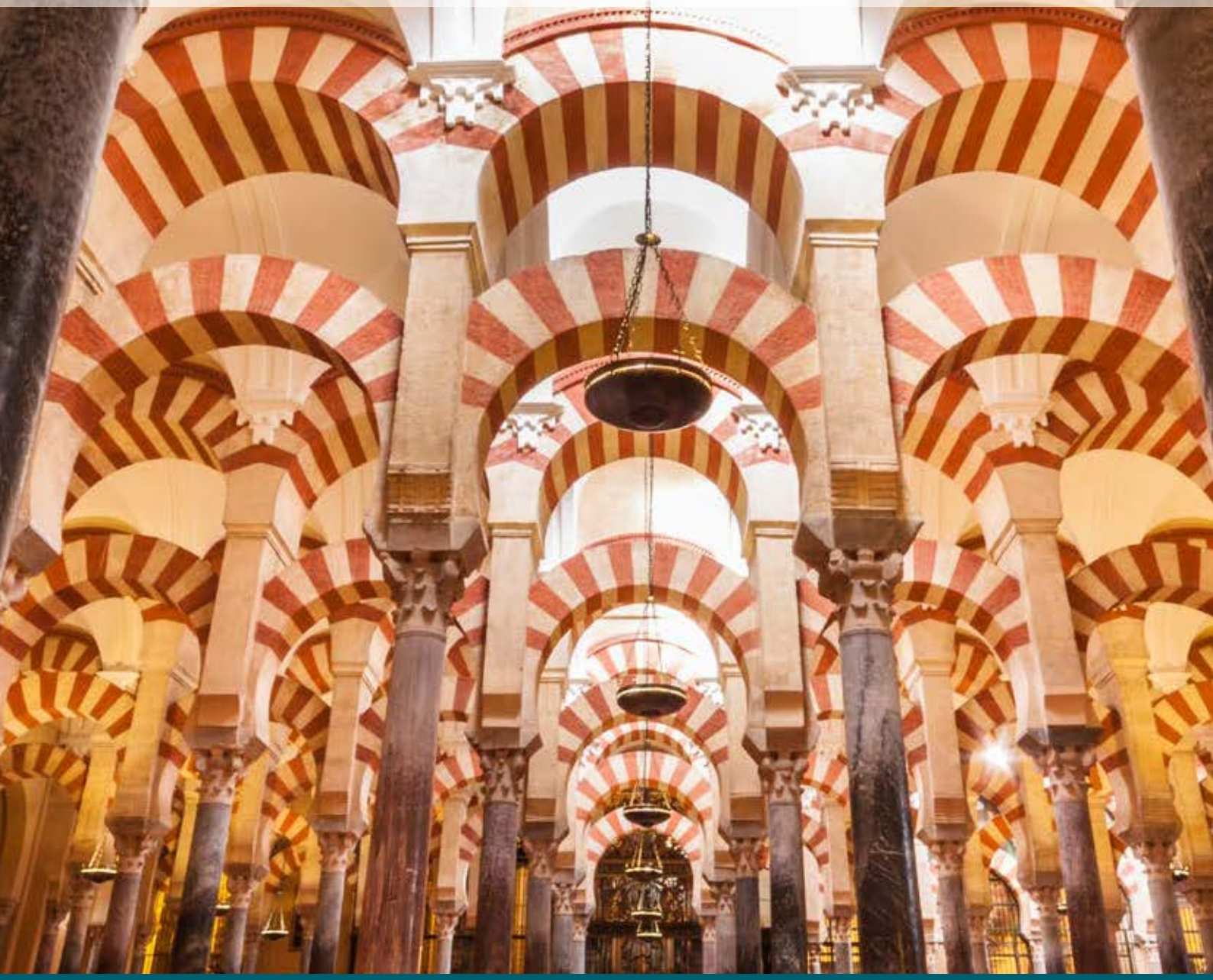
Second Prize:
BEFORE THE STORM
Eva María Celma González-Nicolás

Third Prize:
SCHLAFEN SNE
Enrique de la Fuente Prieto

Córdoba 2024
October 9-11
50 ANNUAL MEETING
SPANISH NUCLEAR SOCIETY

Córdoba 2024

50th ANNUAL MEETING



We are waiting for you in Córdoba from October 9 to 11, 2024

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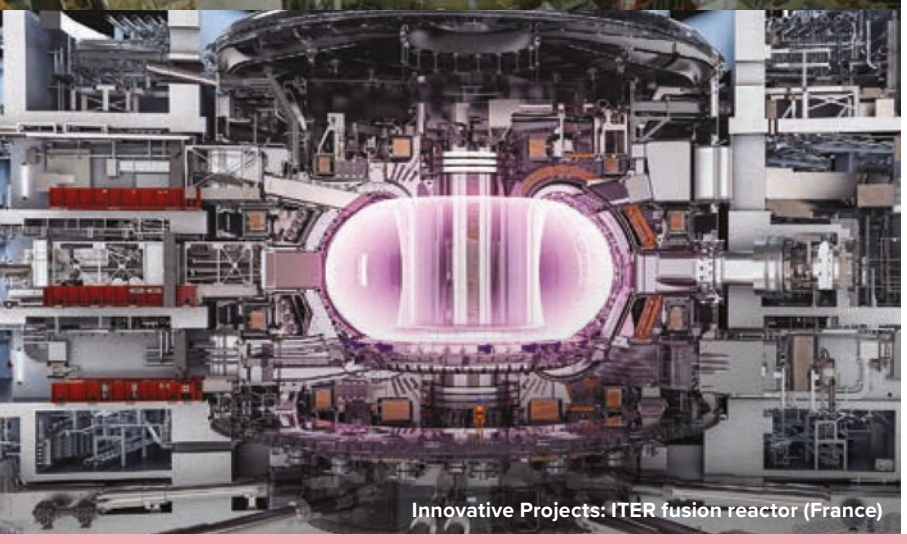

Innovative Projects: ITER fusion reactor (France)

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