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SPANISH NUCLEAR POWER PLANTS 2020



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2021

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NUCLEAR POWER PLANTS 2020. TEN YEARS OF BEING THE LEADING SOURCE OF ELECTRICITY GENERATION

or yet another year, the Spanish Nuclear Society has been faithful to the event that, for more than 25 years, has brought together professionals and companies in the sector to analyze the operation of the Spanish nuclear park during the previous year.

March 5, 2020, was the last time that the sector gathered in person at the Operational Experiences Session. Ten days later, the confinement was declared, and nuclear power plants had to respond to an unknown situation where it was necessary to maintain safe operation and at the same time continue with outage plans for refueling and maintenance.

And the professionals of the plants demonstrated, once again, their excellence, maturity, and knowledge, managing to meet the objectives set.

For the tenth consecutive year, nuclear energy was the leading source of electricity generation in 2020, with 22.18%, and it was also the leading source free of greenhouse gas emissions at 33.14%.

To present these results, this year's Session was a mixed event. In March, plant directors remotely presented operational experiences of the facilities during 2020, and in June, the second part of the session was held with a mixed format, online and in person, from the assembly hall of the Higher Technical School of Industrial Engineers of the UPM.

This special issue of NUCLEAR ESPAÑA includes the entire Session, also maintaining one of the SNE's standard paper issues. All content can also be viewed in the "Special Publications" section of the <u>revistanuclear.es</u> portal.

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GENERAMOS ELECTRICIDAD, ADQUIRIMOS EXPERIENCIA, COMPARTIMOS CONOCIMIENTO



Experiences y Prospects

HÉCTOR DOMINGUIS



PRESIDENT OF THE SNE & CEO OF GDES

Texts: MATILDE PELEGRÍ Photos & video: Grupo SENDA

Challenge, opportunity, transformation, and change are words that are present in the reflections of the new president of the Spanish Nuclear Society.

With a career that has led him to work in different countries, Héctor Dominguis approaches the representation of professionals in the Spanish nuclear sector with enthusiasm and pride, with recognition of the work of the SNE commissions, and with an entrepreneurial perspective that allows him to see the future not in years, but in generations.

THE SNE IN TIMES OF CHANGE

The General Assembly of the Spanish Nuclear Society held on March 4, 2020, ratified his appointment as President of the Board of Directors after the two-year period as Vice President. What does this choice represent for you, from a personal point of view? And from a professional and business perspective? That professionals in the sector, both individual and collective members, trust me to preside over the SNE is a great satisfaction, and I feel and understand that it is a recognition not only to me, but also to my father, for all the years dedicated to the Society and the nuclear industry. A really deep satisfaction and also a great feeling of responsibility, which I assume with pride. From a professional and business perspective, I understand this appointment as recognition to GDES for its commitment to the industry and the trajectory that we have had throughout all these years, being a family business that my father has led for a long period of time and that I have led in recent years. But, without a doubt, I assume this presidency in a personal capacity since the Spanish Nuclear Society represents us all as professionals, and that is what must prevail.

The year 2020 was especially difficult in all sectors, and also for the SNE. In a few weeks, the Board of Directors, of which you were Vice President, had to take on the challenge of continuing to offer services to members, including the convening of the Annual Meeting, in the midst of a health crisis. What were the main lines of action that were proposed at the SNE? What conclusions can you draw now that 2020 is over?

More than a challenge, I would say it was an adaptation. It should be noted that not only the Board of Directors but also the commissions, members, and all of us who make up this association, we considered the crisis as an opportunity. And we were nimbly able to adapt to the new situation to fulfill our mission with almost total normality.

It must be remembered that a few days before the state of alarm was declared, many of us were in Madrid presenting and celebrating the launch of the digital portal for the NUCLEAR ESPAÑA magazine, the Communication committee was in the middle of its project for revamping our website, the Programs committee was working on the decentralization of activities. And, suddenly, the pandemic arrived.

Fortunately, all the necessary diaitalization tools to adapt to this new situation already existed. We were not yet familiar with them, but they were already available for remote communication for the committees and the dissemination of our activities, and what we had to do was get used to using them. If this pandemic hit us five years earlier, it would have been a real disaster. But if we look on the bright side, the pandemic has managed to accelerate the adoption and implementation of tools. It was essential to have enough bandwidth, both for families to be able to connect and for companies to maintain work from a distance in addition to having the necessary technological solutions. All this, together with the fact that we belong to a sector of professionals with a great capacity for adaptation, who in record time, with a lot of work behind the scenes and a lot of motivation, managed to adapt to the situation, has allowed us to continue advancing and meeting objectives.

The year 2021 is the year of the new normal, but also the year of uncer-

tainty. In this scenario, what are the objectives set by the Board of Directors for the period 2021-2023?

Regardless of the pandemic we are experiencing, we are in an era of disruption and constant change. In 2020, and still today, we are affected by a pandemic, but at the beginning of this year, we experience the *Filomena* storm, and tomorrow it may be a digital or technological revolution, or perhaps another economic crisis. Now there are very drastic changes taking place.



PROFESSIONAL PROFILE

Héctor Dominguis is a Materials Engineer from Imperial College London and holds master's degrees in management and executive development from Surrey University, ESADE and IESE.

Before joining GDES, he worked as an assistant to the commercial management at Plexi and as a consultant in Strategy and Management.

In 2003, he joined GDES as Director of Business Development and was appointed General Manager of the Group in 2011, becoming CEO in 2012.

Organizations, in essence, must adapt to a situation of constant change and constant review of our plans. For this reason, a review of the Strategic Plan is underway as a guarantee of service to members to continue maintaining activities, adapting to going virtual, and continuing to maintain face-to-face. In short, to be agile and adapt to the new scenarios that constantly arise.

Likewise, our priority objective is to promote internal communication. At this time, we are working from the Board of Directors and with all the commissions, promoting greater knowledge among all of them in order to generate synergies and enhance the work of the nearly one hundred professionals who collaborate so that the Society continues to meet its objectives. In fact, I am participating, with the General Secretary, in at least one meeting for each committee, and I want to emphasize that there is a lot of value and a lot of dedication in their work, which they perform selflessly, and which many times takes over moments of their personal life.

It is important to point out that, although the Board of Directors is the most well-known group, the commissions constitute the soul of the Spanish Nuclear Society, performing constant work, sometimes not very visible, but fundamental.

On the other hand, we want to promote the recruitment of members, especially from the facilities of our collective partners, as well as increase the number of activities of greater technical and social value and networking between members, both individual and collective, and decentralization will help us a lot on this goal.

Regarding communication, another of our objectives is to continue working intensely to position the SNE as a source of information and reference in everything related to the fields of nuclear science, industry, and technology, in addition to encouraging and promoting the emergence of more disseminators and nuclear professionals willing to explain and give their opinion We are in an era of disruption and constant change and organizations must adapt to a situation of constant change and constant review of our plans

openly to society. In this sense, it is important to strengthen presence on social networks, the positioning of the website and the contents of the NUCLEAR ESPAÑA portal, and the dissemination of all the activities organized in the different Society commissions.

What role does digital transformation play in this process?

Undoubtedly, the pandemic has accelerated digitalization in companies more than the entire technological process that had already been advancing in recent years, and the role of digital tools is also key in this new stage of the SNE, not only because of the launch of the NUCLEAR ESPAÑA portal, our new website, or the launch of the talent management platform, but also because of the adaptation and incorporation of these tools to improve communication and management with members.

Now the challenge is to take advantage of the technology that has already been installed among all of us. We have seen that with online activities we can reach more members, decentralize activities, which is a process that was already being done, and reach professionals from other countries where we have less of a relationship. In fact, when we do a virtual event, we have about 30% international participation. This situation gives us advantages that we must be able to take advantage of.

The key to the future, in my opinion, is knowing how to combine virtual and face-to-face, because our characteristic of an open society requires personal relationships, but we also have technology that allows us to maintain virtual relationships.

Can you tell us if the 46th Annual Meeting will be held in person?

The Organizing Committee, with the support of the Board of Directors, is analyzing all possible options. The progress in the vaccination process and the positive evolution of the contagion data improves the prospects of maintaining the face-toface format, in the city of Granada, guaranteeing at all times the health of the attendees, speakers, authorities, guests, and all people involved in the organization, and with the support and participation of local and regional institutions.

In the event that, for health reasons, the Annual Meeting must be virtual, we will act flexibly and bring to the table the experience learned in the last edition of the 2020 Virtual Meeting and thus not miss this meeting point, the most important meeting for all professionals and companies in the sector.

What initiatives do you consider of interest to promote relationships with other entities in the sector?

Undoubtedly, the relationship with entities in the sector, such as the Nuclear Safety Council, Foro Nuclear, and the corresponding ministries, sister companies, and international organizations, is a key element of the Society, as a group of professionals in the sector.

The fight against global warming does not belong to a single country, or to a single industry. Therefore, it is essential that we open our relationships and our collaborations to all types of organizations, national and international, because together we will be much more effective in conveying our message.

What role does the Nuclear Young People Commission have in the future of the Society?

Spain is becoming a world benchmark in the nuclear sector thanks to the 2019 WiN Global Congress, the ENYGF'21, and Top fuel 2021

In general, the young people of any association or organization, and in particular the nuclear associations, are essential because they represent the future of the sector, and they are the generations that will develop and improve the industry that we leave them. Therefore, they are extremely important.

At the SNE, we have the Nuclear Young People Commission and a group of young professionals who are, in the best sense of the word, hyperactive. Every week, every month, they organize many social, technical, and outreach activities... amazing!

Thanks to this commission, the dissemination of knowledge about nuclear energy is conveyed to the level of the new generations and we encourage the participation and attraction of younger talent.

And they also achieve major milestones such as getting Spain to host the European Nuclear Young Congress this year to be held in Tarragona in October. The European Nuclear Young Generation Forum ENYGF'21 is undoubtedly one of the most important meetings in our sector. In previous editions, professionals from up to 27 countries participated and 400 participants attended in person to learn, exchanae experiences, and discuss the burning issues for the nuclear future.

And with regard to the WiN Commission for women in nuclear, how do you analyze its role in promoting nuclear energy?

Without a doubt, it is also fundamental. If we think internationally, WiN Global is the only women's association in a global industrial sector, such



- A book: Sapiens by Yuval Noah Harari.
- A hobby: spots and meditation.
- A challenge: El Camino de Santiago, qwhich if nothing goes wrong, I will undertake this year.

as nuclear, and its mission reflects, in my opinion, a good roadmap for the promotion of technical training especially among young women. If we add the development of innovative and engaging actions to initiatives like this, we motivate and bring knowledge of the job market for STEM careers and facilitate the incorporation of young professionals into society, both men and women. Personally, I must say that I am proud to have Dominique Mouillot on the GDES team, appointed President of WiN Global, and who continues to demonstrate her strong commitment, leadership, and support towards women in the nuclear industry

> around the world, contributing to the growth and success of this association.

In our field, WIN Spain also carries out extraordinary work, and proof of this is the organization of the 27th WiN Global Congress that was held in Madrid in 2019 which brought together more than 300 professionals from 60 countries on five continents. Therefore, we are seeing that Spain is becoming a world benchmark in the nuclear sector, because in addition to the 2019 WiN Global Congress and ENYGF'21, this year, the Top Fuel 2021 International Congress is also being held in Santander.

THE NUCLEAR SECTOR AND INDUSTRY

Despite the restrictions imposed by the pandemic in 2020, the nuclear sector demonstrated its great capacity to adapt, carrying out outages for refueling that were completely safe for workers and efficient for the plants. We are also witnessing the approval of projects to extend the life of Spanish nuclear power plants. With this reality, how can it be understood that the closure of the plants is still being considered in the near future?

The answer is easy: it is not understandable. First of all, I would like to point out that this is not the case in all countries of the world, and we can talk about, for example, the cases of Sweden or Finland, where public opinion is overwhelmingly in favor of the use of nuclear energy.

And on the other hand, we must not forget that the closure schedule agreed in the INECP can be revised and, of course, will be revised if the objectives for implementing storage infrastructures and new technologies that provide stability to the electricity grid supply are not met.

It makes no sense to close nuclear facilities that operate in an exemplary way in terms of safety and that provide stability to the grid in a sustainable way and prevent greenhouse gas emissions. It does It makes no sense to shut down an industry that generates more than 28 500 highly qualified jobs with an impact of 2.7 billion euros on the GDP without having a real and solid alternative to take its place

not make sense that we have to face unnecessary decommissioning of facilities that, today, are more efficient and safer than when they started and that can continue to operate in that way for many more years. It makes no sense to shut down an industry that generates more than 28 500 highly qualified jobs with an impact of 2,7 billion euros on the GDP.

The investment effort in training and the contribution that nuclear



power plants make to the Spanish electricity system means that what makes no sense is to stop operating facilities without having a real and solid alternative to take their place.

What role should nuclear energy play in the short and medium term in the fight against climate change?

I will answer by changing the question: what role should the energy source that prevents the most CO_2 from the atmosphere play in the fight against climate change? And then the answer is very obvious: a leading role.

And we can continue to ask ourselves other questions such as: what has happened in the countries where they have gotten rid of the nuclear industry in the midst of this fight against climate change? Well, we find cases such as Germany, where the elimination of nuclear energy has increased the price of electricity bills and CO_2 emissions into the atmosphere, making it the second most polluting country in Europe after Poland.

The General Assembly that appointed the new Board of Directors was held on the same day as the now traditional Operational Experiences Session where the excellent work of the plants was confirmed and where the essential work of the collaborating companies was once again affirmed for yet another year. What stands out about the adaptability of the nuclear industry?

My conclusion is that 2020 has put us to the test and nuclear professionals have successfully demonstrated with facts that our technology brings stability, reliability, and security to our country's electricity Our great challenge is to change the perception and social awareness so that people realize that we generate clean and safe energy in a stable way, and that we are a leading industry in the fight against global warming

supply. Nuclear energy has given stability to the electricity grid during the pandemic, compensating for the variability of renewable energies and demonstrating its ability to adapt.

The Spanish nuclear park operated 7,835 hours out of 8784 hours in 2020, that is, 89,81% of all hours of the year.

In addition, the plants were able to control the work required for refueling and all the personnel involved, maintaining strict control over COVID-19.

This data confirms that nuclear energy is essential, even more so in unexpected periods of crisis, to guarantee the supply of electricity and to do so in an environmentally friendly way without reducing the competitiveness of our economy.

What role does international business have for industrial companies?

For any industry, in a world as globalized as the one we live in, international business is essential. In addition, if we stick to the reality of the Spanish nuclear industry, it is evident that we find ourselves with a finite and limited market, and if we want to go beyond the 7 reactors in operation in Spain, it is necessary to move into international markets, something that the Spanish industry began to do many years ago.

We are present in nuclear projects in more than 40 countries thanks to our international prestige, with a competitive, consolidated, and experienced industry, which covers the entire value chain of nuclear activity from initial studies, conceptual design, construction, fuel manufacturing, operation and maintenance engineering development, supply of equipment and components, management of nuclear waste, and the decommissioning of facilities.



Good proof of this is the presence of our companies in the ITER project, the experimental reactor that is considered the largest scientific project in the history of mankind, in which Spanish industry has obtained more than 40 contracts of high technological value in 2020 alone.

What are the main challenges that the sector must take on in the coming years?

According to the Nuclear Energy Agency of the OECD, the challenge of the nuclear sector is to produce clean and safe energy, but for me, this is not a challenge, it is our day-to-day. It is what we do.

In my opinion, our great challenge is to change the perception and social awareness so that people realize that we generate clean and safe energy in a stable way, and that we are a leading industry in the fight against global warming, and that nuclear energy, along with renewable energies, can represent a truly sustainable balanced mix. Hence the importance of the recent inclusion of nuclear technology in the sustainable taxonomy of the European Union, which we hope will be confirmed after the JRC report, equating nuclear energy with other energy sources already included in the taxonomy in terms of their environmental and health effects.

On the other hand, and from a technical perspective, the new generations of reactors constitute another of the challenges we have as an industry, since the improvement in efficiency, in use of fuel, in safety, and in the flexibility of the reactors, reaffirms the position of nuclear power, once again, as a key and essential technology in the face of climate change and of great value to society.

Personally, I do not see the future of the business in years, but in generations. The vision of the evolution of the nuclear industry must be considered in the very long term since it involves very important decisions and investments.

46 ANNUAL MEETING SPANISH NUCLEAR SOCIETY Granada 2021





A A D A is waiting for you





JAVIER GUERRA PRESIDENT OF THE SNE*

ood morning and welcome to the thirty-second Operational Experiences Session. This year we have to see each oth-

*At the General Assembly held at the end of the day, the new SNE Board of Directors, headed by Héctor Dominguis as the new president of the SNE, was sworn in. er's faces using our screens, in a format that has already become familiar to us and that has allowed us to remain close in these times of pandemic, but I will not deny it, I really miss being able to return to meet again and share experiences in person. For this reason, and to be optimistic about a situation that we would like to think will improve in the coming months, we have prepared, for this year, a different format with this virtual session that we are holding today and that will continue with a conference on June 29, which we hope can be face-to-face and that will allow us to meet again at the School of Industry.

On my own behalf and on behalf of the Board of Directors for the Spanish Nuclear Society, I would like to thank all the people whose work has made it possible to organize this event. Especially to the members of our Program Committee and, of course, to you, who are following us live or in a recorded format.

And of course, we would also like to thank all the directors and plant managers, along with their respective plants, for their willingness to join us once again for this session as the main protagonists of this meeting.

Well, before giving the floor to the power plants, to give an overview, I want to emphasize first that, for the tenth consecutive year, nuclear energy continues to be the leading source of electricity generation nationwide, with a 22,18%. It was also the source that operated the most hours, 89.81% of the total, and consequently, it was also the leading source of electricity free of greenhouse gas emissions, with 33,4%.

These are good production figures, and even more so in the year 2020 which has been marked by the COVID-19 pandemic and its consequences. In these difficult

For the tenth consecutive year, nuclear energy continues to be the leading source of electricity generation nationwide, with a 22,18%

circumstances, extreme at times, our plants continued to operate normally, completed their stops for refueling, and demonstrated, as in the recent and historic storm Filomena, that nuclear energy and its professionals can be counted on in any circumstance as the base energy for our electrical system, guaranteeing the security and quality of supply at all times.

In addition to looking back, I also want to look forward, highlighting that, with the authorizations from the CSN and the Ministry expected this year, all the plants will have renewed their operating licenses until the end of their operational lives established in the INECP, or until 2030 in the case of Vandellós II and Trillo. I hope and wish that the end of their operational lives will be reviewed with rigorous criteria so that other renewals can happen and our plants can continue to operate and thus contribute to the energy transition being carried out with full guarantees, complying with all environmental and safety commitments in the most efficient and safe way.

And, to give you one more glimpse, since the facility managers are going to speak next, allow me to delve into the path of innovation to, once again, continue to think about our future. You are all familiar with the Perseverance rover, which recently landed on Mars, and you will also know that this equipment derives its energy from a device that uses nuclear technology for its operation. We are a resource for the future. Beyond the production of electricity and the upcoming industrialization of the next genera-

tion of advanced reactors, there are numerous suitable applications for nuclear energy, such as the generation of hydrogen or heat, which along with the excellent operation and health of our power plants allows us to affirm, with complete certainty, that nuclear energy is essential in the fight against climate change, that it is as essential today as it will be tomorrow. And as further proof of this, I cannot fail to mention this, is the gradual return to reality, to nuclear common sense in Japan, or the recent approval of the long-term operation for the French nuclear park that you are all aware of.

Surely the head facility managers will give us more details about this, but before I give them the floor, let me highlight a fact that personally catches my attention: none of the events reported in 2020 by the Spanish nuclear power plants was rated above 0 on the INES scale, and this is further proof of the excellent work and rigor of our professionals who maintain a level of exigency and truly commendable results. This is the way forward, along with that leap in innovation just described and fair tax treatment, so that our industry can continue to look to the future with optimism.

Many thanks again to all of you for your attendance and attention, I am convinced of the interest in this session that, as every year, will help us to learn a little more about each other and share operational experiences, without a doubt, one of the bases of our continuous improvement and of many of the successes achieved to date..



JOSÉ MANUEL REDONDO

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

First of all, I would like to thank Javier as always for inviting me to participate one more year on behalf of the Ministry for the Ecological Transition and the Demographic Challenge in this Conference on experiences and perspectives for Spanish nuclear power plants.

In addition to satisfaction, it is an honor for me to participate in this Session where the plant Directors will tell us how their plants fared last year. And I am sure that, if every year what they tell us is interesting, that this year it will be much more so since 2020 has been an atypical year that we will never forget.

This Session is also atypical for me, not only because circumstances have forced it to be held in this way, but because, normally I get to speak at the Closing Session and, this year, Javier put me in the Opening Session, so that, in principle, I have less risk of repeating what has already been said.

From my point of view, I would say that, since March 5 of last year, the day on which the previous Session on experiences and perspectives was held (tomorrow that will be one year ago), there are some things that have become clear and which I would like to highlight:

• First, during 2020, something that in recent years has become a tradition has been fulfilled, as the energy generated by nuclear power plants has once again become a basic pillar in the supply to Spanish society for something as fundamental as electricity, being, for the tenth consecutive year, with 22,18%, the technology that has contributed the highest production to the Spanish electricity system.

And it must not be forgotten that this percentage of energy has been supplied in the form of synchronous power; synchronous power that does not emit CO₂, something that is very rarely emphasized.

Undoubtedly, these production levels are, once again, the result of the excellent work that professionals who are part of the Spanish nuclear industry have been doing; I am referring both to those who are in charge of the operation of the plants, as well as to those who carry out their activity in the field of engineering and service provider companies.

 Secondly, we have had to face a health crisis that we have not yet overcome and that has posed an additional challenge for Spanish nuclear power plants, requiring their owners to draft contingency plans to guarantee the continued and safe operation of their facilities.

These plans, relating to both preventive as well as surveillance and response actions, drafted with the objective of protecting the health of workers and guaranteeing the safe operation of the plants, have allowed the Spanish nuclear power plants to operate in a stable manner during the darkest days of this pandemic.

• Third, the increase in electricity production from renewable en-

ergies has been demonstrated, which in 2020 reached a record of 43,6% (including wind power within this percentage, which accounted for 21,7% of production), which makes it possible to envisage a forthcoming future scenario in which nuclear power plants will have to accommodate their production to that of these technologies, something that has already been taking place in recent times with increasing frequency and, particularly, on weekends or in situations where a large production of renewable technologies is expected.

In this scenario, the conventional use of load factor as a parameter to measure the regularity of the operation of a power plant can be said to be history.

In any case, it would be good if the technological developments that are currently being considered in terms of energy storage or alternative uses of it could ensure that these capacities are not wasted.

 And fourth, I believe that we must talk about the importance that guarantee of supply has reached, which has been particularly evident in recent days, with situations such as those caused by the storm *Filomena* or the arctic cold snap in the state of Texas. It is clear that the role of nuclear power plants is fundamental today in achieving this guarantee of supply.

I will now move on to make the usual reference to the most relevant issues that are currently the subject of attention at the Ministry.

First, we are working on the upcoming renewal for the Cofrentes authorization, which already has a favorable report from the Nuclear Safety Council and must be granted before March 20, the date on which the current authorization expires. As requested by the owner, this renewal will be granted until November 30, 2030; that is, for a period of 9 years and 8 months.

Likewise, before October 2, renewals for the Ascó I and Ascó II authorizations must be granted. In this case, their owner has requested them for a period of 9 years for Ascó I and 10 years for Ascó II. As you already know, with these renewals, the provisions of the Protocol signed in March 2019 between Enresa and



In 2020 directors of the plants had to make logistical good plays of all kinds so that the operation of their plants could be carried out, in addition to the maximum safety conditions, to protect the health of their workers in this health crisis situation

the owners of the plants, which is based on the Integrated National Energy and Climate Plan 2021-2030, are being complied with.

On the other hand, at the Ministry, we are continuing with the paperwork for the 7th General Radioactive Waste Plan, whose draft was presented by Enresa last March and which is also based on the aforementioned Integrated National Energy and Climate Plan 2021-2030.

Within the Strategic Environmental Assessment process that is currently being carried out, after the publication last October by the General Directorate of Quality and Environmental Assessment of what is known as the Scope Document, Enresa is currently preparing the Strategic Environmental Study and a review of the draft of the Plan initially presented, which, in principle, starting next July, will be submitted to the corresponding period of public information and inquiries.

On the other hand, on May 21 Enresa submitted a request for authorization of phase 1 of the Garoña decommissioning to the Ministry, a request that is currently being analyzed by the Nuclear Safety Council.

This phase 1 of decommissioning (for which the corresponding Environmental Impact Assessment will have to be conducted) has an expected duration of 3 years and the main activities that will be carried out during this phase will be the loading of spent fuel in containers and their transfer from the plant pool to the ITS, as well as the dismantling of the turbine building to repurpose it as an auxiliary decommissioning building, necessary for the execution of phase 2.



Central nuclear de Santa M^a de Garoña (2018) Rodelar, Wikimedia Commons, Licencia CC-BY-SA 4.0

Given that, at present, the spent fuel from the plant is in the pool, in applying the exception provided for in the Regulation on Nuclear and Radioactive Facilities, Enresa has presented a Spent Fuel Management Plan, which must be approved by the Ministry, following a report from the Nuclear Safety Council. In principle, it is expected that the authorization of this phase 1 could be granted in the second half of 2022.

Subsequently, phase 2 of the decommissioning must be authorized, which will also have an Environmental Impact Assessment associated with it. For this phase 2, which is expected to begin in 2025, a duration of 7 years is estimated, and the reactor will be dismantled, as well as the rest of the buildings with radiological implications, continuing with decontamination activities, declassification, and demolition of buildings to wrap up with the environmental restoration of the site.

And to conclude, I can only reiterate my appreciation to the professionals who during the past year have contributed with their work, their knowledge, and their dedication to ensuring that nuclear energy has maintained the leading role that it has had in recent years in the Spanish electricity supply.

However, I believe that this year, in addition to the previous recognition of professionals in the sector, there have been some parties who, in addition to the complexity of the responsibilities that fall on them in conventional years, in 2020 had to make logistical good plays of all kinds so that the operation of their plants could be carried out, in addition to the maximum safety conditions, to protect the health of their workers in this health crisis situation.

For this reason, I believe that the Directors of the power plants who today are going to explain to us how they have operated during the past year deserve not only recognition but also a tribute that I want to place on record in my speech. Thank you very much.

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FIRST SESSION





Moderated by MIGUEL ÁNGEL CORTÉS MEMBER OF THE SNE



JAVIER SALA DIRECTOR OF COFRENTES NUCLEAR POWER PLANT

s is customary in the nuclear industry, we will begin the presentation by prioritizing nuclear safety. The indicators of the CSN's Integrated Power Plant Supervision System are those that independently and homogeneously reflect the nuclear safety performance of Spanish power plants. Both the inspection findings and the indicators reported in 2020 have been categorized in green, which is equivalent to the most favorable situation for nuclear safety, with the Cofrentes NPP in the licensee response column for the action matrix, which is equivalent to the best position in terms of nuclear safety.

During the year, a single event was reported in accordance with CSN IS-10, which was not part of the INES scale, and therefore not relevant for nuclear safety. The event was due to a momentary loss in the depression of the shielding ring during the fan change maneuver for the ventilation discharge system. After the incident, it was resolved immediately, and it was reported for momentarily exceeding the limit specified for depression in that area.

Focusing on occupational safety aspects, we had a magnificent three-year streak with zero accidents with leave. However, in 2020 we had two accidents, one involving our own personnel and the other involving a collaborating company, which were not very serious. We have learned from these accidents and we have implemented a reinforcement plan in prevention to return to the zero-accident path.

Another aspect of integrated safety that we follow very closely is radiation protection. The responsibilities associated with radiation



protection also focus on the protection of the public, the environment, and workers. If we look at the collective doses received by the workers, we see that there has been a very good evolution in recent years, thanks above all to the Dose Reduction Master Plan that





we have implemented for years. In 2020, we have reached the lowest collective dose value in history.

Regarding the protection of the public, we see that the results of the measures we take show that the impact of the plant on the environment is negligible: given a regulatory limit of 1000 microsieverts per year and an operational restriction of 100 microsieverts per year, the impact of the Cofrentes NPP was 0.13 microsievert for external individuals.

Regarding environmental protection, I would like to highlight the power of the Environmental Radiation Monitoring Program (PVRA), with which we take around 1600 samples a year to analyze the impact on water, vegetables, milk, etc. and check that they have not been affected by the operation of the plant.

In 2020, we continued to maintain the EMAS-III environmental management certification, one of the most demanding in this field.

Focusing on electricity production, what is relevant for 2020 is that nuclear power plants guaranteed the essential supply of electricity during a period of great uncertainty for the country. The Cofrentes NPP contributed significantly with a production of 8,892 GWh, with unscheduled unavailability of 0.31% and a capacity factor of 99.42%.

Another important parameter that reflects the great reliability with which the Cofrentes NPP operates is the WANO performance index, which combines different indicators. The Cofrentes NPP obtained a 100% on a sustained basis in 2020, which places it among the most reliable plants internationally. Among others, this indicator includes the time without automatic shutdowns of the reactor, in which the Cofrentes NPP has already accumulated 11 years.

One of the great challenges that the Cofrentes NPP has for 2021 is

MODERNIZATION AND DIGITALIZATION AT THE COFRENTES NPP



COFRENTES NPP: MODERN AND DIGITAL

PREPARED TO CONTINUE OPERATING SAFELY AND RELIABLY

to obtain its operating license and another great challenge is the management of spent fuel which required the completion of works on the Individualized Temporary Storage (ITS) and the loading of containers with fuel.

How it started

It is clear that the activities associated with managing the pandemic have been critical. I believe that one of the gifts that this situation has given us is that it has opened our eyes to the computer and technological resources that we had available and that we have made greater use of them.

At the Cofrentes NPP, we have a Digitalization Plan based on five pillars. Digitalization is a tool that allows us to make gains in safety, reliability, and also in efficiency, that is, to achieve better, safer, more reliable operation with better methods for analyzing operating parameters and above all trying to save through the digital transformation of processes that had always existed on paper.

How it's going

To cite some examples of these five pillars, we can see that in the Robotics and Drones pillar, a drone has been used for the first time in the plant to inspect the concrete structure of the cooling towers.

In the Digital Processes pillar, two sections should be highlighted: one aimed at digitalizing jobs, launching a computer application to eliminate paper; and another to digitalize the clearance notification process. A computer application that has been very well received by the plant staff is what we call Plant Status, which allows us to get a summary of the most relevant information on the status of the plant, operational priorities, upcoming work, and ongoing day-to-day activities on a cell phone or PC.

Focusing on the Training and Monitoring section, we have made another fundamental change through the use of 3D animations with a high level of detail, which allows us to replicate each of the tasks with great fidelity in order to be accurate in the work.

We have also developed training in virtual mode for the use and handling of platforms as a fundamental tool for personnel who perform load-lifting maneuvers.

Our GEH technologist has developed virtual reality applications to train for the movement of fuel which allows workers to train in a practical way in an environment that perfectly replicates the situation they will find in the plant.

Another fundamental aspect has been the implementation of digital control systems in the control room which have gradually replaced the original analog equipment with more modern equipment.

However, all this has to be framed in a safe environment, since having new technology also offers us new threats, so we have developed a Cybersecurity Plan through which actions are taken to know first of all what are our cyber assets to be protected, what risks they are subject to, and what responses must be prepared in the face of adverse scenarios such as a cyberattack.

I would like to end by showing what the Cofrentes control room was like in its beginnings and how it is today, transformed into a modern, digital, reliable, and safe plant thanks to the work carried out over many years by the great team of professionals that make up our team.

SECOND SESSION





Moderated by LOURDES BORONDO MEMBER OF THE SNE



JORDI SABARTÉS DIRECTOR OF ASCÓ NUCLEAR POWER PLANT

SAFETY

During 2020, the Ascó nuclear power plant reported a total of 13 reportable events to the Nuclear Safety Council (CSN), following the protocols established in Safety Instruction IS-10, 5 corresponding to Unit I and 8 to Unit II. All of them were classified at level 0 on the INES Scale.

Meanwhile, in terms of occupational safety, the general frequency index with leave stands at 1,09 in 2020 compared to 1,83 in 2019.

PRODUCTION

With regard to production during the year, the Ascó I NPP reached a load factor of 88,26%, with a brief unscheduled outage (September 5) and the scheduled outage for the 27th refueling (April 28 to June 2). It was a refueling clearly marked by the COVID-19 pandemic and that forced the plant to review the protocols and reschedule activities in order to adapt them to the pandemic prevention measures to guarantee both the safety of the people and the facility. Among the main activities of the 27th refueling was the external remote visual inspection of the reactor vessel cover and the testing for the fuel handling system.

Regarding Ascó II, the plant reached an annual load factor of 84,65%, with an unscheduled outage (June 22) and a scheduled outage due to refueling (October 3 to November 17). Among the relevant activities carried out in this 26th refueling, it is worth mentioning the replacement of the safeguard isolation heat exchanger, the inspection of the vessel hot branch nozzles and the vessel bolts, and the replacement of the "B" reactor



coolant pump motor, as well as the replacement of the motors for various safety equipment, among others. Likewise, the containment spraying system was also tested.

OTHER SIGNIFICANT MILESTONES

The Ascó NPP submitted its operating license renewal application in March 2020 once all the documentation associated with the periodic safety review had been submitted.

OUTLOOK 2021

The Ascó NPP will face significant challenges in 2021, among which the 28th refueling of Unit I stands out, which is scheduled to begin on October 16. The plant will continue with the plan for loading spent fuel in the Individualized Temporary Storage (ITS) and expects to receive the communication on the renewal of its operating license in October. In the area of preparation for long-term operation, the Ascó NPP will receive the SALTO (Safety Aspects of Long Term Operation) mission from the International Atomic Energy Agency in July 2021. It will also receive the follow-up mission from the WA-NO Peer Review from September 2019.

Ascó will also face challenges related to its processes, including the transition to improved technical operating specifications (MERITS) and the implementation of actions derived from ANAV's Efficiency Plan and a specific plan for proactive obsolescence management.







RAFAEL MARTÍN OUTGOING DIRECTOR OF VANDELLÓS II NUCLEAR POWER PLANT

SAFETY

During 2020, the Vandellós II nuclear power plant reported a total of 4 reportable events to the Nuclear Safety Council (CSN), following the protocols established in Safety Instruction IS-10, all of them classified as level 0 on the INES scale.

Meanwhile, as far as occupational accidents with leave are con-



ANTONIO MARTINAVARRO DIRECTOR OF VANDELLÓS II NUCLEAR POWER PLANT

cerned, the overall frequency rate was 1,79% compared to 2,66% in 2020.

PRODUCTION

During 2020, the Vandellós II nuclear power plant maintained uninterrupted operation with a load factor of 96.78% and with no outages due to refueling, although on September 1 there was a disconnection from the network while maintaining the criticality of the reactor according to the IS-10 safety instruction to perform an action on the alternator cooling circuit.

OPERATIONAL EXPERIENCE

In 2020, ANAV faced the global challenge of combating the COVID-19 pandemic for which the necessary measures were taken to guarantee the safety of people and facilities, as well as its commitment to society to continue generating energy necessary for meeting the needs of the country, assuming its role of critical and essential service.

In this context, the Vandellós II NPP has carried out important activities such as the replacement process, in the second half of the year, for six of the racks that store spent fuel in the pool with more compact racks that optimize space. In this way, the plant has expanded the storage capacity in its fuel pool by 208 slots, which is equivalent to three operating cycles.

On the other hand, on October 2, the follow-up review of the action plan associated with the improvement areas identified during the review of the operation of the Vandellós II NPP carried out by WANO in 2018 was completed. The team of evaluators concluded that the actions undertaken by ANAV have made it possible to make significant

CONCEPT	Result
Gross energy production Everything we have generated	9.242 GWh
Load factor The energy produced with respect to what could have been produced	96,78 %
Operational factor Hours connected with respect to total hours for the period	99,64 %
Availability factor Deducting 100% all unavailability	98,33 %
Unscheduled unavailability factor What we have stopped producing due to outages or reductions attributable to the plant itself	1,51 %



progress in the areas of improvement identified.

OTHER SIGNIFICANT MILESTONES

On July 27, the Ministry for the Ecological Transition and the Demographic Challenge granted the operating license renewal for the Vandellós II nuclear power plant for a period of 10 years, until July 26, 2030.

CHALLENGES 2021

The year 2021 poses several important challenges for Vandellós II, among which it is worth mentioning the work in the area of preparation for long-term operation, as well as a new refueling, the twenty-fourth, which will begin on May 15.

Also noteworthy are challenges related to its processes, such as the monitoring of the action plan derived from the WANO Peer Review and the implementation of actions corresponding to the Reliability and Investments Plan, among which the implementation of proactive obsolescence management stands out.

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THIRD SESSION





Moderated by FRANCISCO TARÍN MEMBER OF THE SNE



FRANCISCO JAVIER VALLEJO

DIRECTOR OF THE TRILLO NUCLEAR POWER PLANT

OVERALL SUMMARY

The operating results related to production were good as the planned objectives were met.

Net production reached a value of 7,729.608 GWh, higher than the target set for the year despite the longer duration of the refueling due to the impact of COVID-19 on planning.

The plant was connected to the grid throughout the year except for the refueling period with a load factor of 90.86%.

The stop for refueling lasted 33.46 days, 1.5 days less than what was planned due to the effects of COVID-19.

The unscheduled unavailability was 0,21%.

There were no unscheduled outages this year and no reactor trips.

There was a reportable event during the year.

ANNUAL RESULTS Gross electricity production

Figure 1 shows the variations in electrical power during the year 2020 and their causes can be seen.

REPORTABLE EVENTS

The plant operated during the past year without significant safety incidents. The reportable event that occurred is described below.

ISN-T-20/001; 06/24/2020

Incident during the realization of a monitoring requirement by means of the PV-T-GI-9219 procedure for the calibration of the delta T increments in the DNB calculation circuit of the YZ reactor protection system.

Collective exposure

90% of the total collective dose was due to the recharge operations, with the total dose for the year 2020 of 256.48 msvxp.

The doses associated with the different activities carried out are kept at very low values in all cases. As an example, the maximum individual dose this year was 2.42 mSv.

Accident rate

The objective of zero accidents with leave was not achieved.

There was a total of 4 accidents, two of them with leave.



On May 2, 2020, there was a disturbance in the turbine control system (Teleperm) with a communications failure in the turbine ring.

Subsequently, there was an actuation of the limitation system due to neutronic noise that forced a reduction in power to 1020 MWe to reset the alarm for the limitation system.

Given the disturbance identified in the turbine control system, and in a conservative manner, the power remained at 1020 MWe until May 11, when the stretch-out prior to refueling began, starting the load reduction.

PROTECTION MEASURES AGAINST COVID-19 DEFINED IN THE SPECIFIC PREVENTION PLAN

- Protection measures against COVID-19 defined in the specific prevention plan
- Minimizing the presence at the plant and promoting teleworking. The amount of presence during refueling was 750 concurrent people in the Protected Area and 400 in operation.
- Control room bunkerization.
- Duplicating collective transportation for operating personnel.
- Completing tests after significant absences.
- Review of the entries to the plant. Sequencing of company entries.
- Automatic temperature monitoring. Disinfection equipment.
- Monitoring of changing rooms for access to the Controlled Area.
- Organization of work to avoid a confluence of workers at the plant.
- Establishment of shifts so that staff do not have to be at the plant in the morning and in the afternoon.
- Team of workers on standby in case it was necessary for them to join.

TYPE OF TEST	2020		2021	
	TESTS	POSITIVES	TESTS	POSITIVES
Antigen	1.284	6	1.676	8
Antibody	3.767	17	52	0

SISC

All the indicators are green, having identified 11 findings, also green, throughout 2020.

No findings greater than white were identified during 2020.

The emergency pillar that was blank during 2019, due to a finding in the emergency drill in 2018, was returned to green after all identified corrective actions were taken.

2020 REFUELING

The development of the thirty-second refueling was marked by the following critical path:

 Plant shutdown phase and periodic tests.

- Network work. 2/6
- Network work. 3/7
- Network work 1/5
- Vessel closure and start-up process

The following activities, among others, were carried out in parallel:

- Unloading and loading of the core.
- Inspection of the lower radial bearing and seals for a YD10 main pump.
- Inspection of seals and motor replacement for the main YD30 pump.
- Induced current inspection for 100% of the steam generator tubes.

- Cleaning and sanitation for an essential services pool,
- Etc.

Special emphasis during preparation was placed on the planning of the execution of the different design modifications within the windows of inoperability of the systems and/or redundancies.

Especially relevant were the organizational and planning measures for refueling derived from the state of the COVID-19 pandemic in such a way that teleworking was maximized for those activities that allowed it and there was extensive monitoring of personnel coming together at the plant so that 750 people would not be exceeded.

Entries to the plant were sequenced in such a way as to minimize contacts in the personnel changing rooms due to the volume of personnel.

MISCELLANEOUS

As a result of the pandemic, a high number of antigen and antibody tests were carried out before entering the plant for the execution of the various tasks, with a positivity rate of less than 0,5%.

SPENT FUEL

During 2020, two ENUN32P type spent fuel containers were loaded.

There are currently 32 containers of the DPT-21 type and 4 of the ENUN32P type in the ITS with a total of 800 fuel elements.

A total of 528 positions are occupied in the fuel pool compared to the capacity of 805 fuel elements.

CHALLENGES 2021

In addition to the activities indicated above, the following activities are considered a priority:

- Reducing the accident rate through the implementation of the A-ZERO program.
- Implementing the refueling reliability plan associated with the 33rd refueling.





RAFAEL CAMPOS DIRECTOR OF THE ALMARAZ NUCLEAR POWER PLANT

YEAR 2020 ACTIVITIES

The units of the Almaraz Nuclear Power Plant generated a total of 15,890.7 million kWh during 2020. Between both units, they accumulated at source a gross production of 561,527 million kWh. The Almaraz Nuclear Power Plant continues to provide electricity, for yet another year, accounting for more than 6% of national electricity consumption. By Unit, the main activities were the following:

UNIT I

The most noteworthy was the stop for the twenty-seventh refueling and maintenance, carried out from April 14 to June 21, with a duration of 67 days, much longer than usual due to the state of alarm decree associated with COVID-19, where up to 6 possible action scenarios were proposed to carry out the 27th recharge depending on its duration and the number of people to be hired, since both factors would contribute to the risk of contagion by coronavirus.

Regarding power reductions to be considered, only two were recorded, one in March to 65% at the request of the Delegated Central Generation Office, for flexible operation and another on August 21 also to 65% for, according to procedure, to proceed to the revision and repair of a venting pore for the FW-1-PP-01B line. On the other hand, on June 22, during the loading process after the completion of the refueling, there was an automatic shutdown of the reactor due to the electrical protection action in the R phase of the main transformer, after 4 days of outage for the inspection and repair of the anomaly, the unit was reconnected to the electrical network.

The gross electric power generation for U-I was 7,161.2 million kWh, with the accumulated production at source being 282,406.50 million kWh.

UNIT II

This Unit remained connected to the grid in a stable manner throughout the year, except in early March, April, and May, when, at the request of the Central Generation Office, load was lowered to 60, 68, and 70% respectively due to Flexible Operation.

It should be noted that this unit has accumulated five years without recording unscheduled unavailability, and more than 6 years without automatic shutdowns, but on June 27, 2020, there was an automatic shutdown signal for the reactor as a result of the unexpected opening of one of the switches for the automatic stop system. After 44 hours with the unit unconnected

for electrical inspection and the replacement of power supplies and boards, it was connected to the electrical network again. Gross electric power generation was 8,729.4 million kWh, accumulating at source 279,119.9 million kWh.

OTHER ACTIVITIES

- On July 24, the Ministerial Order was received with the Operating License renewal until November 1, 2027 for Unit-I and until October 31, 2028 for Unit-II.
- It should be noted that the year 2020 ended with the lowest collective dose record since the Almaraz Nuclear Power Plant came into operation. Likewise, during this year there were no work accidents with leave or without leave at the Power Plant, both for its own personnel and for personnel from collaborating companies.
- During this year 2020, a total of 3 containers of fuel elements were loaded in the ITS. On October 7, the fifth ENUN 32P container load-

ed with 32 spent fuel elements was transferred from the Unit II Fuel Building to the Individualized Temporary Storage.

TWENTY-SEVENTH REFUELING FOR UNIT I

As previously mentioned, this stop for the twenty-seventh refueling and maintenance took place between April 14 and June 21 in a pandemic environment due to COVID-19 with a series of uncertainties regarding the potential impact, which meant that up to six different scenarios would be considered for the execution of the scheduled work.

To a large extent, this was affected by the availability of the specialized personnel who usually participate in the execution of the activities and for this reason, it was necessary to adapt and re-plan them because, for safety reasons, it was necessary to have a smaller number of contracts to guarantee the protection of workers from possible coronavirus infections, reinforcing all prevention measures, distributing shift workers to reduce the number of people with simultaneous presence at the plant, limiting capacity in shared areas, bunkering the control room with access controls, performing rapid antibody detection tests for diagnoses, and sequencing the entry of companies by time and zone, installing temperature monitoring equipment by thermography at the entrances, installing various disinfection and personal hygiene equipment and maintaining the maximum limitation of 750 concurrent people in the protected area, providing them with the necessary protection equipment to carry out tasks safely (respiratory protection, face shield, etc.).

The most notable activities carried out during the refueling stop were the following:

- Unloading and loading of fuel elements from the reactor core, which was configured on the map by 64 new elements, 5 reused from previous to the last cycle, and the remaining 88 from the past cycle.
- Sludge cleaning and induced current inspection for 33% of the tubing for the three steam generators, with satisfactory results, with no need to plug any tubing.



2020 NUCLEAR POWER PLANTS

- Visual inspection of the welds for the hot and cold branches of the reactor vessel.
- Ultrasonic inspection for 50% of the threaded areas of the vessel.
- Review and inspection by laser profilometry for the thermal sleeves of the CRDMs.
- Ultrasonic inspection of the penetrations of the bottom of the vessel with the internal extracted.
- Induced current inspection for 33% of the tubing and visual inspection for the steam generator water boxes.
- Replacement of three pressure safety valves.
- Oil change for the main cooling pump motors 1 and 3 and revision of RCP-3 seals.
- Review of High-Pressure turbine stop and control valve actuators.
- Maintenance of the stop and interceptor valves for the Low-Pressure turbine.

• 32 design modifications were implemented.

REPORTABLE EVENTS

During 2020, the regulatory body (Nuclear Safety Council) was notified of 3 events within 24 hours for Unit-I and 2 events within 24 hours for Unit-II, all of them at level zero on the INES scale (with no significance for Safety).

INTERNATIONAL MISSIONS

On January 20, the Peer Review 2020 mission began at the Almaraz Nuclear Power Plant. For three weeks, a team of 25 nuclear experts and professionals from 9 different nationalities reviewed the processes and expectations of the Plant, exchanging experiences and knowledge in order to continue improving the safety and reliability of the facility.

Observations were previously made for refueling, simulation, as well as the review of the Plant Design.

As a result, 5 areas for improvement

(AFI) and 3 proposals for Strengths to share with the nuclear industry were identified: OCI Index, Refueling Management, Chemical Injection to extend the useful life of Steam Generators.

CHALLENGES 2020

During this year 2021, the main challenges that the Plant is going to undertake are to continue with the actions associated with the most outstanding Project for the facility: ZERO Accidents, the execution of Refueling 26 for Unit II during the month of March-April and for Unit 28 in November-December, the Reliability plan in refuelings, continuing with the loading of spent fuel containers in the ITS, and the implementation of DMs associated with the Operating License renewal.

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

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EDB250x250 2.500x2.500mm 2 x 150kN ± 125mm 800mm/s 6g 0 to 200Hz

CLOSING SESSION





JAVIER DIES BOARD MEMBER NUCLEAR SAFETY COUNCIL

Board member from the Nuclear Safety Council (CSN) and President of CEIDEN, Javier Dies, participated in the closing of the 32nd Conference "Nuclear power plants in 2020. Experiences and Perspectives," organized annually by the Spanish Nuclear Society (SNE). Board member Dies began by thanking the SNE for the invitation to address the attendees and to participate in the closing of the SNE annual meeting on operational experience, this time in a virtual session. He also stated that it would have been his wish to greet all attendees in person, but this pandemic situation did not allow it, so he sent an individual virtual greeting to each attendee.

Dies' presentation made it possible to review the most relevant milestones carried out by the CSN in 2020 related to the purpose of the conference, as well as the ongoing assessments and projects at the CSN.

Regarding the assessments carried out throughout 2020, he particularly highlighted the exhaustive assessment processes that have already been concluded on the operating license renewal applications for the Almaraz I and II (Cáceres) and Vandellós II nuclear power plants (Tarragona). These evaluation processes have made it possible to confirm that continuous safety assessment has been conducted during the operation of the nuclear power plants. Said studies have included the analvsis from proprietary and third-party operating experience, making it possible to verify that the nuclear power plants have the appropriate processes for the detection and assessment of the operating experience, including, among others, the study of incidents, events, and operational data related to safety, which, where appropriate, has materialized in necessary improvements in the operation and safety of the facility.

Likewise, the board member highlighted the favorable assessment for the operating license renewal for the Cofrentes nuclear power plant (Valencia) granted by the CSN General Session on February 17, 2021, once the evaluation process that it was subjected to was approved.

OPERATING LICENSE RENEWALS FOR THE ALMARAZ I AND II NPPS AND THE VANDELLÓS II NPP

Order TED/773/2020, from July 23, which grants the operating license renewal for the Almaraz Nuclear Power Plant, Units I and II



Order TED/774/2020, from July 23, which grants the operating license renewal for the Vandellós II Nuclear Power Plant





In his presentation, he also mentioned the licensing processes currently underway at the CSN, starting with the licensing process for the Cofrentes NPP's individualized temporary storage (ITS) and that given the exhaustion of storage capacity in the pools, it is urgent in order to ensure the continuity of operation. This process is very close to its conclusion. Likewise, and in parallel, the process for evaluating the design of the dual-purpose HI-STAR 150 container (storage and transport) that will house spent fuel with the characteristics specific to Cofrentes fuel. The licensing schedule associated with the project shows that its very near completion. As a result, the Cofrentes NPP will have expanded storage capacity in the ITS already operational once its fuel pool has reached its capacity limit.

As an ongoing evaluation process, express mention was made of the request for renewal of the Ascó I NPP and the Ascó II NPP. In line with this process, the schedule of pending activities was presented up until the conclusion of the process, with the deadline for granting the operating license renewal on October 2nd of this year.

As an important milestone, these two plants will begin their long-term operation on August 13, 2023 for the Ascó I NPP and October 23, 2025 for the Ascó II NPP, which entails a



Retortillo Site.

Concentrated uranium oxide.

specific study to address this life extension. To illustrate this process, the CSN has already issued twenty-six requests for information. As in any power plant, long-term operation requires the creation of an Integrated Aging and Assessment and Management Plan (PIEGE) as a basic document, which includes, among others, the activities for the life management plan with the review of operational experience having special relevance.

To date, the Ascó NPP has identified 63 strengths, 93 improvement proposals, and 109 actions grouped into 11 lines of action. This work has been carried out in parallel with the adoption of the NFPA standard on fire protection.

As an issue currently underway and equally relevant, mention was made of the activities for the presentation to the General Session of the evaluation studies that are being carried out by the technical areas of the CSN for the request for authorization to build the uranium concentrate manufacturing plant in Retortillo and a uranium mine.

- 2021-01-19 Earth Sciences Area
- 2021-02-10 Radiological Protection for Workers Area
- 2021-02-17 Systems Engineering Area
- 2021-03-03 Environmental Radiological Surveillance Area

Finally, the board member conveyed to the attendees information about the next call for 25 positions in the CSN Upper Management of the Nuclear Safety and Radiological Protection Technical Division, as well as 5 positions for state computer scientists reserved for the CSN. The information on the call will appear on the CSN website in the coming weeks, which will be similar to that of previous years. Information on calls from previous years can also be viewed on the CSN website to serve as a reference. Competition for the state IT vacancies is not managed by the CSN, but rather the total number of IT vacancies in the state (about 200) from the public job offer are summoned together.

This year 2021 continues to be a year of uncertainty and with significant challenges ahead, that is why it is very important that we remain united and strong as a society defending the important role of nuclear energy

> that, despite the pandemic, we have not missed the opportunity to learn about and analyze the operation of nuclear power plants in Spain directly from their directors and to see each other, even virtually, to bring up lessons and experiences learned.

> For yet another year, the excellent performance of our nuclear power plants and the very high level of professionals who make it possible have been confirmed. But this year, it was not just any year, as COVID-19 has made the value of the Spanish nuclear park clear as a guarantor of the electricity supply for our country in the face of any crisis.

> All the Spanish plants have maintained their activity and adapted their refueling schedules, demonstrating resilience and agility in adopting exemplary prevention measures. Even anticipating and exceeding the government's recommendations, all to protect our greatest value, the people, and to thus continue to serve society.

> This year 2021 continues to be a year of uncertainty and with significant challenges ahead, that is why it is very important that we remain united and strong as a society defending the important role of nuclear energy.

> The second part of the 2021 Operational Experiences Session, on June 29, will be an excellent opportunity to continue with our communication and dissemination efforts to highlight the value of our industry.

> If the pandemic allows it, we will meet in person and we will be able to enjoy the traditional special part of this Session and the presentation of some well-deserved awards.

Thank you very much for your attention and see you soon.



HÉCTOR DOMINGUIS VICE-PRESIDENT OF THE SPANISH NUCLEAR SOCIETY*

Thank you very much to all the Plant Directors and Managers for sharing the relevant experiences and milestones in the operation of their plants during 2020 with us in such a clear and transparent way.

We will now proceed with the closing of the Operational Experiences session. For this, we have the presence of Javier Dies, CSN board member, whom I would like to thank on behalf of the entire SNE for his presence at our meeting for yet another year and for his participation in this closing event.

Thank you very much Javier, the Session that we have experienced and enjoyed online constitutes one of the most important annual events for our sector and for the SNE.

Undoubtedly the Programs Commission has achieved, with great effort,

^{*}At the time the first part of the Operational Experience Day took place, I was still vice-president of the SNE.



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. M^a 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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SESIÓN ESPECIAL



The second part of the SNE annual Session on the experiences and perspectives of Spanish nuclear power plants in 2020 was held in person at the Higher Technical School of Industrial Engineers (ETSII) of the Polytechnic University of Madrid on June 29, 2021, and was broadcast live online for all those interested in the event.

The Spanish Nuclear Society prepared a special session on "The Challenge of Decarbonization in the Post-COVID-19 Economy" presented by Fernando Fernández Méndez de Andés, doctor of Economic Sciences and professor of Economics and Finance at the IE Business School. In addition, the opening session was attended by Ignacio Araluce, President of Foro Nuclear, and Héctor Dominguis, current President of the SNE, who moderated the session.



HÉCTOR DOMINGUIS PRESIDENT OF THE SPANISH NUCLEAR SOCIETY

elcome to this very special event, not only because it is the first time that we have divided the Operational Experiences Day into two parts, but because it is also our first face-to-face meeting after more than two years, and that is undoubtedly a milestone since it allows us to come back to the warmth and human character of our meetings.

For this reason, on my own behalf and on behalf of the Board of Directors of the Spanish Nuclear Society, I would like to thank all the people who have ensured that all the necessary measures were taken to make it possible for us to be here today. Especially to the members of our Programs Committee and, of course, to all of you who are accompanying us today, in person or via streaming.

I also want to acknowledge the presence of our guests **Ignacio Araluce** Letamendia, President of Foro Nuclear, and **Fernando Fernandez Méndez de Andés**, special guest for the session.

But, before giving the floor to our guests, I think it is necessary to summarize the situation in which we find ourselves.

The Spanish energy market is going through turbulent times; on the one hand, with the entry into force of the new tariff regime and, on the other, with the draft bill that will reduce the remuneration of certain technologies, mainly nuclear and hydraulic.

This law is yet another blow to a nuclear park that has been economically suffocated to unsustainable limits.

And it seems incredible that such a frivolous and vehement game is being played with an essential service such as the electricity supply and with an essential industry for the Spanish electricity system.

And we must highlight ESSENTIAL with capital letters, because, although we all have it very internalized, we must not stop repeating that the nuclear industry:

- Is the leading source of electricity generation in the country and the industry that prevents the most CO₂ into the atmosphere.
- Provides reliable energy and contributes to the stability of the electricity system.
- Can operate in conditions where other sources are not able to produce.
- Boosts the economy, generating more than 28000 qualified jobs, with a contribution of more than €2,7 billion to the GDP.
- And that, being honest and realistic, there is no viable technological alternative at present.

It is in our power to defend nuclear science and technology by demonstrating the capabilities and value of the Spanish nuclear park with facts and with excellent results, such as those from 2020

• It is unavoidable to mention the progressive start-up of power plants in Japan, the recent approvals of 80-year operation in the United States, and the ambitious program to extend the life of the French nuclear park.

The boom in private investment in new nuclear technologies, with projects supported by Warren Buffet, Bill Gates, and Jeff Bezos, among others, makes it clear that nuclear technology is not only essential as a current source of energy, but also as part of the energy mix for the future.

And all this is more than obvious, not only for us as nuclear professionals, but also for the International Energy Agency, as has been made clear in its recent report on the energy sector in Spain.

A report that highlights the excellent performance of the Spanish NPPs with availability factors around 90% and in which they recommend that Spain make more effective use of nuclear infrastructure to meet decarbonization targets by 2050.

And it is that, with such clear data, which demonstrates the important role we play for the decarbonization and competitiveness of our country, it is difficult to understand the motivations that lead our government to adopt counterproductive measures for the economy and the environment.

For this reason, from the Spanish Nuclear Society, as the voice of professionals in the sector, we defend nuclear energy as a resource for the future, as a source of economic wealth, social well-being, and technological development, and we join in the appeal for reasonable remuneration to guarantee the sustainability our sector and at the same time, that of the environment.

I share with you the statements made just two weeks ago by the United States Secretary of Energy, Jennifer Granholm.

"President Biden is absolutely committed to making this country run on clean energy, using every clean energy tool available." "Those are big goals, so let me say it loud and clear: carbon-free nuclear power is an absolutely critical part of our equation for decarbonization."

It is a shame that among all the issues that were discussed in the fleeting bilateral summit between Biden and Sanchez that the energy agenda did not come up since it would have helped our government to see the role of nuclear energy in decarbonization with the same clarity and forcefulness.



It is in our power to defend nuclear science and technology by demonstrating the capabilities and value of the Spanish nuclear park with facts and with excellent results, such as those from 2020.

Today's session has been a big step towards returning to normalcy. And that has been possible thanks to you and thanks to the commissions, the soul of the SNE, whose constant and not always visible work is fundamental.

Progress in the vaccination process and the prospects for the coming months have allowed us to take another little step and, as you know, we are moving back to the face-to-face format for holding the next SNE Annual Meeting, in the city of Granada, with ENDESA as the host company.

The Organizing Committee, with the support of the Board of Directors, is working intensely, prioritizing the safety and health of all at all times so that we can get back to those spaces and those meetings that we have missed so much. So, I hope to see you all in Granada!



IGNACIO ARALUCE PRESIDENT OF THE SPANISH NUCLEAR INDUSTRY FORUM

would like to begin my speech by thanking the Spanish Nuclear Society for inviting me to participate again in this "Nuclear Power Plants in 2020: Experiences and Perspectives" session.

In 2020, and in the same way that has occurred throughout the last

It is essential that the disproportionate, discriminatory, and confiscatory tax burden currently imposed on nuclear energy in Spain be reviewed

decade, the Spanish nuclear park, made up of seven reactors at five sites, has been essential in electricity generation with more than 22% of the electricity produced, in preventing polluting emissions (more than 20 million tons of CO_2), producing more than a third of the clean electricity, and in regulating and balancing the electricity system with performance indicators around 90%, above those of the world average.

And all this, despite the exceptional circumstances that occurred due to the COVID-19 pandemic, thanks to the **extraordinary work of the owner companies**, the **unconditional support of the companies** that make up the entire Spanish nuclear industry, and the **commitment and professionalism of all the workers**. I would like to point out that throughout the year, the Ministry for Ecological Transition (MITECO) granted the operating license renewal for the two units of the Almaraz plant and the Vandellós II plant, and licenses were requested for the Cofrentes plant (granted in March 2021) and for the two units for the Ascó plant (pending to be granted).

However, and in spite of these excellent results, I would like to continue to point out the **excessive tax burden experienced by Spanish nuclear power plants** that increased throughout the 2020 financial year and which amounts to a total of close to €22/MWh produced, and which meant that last year more than 60% of the income from the sale of electricity in the wholesale market had to be dedicated to the payment of taxes and fees (state,



Source: Foro Nuclear with REE dates

Nuclear Energy in Spain in 2020

regional, and local, in some cases redundant) that are levied on the generation unit nuclear power plant regardless of the wholesale market price and the income and eventual benefits obtained from its sale.

This has led the park as a whole to have losses of more than 1 billion euros and a negative operating cash flow of close to .5 billion euros. This situation is unsustainable and, if it continues in the coming years, will lead to its economic-financial bankruptcy.

As if this were not enough, on June 1, 2021, MITECO announced a draft bill that seeks to limit the supposed and misnamed "benefits fallen from the sky" that, as the draft bill stands, mentions an alleged over-remuneration to nuclear power plants and other facilities that were put into service before 2005. If this preliminary draft were to come into force in the announced terms, the taxation of the power plants would increase to €35/ MWh, which, as along with the estimated decreasing future prices for the next decade of about €40/MWh in 2030 would make the continuity of the operation of our seven nuclear reactors completely unviable, leading them to cease their activity.

All of this would call into question, and would make compliance practically impossible, for the Integrated National Energy and Climate Plan 2021-2030 (INECP) for the Government of Spain, a basic pillar for the energy transition in Spain and the decarbonization of our economy which includes the operation of the entire Spanish nuclear park until 2027 and its progressive shutdown by 2035.

Therefore, it is essential that the disproportionate, discriminatory, and confiscatory tax burden currently imposed on nuclear energy in Spain be reviewed and for the new regulations announced to be reconsidered.

From the nuclear industry, we believe that there are mechanisms that can resolve this situation. This requires dialogue, and we trust that common sense will be used to reach the necessary consensus that enables continuity over time, as agreed, for the operation of the Spanish nuclear power plants, essential in the electricity system of our country.

THE ECONOMIC CHALLENGES OF A POST-COVID-19 WORLD: THE ENERGY TRANSITION



FERNANDO FERNÁNDEZ MÉNDEZ DE ANDÉS IE BUSINESS SCHOOL

n my presentation, I have tried to briefly describe the major structural trends in the economy to then study the economic consequences of COVID-19, the perfect storm, and point out the fundamental lines of reconstruction after the pandemic. Only in this context is it possible to understand the energy transition as a European strateay. a political commitment to which Spain has committed itself with conviction, but without a serious analysis of its economic and social consequences, its fiscal cost, and the need for structural transformation of the productive system that it implies.

There are six major underlying trends of the global economy described:

questioned but unstoppable globalization, multidimensional demographic change (aging of the population, urbanization, migrations, and labor feminization), the digital revolution that questions the future of employment and existing social protection systems, the delocalization of employment and the emergence of teleworking, growing inequality within countries while improving the alobal distribution of income leading to the sometimes virulent emergence of the issue of redistribution, and a deep energy transition as a fundamental element to contain climate change. The consequence of all these changes is great social uncertainty and the emergence of populism in politics in too many cases filled with identity-based claims.

COVID-19 has been the biggest economic crisis in peacetime, which has fallen on an economy that was just recovering from the financial crisis. A crisis with very asymmetrical consequences for countries and social groups. A perfect storm that combined a supply shock due to a supply problem with a demand shock due to fear and the confinement of the population which now threatens to create problems in the financial system. The good news is that this time the economic policy responses have lived up to the demands, even being excessive for some. A response that we can define as an open bar: a coordinated international monetary and fiscal expansion of an unprecedented magnitude. And that in Europe it has caused progress that seemed unthinkable towards fiscal union with the Recovery and Resilience Plan, although it remains to be seen if it will become the necessary fiscal stabilization tool in the Eurozone.

Europe has decided to use the pandemic to accelerate the energy transition. But let us remember some basic facts: keeping global warming below 2° means reducing CO₂ and GHG emissions between 25% and 50%, and to achieve this, the global price of coal should be around US\$75 tn in 2030 when today it is US\$3

The Spanish strategy for the energy transition is populist and is excessively permeable to the electoral needs of the government

tn. Much remains to be done. The European decarbonization strategy is made up of many instruments: a fiscal policy based on Pigouvian taxes and subsidies and a market for emission rights, carbon adjustments at the border (Carbon Adjustment Tariffs), and an international coal price cap (in line with the minimum corporate tax rate). A complex and not risk-free strategy that promises to be complemented by an active monetary policy in decarbonization and which has social pressure from investors through the introduction of ESG criteria in business management.

But in economics, nothing is free, and neither is the energy transition, despite what many want us to think. It involves a significant change in the relative prices of many goods and services, an increase in produc-



Green Deal: Europe to achieve carbon neutrality by 2050 With an intermediate target of 55% reduction in GHG emissions by 2030







tion costs, and a significant transfer of resources between sectors, creating new profit opportunities and displacing production and employment. Its effects on inflation are already beginning to be felt, and they can only increase as the price of emission rights rises to achieve their reduction. The energy intensity of GDP and employment is very different by country and energy expenditure is very unequal by social strata, which will cause important redistributive effects between countries and between different social groups. The implications by sector are also very important, which will require changes in the economic model and adjustments in the productive fabric of each country. As in all technological change, and this one is, there will be winners and losers, and the success of the transition depends on the adequate distribution of costs and subsidies, on good planning for the aid to those who bear the greatest burden, and on guaranteeing the sustainability of public accounts and maintaining the competitiveness of the economy.

Spain is finally discovering that you cannot make an omelet without cracking eggs. The Spanish strategy for the energy transition is populist and is excessively permeable to the electoral needs of the government. Its regulatory volatility only creates confusion in a sector that needs stability because investments only pay off in the long term. Energy taxation lacks a global approach when it would require a broad technical and political agreement that guarantees its maintenance beyond the electoral cycle. Talking about a climate emeraency is a strategic mistake because, in an emergency, anything goes. And nothing is falser in the energy transition. Its success is a matter of rhythm, of adapting the changes to the possibilities of the productive fabric and the fiscal capacity of the Spanish economy. Fundamentalists abound and there is a lack of transparency and serious, rigorous calculations. There is too much ideology and there is not enough economics. 🟊

2020 SNE AWARDS

At the end of the Operational Experiences Session, the 2020 SNE Awards were presented, which on this occasion included:

- the SNE DIPLOMA to Francisco Sánchez Álvarez
- the SNE DIPLOMA to José García Laruelo
- NUCLEAR ESPAÑA AWARD FOR THE BEST TECHNICAL ARTICLE

"The Future of Low-Power Mobile Nuclear Units (The Example of the 'Akademik Lomonosov' Floating Nuclear Unit)" to Vitaly Trutnev.

NUCLEAR ESPAÑA AWARD FOR THE BEST INFORMATIONAL ARTICLE
 "A Love of High Activity, Pierre and Marie Curie" to Gonzalo Jiménez
 Varas

• BEST DOCTORAL THESIS 2020

"Multimodal Human-Robot Interface for Heterogeneous Robotic Systems Control in Harsh Environments" Giacomo Lunghi.

BEST 2020 VIRTUAL MEETING PRESENTATIONS in the areas of:

- QUALITY, REGULATIONS, ORGANIZATION, AND HUMAN FACTORS "Checklists, Public Health, and Engineering Processes at ANAV" by Ferran Tarrasa Blanes.
- FUEL

"Structural Integrity of Nuclear Fuel Cladding with Radial Hydrides" by Jesús Ruiz-Hervías, Miguel Cristóbal Beneyto, and Daniel Pérez Gallego.

- DECOMMISSIONING

"Mitigating Risks in Nuclear Reactor Decommissioning" by Stephanie Laurier.

- DESIGN AND BEHAVIOR OF SSC
 "Modernization of the Auxiliary Transformer Fleet of the Ascó NPP" by Jorge Montero Lansac.
- WASTE MANAGEMENT

"Construction of the Cofrentes NPP. Management of the Pandemic" Fernando Turrión López and Jesús Hernando Pérez.

- ENGINEERING AND INNOVATION

"Thermohydraulic Analysis of an Isolation Condenser Self-Regulated by Non-Condensable Gases (SIRIO FACILITY)" Elena Redondo Valero, Elena de la Fuente García, César Queral, Gonzalo Jiménez, and Pierdomenico Lorusso.

- MAINTENANCE

"Electric Arc Study (ARC FLASH) in Nuclear Power Plants" Juan Rafael Cabello García

- RADIOLOGICAL PROTECTION

"Evolution of Radon Transfer from Water to Air on a Pilot Scale" Aina Noverques, Belén Juste, María Sancho, and Gumersindo Verdú.

- NUMERIC CODE + 3D SIMULATION

"Polynomial Chaos Expansion for Uncertainty Propagation in Advanced Nuclear Fuel Cycles" Francisco Álvarez-Velarde and A.V. Skarbel.

- FUSION

"Dynamic Analysis of a Supercritical CO_2 Power Conversion System for Demo Using Modeling".

Lluís Batet, Simone Ferrero, José Ignacio Linares, Eva Arenas, Alexis Cantizano, and Laura Savoldi

- THERMOHYDRAULICS AND NEUTRONICS
 "Use of Neural Networks to Predict the Critical Heat Flow in a Reactor" Javier Riverola Gurruchaga.
- POSTER

"Modeling of a Test Environment for the Study and Simulation of Failure Monitoring in Tritium Processes"

Eduardo Iraola, José María Nougués, Lluís Batet, and Luis Sedano.





FRANCISCO SÁNCHEZ ÁLVAREZ





JAVIER RIVEROLA GURRUCHAGA



JESÚS RUIZ-HERVÍAS





ELENA REDONDO VALERO



JUAN RAFAEL CABELLO GARCÍA



FERNANDO TURRIÓN LÓPEZ



FRANCISCO ÁLVAREZ VELARDE & A. V. SKARBEL

EUROPEAN NUCLEAR YOUNG GENERATION FORUM

The European Nuclear Young Generation Forum (ENYGF) is seen as the main opportunity for young people to be heard globally. It provides an international platform for knowledge transfer, discussion, and sharing best practices. The Spanish Young Generation Network will host the 2021 event in cooperation with the IAEA. It will take place in Tarragona, a Mediterranean city full of history, in a new hybrid format. Our motto is Look ahead.

We know that the success of ENYGF depends on the technical and cultural tours included in the program, an opportunity to learn while getting to know and exchange opinions with new colleagues.

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The most inmportant event for nuclear young generation

#LookAhead







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- Decontamination and Dismantling
- Cybersecurity



Almaraz Nuclear Power Plant (Spain).



ITER (France).



Angra Nuclear Power Plant (Brazil).



Trillo Nuclear Power Plant (Spain).



Cofrentes Nuclear Power Plant (Spain).



Temelín Nuclear Power Plant (Czech Republic).