Conexão Nuclear

Vol. No. **06**
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Nuclear energy in the sustainable taxonomy

A new phase for financing and regulation in the energy sector

COP30

Nuclear energy secured a prominent place on the climate agenda

Hackapower 2025

Learn more details about the winning projects

ABDAN at the World Nuclear Exhibition (WNE)

The Brazilian mission reinforced the country's positioning on the global clean energy and decarbonization agenda

Interview with Miguel Fernández

Youngest president in the history of CREA-RJ highlights the importance of the nuclear energy mix

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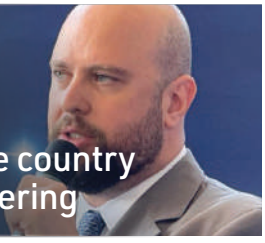


CHARTING THE PATH OF THE ENERGY OF THE FUTURE

Writing this editorial means revisiting every step we have taken in recent months and recognizing that we are living through a decisive period for the Brazilian nuclear sector. The pieces of this great mosaic — public policies, regulatory advances, institutional coordination, innovation, and professional qualification — are beginning to come together with clarity. I invite you, the reader, to walk this path with me in this edition of Conexão Nuclear.

We begin with a historic milestone: the definitive inclusion of nuclear energy in the Sustainable Taxonomy, now backed by law. This recognition is not merely symbolic. It establishes legal certainty, broadens the investment horizon, and positions nuclear energy as an indispensable component of the energy transition. This is the foundation upon which many of the transformations presented here are built.

On the international stage, we have consolidated our leadership. COP30, hosted in Brazil, reinforced the urgency of firm, low-emission energy sources if climate goals are to be truly achieved. ABDAN was present there, in strategic forums, delivering the message that Brazil has the capacity and the responsibility to lead a solid and sustainable energy agenda.

This movement connects with the ABDAN Mission at WNE in Paris, where we were received with respect and interest. Each meeting, panel, and new partnership reaffirms something the world is already beginning to recognize: Brazil has awakened to its nuclear potential — and has much to offer.

In this edition, we also highlight the inspiring interview with Miguel Fernández, the youngest president in the history of CREA-RJ. His modern vision of engineering and innovation shows that a new generation is already prepared to assume strategic roles in building the country's energy future.

The spirit of renewal is also present in the HackaPower papers, which you will find summarized in this edition. Seeing young talents propose creative and technically robust solutions only confirms that we are training the professionals who will lead the sector in the coming decades.

And looking ahead, we are enthusiastically building the Nuclear Summit 2026, an event that will consolidate Brazil on the global map of nuclear energy. We are preparing a meeting that will reflect the strength, maturity, and international projection achieved by the sector.

Finally, we reaffirm our commitment to excellence through the 2026 courses — among them the prestigious ASME course. Solid and continuous training is the foundation of everything: safety, innovation, and trust.

By weaving together each of these themes, I see a very clear scenario. The Brazilian nuclear sector is not merely following global trends. It is helping to shape them. With planning, dialogue, and maturity, we are building a firm path — the path of the energy of the future. ▪

Enjoy your reading!
Celso Cunha President of ABDAN

THE GREATEST OBSTACLE TO NUCLEAR ENERGY IS NOT THE LICENSE. IT IS PERMISSION

BY JEFFREY DONOVAN

On a stretch of Poland's Baltic coast, not far from white dunes and pine forests, a harvest festival takes place in the village. Stalls sell sausages and honey. Folk singers in embroidered costumes sway in the breeze. Children chase one another among the trees.

Then something less bucolic enters the scene: scientists in white lab coats explaining radiation on one side; protesters shouting "No to atoms in the Baltic" on the other. This is Choczewo, the planned site of Poland's first nuclear reactors. For Warsaw, the project promises energy security and cleaner air. For local residents, it concerns their beaches, forests, and homes. This gap between national ambition and local experience is where Europe's energy future will be decided.

WHY THE GREATEST OBSTACLE TO NUCLEAR ENERGY TODAY IS NOT A LICENSE. IT IS PERMISSION

Across Europe, something long dismissed as politically impossible is happening: nuclear energy is coming back. This is not the "renaissance" driven by early-2000s enthusiasm, but a steadier resurgence, born of climate pressure and the shock of war. When Russia invaded Ukraine, Europe discovered its energy vulnerability. The case for firm, domestic, low-carbon energy strengthened almost overnight.

Policy shifts have been dramatic. Sweden has abandoned its phase-out stance and plans to build up to ten new reactors. Belgium has reversed its own policy. Bulgaria has revived a project that had been shelved. France is recommitting to new reactors. The United Kingdom is moving forward with Hinkley Point C and Sizewell C, while also paving the way for small modular reactors.

Finland has finally delivered its long-delayed Olkiluoto-3 and is pioneering the world's first deep geological repository at Onkalo — a project that IAEA Director General Rafael Mariano Grossi calls a "game changer." To the east, the Czech Republic, Hungary, Romania, and Slovakia are planning expansions or lifetime extensions, often with advanced designs in mind. Newcomers such as Poland and Estonia are moving quickly to build their first reactors.

And zooming out, the trend is unmistakably global. More than 30 nations have joined a pledge to triple nuclear energy by 2050. The World Bank has ended decades of silence by entering into a partnership with the IAEA (International Atomic Energy Agency). In Latin America, Brazil is preparing to restart construction of Angra 3 and has launched plans for a fleet of small modular reactors to support remote regions and industrial centers — part of a broader regional recovery that includes renewed interest in Argentina and even early-stage studies in Chile.

FOR THE FIFTH CONSECUTIVE YEAR, THE IAEA HAS RAISED ITS GLOBAL NUCLEAR FORECAST

Yet the hardest challenge is not engineering, or even finance. It is legitimacy. Social license — the tacit permission communities grant when they see a project as safe, fair, and beneficial — has become the true gatekeeper of major infrastructure. Europe has learned this the hard way. In the 1980s, villages were demolished for the construction of the Żarnowiec plant in Poland, which was abandoned after the Chernobyl accident, leaving scars that still shape attitudes. In Slovakia, communities displaced for the Mochovce plant remain resentful decades later. In Wyoming, a microreactor project lost support almost instantly after residents learned that used fuel would be stored on site.

But there are counterexamples. Finland's repository earned consent through trust and tangible regional benefits. Canada spent 15 years in dialogue with Indigenous and local communities and secured broad support for a deep repository.

THE PATTERN IS CONSISTENT: IMPOSED PROJECTS FAIL; CO-CREATED PROJECTS SUCCEED

And this is no longer only a nuclear story. Consider data centers — the "AI factories" of the digital economy. In Frankfurt, they consume more electricity than all the city's households combined. In Georgia, residents revolted against a proposed US$17 billion AI campus due to wa-

ter use, land disruption, and negligible local gains. The question was blunt: why should we bear the burden for someone else's profit?

Nuclear plants and data centers may soon become intertwined — the latter hungry for 24/7 clean power, the former seeking stable industrial customers. Both face the same demand: show us the benefits.

Here is the twist: the very AI systems driving rising electricity demand can also strengthen social license. Used correctly, AI can analyze thousands of community comments, track sentiment in real time, flag misinformation early, and tailor engagement to different groups. It cannot replace human listening, but it can make it sharper — and more honest.

Still, no digital tool can substitute for fundamentals. From Choczewo to Onkalo, from Canada to the Czech Republic, the five pillars of social license appear again and again:

- **Equity**: communities must see real benefits — jobs, schools, better infrastructure — not just national climate goals;
- **Trust**: earned through competence and transparency, not slogans;
- **Accountability**: clarity about who is responsible — now and decades from now;
- **Participation**: the old "decide, announce, defend" model is dead. People expect a real voice in the project;
- **Transition**: plants last generations; communities want assurance that decommissioning and retraining are planned from day one.

Neglect any one of these, and even the most elegant engineering will falter.

Which brings us back to that harvest festival on the Baltic: protesters on one side, scientists on the other, and families in between who would rather think about mushrooms than megawatts. It is here — not in press releases issued in Brussels — that Europe's nuclear revival will be decided.

If Europe can offer not only reactors but also trust; not only low-carbon energy but also shared prosperity; not only engineering but also genuine partnership, then it can build something greater than a fleet of new plants. It can build a new social contract between technology and society — one that countries like Brazil and Bangladesh may one day study as a model.

Nuclear energy is back. Its staying power will depend on earning its place — one village, one conversation at a time. ▪

Jeffrey Donovan is President and Co-founder of GLOW Strategies, a consultancy specializing in communications, capital activation, and social license for nuclear energy and other high-risk industries, including data centers and mining. A former international journalist, in December he completed an 11-year career at the International Atomic Energy Agency, where he led nuclear energy communications, outreach, and stakeholder engagement.

NUCLEAR ENERGY'S TURN IN THE SUSTAINABLE TAXONOMY

THE PUBLICATION OF THE DECREE AND THE TECHNICAL BOOKLETS INAUGURATES A NEW PHASE FOR THE FINANCING AND REGULATION OF SUSTAINABILITY IN THE ENERGY SECTOR.

In early November 2025, the federal government published Decree No. 12,705/2025, which establishes the Brazilian Sustainable Taxonomy (TSB) as an integral part of the Ecological Transformation Plan. The regulation represents a legal and institutional milestone for the country's sustainable finance agenda, creating a technical classification system to define what can be considered "sustainable" in Brazil. At the same time, the government published the first TSB technical "booklets" — documents that detail sectoral and environmental criteria for various economic activities.

WHAT IS THE BRAZILIAN SUSTAINABLE TAXONOMY

In simple terms, the Brazilian Sustainable Taxonomy is a "sustainability dictionary" for the market and for public policy. Through it, an economic activity, a financial asset, or an investment project may be classified as sustainable if it meets three main criteria: (i) it contributes substantially to one or more climate, environmental, or socioeconomic objectives; (ii) it does not cause significant harm to the other objectives ("do no significant harm"); and (iii) it complies with minimum safeguards for the environment, social rights, gender, race, among others.

Decree No. 12,705/2025 formalizes the TSB as an instrument of the Ecological Transformation Plan. It defines the structuring principles — such as scientific grounding, just transition, international interoperability, coherence with public policies, and proportionality — and establishes the Interinstitutional Committee of the Brazilian Sustainable Taxonomy (CITSB) as the body responsible for approving, reviewing, and updating the taxonomy, with a minimum interval of one year and a maximum of five years between revisions.

The TSB technical booklets — already made available for consultation — detail methodologies, technical criteria, indicators, sectoral thresholds, as well as monitoring, reporting, and verification (MRV) measures. For example, in the Electricity and Gas sector booklet (CNAE D), there is a list of eligible activities ranging from electricity generation from hydropower, wind, and solar sources to generation from nuclear sources, transmission, distribution, grid digitalization, and energy storage.

WHY DOES THIS MATTER FOR THE NUCLEAR SECTOR?

Although the taxonomy's focus is broad and spans multiple sectors, there are direct implications for the nuclear sector. The Electricity and Gas booklet (CNAE D) explicitly states that "electricity generation from nuclear sources" (activity D6) is qualified as making a substantial contribution to the objective of climate change mitigation, provided that criteria such as radioactive waste management, availability of a final repository, and others are met.

This means that nuclear power plants, next-generation facilities, or sector expansions that meet the described technical requirements may, under the TSB label, benefit from classification as a "sustainable" activity. In practical terms, this opens the way for the nuclear sector to be viewed as part of the "low-carbon economy" and to access financing lines, tax incentives, or support policies that may be linked to the TSB.

CHALLENGES AND CAUTIONS

Even with this promising scenario, some points deserve attention:

- For nuclear companies that are not yet prepared to provide sustainability reports, MRV metrics, and technical compliance, the challenge of adaptation will be real.
- Despite the inclusion of nuclear generation as an eligible activity, this does not mean that all nuclear projects automatically qualify: they must meet the technical, operational, and governance criteria described in the booklet.

FOR THE NUCLEAR SECTOR, IT REPRESENTS A STRATEGIC OPPORTUNITY TO POSITION ITSELF AS PART OF THE LOW-CARBON ENERGY MIX WITH SOLID TECHNICAL AND REGULATORY BACKING

EXPECTED IMPACTS AND OUTLOOK FOR THE SECTOR

1. **Transparency and capital attraction**: With the taxonomy in force, companies in the sector — including nuclear — will have a technical standard to demonstrate their sustainability. This increases predictability for investors, reduces the risk of "greenwashing" (misleading labeling), and may attract private and international capital to nuclear projects aligned with TSB criteria.
2. **Incentives and future regulation**: The decree provides that the TSB may guide the granting of tax and credit incentives, sustainable public procurement, labeling of financial products, and monitoring of capital flows. In the nuclear sector, this may mean that new projects meeting TSB criteria become more competitive in financing or that the government prioritizes public support policies for them.
3. **Portfolio adjustment and corporate strategy**: Nuclear operators or sector suppliers may need to assess in advance whether their assets or expansion plans meet the TSB's technical criteria — for example, regarding waste, decommissioning, safety, water use, environmental impact, etc. Companies that move early will gain a competitive advantage.
4. **Transition and justification of existing nuclear assets**: For existing nuclear plants, there may be pressure to demonstrate compliance with the criteria (such as decommissioning funds, waste management systems, etc.) in order to remain eligible as "sustainable."
5. **Fostering innovation and new nuclear technologies**: The inclusion of nuclear generation in the taxonomy points to an institutional recognition that it can be part of Brazil's low-carbon transition. This may stimulate greater attention to the next generation of plants (small modular reactors, new technologies), especially if aligned with criteria on safety, waste, efficiency, and environmental impact.

WHERE TO LOOK

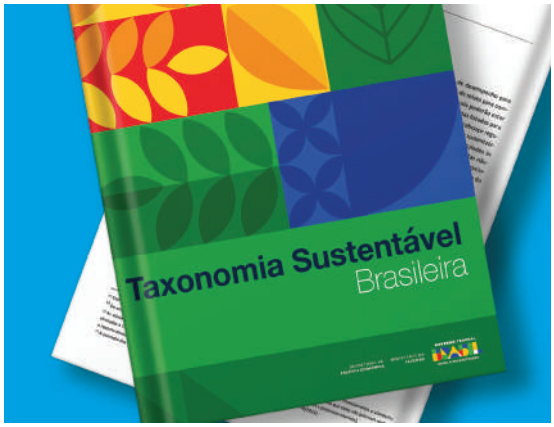
For the nuclear sector, the most relevant outlook over the next two to five years includes:

- Nuclear companies or component suppliers may position themselves as "suppliers of TSB-eligible activities" and create a competitive advantage.
- Integration between the TSB and international or bilateral financing may attract external resources to nuclear or sustainable nuclear infrastructure projects in Brazil.
- Monitoring the revision of the TSB (every 1 to 5 years) will be essential: technical criteria may become more stringent, requiring a long-term strategy for the nuclear sector.

The publication of Decree No. 12,705/2025 and the Brazilian Sustainable Taxonomy booklets marks a significant advance in the governance of green finance and sustainability in Brazil. For the nuclear sector, it represents a strategic opportunity to position itself as part of the low-carbon energy mix with solid technical and regulatory backing, but it also imposes challenges of compliance, investment, and reporting. In a global environment in which the credibility of "green" investments is increasingly demanded, the TSB offers Brazil — and its nuclear sector — a platform to integrate technology, capital, governance, and sustainability in an integrated manner. ▪

SUSTAINABILITY CRITERIA

ABDAN



ABDAN: POLITICAL LEADERSHIP AND A NEW ERA FOR NUCLEAR ENERGY

THE ASSOCIATION MODERNIZED ITS INSTITUTIONAL PRESENCE, EXPANDED THE DISSEMINATION OF TECHNICAL CONTENT, AND BEGAN TO DIALOGUE WITH SOCIETY IN A CLEARER AND MORE ACCESSIBLE WAY

In recent years, ABDAN has intensified its institutional engagement and achieved decisive political results for strengthening the nuclear sector in Brazil. In an environment marked by regulatory challenges, budget disputes, changes of government, and a growing need for qualified technical dialogue, the association has established itself as the leading articulating voice among industry, government, parliament, and international organizations. The recent period reflects a strategic repositioning that combined diplomacy, technical expertise, and a continuous presence in decision-making arenas.

The central point of this journey was the strengthening of dialogue with the National Congress. ABDAN structured a permanent agenda with deputies, senators, and parliamentary fronts strategic to the energy sector, expanding understanding of the role of nuclear technology in the country's economic and social development. This engagement was decisive for advancing sensitive agendas—such as modernization of the regulatory framework, support for the expansion of INB, and actions to reduce bureaucracy in licensing—as well as for broadening debate on new applications of nuclear technology in energy security, agriculture, health, and industry.

The association also played a relevant role in enhancing the technical quality of political discussions. By producing technical notes, sector analyses, and economic impact assessments, it helped raise the level of dialogue between legislators and specialists. This effort was reflected in the growing demand for ABDAN's information by offices and committees, transforming the association into a постоян source of consultation. Its technical and nonpartisan stance has been fundamental to building credibility and distancing the sector from polarization, ensuring that decisions are guided by evidence and planning.

Another advance was the intensification of engagement with the Executive Branch. ABDAN expanded its presence in meetings with strategic ministries—especially Mines and Energy, Science and Technology, the Civil House, and Planning—bringing forward structural demands such as financing, project continuity, process simplification, and the inclusion of nuclear energy in State programs. In parallel, it strengthened ties with bodies such as CNEN, INB, Eletronuclear, and BNDES, reinforcing an institutional network capable of thinking in an integrated way about the future of the sector.

The recent year also marked a qualitative leap in results with Parliament. ABDAN helped expand understanding of the need to renew and expand nuclear infrastructure, highlighting historical bottlenecks, risks of discontinuity, and large-scale economic opportunities. There has been progress in political perception that Brazil needs to diversify its energy mix, modernize its supply chain, and increase technological sovereignty—topics that have begun to appear more frequently in speeches, public hearings, and official agendas.

In numbers, ABDAN's political impact becomes even more evident: more than 70% of the strategic agendas debated in Congress involving nuclear technology had direct contributions from the association—whether through technical notes, engagement with leadership, participation in public hearings, or the building of consensus between government and industry. Among the most emblematic advances is its work on several structuring bills, including Bill 1304, whose debate gained technical depth through analyses and interventions produced by the association. This continuous and strategic presence transformed ABDAN

MORE THAN 70% OF THE STRATEGIC AGENDAS DEBATED IN CONGRESS INVOLVING NUCLEAR TECHNOLOGY HAD DIRECT CONTRIBUTIONS FROM THE ASSOCIATION

into a political "hub" for the sector, capable of influencing agendas, correcting course, and consolidating national priorities with precision and speed.

Although dialogue with Congress remains challenging—especially given the turnover of legislators and the complexity of the topic—ABDAN has observed positive signs. Building a more technical and informed base tends to generate relevant advances starting in 2026, when important projects are expected to mature within committees and thematic fronts. The association has acted proactively to support this movement, preparing studies, mapping risks, and building bridges with political leaders who show interest in innovation, energy transition, reindustrialization, and competitiveness.

FROM BRAZIL TO THE WORLD

On the international stage, ABDAN consolidated its institutional presence by participating in missions, events, and strategic forums, strengthening Brazil's image as a developing nuclear player. By representing Brazilian industry in dialogues with agencies and associations from other countries, the association has expanded the country's visibility and attracted the attention of companies, funds, and multisector organizations seeking partnerships and opportunities in the national market. This role is crucial for Brazil to keep pace with technological trends, incorporate best practices, and maintain active engagement within the global ecosystem.

Another important axis of recent political action was strategic communication. ABDAN modernized its institutional presence, expanded the dissemination of technical content, and began to communicate with society in a clearer and more accessible way. This change was fundamental to reducing noise, combating misinformation, and increasing public understanding of the benefits of nuclear technology—going beyond power generation and highlighting its contributions to health, agriculture, industry, and sustainability.

The results of this process are already evident in expanded political support and a shift in social perception. By positioning itself as an articulating entity, ABDAN has become a protagonist in consensus-building and in constructing realistic pathways for advancing the Brazilian nuclear program. This posture has also strengthened trust among members, who have come to see the association as a point of stability, representation, and strategic vision.

The recent period shows that the Brazilian nuclear sector has entered a new cycle of institutional maturity. ABDAN's political action has been decisive in sustaining this movement, ensuring that public decisions are guided by planning, safety, and responsibility. The challenge now is to transform this accumulated political capital into concrete advances—such as regulatory modernization, expansion of productive capacity, increased international insertion, and the implementation of long-term structural policies.

ABDAN remains committed to this process. With an active presence, qualified dialogue, and a forward-looking vision, the association reinforces its role as a bridge between industry and the State, contributing to Brazil realizing the full potential of nuclear energy and technologies. The results achieved to date demonstrate that the path is consolidated—and that the sector finally has real conditions to move forward in a consistent and sustainable manner. ▪

COP30: THE MOMENT FOR TECHNOLOGICAL DIVERSITY IN THE GREEN TRANSITION

WITH BRAZIL AS HOST, THE NUCLEAR SECTOR TOOK ON A LEADING ROLE IN THE CLIMATE AGENDA, CLAIMING A STRATEGIC POSITION ON THE PATH TO "NET ZERO."

COP30 was held for the first time in Brazil, where the nuclear sector emerged as a strategic protagonist in the global energy transition. The climate debate revealed the limitations of intermittent sources and the urgency of ensuring security, reliability, and low carbon emissions.

"The outcome of COP30 was very positive," assessed Celso Cunha, President of ABDAN. "It was a pleasant surprise — the city managed to host an event of this scale with hospitality and organization. We faced some infrastructure challenges, but nothing that compromised the overall experience." According to him, the presence of the nuclear sector was significant: "We participated in three panels organized by the International Atomic Energy Agency (IAEA) — one on small modular reactors (SMRs), another on energy planning, and a third on nuclear technology worldwide. We also took part in the World Nuclear Association (WNA) panel on sustainable taxonomy, which was extremely rich. There was strong interest in understanding how nuclear energy is being included in this new legislation and how it connects to the energy transition."

Nuclear associations worldwide have been consolidating this message. On the eve of COP30, 17 national and international associations from 15 countries signed a joint declaration reaffirming the commitment to triple global nuclear capacity by 2050 — a target considered technically and economically viable by the IAEA. According to the data cited, nuclear reactors currently in operation generate around 9% of the world's electricity and 23% of the planet's clean energy, having avoided approximately 70 gigatonnes of CO_2 over the past 50 years — and, if the pace of expansion is maintained, another 90 Gt could be avoided by 2050.

BRAZIL: A POSITION OF PROMINENCE

In this context, Brazil assumed a unique position. As the host country of COP30, it operates Angra 1 and Angra 2 — among the most efficient nuclear power plants in the world — and is preparing for the completion of Angra 3, a project essential to diversifying the national electricity mix and ensuring security of supply. Cunha also highlighted progress in initiatives such as the multipurpose reactor, food irradiation programs, and nuclear medicine, as well as the strengthening of nuclear technology supply chains. All of this places Brazil "in a position of prominence on the global agenda, as a country capable of balancing sustainability, sovereignty, and innovation."

During COP30, the nuclear sector had a strong presence. At the IAEA pavilion ("Blue Zone"), events such as Atoms4Climate and panels on SMRs (Small Modular Reactors) and Regional Leadership and Global Pathways for SMRs provided opportunities to present the nuclear agenda within the energy transition. In parallel, the World Nuclear Association (WNA) organized, at its Net Zero Nuclear pavilion, the launch of reports and debates on non-electric uses of nuclear energy and on the importance of the technology for deep decarbonization.

The inclusion of nuclear energy in this edition of COP30 responded to multiple fronts. First, to the recognition that intermittent renewable sources — such as solar and wind — alone cannot solve challenges related to variability, storage, and growing demand. Power systems require a firm, reliable, high-capacity base. Nuclear energy operates 24 hours a day, with capacity factors above 80%, ensuring predictability for industry and essential services. Second, the transition to "net zero" requires scale and speed — and in this context, the nuclear sector appears as an indispensable lever.

Reporting directly from COP30 on Globonews, journalist André Trigueiro highlighted an essential issue for the global energy transition: the indis-

pensable contribution of nuclear energy. As a successful example, he cited China, which achieved a reduction in CO_2 emissions over an 18-month period through strategic investment in nuclear energy.

From a global policy perspective, COP30 represented a window of opportunity. According to the report The Road to COP30: Building the Net Zero Nuclear Coalition for a Sustainable Future, the WNA and its partners sent communications to more than 30 countries, encouraging them to explicitly include nuclear energy in their Nationally Determined Contributions (NDCs) under the Paris Agreement. In the Brazilian context, the Director General of the IAEA stated that COP30 could help expand the share of nuclear energy in the national energy mix — reinforcing Brazil's role as a relevant case for the technology.

However, nuclear leadership is not without challenges — technical, regulatory, financial, and communicational. The goal of tripling global capacity requires stable regulatory frameworks, mobilization of investment, and the safe and predictable advancement of new projects, such as SMRs and AMRs. This is precisely the appeal of the international declaration that was signed: "triple, extend, invest" — in other words, expand capacity, extend the lifetime of existing reactors, launch new projects, and strengthen the entire fuel cycle. In Brazil, this translates into the need to ensure a favorable business environment, expand international cooperation, and integrate new technologies.

ENERGY TRANSITION

At COP30, Brazil brought a clear message to the center of the debate: the energy transition requires technological diversity, long-term planning, and international cooperation — and ignoring the role of nuclear energy is to repeat mistakes that other countries have already recognized. The convergence between the demands of the nuclear sector and the COP30 agenda — especially on issues such as energy security, decarbonization, innovation, and sovereignty — reinforced the relevance of Brazil's participation.

Cunha also highlighted international interest in Brazil's role in expanding nuclear energy: "We talked about our energy mix, the need for baseload power, and how nuclear can contribute in a complementary and strategic way. We discussed recent advances, such as the approval of the Hydrogen and Energy Transition laws, and the revision of the National Energy Plan 2055, which foresees a significant volume of nuclear energy."

For him, COP30 represented a point of convergence: "There were many meetings with representatives from various countries and institutions, all seeking synergy around the sustainability of the planet. The feeling is that nuclear energy has finally gained space in the global dialogue on the future of energy."

"THE FEELING IS THAT NUCLEAR ENERGY HAS FINALLY GAINED SPACE IN THE GLOBAL DIALOGUE ON THE FUTURE OF ENERGY," CELSO CUNHA

In the final assessment, COP30 may mark a turning point for nuclear energy — if, and only if, it is able to combine discourse, facts, and delivery. For Brazil, embracing this agenda with clarity may mean occupying a leadership position in the global transition, expanding its legacy in clean energy, technological innovation, and industrial development. As Cunha emphasizes, strategically incorporating nuclear energy is "the path to ensuring a fair, safe, and lasting transition, for the benefit of future generations." ▪

COP30: WHAT IT IS, WHY IT MATTERS, AND WHAT TO EXPECT FROM THE NEXT EDITION

The United Nations Climate Change Conference, better known as COP, is the main global forum for climate negotiations. Created in 1995 under the United Nations Framework Convention on Climate Change (UNFCCC), it brings together annually leaders, scientists, civil society representatives, companies, and international organizations with a common goal: to coordinate actions to reduce greenhouse gas emissions, adapt countries to the already unavoidable impacts of the climate crisis, and finance the transition to more sustainable economies.

Since its first meeting in Berlin, COP has become the central space for building multilateral agreements — including historic milestones such as the Kyoto Protocol (1997) and the Paris Agreement (2015). Over its editions, more than 190 countries have participated in the negotiations, each bringing their priorities, challenges, and proposals to address global warming.

The most recent conference held in Brazil reinforced the country's strategic role in the global climate debate. With its megabiodiversity, large renewable energy matrix, and geopolitical relevance, Brazil has been assuming a growing leadership role in discussions on forest preservation, decarbonization, and socio-environmental inclusion.

The choice of Belém placed at the center of discussions issues such as deforestation, the bioeconomy, protection of Indigenous peoples, energy transition, and sustainable development for tropical forest regions.

The next major Climate Conference after COP30 in Brazil will be COP31 in 2026, to be held in Antalya, Turkey, and will again include the presence of ABDAN. The association has been officially accepted as a permanent observer organization by the United Nations Framework Convention on Climate Change (UNFCCC), expanding its international engagement in the climate debate.

"This recognition marks an important step on the international climate stage, reinforcing the role of nuclear energy as a strategic component of decarbonization policies," states ABDAN President Celso Cunha.

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MIGUEL FERNÁNDEZ, CREA-RJ, COMMENTS ON THE CHALLENGES OF MODERN ENGINEERING

EXECUTIVE DEFENDS THE IMPORTANCE OF LARGE-SCALE INVESTMENTS IN THE DIVERSIFICATION OF INTEGRATED ENERGY SOURCES IN BRAZIL

A civil engineer, holder of a master's degree in Urban Engineering from UFRJ, public servant at Fiocruz, and professor at CEFET/RJ, Miguel Fernández, 42, is the youngest president in the history of CREA-RJ. Leading an administration marked by modernization, interinstitutional dialogue, and strengthened communication with society, he heads a Council that represents approximately 100,000 professionals in the state and 20,000 registered companies. In this interview with Conexão Nuclear Magazine, Fernández discusses the importance of the nuclear energy mix for the country, the challenges of contemporary engineering, partnerships with sector entities, and strategies to attract new professionals to the field.

1 – Considering the recent financial impasse at Eletronuclear and the need for budget reinforcement to avoid the risk of insolvency, what role does CREA-RJ see for itself in monitoring or overseeing the Angra 3 project?

It is necessary to state that we at CREA-RJ, under this administration, strongly defend the importance of making large-scale investments in the diversification of integrated energy sources in our country and in our state. Angra 3 is a fundamental project in ensuring this guarantee through the nuclear energy mix. So the first point is a defense, not only because of the major engineering works involved, but also because of reinforcing the importance of this energy diversification, which is ensured when you have another modern nuclear power plant serving the state and the entire country. Second, CREA plays a fundamental role — through its registry of both individuals, the professionals, and legal entities — with a database that can be used primarily to qualify technical capacity through certificates and technical records of professionals who have already worked on similar systems and comparable competencies, enabling them to execute these services and works together with Eletronuclear. Thus, CREA serves not only as a technical record base for selecting these professionals and companies, but especially during execution as an oversight body to ensure that properly qualified and registered professionals are carrying out these services.

2 – With authorization to extend the operating life of Angra 1 until 2044 and investment plans for maintenance, how does CREA-RJ assess the technical and regulatory challenges to ensure the safe operation of older plants?

This is perhaps the major issue that engineering in this generation will have to face. Unlike previous generations, when the objective of engineering works was mainly to meet deficits caused by population growth and the de-

mands resulting from that growth, population levels are now beginning to stabilize in some regions and the demand is becoming different, with the need to discuss existing infrastructure that is reaching the end of its life cycle and must undergo rehabilitation or even replacement. This is not only an issue related to Angra 1. It also applies, for example, to hydroelectric plants that are more than one hundred years old. Here in the state of Rio de Janeiro, for instance, we have the transposition of the Paraíba do Sul River in the Santa Cecília-Light System, as well as other major, essential infrastructures such as bridges and roads. This is therefore a highly relevant topic for engineering, and Angra 1 is an example of the need for an in-depth discussion, not only to ensure safety, but also to continually seek system efficiency. CREA must be present, with duly registered and qualified professionals, supporting capacity building and, above all, enhancing the quality of this discussion, helping decision-makers understand what this truly means.

3 – CREA-RJ has adopted initiatives with greater visibility for society (such as the CREA AQUI event). How could these practices be adapted (or are already being adapted) for the nuclear sector, in order to increase transparency, citizen participation, and public trust?

It is necessary to inform the population that nuclear energy is a sustainable source with extremely low environmental impact, and that it is supported by high-quality professional services provided to society. Brazil has already had 50 years of nuclear energy generation without a single accident. This demonstrates the high level of competence of the engineers working in the field, ensuring safety. CREA's strategy is to bring this topic to the public through a partnership with ABDAN at CREA AQUI 2026, and to consider various partnership developments, whether in communication or in events organized by CREA or by ABDAN itself, in which CREA is supporting, sponsoring, and participating jointly.

4 – Given the decline in interest in engineering degree programs in recent years, what concrete strategies does CREA-RJ envision to encourage new professionals to enter the nuclear sector?

CREA-RJ's strategy applies to all areas of engineering, including the energy sector and specifically the nuclear sector, which is very important but not the only one facing a labor shortage. Looking to the future, in the long term, this situation is catastrophic for all engineering sectors in Brazil, not only in Rio de Janeiro. The Confea/CREA system has been developing a strategy that begins with raising awareness, sharing this information with the public. There are numerous articles and initiatives through which CREA presents research to inform society of this concern regarding the issue. In addition, we aim to create actions that can spark young people's interest in pursuing engineering. We are therefore moving forward with sponsoring events focused on secondary education, such as science fairs or similar initiatives, that can inspire young students to enter engineering programs. Above all, however, it is essential to implement actions that restore the value of the profession and the sector, dismantling a stigma that has been attached to it over the past decade — that it is a sector supposedly associated with corruption scandals and one that does not value its professionals. Restoring pride in being an engineer not only increases interest, but also improves remuneration and enhances the appreciation of both current and future professionals.

5– How does CREA-RJ view the need to update regulatory standards, radiological safety rules, environmental impact requirements, and technological innovation in Brazil's nuclear sector?

Constant updating and modernization of regulatory standards are essential. The Confea/CREA System, for example, holds a seat at ABNT and is one of the entities that participate in the development of standards at the Brazilian Association of Technical Standards. Any professional registered with the Confea/CREA System and in good standing has free access to all Brazilian standards through the system's platform. Moreover, technological advancement is occurring so rapidly that we must always be attentive to international standards and seek alignment with the national context, so that we do not lag behind the global technological frontier. This is one of the discussions surrounding the Brazilian Multipurpose Reactor project, which has, among its strategies, localized nuclear energy supply. These can be very interesting solutions for small urban centers and large data centers. This is therefore a very important action in which Brazilian engineering must remain at the forefront. The entire strategy that the Confea/CREA System is currently developing involves updating its governing law (Law 1,024), moving toward greater international dialogue so that cooperation can be simpler and easier to achieve. Regarding the resumption of uranium exploration, CREA must also be in favor. In general terms, everything that involves engineering is something we at CREA-RJ will always support — but with priority given not only to economic considerations, which are fundamental for development, whether of the engineering sector or society, but above all to meeting social expectations, ensuring governance, and, above all, defending the environment, thus ensuring sustainability. ▪

ABDAN MISSION AT THE WNE 2025

BRAZIL GAINS PROMINENCE AT THE WORLD'S LARGEST NUCLEAR EVENT

Brazil's participation in the World Nuclear Exhibition (WNE) 2025, held from November 4 to 6 in Paris, marked a historic chapter for the national nuclear sector. For the first time, Brazil had its own stand, led by ABDAN – the Brazilian Association for the Development of Nuclear Activities, bringing together strategic companies from the production chain to present the country's technological, industrial, and scientific potential to the world.

Over three intense days, the mission coordinated by ABDAN held 54 meetings and bilateral contacts with representatives from 17 countries, reinforcing Brazil's positioning as a relevant player on the global clean energy and decarbonization agenda.

FIRST BRAZILIAN STAND

The Brazilian stand — structured by ABDAN in partnership with associated companies — brought together Diamante Geração de Energia, INB, Amazul, and ATECH, which presented innovative solutions, technological development cases, and opportunities for international cooperation.

The Brazilian presence drew attention from the very first day. High-level authorities from the global nuclear sector made a point of visiting the space, including:

- Rafael Mariano Grossi, Director General of the International Atomic Energy Agency (IAEA)
- Sama Bilbao y León, Director General of the World Nuclear Association (WNA)
- Sylvie Bermann, President of WNE

These visits consolidated international recognition of Brazil's progress in nuclear technology, fuel production, reactor projects, and expansion potential.

HIGHLIGHTS OF THE STRATEGIC AGENDA

With an intensive program, the Brazilian delegation took on a role active in the technical and institutional discussions of the event

KEY BILATERAL MEETINGS

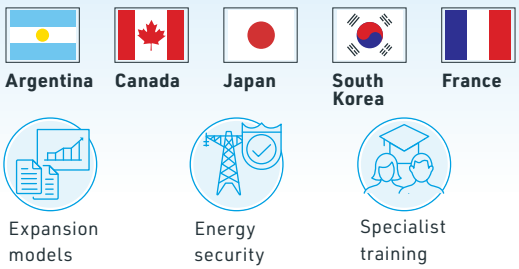
Nuclear Energy Institute (NEI)
Regulatory and technology cooperation

Framatome
Opportunities for industrial participation

Rolls-Royce
Integration of SMRs and industrial synergies

World Nuclear Association (WNA)
Institutional strengthening

DIALOGUES ON PARTNERSHIPS



Technical visits and official dinner with representatives of Tractebel Engie

The event brought together executives and authorities to discuss new paths for cooperation

ABDAN

A STRONG DELEGATION

The mission included the participation of Admiral Bento Albuquerque, former Minister of Mines and Energy, who acted as the focal point of the Brazilian delegation. His presence symbolized Brazil's institutional relevance in the international nuclear arena.

The delegation also included representatives from ABDAN and the companies at the stand, among them:

- Amazul – Adm. Newton Costa, Adm. Matias, Flavio Macedo Brasil, Flávio Pereira
- ATECH – Carlos Eduardo Perez, Adriana Cappellotto
- Diamante Energia – Jorge Nemr, Pedro Kassab, Adolfo de Aguiar Braid
- INB – Luciano Martins Sadde, Reinaldo Gonzaga
- ABDAN – Gabriela de Sales Costa Nascimento

The technical and institutional diversity of the delegation raised the level of discussions and opened new fronts for exchange and opportunities.

INTERNATIONAL SIGNATURE IN SUPPORT OF COP30

One of the most notable moments of the mission was the signing of the Joint Declaration in Support of COP30, at the GIFEN stand. ABDAN, represented by Vice President Paulo Coelho and by Gabriela Sales, took part alongside international authorities.

The signing aligns with Brazil's commitment to expand the use of nuclear energy as an essential component of the global energy transition, a theme that has been championed by the association in partnership with EPE through the modeling of SMR scenarios and expansion of baseload capacity.

BRAZIL IN A PROMINENT POSITION ON THE GLOBAL AGENDA

Brazil's presence at WNE 2025 attested to the maturity of the national nuclear sector and its ability to engage with the leading players in the global industry.

The Brazilian stand became a focal point for cooperation, business, and technological diplomacy, demonstrating that the country has technological mastery in key areas; an expanding industrial base; projects aligned with decarbonization goals; and growing participation in international forums.

"The mission led by ABDAN at WNE 2025 consolidated the association as the natural spokesperson for the Brazilian nuclear sector on the international stage. Through institutional, diplomatic, and business articulation, Brazil's presence in Paris opened the way for new investments, partnerships, and cooperation initiatives that are expected to strengthen the role of nuclear energy in Brazil's energy mix. More than merely being present, Brazil occupied space and demonstrated that it is ready to contribute to global energy security," concludes President Celso Cunha. ▪

HACKAPOWER 2025 REVEALS THE NEW GENERATION OF NUCLEAR INNOVATION

OFFSHORE REACTORS, EMBARKED IRRADIATION, AND INTELLIGENT WASTE MANAGEMENT STAND OUT AMONG THE WINNING PROJECTS

At a time when Brazil is debating the future of its energy mix and advancing discussions on topics such as food security and industrial sustainability, Hackapower 2025 demonstrated that innovation emerging from universities is already prepared to engage with the real challenges of the sector. The competition, promoted by ABDAN within the framework of the National Nuclear Energy Olympiad (ONB), brought together students from different regions of the country over six months of mentoring, classes, meetings with specialists, and prototype development.

This year, the winning projects demonstrated a remarkable ability to integrate engineering, strategic vision, and practical applicability, proposing innovative solutions for the three central axes of the competition: Energy, Food Preservation, and Sustainability. Below are details of the three projects that won over the panel of expert judges.

ENERGY – TEAM NAUTILUS

OFFSHORE MODULAR REACTORS TO ENSURE ENERGY AUTONOMY ON FPSO PLATFORMS

The proposal by Team Nautilus, winner of the Energy track, presented a robust, high-impact solution to one of the biggest bottlenecks in the oil and gas industry: onboard power generation in remote environments. The project, titled "Implementation of MMRs in Offshore Systems: FPSO Oil Platforms," proposes the installation of micro modular reactors (MMRs) dedicated exclusively to supplying energy to stationary production units — such as FPSOs, which are responsible for offshore oil operations.

Currently, onboard generation relies primarily on diesel- or gas-powered turbines, increasing logistics costs, emissions, and operational vulnerabilities. The team's solution points to a completely different scenario: autonomous platforms with continuous, safe, and ultra-low-carbon power supply.

The pitch presented by the students further details:

- MMR models adapted to maritime conditions, with operational redundancy;
- Risk mapping and mitigation strategies for the offshore environment;
- Emissions analysis showing the potential for near-total CO_2 reduction in the platform's energy operations;
- Economic feasibility study highlighting the positive impact on supply security.

Team composition:

- Roberta Freire (UFRJ, Nuclear Engineering)
- Osman Granada (IPEN, Master's degree in Nuclear Technology)
- Jullyano Lino (UNINTER, Mathematics)
- Emelca Teles (UFLA, Physical Engineering)

Watch the full project video: https://www.youtube.com/watch?v=mCLb2N3HDRg

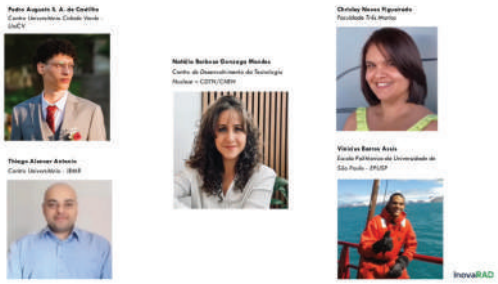
FOOD PRESERVATION – TEAM INOVARAD

ONBOARD IRRADIATION TO REDUCE LOSSES AND REVOLUTIONIZE BRAZILIAN LOGISTICS

Winner of the Food Preservation track, Team InovaRad developed a bold and unprecedented project in Brazil: the Shipboard Irradiation System (SIS). The idea directly addresses a structural Brazilian challenge: food waste along long logistics chains, especially those involving maritime transport for exports and coastal shipping.

The SIS consists of an irradiation module installed directly on the vessel, allowing fruits, grains, meats, and other products to be treated during transit, extending shelf life and reducing post-harvest losses. The team's pitch further explores:

- The application of gamma radiation for microbiological



control and pest reduction;

- The adaptation of shielding solutions and radiological safety measures to the naval environment;
- The possibility of integrating the SIS into routes linking the North and Northeast regions to the world's main consumer ports;
- Simulations indicating logistical gains and a substantial reduction in waste.

Team composition:

- Pedro Castilho (UniCV)
- Natália Mendes (CDTN/CNEN)
- Chrisley Figueiredo (Faculdade Três Marias)
- Thiago Alencar Antonio (IBMR) Vinicius Barros Assis (EPUSP)

Watch the full project video: https://www.youtube.com/watch?v=ih_of_AtoyI&feature=youtu.be

SUSTAINABILITY – TEAM POWER FUSION GIRLS

NAVINORM: A MODULAR AND TRANSPORTABLE SOLUTION FOR THE TREATMENT OF NORM-CONTAINING WASTE

The Sustainability track awarded an innovative proposal aimed at the oil and gas industry: NaviNorm, developed by Team Power Fusion Girls. The project offers a practical, modular, and transportable alternative for the treatment of oily sludges containing NORM (Naturally Occurring Radioactive Material) — residues commonly found in drilling and production operations that require specialized treatment.

The distinguishing feature of NaviNorm lies in the system's mobility, which can be transported by trucks, barges, or tugboats, bringing treatment closer to the point of waste generation. This reduces costs, risks, and emissions associated with the transportation of radioactive materials.

The pitch highlights:

• A modular system with stages for separation, stabilization, and conditioning;

• Compact shielding for operation in industrial zones;

• Significant reduction of environmental liabilities;

• Potential to serve offshore platforms and onshore facilities.

Team composition:

- Danielle Pereira
- Larissa de Sá

Watch the full project video: https://www.youtube.com/watch?v=YkEXen7xEiY&feature=youtu.be

THE IMPACT OF HACKAPOWER ON THE SECTOR

For ABDAN President Celso Cunha, the projects presented demonstrate the technical maturity of the new generation of students engaged with nuclear energy:

"Hackapower shows the strength of the new generation in proposing creative and technically solid solutions. The Brazilian nuclear sector needs this innovative perspective to consolidate itself as a protagonist of the energy transition and the clean economy."

The winners will be recognized on the Nuclear Legacy 2025 stage in Brasília and will take part in a technical visit to Itaipu Parquetec, in Foz do Iguaçu, to deepen their immersion in energy innovation.

For Patrícia Wieland, Director of the ONB, the competition plays an essential role in education and in fostering dialogue between academia and industry:

"This exchange is fundamental for the country to advance in sustainable solutions and strengthen its technological sovereignty in the nuclear field." ▪

NUCLEAR SUMMIT 2026: THE FUTURE OF THE BRAZILIAN NUCLEAR SECTOR

ABDAN PREPARES THE LARGEST EDITION EVER HELD, WITH A FOCUS ON INNOVATION, ENERGY TRANSITION, AND STRENGTHENING THE SUPPLY CHAIN

The year 2026 begins with high expectations for the Brazilian nuclear sector. ABDAN – the Brazilian Association for the Development of Nuclear Activities – announces, firsthand, the details of Nuclear Summit 2026, to be held on March 23 and 24, at Casa Firjan, in Rio de Janeiro. The event consolidates itself as the most strategic gathering of the nuclear industry in the country and, in its third edition, promises to deliver a dynamic, innovative experience aligned with global energy challenges.

More than a seminar, Summit 2026 emerges as a hub for international exchange, technical debate, high-level networking, and institutional articulation. With interconnected tracks covering regulation, technological innovation, SMRs, artificial intelligence, geopolitics, energy security, and industrial supply chains, the event positions itself as the most robust forum for discussion in Brazil's nuclear sector.

With curation anchored in the main global trends, Nuclear Summit aims to foster business, drive strategic agendas, and bring together government, industry, academia, and emerging markets.

CASA FIRJAN: INNOVATION AS THE STAGE FOR NUCLEAR ENERGY

The announcement of Casa Firjan as the venue for Nuclear Summit 2026 reinforces Rio de Janeiro's position as one of the country's main nuclear hubs. The partnership between ABDAN and Firjan, built over recent years, reaches its peak in 2026 by combining the strength of Rio de Janeiro's industrial base, its network of qualified suppliers, and the technological tradition of companies such as INB, Eletronuclear, and Amazul.

Casa Firjan offers an ideal ecosystem: innovation environments, integrated outdoor areas, contemporary workspaces, and infrastructure geared toward networking. A setting particularly favorable for meetings among leaders, investors, political authorities, and international specialists.

Photo: Leonardo Martins

TWO DAYS OF DEBATES

The Nuclear Summit 2026 program was designed with precision. The structure will include opening addresses, eight thematic panels, and two business brunches, in addition to exclusive networking moments.

MARCH 23 – DAY 1

- Welcome Coffee
- Opening Session
- Opening Keynote
- Panels 1 and 2
- Business Brunch
- Panels 3 and 4

MARCH 24 – DAY 2

- Welcome Coffee
- Opening Keynote
- Panels 1 and 2
- Business Brunch
- Panels 3, 4, and 5
- Closing Networking Session

These sessions will address strategic topics such as:

- Nuclear energy and the energy transition
- Global energy security
- Artificial intelligence applied to the sector
- Innovation and new business models
- SMRs and industrial applications
- Supply chain and local content
- Geopolitics and the new global competition for energy
- Nuclear medicine and technological expansion

The event's technical curation highlights ABDAN's commitment to expanding the maturity of the Brazilian sector by aligning national debate with global practices, technologies, and trends.

FIRJAN OPPORTUNITIES NETWORK

One of the highlights of the Summit will be another edition of RDO Firjan – Rede de Oportunidades (Opportunities Network), which connects suppliers from Rio de Janeiro with major industry demanders. In 2026, the initiative arrives at the event with an even more robust proposal: bringing nuclear sector companies closer to a highly qualified supply chain, expanding opportunities for business, partnerships, and industrial development.

The presence of RDO at the Summit reinforces ABDAN's strategy to vertically integrate the Brazilian nuclear supply chain, increasing the participation of national companies in large-scale projects.

HACKAPOWER AND ONB 2026

The event will also mark the official launch of the new edition of the National Nuclear Energy Olympiad (ONB) and its traditional Hackapower, a challenge that brings together students from across the country to propose innovative solutions for the sector.

The Summit will serve as the starting point of the competition, which will culminate in the presentation of finalist projects at the end of the year. It is one of the largest programs aimed at fostering talent development and advancing emerging technologies in the Brazilian nuclear sector. ▪

ABDAN AND ASME HOST WORKSHOP ON CODES AND STANDARDS APPLIED TO THE NUCLEAR SECTOR

MEETING HELD AT ELETRONUCLEAR BROUGHT TOGETHER SPECIALISTS FROM BRAZIL AND ABROAD TO DISCUSS SECTIONS III AND XI OF THE ASME BOILER AND PRESSURE VESSEL CODE

Between October 14 and 16, 2025, the Brazilian nuclear sector hosted an important technical and scientific exchange. The Brazilian Association for the Development of Nuclear Activities (ABDAN), in partnership with the American Society of Mechanical Engineers (ASME), organized an international workshop on ASME Codes and Standards applied to the nuclear sector. The event, held at Eletronuclear's facilities in Rio de Janeiro, brought together engineers, technicians, industry representatives, and energy sector authorities around a common goal: to strengthen technical knowledge and expand the culture of safety and standardization within the Brazilian nuclear environment.

Over three days, participants were able to delve into fundamental content essential for the safe and efficient operation of nuclear facilities. Discussions focused on Sections III and XI of the ASME Boiler and Pressure Vessel Code (BPVC) — global references for the design, construction, and inspection of nuclear components. In addition to theoretical sessions, the event included technical visits to Brazilian nuclear facilities, offering a practical immersion into the challenges and best practices applied in the country.

The workshop was conducted by some of ASME's leading international experts. Among them were Robert Keating, Group Manager at MPR Associates and Chair of the ASME BPV Section III Committee; Oliver Martinez, Standards Development Project Advisor at ASME; Dale Matthews, Technical Consultant at Framatome and member of the BPV III Standards Committee; and Tom Roberts, Principal Officer at POMO18 Consult LLC and member of the Section XI Committee. The presence of these prominent figures

reinforced the relevance of the meeting and Brazil's recognition as a country committed to international best practices in nuclear engineering.

According to specialists in attendance, the adoption and continuous updating of ASME Codes and Standards are essential to ensure the reliability and safety of nuclear power plants, as well as to promote the competitiveness of the national industry.

"Alignment with international technical standards strengthens not only the operation of our plants, but also the ability of Brazilian industry to participate in global nuclear energy projects," highlighted Celso Cunha, President of ABDAN, during the event.

The discussions also addressed the role of international standards in strengthening the country's regulatory and industrial infrastructure. As Brazil advances with its Nuclear Energy Development Program, which includes long-term projects such as the completion of Angra 3 and discussions on new modular technologies (SMRs), mastery of ASME standards becomes even more strategic.

Another key highlight was the technical exchange between Brazilian and international professionals, reinforcing the importance of continuous training and integration between academia, industry, and regulatory bodies. According to the organizers, one of the workshop's main legacies was the creation of a network of qualified professionals capable of disseminating the acquired knowledge, promoting a culture of technical excellence in line with international safety standards.

With more than a century of global activity, ASME is recognized as one of the most influential organizations in defining technical standards for mechanical and nuclear engineering. ABDAN, in turn, has for decades acted as a bridge between government, industry, and the scientific community, consolidating itself as an articulator of initiatives that bring Brazil closer to the most advanced practices in the sector.

At the conclusion of the three-day program, the relevance of the partnership between ABDAN and ASME for the future of the Brazilian nuclear segment was clear. The event not only updated knowledge on standards and procedures, but also reaffirmed the country's commitment to safety, innovation, and technical excellence — essential pillars for the sustainable development of nuclear energy in Brazil.

Due to strong demand — with a waiting list for registrations — ABDAN and ASME announced that the workshop will have a new edition in 2026, once again to be held in Brazil. The initiative reinforces the entities' commitment to disseminating technical knowledge and strengthening the national nuclear industry, consolidating the event as a permanent reference in the sector's calendar.

"In addition, the year will begin quite intensively in this area, with three courses scheduled for the first three months of the year, reinforcing one of ABDAN's objectives, which is to share and expand knowledge," Celso concludes. ▪

80 YEARS OF THE RUSSIAN NUCLEAR INDUSTRY

A history of achievements that shaped the development of global nuclear energy: from the first power plant in Obninsk to the fleet of nuclear icebreakers and the tokamak.

ROSATOM

80 YEARS OF RUSSIAN NUCLEAR INDUSTRY

A NEW ARCTIC CORRIDOR IS TRANSFORMING GLOBAL LOGISTICS

On October 13, 2025, a Chinese container ship arrived for the first time at the British port of Felixstowe, using the shorter route through the Arctic. The vessel, which departed from Ningbo on September 23, traveled via the Northern Sea Route (NSR) and reached Europe in just 20 days — almost twice as fast as the traditional route through the Suez Canal.

The voyage was made possible by Rosatom, the Russian state-owned corporation and infrastructure operator of the route, whose nuclear-powered icebreakers make navigation safe and predictable throughout the year. This historic success confirms that the Arctic route is no longer a curiosity but has become part of the global maritime transport system. Its development brings benefits not only to Europe and Asia, but also to global trade as a whole, including countries in Latin America, far from icy waters yet deeply connected to international logistics chains.

The Northern Sea Route also stands out as a "green corridor," where technological innovation and environmental responsibility go hand in hand. On the eve of COP30 in Brazil, the NSR naturally fits into the global agenda for decarbonizing transportation: fewer nautical miles mean less fuel consumption — and therefore fewer emissions.

THE SHORTEST DISTANCE BETWEEN EUROPE AND ASIA

The Northern Sea Route is the shortest maritime path between Europe and East Asia — about 5,600 kilometers, or 30–40% shorter than the route through the Suez Canal. This difference represents significant savings in time and fuel, allowing the duration of voyages between Asia and Europe to be reduced by nearly half.

When global transportation becomes faster and more accessible, the entire world economy benefits. Exporters of agricultural and mineral products from South America, for example, gain indirect advantages: their goods can compete more effectively in international markets if global logistics costs decline. Even if Brazilian soybeans or Chilean copper do not pass directly through the Arctic, the shorter delivery times for Asian inputs or European equipment help reduce production costs and facilitate Latin American foreign trade.

The episode involving the ship Ever Given, which blocked the Suez Canal in March 2021, exposed the vulnerability of global trade and boosted interest in alternative routes. In this context, the Northern Sea Route is increasingly viewed as a reliable and predictable corridor, immune to geopolitical risks in the Middle East and piracy in equatorial waters. Global companies value this security, while countries — including those in Latin America — benefit from price stability and regularity in deliveries.

GLOBAL COMPETITIVENESS AND LOGISTICAL FLEXIBILITY

The emergence of the Northern Sea Route as an alternative to the Suez Canal and the Panama Canal makes global logistics more resilient and flexible. Previously, about 85% of global maritime trade passed through a few congested straits and canals; now, cargo flows can be distributed more evenly, increasing the efficiency of international trade.

Competition between routes reduces tariffs and stimulates innovation: even countries that do not directly use the NSR benefit from lower transportation costs and faster deliveries between Asia and Europe. The quicker goods move from China to Europe, the cheaper and more predictable shipments to Brazil or Peru also become.

The new route favors the development of multimodal logistics chains, such as the Asia–NSR–Europe corridor, followed by onward shipping to Latin America. Cargo from East Asia reaches ports in Northern Europe in just 20 days; adding another week to cross the Atlantic, it is possible to reach Latin American ports more quickly and at lower cost. As a result, countries in the region can integrate into new global logistics chains, acting as transshipment hubs or final destinations for accelerated cargo flows.

Interest in the NSR is growing rapidly. Russian President Vladimir Putin has described it as one of Russia's strategic advantages, and in 2024 cargo volumes reached a record 37.9 million tons. By 2030, traffic is expected to reach 100 million tons. The emergence of this new corridor is reshaping global supply chains, creating new logistics hubs, redistributing cargo flows, and attracting investment.

One example is cooperation between China and Rus-

sia, which in 2025 approved a joint roadmap to develop a sustainable transcontinental corridor — the "Polar Silk Road," integrated into China's Belt and Road Initiative. For Latin American countries, many of which maintain strong trade ties with China, this represents a new opportunity to develop ports, transportation infrastructure, and multimodal connections, as well as to attract technology and investment. Brazilian scientists already participate in joint Arctic research projects, laying the groundwork for future scientific and business partnerships.

THE ARCTIC ROUTE AS A "GREEN CORRIDOR"

The Northern Sea Route demonstrates that it is possible to expand global trade without harming the environment, while promoting green and innovative technologies. The Russian experience shows that logistics can be both efficient and environmentally responsible.

Since 2018, Rosatom has operated as the infrastructure manager of the NSR, administering the world's only fleet of nuclear-powered icebreakers — eight vessels currently in operation and several under construction, including the "Leader," with 120 megawatts of power. These ships ensure year-round navigation with zero CO_2 emissions, as they use nuclear energy instead of diesel. The Arktika-class icebreakers can break through up to three meters of ice, guaranteeing safe passage even in winter and transforming the NSR into a low-carbon maritime corridor.

Environmental safety is reinforced through systematic monitoring. Since 2021, Rosatom and Moscow State University (MGU) have conducted continuous studies of water, air, ice, and ecosystems along the route. Researchers from Brazil, India, Turkey, China, and other countries participate, and the results are published openly, ensuring transparency and scientific credibility. Initial analyses show that despite increased maritime traffic, environmental conditions remain stable.

In addition to nuclear propulsion, Rosatom has implemented a unified digital platform for the NSR, which monitors vessels, weather, and ice conditions in real time, enhancing safety and reducing fuel consumption. In the future, the use of drones for ice reconnaissance is planned.

The development of the Arctic is a strategic objective for Russia, which in 2025 marks 500 years of exploration of the Northern Sea Route. Ice has ceased to be an obstacle and has become an engineering challenge. For Latin America, this "Arctic revolution" opens new perspectives — accelerating global trade, expanding partnerships, and fostering technological exchange.

The NSR proves that economic growth and environmental responsibility can go hand in hand — an idea aligned with the Sustainable Development Goals (SDGs) and the agenda of COP30 in Brazil. ▪

WE ARE ABDAN

38 years promoting the

DEVELOPMENT OF THE NUCLEAR SECTOR!