Conexão Nuclear

Vol. No. **06**
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Jun. 2025

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UNITED FOR THE ADVANCEMENT OF BRAZIL'S NUCLEAR PROGRAM

When looking at the central theme of this edition of Conexão Nuclear, a clear message emerges: Brazil's nuclear sector is in motion and continues to move forward with consistency, dialogue, and a long-term vision. This magazine, page by page, is proof of that. Regardless of the obstacles still faced by specific projects, such as Angra 3 — whose interruption reflects issues of poor management, not a lack of potential — the national nuclear agenda is progressing on multiple fronts.

The following pages address topics that reflect the current moment: the institutional strengthening of the sector, the construction of modern legislation, the expanding debate on Small Modular Reactors (SMRs), progress in the decarbonization agenda for the Legal Amazon, the bottlenecks and opportunities in nuclear medicine, the impacts of electricity sector reform, and contributions to the Climate Plan. In other words, we are not only discussing the present — we are helping shape the future.

All of this connects to the experience we had at NT2E, the largest event ever held by Brazil's nuclear sector. More than 3,000 participants, 147 institutions involved, and representation from industry, research, the power sector, government, and international organizations such as the IAEA. It was an event that delivered a clear message: nuclear energy plays a key role in the energy transition and in Brazil's development — a message recognized by several segments of society.

Beyond the impressive numbers, NT2E represented a convergence of ideas and purposes. It showed that nuclear is, indeed, strategic. And that its expansion does not rely solely on large-scale projects, but on a strengthened ecosystem, efficient regulation, technological innovation, and, above all, collaboration between public and private actors.

This editorial is, above all, a message of progress. Of unity. Of trust in everything that is being built — with responsibility, technical rigor, and dialogue. ABDAN has worked tirelessly to bring the nuclear sector closer to society, to the National Congress, to regulatory agencies, and to the business community. The interview with Congressman Arnaldo Jardim, for example, shows how the Legislative Branch has positioned itself as a partner to unblock paths and ensure legal certainty for the sector.

Even sensitive topics, such as the bottlenecks in nuclear medicine and the impact of electricity sector reform, are addressed here with transparency and a commitment to finding solutions. We also show that the debate around SMRs is advancing, including in innovative contexts such as maritime regulation — a topic that positions Brazil at the forefront of the civil use of nuclear technology.

In this context, we reaffirm: Angra 3 is an important project, but Brazil's nuclear sector goes far beyond it. The energy transition requires diversity, and nuclear energy has a guaranteed role in that process. What is underway is a movement that encompasses environmental sustainability, energy sovereignty, technological development, and, above all, responsibility for the country's future.

We invite everyone to join this journey. The progress is real — and as the numbers and articles in this edition show, it is meaningful and the result of joint efforts. May this edition inspire even greater engagement, confidence, and cooperation. Together, with energy and determination, we continue building the present and future of Brazil's nuclear program. ▪

Enjoy the read!
Celso Cunha, President of ABDAN

NUCLEAR ENERGY GAINS GROUND IN CLIMATE AGENDA DISCUSSIONS

CLIMATE PLAN WORKSHOP PAVES THE WAY FOR ACTIONS FOCUSED ON ENERGY SECURITY AND DECARBONIZATION OF THE ENERGY MIX

Brazil is redesigning the foundations of its climate policy for the next 25 years. One of the main platforms for collective construction in this process is the in-person workshop of the Sectoral Mitigation Plan for Energy, Industry, and Transport — better known as the Climate Plan (Plano Clima). Held with the participation of representatives from the government, academia, and the productive sector, the workshop focused on formulating practical actions to reduce greenhouse gas emissions and promote a just and sustainable energy transition.

Amid intermittent renewable sources such as solar and wind, one particular sector has been seeking greater recognition for its strategic potential: nuclear. With this perspective, Eliene Silva, a specialist and member of the Sustainability Committee of the Brazilian Association for the Development of Nuclear Activities (ABDAN), participated in the workshop, contributing proposals aimed at increasing the role of nuclear energy in Brazil's electricity mix.

"Nuclear energy can and must be treated as an ally in decarbonization, as it combines high energy density, low carbon emissions, and supply reliability. It is an essential pillar to ensure energy security in a context of growing electrification," says Eliene, who collaborated in the development of three impactful actions, 17 structuring actions, and two specific action plans focused on nuclear technology.

Among the highlights is the planning for the expansion of nuclear energy through large power plants to stabilize the system by 2050, and the use of Small Modular Reactors (SMRs) starting in 2035 to decarbonize energy-intensive segments such as industry and data centers. Another critical point is the proposal to accelerate the licensing and operation of a definitive repository for radioactive waste, considered a key element for the sector's sustainability.

ADVANCES AND CHALLENGES ON THE AGENDA

During the work sessions, the workshop groups prioritized actions that were relevant, feasible, and aligned with the plan's timeframe, which spans from 2025 to 2050. "It was a collaborative, technical, and multidisciplinary process. The nuclear sector showed that it is ready to take part in Brazil's energy transition with concrete proposals — including for long-standing issues, such as the regulatory framework and the diversification of reactor uses," explains Eliene.

Despite its current low share in Brazil's power generation — around 2.5% — nuclear energy is increasingly being recognized as a long-term solution to ensure supply stability and to meet the climate targets established in international agreements, such as the Paris Agreement. However, achieving this will require overcoming barriers such as regulatory modernization and creating financing models for new projects.

THE INTERNATIONAL EXAMPLE

Countries like Finland, Japan, and Spain have been reconsidering the strategic importance of nuclear energy in their power systems. Finland, for example, recently inaugurated the Olkiluoto 3 plant and is already seeing positive results: electricity prices have dropped, and supply security has improved. Japan, after a cautious period following Fukushima, has resumed its policy of operating nuclear plants. Spain, in turn, has postponed the timeline for shutting down its reactors, due to pressure for stable energy sources and the country's energy isolation.

RECOGNIZING NUCLEAR ENERGY AS A SYSTEMIC RESOURCE REQUIRES ROBUST PUBLIC POLICIES, REGULATORY PREDICTABILITY, AND APPROPRIATE FINANCING MECHANISMS.

Photo: Rovena Rosa/Agência Brasil

On the diplomatic front, the movement is also gaining momentum. In forums such as COP28, 28 countries committed to tripling their installed nuclear capacity by 2050 as part of the global decarbonization effort.

AN OPPORTUNITY FOR BRAZIL

In this context, the perception is growing that Brazil needs to strategically incorporate the use of nuclear energy. The completion of the Angra 3 plant — which will add 1,405 MW of capacity to the grid — and the development of new reactors are seen as essential steps to increase the source's share and ensure the resilience of the electricity matrix.

"The consolidation of nuclear energy as a pillar of Brazil's energy transition is not just a technical matter. It is a strategic choice involving sovereignty, energy security, and sustainable development," highlights Eliene. According to her, joint efforts among the public and private sectors and academia will be decisive in moving forward with the proposals discussed under the Climate Plan and putting them into practice with responsibility and transparency.

NEXT STEPS

The Climate Plan is now moving into the phase of consolidating and detailing the prioritized actions. The expectation is that, by the end of the year, the proposals will be incorporated into national mitigation strategies. For the nuclear sector, active participation in building this document represents a milestone. After all, it is the first time that this energy source receives structured attention within a Brazilian climate plan with clear targets and defined timelines.

According to experts, recognizing nuclear energy as a systemic resource — that is, essential to grid stability — must be accompanied by robust public policies, regulatory predictability, and appropriate financing mechanisms.

"If Brazil wants to be a protagonist in the global race for a low-carbon economy, it must consider nuclear energy as part of the solution. Decisions must be made now, based on technical evidence and a forward-looking approach. That is what the Climate Plan can represent," concludes Eliene. ▪

NT2E 2025 REINFORCES NUCLEAR LEADERSHIP IN BRAZIL

WITH OVER 3,200 PARTICIPANTS, THE FAIR PROMOTED STRATEGIC DEBATES ON THE ELECTRICITY MIX, MINING, ARTIFICIAL INTELLIGENCE, AND NUCLEAR MEDICINE

NT2E 2025 — the largest nuclear business and technology fair in Latin America — established itself as a milestone in Brazil's national energy agenda by bringing together, from May 20 to 22 at ExpoMag (Rio de Janeiro), representatives from the government, international organizations, industry, academia, and civil society to discuss the future of nuclear technology in the country. With more than 150 speakers, 30 panels, short courses, and representatives from 15 countries, the event reaffirmed the strategic role of nuclear energy in building a sustainable, technological, and secure future.

At the opening ceremony, leaders highlighted the decisive moment the sector is experiencing. "It's time to show that nuclear means cutting-edge technology, innovation, autonomy, Brazil, and leadership. NT2E 2025 is proof of that," said Celso Cunha, president of ABDAN (Brazilian Association for the Development of Nuclear Activities). Authorities such as the Minister of the Institutional Security Cabinet, General Marcos Amaro; the National Secretary for Geology, Mining, and Mineral Transformation at the Ministry of Mines and Energy, Ana Paula Bittencourt; and the IAEA Director General Rafael Grossi (via video) were also present, reinforcing Brazil's alignment with global decarbonization and energy security goals.

STRATEGIC AGREEMENTS

On the first day alone, NT2E hosted the signing of three strategic agreements. Amazul and IPEN formalized a partnership to develop irradiation centers and new materials. Westinghouse Electric Company and Constellation signed a confidentiality agreement focused on applications of the eVince microreactor on drilling platforms. The third partnership brought together ABDAN and ABH2 to foster synergies between the nuclear sector, low-emission hydrogen, data centers, and innovative technologies, with support from the Brazilian Data Center Association (ABDC).

ENERGY MATRIX AND MINING: CHALLENGES AND PATHWAYS

The second day of the event was marked by panels discussing the future of the electric grid, the uranium market, and the regulatory framework. In the panel "Challenges

for the Future of Brazil's Electricity Mix," moderated by Celso Cunha, experts pointed out the need for balance between renewable and firm energy sources. Marcello Cabral (ABEEÓLICA) and Marcio Trannin (ABSOLAR) advocated for technological complementarity, while Xisto Vieira (Brazilian Association of Thermoelectric Generators – Abraget) and Nazareno Araújo (National Water and Basic Sanitation Agency – ANA) emphasized the role of water resources. For Giovani Machado, former director of EPE, there is an urgent need to establish a new regulatory model that values stability and reliability — central attributes of nuclear energy.

Uranium mining was also a key focus. In a panel moderated by Caio Seabra (National Mining Agency – ANM), experts such as Marcos Lee (ADL Mineração), Marcelo Silvestre (Galvani), Felipe Tavares (INB), and Alexander Boytsov (Rosatom) discussed the growing global demand for the mineral, driven by the nuclear renaissance in several countries. Brazil, which holds the sixth-largest uranium reserve in the world, emerges as a key player in this new scenario.

REGULATORY FRAMEWORK: AN URGENT NEED FOR MODERNIZATION

The panel "Improving the Regulatory Framework" brought together leading figures in the sector, including Admiral Bento, Leonam Guimarães (Amazul), Alessandro Facure (CNEN), Reive Barros (Acropolis Energia), and Sanzio Pereira (INB). All were unanimous: Brazil's regulatory environment is fragmented and unpredictable, hindering investment and the expansion of nuclear energy. The proposal is clear: to create a modern framework aligned with international best practices, capable of unlocking projects such as Angra 3 and future SMRs (Small Modular Reactors).

HACKAPOWER: INNOVATION THROUGH YOUTH AND DIVERSITY

With 86 students from 37 universities and 52 cities, Hackapower 2025 reinforced NT2E's commitment to talent development and decentralized innovation. The competition, which runs through November, challenges young people to propose solutions in energy, sustainability, and food security. Additionally, a lecture on anti-racism marked this edition, promoting inclusion and equity in technological spaces.

ARTIFICIAL INTELLIGENCE AND ENERGY DEMAND

The event's closing addressed themes that connect cutting-edge technology with contemporary demands. In the panel "A World with Artificial Intelligence," moderated by Renan Lima (ABDC), experts such as Gustavo Brito (Stefanini IHM), Marco Fidos Jr. (ATECH), Marcos Raimundo

(UNICAMP), and Donato Silva (Volt Robotics) discussed AI's role in transforming critical processes, emphasizing the growing energy demand of data centers and the importance of nuclear energy in ensuring grid stability and system security.

NUCLEAR MEDICINE: ACCESS, REGULATION, AND PUBLIC POLICY

Another highlight was the robust program dedicated to nuclear medicine. In the panel "The Role of Nuclear Medicine in National Policy and Cancer Control in Brazil," Sibila Grallert (Center of Molecular Research – CMR), Elba Etchebehere (Brazilian Society of Nuclear Medicine – SBMN), Isolda Costa (IPEN/CNEN), and Congressman Reimont Otoni emphasized the urgency of expanding access to diagnostics and therapies within the SUS (Unified Health System). Subsequently, experts such as Hamilton Monteiro (Theia Nuclear), Dr. Claudio Tinoco (Pro Cardíaco Hospital), Renato Costa (ANVISA), and Dr. Gustavo Gomes (Clínica Núcleos) discussed the logistical and regulatory bottlenecks that impact the sector.

The shared conclusion was the need to modernize processes, integrate agencies, and boost nuclear medicine as a key ally of public health.

SCIENCE AND SOLIDARITY SIDE BY SIDE

NT2E 2025 also promoted a campaign to collect non-perishable food for social institutions. The initiative reinforces the nuclear sector's commitment to social responsibility and to building a more just country.

LIFE-SAVING TECHNOLOGY: THE CHALLENGES OF NUCLEAR MEDICINE IN BRAZIL

SCIENTIFIC ADVANCES, PRECISION THERAPIES, AND EARLY DIAGNOSES FACE STRUCTURAL BOTTLENECKS AND DEPENDENCE ON IMPORTED SUPPLIES

Imagine detecting cancer at an early stage, with extremely high precision, and beginning a treatment that targets the disease directly — with fewer side effects and a higher chance of success. This is the promise — and the reality — of nuclear medicine, a medical specialty that is transforming healthcare worldwide. However, despite its potential, Brazil still faces structural and logistical barriers that hinder the expansion of this technology, especially within the public healthcare system.

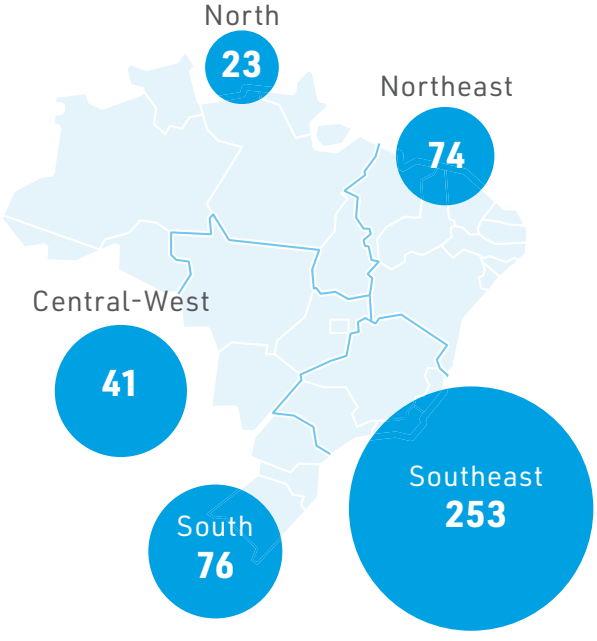
Nuclear medicine uses radioisotopes — unstable atoms

DISTRIBUTION OF NUCLEAR MEDICINE IN BRAZIL

The Southeast accounts for 54% of all facilities in the country

Nuclear medicine facilities

By region:



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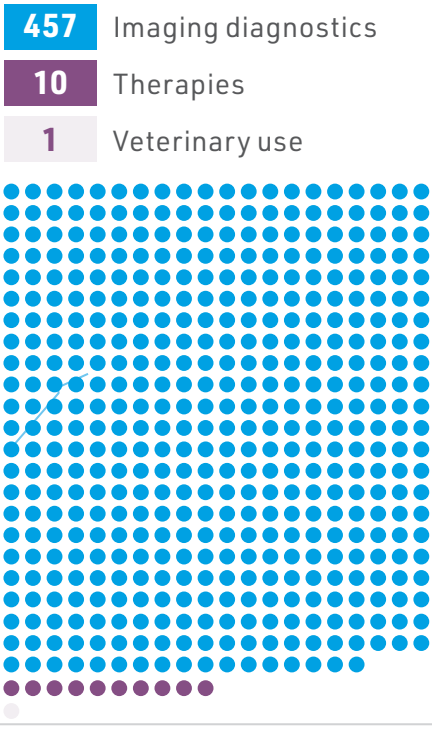

Source: ABDAN

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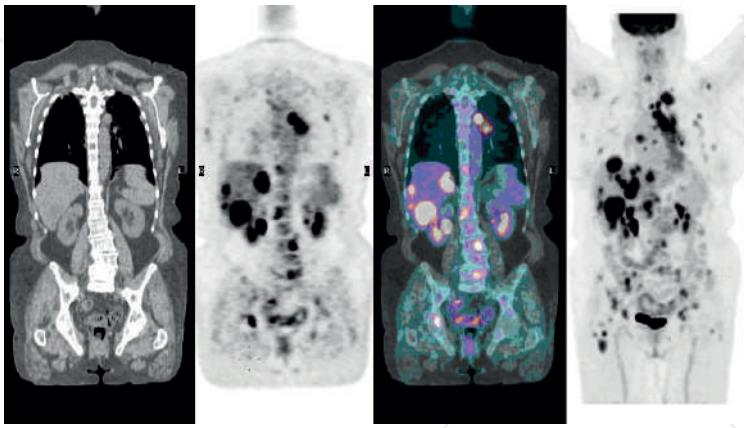


that emit radiation — for imaging diagnostics and targeted therapies. One of the field's major innovations is the so-called theranostics approach, which combines diagnosis and treatment in a single protocol. This personalized method allows for highly effective visualization and treatment of tumors, saving time — and lives.

BRAZIL GOING AGAINST THE GLOBAL TREND

The global nuclear medicine market, valued at between US$ 5 and 10 billion in 2022, is expected to exceed US$ 25 billion by 2030. This growth reflects not only scientific progress but also the rising demand for more accurate diagnostics and personalized treatments. Yet Brazil has not kept pace with this trend.

One of the main bottlenecks is the production and distribution of radioisotopes. Although the country has eleven cyclotrons — particle accelerators used to produce short half-life radioisotopes such as fluorine-18 — it still depends on external sources for the supply of molybdenum-99, the raw material essential for technetium-99m, a radiopharmaceutical used in around 80% of diagnostic procedures in the field.

A chart showing a wide range of isotopes used for diagnosis (blue) and therapy (orange) for various types of cancer and other conditions. Courtesy of Nuclear Medicine Europe.

"However, Brazil still depends on external sources for the supply of molybdenum-99, which is essential for producing technetium-99m, one of the most widely used radiopharmaceuticals in nuclear medicine. This external dependence and the logistical challenges involved in transporting radioactive materials pose significant obstacles for the specialty in the country," explains Sibila Grallert, Managing Director at CMR Pharma and member of ABDAN's Advisory Board.

Instability in the supply of this input directly impacts both the number and the quality of exams performed, potentially compromising early diagnoses and more effective treatments.

INEQUALITY IN ACCESS

Brazil currently has 467 nuclear medicine facilities, including hospitals, clinics, and specialized centers. Of these, 457 focus on imaging diagnostics, 10 operate with therapies, and one is dedicated to veterinary use. However, this distribution is uneven: 253 are located in the Southeast, followed by the South (76), Northeast (74), and Center-West (41).

"Despite this infrastructure, access to nuclear medicine services remains unequal, limiting the most vulnerable populations' access to technological advancements in the field," says Sibila.

This imbalance is especially felt within the Unified Health System (SUS), where the availability of radioisotope-based exams and treatments remains limited, forcing patients into long waiting lists or to resort to less effective alternatives.

STRATEGIC POTENTIAL AND THE NEED FOR PUBLIC POLICY

In addition to the direct impact on patients' lives, the nuclear medicine chain drives a complex ecosystem: it involves scientific research, the training of highly qualified professionals, and national technological development. It is, therefore, a strategic opportunity for the country.

"Nuclear technology plays a fundamental role in the modernization of medicine. The use of radioisotopes in diagnostics and treatment is an indispensable tool for saving lives and ensuring more precise medical approaches," says Celso Cunha, president of ABDAN.

According to experts in the sector, it is essential to strengthen the national technological infrastructure, stimulate research investments, and design specific public policies for nuclear medicine. The goal is clear: to ensure that all Brazilians — regardless of where they live — have access to a more modern, efficient, and humane healthcare system. ▪

NUCLEAR ENERGY, SUSTAINABILITY AND SOVEREIGNTY: THE PATHS DEFENDED BY CONGRESSMAN ARNALDO JARDIM

With a strategic view of Brazil's role in the global energy transition, Federal Congressman Arnaldo Jardim (Cidadania-SP) has stood out as one of the most active voices in the National Congress advocating for the peaceful and sustainable use of nuclear energy. Currently serving as Chair of the Energy Transition Committee in the Chamber of Deputies, Jardim has been leading legislative proposals—such as the creation of the Energy Transition Acceleration Program (PATEN)—and promoting debates on the future of Brazil's energy matrix. In this interview with Conexão Nuclear magazine, the lawmaker analyzes the obstacles and opportunities for expanding nuclear energy in Brazil, defends the need for a new legal framework for the sector, and explains how the country can combine energy sovereignty, economic growth, and decarbonization.

1 – You have advocated for resuming construction on Angra 3 and for expanding nuclear energy in Brazil. What are the main barriers to advancing this agenda, and how can they be overcome?

The viability of Angra 3 and nuclear expansion depends less on technology—Brazil already masters the nuclear fuel cycle—and more on political will, efficient governance, and creative financing. If integrated as part of a diversified matrix—not as a competitor, but as a complement to renewables—nuclear energy can strengthen Brazil's energy security in a green transition scenario.

The path forward requires technical dialogue, transparency, and strategic vision—especially when considering the investments already made in the sector, which cannot be jeopardized by a narrow analysis focused solely on the project's high costs, rather than a broader, global perspective.

The main barriers are a lack of investment, complexity and associated risks, and high costs. To overcome them, we need a new, modern legal framework that sets clear goals and streamlines processes. This will be essential to establish international partnerships, absorb more nuclear expertise, and attract foreign capital to invest in the sector.

2 – How do you view the role of nuclear energy in Brazil's energy matrix, particularly in complementing intermittent renewable sources such as solar and wind?

Nuclear energy can play a strategic and complementary role in Brazil's energy matrix, especially in light of the expansion of intermittent sources like wind and solar, and the growing climate challenges. Nuclear is not a competitor to renewables; it is a structural ally.

Countries that fail to include the nuclear component in their energy strategies will lose their "passport to the future." With its production versatility, nuclear energy is indispensable to Brazil's energy security.

Brazil has unique conditions to lead a low-carbon hybrid model: hydropower as "natural batteries," wind and solar as variable sources, and nuclear as a firm base. Angra 3 would be a symbolic step in this direction, but the strategy must

also include SMRs (Small Modular Reactors) and innovation in sustainable fuels. The key is to plan the energy system as an integrated ecosystem, not as isolated sources.

3 – You proposed the creation of a green guarantee fund to finance the energy transition. How could this fund benefit nuclear projects, and what would be the criteria for accessing these resources?

Law 15.103/25, which I authored, establishes the Energy Transition Acceleration Program (PATEN) and creates a green guarantee fund focused on mitigating the risks of complex low-carbon projects, including nuclear energy. Its design can catalyze investment in Brazil's nuclear sector by resolving longstanding bottlenecks—provided it is aligned with rigorous sustainability criteria.

PATEN is not a "subsidy." It is a risk-equalization mechanism. The regulation will define the executive branch agency responsible for analyzing the projects and will also establish the analysis criteria, procedures, and approval conditions. Companies will then be able to request that the National Treasury transfer tax credits they hold against the Union to the Green Fund, which will issue a guarantee to be used in securing project financing.

It is important to stress that no public funds will be allocated. The loan guarantees are backed by tax credits already granted by the Federal Revenue Service. Even in the event of default, the credits will be released on schedule, with no impact on the federal budget.

4 – You chaired debates on the importance of nuclear energy in the global context. What lessons can Brazil learn from other countries that have invested in nuclear energy, and how can these experiences be adapted to Brazil's reality?

In June 2024, the Energy Transition Committee of the Chamber of Deputies—which I chair—held an important debate on nuclear energy, featuring Rafael Mariano Grossi, Director General of the International Atomic Energy Agency (IAEA). According to him, the climate change scenario has contributed to increased recognition of nuclear energy as a key tool for decarbonizing the more polluting sectors of the economy.

Brazil can draw valuable lessons from countries with successful nuclear trajectories, adapting them to its own geographic characteristics, energy matrix, and industrial capacity. We must build our own path—but we can and should be inspired by others: China's industrial capacity, Canada's agility in developing SMRs, and the United States' creative financing and risk reduction strategies. Nuclear is not just energy; it is technological sovereignty. Brazil has uranium, niobium, and rare earths. What we lack is a national strategy to integrate them, as other countries do.

> **"NUCLEAR IS NOT A COMPETITOR TO RENEWABLES — IT'S A STRUCTURAL ALLY."**

5 – You have supported modernizing the legal framework for the nuclear sector and the creation of a parliamentary front to advance this agenda. What are the main aspects that need to be updated, and how can Congress help attract private investment in a secure and strategic way?

The update of Brazil's nuclear legislation should focus on enhancing safety, modernizing standards, and adapting the legal framework to new technologies and challenges, such as the energy transition and radioactive waste management. Additionally, we need to foster a favorable environment for public-private partnerships, facilitate corporate investment in workforce training, and establish clear and transparent communication rules.

Congress has the opportunity to transform Brazil into a 21st-century nuclear power—provided it develops financial instruments that attract private capital without giving up state control, since the sector is strategic for the country.

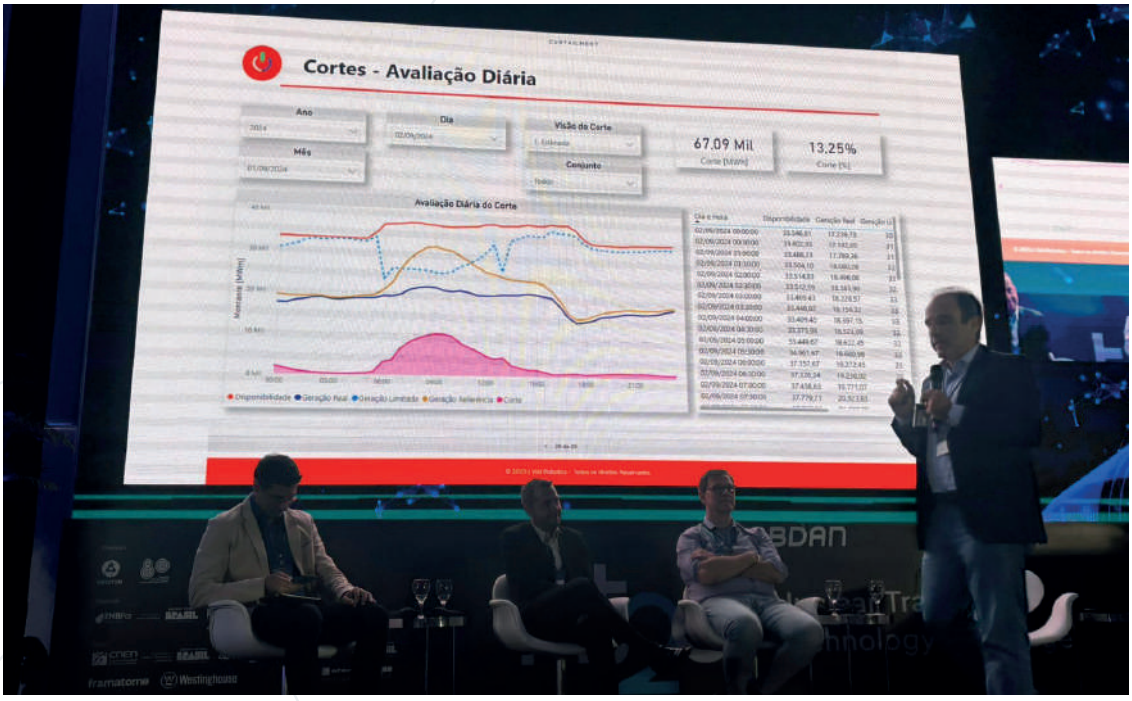
6 – Considering the importance of strategic minerals for the development of energy technologies, how do you assess Brazil's role in the global supply chain of these minerals, and what public policies are needed to strengthen this sector?

Brazil has exceptional geological potential in critical and strategic minerals, but it faces structural challenges in turning this into global leadership. We can evolve from being an exporter of mineral commodities to a global leader in green high-tech value chains. But this will require state coordination, pragmatic international partnerships—with a focus on technology—and an integrated vision that connects mining, energy, and industry.

That is why approving Bill PL 27/80 of 2024, for which I am the rapporteur, is so important. Authored by Congressman Zé Silva, who leads the Parliamentary Front for Sustainable Mining, the bill sets out guidelines for the sector, extending incentives for mining companies to explore inputs used in the energy transition. It will also define the taxonomy and governance rules. ▪

ARTIFICIAL INTELLIGENCE: A NEW FRONTIER FOR THE NUCLEAR INDUSTRY

NT2E PANEL HIGHLIGHTS HOW AI CAN TRANSFORM THE SECTOR AND HELP POWER THE DATA AGE



At a time when Artificial Intelligence (AI) is breaking barriers and redefining operations across virtually every productive sector, the topic is gaining traction in the nuclear industry as well. During NT2E 2025, the panel "A World with Artificial Intelligence" shed light on the impact of this technology in the nuclear field and, most notably, on the intersection between AI, data centers, and energy demand—a convergence that is already drawing attention from experts, investors, and policymakers.

Moderated by Renan Lima, president of the Brazilian Association for Computing Development (ABDC), the discussion brought together prominent figures such as Gustavo Brito (Stefanini IHM), Marco Antonio de Almeida Fidos Junior (ATECH), Marcos Medeiros Raimundo (UNICAMP), and Donato Silva (Volt Robotics). The panel covered a wide range of topics—from AI-driven advancements in safety and process automation in critical facilities to its role in the booming data center market and the urgent need for reliable energy sources to sustain it.

"Today, the energy load is no longer concentrated in generation but in distribution. In this context, placing a Small Modular Reactor (SMR) next to a data center addresses challenges that used to require multiple actors—government, infrastructure, concessions. It's a direct and strategic solution," said Renan Lima.

According to the ABDC president, Brazil currently has around 600 MW of installed capacity in commercial data centers. But the real opportunity lies in AI-training data centers, which do not require low-latency networks and can therefore be located in remote regions—as long as there is firm energy supply. "If Brazil manages to seize this trend, leveraging its already clean energy matrix and incorporating SMRs, we could position the country as a global reference in the sector," Lima added.

AI AND ENERGY: AN INEVITABLE CONVERGENCE

During the panel, experts emphasized that the growth of AI is directly tied to countries' energy capacity. "Language models like ChatGPT or machine learning systems require intensive and continuous processing. AI operates in real time, with decisions that must be made in either assisted or fully autonomous fashion. And that is only possible with energy stability," explained Professor Marcos Medeiros Raimundo from UNICAMP.

He noted that AI is no longer just a theoretical field. "The original focus was to model human intelligence—to understand how the brain thinks, learns, and solves problems. Today, with advances in machine learning, we're seeing systems that operate with massive volumes of data and produce complex responses—raising the bar in terms of energy demands," he said.

The panel also explored the practical implications of AI for operating nuclear facilities. AI-based tools are already being used to predict failures, optimize safety routines, interpret data in real time, and even assist in regulatory and technical licensing processes. In this context, intelligent automation is emerging as a key competitive advantage for the sector.

THE ROLE OF SMRS IN THE DIGITAL FUTURE

The experts' greatest bet, however, is on Small Modular Reactors (SMRs). In addition to offering greater flexibility and the ability to be installed close to demand centers, SMRs operate with high reliability, zero intermittency, and low carbon emissions—critical attributes for sustaining the data centers of the future.

"More than 90% of Brazil's power grid already runs on renewable sources. By incorporating nuclear energy—especially SMRs—we have a real opportunity to consolidate a clean and stable matrix that can support not only the digitalization of the economy but also the development of strategic sectors like AI," said Celso Cunha, president of ABDAN.

"WE ARE FACING SYSTEMS THAT OPERATE WITH MASSIVE VOLUMES OF DATA AND PRODUCE COMPLEX RESPONSES—SETTING A NEW STANDARD FOR ENERGY DEMAND."

A CONVERGING AGENDA

The NT2E 2025 panel left a clear message: the rise of Artificial Intelligence and the establishment of Brazil as a hub for data centers will not happen without energy planning—and nuclear energy must be a key part of that process.

Under ABDAN's leadership, Brazil's nuclear sector remains alert to the opportunities created by the digital revolution. The integration between AI and energy is no longer a possibility—it is an irreversible reality. And Brazil, with its technical expertise, clean energy matrix, and strategic resources, has all the elements needed to lead this new chapter. ▪

TOWARDS A NEW LEGAL FRAMEWORK FOR NUCLEAR ENERGY IN BRAZIL

ANALYSIS PROPOSES DEEP LEGISLATIVE UPDATES TO ATTRACT INVESTMENT, PROMOTE INNOVATION, AND ENSURE LEGAL CERTAINTY

Brazil is at a critical turning point for the nuclear sector. Although the country has a well-established legal structure—grounded in historical legislation and strict constitutional provisions—the current regulatory framework is no longer sufficient to meet today's technological, environmental, and economic challenges. That is the conclusion of a study by Leonam dos Santos Guimarães, Technical Director of ABDAN, who analyzes the main bottlenecks of the current legislation and proposes the creation of a new General Nuclear Energy Law.

This proposed legislation aims to update the set of rules currently governing everything from uranium mining to the production of radiopharmaceuticals. It would incorporate international best practices, ensure legal certainty, and open the door to public-private partnerships across several areas—including power generation.

KEY PILLARS OF THE PROPOSED NEW FRAMEWORK

The proposed legislation is structured around the following core pillars:

- **Modernization of the State's role**: Maintaining sovereign control while allowing regulated private sector participation in areas such as mining, fuel production, and radioisotope development.
- **Establishment of ANSN (National Nuclear Safety Authority)** as an independent regulatory agency, with resources and authority aligned with international best practices.
- **Creation of a National Council for Nuclear Policy**, tasked with coordinating interministerial actions and defining strategic directives.
- **Adoption of updated technical standards**, based on IAEA (International Atomic Energy Agency) benchmarks.
- **Promotion of innovation and knowledge production** through partnerships with universities and research centers.

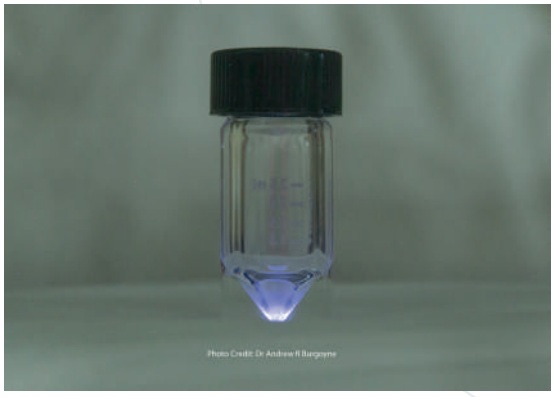
WHAT WOULD CHANGE COMPARED TO THE CURRENT MODEL?

Electricity Generation Today, only Eletronuclear is authorized to operate nuclear power plants. The new law would introduce a concession or authorization regime, maintaining state control while enabling private investment and the construction of Small Modular Reactors (SMRs).

Mining and the Nuclear Fuel Cycle Currently under the exclusive control of INB, the proposal would allow partnerships with the private sector through cooperation contracts, under the oversight of ANSN and ANM (National Mining Agency), expanding exploration of Brazil's geological potential.

Medical and Industrial Applications Following Constitutional Amendments 49/2006 and 118/2022, which opened radioisotope production to the private sector, the new law would establish clear rules for safety, licensing, and quality control in this emerging environment.

Safety and Safeguards The proposal strengthens ANSN's role as the full regulatory authority, establishing mechanisms for accident prevention, physical protection, and cybersecurity of nuclear facilities, while also ensuring transparency and public participation in decision-making processes.



KEY PROPOSALS

CREATION OF A NUCLEAR EMERGENCY FUND
To finance rapid-response actions and compensation in the event of accidents.

NATIONAL NUCLEAR ACCOUNTING SYSTEM
To ensure full traceability of all nuclear materials within the country.

NATIONAL SITE PLAN FOR NUCLEAR FACILITIES
Would eliminate the need for a separate law for each new nuclear project.

MANDATORY R&D INVESTMENT
Sector companies would be required to allocate a percentage of their revenue to research and innovation.

INSTITUTIONAL ADVANCEMENT: MORE SECURITY, MORE INVESTMENT

Leonam's proposal emphasizes that a clear and modern legal framework is essential for Brazil to fully realize its nuclear potential. This means not only completing stalled projects like Angra 3 but also fostering a favorable environment for attracting new investments—especially in emerging technologies such as SMRs and advanced reactors.

In addition, the legal certainty offered by a robust regulatory framework is key to integrating Brazil into global nuclear value chains—whether through the export of radiopharmaceuticals, scientific collaboration, or the sale of clean, reliabl ▪

ACCESS THE FULL STUDY

Want to explore all the details of the proposal to modernize Brazil's nuclear legal framework? Scan the QR code and read the full article on ABDAN's website.

A SMOKELESS AMAZON: WHY NUCLEAR ENERGY COULD BE A KEY PIECE IN THE REGION'S ENERGY TRANSITION

FOCUSED ON DECARBONIZATION AND ACCESS FOR REMOTE COMMUNITIES, THE AMAZON REQUIRES INNOVATIVE SOLUTIONS

On the map of Brazil's energy transition, there is a region where the challenges are as vast as its strategic importance: the Legal Amazon. With its immense territory, countless isolated communities, high logistical costs, and environmental sensitivity, the search for clean and reliable energy sources has become urgent—not only from an environmental standpoint, but also socially and economically. In this context, once-distant technological alternatives such as Small Modular Reactors (SMRs) are beginning to gain ground in discussions about the future of the region's energy mix.

According to the perspective of ABIAPE (Brazilian Association of Self-Production Energy Investors), no single energy source will be sufficient to tackle the challenge. "It's important to remember that there's no one-size-fits-all solution to complex problems. In this sense, nuclear energy—especially through SMRs—is a promising option to complement the energy matrix of the Legal Amazon and support the region's decarbonization," says Mário Menel, president of the association.

His statement reflects a necessary pragmatism: in the short term, SMRs won't replace currently operating sources such as diesel, which is still widely used in isolated systems. However, nuclear technology—non-emitting and capable of continuous operation—could be strategic in areas where transporting fossil fuels comes with high costs and ongoing logistical risks. "Although the technology still faces hurdles such as regulatory development and public acceptance, it offers a medium- to long-term alternative, especially in very remote areas where fuel transport is expensive and risky," Menel adds.

This long-term perspective aligns with a broader movement the Brazilian government is trying to establish. With the launch of the Energias da Amazônia program, federal authorities have opened a direct channel with the private sector to stimulate projects aimed at decarbonization and increased energy security in the region. The public calls for proposals include not only large infrastructure works but also energy efficiency initiatives, storage solutions, and microgeneration.

"The challenges are significant. Environmental licensing processes are complex throughout Brazil, and even more so in the Amazon, given the region's environmental and social sensitivity," says the ABIAPE president. In addition to environmental concerns, logistics pose a major obstacle: in many places, access is only possible by boat or plane. This physical isolation demands energy solutions with low maintenance, high reliability, and long operational life—all of which are areas where nuclear technology, including SMRs, can make a real difference.

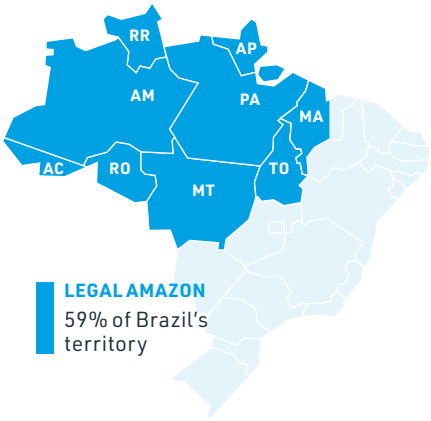
Even so, Menel believes the Energias da Amazônia program creates real opportunities for private sector participation—even with smaller investments and controlled risks. "The call for proposals includes a range of actions beyond large-scale construction. This allows companies to participate with smaller-scale investments and manageable risks."

A COLLECTIVE EFFORT

In parallel, ABIAPE is also closely monitoring hybrid models—that is, the combination of different renewable sources with storage systems. The idea is to balance the strengths of each technology while mitigating their limitations. "Once again, there's no single solution for complex problems. In this sense, hybridization is a sound path forward, as it brings out the best in each technology," says Menel. He also notes that this model is being encouraged through the 2025 Isolated Systems Auction, which promotes configurations that rely heavily on renewable energy.

The critical variable in this context is energy storage. Without it, integrating intermittent sources like solar be-

NUCLEAR ENERGY OPPORTUNITIES FOR THE AMAZON



Reduces costs and logistical risks
Eliminates the expensive transportation of fossil fuels

Zero greenhouse gas emissions
Continuous operation with no air pollution

Low maintenance and high reliability
Ideal for hard-to-reach areas

Source: ABDAN

WITH ISOLATED COMMUNITIES AND HEAVY DEPENDENCE ON FOSSIL FUELS, THE LEGAL AMAZON URGENTLY NEEDS AN ENERGY TRANSITION. SOLUTIONS LIKE SMRS, HYBRID RENEWABLES, AND STORAGE ARE GAINING TRACTION IN A DEBATE THAT GOES FAR BEYOND INFRASTRUCTURE—IT'S ABOUT SOVEREIGNTY, THE ENVIRONMENT, AND THE FUTURE.

Photo: Andre Deak

comes a risk to system reliability. "Without storage, system operations become more complex and less reliable. Advancements in this area will be decisive to ensure grid stability in the region and reduce dependence on fossil fuels," he adds.

The pursuit of both energy and regulatory stability also relies on institutional efforts. ABIAPE has been actively involved in discussions with the federal government and advocates for measures that reduce emissions while easing the burden of the Fuel Consumption Account (CCC), one of the major bottlenecks in the Legal Amazon's power sector.

"ABIAPE has publicly expressed support for government initiatives aimed at decarbonizing the Legal Amazon, particularly the Energias da Amazônia Program. The association is especially supportive of measures that help reduce emissions while also lowering CCC costs," says Menel.

The Legal Amazon demands more than promises—it requires technical solutions, strategic vision, and institutional coordination. Among the emerging alternatives, nuclear energy—and particularly SMRs—is beginning to occupy a legitimate place in conversations about the region's future. Not as a silver bullet, but as part of a collective effort to build a smokeless, more integrated, more stable, and cleaner Amazon. ▪

POWER SECTOR IN TRANSITION: CHALLENGES AND OPPORTUNITIES

EXPERTS STRESS THE NEED TO RECOGNIZE THE VALUE OF FIRM POWER SOURCES AMID MARKET LIBERALIZATION AND HIGHLIGHT THE STRATEGIC ROLE OF NUCLEAR ENERGY IN BRAZIL'S ENERGY SECURITY

The reform of Brazil's electricity sector is underway and promises to profoundly reshape how energy is generated, traded, and consumed across the country. As discussions advance around full market liberalization—which would allow all consumers, including low-voltage residential users, to freely choose their energy supplier—concerns are also growing over the impact of this modernization on traditional and firm power sources, such as nuclear energy.

According to Mario Menel, president of the Brazilian Association of Self-Production Energy Investors (ABIAPE), nuclear energy could face significant challenges in this new scenario. "Competition among all sources, with a focus on price and flexibility, may create a tough environment for nuclear, which offers limited operational flexibility—especially as intermittent renewable sources like solar and wind gain ground," explains the expert.

Beyond flexibility, the high capital cost of nuclear projects is another sensitive issue. "Nuclear energy requires very large upfront investments and long maturation periods. These factors make it harder to develop new projects in a market that favors quicker returns and less capital-intensive ventures," Menel adds.

STRATEGIC ROLE

Despite these challenges, Menel believes there is room for nuclear energy to play a strategic role in the redesigned electricity sector—particularly due to its capacity to ensure energy security and its low carbon emissions.

"Nuclear power generation is independent of hydrological conditions and extreme weather events, which makes it highly reliable. That's a crucial advantage in a system seeking stability amid growing reliance on intermittent sources," he states.

To ensure nuclear energy remains competitive in this new environment, Menel argues that value must be placed not only on the electricity delivered, but also on the specific attributes of each source. "For nuclear, reliability is an asset that must be priced. This could be done, for example, by creating a capacity market," he suggests.

The executive also stresses the importance of regulatory and institutional progress. "Environmental agencies need to accelerate licensing processes, and investors must have legal certainty. Only then will new projects—including private sector participation—be viable."

STATE-LED PRESENT, HYBRID FUTURE

Currently, the leadership of Brazil's nuclear sector lies with Eletronuclear, the state-owned company that operates Angra 1 and Angra 2, and is building Angra 3. According to Menel, the company will remain the sector's main player in the short and medium term. Still, a more dynamic role is possible as the market opens.

"In a liberalized market, Eletronuclear could position itself as a long-term provider of firm power, offering predictability and stability to consumers who value those attributes," he points out.

Looking ahead, the nuclear sector could evolve to include private projects—particularly with Small Modular Reactors (SMRs). "The growth of these projects would depend on changes to the legal framework, since current Brazilian law grants a state monopoly over nuclear power generation. Opening the sector to private initiatives could boost dynamism and attract investment," says Menel.

"WITH HIGH CAPITAL COSTS AND LOW FLEXIBILITY, NUCLEAR ENERGY SEEKS RECOGNITION FOR ITS RELIABILITY AND STRATEGIC ROLE IN ENERGY SECURITY."

ENERGY SECURITY IN FOCUS

While energy market liberalization brings many opportunities, it also introduces risks—especially regarding supply security. According to Menel, a major concern is the possibility of overlooking the technical attributes of different sources during the reform process.

"If the reform is guided solely by the price of generated electricity, without factoring in reliability and flexibility, we risk compromising the security of the national power system," he warns.

In this context, nuclear energy emerges as a strategic ally. "Nuclear generation enhances system stability and ensures continuous supply—particularly during hydrological crises or periods of low renewable output. Additionally, it helps Brazil meet its carbon reduction targets," he emphasizes.

MODERNIZATION THROUGH PLANNING

To ensure that power sector reform meets its goals without undermining energy security or sidelining strategic sources like nuclear, Menel calls for careful planning and a balanced approach. "Modernization is necessary, but it must come with mechanisms that recognize and reward all the services delivered by different energy sources. Otherwise, we risk penalizing the very technologies that contribute the most to system stability," he concludes.

As reform discussions continue in Congress and among sector stakeholders, the future of nuclear energy in Brazil remains open—and closely tied to the country's ability to build a modern, sustainable, and secure energy market for all Brazilians. ▪

SMR REGULATION IS CRUCIAL IN THE MARITIME ENVIRONMENT

WITH THE GROWING USE OF SMALL MODULAR REACTORS IN MARITIME CONTEXTS, BRAZIL BETS ON STRATEGIC REGULATION TO ENSURE SAFETY WITHOUT HALTING INNOVATION

Small Modular Reactors (SMRs) represent a promising technological frontier for energy generation in isolated environments, such as ships and naval platforms. However, innovation brings the challenge of adapting — without weakening — existing regulatory frameworks. In this context, the role of the Naval Secretariat for Nuclear Safety (SecNSNQ) is strategic: the agency is responsible for ensuring that Safety, Security, and Safeguards (3S) go hand-in-hand with the technical and regulatory feasibility of these projects.

Created in December 2022 and headquartered in Rio de Janeiro, the SecNSNQ is responsible for regulating, licensing, supervising, and controlling both civil and military vessels equipped with onboard nuclear plants, ensuring nuclear safety, radiation protection, and the transportation of nuclear fuel in maritime and river environments. The Secretariat comprises around 50 specialists, primarily PhDs and MScs in physics and engineering.

According to Admiral Petronio Augusto Siqueira de Aguiar, Naval Secretary for Nuclear Safety and Quality, striking a balance between nuclear safety and minimizing regulatory impacts is a demand from society itself. “While society demands safety, it also wants access to the benefits that ionizing radiation can bring to daily life—in energy, medicine, agriculture, industry, and beyond,” he affirms. In his view, particularly in maritime applications, nuclear energy has strong potential to reduce CO_2 emissions—whether used for propulsion or to generate electrical and thermal energy for offshore installations.

“Obviously, it is the nuclear regulator’s role to protect the public and the environment from the harmful effects of radiation, but that goal must be pursued using a graded approach,” he explains. This approach, he says, allows the regulator to impose stricter requirements on higher-risk activities, while avoiding over-regulation that could drive up service costs and, consequently, affect society as a whole.

According to the Naval Secretary, “every industrial activity carries risk, and the challenge is to determine what level of risk is acceptable.” He points out that, generally, beneficiaries of a given activity tend to tolerate more risk than those who do not benefit from it—such as in air travel. “It’s understood that beyond a certain point, reducing risk further requires disproportionate investment. This is the basis upon which the regulator imposes requirements,” he notes. He also emphasizes the importance of establishing technologically neutral requirements.

From the Admiral’s perspective, international regulatory harmonization is not just a viable path—it’s the best path to accelerate naval SMR projects. He draws a comparison with civil aviation, where shared global standards allow aircraft to be built in one country, fueled in another, piloted by professionals from a third, and operated in multiple jurisdictions. “There must be harmonization so that any country can clearly understand which requirements a nuclear-powered vessel complies with. This also allows for joint work between regulators,” he explains.

Brazil, he adds, has played an active role in this global conversation. “Both the SecNSNQ and DRS/CNEN (future ANSN) are part of the IAEA’s Nuclear Harmonization and Standardization Initiative (NHSI), in broad cooperation,” he emphasizes.

Another key point is the importance of close interaction between the regulator and license appli-

"OBVIOUSLY, IT IS THE NUCLEAR REGULATOR'S ROLE TO PROTECT THE PUBLIC AND THE ENVIRONMENT FROM THE HARMFUL EFFECTS OF RADIATION, BUT THAT GOAL MUST BE PURSUED USING A GRADED APPROACH."

cants, especially in innovative projects. Augusto highlights that this proximity is recommended by the International Atomic Energy Agency (IAEA) for any nuclear activity. "Such collaboration—without compromising regulatory independence—is encouraged to accelerate licensing and optimize efforts among regulators, designers, builders, and operators," he states.

In the case of innovative reactors, this relationship becomes even more critical, since regulatory requirements are usually broader and specific guidance on how to meet them may be lacking. "Often, dialogue is necessary to refine First-Of-A-Kind (FOAK) project designs," he says. He notes a growing trend toward pre-licensing processes, in which discussions of sensitive topics begin even before sufficient information is available for formal licensing.

Regarding cooperation among regulatory authorities to avoid redundant licensing, the Naval Secretary notes that the industry's long-standing ambition has been to achieve a single licensing system accepted by all countries. "In the past, there were some efforts toward this goal, but they fell short. More recently, the IAEA has chosen to invest in the harmonization and standardization of approaches between regulators and the industry," he explains. While a unified license may still be far off, he says the current recommendation is for regulators to establish bilateral or multilateral agreements to share information and mutually recognize safety assessments.

"Joint licensing will depend on the maturity level of the regulators involved, the formalization of shared information, and the conditions laid out in those agreements," he states. To that end, the parties must harmonize their requirements and assessment methods and have compatible licensing processes. "Work done by one regulator should not have to be repeated by another," he emphasizes.

REGULATORY MONITORING COMMISSION

In Brazil, the SecNSNQ has established a Monitoring Commission for the Regulation of Vessels with Onboard Nuclear Plants, which oversees ongoing activities and exchanges information with key stakeholders in the sector. "Within the Naval Nuclear Safety and Quality Directorate, a dedicated department was also created to address new technologies," he adds. At the national level, Petronio stresses that all relevant regulatory bodies involved in a given installation should also establish agreements to avoid redundant licensing.

Commenting on the challenges of licensing FOAK (First-Of-A-Kind) technologies, the Secretary points to the lack of project maturity and the regulatory requirements themselves as the main obstacles. "That's why building prototypes and experimental stations for safety demonstration is necessary," he explains. According to him, this process often leads to revisions—either to the design or the requirements themselves—which is natural in innovation. "One way to mitigate these issues is through early engagement between regulators and stakeholders to anticipate potential difficulties," he says.

Finally, on the application of the 3S principles (safety, security, safeguards) to the regulation of maritime SMRs, Petronio affirms that they are applied in the same way as for land-based facilities, but with attention to the specific characteristics of the maritime environment. "Many of these installations will be in constant motion, which complicates oversight and monitoring," he notes. The challenge, therefore, is to develop regulatory mechanisms that protect the environment and the population without hindering the advancement of a technology that could represent a strategic leap for Brazil in energy and naval innovation. ▪

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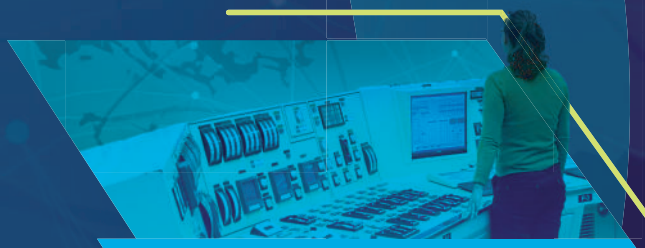


RESEARCH REACTORS

INDUSTRIAL PLANTS

- INTEGRATED LOGISTICS MANAGEMENT
- LICENSING PROCESSES
- IMPLEMENTATION AND COMMISSIONING
- TRAINING, ASSISTED OPERATION, AND MAINTENANCE
- GLOBAL EXPERIENCE IN THE NUCLEAR MARKET
- SYSTEMS INTEGRATION
- HARDWARE ENGINEERING
- NUCLEAR-QUALIFIED SOFTWARE

POLINA LION: "WITHOUT NUCLEAR ENERGY, CARBON NEUTRALITY IS IMPOSSIBLE"

ROSATOM'S DIRECTOR OF SUSTAINABILITY DEFENDS NUCLEAR ENERGY AS A KEY ELEMENT IN ACHIEVING CARBON NEUTRALITY AND OUTLINES THE COMPANY'S INITIATIVES TOWARD A CLEANER, SAFER, AND MORE COOPERATIVE ENERGY FUTURE.

On the eve of COP 30, which will be held in Brazil, Conexão Nuclear interviewed Polina Lion, Director of the Sustainable Development Department at the Russian state corporation Rosatom. She is responsible for implementing sustainability practices within the company, participating in global climate dialogues, and strengthening international cooperation in green technologies.

"Sustainable development for us is not just a strategy, but an integral part of our business model," she states. According to her, achieving carbon neutrality is impossible without nuclear energy. In this interview, she also discusses the energy transition, the role of nuclear energy in that process, innovative nuclear technologies such as fast reactors, and the principles guiding Rosatom's international cooperation.

1 – In recent years, an increasing number of countries have recognized the importance of nuclear energy in meeting climate goals. How does Rosatom view its role in this process?

Without nuclear energy, achieving carbon neutrality is impossible. Nuclear energy does not produce direct CO_2 emissions, and the greenhouse gas emissions across its entire life cycle are minimal—comparable to wind, solar, and hydropower.

At Rosatom, we view nuclear energy as the foundation of a future sustainable energy system: clean and reliable. We are actively present in more than 60 countries, including Brazil, promoting partnerships, implementing new technologies, and offering integrated solutions in clean energy and other green areas.

Furthermore, nuclear technologies go beyond the energy sector. They are used in medicine for cancer diagnosis and treatment, in agriculture to increase productivity and protect crops from pests, and in water supply for purification and desalination. These innovations improve quality of life and contribute to achieving the UN's Sustainable Development Goals (SDGs).

2 – What initiatives is Rosatom implementing to make nuclear energy even "greener"?

It is important to remember that the "green" nature of a technology is not defined solely by its low CO_2 emissions. A key criterion is the responsible use of natural resources and the introduction of recycling processes in the production cycle. This is also how we approach sustainable nuclear energy.

In the near future, nuclear energy could become not only ecological but also renewable. Rosatom is working to close the nuclear fuel cycle, which will allow for the reuse of irradiated fuel. Russia is the only country in the world currently operating industrial-scale fast reactors (BN-600 and BN-800) and continues to expand this technology. The major advantage of these reactors is their ability to efficiently use plutonium and uranium-238, converting them into new fuel. This significantly reduces radioactive

waste and increases the utilization of natural uranium, multiplying the resource base of nuclear energy without the need for new mines.

At the Siberian Chemical Plant, the Fabrication/Refabrication Module (MFR) for the BREST-OD-300 fast reactor has entered pilot operation. This is the world's first fast reactor using lead coolant, under construction since 2021. Together with the MFR and irradiated fuel reprocessing facilities, it forms the Experimental Demonstration Energy Complex (ODEK), where, by 2030, it will be possible to completely close the nuclear fuel cycle—an unprecedented achievement in energy history.

Simply put, after the initial fuel load, ODEK will become self-sufficient in fuel, regenerating the necessary material internally. The SNUP fuel (derived from irradiated fuel) will be reprocessed and reused in the cycle—only fission products are removed, and depleted uranium is added. ODEK will serve as the basis for the first serial fast reactors—the BR-1200 and BN-1200M, scheduled for construction after 2030.

Rosatom is also developing other green technologies: small modular nuclear power plants (SMRs), wind energy, and both stationary and mobile energy storage systems. SMRs, in particular, are a promising solution for remote or isolated regions where large nuclear power plants are technically or economically unfeasible. They ensure continuous clean energy supply and can be integrated with renewable sources such as solar and wind. Thanks to their efficiency and adaptability, these solutions are attracting interest from countries with diverse climates and infrastructure.

While nuclear energy provides baseload power to the grid, renewable sources help meet peak demand.

However, we know that these sources are entirely dependent on weather conditions: there isn't always wind, and sunshine forecasts are not always reliable. That's why Rosatom is also investing in battery development and storage technologies to stabilize renewable energy generation.

3 – Rosatom is one of the largest international corporations in the sector, with a diversified business portfolio. How do you manage to implement sustainable development principles within such a complex structure?

Sustainable development for us is not just a strategy, but an integral part of our business model. To enhance the sustainability level of our product line, we implemented an internal ESG qualification process at Rosatom. This is a questionnaire with 50 ESG-related questions through which we assess how aligned each business area is with sustainable development criteria and provide recommendations on how to further strengthen compliance with these principles.

4 – This year, Brazil will host COP 30 – the main international climate summit. What will be your priorities at the event?

Rosatom has actively participated in UN climate conferences in recent years, and COP 30 will be my fifth consecutive edition. Every year, on the COP platform, we discuss the role of nuclear energy in achieving global climate goals, present the "green" attributes of nuclear energy, and share experiences and best practices from implementing nuclear projects in different countries.

Each year, participants show greater interest in innovative nuclear solutions such as small modular reactors (SMRs) and fast reactors. These technologies significantly enhance fuel efficiency, minimize radioactive waste, and raise the safety standards of nuclear energy.

It is essential for us that nuclear energy be fully recognized within the climate agenda, on equal footing with other "green" energy sources. This matters not only in terms of public recognition but also in enabling countries and companies to use the "green atom" as an official tool to meet their climate goals.

For this to happen, the international nuclear community is working to include nuclear energy in strategic documents and climate regulations—for example, in green finance taxonomies, which define the criteria for accessing credit and investments under preferential conditions.

5 – What core principles guide Rosatom in its international cooperation efforts?

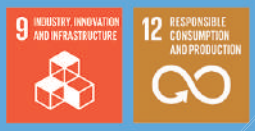
We always focus on long-term partnerships, scientific and technical exchange, and local capacity building. Given the scale of nuclear projects, it is not enough to just provide technology: it is essential to train professionals, develop local industries, and create jobs. This model allows partner countries not only to access the most advanced nuclear technologies but also to build their own sustainable energy systems—with autonomy and security. ■

Rosatom and the UN Sustainable Development Goals

How nuclear sector technologies help address global ESG challenges

NPPs and SMRs

Waste management



Wind energy

Smart cities

Hydrogen

Clean water

Nuclear medicine

International logistics

Functional irradiation centers

Composite materials

Environmental sustainability, positive social impact, and efficient governance are the ESG principles that underpin Rosatom's approach. Its product portfolio is focused on solving a broad range of challenges that cover all 17 of the UN Sustainable Development Goals.

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