CLIMATE
Nuclear industry working for the planet

INNOVATION
Inventing a sustainable future

JOBS
Tomorrow's nuclear industry needs you!

YELLOW TOMORROW

DIVERSIFICATION

Nuclear energy

where you don't expect it

orano

“A NEW ERA IS BEGINNING...”

Open letter

Claude Imauven
Chairman of the Board of Directors

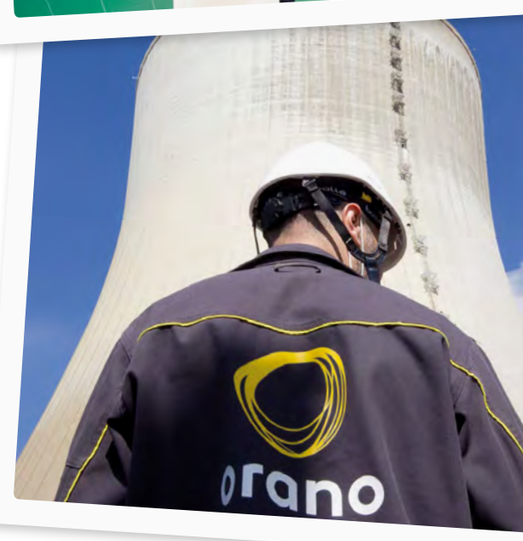
The return of nuclear energy to the spotlight is significant and deep-rooted. First and foremost, we are undergoing an energy crisis at a time of geopolitical upheaval, which makes energy sovereignty a strategic imperative. France, which has chosen nuclear energy, produces over 50% of its energy domestically. This is a major advantage.

And there is of course the fight against climate change. By helping to produce safe, low-carbon electricity at a competitive cost, nuclear energy is one of the solutions for achieving carbon neutrality by 2050. We are witnessing the start of a new era in which electricity will play an ever-increasing role in our daily lives, gradually replacing fossil fuels. To meet the challenges of this expansion, our country has a robust electricity grid, low-carbon production resources and leading energy operators.

Nuclear energy is France’s third-largest industrial sector and a source of national pride. The investments planned in the nuclear industry, in particular for building new reactors, are good news for our country’s industrial fabric and employment and will contribute to its reindustrialization.

Nuclear energy is therefore, a real asset for meeting the many challenges we face. The Orano group is going further, working not only for the generation of low-carbon electricity, but also for resource conservation and health, while continuing to invest in the regions where it operates.

Nuclear energy is a young energy with a bright future and we are proud to contribute to its ever-increasing use.



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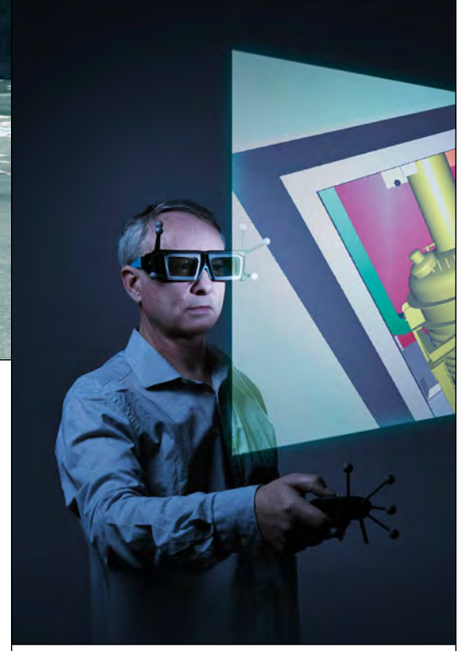

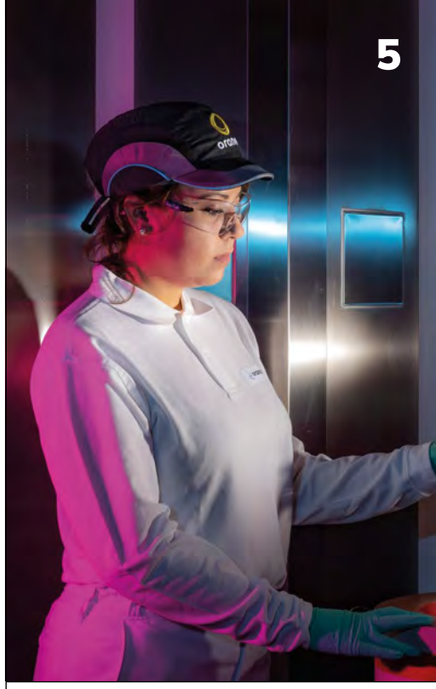

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Max Fressonnet,
2nd year student at MINES ParisTech

Committed to environmental issues, especially climate and biodiversity, Max is more specifically interested in decarbonization, energy efficiency and the reduction of its consumption.
One of his favorite pastimes is reading science fiction, which inspires him with its exploration of scientific progress and socio-political impact.

Philippe Knoche
Chief Executive Officer

Appointed Chief Executive Officer of Orano upon its founding in 2018, Philippe is an engineer from the Corps des Mines and a graduate of the École Polytechnique. He joined the Areva group in 2000 as Head of Strategy.
Skiing and sailing are two of his favorite pastimes. These sports involve endurance and commitment and are at the nexus of nature and technology, just like the nuclear energy sector.

Nuclear
A meeting of generations

It is 5 PM at Orano's head office.
Philippe and Max meet to discuss the issues of energy transition, a major challenge for future generations.

Energy: what are the issues?

Max Fressonnet
I'm interested in energy issues for several reasons. First of all, there is fighting climate change with the necessary decarbonization of energy as we move away from fossil fuels. Then there are the various energy crises we have experienced over the past year, which have made us realize that energy independence is vital for a country like France and for a continent like Europe.

Philippe Knoche
Energy is a daily concern for all of us and a major issue for the future. Besides climate considerations, it has become a matter of national sovereignty. Thanks to nuclear energy, France produces more than 50% of its energy requirements.

M.F. I would point out that the issues of climate change and energy price independence are closely related. For these two reasons, the solution is to end our dependence on fossil fuels.

P.K. You're right. Europe produces only 29% of its primary energy with clean energy sources, while 70% of its energy is still based on fossil fuels, the first consequence of which is an impact on climate change. The second consequence is an energy dependence that makes us vulnerable to a certain extent. Because uranium has a much higher energy density than hydrocarbons (100 g of natural uranium = 1 ton of crude oil), it is more easily stored. In France, there is typically a two- to three-year stockpile in case of a supply interruption, not counting the reserve of depleted uranium held by Orano, which adds several years. For fossil fuels, it is difficult to have a reserve of more than a few months. This nuclear reserve generates price visibility and a degree of sovereignty that is quite strong. There is a consistency between the demands of decarbonization, energy sovereignty and, ultimately, competitiveness.

Electricity: The energy of the 21st century?

M.F. As electrification of our society and activities becomes inevitable, low-carbon electricity is more than ever an important source.

P.K. Indeed, power consumption will increase considerably. Most global studies estimate a doubling or even tripling of demand by 2050. That's a lot. Meanwhile, electrification is

gaining momentum. For example, there are 10 million electric cars on the road worldwide, which could increase to more than 100 million by 2030. This will be an entirely different world.

M.F. After that, the question is: What is the best electricity mix to provide decarbonized electricity that meets the increase in this demand? The RTE report points out that the mixed nuclear and renewable scenarios are the most efficient. However, it is conceivable for electricity to be generated solely from renewable sources, though that approach has its challenges with cost and land use.

P.K. Yes, if we want to meet the challenges of climate change, energy sovereignty, surging electricity demand and competitiveness, we will need both nuclear energy and renewables. The RTE report shows that the scenarios with a nuclear/renewable mix cost up to €20 billion per year less than the 100% renewables scenario. This is not insignificant. These are also the most reliable and environmentally friendly scenarios.

M.F. Hasn't the closure of nuclear energy facilities for maintenance come at the worst possible time? The RTE scenario with the largest nuclear segment envisions extended lifetimes of up to 60 years. Is that possible?

P.K. Nuclear energy sites are closely monitored technological facilities. Safety must always be verified and prioritized, and all of the equipment except for the reactor vessel itself can be replaced. If there are no safety risks, then these facilities should be kept in operation for a lifetime of 60 years or more. In the United States, reactors have received extended licenses to operate for up to 80 years.

Nuclear energy & climate

M.F. Nuclear energy is one of the solutions for decarbonizing energy production, which is the primary source of global CO_2 emissions. I also see it as a solution for supporting the significant increase in electricity consumption, which will be amplified by the reindustrialization of France.

P.K. Nuclear energy is one of the least CO_2 emitting sources of power generation and is comparable to wind power. Nuclear energy generates 4 times less emissions than solar power, 40 times less than gas and 70 times less than coal. It is an energy that is essential to energy transition and the carbon neutrality objective. Many expert reports (RTE, IPCC, IEA, etc.) acknowledge that nuclear energy is an important component of the energy mix for achieving the Paris Agreement goal of keeping global warming below 1.5°C.

> **"Most global studies estimate a doubling or even tripling of electricity demand by 2050. That's a lot."**
>
> **Philippe Knoche**

> **"The RTE report points out that the mixed nuclear and renewable scenarios are the most efficient."**
>
> **Max Fressonnet**

M.F. Is reducing greenhouse gases sufficient to fight climate change? Shouldn't we also be tackling the issues of energy efficiency and the reduction of its consumption?

P.K. You have a point about energy efficiency. In France, 40% of greenhouse gas emissions come from buildings. And we have 5 million housing units that are poorly insulated and in need of renovation. There is a strong need to decarbonize housing and reduce its energy consumption. It requires that we give up certain habits. These are issues of comfort that are difficult to talk about, but we can, through our individual and corporate behaviors, decide to lower our heating temperature in winter by one or two degrees. From an industrial standpoint, thought is being given not only to having more efficient processes, but also to using fewer raw materials and more recycling, which will cause us to reduce our energy consumption.

M.F. There is another issue that has not received as much attention as global warming, namely the collapse of biodiversity and its consequences. This includes the construction of man-made spaces in place of natural spaces and the release of chemicals into the environment.

P.K. The impact on biodiversity is analyzed throughout the life cycle of a facility, whether for fossil fuels, renewables or nuclear energy. The density of nuclear energy means that a nuclear energy facility takes up 100 to 300 times less space than the equivalent renewable energy facility. The right balance must be found. In terms of controlling chemical and radioactive discharges, we seek to prevent our activities from having a significant impact by regularly monitoring the environment and biodiversity around our sites. We perform more than 100,000 measurements and analyses each year using about 1,000 sampling points.

Nuclear energy's big comeback

M.F. There is a growing consensus around nuclear energy. Nuclear phaseout is no longer an imperative advocated by organizations historically opposed to nuclear energy: it is

the phaseout of fossil fuels that is becoming the priority. Nuclear energy is increasingly defended as a transitional energy apparently indispensable over the coming decades.

P.K. Nuclear energy is much more than a transitional energy. It's an energy with fresh potential. Over the last three years, at the initiative of climate experts and the International Energy Agency, there has been genuine understanding of the challenges surrounding the decarbonization of energy production and the need for a balance between intermittent renewables, hydroelectricity and nuclear energy. This has led countries like Belgium to postpone their nuclear phaseout. In France, public opinion is increasingly turning in favor of nuclear energy. President Macron's announcement of the construction of six new EPRs followed by eight more under review, as well as the extension of the life of existing reactors, marks a turning point. We are at the dawn of a new era.

M.F. While I understand that nuclear energy is an energy of the future, there are conflicting messages flying around regarding the Flamanville project, for example. And there are still concerns about waste management.

P.K. Flamanville is indeed a challenging project. But it's a pilot project and the industry has learned a lot from it. Remember that the EPR reactor in Finland has just started production, as have other EPRs in China. As for waste, that's an important thing to talk about. Contrary to popular belief, we know how to manage it, i.e., isolate it from people and the environment. We also know how to reduce the volume of the most radioactive waste, store it safely and recycle up to 96% of used fuel. High-level radioactive waste adds up to less than 200 m^3 per year, or the weight of one 20 cents of euros per person. We must make progress in education to show how we're capable of reducing the quantity of waste and containing it safely.

> **"Nuclear energy is one of the least CO_2-emitting sources of power generation, comparable to wind power, and it generates 4 times less emissions than solar power, 40 times less than gas and 70 times less than coal."**
>
> **Philippe Knoche**

Nuclear energy: An attractive career for young people?

M.F. Nuclear energy's image has changed. The industry has become more attractive to young people seeking to work in meaningful sectors of the economy. It's obvious that nuclear energy is one way of contributing to the most sustainable environment possible, not only in the future, but also here and now.

P.K. Nuclear energy is France's third-largest industrial sector, with more than 220,000 jobs in France and nearly 7,000 new hires every year. It's a field that values excellence with skills and technologies that are unique in the world. At Orano, for example, our expertise in the transformation of nuclear materials and our advanced technologies enable us to develop solutions for cancer treatment, the recycling of electric car batteries, the recovery of rare metals, and quantum computing in our stable isotope lab. We work with dozens of start-ups to come up with disruptive solutions. So yes, nuclear technologies are contributing to a low-carbon future. But more than that, they are fueling other sectors, helping to create a more sustainable world.

M.F. Innovation in nuclear energy is apparent and we are awaiting the fourth generation of reactors, including SMRs, which are easier to build and finance. Fusion is still undoubtedly the dream of many people, not just engineering students, and enjoys an even more sustainable image.

P.K. Orano is contributing to fusion research with the technologies it develops for fission. It is important to remember that nuclear energy is an industry that has continuously developed for 50 years and offers tremendous technological resources for our society. We need talent from all walks of life to build the nuclear energy of tomorrow, alongside renewable energies. Nuclear energy is an industry of the future.

> **"Nuclear energy's image has changed. The industry has become more attractive to young people seeking to work in meaningful sectors of the economy."**
>
> **Max Fressonnet**

WORKING FOR THE FUTURE OF SOCIETY

Through its corporate purpose, Orano has made a proactive commitment to protecting the climate, preserving natural resources, and finding innovative solutions for health.

> Develop know-how in the transformation and control of nuclear materials for the climate, for a healthy and resource-efficient world, now and tomorrow.

5 COMMITMENTS

that demonstrate our determination, our values, and our responsibility to society.

CLIMATE
Contribute to carbon neutrality

This is the world's number one climate issue. By using low-carbon nuclear energy to produce electricity, Orano is contributing to the fight against climate change while reducing its carbon footprint.

COMMUNITY
Be locally engaged and responsible in our environment

Relationships with stakeholders are all the more important because our activities span several decades. Orano's purpose is to be a committed and responsible player in the regions where it operates to further their development and protect the environment.

CUSTOMER GROWTH
Innovate to preserve resources and protect health

Companies cannot grow unless they enjoy the trust of their customers. Orano must continue to meet the needs of its present and future customers through innovative products and services while offering environmental and health solutions to society.

CASH
Operate efficiently and reduce our footprint

Orano is convinced that there can be no sustainable economic performance and profitability without a reduction in our carbon footprint.

COMPETENCIES
Mobilize proud and committed employees who embody our purpose

Orano's people are key to the implementation of our commitment policy. Our goal is to develop the skills of today and tomorrow in an attractive, inclusive, and innovative environment.

Listen to the conversation between Anne-Laure Calvez and Fabrice Bonnifet in our **"Parole d'experts" podcast**

VISIBLE ACTIONS STARTING IN 2022

Expand the calculation scope for greenhouse gas emissions

Since 2020, a working group has been responsible for defining action levers to reduce Scope 3 emissions*. Launched at the end of 2021, the action plan will continue to identify the emission sources of our suppliers. A common framework is also being applied to reduce the impact of their operations for the Group. In 2022, 10 suppliers are involved in this process. A working group is also studying eco-design initiatives to build an efficient approach to decarbonization.

Supporting new growth opportunities

With the inauguration of three new facilities in 2021, Orano is positioning itself as a key driver of industrial, energy and ecological transitions. These facilities include the Extractive Metallurgy Innovation Center (CIME), a unique center of technological excellence located in Bessines-sur-Gartempe, and the Stable Isotope Laboratory (LIS) located in Tricastin. Orano Med's Maurice Tubiana Laboratory and its new R&D center, with its fivefold increase in lead-212 production capacity, are also helping to develop cancer treatments.

Transforming the COMINAK mining site in Niger

As soon as COMINAK's production activities ceased in March 2021, work began on redeveloping the site.
In this context, the Orano group is committed to cleaning up the site and making it safe, in accordance with national regulations and international recommendations, while minimizing the social impact of the mine's closure on the region and its employment market.
To ensure a lasting, sustainable and useful social transition for the local population, tangible steps have been taken, such as the transfer of the COMINAK hospital to the Government of Niger, the creation of scholarships for students in the region, and programs to support entrepreneurship and occupational redeployment.

*Other indirect greenhouse gas emissions, Scope 3 of the GHG Protocol.

Nuclear energy: we're stepping up the pace!

A look back at the news, reports, world conferences, and national and European political decisions that impacted the future and people's perceptions of nuclear energy.

6

RTE report

Relying on both nuclear energy and renewable energies

This is the number of scenarios studied by the French electricity transmission system operator (Réseau de transport d'électricité, RTE) for France to achieve carbon neutrality in 2050: three scenarios involving a nuclear/renewable energy mix and three 100% renewable scenarios. The scenarios that include nuclear energy are the least costly, entailing the least uncertainty, having the least impact in terms of land use and reclamation, and generating the least tension on certain essential resources such as critical metals.
www.rte-france.com

COP 26

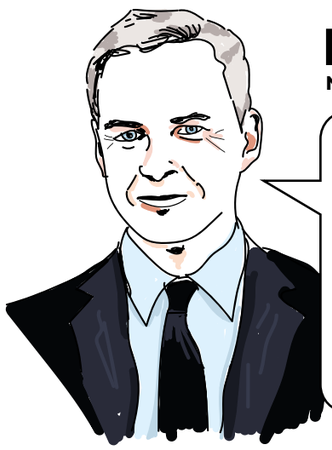
The Glasgow Pact, which was signed by 200 member states, says it is imperative to reduce the use of fossil fuels worldwide, especially coal.

https://ukcop26.org

-45%

CO_2 emissions must be reduced by 45% by 2039

Glasgow Pact



World Nuclear Exhibition

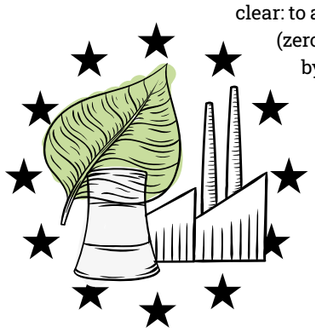
November 30-December 2, 2021

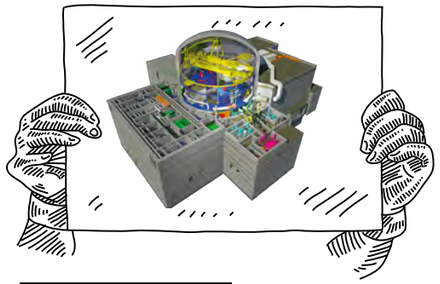
Nuclear energy is the keystone of our energy system. [...] The unique feature of the French solution is the complementary nature of nuclear and renewable energy. [...] We are faced with a challenge: an exponential rise in electricity demand over the coming years. If we want more decarbonized electricity, we need more nuclear reactors.

Bruno Le Maire, French Minister of the Economy, Finance and Recovery

A European green label

On February 2, 2022, the European Commission announced the creation of a green label for nuclear and gas power plants, recognizing, under certain conditions, their contribution to the fight against climate change. The goal of green taxonomy is clear: to achieve its bold climate goals (zero net greenhouse gas emissions by 2050), the European Union must move away from fossil fuels and mobilize capital to finance the required investments in environmentally friendly "green" technologies.





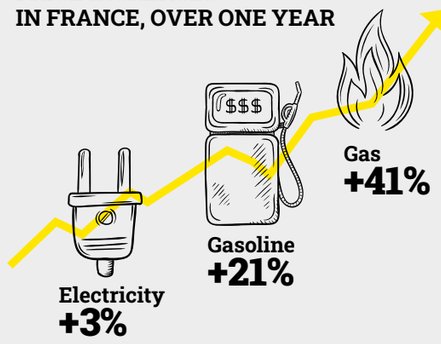
New reactors for France

On February 10, 2022, in Belfort, France, President Emmanuel Macron announced the start of construction work on six EPR2 reactors, studies for eight additional EPR2 reactors and the extension of all nuclear reactors possible. In addition, investments of up to €1 billion between now and 2030 will be allocated to developing innovative small-scale reactors.

ENERGY PRICES SOAR

Since January 2021, energy prices (gasoline, natural gas and electricity) have been rising. For natural gas, this is the result of supply chain tensions, as gas production and delivery continue to be heavily impacted by the health crisis. The conflict in Ukraine and the ensuing desire to gradually stop using Russian natural gas (1/3 of Europe's supply) and oil have sent prices skyrocketing to record levels. In addition, electricity prices, which are indexed to the price of natural gas under current market mechanisms, have also risen. This global crisis is one more step in the realization of the need to achieve a high level of energy independence and develop a competitive energy industry such as nuclear energy, which is also low-carbon and sustainable.

PRICE INCREASES IN FRANCE, OVER ONE YEAR



Source: INSEE - January 4, 2022

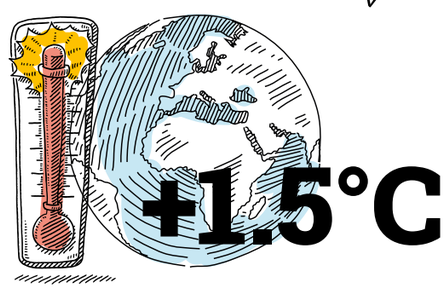
IPCC

April 4, 2022

It's going to be hot!

To stay at a maximum of +1.5°C, the IPCC is calling for the cessation of all coal use by 2050 and a reduction of 60% and 70% in the use of oil and natural gas respectively (compared to 2019 levels).

www.ipcc.ch



53%

of French people believe that nuclear energy is essential for France's energy independence.

BVA/Orano survey - May 2021

NUCLEAR INDUSTRY WORKING FOR THE PLANET

The equation to be solved is well known: in 2050, due to global population growth, the deployment of electric mobility and the economic development of emerging countries, we will need twice as much electricity. Meanwhile, we will have to reduce our greenhouse gas emissions to keep global warming below the 1.5°C target. Since electricity production is currently the main source of global CO_2 emissions due to the use of fossil fuels (coal and natural gas), nuclear energy is one of the solutions available.
By contributing to the production of a continuous supply of affordable, low-carbon electricity, nuclear energy is a valuable tool for tackling the climate emergency.

CLIMATE: SOLUTIONS FOR THE FUTURE, HERE AND NOW!

More than ever, the climate emergency is our number one environmental priority. To achieve carbon neutrality by 2050, we must replace fossil fuels, which currently account for 80% of global energy consumption.
Expert opinion is clear: electricity consumption will increase and, to produce it, we will have to mobilize all available low-carbon energies, especially nuclear energy.

> The extent to which we will be able to maintain our modern comfort in a world without fossil fuels will mainly depend on the nuclear share of the energy mix, as nuclear energy is the only decarbonized, concentrated and controllable energy apart from hydroelectricity.

Jean-Marc Jancovici,
President of The Shift Project

THREE YEARS TO ACT

According to the latest IPCC report, if greenhouse gas emissions are not significantly reduced by 2030, the 1.5°C target will be out of reach and global warming will pose a serious threat to the planet. First action: stop exploiting oil, gas and coal deposits until they run out, without carbon capture technology, and replace them with low-carbon or carbon-neutral sources. Switching to less carbon-intensive energy sources should not, however, overshadow structural transformations such as soft mobility, electric vehicles, working from home, building insulation and fewer flights, which could reduce emissions by 40% to 70% by 2050. Meeting the +1.5°C target will require investments of $2.3 trillion per year between 2023 and 2052 for the electricity sector alone. Taking action is expensive, but doing nothing is even more expensive.

MOVING AWAY FROM FOSSIL FUELS

The European Union has set a goal of carbon neutrality by 2050. We must take action now and decarbonize power generation, which is the world's primary source of greenhouse gas emissions due to its dependence on fossil fuels (primarily coal and natural gas). RTE recently published a report stating that electricity consumption would increase from 25% to 55% of total energy consumption by 2050. This is a gigantic paradigm shift. The challenge therefore is to move away from fossil fuels and turn to low-carbon forms of energy. Nuclear energy is one of the solutions with emissions of less than 12 g of CO_2/kWh, which is equivalent to wind power, 4 times less than solar power, 40 times less than gas and 70 times less than coal. This explains why France, where more than 70% of electricity is generated by nuclear energy, is one of the "good students" of climate change.

NUCLEAR ENERGY AND RENEWABLES: THE POWER MIX OF TOMORROW

In the IPCC and IEA scenarios for low-carbon power generation, a significant increase in renewable energy can only be envisaged in conjunction with nuclear energy if we are to phase out fossil fuels completely. For Brussels, even if renewable energies remain a priority, they will not be able, on their own, to meet the growing demand for electricity, especially because of their intermittent nature. Hence the need to encourage investment in stable and controllable resources. Consequently, nuclear and renewable energies must be considered together. Nuclear energy will have an essential place in tomorrow's electricity mix, ensuring the necessary continuity of power generation without increasing the carbon footprint.

Are climate targets still achievable?

August 9, 2021: The IPCC identifies human responsibility for global warming. The temperature of our planet is expected to increase by +1.5°C by 2030, ten years earlier than the previous forecast.

February 28, 2022: 3.3 billion people are exposed to climate change. The new IPCC report is conclusive.

April 4, 2022: The IPCC issues another warning stating that the global greenhouse gas emissions trajectory must be reversed by 2025 at the latest.

What does "acting for the climate" mean?

> We can no longer afford to oppose low-carbon energy sources.

Fatih Birol,
Executive Director,
International Energy Agency

37%

In total, renewables and low-carbon energy, including nuclear and hydroelectric power, currently account for 37% of the world's electricity production, with the rest coming from fossil fuels.

IPCC Report - April 2022

TRUE or FAKE

PRECONCEPTION No. 1

Nuclear energy is a major emitter of CO_2

Fake

Nuclear energy is one of the lowest CO_2 emitting energies in the world with emissions comparable to wind power, 4 times lower than solar power, 40 times lower than gas and 70 times lower than coal. Its minimal level of CO_2 emissions makes it an indispensable component of energy transition.

PRECONCEPTION No. 2

Nuclear energy contributes to France's energy independence

True

Nuclear energy contributes to France's energy independence through its domestic generation of power. It therefore makes the country more than 50% energy independent. This is a major asset for the sovereignty of France.

PRECONCEPTION No. 3

Smoke from nuclear energy facilities causes pollution!

Fake

Nuclear energy facilities are often depicted with gigantic plumes of "smoke" emanating from the reactors. These are not CO_2 discharges, but only water vapor from the cooling towers. It is harmless to humans and the environment. Nuclear energy operations do not emit fine particles, nitrogen dioxide, or sulfur dioxide into the atmosphere.

PRECONCEPTION No. 4

The production of radioactive waste is the biggest drawback of nuclear energy

Fake

96% of used nuclear fuel is recyclable and high-level long-lived radioactive waste (HLW) represents only 0.2% of radioactive waste produced in France. Orano has been recycling used nuclear fuel for more than 50 years to produce new fuel, thus helping to preserve natural resources and reduce waste. In France, one out of ten lightbulbs is nuclear-powered from recycled materials. The remaining 4% of final waste is vitrified and stored safely while awaiting final disposal.

PRECONCEPTION No. 5

Nuclear energy is dangerous

Fake

The industry's safety and security standards are among the highest of any industry in the world. Nuclear operators are in charge of the cleaning, maintenance and servicing of their facilities in order to minimize any accident risk and anticipate abnormal situations.

Watch the **video by Dr Nozman** in partnership with Orano

> "We are a generation committed to the climate emergency and we are more open about the need for nuclear energy."

FROM ANTI- TO PRO-NUCLEAR

Clément is an environmentally aware high school student studying sciences with an energy and environment option. He was anything but pro-nuclear, far from it. But over the course of his studies, encounters and experiences, he has changed his mind.

During his studies, Clément has embarked on a project to build a sheepfold that would be self-sufficient in renewable energy. He has come up against a hard reality: the need to oversize the batteries and the great difficulty, if not impossibility, of using only 100% renewable energy. It was then that he understood the importance of multiple sources of power generation. For him, "*no one energy sector can succeed on its own; sectors must work hand-in-hand.*"

Meanwhile, Clément discovered the work of Tristan Kamin, a nuclear safety engineer whose arguments inspired Clément due to the relevance of the scientific data.

For Clément, it was obvious: "*If we want to win the battle against climate change and limit our impact on the planet, we must galvanize to reduce our carbon emissions. And nuclear energy plays a key role in providing low-carbon energy.*"

Clément Fortin is an aeronautics student and spokesperson for the Pirate Party. This political movement is committed to the values of democracy, ecology and community. He explained his journey and his gradual shift in favor of nuclear energy.

@akurag2

Clément is in agreement with the bold plan to revive commercial nuclear energy through the construction of six new reactors. "*An additional generation of reactors is needed for the next 100 years.*"

A COMMITTED ACTIVIST

Clément is now working as a spokesperson for the Pirate Party. "*I joined an environmentalist party that included nuclear energy in its energy transition manifesto.*" He is also a rank-and-file activist with the "Les Voix du Nucléaire" association. "*I want to defend the nuclear industry, help demonstrate that nuclear energy is beneficial and break down misconceptions such as those about the danger of nuclear energy and waste.*"

In his view, we should be proud of the French nuclear industry, which produces low-carbon electricity and allows France to have the smallest electricity footprint.

Since the various energy crises, Clément has felt that the winds are changing in favor of nuclear energy. "*I meet young activists from the French Green Party (Europe Écologie-Les Verts) who have a more nuanced view of nuclear energy.*"

Through his involvement, Clément has noticed a stronger distinction between civilian and military nuclear energy among the new generation of activists. "*There is a real awareness of the urgent need to reduce CO_2 emissions, and this is made possible by nuclear energy.*"

MADE IN FRANCE

In light of the challenges of reindustrializing France and ensuring its energy sovereignty, the nuclear industry is more mobilized than ever. As France's third-largest industrial sector after the aeronautics and automotive industries, the nuclear industry designs and builds its own facilities for power generation, uranium conversion and enrichment and fuel fabrication, including recycling.
The industry is a paradigm of excellence recognized worldwide for its high technology, expertise and industrial know-how, which are unique in the world. It contributes to regional economic development, job creation in France, and France's trade balance by some €6 billion per year.

THE BIG COMEBACK

Orano, a 4.0 industrial player

Orano's industrial know-how is rooted in some of the most modern facilities in the world, which are recognized by the entire market for their technological expertise and cutting-edge processes. All facilities are already connected and digitalized. Digital technology serves industrial performance through...

Digital twin - what it is?

A digital twin is a realistic digital representation of an object, system, facility, or process. It is based on data connections and visualization technologies, which support the convergence between physical and digital states. This representation is used for simulation, real-time performance monitoring and system performance optimization, from design to operation.

Today, industries are integrating digital technologies, such as the Internet of Things (IoT), cloud computing and artificial intelligence to develop new solutions and tools for operations, maintenance, facility monitoring and employee training. This is the concept of "Industry 4.0". The goal is to provide greater availability, performance, and flexibility while guaranteeing the safety of operators.

MAINTENANCE 4.0

Maintenance 4.0 encompasses a set of digitized operations and procedures that use digital data analysis and artificial intelligence to increase the reliability and lifespan of equipment. This type of maintenance helps to dramatically reduce the number of sudden breakdowns and improve productivity.

Digital technology has allowed us to shift from corrective to predictive maintenance. The next step is prescriptive maintenance, which entails the ability to define the operating parameters that are most favorable to the lifespan of equipment.

VIRTUAL REALITY AND 3D MODELING

These digitalization technologies make it possible to define intervention scenarios in advance, prepare teams and develop training modules representative of our industrial environments.

ROBOTICS

The digitalization of operations, along with the use of robotics, facilitates field operations in radioactive environments and improves working conditions for employees.

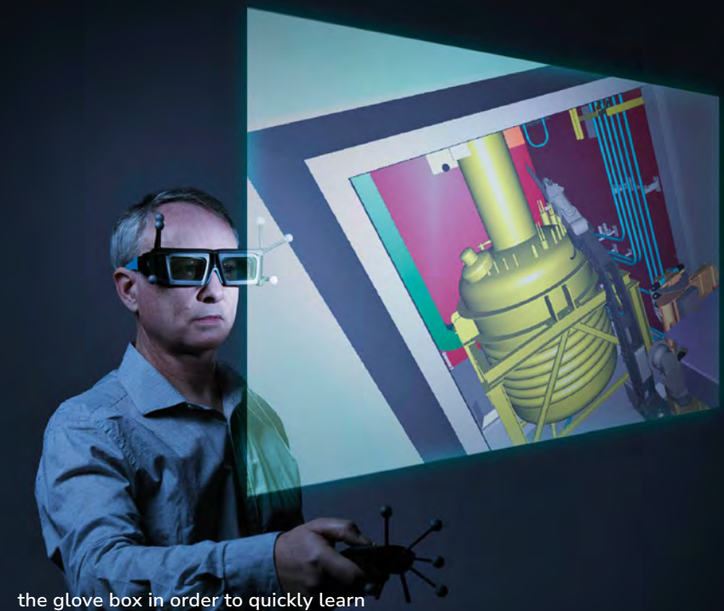
IOT

The Internet of Things (or connected objects) provides real-time data collection and monitoring through the use of connected sensors and low-energy wireless transmission technologies. This data contributes to real-time productivity tracking, anticipating breakdowns and enhancing the analysis of equipment functionality.

DATA ANALYSIS

Data science makes it possible to analyze, diagnose and predict events by combining real-time data and historical facility data with analytical and learning algorithms. Statistical processing of the data allows us to model processes and provide performance improvement leads to the "business line" teams.

Listen to the conversation between Jean-Pierre Pélicier and Julien Geffard in **our "Parole d'experts" podcast.**



Using virtual reality to enhance skills development

80% of the recycling process at the Orano Melox plant is conducted in glove boxes, watertight transparent units in which the operators use gloves attached to the walls. Maintenance operations are highly complex. Movements require dexterity and watchmaking precision. On top of that, visibility is often limited. At the Melox Trade School, the new Virtual Room immerses operators and maintenance technicians in the heart of the process thanks to a 360° camera that displays images on a large screen or via 3D glasses. Operators are immersed in the glove box in order to quickly learn the right movements and obtain the qualification required to start working. This innovative digital instruction is a key factor in the Melox site's transformation project. It supplements training on life-size machine replicas.

3 QUESTIONS FOR

Pascal Aubret

SEVP Recycling BU
Orano la Hague Site Director

What impact has digital transformation had on the La Hague facility?

At Orano la Hague, digital technology has a number of applications: ensuring operational safety, improving production plant performance and increasing our skills and attractiveness. It involves building a different way of working and extending the lifespan of equipment involving less exposure to radiation and fewer complicated tasks. At the same time, we must ensure that no compromise is made to the safety of nuclear sites during this transition to the "4.0 era".

What are the real-life applications?

Using the touch panels installed in the control room, shift supervisors can get a real-time view based on the latest data. As a result, team briefings during shift changes are made easier in the 24/7 units.

The use of virtual reality and 3D immersion saves time for training operators and prior approval of any intervention scenarios. This process allowed us to save two months, for example, in the replacement of a dissolver wheel, a four-ton, five-meter diameter component in the shearing unit. Digital data analysis helps optimize remote maintenance operations and predictive maintenance.

How does upskilling support this transformation?

Digital technology has become an integral part of our Trade School, which trains 400 to 500 people each year. 3D simulated environments enable our employees to understand the operation of equipment located in inaccessible areas. Work environments such as testing rooms and training platforms are recreated at actual scale and combined with new tools such as computer-assisted telemanipulator arms, which are easier to use than mechanical arms. A unit located in an inaccessible area is replicated almost identically in a virtual reality room. This process makes training possible and allows trainees to "enter" these rooms virtually to fully understand their complexity.

Working closely with **communities**

Le Prisme - Châtillon
Orano group head office

Saint-Quentin
Orano NPS head office: packaging and logistics Engineering site

Gif-sur-Yvette
Dismantling and Services Offices

Bessines
Benchmark industrial platform for mining innovation with the Innovation Center for Extractive Metallurgy (CIME) Maurice Tubiana Laboratory: lead-212 manufacturing (Orano Med)

La Hague
Used fuel treatment and recycling plant

Équeurdreville
Engineering site

Beaumont-Hague
Orano Projets: Research Center

Saint-Sauveur
Orano Temis: mechanical manufacture

Valognes
Logistics platform

Orano Temis: head office - concrete manufacture

Tricastin
Philippe Coste: uranium conversion plant (2nd stage)
Georges Besse II: uranium enrichment plant
Triade: decontamination unit
Stable Isotope Laboratory (LIS)

Malvési
Uranium conversion plant (1st stage)

Marcoule
Melox: MOX fuel manufacturing plant
Paloma: logistics platform
Orano Temis: integrated system

Bagnols-sur-Cèze
Engineering site

Projects supported by FRANCE RELANCE

Orano is increasing the number of projects that meet the criteria of the France Recovery Plan initiated by the government to make the French industrial base even more competitive. 10 projects have already been selected for a total of €28 million in grants. Here is a look at five of them.

re:solution

Focus on electric battery recycling

The REsolutION project is part of a circular economy initiative that aims to give a second life to recoverable materials from batteries. Working as a consortium, Orano and its partners have developed a process to purify and separately recover the materials (lithium, cobalt, nickel, graphite, etc.) contained in electric vehicle batteries for recycling into new battery components. Battery recycling is an important issue for the preservation of the environment as it reduces our impact on natural resources. It also contributes to French and European autonomy in the supply of strategic materials.

Usine de demain Orano

Step up the deployment of the plant of the future

Coordinated by Orano, this project brings together 11 industrial partners over a three-year period. Orano and its partners are pooling their expertise to develop and implement new technological solutions. Applicable to the nuclear sector and the whole of industry, these solutions aim to keep Orano's industrial sites at the cutting edge of technology by improving performance, production, plant competitiveness and operator safety. They also contribute to the development and growth of partner start-ups and SMEs by promoting the breakthrough technological solutions developed by the project. Finally, they foster the development of new knowledge and innovative technological building blocks that contribute to strengthening the French industrial fabric as a whole.

MAGNOLIA

Short-circuit magnet recycling and remanufacturing

The ultimate goal of this project is to re-establish an industrial base for the production of high-performance sintered magnets in France. For this project, Orano is part of a consortium of five complementary French operators that contribute key skills at each stage of the magnet recycling ecosystem, from sorting and collecting magnets, processing them, manufacturing new magnets, to integrating them into eco-designed electrical systems (engines, generators). The goal is to industrialize a future magnet production line for the European market.

A NEW CAMPUS FOR RECYCLING TRADES IN MELOX

This Trade School (École des Métiers) aims to accelerate the mastery and development of critical skills for a technological process that is unique in the world. It focuses on autonomous operation of a "glove box", which requires a minimum of 6–9 months' training. More than 250 employees and subcontractors will attend the school each year. Starting in late 2023, the campus will bring together physical and digital tools in a non-radioactive environment spanning more than 1,000 m². 40 full-scale industrial models will be built in addition to the 30 or so already in service.

TN® EAGLE

Design and manufacture of new packaging for transportation

The goal of the TN® Eagle project is to relocate to Cherbourg and insource within Orano the assembly of a new modular nuclear packaging concept for the transportation and dry storage of used fuel. Thanks to this modernization project, Orano NPS is strengthening its skills, securing its supply chain and modernizing and automating the manufacture of nuclear packaging. Another major advantage is protecting the intellectual property rights for an innovative concept in packaging and assembly plant design. TN® Eagle is aimed at a global market.

INVENTING A SUSTAINABLE FUTURE

Innovation is an integral part of Orano's DNA and it is helping the Group prepare today to become a player in tomorrow's industrial, climate and energy transitions. Innovation enables us to reinvent ourselves, open up new possibilities, adapt to changing environments and explore new growth opportunities for the climate, a resource-efficient world and health. Innovating to continue to improve the safety and performance of our activities, speeding up innovation cycles, imagining the plant of tomorrow by leveraging cutting-edge technologies and Industry 4.0 technologies to achieve progress... Our culture of innovation is nourished by our openness to innovative ecosystems, start-ups and SMEs and new kinds of partners including design and deep tech companies. This culture encourages boldness, freedom and collective intelligence through the development of a mindset that places customers, users and value creation at the forefront of our achievements.
Welcome to our innovation ecosystem.

Innovating TODAY FOR tomorrow's world

At Orano, innovation means reinventing tomorrow, accelerating our innovation cycles to anchor the company in Industry 4.0, and exploring new growth opportunities for the benefit of society.

transformation

connected plant

collective intelligence

value creation

sharing

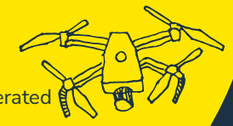
acceleration

impact & meaning

INDUSTRY 4.0

10 KEY TECHNOLOGIES

- Smart sensors
- Industrial Internet of Things (IIoT)
- Instrumentation, characterization and nuclear measurement
- 3D Simulation & Modeling
- Additive manufacturing
- Industrial Data Analysis & Artificial Intelligence
- Virtual reality
- Autonomous and remotely operated robots and drones, cobotics
- Augmented reality
- New materials and advanced coatings



The world of Orano 4.0

An interactive module that presents the new uses of Industry 4.0

Tomorrow's facilities

A collaborative project with 11 partners, start-ups and SMEs, to accelerate the shift in the industry of the future toward an ecoresponsible industrial transition

The Orano Awards reward internal innovation every two years with 6 winners out of more than 100 innovative projects submitted

openness

agility

synergies

exploration

augmented operator

co-construction

Open innovation

- **An ecosystem of more than 1,500 innovative start-ups and SMEs**
- **Collaboration with more than 100 start-ups**
- **50 open innovation challenges**

disruption

Lab'O

A future-oriented laboratory @Orano

Through "expeditions", employees build future-oriented worlds in which ideas and new concepts emerge

DIVERSIFICATION

- **over 40 business explorations** in progress
- **3 areas of exploration:** services, circular economy, deep tech
- **Fields of possibility:** health, aerospace, climate, strategic resource economics, complex materials management, industrial transition

collaboration

innovation ecosystems

circular economy

8 AM

Customer issue identified in **material recovery/recycling.**

10 AM

First, the CIME teams study the feasibility of a project. At that stage, **CIME's various business units are called upon** to develop appropriate solutions through pilot tests.

80

EXPERTS, ENGINEERS AND TECHNICIANS IN VARIOUS SPECIALTIES

CIME

24h

at the leading edge of technological innovation

11 AM

Laboratory scale tests using mineral-processing and hydrometallurgical processes of extraction, separation and purification of materials are performed on samples. Thanks to material handling authorizations, CIME can work on a large number of projects involving radioactive materials.

Located in Bessines-sur-Gartempe, the Innovation Center for Extractive Metallurgy (CIME) is one of Orano's main R&D centers. Working from its new state-of-the-art building, CIME puts its expertise and innovations to work for responsible industry players and decision-makers.

6 PM

Whatever the field of activity (industry, local authority, mining, etc.), CIME's teams **assist customers until the pilot is installed on their site** following a training phase in managing and monitoring the industrial launch.

PILOT FACILITY SPANNING

1,000 m²

2 PM

Throughout the process, parameters are analyzed. Using state-of-the-art technology, CIME's teams carry out high-precision analyses that contribute to the validation of operating procedures. Proposed testing is adapted as required.

5 PM

A custom pilot is developed on a semi-industrial scale. All of the center's expertise is harnessed in building and launching the pilot: design offices, mechanics, instrument makers, etc.

What fuels do the newest reactors need?

INTERVIEW WITH
Bertrand Morel
R&D Director

What are fourth-generation reactors?

Gen IV reactors are advanced technology reactors still at the research or prototype stage. They will reach industrial maturity after Gen III reactors, which include EPRs and are currently being deployed. There are six types of Gen IV reactors. They are more efficient and generate less nuclear waste. Today, many start-ups are developing compact and modular Gen IV reactors called AMRs.

What new fuels are being slated for these reactors?

There are multiple fuel categories tailored to the various types of Gen IV reactor, depending on the fissile materials they contain, their chemical form and their geometry. For example, fuels based on HALEU, plutonium and other actinides are being developed in solid (oxide pellets, metal, TRISO beads) or liquid form (molten salt).

What specific advances are there in molten salt reactors?

This is a breakthrough technology compared to all other Gen IV reactors.
Its distinctive feature is that the fuel is liquid and takes the form of high-temperature molten salt. This is a highly promising technology as it is intrinsically safe. The molten salt reactor has a high energy yield, is highly flexible and, above all, is capable of using minor actinides currently considered as waste. This concept opens up new perspectives for reducing the volume and radiotoxicity of tomorrow's waste. Orano is working with several start-ups on this new technology.

What added value does Orano contribute?

Orano covers all stages of the fuel cycle. We are therefore well positioned to develop and supply many of these new fuels. Orano also handles their fuel management after use in the reactor, including recycling and safe waste packaging.
We can adapt our industrial facilities to supply the fissile materials in the requisite form. In particular, we are developing new processes for manufacturing molten fuel salts, drawing on industrial expertise in the purification and extraction of radioactive materials at our Orano la Hague facility.

AMR
Advanced Modular Reactors

SMR
Small Modular Reactors

HALEU
High-Assay Low Enriched Uranium

TRISO
TRi-structural ISOtropic

MSR
Molten Salt Reactor

NUCLEAR ENERGY WHERE YOU LEAST EXPECT IT

Thanks to its know-how in recycling and recovering nuclear materials, Orano is exploring new fields of activity that offer genuine growth opportunities. Whether in healthcare with Orano Med, the circular economy with electric vehicle battery recycling, aerospace, or the energy transition with the development of processes to reduce carbon footprint, Orano is reinventing its business models in the industry sectors of tomorrow. And it is launching a new stable isotope laboratory, the first of its kind in France. This diversification of activities for the benefit of society, the climate, health and a resource-efficient world is part of the Group's purpose.

Orano Med
hope in the fight against cancer

Orano Med, Orano's medical subsidiary, is combining biotechnology and nuclear energy to develop targeted cancer treatments using the unique properties of lead-212 (^{212}Pb).
Its work is fueling the hope that the international medical community will move toward less toxic, more effective treatments for patients with limited treatment options.

62	12	2	2
employees	developments in progress	units working on the production of lead-212 in France and the United States	laboratory projects for the production and distribution of radiopharmaceuticals in the United States and France (ATLabs)

2005 — Discovery of the process for extracting lead-212

2009 — Founding of Orano Med

2011 — Acquisition of Macrocyclics, a company specializing in the production and development of chelating agents for nuclear medicine

2012-2014 — First clinical trial of alpha therapy using lead-212

2013 — Inauguration of the Maurice Tubiana Laboratory (LMT) in Bessines-sur-Gartempe

2016 — Inauguration of Orano Med's 2nd unit in Plano, Texas (DDPU)

2018-2020 — Beginning of clinical trials for a treatment against neuroendocrine tumors

2019 — Extension of lead-212 production capacities in France and the United States

2020 — Commissioning of the extended LMT laboratory and R&D center in Bessines-sur-Gartempe

2021 — Alphamedix™, a treatment for neuroendocrine tumors, enters Phase II clinical trials

The properties of lead-212

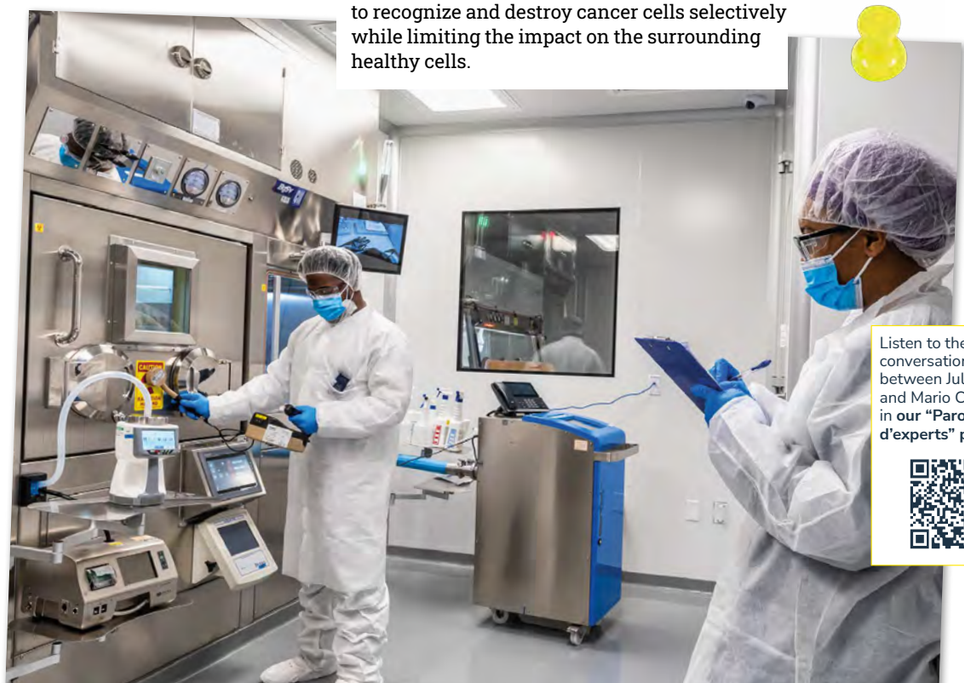
Lead-212 is a very rare radioactive isotope that comes from thorium. Orano's expertise in cutting-edge nuclear technologies has made it possible to develop a unique process that contributes to the extraction and purification of lead-212. This rare metal is used in the development of several promising targeted cancer treatments referred to as "Targeted Alpha Therapy".

Increased lead-212 supply capacity

Orano Med has **increased its lead-212 manufacturing capacity fivefold** using thorium nitrate from Orano's former mining activities, having doubled the surface areas of its Maurice Tubiana Laboratory in Bessines. This milestone embodies Orano Med's commitment to **producing radioisotopes in sufficient quantities and at a level of purity in line with pharmaceutical standards** to enable the development and marketing of cancer treatments.

The promise of Targeted Alpha Therapy

Targeted Alpha Therapy is an innovative technology that combines lead-212 with biological molecules (peptides, antibodies) to target cancer cell receptors or antigens. Targeted Alpha Therapy thus makes it possible to recognize and destroy cancer cells selectively while limiting the impact on the surrounding healthy cells.



Listen to the conversation between Julien Dodet and Mario Campone in **our "Parole d'experts" podcast.**

The next advances for Orano Med

Orano Med's ambition is to develop a robust portfolio of cancer treatments that combine the properties of lead-212 with targeting molecules. To achieve this, the company is currently working on a dozen developments either alone or in partnership with other French and international biotechnology and pharmaceutical companies.

REsolutION

Our ambition is to become a leading player in the recycling of electric vehicle batteries in France and on the European market via a complete low-carbon hydrometallurgical process to be rolled out by 2025.

3 QUESTIONS FOR Catherine Cabau

Project Management Officer for the REsolutION project

What challenges are involved in recycling electric batteries?

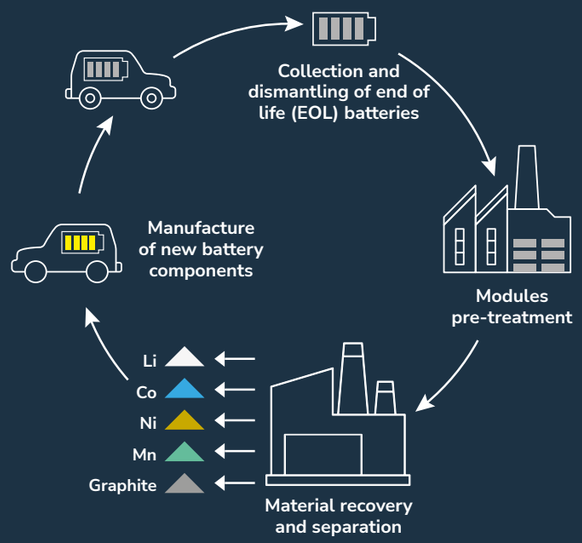
As a member of the European Union, France is committed to achieving carbon neutrality by 2050. One of the major challenges is to decarbonize the sectors that generate the most greenhouse gas emissions (GHG), starting with transportation and mobility. Electricity, especially when production is highly decarbonized, is a sound alternative to fossil fuels.

European demand for electric vehicles, and therefore lithium-ion batteries, is expected to grow to more than 500 GWh by 2028. At the end of 2022, a revised regulatory framework calls for 70% of batteries to be recycled in Europe by 2030 and a high recycling rate for metals. The aim is to move toward a circular economy in which the Orano group is already involved through its nuclear industrial activities.

What makes Orano stand out in the battery recycling market?

Our Group is known for having more than 40 years' experience spanning the entire nuclear fuel cycle, including materials chemistry, hydrometallurgy and process industrialization.

This know-how can be applied to battery recycling, via an innovative low-carbon process that allows materials of interest (cobalt, manganese, nickel, lithium, graphite) found in any type of battery module to be recovered and purified for reuse in new battery components. This is the aim of our project: REsolutION.

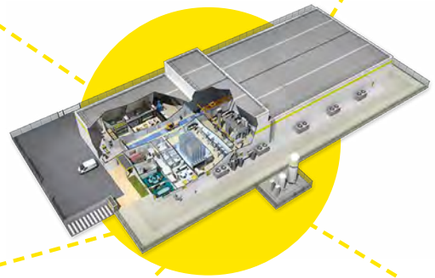


In concrete terms, what is REsolutION?

In July 2021, Orano formed an initial consortium for R&D purposes. It received financial support from France Relance to develop the process via the commissioning of two industrial pilots currently under construction at the Orano site in Bessines-sur-Gartempe (€20 million investment). These pilots are designed to verify the feasibility and performance of the new recycling process with a view to industrial scale-up from 2025 in cooperation with industrial partners in the battery ecosystem.

The completion of this project will be an opportunity for Orano to contribute to the reindustrialization of France and development of its sovereignty by harnessing its high value-added technological and environmental know-how on a fast-growing European and global market.

5 THINGS TO KNOW about the new stable isotope laboratory (LIS)



1 This is a first in France

Harnessing its expertise and mastery of cutting-edge technologies in the transformation, conversion and enrichment of uranium, Orano is developing the production of stable isotopes. Because of their special properties, these non-radioactive forms of atoms are used in a large number of applications, notably in the fields of medicine, industry and basic research.

2 First commercial production in 2023

The LIS will make it possible to develop the stable isotopes needed by the international market in France and ensure the production of "ultra-pure" elements that will meet the needs of users.
The laboratory team will comprise about 20 engineers and technicians.

3 Applications in quantum and space physics

In the field of quantum computing, silicon-28 promises great advances in the industrialization of quantum chips with thousands or even millions of "qubits*". Xenon-136 could improve our knowledge of neutrinos and consequently of matter and antimatter.

4 Isotopes that benefit industry

The use of natural isotopes is expanding into areas such as improving laser performance and the resolution of magnetic resonance imaging.

5 Stable isotopes for cancer diagnosis

Stable isotopes are mainly used as starting material for many radiopharmaceuticals. Molybdenum isotopes are used to make a solution of metastable technicium 99 (the world's most widely used radiopharmaceutical) for many diagnostic purposes, such as a lung scan to detect possible cancers.

* The quantum bit or "qubit" is the elementary unit that can carry quantum information.

OXILIO a nuclear materials management service

Oxilio is the service offered by Orano for all users of radioactivity for non-electronuclear applications such as hospitals, radiotherapy centers and research institutes. With its expertise in dismantling, cleanup, radiation protection, maintenance and radioactive waste management, Orano helps more than 2,000 professionals and industrialists to focus on their core business.
Oxilio is simultaneously a community of sharing, services and a set of digital and practical tools designed to support a maximum number of people in the daily management of radioactivity.

- Radiation protection and radiological examinations.
- Radiological decontamination of surfaces and equipment.
- Containment or fixation of radiological contamination.
- Controlling the efficiency and compliance of ventilation and filtration equipment.
- Sizing and installation of containment locks.
- Dismantling operations.
- Digital solution for optimized nuclear waste management.

www.orano.group/oxilio

TOMORROW'S NUCLEAR INDUSTRY NEEDS YOU!

The nuclear industry has a strong future and we need talent. Orano offers a multitude of positions with a wide range of profiles, not just nuclear specialists. Whether you are a student, young graduate, or experienced professional, you will be impressed by a group where you will be able to pursue several careers and perform meaningful work in a stimulating environment that respects your privacy. We continue to hire more than 1,000 people a year on permanent contracts and train more than 500 work-study students. And because an industry of the future needs the best talent, Orano encourages skills development and renewal. This goal has been furthered by the industry's creation of a University of Nuclear Occupations (UMN) supported by France Relance.

There's a future in nuclear energy

Come and join us!

Orano is hiring! We need talent, personalities and profiles from all walks of life to build the future of the nuclear industry together. Joining Orano and its 17,000 employees is also an opportunity to find your vocation among the Group's 250 professions spanning multiple areas of activity. We are brimming with positive energy!

www.orano.group/jobs/en

Camille Theroine
Research & Innovation Project Manager

A facilitator, innovator and collaborator, Camille plays a major role in the dismantling of nuclear facilities. Deeply involved in the national and international challenges of technology transfer, Camille provides nuclear measurement solutions for operational staff. At Orano, she enjoys challenging herself and going beyond her areas of expertise.

Sarith Nong
Technician and Set-up Operator

As an equipment monitoring supervisor, Sarith provides support for instrumentation systems. He harnesses his expertise during the certification process of on-site facilities. Sarith verifies and diagnoses several levels of control including pressure, temperature bands and weight. In his job, Sarith likes the autonomy, the responsiveness and the responsibility of playing a central role in the transfer of knowledge essential to the Group. He also appreciates the career opportunities offered by Orano.

Anne Sirop Masselot
Customs Director

As a cornerstone in the regulation of international flows, Anne's function is highly strategic.
The success of her mission implies a perfect mastery of the Group's facilities and industrial processes. The complexity and diversity of projects are as exciting as they are rewarding. Anne is proud to make a personal contribution to the deployment of nuclear energy in France.

William Chomaz
Strategy Manager - Orano Mining

All-round perspective perfectly sums up William's job. Deeply involved in the Group's strategic trajectories, William keeps an eye on both operational and development issues. His tasks require him to get out of his comfort zone and use his analytical mind and ability to adapt. For William, variety of projects and an ever-friendly work environment are the Orano group's strengths.

Leslie Ribeyrols
Head of the Disability Task Force

Energized by her day-to-day challenges, Leslie is enriched by the variety of her responsibilities. Bonds of trust are forged with employees. She intervenes on both a professional and personal level to provide solutions. With the Disability Task Force, Leslie has a pivotal role: putting the Group's inclusion policy into action and incorporating networks of external players. In addition to the friendly work environment, Leslie enjoys working for a company that is a leader in tomorrow's energy issues.

Youcef Bensedik
Engineer and Geophysicist

Youcef was deeply impressed with Orano's capacity for innovation. He is also involved in the design of new instrumentation tools for Orano Mining's production and exploration sites. In all of his projects, Youcef harnesses his key skills in radiometric mining instrumentation and results analysis.

Léa Tillard
R&D Engineer

Within the R&D team, Léa uses her engineering expertise to further the improvement of radioactive materials and waste management. According to Léa, only a company like Orano can put into action the solutions planned in R&D. This combination of research and concrete applications positions the Group as a key player in the fuel cycle.

Innovative and collaborative ways of working

To the promise of new start-ups, we respond with flexibility and shared intelligence. We are developing the flex office, open and flexible spaces that are conducive to discussion and creativity, the digitalization of work methods and the deployment of collaborative tools.

Work/life balance

We ensure a good work/life balance and we defend the right to disconnect. We make every effort to ensure that your work environment is a source of motivation, self-realization and personal development.

PATERNITY LEAVE WITH 4 ADDITIONAL DAYS, I.E.
32 DAYS

UP TO
90
DAYS OF TELEWORKING EACH YEAR

Orano INSIDE

We want our company to be an environment where everyone finds meaning in their work, feels involved in a rewarding collective process and can develop personally through shared values. All in an attractive, inclusive and innovative environment suited to our lives today and even more so to our lives tomorrow!

Gender diversity: a driver of performance

The only criterion for discrimination within Orano is competence. So, when it comes to giving women their full place, it's not just idle talk! This starts with gender equality in the workplace, which is enshrined in agreements signed with all of our labor representatives. Orano is also committed to hiring more women and paying special attention to their professional development and advancement.

89/100
GENDER EQUALITY INDEX

200
WOMEN ENGINEERS AND MANAGERS PARTICIPATING IN TALENT DEVELOPMENT PROGRAMS

TARGET 2022
31%
MORE WOMEN HIRED ON PERMANENT CONTRACTS

Varied and evolving career paths

At Orano, your career plan can take several turns, even a complete 180°, but it has only one goal: helping you to grow. We support our employees' career development by offering them mobility, advancement, training programs and challenging projects.

700
PEOPLE WITH DISABILITIES IN ORANO'S WORKFORCE IN FRANCE

ORANO HAS JOINED THE "STOP ORDINARY SEXISM IN THE WORKPLACE" (#STOPE) INITIATIVE

Diversity & Inclusion

Diversity is a value close to Orano's heart. It is based on a commitment and actions that have been deployed for more than ten years to fight against all forms of discrimination, ensure equity among employees, and be inclusive of all differences.

A LABEL AWARDED BY AFNOR IN 2010 AND RENEWED FOR ORANO IN 2020

over 500 TRANSFERS EACH YEAR

Training central to every employee's career path

An industry of the future needs the best talent to build the world of tomorrow. For Orano, skills development is a strategic lever that accompanies and supports its growth. This is why we provide our employees with numerous training programs throughout their careers.

3,500 TRAINING COURSES OFFERED TO EMPLOYEES

Work-study: a win-win contract

We hire more than 500 work-study students per year at our various sites in France. This enriching encounter with cutting-edge technology and innovation opens doors to employment in our Group.

over 500
WORK-STUDY OFFERS IN VARIOUS FIELDS OF ACTIVITY

32%
OF WORK-STUDY TRAINEES, INTERNS AND EMPLOYEES ON FIXED-TERM CONTRACTS ARE HIRED ON PERMANENT CONTRACTS

As a recognized international operator in the field of nuclear materials, Orano delivers solutions to address present and future global energy and health challenges. Orano's expertise and mastery of cutting-edge technologies enable it to offer customers high value-added products and services spanning the entire fuel cycle. Drawing on their skills, unwavering

Orano

dedication to safety and constant quest for innovation, all of the Group's 17,000 employees are committed to developing expertise in the transformation and control of nuclear materials, for the climate and for a healthy and resource-efficient world, both today and tomorrow.

Orano, giving nuclear energy its full value.

OUR VALUES

- **SAFETY AND SECURITY**
- **CONTINUOUS IMPROVEMENT**
- **CUSTOMER SATISFACTION**
- **ETHICS, TRANSPARENCY, AND DIALOGUE**
- **RESPECT FOR PEOPLE AND THEIR DEVELOPMENT**
- **COHESION AND TEAM SPIRIT**

OUR AMBITION

Making nuclear energy increasingly reliable and competitive.

Getting the most out of nuclear materials, in particular through recycling, so that they contribute to the development of society.

Remaining the world's leading player in the production and recycling of nuclear materials, waste management and dismantling.

Continuing to reduce our carbon footprint and remaining on course as a responsible player.

in brief

ETHICS & COMPLIANCE

Ethics and compliance are the responsibility of every Group employee and are reflected in **our relations with our partners** and with society as a whole.
Orano operates in many countries, where laws and regulations must be scrupulously observed, as must our own internal rules, while aiming always to apply the highest standards.

The Group seeks to maintain and develop a **culture of ethics and compliance** by deploying policies, programs and tools adapted to each field that are in line with its **Code of Ethics and Business Conduct**. Communication, awareness-raising and **training** activities are conducted throughout the year with the support of expert networks, documentation is regularly updated and improved and **controls** are performed according to the **risks** identified. Finally, the Group's **ethics alert system** allows employees to report any situation or event that is contrary to the rules in force.

KEY FIGURES

Together with its 17,000 employees worldwide, Orano is committed to meeting the world's energy challenges on a daily basis and providing powerful, secure, low-carbon and competitive electricity.

€4.7 bn
REVENUE IN 2021

17
INDUSTRIAL SITES
IN FRANCE

Top 3 worldwide
IN OUR KEY ACTIVITIES

2021 revenue from main activities

BACK END **€2,693** million

MINING **€1,065** million

FRONT END **€955** million

€25.8 billion
BACKLOG

WORK SAFETY

OCCUPATIONAL INJURY WITH LOST TIME FREQUENCY RATE IN 2021:
1.5 (vs. 1.3 in 2020)

OCCUPATIONAL INJURY SEVERITY RATE IN 2021:
0.07 (vs. 0.05 in 2020)

17,000
EMPLOYEES,
INCLUDING **13,500** IN FRANCE

30.7% WOMEN ON MANAGEMENT COMMITTEES

32% WOMEN HIRED AS MANAGERS

NEARLY 5% RATE OF EMPLOYMENT OF PEOPLE WITH DISABILITIES

€550m
CAPEX

SECURITY

NUMBER OF EVENTS RANKED ON THE INES SCALE IN 2021

	7 Major Accident	
	6 Serious Accident	
	5 Accident resulting in off-site risk	
	4 Accident without major off-site risk	
	3 Serious incident	
	2 Incident	
Events reported by Orano → **6**	**1** Anomaly	
→ **119**	**0** Discrepancy	Insignificant from a security point of view

ENVIRONMENT

417 ktCO2eq
DIRECT AND INDIRECT GREENHOUSE GAS EMISSIONS (SCOPES 1 & 2)

1,301 ktCO2eq
INDIRECT GREENHOUSE GAS EMISSIONS (SCOPE 3)

43%
DECREASE IN EMISSIONS SINCE 2015 (SCOPES 1 & 2)

21%
DECREASE IN WATER CONSUMPTION SINCE 2019

OUR ACTIVITIES

As a key player in the nuclear fuel cycle, Orano recovers nuclear materials so that they can contribute to society's development in the field of energy, as well as research in nuclear medicine.

Mining

Our mining operations cover uranium exploration, production and marketing worldwide, as well as the remediation of former mining sites. Orano ranks among the world's leading uranium producers.

Uranium conversion and enrichment

With a unique integrated industrial platform and the most modern facilities in the world – the Philippe Coste conversion plant and the Georges Besse II enrichment plant – Orano is recognized by the entire market for its technical expertise and cutting-edge processes.

Used fuel recycling

Thanks to the performance of its La Hague and Melox sites – which are the only ones to operate on an industrial scale – Orano is the recognized international leader in the reprocessing and recycling of used nuclear fuel.

Dismantling and services

With 50 years' experience, Orano is a benchmark supplier in the field of operations support for nuclear sites (work-site logistics, specialized maintenance and radiological security), as well as the management of radioactive waste and dismantling of end-of-life equipment and facilities.

Nuclear packages and services

Throughout the fuel cycle, Orano provides its unique expertise in the design, certification and production of casks, as well as the associated transport, whether overland, sea or rail, with the highest level of risk control.

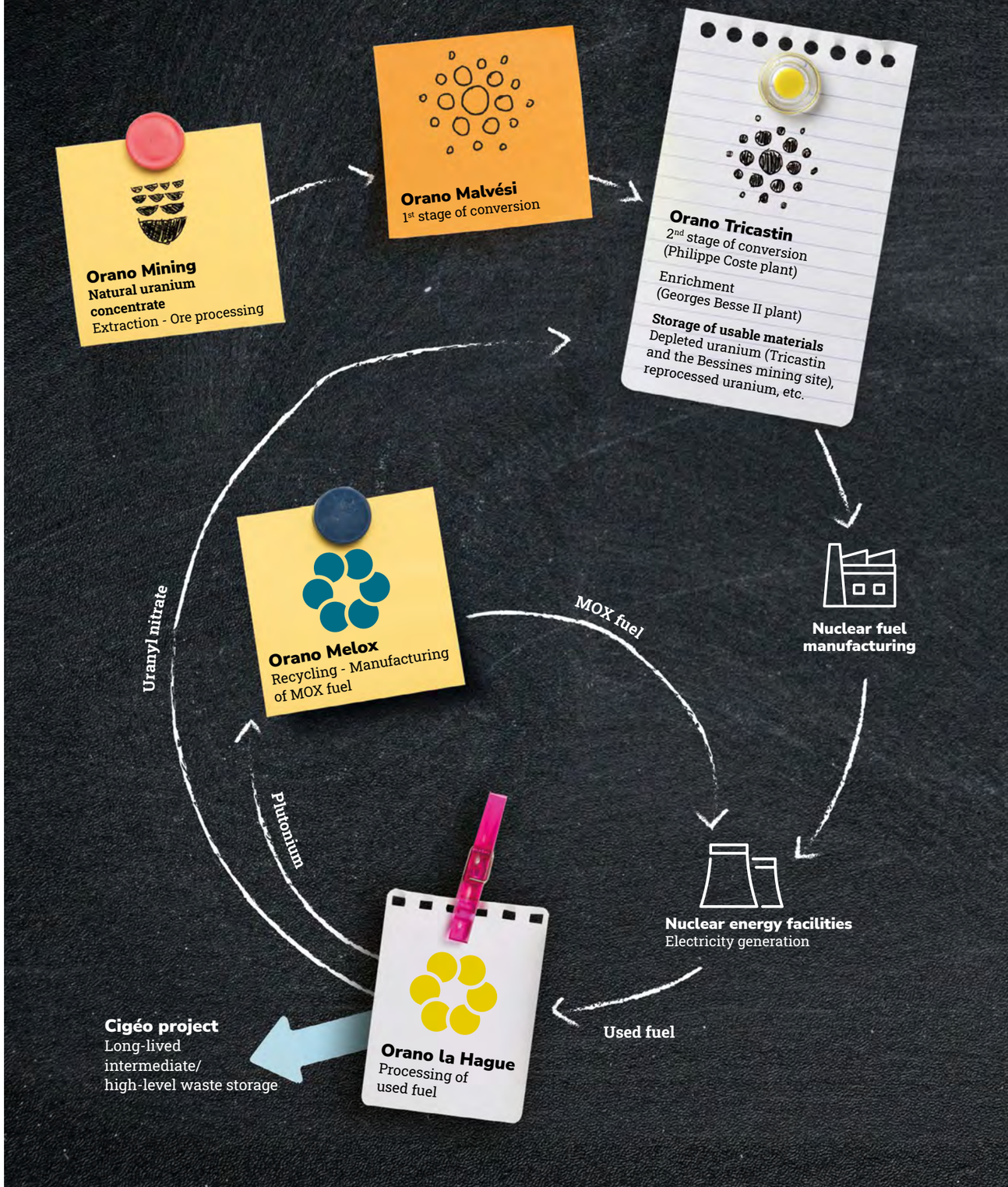
Engineering

Engineering operations involve engineering consulting services, contracting and project management assistance, design and construction engineering, plant commissioning and operational support. The teams operate in the Group's own facilities and for external customers in France and worldwide.

Orano Med

Orano Med – a subsidiary of Orano – is a company that brings together biotechnologies and nuclear technology to develop new therapies to fight cancer.

THE NUCLEAR FUEL CYCLE



Solutions for our customers

Almost **200** customers in **30** countries

2021 REVENUE BY REGION

11% Americas

39% rest of Europe

36% France

13% Asia-Pacific

1% Africa and Middle East

Unloading of used nuclear fuel in the United States

As part of a contract to remove used fuel from a storage pool at a closed US reactor, our teams put their heads together to find a solution to remove a defective fuel assembly with a damaged safety handle. The problem of safely transferring the assembly had remained unresolved since 1976.

After an in-depth analysis, the Orano teams designed and certified a custom "defective fuel package" system including a specially designed lifting device. Using these tools, the operations team successfully removed and placed the defective fuel assembly in dry storage.

Also, a new industrial record was achieved by offloading the pool 10 months faster than the previous industry benchmark.

OUR CUSTOMERS

- ✓ Electricians (nuclear energy facility operators)
- ✓ Research reactor operators
- ✓ Nuclear fuel cycle players
- ✓ National agencies
- ✓ Industry players

DISMANTLING OF TWO USED FUEL STORAGE POOLS IN FRANCE

In southeastern France, two former used fuel storage pools required dismantling of all of their stainless steel walls and metal structures in one of the largest dismantling projects of its kind in France.

Orano developed an integrated solution, assuming the risks and responsibility for the project. The engineering studies focused on optimizing safety, costs and planning of the operation. The use of innovative technologies was essential. As a result, the use of the largest existing remote-controlled cutting machine on the market minimized the exposure of the operators to radiation.

Remediation and cleanup of Fukushima plant, Japan

After the nuclear accident at the Fukushima Daiichi plant, the No. 2 reactor was heavily damaged. Access to the reactor to recover the corium was essential in order to safeguard and clean up the plant.

To meet this challenge, Orano developed a custom technological solution called TOrNAD. Specifically designed to fit the conditions of the Fukushima Daiichi plant, this technology facilitates the collection and management of waste. The operation made it possible to:

- create an access way to the reactor vessel using targeted hydro-demolition technology;
- recover and transfer effluents using a suction turbine technology suitable for remote operations.

The validation of the results resulted in the deployment of a full-scale demonstration test enabling the recovery, transfer and solid-liquid separation of the waste.

EXECUTIVE COMMITTEE

Board of Directors

The Board of Directors guides and oversees the Company's actions and performance, and deliberates on strategic and financial decisions.

COMPOSITION OF THE BOARD OF DIRECTORS

Claude Imauven
Chairman, independent director

Philippe Knoche
Chief Executive Officer, director

French State represented by
Bruno Vincent,
director

Directors appointed upon proposal by the French State
Philippe Braidy
François Delattre
François Jacq
Cécile Sellier
Marie-Solange Tissier

Independent directors
Anne-Sophie Le Lay
Patrick Pelata
Marie-Hélène Sartorius

Directors representing employees
David Lecavelier
Cyrille Vincent

Board Committees

To perform its duties, the Board of Directors is supported by four specialized committees which issue opinions and recommendations to the Board.

Strategy and Investment Committee
Chaired by Claude Imauven

Audit and Ethics Committee
Chaired by Marie-Hélène Sartorius

Compensation and Nominating Committee
Chaired by Marie-Solange Tissier

End-of-Lifecycle Obligations Monitoring Committee
Chaired by Cécile Sellier

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Giving nuclear energy its full value

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