

# Front-End Solutions to Your Business Needs

Uranium Mining, Chemistry, Enrichment



**orano**  
Giving nuclear energy its full value



# Securing your fuel cycle supplies for the long term



Orano is a **recognized international operator and reliable long-term partner** in the field of nuclear materials, mastering cutting-edge technologies. We offer customers high value-added products and services **throughout the entire fuel cycle, through innovation and operational excellence, in a competitive and profitable way**. We are proud to contribute to the production of **low carbon and competitive electricity**.

We **provide customers** with efficient products, services and technologies in uranium mining, chemistry and enrichment, as well as used fuel and nuclear waste management, nuclear material transportations, engineering, support to operations and decommissioning. The company aims to become an important player in nuclear medicine developing cancer treatments using targeted alpha therapy with lead-212 ( $^{212}\text{Pb}$ ), thanks to the work of its Orano Med subsidiary.

Orano contributes to the fight against global warming, to the preservation of natural resources, and to human health, all of which are major challenges of our century. We are making them central to our purpose: **to develop know-how in the transformation and control of nuclear materials, for the climate, for a healthy and resource-efficient world, today and tomorrow**.

## Our values

- Safety and security
- Customer satisfaction



- Continuous improvement
- Respect and people development
- Cohesion and team spirit
- Ethics, transparency and dialogue

## Our strengths

- An uncompromising culture of industrial and occupational safety;
- A strong portfolio of nuclear customers;
- Recognized industrial expertise and modern facilities;
- Technologies that have set worldwide standards;
- Teams renowned for their skills, their commitment and their ability to succeed.

## Our Front-End solution drivers

- Discover, develop and operate a geographically diversified and profitable portfolio of **uranium** deposits in a responsible manner in order to ensure the security of your supply.
- Supply high-added-value services in **chemistry and enrichment**, with the best practices and best innovative processes in terms of safety and competitiveness.

## Our global network

Anticipating your needs and meeting your expectations are our top priorities. Our sales teams located in the European, North American and Asian markets maintain close relationships with each customer. Orano provides innovative, tailor-made and competitive offers, and supports your needs all around the world.

# MINING

## One of the world's leading uranium producers



Exploration in Uzbekistan.

**Diversified reserves and resources provide our customers with twenty years worth of production visibility.**

**“As a dynamic and responsible primary producer, we currently prepare several production start-ups or expansions to guarantee the security of supply to our utilities customers within the coming 10 years. We also prepare the longer term with new diversified promising developments and continuous investments and innovations.» Xavier Saint Martin Tillet, President, Orano Mining.**

- **Among the top 3 uranium producers** in the world with an annual production of about 7,500 tU in 2022. One of the world's most **diversified** uranium players, with 4 mining sites in operation in 3 countries, **competitive production costs and cutting-edge extraction techniques** implemented:
- **Canada:** As a minority owner-partner, access to production from Cigar Lake and McArthur River, the two highest-grade and largest uranium mines in the world. Operator of McClean Lake, the only mill to treat undiluted very high-grade Athabasca ore.
- **Kazakhstan:** KATCO, one of the world's largest ISR mine operators implementing innovative wellfield optimization technologies.
- **Niger:** SOMAIR, an open pit mine using both dynamic and heap-leaching techniques.
- A diversified portfolio of **projects** (in Niger, Canada, Kazakhstan, Mongolia and Uzbekistan) **in different stages of development**. Continuous investment in **exploration** in the most prospective countries, focused on Canada and Uzbekistan.
- **Innovation projects across all stages** of mining cycle, from exploration to remediation. Developing efficient and environmentally friendly technologies and techniques on uranium recovery processes at our **Innovation Center for Extractive Metallurgy (CIME)**.
- **A responsible mining operator** recognized for our robust and integrated Corporate Social Responsibility (CSR) approach, implementing **international best practices as a member of the International Council of Mining and Metals**, in the field of ethics, transparency, safety, environment, biodiversity, mine closure, social and community investment built on the long-term partnership approach with stakeholders. Occupational Safety and Health Management System certifications (ISO 14001, 45001 or OHSAS 18001) for all our sites. **Low CO<sub>2e</sub> ratio: 25 kg CO<sub>2e</sub> per kg U.** A clear decarbonation roadmap implemented on our sites.

To know more:



# CHEMISTRY

## Modern and right-sized industrial complex



Conversion services carried out at our facilities in France for our customers worldwide.

**The only Western operating industrial conversion site being fully modernized with new facilities and innovative processes, while achieving a reduced environmental footprint.**

**“We are committed to delivering high-value-added services for our customers over the long-term, with a unique European location and an integrated industrial platform, based on best practices and processes. It provides utilities with security and diversification of supply.” François Lurin, President, Chemistry-Enrichment (Orano CE).**

- **The UF4 production plant** – commissioned in 2016 at the Malvési site – completed its refurbishment plan in 2020, with the modernization of its hydrofluorination workshop. It ensures the supply of UF4 to the Philippe Coste conversion plant at full capacity.
- **The new Philippe Coste conversion plant** located at Tricastin to convert UF4 to UF6 was commissioned at the end of 2018. The latest workshop completed – second fluorine production facility – began operation in 2020. The facility's 15,000 t nominal capacity is installed and operating at monthly **production rates** of +1,000 tU. The plant ramp-up will continue until 2025.
- Processing **all forms** of concentrates from all uranium mines in the world, Malvési and Philippe Coste conversion plants offer an **international safe storage** haven for uranium concentrates and natural UF6 assets owned by our customers worldwide.
- For more than 60 years, Malvési-Tricastin has been an integrated and **efficient chemistry-enrichment platform** that mitigates transportation risk and reduces lead times. Its operations also encompass defluorination, denitration and cylinders maintenance.
- Latest **nuclear safety** requirements achieved: increased seismic resistance and confinement workshops.
- **Innovative** and proven technology used, such as the Isoflash technology and effluent management workshop. **Environmental** footprint reduced even further: Ammonia -75%, nitric acid -50% through recycling, industrial water -90%, thanks to our new facility and workshops at nominal capacity. **Low CO<sub>2</sub> ratio:** 1,7 kg CO<sub>2e</sub> /kg of conversion: -60% since 2015.
- A **responsible company:** ISO 9001, 14001 and 45001 certifications, well integrated locally and with close relationship with stakeholders, and publication of an annual Corporate Social Responsibility report.

Inauguration of Philippe Coste plant:



# ENRICHMENT

## A state-of-the-art facility using the most competitive technology



Enrichment services carried out at the Tricastin site in France for our customers worldwide.

**Georges Besse II,  
a state-of-the-art facility  
that provides increased  
diversification of supply  
for your procurement strategy.**

**“We are focused on being a leading Western supplier to the world, continually developing innovative, dedicated and competitive products and services, as LEU+ and HALEU, for the benefit of our customers. This is important to support the current nuclear fleet and the development of new nuclear.” François Lurin, President, Chemistry-Enrichment (Orano CE).**

- **Georges Besse II** (South and North units) reached its full production capacity of 7.5 million SWU in 2016. To enhance security of supply, discussions launched for a 30% capacity increase with the French nuclear safety authorities and stakeholders, with a production start-up objective in 2028. The investment decision is subject to our Board approval.
- The **largest** enrichment facility in Europe, using the most efficient and proven enrichment technology (TC12 and TC12+ centrifuges).
- Ready to produce and transport **LEU+** (up to +6% enriched as a 1<sup>st</sup> step) by 2025. For enrichment to **higher assays**, ready to discuss with customers. For **HALEU**, we do not foresee any technical issue. Further downstream, we have industrial solutions, for deconversion in oxide as well as metal form. We are just waiting for a firm commitment from the market.
- The North unit is suitable for the enrichment of **reprocessed and depleted uranium**.
- Latest **nuclear safety** requirements (e.g. increased seismic resistance, confinement workshops) and **environmental** footprint reduced even further: energy consumption -98%, water consumption -100%. Thanks to its new conversion and enrichment facilities, the whole Tricastin platform has reduced by more than 80% its CO<sub>2e</sub> emissions between 2004 and 2020. **Low CO<sub>2</sub> ratio**: 2,2 kg CO<sub>2e</sub> per SWU.
- For more than 60 years, Malvési-Tricastin is an integrated and **efficient chemistry-enrichment platform**: mitigation of transportation risk and lead time reduction. Highly skilled and trained operators, operational experience and excellence.
- A **responsible operator**: ISO 9001, 14001 and 45001 certifications, well-integrated locally and close relationship with stakeholders, and publication of an annual Corporate Social Responsibility report.
- Leveraging our unique conversion and enrichment technologies and competencies with a new activity in **stable isotopes production** to serve health sectors (oncology) and quantum technologies. First production expected in 2023, in a new dedicated facility at Tricastin.

To know more:





As a recognized international operator in the field of nuclear materials, Orano delivers solutions to address present and future global energy and health challenges.

Its expertise and mastery of cutting-edge technologies enable Orano to offer its customers high value-added products and services throughout the entire fuel cycle.

Every day, the Orano group's 17,000 employees draw on their skills, unwavering dedication to safety and constant quest for innovation, with the commitment to develop know-how in the transformation and control of nuclear materials, for the climate and for a healthy and resource-efficient world, now and tomorrow.

Orano, giving nuclear energy its full value.

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Energy is our future. Don't waste it!