POWER

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by Sonal Patel

Nuclear

Europe's SMR Alliance Endorses Nine Nuclear Projects in Push for 2030s Deployment

The European Industrial Alliance on Small Modular Reactors (SMRs) has identified nine SMR projects it will support as its first batch of project working groups (PWGs). The effort marks a significant first step toward the alliance's goal of deploying SMR technologies across Europe by the early 2030s.

The alliance, a collaborative public-private platform launched by the European Commission in February 2024, said on Oct. 11 it picked its first batch of PWGs from a pool of 22 applications submitted as part of a June 2024 call for projects.

The nine projects identified at this stage are: EU-SMR-LFR project (Ansaldo Nucleare, SCK-CEN, ENEA, RATEN); CityHeat project (Calogena, Steady Energy), Project Quantum (Last Energy), European LFR AS Project (newcleo), Nuward (EDF), European BWRX-300 SMR (OSGE), Rolls-Royce SMR (Rolls-Royce SMR Ltd), NuScale VOYGR SMR (RoPower Nuclear S.A), and Thorizon One project (Thorizon).

A Significant Opportunity to Foster Collaboration

The selections do not constitute direct funding from the alliance. However, under PWGs, they will have the opportunity to foster collaboration among various stakeholders, such as SMR developers, regulators, and supply chain entities, ensuring that technical, regulatory, and logistical challenges are addressed efficiently.

PWGs are just one part of the alliance's broader goals, which seek to establish a robust nuclear ecosystem across Europe. In addition to fostering collaboration on SMR projects, the alliance has set out to address supply chain gaps, explore new funding models, and engage key industrial sectors like hydrogen production. It also focuses on raising public awareness and developing critical workforce skills through initiatives like the proposed Nuclear Skills Academy.

While the nine selected projects represent the first wave of SMR development under the alliance, additional projects that were not selected in this round will have the opportunity to reapply in the second quarter of 2025 after refining their proposals, the alliance said.

A Range of Technologies Representing Several Applications

Projects in the first batch include a diverse range of reactor designs, from lead-cooled fast reactors and pressurized water reactors (PWRs) to molten salt reactors and micromodular nuclear plants. They showcase solutions for power generation, district heating, and industrial applications.

EU-SMR-LFR (Ansaldo Nucleare, SCK-CEN, ENEA, RATEN). Led by Ansaldo Nucleare in collaboration with ENEA, the Romanian Institute for Nuclear Research-RATEN, and with the participation of the Belgian research organization SCK-CEN, this project has sought to build ALFRED, a modular fast-neutron and lead-cooled nuclear reactor that could be operational from 2040. "The development path, which has been awarded by the European Commission, includes the construction of two demonstration prototypes (LEANDREA and FALCON) designed to validate the technological choices, which will be built in Belgium and Romania respectively," Ansaldo told *POWER* on Friday.

Lead-cooled fast reactors, which are fourth-generation technologies, may hold significant advantages over existing technologies "with significantly higher fuel efficiency, high operating temperatures that will allow thermal as well as electrical energy to be supplied, and passive safety systems capable of intervening without human action," the company said. "This technology will also make it possible to close the fuel cycle, reusing spent fuel from previous generation plants and minimizing the amount of waste."

"The choice of the European Industrial Alliance on Small Modular Reactors is an important recognition that confirms the expertise of Ansaldo Nucleare and its partners," said Daniela Gentile, Ansaldo Nucleare's CEO. "This result rewards the technological development efforts that our company, a frontrunner in this technology, has carried out and strengthened over the years, laying the foundations for future economic support from the European Union for our project."

CityHeat (Calogena, Steady Energy). Finnish nuclear startup Steady Energy has developed the LDR-50, a 50-MW PWR operating at low temperatures. It says the reactor can be deployed within

seven years, including licensing, at a cost of €100 million. Specifically designed to produce heat up to 150C, the LDR-50 is optimized for district heating, industrial steam production, and desalination projects.

Steady Energy plans to start building a pilot plant in Finland next year to test its functionality and project management capabilities. The pilot, which will use an electric heater instead of nuclear fuel, will pave the way for further installations with possible locations to include Helsinki, Kuopio, Espoo, and Lahti. The company is targeting operations of its first commercial plant by 2030. Steady Energy so far has agreements with Finish utilities Keravan Energia and Kuopian Energia. The Kuopion project planned for eastern Finland is notably in the pre-investment phase, with zoning and environmental permitting “starting soon,” the company says.

“Across Europe, energy companies face the challenge of replacing hundreds of aging heat plants that are nearing the end of their lifecycle. With around 3,000 heat plants needing renewal, a significant shift to zero-emission solutions is crucial to maintain global habitability,” the company notes. “Each reactor costs €100 million, and Europe alone could quickly need 300 of these units. There is a need for another 300 if we are to decarbonize desalination as well as industrial heat production,” it said.

Steady Energy is a Finnish startup developing the LDR-50, a small modular reactor (SMR) that operates at low temperatures and pressures to produce safe, emission-free heat, ideal for district

heating and industrial applications. The company targets its first commercial plant by 2030. Courtesy: Steady Energy

Project Quantum (Last Energy). Last Energy, a full-service developer of 20 MWe "plug and play" micromodular nuclear power plants, has secured commercial agreements for 80 units, and the company has set ambitious goals to build 10,000 units within the next 15 years. "Last Energy differentiates itself within the nuclear sector by focusing all technological innovation on high throughput manufacturability, rather than the industry's historical focus on novel reactor core physics," it notes. So far, the American company is targeting key markets in Poland, Romania, and the UK. Of Last Energy's agreements, 39 of the 80 units will be built to serve data center developers, it notes.

"Last Energy is honored to be acknowledged by the European Commission and excited to work with the Alliance to create a new model for nuclear development that brings plants online in a few years rather than a few decades," the company told *POWER*. "Several industries have woken up to the potential of microreactors, particularly data centers. Project Quantum is one of several European data center projects we're pursuing, and we anticipate being able to share more details in the coming months."

Last Energy noted it has made development progress in the UK, including to obtain site control and beginning the local planning process for a four-unit project in Wales. "In recent months we've also held ongoing technical and design workshops with national regulators, and are engaged jointly with the Office for Nuclear Regulation, Natural Resources Wales, and the Environment Agency for a Preliminary Design Review of the PWR-20. We've also entered the authorization phase with the National Commission for Nuclear Activities Control in Romania," it said.

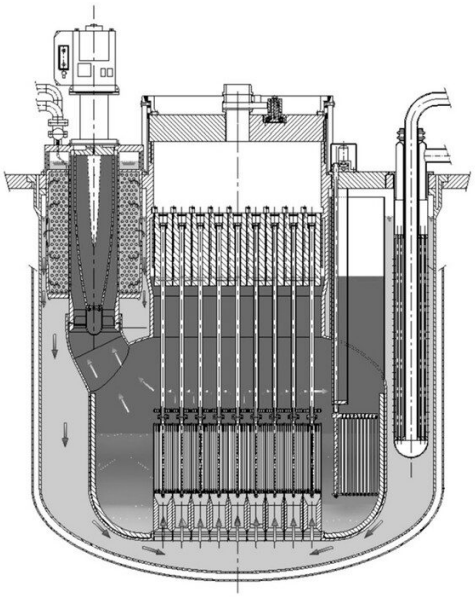
In October 2023, Last Energy successfully showcased a full-scale Nuclear Island prototype, fabricated in just five weeks, using an exclusively Polish engineering, procurement, and construction supply chain. It showcased this prototype at the PAIH Business Forum in Warsaw. Courtesy: Last Energy

European LFR AS (newcleo). Italian firm *new*cleo is developing a lead-cooled fast reactor (LFR) that it says will recycle spent nuclear fuel from conventional reactors. The first step of its "delivery roadmap" will be the design and construction of a first-of-a-kind "mini" 30-MWe LFR to be deployed in France by 2030, rapidly followed by a 200-MWe commercial unit in the UK. At the same time, *new*cleo has said it will directly invest in a mixed uranium/plutonium oxide (MOX) plant to fuel its reactors from existing nuclear waste.

The alliance's selection will "provide a boost" to the company's program, which has "already seen as the fastest growing nuclear start up in Europe whose business now counts over 90 partnerships, and more than 850 employees based in 19 locations across France, Italy, the UK, Switzerland, and Slovakia, including three manufacturing facilities," the company said on Friday.

"This is a proud moment for *new*cleo and a ringing endorsement for our technology," said Stefano Buono, CEO of newcleo. "While the notion of using lead isn't new, our project will maximize its potential to simplify the design and cost-effectiveness of our system, all while enhancing its passive safety functionality. Lead's ability to support higher temperatures also opens the potential to create high temperature heat upon which so many industrial processes depend, with greater reliability and more sustainably than ever before. In addition, by closing the nuclear fuel cycle we aim not only reduce the need to mine, transport and process new uranium but to provide a

sustainable solution to the stockpiles of nuclear waste created by Europe's existing fleet of nuclear reactors."



This is a cutaway of newcleo's LFR-AS-200—a lead fast reactor amphora-shaped (referring to the shape of the inner vessel) 200-MWe small modular reactor design. Courtesy: newcleo

Nuward (EDF). French company EDF is spearheading development of a 340-MWe PWR technology that would feature two reactors of 170 MWe each using France's experience in PWRs. While NUWARD was unveiled in 2019, EDF in March established its development under a dedicated subsidiary. In July, the company said it would optimize the SMR's design to focus on existing and proven technologies. The company wants to offer an SMR by the 2030s.

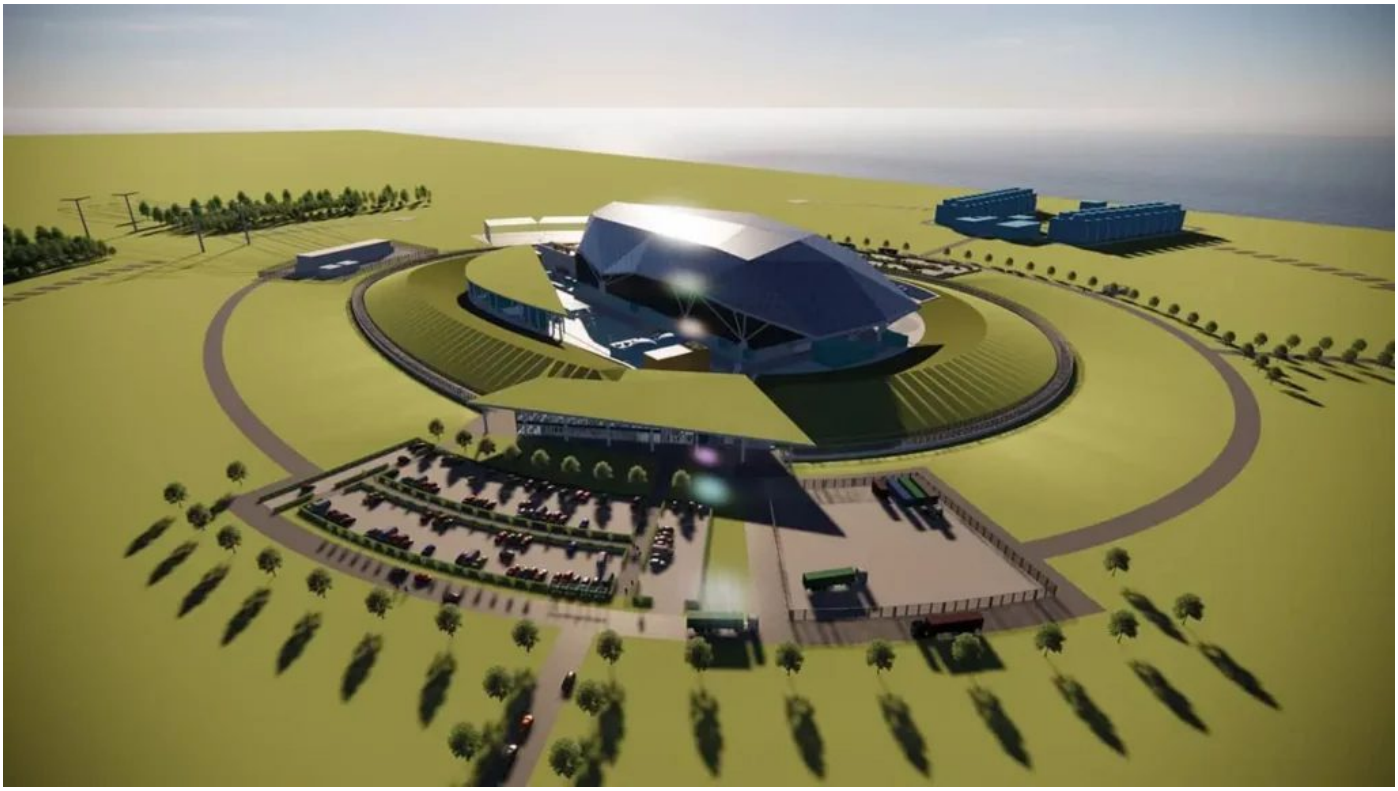
European BWRX-300 SMR (OSGE). Poland's ORLEN Synthos Green Energy (OSGE), in partnership with GE Hitachi, leads the European BWRX-300 SMR initiative, which has garnered support from 17 companies across 11 countries. The boiling water reactor (BWR) project focuses on deploying GE Hitachi's BWRX-300 SMR technology, a simplified and cost-competitive solution designed for electricity generation and industrial applications like hydrogen production and district heating. OSGE plans to build a fleet of these reactors in Poland, with the first unit expected to be operational by the end of the decade. In 2023, Poland's Ministry of Climate and Environment issued permits for six potential sites, with plans for up to 24 reactors.

The project's working group will work to standardize licensing across the EU, build a robust European supply chain, and accelerate SMR deployment. "BWRX-300 not only has the potential to be the first SMR to be deployed in the EU, but it also brings opportunities to be built by European companies, using key components manufactured in Europe. A dedicated project working group gathering nearly 20 companies confirm the strong interest in the BWRX-300 technology from European players," said Rafał Kasprów, CEO of OSGE in July.

An artist's rendition of a GE-Hitachi BWRX-300 nuclear unit. The BWRX-300 is a 300-MW boiling water reactor (BWR) that derives from the Gen III+ 1,520-MW ESBWR, which the Nuclear Regulatory Commission certified in 2014. Courtesy: GEH

Rolls-Royce SMR (Rolls-Royce SMR Ltd). UK-based Rolls-Royce SMR is developing a "home-grown" 470-MWe PWR design, which features a "factory-built" plant. In September, the Czech Republic picked the Rolls-Royce SMR as the preferred supplier for its proposed small modular reactor program, after assessing seven potential suppliers. The Czech government, in collaboration with ČEZ, the country's national nuclear energy company, aims to deploy the first Rolls-Royce SMR at the Temelín nuclear power plant by the 2030s. ČEZ is also exploring other locations that may be suitable for SMRs. These include the sites in Tušimice and Dětmarovice.

In July, Rolls-Royce SMR won a spot on Vattenfall's shortlist of two SMR vendors competing to deploy a potential SMR fleet in Sweden. This selection positions Rolls-Royce as a key player in Vattenfall's nuclear expansion plans, aimed at meeting Sweden's growing electricity demand and supporting the country's goal of achieving a fossil-free economy by 2045. The project would focus on deploying SMRs at the Ringhals nuclear site, with the earliest operational date expected in the first half of the 2030s.



The 470-MWe Rolls-Royce SMR, a pressurized water reactor, has a 60-year design life and a capacity factor above 95%. Its modular construction, involving 1,500 transportable modules, aims to reduce on-site construction time. The SMR is designed with both passive and active safety features, and it has potential for cogeneration applications. Rolls-Royce SMR targets both domestic and international markets, focusing on scalability and competitive energy generation. Courtesy: Rolls-Royce SMR

NuScale VOYGR SMR (RoPower Nuclear S.A). U.S.-based NuScale is spearheading a project to deploy its first NuScale 462-MWe VOYGR-6 nuclear power plant in Romania by 2029.

The project stems from a June 2022 memorandum of understanding between NuScale and Nuclearelectrica, a state-owned owner and operator of Romania's only two nuclear units—Cernavoda 1 and 2. The 650-MW CANDU 6 units, sited in southeast Romania, came online in 1996 and 2007. Bolstered with a January 2021–issued grant from the U.S. Trade and Development Agency (USTDA) to pin down SMR-suitable sites, Nuclearelectrica identified Doiceşti Power Station, a former coal power plant owned by E-Infra Group as its preferred location for its first NuScale plant. The former coal plant is located in central Romania, about three hours away from the Cernavoda nuclear plant.

During an earnings call in August, NuScale CEO John Hopkins highlighted the growing momentum in Europe for the company's technology. "We're seeing significant interest. And a lot of it in Central and Eastern Europe is driven by energy security as well as climate disruption. Romania is a good case in point. The Romanian project, we've been working with the Romanian government for quite some time. As I commented, Fluor Corp. will be the prime contractor or the

subcontractor for that project, which will bring in our power modules to the RoPower project." That project is the "farthest along" in Central and Eastern Europe, he noted. "We're also in discussions with other countries because … they need clean, 24/7 reliable energy."

Hopkins expressed optimism for SMRs, citing regulatory cooperation as a crucial factor driving the market after key climate conferences like COP28 and COP29. "So we're pretty bullish on what we're seeing in the market overall," he said.

An artist's rendering of a terrestrial NuScale SMR site. Courtesy: NuScale Power

Thorizon One (Thorizon). Thorizon, a spin-off from the Dutch Nuclear Research Institute (NRG), is advancing the development of a 250 MWth (100 MWe) molten salt reactor known as Thorizon One. "Our ambition is to develop a molten salt reactor that can be realized rapidly, is 'walk-away' safe, and takes a first step towards circularity by utilizing long-lived nuclear waste as fuel," the company explains. Thorizon aims to finalize a non-nuclear molten salt demonstrator soon and begin construction on its first reactor by 2030.

The company is backed by partners to include Orano, Tractebel, and EDF. As a recipient of the France 2030 investment plan for innovative nuclear reactors, it says it is working to meet Europe's climate neutrality goals by 2050. Its Thorizon One reactor is currently undergoing a preparatory review by Dutch and French regulators, with plans to comply with safety regulations and use licensed materials to streamline the licensing process. "Licensing is a critical path in this timeline, making early dialogues with regulators essential. To streamline the licensing process, Thorizon One plans to comply with existing safety regulations, use licensed materials and components, and work with experienced companies with prior nuclear licenses," it says.

*—**Sonal Patel** is a POWER senior editor (@sonalcpatel, @POWERmagazine).*

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