

Oil and mining giants among firms exploring nuclear's industrial use potential

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The Industrial Advanced Nuclear Consortium, whose members include ExxonMobil, Shell, Chevron and Rio Tinto, has published a report outlining the potential for nuclear energy as "a practical, low-carbon alternative that can be co-located with industrial facilities to provide dependable baseload heat and power, with the grid and renewables serving complementary roles".



(Image: Adobe stock)

The consortium was launched last year by The Open Group, a global vendor-neutral technology and standards organisation, with founder members also including ConocoPhillips, Freeport-McMoRan and steel producer Nucor. The report focuses on the hard-to-decarbonise sectors of offshore energy, refining and petrochemicals, mining and energy-intensive manufacturing.

Industrial end users make up the consortium, with the [Application Scenarios White Paper](#) aiming to "demonstrate how modular nuclear solutions can be deployed at varying scales and environments, from remote, off-grid operations to large industrial hubs, delivering high-reliability baseload energy - at the same time as reducing exposure to volatile fuel costs and grid instability".

Mohan Kalyanaraman, Technology Acquisition Advisor, ExxonMobil said: "The Industrial Advanced Nuclear Consortium was formed to unlock the potential of advanced nuclear for industrial applications - bringing together end users to clearly define what industry needs from nuclear. Our goal is to aggregate and communicate those requirements to enable solutions that can deliver both heat and power reliably and at scale, with the aim of making nuclear a viable option for industrial projects by 2030."

Steve Nunn, President and CEO, The Open Group, said: "This first set of application scenarios provides a clear end-user perspective on where and how advanced nuclear can be deployed - detailing real energy needs, operational requirements, and integration challenges. By sharing this aggregated view, we aim to help the nuclear industry better understand and respond to industrial demand."

The report focuses in particular on the potential for small and micro modular reactors (SMRs/MMRs) which "can fill the requirement of a low-carbon baseload heat and power source by acting as nuclear boilers and behind-the-meter generators that integrate directly with industrial energy systems. In petrochemical complexes, refineries, and LNG facilities, nuclear heat can displace gas-fired cogeneration and boilers supplying high-reliability steam and electricity while reducing consumption of natural gas. Offshore, nuclear modules on floating production, storage, and offloading, or dedicated platforms can replace turbines powered by produced-gas and provide stable power and low-grade process heat for decades without the emissions and maintenance profile of conventional generation. In remote mining and upstream fields, modular nuclear offers a way to address the constraints of limited grid capacity, intermittent wind/solar resources, and high logistics costs associated with diesel, LNG, or Compressed Natural Gas fuels."

It also notes the variation in scale of potential applications: "At one end of the spectrum, MMRs can provide a few megawatts of electricity and modest low-temperature heat to remote well pads, central oil-water processing facilities, or small industrial sites, with the ability to relocate units as fields mature or developments shift. At the other end, multi-module SMR configurations can support large, integrated refineries, petrochemical hubs, and major mining operations requiring combined electrical and thermal loads in the hundreds of megawatts. Maritime concepts extend this modularity offshore, where nuclear platforms or barge-based units can serve multiple facilities over multi-decade field life."

The report says: "In summary, heavy industrial sectors - including refining, petrochemicals, LNG, mining, upstream O&G, and maritime operations - depend on continuous, high-reliability heat and power that is currently supplied by fossil fuel-based systems, resulting in carbon emissions, fuel price volatility, and grid risks. To credibly achieve a low-carbon future for industry, modular nuclear represents a compelling option in the portfolio of available solutions. Advances in SMRs and MMRs open the potential for modular nuclear to be a practical, low-carbon alternative that can be co-located with industrial facilities to provide dependable baseload heat and power, with the grid and renewables serving complementary roles."

The four application scenarios said to be most relevant to the consortium members are: Maritime heat and power; Nuclear cogeneration of heat and power for refining, petrochemicals, LNG; Remote power and heat for O&G exploration and production, mining; Electricity-intensive industrial loads - aluminum smelter and steelmaking.

The consortium says its next steps will be "to define the technical architectures for these scenarios" as well as look at the regulatory considerations, technical integration challenges and business and commercial models to enable deployment. It says the consortium will engage "across the full nuclear and industrial ecosystem: end users, EPCs, utilities, technology developers, suppliers, regulators, academia, national labs, policymakers, finance, and many more".



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