

VTT Nuclear Services

Introduction to VTT

VTT is Finland's state-owned, Europe-leading research and technology organisation, serving as a visionary R&D partner to both industry and society, turning global challenges into sustainable growth and wellbeing through scientific innovation. VTT brings together over 2,300 professionals across multidisciplinary fields—ranging from carbon-neutral solutions and digital technologies to smart products and materials—enabling systemic breakthroughs. With an annual operating income of nearly €300 million, VTT holds close to 460 patent families, publishes hundreds of scientific articles, and serves more than 1,100 clients worldwide, with roughly half of the revenue generated internationally. Anchored by values of credibility, respect, and forward-thinking, VTT works collaboratively with public and private stakeholders to foster scientific-informed policymaking, industrial renewal, and a sustainable future.



VTT's strategy for 2021–2025, called *"the path of exponential hope,"* defines our purpose as uniting people, business, science, and technology to tackle global challenges and drive sustainable growth through systemic and technological breakthroughs. Our strategy is built on five guiding principles — aiming for impact, collaborating with customers, striving for excellence, fostering sustainable business, and creating a meaningful workplace — underpinned by values of Respect, Together, Passion, and Forerunner. VTT prioritizes eight focus areas — from carbon neutrality and productivity leaps to quantum computing and next-gen materials—where we can deliver the greatest impact. Our forward-looking approach extends beyond 2030, emphasizing proactive innovation in the face of complex global challenges.

VTT works across all major industrial sectors, including bio, chemistry, energy, electronics, transportation, manufacturing, healthcare, ICT, and more, providing tailored research, development, and innovation services to help organisations lead in their fields. VTT supports clients in emerging technologies such as smart mobility, autonomous systems, Arctic marine tech, hydrogen, batteries, CCS, and digitalisation, driving sustainability and efficiency. With over 500 energy experts alone, VTT accelerates the transition to low-carbon, decentralised, flexible systems—integrating renewables, smart grids, nuclear, CCUS, and digital solutions. VTT's cross-sector approach combines advanced pilot infrastructure, AI, IoT, and systems-level foresight to deliver market-ready innovation and transform industries

VTT Nuclear Services

VTT offers end-to-end expertise across the full nuclear lifecycle, from early-stage development, licensing and safety assessments to operational support, decommissioning, and waste management. With over 200 specialists and advanced experimental and computational infrastructure — such as hot cells, the Serpent neutron transport code, and Apros simulators — VTT ensure deep technical support for reactor physics, radiochemistry, structural integrity, and severe-accident analyses. VTT is highly integrated into European nuclear innovation, contributing to SNETP, NUGENIA, IGD-TP, and ETSON, while coordinating Finland's SAFER2028 nuclear safety and waste research programme. VTT also pioneer future technologies — such as SMRs, AI-enhanced I&C systems, cybersecurity, and virtual/augmented reality — helping clients innovate beyond current nuclear capabilities.



Newbuild Nuclear

VTT Technical Research Centre of Finland offers comprehensive support for nuclear newbuild projects, providing independent safety analyses and licensing assistance to both project developers and regulatory authorities. As a key technical support organization for Finland's Radiation and Nuclear Safety Authority (STUK), VTT aids in demonstrating compliance with regulatory requirements across various domains, including reactor physics, structural integrity, and human factors. Utilizing advanced tools such as the Apros® process simulation software, Serpent for reactor physics, and FinPSA for probabilistic risk assessments, VTT conducts deterministic safety analyses encompassing transients, accidents, and severe events. VTT's state-of-the-art facilities, including the world's largest airgun-based impact testing facility, enable rigorous testing of structural resilience against external hazards.



Future Nuclear

VTT supports the development and implementation of advanced nuclear technologies, including small modular reactors (SMRs) for electricity, heat, cold, and chemical production, and leverages its EcoSMR Hub and coordination of the SANE project to integrate SMRs into urban and industrial energy systems. VTT spearheaded the low-cost LDR-50 district heating reactor, now commercialized by Steady Energy, and conduct feasibility studies for its deployment in local energy networks. VTT actively participates in fourth-generation (Gen IV) reactor research, supporting materials testing via the Jules Horowitz reactor and engaging with the ESNII consortium for advanced reactor safety and lifecycle resilience. VTT's fusion expertise includes plasma physics, materials science, and remote handling—highlighted by a full-scale ITER divertor mock-up used for testing and training.



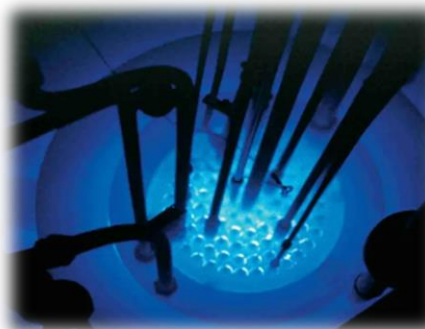
New Nuclear Country Support

VTT Technical Research Centre of Finland offers comprehensive support to countries initiating nuclear energy programs, focusing on developing local competencies rather than transferring existing solutions. VTT services encompass policy and legislation development, regulatory framework establishment, human capacity building, and the design and implementation of nuclear waste management systems. Collaborating with various partners, VTT provides tailored assistance to governments, regulatory bodies, nuclear power plant developers, and waste management organizations. Operating as an independent entity without proprietary reactor technology, VTT offers unbiased and transparent expertise, leveraging Finland's extensive experience in nuclear energy.



Decommissioning

VTT Technical Research Centre of Finland offers comprehensive nuclear decommissioning services, leveraging decades of experience from the decommissioning of our own FiR 1 research reactor. VTT's expertise encompasses planning, dismantling, waste management, and regulatory compliance, supported by advanced tools like the Serpent Monte Carlo code and extensive radiochemistry laboratories. Through the dECOMm ecosystem, VTT collaborates with industry partners to develop innovative solutions, including robotics and digital technologies, to enhance safety and cost-efficiency in decommissioning projects. The successful decommissioning of FiR 1, completed in 2024, serves as a model for future commercial reactor decommissioning in Finland and internationally.



Waste Management and Disposal

VTT Technical Research Centre of Finland offers comprehensive services in nuclear waste management and disposal, with over 30 years of experience in ensuring the long-term safety of radioactive waste. VTT's multidisciplinary team of approximately 100 experts provides solutions across the entire waste management lifecycle, including waste acceptance classification, transport, treatment, conditioning, interim storage, and final disposal. VTT has been instrumental in developing practical solutions for high-level nuclear waste in Finland and Sweden, collaborating with entities like Posiva, TVO, Fortum and Fennovoima. VTT's extensive laboratory facilities, totaling 10,000 m², support research and proof-of-concept studies ranging from nanoscale analyses to full-scale structural mock-ups, ensuring the highest quality solutions for clients worldwide.



VTT Centre of Nuclear Safety

VTT's Centre for Nuclear Safety (CNS) in Espoo offers comprehensive services spanning the full lifecycle of nuclear facilities—from new build, operation, and life-extension to decommissioning and waste management—supported by world-class expert teams and infrastructure. Its advanced experimental capabilities include irradiated specimen testing in hot cells, mechanical and microstructural material analysis, radiochemistry, aerosol laboratories, and computational safety modelling. With accredited and custom testing for regulators and industry both domestically and internationally, CNS provides independent TSO-level expertise backed by Finland's Radiation and Nuclear Safety Authority (STUK). VTT's integrated facilities and multidisciplinary teams ensure high-quality support in reactor safety, waste management, structural integrity, and severe accident analysis.



VTT Nuclear Research Infrastructure

VTT Technical Research Centre of Finland provides advanced nuclear energy research infrastructure through our Centre for Nuclear Safety (CNS) in Espoo. The CNS offers comprehensive experimental and computational facilities supporting reactor safety, nuclear waste management, and radiochemistry. Key infrastructures include hot cells for irradiated specimen testing, aerosol and radiochemistry laboratories, an impact facility for structural resilience studies, and a clay laboratory for geological disposal research. These facilities enable VTT to conduct mechanical testing, elemental and isotopic analyses, aerosol generation for severe accident simulations, and bentonite clay performance assessments. VTT's expertise and infrastructure support regulators and industry bodies both domestically and internationally, ensuring the safe and sustainable use of nuclear energy.



Projects



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