TECHNOLOGY LEADERSHIP & INNOVATION

Meeting the challenges of the future

As one of the world's leading equipment manufacturers, ANDRITZ continually invests in research and development. Our R&D investment philosophy is driven not only by a requirement to meet today's market needs, but also to prepare for the challenges of the future energy transition.

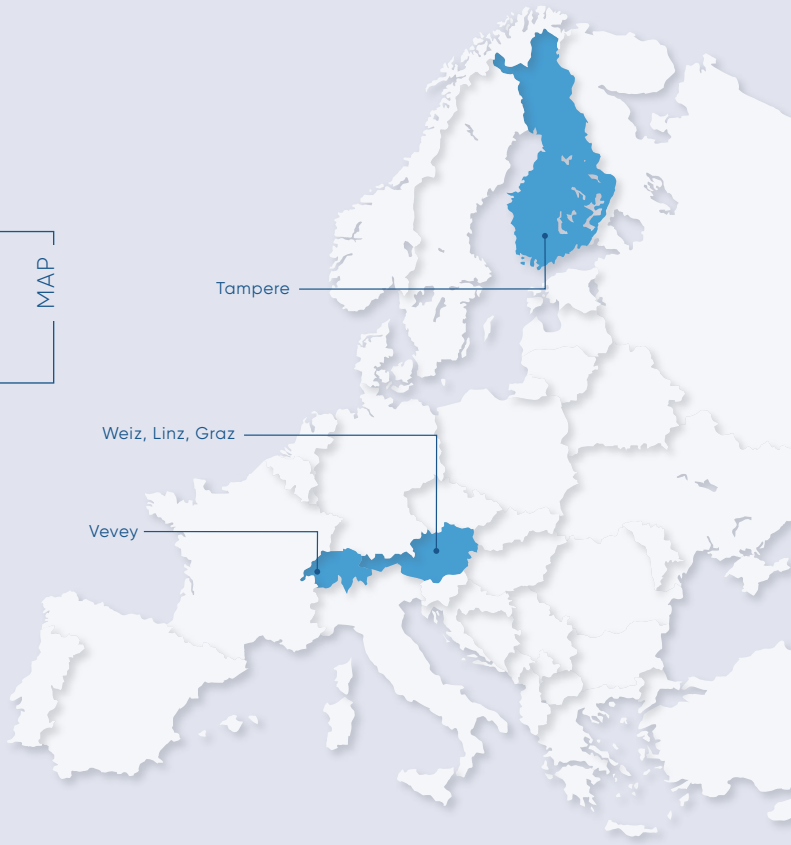
Innovative research and development is a long-held tradition at ANDRITZ and our R&D activities cover a host of the technologies. Areas such as turbines and pumps, penstocks and gates, generators, Electrical Power Systems (EPS), and automation are all key to our R&D program. Supporting our customers to develop new large hydropower plants with specific requirements or refurbishing existing installations which are in need of a particular uprating solution – for every application, ANDRITZ develops and designs optimized solutions.

TARGETS DRIVEN BY MARKET NEEDS

Our research and development addresses major market concerns, delivering highly efficient units that remain cost-effective over their operational lifetime. In addition, flexible and rapid response energy systems are needed to meet the need for safe grid operation and the stable integration of non-dispatchable renewable energy sources like wind and solar. Furthermore, new environmentally-friendly solutions which preserve aquatic life such as fish, enable natural sediment transportation through the power

ANDRITZ HYDRO TEST RIGS, TEST FIELDS AND LAB PLANTS FOR GENERATORS, TURBINES AND BEARINGS

MAP



THE DIGITAL TWIN

Development of the digital twin marks the start of hydropower project development. The entire electro-mechanical system, including automation and EPS, is digitally modelled and simulated. Major tools used during this phase are dynamic electrical and hydraulic network simulation, flow simulation (CFD) in pumps, turbines and generator ventilation, as well as simulation of heat transfer (CHT) in cooling systems, electromagnetic simulation and optimization of the structure by means of finite element analysis (FEA).

Development work continues based on interaction between the physical world and the digital world. High-end test rigs for turbines and pumps enable hydraulic development with the aim of achieving the most flexible operational characteristics across a broad range of operating conditions. The digital twin also supports the development of designs that are capable of delivering flexibility alongside a rapid response and stability – all while supporting the production of the necessary documentation needed to prove hydraulic and electrical performance targets according to IEC (International Electrotechnical Commission) standards.

Further measurements for design advancement are for example bearing optimization and high efficiency generator insulation development. Site measurements complete the development process and are a valuable source of information with regard to fulfillment of guarantees, feedback on designs and assessment of existing equipment. ANDRITZ uses world-leading measurement technology in order to cover the full range of site measurements needed for optimal designs and appropriate operational characteristics.

Subsequently, measurement data both from the test rig as well as from the site are systematically fed back to the digital twin for optimizing the products over the entire life cycle.

station, and protect water quality are also imperative for modern hydropower plants. Innovation – especially with regard to product life cycle management and operational optimization – is essential for transforming and improving the development process of new products and services.

CUSTOMER-DRIVEN DEVELOPMENT

Collaborative development with our customers is a core tenet of the ANDRITZ approach to hydropower development. Each hydropower project has unique requirements which have to be thouroughly assessed and transformed into reality using tailor-made and world-leading technology solutions. Only in this way can we fully support our clients.

DIGITALIZATION

The growing digitalization is a driver for many new developments especially in the field of operational optimization and predictive maintenance, for which ANDRITZ is developing the Metris DiOMera system. (⟶ see article page 30) Co-development with customers, rapid prototyping and improvements based on feedback from on-site experience are made possible too, enabling an agile and lean development process.

AUTOMATION

With the development of the new HIPASE platform, ANDRITZ is able to actively respond to the changing market environment for secondary systems. Major goal of this development is the conflation of multiple disciplines into one common platform. This supports a common engineering workflow, as well as a single common workflow for commissioning. With the new HIPASE platform, ANDRITZ has developed a solid foundation to meet all future market requirements.