



FFPLUS SUCCESS STORY: BUSINESS EXPERIMENTS

EXERGY IMPROVED SEALING SYSTEM

ORGANISATIONS

Exergy International is a global leader in technology that converts waste heat, geothermal energy and industrial by-products into electricity. **EnginSoft** provides advanced engineering simulation and digital design expertise. **LuxProvide** operates EuroHPC's supercomputer in Luxembourg, delivering advanced HPC resources and technical expertise for industry and research.



THE CHALLENGE

Exergy needed to improve the efficiency of Waste Heat Recovery turbines, where leaks through multistage sealing systems can reduce performance by up to 12% of isentropic power. Understanding fluid behaviour across many seal designs required high-fidelity CFD models, with fine computational meshes and advanced turbulence modelling. Running these simulations to reduce engineering timescales demanded HPC resources far beyond conventional workstations.



Technology used: HPC, CFD
Industry Sector: Energy

THE SOLUTION

The project created an HPC-enabled design workflow using CFD simulation to evaluate and optimise turbine sealing concepts. Running on the MeluXina supercomputer, simulations typically used 128 CPU cores and enabled rapid assessment of 46 design variants. HPC made it possible to analyse leakage behaviour, compare alternative geometries and validate results against testing. The work delivered two improved sealing concepts, including an innovative microfluidic brush seal.

THE IMPACT

HPC-enabled simulation strengthened Exergy's competitive position in the growing waste heat recovery market by accelerating development of higher-efficiency ORC turbines. By replacing much of the traditional trial-and-error prototyping process with virtual design exploration, the company reduced development risk, shortened innovation cycles and identified sealing technologies capable of supporting WHR efficiencies approaching 21%. The project also established a repeatable HPC-based engineering methodology that can be applied across future turbine programmes, enabling faster product development and more informed design decisions. Beyond the company, the work demonstrated how European supercomputing infrastructure can help industrial SMEs solve complex engineering challenges, improve energy recovery technologies and support wider decarbonisation goals.

BENEFITS

- Evaluated 46 seal designs using parallel CFD simulations on MeluXina.
- Simulations used up to 128 CPU cores per design study.
- Pathway towards waste heat recovery cycle efficiencies approaching 21%.
- Reduced physical prototyping, cost and development risk.
- Potential business growth estimated at €25–30 million.



Funded by
the European Union



EuroHPC
Joint Undertaking