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EOSC turns Europe's fragmented energy research data into clean-energy innovation

Europe's energy policy must simultaneously deliver **secure, affordable and clean energy while strengthening industrial competitiveness**. The emerging FP10 framework places clean energy and industrial decarbonisation at the heart of collaborative research and innovation, spanning low-carbon and resource-efficient industries, net-zero technologies and clean and efficient energy systems. Research and innovation are therefore central to the **Strategic Energy Technology Plan, the Clean Industrial Deal,** and to Europe's ambitions for **batteries, renewables, hydrogen, carbon management, energy efficiency, and nuclear energy**.

Europe has already made huge investments in exceptional energy research assets—from materials databases and high-performance computing to synchrotrons, neutron sources and specialised laboratories. **The European Open Science Cloud (EOSC),** which entered production in October backed by 218 European research organisations, **provides the federating layer** that connects the **data, software, computing, and services** across borders, strengthening scientific data sovereignty and interoperability while making Europe's energy research **more reusable and AI-ready.**

Three strategic contributions to energy policy

- **Innovation:** EOSC helps combine experiments, simulations and AI to accelerate development of net-zero technologies and clean and efficient energy systems.
- **Competitiveness:** EOSC connects Europe's scientific facilities, materials platforms and computing capacity to shorten development cycles and strengthen low-carbon, circular and resource-efficient industries.
- **Sovereignty:** EOSC strengthens scientific data sovereignty and cross-border interoperability, enabling secure access to high-quality research data while providers retain stewardship and control..

From energy research to the energy transition

Two complementary examples show how EOSC can accelerate clean-energy innovation. Europe's **photon and neutron research infrastructures, where hundreds of complex energy-related experiments are performed each year**, can observe batteries cycling, catalysts reacting and solar cells operating at atomic and nanoscale resolution, revealing causes of failure and opportunities to improve performance. Through the PaNOSC EOSC Node, **tens of thousands of datasets generated by energy-related experiments** from 11 European photon and neutron facilities will become accessible and reusable through the EOSC Federation.

NOMAD **is another established platform** for connecting experimental and computational materials data with workflows and AI services. **NOMAD will connect to the EOSC Federation** through the German EOSC Node as well as forthcoming materials-science-focused Nodes. Its energy datasets already include more than **50,000 perovskite solar-cell devices, 5,000 battery records, 1,500 catalytic reactions, and 17,000 calculations on metal-organic frameworks**—providing a foundation for clean-energy materials development from measurement and simulation to modelling and machine learning.

Working together, EOSC Nodes can support:

- **Better batteries and storage**, by linking degradation studies with materials discovery;
- **Hydrogen and clean fuels**, through improved catalysts, electrolysers and fuel cells;
- **More efficient solar and low-carbon materials**, combining characterisation, simulation and AI;
- **Safer nuclear and fusion technologies**, by understanding materials under radiation, heat and stress;
- **Faster research-to-market cycles**, by enabling researchers and industry to reuse existing data.

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