

Scaling Sustainability Competencies: Digital Learning For The Energy Transition

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Extended Abstract

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Abstract Summary

This study examines how the integration of artificial intelligence (AI) is transforming competency requirements, work practices, and organizational structures in the energy sector, particularly in the context of addressing the Energy Trilemma. AI is increasingly embedded across the energy value chain—from renewable energy forecasting to grid management and market optimization—reshaping both technological processes and human roles.

In energy-specific contexts, AI-driven work is becoming more data-intensive and system-oriented, requiring employees to interpret algorithmic outputs, manage complex infrastructures, and make decisions under uncertainty. While this expands task complexity and innovation potential, it also increases work intensity, particularly in time-critical environments.

At the organizational level, AI adoption contributes to flatter hierarchies and more decentralized decision-making processes. At the same time, responsibilities shift toward hybrid human-AI collaboration, raising new challenges related to accountability, regulatory compliance, and the need for effective human oversight in safety-critical systems.

Results show a shift from domain-specific expertise toward meta-competencies, including critical evaluation of AI outputs and decision-making under uncertainty. However, risks such as increased workload, cognitive overload, and “competency drift” emerge. Overall, while AI enhances efficiency and innovation, it introduces new tensions that require adaptive governance, updated education frameworks, and sustained human oversight.

Presenting Author Biography

Anna Ginter studied business administration at the University of Cologne. She earned her Bachelor of Science degree in 2023. She then completed a master's degree in business administration at RWTH Aachen University, specializing in corporate development and

strategy. Her master's thesis focused on the sustainability of the traction battery supply chain. In 2025, Anna Ginter earned her Master of Science degree. Since October 2025, she has been working as a research assistant and doctoral student at the Chair for Energy Systems Economics at RWTH Aachen University.