

Energy Self-Sufficiency Through Smart Micro-Grids and Decentralised Sector-Coupling

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Abstract : Decentralised micro-grids with sector coupling can combat the spatial and temporal intermittence of renewable energy by combining power, transportation and infrastructure sectors. Intelligent energy conversion concepts such as electrolyzers, hydrogen engines and fuel cells combined with energy storage using intelligent batteries and hydrogen storage form the back-bone of such a system. This paper describes a micro-grid based on Photo-Voltaic cells, battery storage, innovative modular and scalable Anion Exchange Membrane (AEM) electrolyzer with an efficiency of up to 73%, high-pressure hydrogen storage as well as cutting-edge combustion-engine based Combined Heat and Power (CHP) plant with more than 85% efficiency at the university campus to address the challenges of decarbonization whilst eliminating the necessity for expensive high-voltage infrastructure.

Keywords : sector coupling, micro-grids, energy self-sufficiency, decarbonization, AEM electrolysis, hydrogen CHP

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