



DECENTRALIZED STORAGE AND GENERATION PLANTS AS AN IMPORTANT BUILDING BLOCK FOR A SUCCESSFUL ENERGY TRANSITION

I. Overview

The Power Systems business unit of the Rolls-Royce Group with its **mtu** product and solution brand is known worldwide as a manufacturer of first-class energy and propulsion solutions as well as life cycle services in business-critical areas. These include, for example, energy and emergency power supplies for data centers, hospitals, decentralized power generation, including combined heat and power, and propulsion systems for ships and rail vehicles. This range is currently based on diesel and gas engines as well as

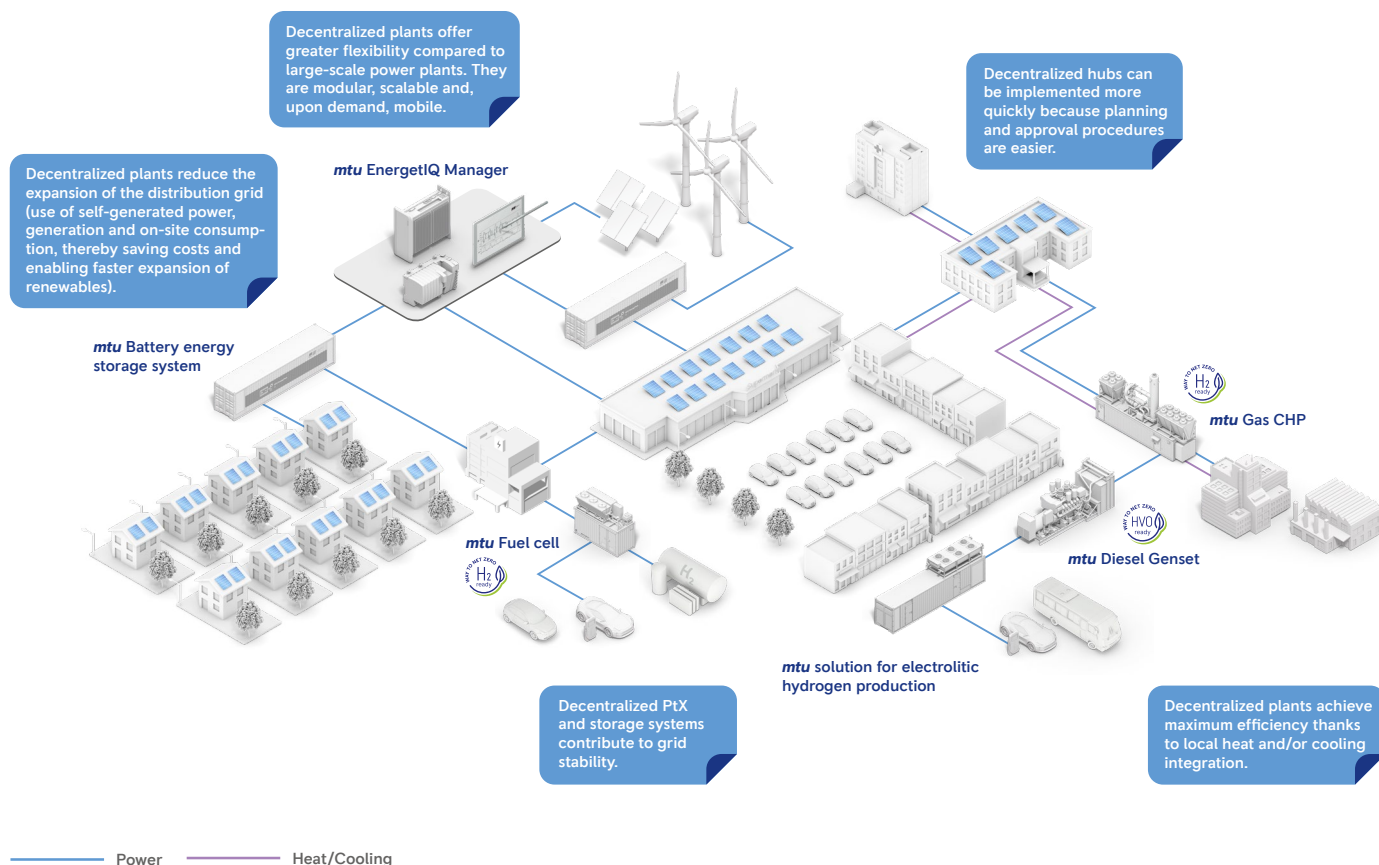
battery and automation systems. In addition, Power Systems is working on energy and propulsion systems that use hydrogen as a fuel or in a processed form as e-fuel. Solutions for scalable green hydrogen production are being developed for this purpose. With over one hundred years of experience, our products continue to set new standards in terms of performance and availability on the one hand, and energy efficiency, low fuel consumption, and low emissions on the other.



A Rolls-Royce
solution

II. Our Decentralized Solutions

Our range of products and services forms a sustainable ecosystem that focuses on decentralized energy supply solutions. The following chart provides an overview of our portfolio and the advantages of decentralized energy solutions:



III. Challenges and Solutions in Implementing the Energy Transition

The expansion of renewable energy sources will progress strongly in the coming years and will become the mainstay of the electricity system in Germany and Europe. This development brings numerous challenges along with it, including the following, which need to be carefully considered:

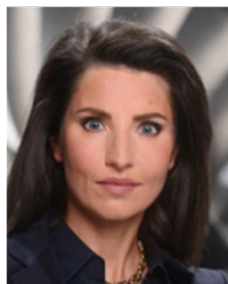
- 1. The expansion of renewable energies must go hand-in-hand with the expansion of decentralized power generation and facilities**
 In addition to the major expansion of renewable fluctuating power generation facilities, new electricity consumers such as fast-charging infrastructure for electric vehicles or heat pumps are leading to an increasing load on the power grids. With an increasing number of both plants feeding electricity into the grid and large electrical consumers, operating distribution grids is becoming increasingly challenging and grid bottlenecks are imminent. The consequences are rising costs due to grid expansion measures or high costs due to the regulation of renewable energies (feed-in management). Energy storage systems such as batteries, hydrogen, and Power-to-X systems at the distribution grid level can prevent grid bottlenecks and restrictions on renewable energy plants. In addition, electricity storage systems help to make electricity demand more flexible. Although Rolls-Royce has already implemented numerous battery storage projects with grid-supporting features, many potential customers are reluctant to implement such projects due to the substantial amount of capital expenditure involved.
- 2. Decentralized CHP plants are critical to the power system of the future**
 Despite the significant expansion of renewable energy sources, the demand for installed controllable power plant capacity remains almost constant. Controllable power plants will continue to be necessary to secure the energy supply in times when only a limited amount of renewable energy is fed into the grid. The loss of fossil fuel-based power plants must be compensated for by controllable renewable power plants. In particular, decentralized combined heat and power plants (CHP), which can be operated with biogas, biomethane and, in the future, also with hydrogen, are already suitable as backup power plants. In light of the phaseout of nuclear energy and coal, existing CHP plants must be maintained and the construction of further decentralized controllable capacities must begin in a timely manner.

IV. Support from Policymakers

Unfortunately, the current design of the electricity market in Germany creates hardly any incentives to invest in the urgently needed storage facilities and residual power plants. For this reason, a new market design must be implemented as quickly as possible. We welcome the fact that the German Federal Ministry for Economic Affairs and Climate Action has founded the Climate-Neutral Electricity System Platform, where it is discussing proposals for the future design of the electricity market with all relevant stakeholders. In order to make the urgently needed investments, the platform must deliver results as quickly as possible. In our view, the following points are key to shaping the future design of the electricity market:

- A capacity market is needed: A market design and revenue system tailored almost exclusively to the kWh generated does not create sufficient incentives for the necessary investments in controllable power plants and storage facilities that supply electricity in a flexible manner. The creation of an additional performance-based revenue component should therefore be introduced at an early stage.
- The grid tariff system should be quickly adapted to the flexibility requirements of the electricity system in order to stimulate investments in storage facilities.
- The benefits of decentralized generation facilities should be taken into account to a greater extent: In the current political debate, there is a strong focus on large power plants as backup load power plants. Decentralized plants achieve maximum efficiency through heat integration. They also offer greater efficiency than large-scale power plants in partial load range and flexibility, for example, when used as a mobile solution. In the electricity market of the future, more attention should therefore be paid to decentralized generation plants that can be powered by hydrogen or advanced biofuels.

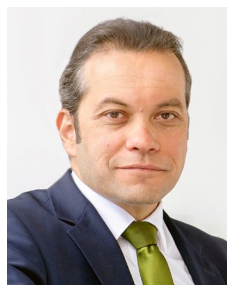
Your contact in Berlin and Friedrichshafen



Dr. Stephanie Willmann

Country Director
Rolls-Royce Group

Email: stephanie.willmann@rolls-royce.com



Dr. Daniel Chatterjee

Director of Sustainability, Technology
Management & Regulatory Affairs
Rolls-Royce Power Systems

Email: daniel.chatterjee@ps.rolls-royce.com