

Sucre off-grid systems

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To meet decarbonization targets of the Paris Agreement while providing universal access to electricity calls for renewable energy solutions. It is a key strategic goal of CIGRE to provide electricity for all in a sustainable way.

The Technical Brochure shares experiences on techno-economic pre-feasibility studies. Further, the study shows the necessity of stability studies and shares examples for hybrid systems for off-grid power supply. It further presents experience from systems that have been successfully in operation for several years. It is a proof of the concept that hybrid systems for off-grid power supply are already state-of-the-art and that high shares of renewable energy resources can be achieved while keeping power quality within the prescribed limits.

As an outlook, modelling and stability studies become more and more important. A benchmark model for hybrid off-grid systems and microgrids would be useful in addition to the already existing CIGRE Benchmark. This will support informed decisions by valid comparison of different control algorithms and power conversion systems e.g. during tendering phases of projects.

UN Sustainable Development Goal Number 7 calls for universal access to sustainable energy by 2030. Initiatives such as "Sustainable Energy for All" (SE4ALL) are a global platform that empowers leaders to connect stakeholders and unlock finance to achieve universal access to sustainable energy. The purpose of this Technical Brochure is to bridge knowledge gaps on hybrid systems for electricity supplies in off-grid and remote areas. It serves as a guide for governments, entrepreneurs, technical experts and financing organizations.

The work includes five chapters and an appendix for the example case descriptions.

Hybrid systems use a mixture of distributed energy resources, including solar, wind, hydro, biofuels and fossil fuels, combined with energy storage and controlled by an energy management system. By presenting experiences related to existing hybrid systems for off-grid power supply for different applications, this study can offer broad support for the preparation of installations for remote power supply, in particular those using renewable energy.

When considering bringing modern energy services to an off-grid area, three primary modalities are typically requested:

Focus is on hybrid systems for off-grid areas. In this context, we refer to microgrids as a common technology for off-grid power supply. They may also be deployed as part of a broader grid edge approach, which is a distributed approach in contrast to traditional centralized planning and operation.

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