ENERGY SELF-SUFFICIENCY WITH RENEWABLE ENERGIES: FEASIBILITY STUDY RITTEN

Challenge
Already today, distribution grids of regions with a particularly high share of renewable energy sources can work temporarily at their load limit. Especially the feed-in power from a variety of distributed photovoltaic systems without a smart management may already carry distribution grid peak loads and partial shutdowns. On the other hand, a variety of distributed power generation offers the opportunity to operate the entire system as an offgrid system. Smart automation and control technologies in conjunction with power system mananagement, power grid protection and remote control technology can solve these two problems together. Through parallel operation mode, critical distribution grid conditions can be cleared, on a black out, the power grid can be operated in an isolated operation mode. However, off-greids are complex systems which require an exact analysis of power supply, power consumption and power grid infrastructure including secondary systems. An example of these challenges is the power distribution grid region Ritten near Bolzano in South Tyrol with its approximately 2,500 inhabitants and a high number of commercial and industrial companies.

The feasibility study
By order of the Etscherwe Netz AG - the largest regional power utility company in South Tyrol, the Fraunhofer AST analyzed together with SPRECHER Automation Germany GmbH the option of an isolated operation mode in a feasibility study. That study include the possibility operating the existing middle and low voltage power grid with 20 local network stations in an isolated operation in case of a power grid black out.
### Fraunhofer AST: Scientific research
- Modeling and simulation of the off-grid structure with PowerFactory
- Analysis and report of energy data with EMS-EDM PROPHET®
- Power flow and short-circuit static current simulation
- Stationary power studies
- Research on voltage band in medium voltage power grids
- Data processing and plausibility
- High-resolution power measurements
- Research on idle performance

### SPRECHER Automation Germany GmbH: Technical Analysis
- Remote control concept (including reconstruction after black out)
- Creation of a control concept including photovoltaics
- Creation of the power grid protection concept (power grid and grid equipment protection)
- Creation of an automation concept
- Switch concept for power grid black start
- Approach to synchronization between mains parallel operation mode and isolated operation mode
- Communication concept to control grid protection and grid stability in the isolated operation mode
- Communication concept as backbone for isolated operation mode
- Integration into the grid control center of Etschwerke Netz AG

### Results
- During the summer months and the transition period an isolated operation mode of the entire region is technically feasible
- The pillar of the power grid stability and grid frequency in isolated operation mode are biomass-fired power plants as well as a stationary standby set
- In combination with energy storages, photovoltaics can also contribute to the power grid stability
- The realization of an off-grid-system with optional parallel mains operation mode is a lighthouse project for the grid integration of renewable energies in rural areas
- In Ritten, numerous technologies of a smart grid can be practically tested and implemented

### Project consortium
- Advanced System Technology AST
- SPRECHER Automation Germany GmbH

### Customer
- Etschwerke Netz AG, Azienda Energetica Reti S.p.A.

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![Example photovoltaic load curve in the summer](image_url)