

# SIEMENS

*Ingenuity for life*

## How a distributed energy supply works – economically and reliably.

Wildpoldsried, Germany

[www.siemens.com/IREN2](http://www.siemens.com/IREN2)

### Microgrid with added value

The portion of renewable sources in energy supply is growing worldwide. Its expansion depends on economic, political, and technical factors. The long-term intent should be to reduce the amount of fossil fuel energy sources, most of which are centralized. Renewable energy systems – mostly decentralized – are expected to meet demands while maintaining a high level of supply reliability and profitability.

That's why the IREN2 research project in Wildpoldsried, located in Bavaria's Allgäu region, is studying innovative grid structures that predominantly feature distributed generation devices and their technical and economical management.

The main goals of the project are:

- Operation of the microgrid as an island grid – disconnected from the main grid
- Use of the microgrid as a topological power plant – to provide system services
- Stable and economically optimized grid operation

In addition to Siemens, Allgäuer Überlandwerk GmbH (AÜW) / AllgäuNetz GmbH & Co. KG, RWTH Aachen, Kempten University, and ID.KOM Networks GmbH are also participating in the research project. The project is funded by Germany's Ministry for Economic Affairs and Energy (BMWi).



IREN2 is the first microgrid test of its kind outside of the laboratory.

*“In the local projects here, the research partners are acquiring experience that will help advance the integration of renewable producers into a microgrid.”*

Arno Zengerle, Mayor of Wildpoldsried

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# Challenge for Wildpoldsried

Biogas, solar, and wind power – the community of Wildpoldsried in Bavaria's Allgäu region draws on renewable energy sources to generate five times as much energy as it consumes. That's why the local grid needs to be capable of handling bidirectional energy flows and huge energy fluctuations. Thanks to intelligent grid planning, the implementation of measurement technology at critical points, and controllable network components like intelligent secondary substations, it was possible to avoid high investments in grid expansion and extensive measurement technology.

The existing structures form an ideal foundation for more research activities: Working with its consortium partners, Siemens will show that a grid with a high share of renewable energy producers can also run independently – and how such a grid can even temporarily replace large power plants by supplying ancillary services to the higher-level grid.

## The solution

Renewable and conventional producers combine to form a hybrid structure in Wildpoldsried. In the test area, photovoltaic roof installations and a biogas cogeneration plant are supplemented with two diesel generators and one lithium-ion storage system. The grid is equipped with a measurement and control infrastructure as well as controllable transformers.

Control center technology from Siemens – the microgrid manager and the hybrid power plant control – manage the regulation and control of all units. Their main task is to maintain the grid's stability in real-time operation,

including stabilizing voltage and frequency and providing short-circuit power within the microgrid. One special challenge is to stabilize the grid during a black start – in other words, restoring the grid "from below" as well as with the main grid during resynchronization when the microgrid is reconnected following testing of the independent grid.

In addition to internal stability, as a topological power plant the Wildpoldsried microgrid is expected to provide services that can ensure system stability in the higher-level grid. Through these ancillary services, the microgrid will occasionally be able to completely replace conventional power plants. To accomplish this, the control technology will predict, intelligently plan, and control the performance of renewable producers.

## What the microgrid provides as a topological power plant:

- The potential need for system services is predicted in advance.
- If ancillary services are agreed upon, the microgrid will be capable of delivering those services at any given time.
- A control system that ensures that the distributed systems can provide the system service in addition to normal operation.

## The benefits for Wildpoldsried and microgrids worldwide

The IREN2 research project in Wildpoldsried shows that supply grids with a high share of renewable energy generators can be operated economically and in a stable manner.

Whether within an upstream power grid or as an island grid, today's microgrid technology is paving the way for lower consumption of fossil fuels while ensuring the highest level of supply security. Renewable energy sources can be exploited to their fullest while minimizing the runtime of backup generators. If this type of microgrid is also given the job of ensuring superordinate grid stability, it will completely replace large conventional power plants some of the time.

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