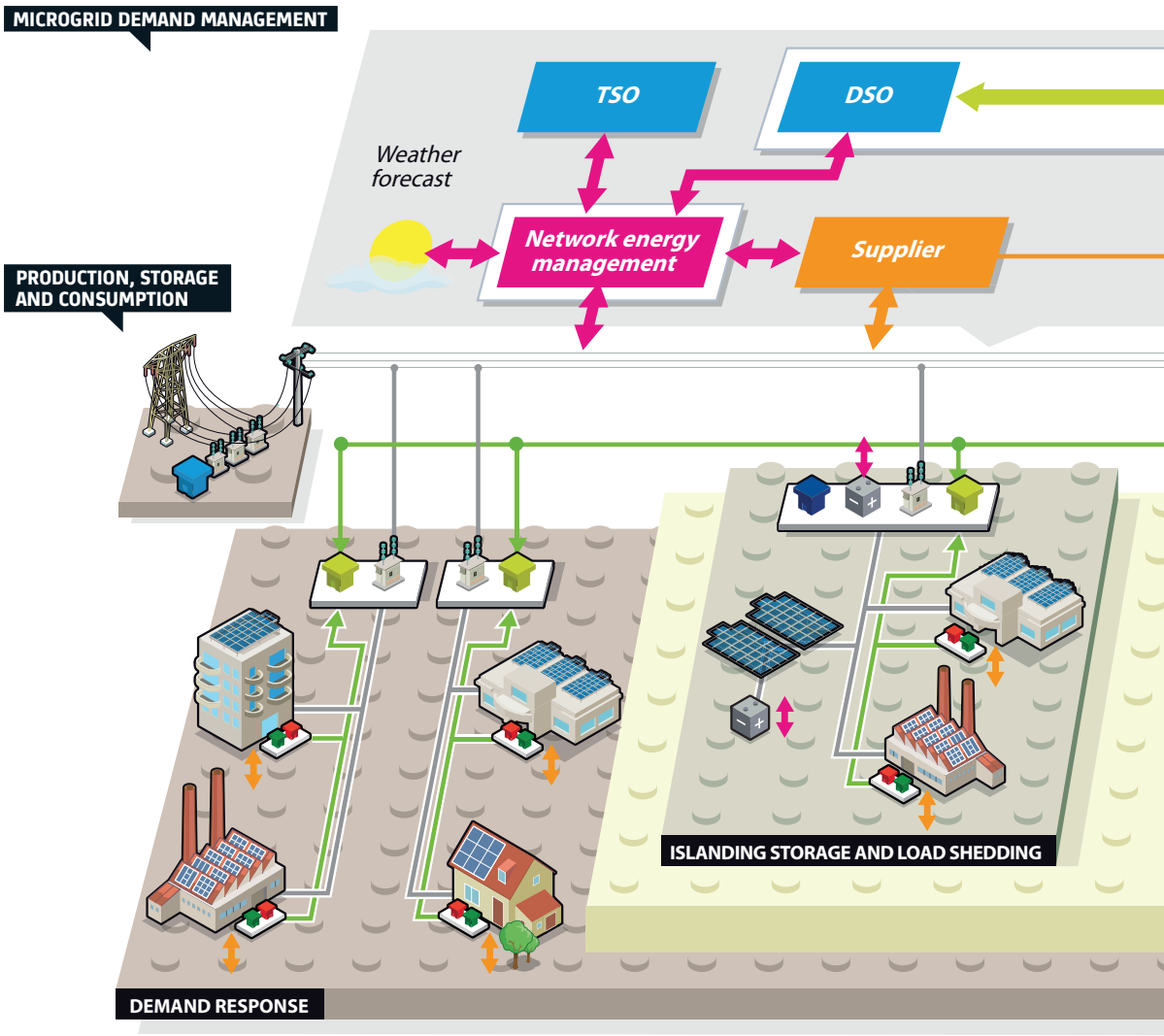
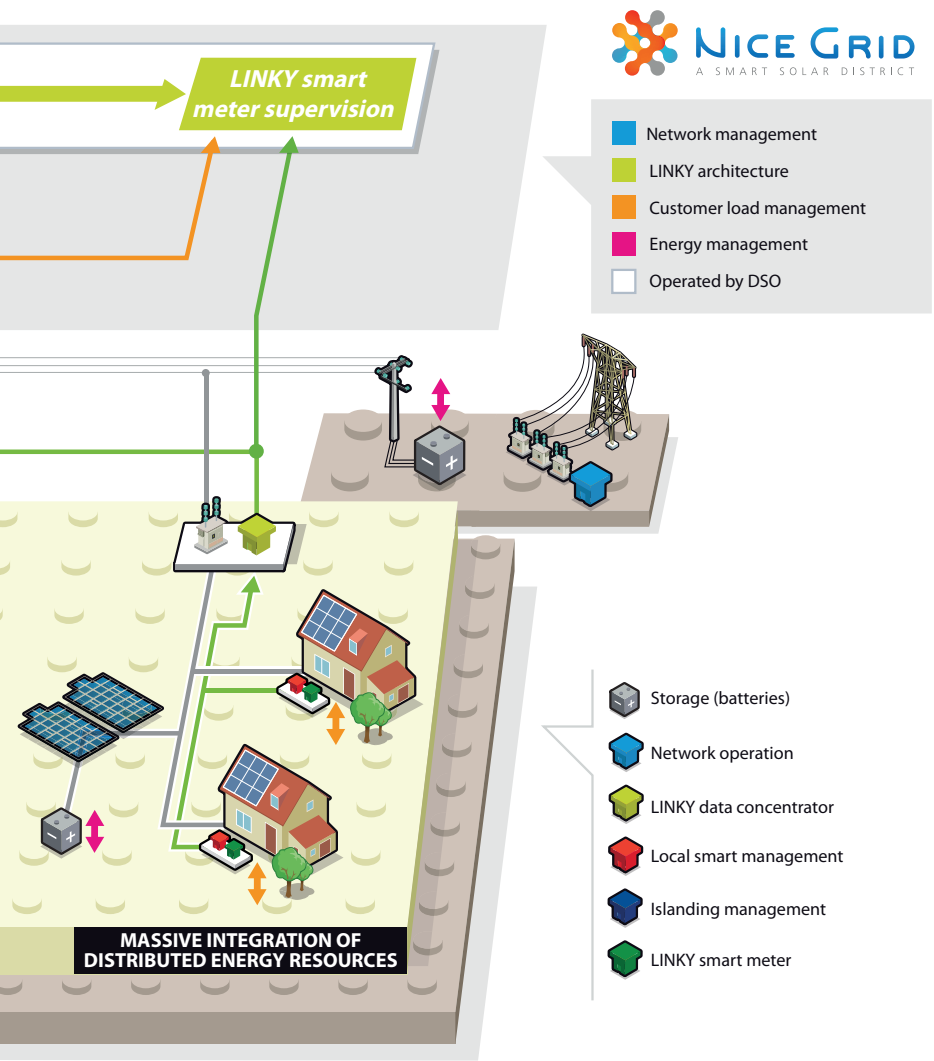


Nice Grid – testing the future

Microgrids have been called "the impatient upstarts of our energy future". They are independent, small-scale electricity systems for communities, towns, campuses and even individuals, delivering integrated distributed renewable energy, improved grid reliability, personal energy use data and customised control.



The objectives of Nice Grid are threefold: to test massive photovoltaic integration; enable islanding for secure supply; and provide demand response for flexible consumption.

Although they are a hot topic, few fully commercialised state-of-the-art microgrids with significant generation capacity are actually up and running. Nice Grid, a living laboratory located near Nice in the south of France, is one of the rare demonstrations of microgrids in the world. The project, which is expected to last four years, brings together ERDF (the French distribution network operator), EDF (the electricity supplier), Alstom, battery maker Saft, and other industrial partners and innovative SMEs. The project has been selected as one of the six smart grid demonstrators of the European Union's Grid4EU programme. It will test an innovative architecture for medium and low voltage distribution networks with smart houses capable of managing their electricity needs and new architectures called Virtual Power Plants to run them. A total of 1,500 residential, commercial and industrial end users are expected to participate in the experiment. The Nice Grid project is one of 15 smart grid demonstration projects in which Alstom is actively participating around the world. The project will study and →→

MORE

Said Kayal

MICROGRIDS TODAY...

The balance of energy on the grid will rely on larger volumes of distributed energy resources (renewable energy, demand response and storage). Because today's distribution network does not accommodate these new types of energy flows, smart local optimisation is needed, while maintaining the quality and security of energy supply.

... AND TOMORROW

Microgrids are the building blocks of tomorrow's smart cities. They take full advantage of the flexibility of "prosumers" (consumers who also produce electricity) while integrating new distributed energy resources and storage solutions. Fragile areas susceptible to blackouts, as well as densely populated cities, will eventually be made up of autonomous grids within an overall smart grid able to survive major disturbances.
Tomorrow's energy management systems will be designed around a decentralised, multilayer architecture, where microgrids provide the local intelligence and optimisation. New sources of renewable energies such as biomass and microhydro solutions, as well as new storage solutions, will be integrated at the local level. Local microgrids and smart campuses will be part of smart districts, which in turn will be part of smart cities, with each layer optimising the layer below to build up the overall smart grid infrastructure.

> "Nice Grid will interconnect smart homes, smart industrial buildings, energy storage and a large number of solar panels."

→→ test the economic, technical and social issues related to microgrids of the future. These include the optimisation and use of medium and low voltage networks with a massive contribution from decentralised and intermittent renewable energy sources (principally photovoltaic) as well as the behaviour of customers, who will become agents for their own production, consumption and storage of electricity. Also to be studied is the operation of an independent consumption zone equipped with energy storage resources and isolated from the main network.

DERMS

"Nice Grid will use the Alstom Grid Distributed Energy Resource Management Solution (DERMS) to interconnect smart homes, smart industrial buildings, energy storage and a large number of solar panels, gathering them into a single integrated microgrid," explains Said Kayal, Smart Grid Innovation Manager at Alstom Grid. "DERMS will allow for more optimised energy consumption in the microgrid and connect it to the main ERDF distribution network. The current distribution network is unable to accommodate this new type of energy flow, so local optimisation and balance between production, consumption and storage appears to be the right approach to avoid massive investments in the distribution network," he adds.

Connected to the microgrid?

ERDF and EDF have to integrate distributed energy resources (DER) into their daily grid and commercial operations. Nice Grid will attempt to answer their

A nice place to be when the sun shines.

→→ business needs in terms of DER enrolment, optimisation and dispatch around an MV/LV grid node.

Overcoming the challenges

The south-eastern region of France where Nice Grid is to be located is an "electric peninsula". It produces only 40 percent of its energy needs for the moment, but it already has a high concentration of solar panels connected to the grid, making it an ideal location for experiment. The demonstration will capture around 2 MW of installed photovoltaic capacity in the region. In extreme situations, the microgrid can also be islanded. This principle works on the basis that if the distributed network experiences a blackout or other extreme conditions, the microgrid will continue to draw power from internal DER (solar panels, storage or demand response), as it is an independent autonomous network.

"One of the key challenges of the project includes the smooth injection of decentralised and intermittent renewable energy into the distribution grid, and its management. The project integrates storage systems and centralised demand management centres in order to achieve this; however, energy optimisation via storage solutions will be pushed to the maximum," Kayal specifies.

> "Customers will become agents for their own electricity production, consumption and storage."

Another key challenge of the project is to enable consumers to become active participants in the local energy balance via demand response. Nice Grid will attempt to design and validate a new model of interactions between energy actors: consumer, commercial aggregator, and the distribution system operator (DSO) at the microgrid level.

The DSO (ERDF) will be able to route energy to where it is needed, and end users will be able to monitor and control their energy consumption via smart meters. In this way, the Nice Grid project will demonstrate the impact of lowering energy demand and reducing CO_2 emissions, while maintaining the quality and security of the network, acting as a kind of laboratory for experiments that are not possible on a working national grid. ■