



# Big footprint for a small island

Text: Claudia Flisi | Photos: feedback communication

During winter, the energy demand of Ventotene's 700-plus residents is not huge, but in the summer the population swells to over 3,000, and the need for electricity surges. As the islanders turn to photovoltaic panels for more power, will a microgrid allow them to integrate the renewables into an already volatile power grid?



Pietro Pennacchio, director of Ventotene's Mezzatorre Hotel, came to the island in the 1970s and has witnessed its transformation into a popular summer destination.

**I**solation, as well as seasonal volatility, was a problem for the island aptly named Ventotene, "swept by the wind." It is located 46 kilometers from Italy's western coastline about halfway between Rome and Naples, and is so remote that it was once used as a place of exile by Roman rulers. Even today, its 700-plus permanent residents are not connected to Italy's national electric grid.

For years, the island's energy needs had been met by four diesel generators, each with 480 kilowatts of power. The motors struggled to cope with load variations and were not working in the optimal operating range. The result was a decrease of asset service life.

The advent of tourism in recent years has changed Ventotene's needs and expectations, reports

Pietro Pennacchio, director of the island's Mezzatorre Hotel: "I have seen this place transform from a state of quasi abandonment when I came in the 1970s to what it is today." One example: Buildings that were used as dwellings for exiled prisoners centuries ago have become vacation homes for summer visitors today – visitors with modern energy demands.

### A new hybrid solution

Enel, the Italian energy utility, decided to take a look at the situation in Ventotene in 2014. As elsewhere in Italy and other countries where they are present, Enel is pursuing sustainable actions aimed at decreasing greenhouse gas emissions and increasing asset efficiency, flexibility and reliability. The goal for Ventotene was to support power generation

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Pietro Pennacchio, Ventotene local and hotel director

and the distribution of their isolated network, thereby lowering fuel consumption as well as emissions and energy supply costs, and increasing their grid hosting capacity for new renewable energy systems. Giuseppe Molina, Head of Enel's Thermoelectric Plants Italy, explains that the company planned to do this by developing a new hybrid solution that would integrate existing infrastructure (the diesel generators) and innovative storage systems (lithium-ion batteries) to maximize plant efficiency, reduce emissions, and increase system reliability and asset lifetime, allowing for higher renewable penetration.

Thanks to Enel's intervention in the power station, many of the island's homeowners and businesses have had the opportunity to install photovoltaic panels over the last years, reports Pennacchio. "We have seen large savings in our energy costs during this transition. It is a great satisfaction for us to use the sun's renewable energy – consuming less and polluting less." Solar panels currently produce 130 kilowatts of energy for the island. They are useful for water heating and cost saving. But the problem was that the energy produced was inherently unstable and existed independently of the energy from the diesel motors.

### A customized turnkey solution

Flexibility and storage capability were going to be key to the new system. Since Enel had worked with >



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Plants Italy, Enel

Siemens on a storage system that was later installed in Enel’s distribution network, the Italian utility asked Siemens to participate in the project. “We were interested not only in pricing but in competence, reliability, and sustainability, too.” notes Molina. “And we were looking for a partner who shared our values.”

The partners proposed a customized turnkey solution that included building a Siestorage battery energy storage system with an output of 300 kilowatts and a storage capacity of 600 kilowatt-hours, managed by a microgrid controller. The advanced control system, developed by Enel and Siemens, ensures that the diesel generators can be used more efficiently because short-term peak loads are covered by power from the storage system and not from the generators.

The lithium-ion batteries help compensate for load and voltage fluctuations that occur in the electrical grid, ensuring stability of the network. Lithium-ion batteries were chosen specifically because they combine high performance and a high number of charge and discharge cycles. The batteries alone can supply energy to the network when they are sufficiently charged and demand is “normal” – that is, in all but peak periods. According to Molina, Ventotene’s energy comes only from the batteries nearly 25 percent of the time.

### Managing supply and demand intelligently

Modularity and flexibility are other key elements of the hybrid system. It is designed to allow proper functionality even when part of the battery is disconnected or when there is a breakdown in one of its inverters. Its flexible design ensures that renewable sources, such as the island’s solar panels, can be integrated into the network seamlessly.

The microgrid controller manages supply and demand intelligently, reducing the problems of seasonal

volatility and fluctuations inherent in solar energy sources. Its intelligence also means optimal functioning of the diesel motors, turning them off when demand is low and allowing them to work with maximum efficiency. This results in annual fuel cost savings of 15 to 17 percent because a motor functioning at full load consumes less fuel, reduces emissions, and experiences less wear and tear.

Consequently, the island’s grid stability increased, allowing more distributed PV panels to be installed. Constant monitoring of electrical frequency and voltage has virtually eliminated blackouts in the summer.

### Improved way of life

Additional benefits include decreased maintenance costs due to fewer hours of operation of the diesel motors (54 percent less), and an improvement in environmental sustainability because CO<sub>2</sub> and NO<sub>x</sub> emissions are drastically reduced.

The upshot is a reliable system for the entire life of the installation, satisfying to both Enel and the islanders. Long-time resident Pennacchio enthuses: “This initiative has improved our way of life on the island. It is the beginning of a new way to live, a new coexistence with and respect for our environment.”

The implications extend beyond one little island. Ventotene may be a small project but it has a potentially large footprint. It represents on a small scale what could be accomplished more and more frequently in the future, in Italy and beyond: the integration of preexisting energy solutions, such as diesel motors, with sustainable implementations that are technologically advanced and tap renewable energy sources. ■

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Enel technicians maintain Ventotene’s energy system, ensuring a reliable and sustainable power supply for islanders.