

Nidec

All for dreams

Installed Smart Micro Grid for a resort in the Maldives

Renewable Energy Applications for islands tourism – Cyprus 29-30 May 2014





All for Dreams

“Dreams challenge and the Nidec-Group will continue to meet the challenge”

From the Company's Corporate Philosophy statement

***Our goal is to be N° 1
in electric drive solutions***

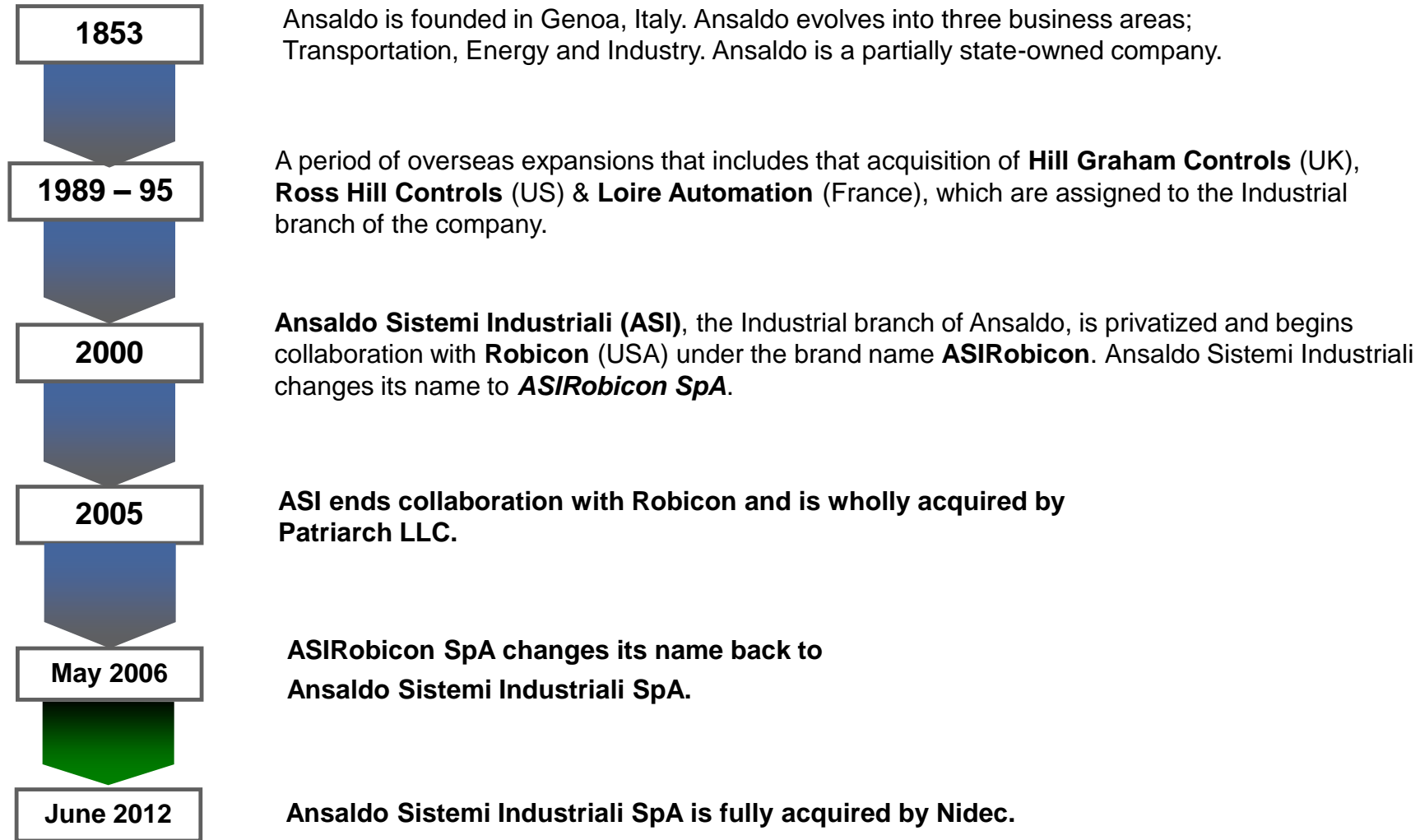
Nidec started out as the dream of its CEO Shigenobu Nagamori and his three partners back in 1973. From the beginning their goal was to become number one in electric drive solutions, with a strong focus on electric motors.

Over the years, through hard work and determination, the company has grown, expanding from its original product base of motors for Information & Communication Technologies into motors for home appliances, automobiles, office equipment and industrial machinery.

With a work force of approximately 98,000 and operations in more than 18 countries, Nidec is well positioned to become the number one brand in electric drive solutions worldwide.

Quoted on the New York Stock Exchange (NYSE) since 2001, Nidec is headquartered in Kyoto, Japan.

A Brief History of Nidec ASI





NIDEC-ASI has been providing:

- Variable speed drive systems
- Generators
- Static excitation systems
- Soft starters for auxiliary equipment and automation system in all types of power stations, including nuclear
- Power Supply

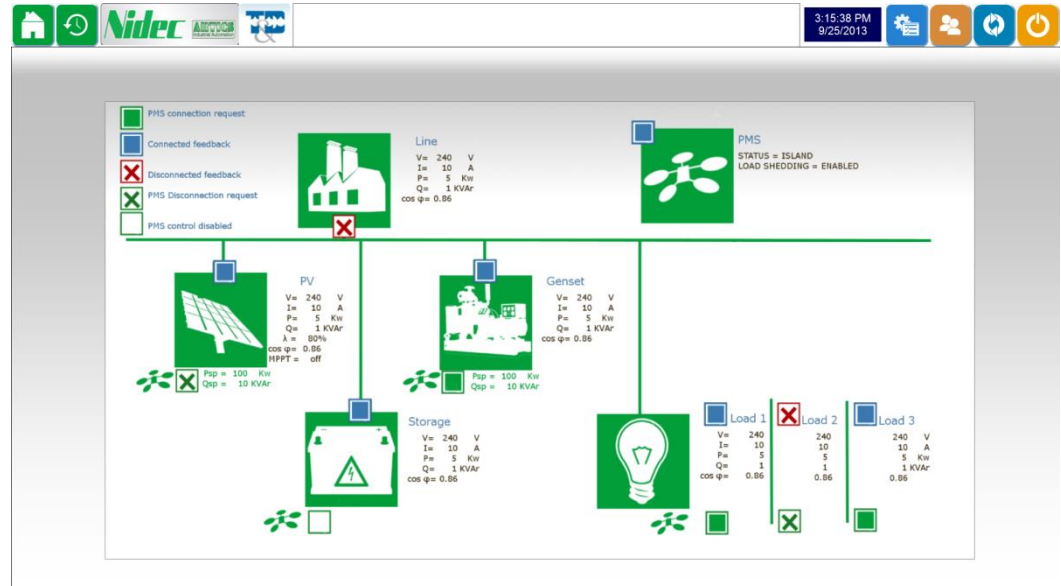
Microgrid definition

A micro-grid is an electrical network portion with, at minimum, a local distribution system and an auto-energy production.

In a more general definition, a micro-grid includes distributed generators (DG), distributed storages (DS) and a variety of customer loads, which can be operated completely independent from a main distribution system.

Micro-grids are proliferating around the world in a variety of forms, mainly for integrating distributed energy generation, both from renewable and fossil fuel resources.

Micro-grids may be grid-tied or remote and are utilized in several key application segments including commercial, community, institutional, military, and remote installations.



Categories (as indicated in “IEEE Std 739-1995 - IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities”):

- Lighting
- HVAC (heating, ventilation and air conditioning)
- Motors and drives
- Processes (electric arc, welders, ...)
- Other electrical equipment (transformers, computers, ...)
- Building environment shell

Type:

- AC loads
- DC loads

Duty:

- Continuous
- Intermittent
- Standby

Control:

- Critical
- Necessary
- Deferrable
- Unnecessary

Categories:

- conventional generation (turbines)
- distributed generation (microturbines, renewables)

Type:

- AC generation (hydro, biomasses, wind, ...)
- DC generation (photovoltaic, fuel cells, ...)

Duty:

- Controllable (depending on stored fuel, such as gas, hydrogen, ...)
- Uncontrollable (depending on external/environmental factors such as wind, sun, ...)

Control:

- Active and reactive power control
- Voltage and frequency control



Maldives Island project

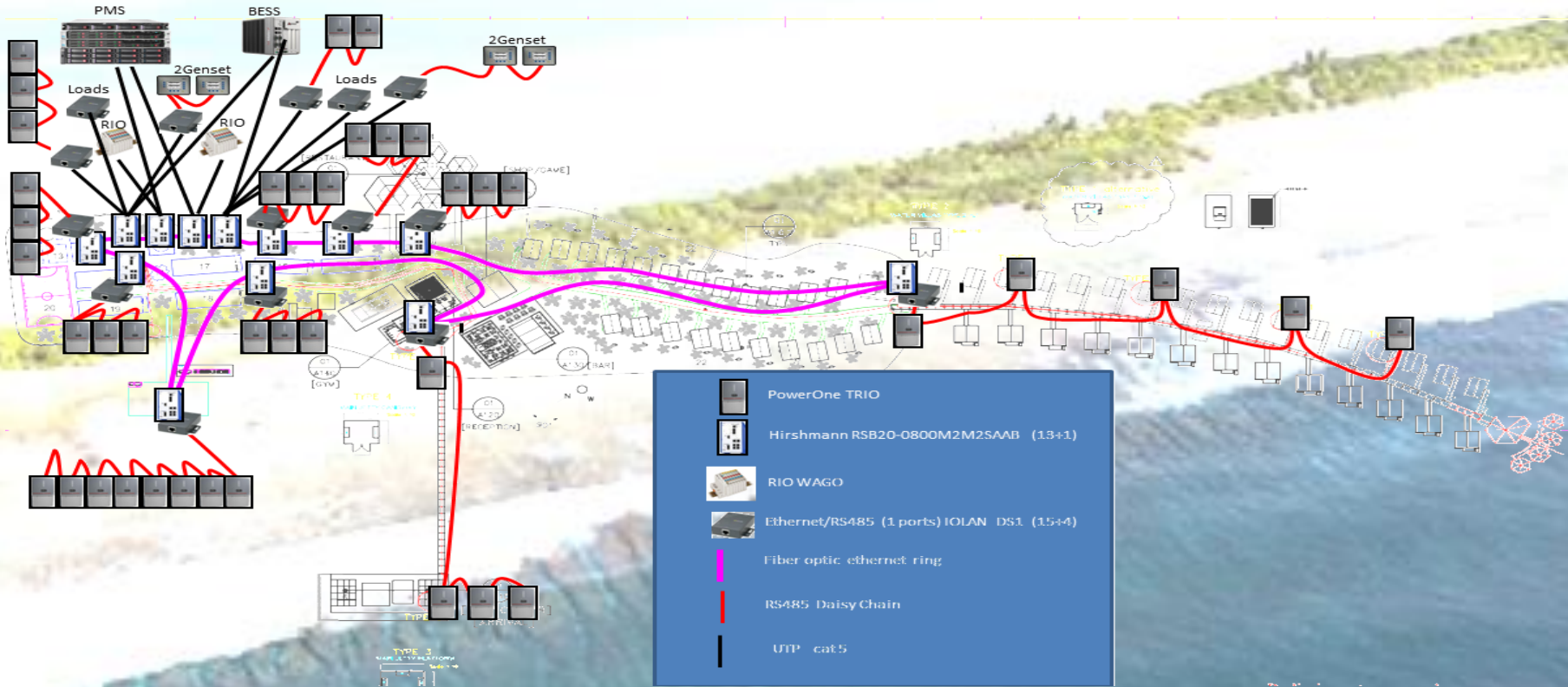
Power Management System for the Microgrid has been installed at Maldives Island.

The Microgrid is made by the following elements:

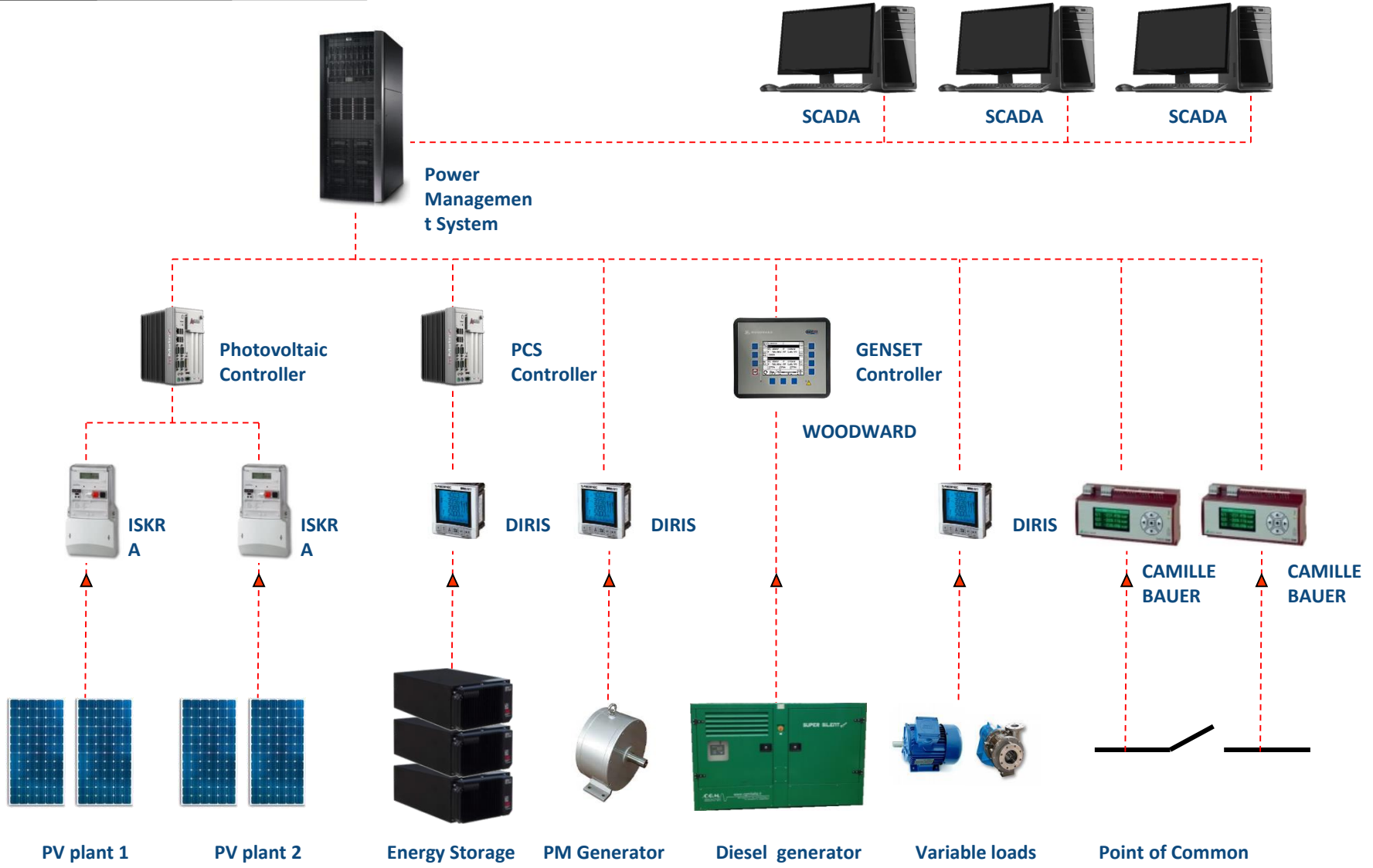
- 1 MWp photovoltaic plant installed in roofs of the resort;
- No.4 diesel generators, total of 2,6 MW;
- 1,5 MWh energy storage system;
- 800 kVA Active Front End (AFE) AC/DC converter;
- Resort electrical loads – max load 550 kW;
- Power Management System.



Smart Micro Grid



Smart Micro Grid



General considerations for sizing the Micro Grid

LOADS

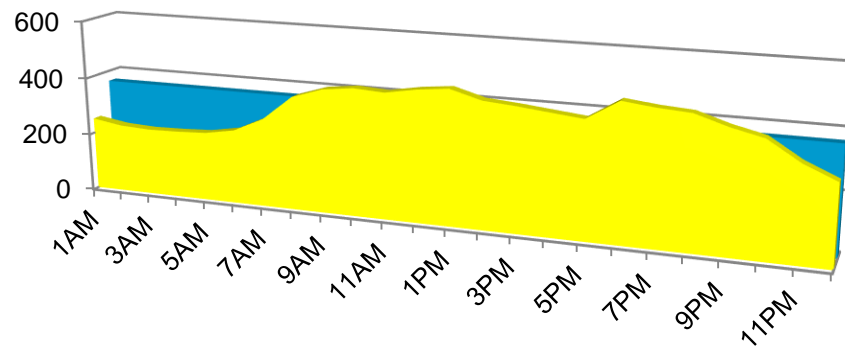
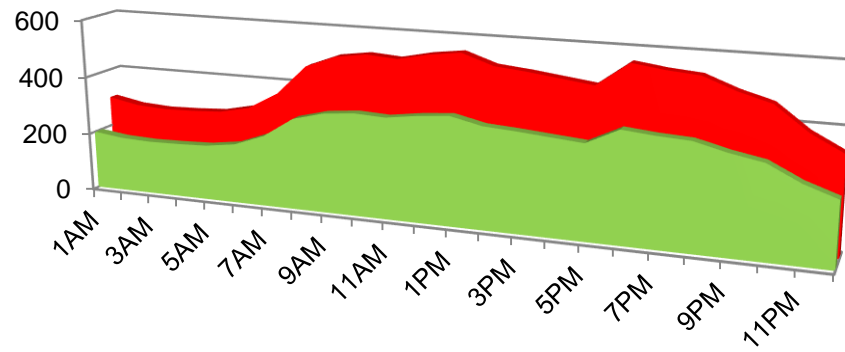
- Categories (heating, air conditioning, water treatment,...)
- Type (AC, DC)
- Duty (continuous, intermittent, stand-by)
- Control (Critical, necessary, deferrable,...)

GENERATORS

- Conventional (diesel)
- Distributed (renewable)
- Type (AC – wind, DC – PV)
- Duty (controllable – stored fuel, uncontrollable – wind, sun)
- Control (voltage and frequency control)

Technical Calculations - Example

Time	Min. power consumption (kW)	Max. power consumption (kW)
1AM	201	302
2AM	188	282
3AM	184	276
4AM	186	279
5AM	190	285
6AM	205	308
7AM	244	366
8AM	312	468
9AM	339	509
10AM	349	524
11AM	344	516
12AM	359	539
1PM	368	552
2PM	344	516
3PM	337	506
4PM	328	492
5PM	319	479
6PM	372	558
7PM	362	543
8PM	356	534
9PM	329	494
10PM	309	464
11PM	256	384
12PM	219	329



Economical Calculations - Example

Calculated load: 350 kW during day, 200 kW during night
Necessity of storage (absence of renewable generation): 12 h
PV installed capacity: 500 kW
Energy storage installed capacity: 1,5 Mwh
Diesel generators: 500 kW (1+1 as stand by)

Comparison with standard 100% diesel generation
Energy storage installed capacity limited to 1,5 MWh
Average saved energy per day: 5 MWh
Investment cost: 2,2 Mi Euro
Parameter: 0,2 kg of fuel per kWh
Return of Investment:

- In case of fuel cost of 1,5 Euro/l: 3 years
- In case of fuel cost of 1,0 Euro/l: 4,8 years
- In case of fuel cost of 0,5 Euro/l: 9 years

Additional reasons to install Renewable Energy Microgrid

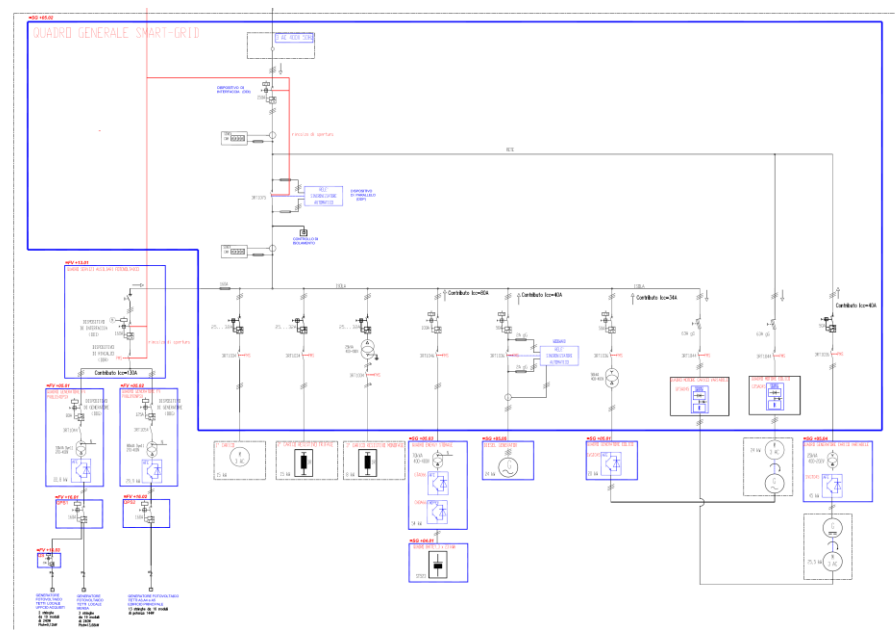
- Pollution in the area
- Smell
- Noise
- Fuel feeding
- Fuel storage

Smart Micro Grid – Added value

Nidec ASI Microgrid Pilot Plant

A Microgrid Pilot Plant is active in our Montebello Vicentino site and is made by:

- 52 kW photovoltaic plant installed in roof (split into “thin film” and “polycrystalline”);
- 30 kW diesel generator;
- 70 kWh energy storage system;
- 20 kW eolic plant simulator;
- Fixed and variable loads;
- Power Management System.



Local Smart Micro Grid



Many thanks for your kind attention

Please consider yourself invited to visit our

Smart Micro Grid system in our production facility