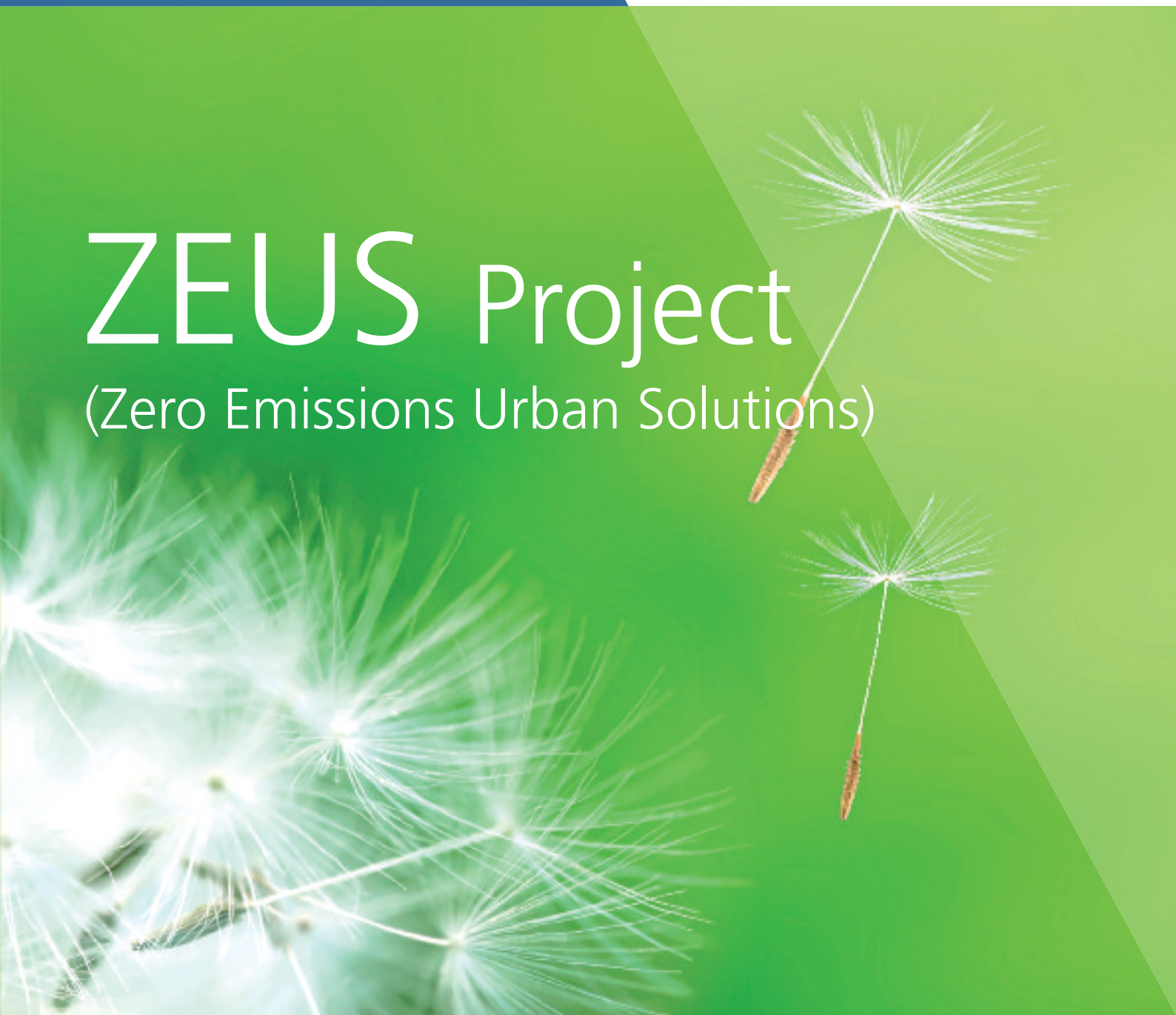
Ansaldo Sistemi Industriali

RESULTS TO THE POWER OF THREE

ZEUS Project

(Zero Emissions Urban Solutions)



160 years of experience committed to the future

Our history says it all: throughout the years we have searched for the best solutions to respond to the demands of the market.
To us, these ever-changing demands represent exciting challenges. We have evolved through each, seeking out the innovative technological solutions that have led our Group to become a world leader in industrial automation.

Today, we're putting that invaluable repertoire of knowledge to use in a great new mission: intelligent energy use. It's a strategic choice that – we're sure – will prove to be a winning one for us, and, more importantly, for the future of the environment.

Considering energy conservation as an alternative resource drives us to find state-of-the-art technological solutions, where efficiency and balance become the foundations for building the world of tomorrow.

ZEUS: The challenge of green infrastructures

In 2008, Ansaldo Sistemi Industriali (ASI) created project ZEUS, or Zero Emissions Urban Solutions, on the theory that the ideal model of urban development is represented by the creation of a self-sufficient, clean, green, low-cost infrastructure.

Today, this means rethinking the way we produce, deliver, and consume electricity, not only to reduce costs but also to obtain the benefits of reduced noise and pollution.

ASI has the technology to meet many of the most important challenges related to the development of infrastructure that would appreciably reduce CO2 emissions to improve the quality of life for current and future generations.

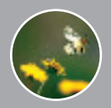
Project ZEUS is structured around four pillars:

Energy efficiency

Modernizing systems and optimizing energy consumption through the installation of power electronics designed for controlling motor speed and improving power quality to minimize losses during transmission and distribution.

Renewable resources

Introducing new sources of renewable energy into local grids to reduce energy dependence and costs, while also improving environmental conditions.



Electric transportation

Implementing electric transport systems to reduce harmful emissions of CO_2 and NO_X.

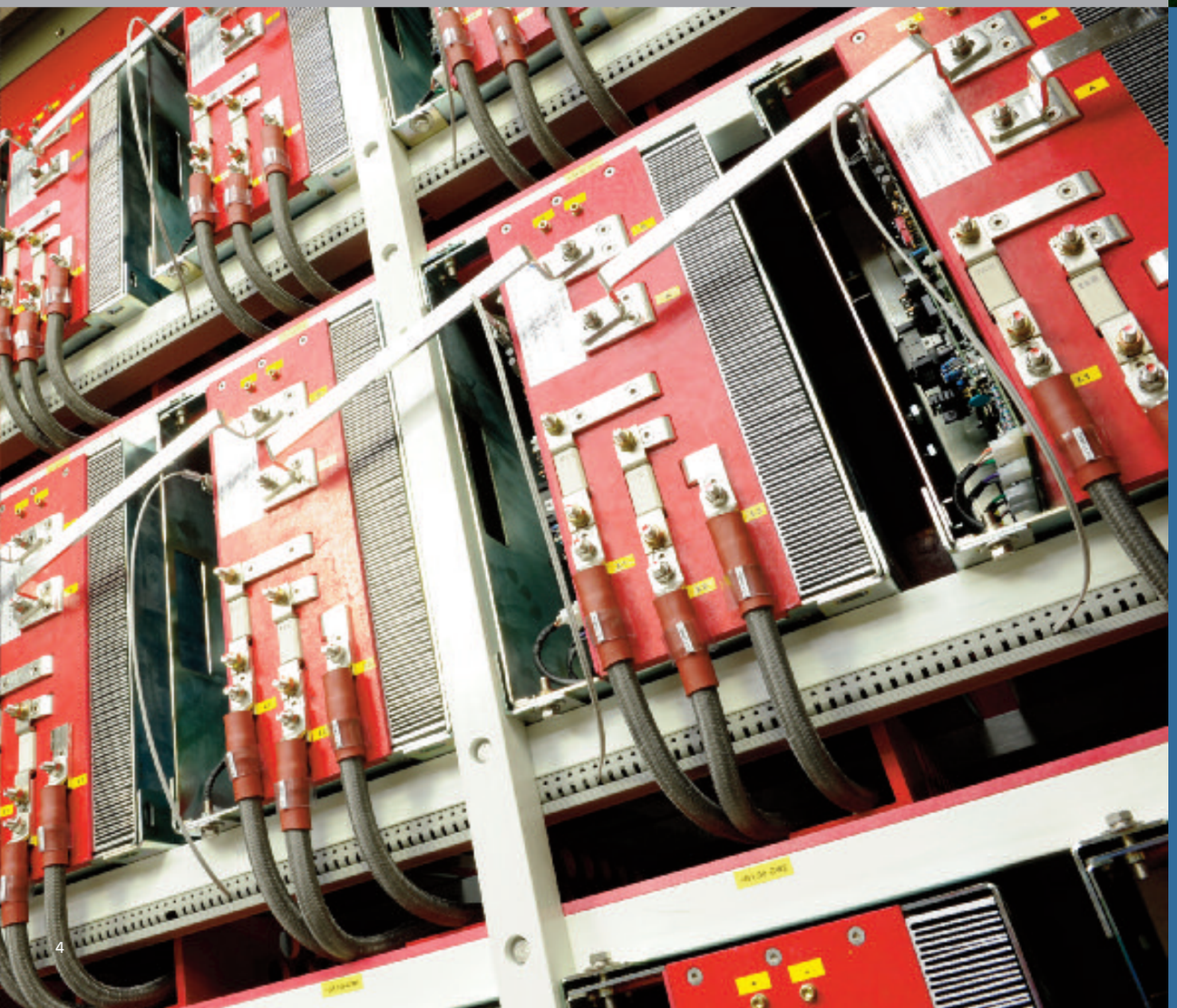
Energy conservation

A sustainable economy can be built through the first three pillars of project Zeus.
But that isn't enough to guarantee its success. A fourth pillar is needed: a change in public mentality. Everyone in society needs to adapt themselves to leading a different lifestyle focused on energy conservation.

A paradigm shift:
from state-of-the-art to custom-made technology...

Identifying cost-effective solutions to infrastructure problems is a challenge all government officials must address during their terms. In these times of financial crisis, to justify investments in infrastructure development, politicians and policy makers at all levels are being called on to unite a long-term vision with tangible short-term results.

This represents one of the key issues facing the development of environmentally sustainable economies throughout the world.



For Ansaldo Sistemi Industriali, the solution lies in increasing energy efficiency through the use of existing technologies. Many governments invest huge amounts of money in often-untested technology, simply because they are told it is state-of-the-art. The most recent or most expensive technology isn't necessarily the best-suited technology for achieving desired goals.

The focus should be on what is needed, not on what lures us in.
In this sector, state-of-the-art must be synonymous with tangible results.
Identifying the best solution to achieve improved results requires a careful assessment of what is needed, taking into consideration existing conditions and the infrastructure's life cycle development.

Cost-effectiveness tied to energy conservation: this is the paradigm ASI has always proposed. The heart of our solutions is energy efficiency and reliability, thanks to our experience in power electronics and electric motors and generators we designed **ARTICS Smart Energy**.

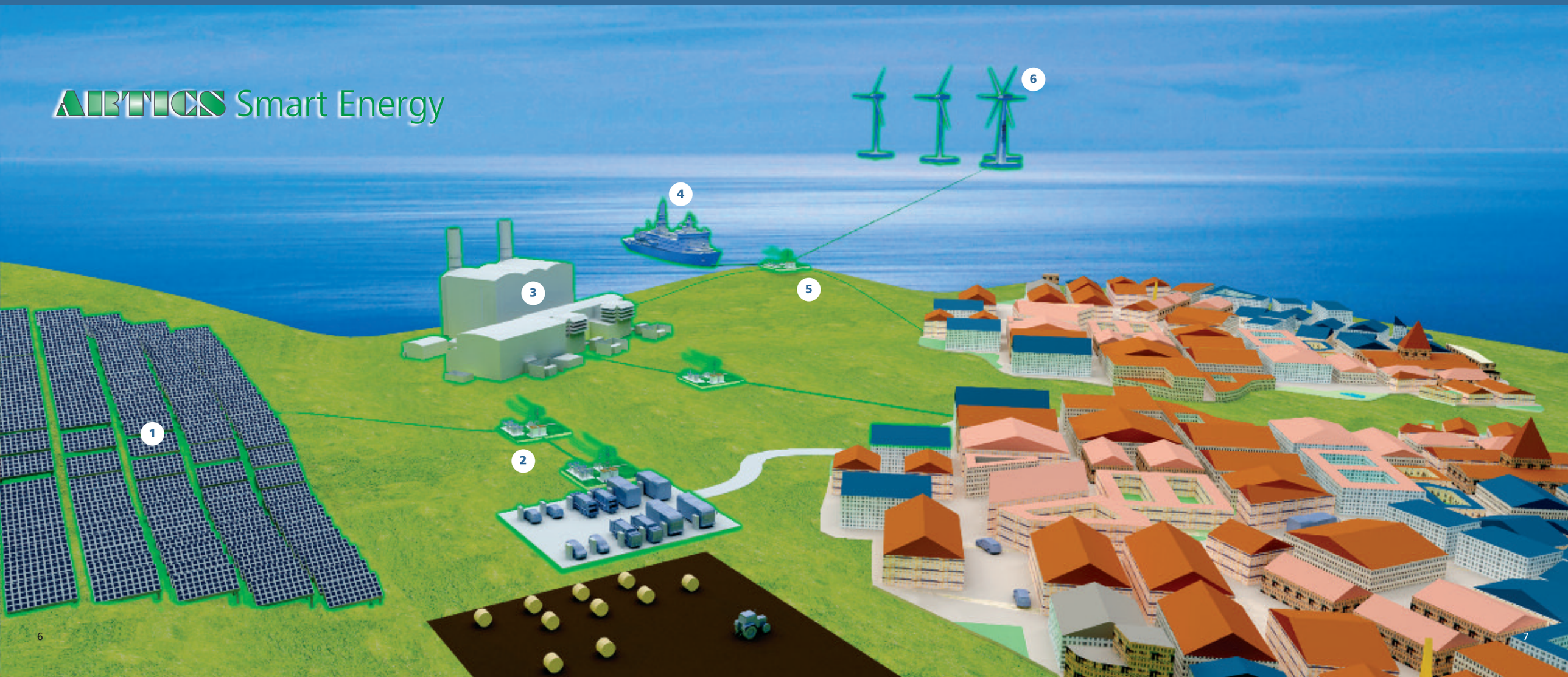
ARTICS Smart Energy is an excellent innovation in energy efficiency. ARTICS Smart Energy manages the energy flow within a micro-grid and allows the intelligent integration of generators and loads, maximizing the use, where possible, of renewable sources to achieve energy savings. ARTICS Smart Energy is also designed to guarantee a high level of network stability by attenuating the fluctuations in energy flow typical of renewable sources such as wind and solar.

ZEUS Project

The perfect union of a long-term vision and tangible short-term results…

ARTICS Smart Energy permits the integration of generators and loads, managing the flow of electricity to guarantee optimal performance and concrete energy savings. Our know-how covers the supply of:

1. Large scale Turn-key Solar plants, AFE inverter systems for Stable grid connection of renewable energy sources.
2. Turn-key substations (HV/HV; HV/LV), Static Var Systems, Active Harmonic Filtering, power feed for BEV and PHEV.
3. Variable Speed Drives, Electric Motors and Generators, Revamping of existing equipment to improve energy efficiency, power management systems.
4. Electric propulsion systems and on-board generation, Thrusters.
5. Ship-to-shore power supply
6. Electric generators for wind applications up to 5MW. ASI provides electric generators for the distributed generation: hydropower, biomass and cogeneration up to 50 MVA.



Energy efficiency

Solutions for optimizing energy efficiency…

Inverter
Ansaldo Sistemi Industriali

One of the application fields our Research and Development activities focus on involves flow capacity control, that is, the combination of production processes that uses pumps, compressors, and fans. This sector is of particular interest as it can deliver the most significant results in terms of energy conservation.

LOSSES WITH FIXED SPEED MOTORS

Normally, centrifugal equipment needs to use mechanical devices - such as valved and vanes - to govern flow capacity because they are driven by fixed-speed motors.
Mechanical devices intervene to create the drops in pressure needed to bring about changes in flow capacity. The operations of these governing members, however, consume more power than what is absolutely necessary: they result in significant energy loss.

INVERTERS AND VARIABLE SPEED

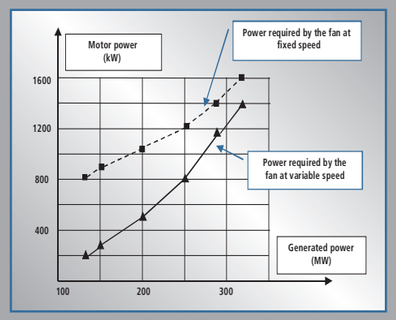
Ansaldo Sistemi Industriali has developed a series of devices, called inverters, capable of governing the revolutions of electric motors, thereby eliminating excess energy consumption. Inverters are electronic equipment that can produce output voltage that is fully adjustable in terms of frequency and range.
Through their application, motors only draw the amount of energy absolutely necessary for performing their operations.
The inverters developed by Ansaldo Sistemi Industriali are based on NPC (Neutral Point Clamped) technology with IGCT and IGBT semiconductors of the latest generation.

EASE OF USE

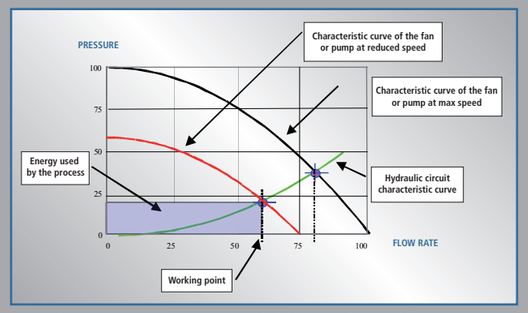
Inverters can be used in both existing installations and new applications.
Thanks to convenient solutions in containers, Ansaldo Sistemi Industriali's inverters can be installed in any existing setup, without needing to change the motor.
Moreover, they are "motor friendly" devices: voltages and currents fed to the motors have a harmonic content to prevent heating and damage.

Combustion air fans

For a 320-MW internal combustion motor using two 2-MW combustion air fans, yearly savings of 3,175,500 kWh can be calculated per fan, equal to a total of 6,351,000 kWh per motor. Setting the average price of energy at 0.065 Euros/kWh, this amounts to a savings of 412,815 Euros.



Single speed and variable speed combustion air fans.



Capacity/pressure curve for variable speed centrifuges, highlighting the energy used by the process alone.

Condensate pump

For a 1,100 kW pump, yearly savings of 3,700,000 kWh can be calculated. Setting the average price of energy at 0.065 Euros/kWh, this amounts to a savings of 240,500 Euros per pump.

Container for inverter installation.

Renewable resources

Solutions for energy production from new sources…

The use of energy from renewable resources like the sun, wind, water, and biomass is a fundamental component of today's new energy plans, but we have to be realistic in their implementation and remember that these resources can be unreliable, causing significant disruptions in delivery grids or presenting limits in their electricity output.

Ansaldo Sistemi Industriali has developed a series of products to meet the rising use of alternative energy, focusing its research and development activities on the issues of maximizing yields and optimizing power quality.

SOLAR POWER

Launched on the market in 2009, SolarGate5000 attained a leading position on the national market in 2010. With over 50 MW installed, SolarGate5000 assists in maximizing the yields of large-scale photovoltaic plants, contributing to the profitability of solar electricity production on a commercial scale.

WIND POWER

Mankind has used wind to produce energy for centuries. To this day, it remains one of the most promising sources of renewable energy. The most pressing challenges concerning this resource are how to capture off-shore wind and how to increase the electricity produced by a single turbine. Ansaldo Sistemi Industriali has developed a series of generators up to 5 MW in capacity ready to meet these challenges. The innovative design of these segmented permanent magnet generators allows them to operate, and therefore generate electricity, even if their stator fails, maximising system yields.

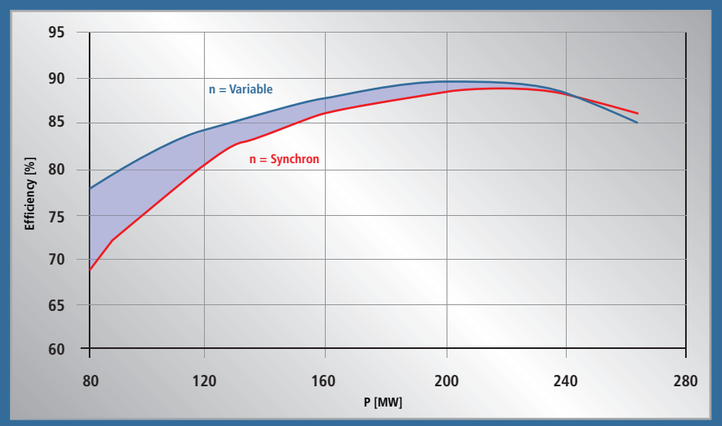
BIOMASS PLANTS

Our new series of synchronous generators is contributing to the creation of mid-sized biomass power plants, ideal for rural areas and/or industries wishing to produce their own energy from their production wastes (wood processors, sugar refineries, paper mills).

HYDROPOWER

Today, the revamping of hydroelectric power plants offers new opportunities for producing clean energy. With the use of permanent magnet generators activated by AFE (Active Front End) inverters, we can significantly increase the production of electricity.

In the past, plants were designed based on the idea of operating with flow and maximum capacity, unable to adjust to potential changes. Considerable energy losses resulted.
AFE inverters allow for maintaining precise control over the generator's speed, permitting electricity production even in poor flow and capacity conditions. Ansaldo Sistemi Industriali has developed a solution especially suited to small hydro plants that is giving new life to plants that have been idle for decades.

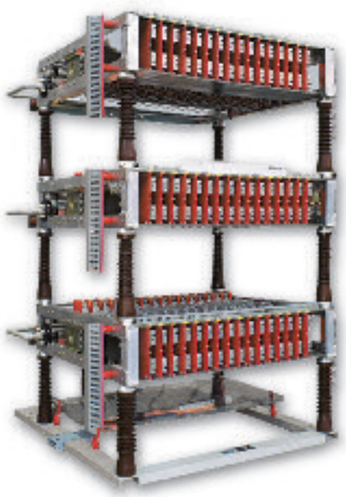


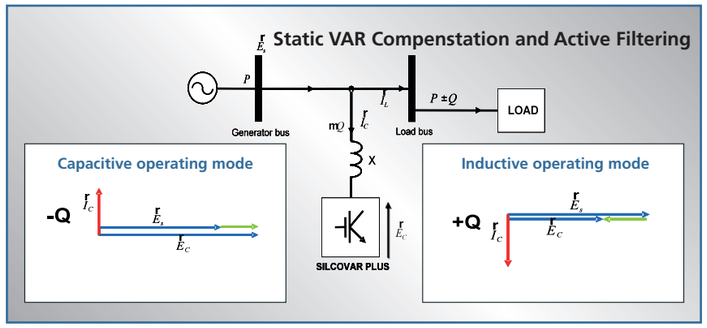
...safeguarding the stability of the electricity network...

Active Front End inverters concretely contribute to the stability of electricity networks by mitigating harmonics that can cause troubles in the delivery of electricity. Active Front Ends are especially suited to connecting renewable energy plants to the grid as they allow for managing sudden drops in energy via their Low Voltage Ride Through (LVRT) feature.

POWER QUALITY

Harmonic mitigation, or rather Power Quality improvement, is a well-known phenomenon at Ansaldo Sistemi Industriali. For decades, we have been developing power electronics aimed at overcoming problems of network instability, in order to strengthen electricity networks to firmly meet the growing energy demands. The company is also engaged in developing technologies for monitoring and managing microgrids intelligently.





ARTICS Smart Energy

Today, smart microgrids are becoming a reality; in this view, the company has developed the ARTICS Smart Energy power management system.

ARTICS Smart Energy allows small groups of users to make the most of energy from renewable resources by guaranteeing a steady delivery to meet the requested demands.

SMART GRIDS FOR INDUSTRIAL APPLICATIONS

In some sectors, electricity costs represent a significant item among the overall costs of production. The average needs of a mid-sized industrial plant are about 5 MW. By way of example, let's consider a solar power plant installed on the roof of a 2 MW factory. It isn't unusual for factories to have co-generation plants, as well.

Theoretically, with these two energy sources, the plant can operate in complete energy independence, like an island. During drops in demand, excess energy can be fed into the national electricity grid. During drops in production from renewable resources, energy from the grid can be used. Smart microgrids can be applied to large commercial centres, hospitals, public bodies, and rural communities.

Electric transportation

Solutions for reducing harmful emissions...

Our world will never be 100% electric, but sufficient evidence exists to allow us to state that the implementation of electric solutions for energy conservation can bring us very close to that goal without increasing energy production.

For example, in a study completed for ENEL, an Italian energy provider, we demonstrated that retrofitting variable speed drives onto all auxiliaries (pumps, fans and compressors) in Italy's power plants would save up to 420 MW/year, which could be used to power an electric urban transport system. The ROI for ENEL would be 18 months.

By using less energy, we can free up resources for projects with clear economic and environmental advantages like electric transportation.

Implementing electric transport systems to reduce harmful emissions of CO_2 and NO_X

The Electric Urban Transportation Case Study of New York City, USA – Average miles travelled per year per city bus: 14,101*

Cost Comparison Between:	Electric Solution		Diesel Oil	
Scenarios	Low Cost	High Cost	Base Case (current arrangement)	
Electricity needs:			Miles per gallon	3,69
Miles per battery charge	320			
No. of charges per year	44			
Electricity consumed during charging (kW/h)	3,5			
No. of hours needed to charge	8			
Total yearly needs per bus (kW)	1232			
Cost of electricity (USD/kW/h)	0,11	0,30	USD per gallon	1,80
Total yearly cost per bus	**$135.52**	**$369.60**	**$6,909.49**	
Yearly savings in % as compared to the base case	**98%**	**95%**		**0%**
	Environmental Impact			
Emissions: PM	0		10 tonnes*	
NO_x	0		3154 tonnes*	

* Data compiled from a 2006 study by the NYC Department of Transportation. (The above table shows a comparison between an electric solution and the current setup using diesel oil.)

Energy conservation

Solutions for a fundamental change...

Developing a sustainable economy requires the involvement of everyone. The fourth pillar of project ZEUS is, broadly speaking, an initiative of public education.

For over five years, Ansaldo Sistemi Industriali has been carrying out activities to raise public awareness at all levels on the necessity of energy conservation.

This commitment has led us to visit schools, speak in national and international spheres, and perform increasingly important roles in European Committees to define regulations and standards related to energy efficiency, Smart Grids, and electric cars.

ELETTRICITTÀ

NUOVI ORIZZONTI TRA TECNOLOGIA E NATURA

MASSIMO VOLTAGGIO (MAX VOLTAGE)

Massimo Voltaggio was a character invented for a role-playing game engaging schools on the subject of energy conservation at Genoa's 2010 Festival della Scienza (Science Festival). He became so popular that employees made him his own page on Facebook.

Ansaldo Sistemi Industriali wishes to play a leading role in the era of environmental sustainability and energy efficiency.

We are committed to obtaining tangible results today in order to safeguard tomorrow: a long-term commitment, to reduce industry's impact on the environment. The solutions we offer clients are designed to increase energy efficiency in order to produce concrete savings. For revamping projects, our work begins with a thorough survey of the customer's existing plant in order to identify the best solutions.

To this end, our Research and Development division dedicates itself to the study of innovative products to facilitate energy conservation and improve production processes, in order to extend the life of the plant. Each project is custom designed to ensure long lasting results from the very first use, without wasting time or money.

Our Mission

Provide our clients with tangible results based on our expertise in:

- Industrial Systems & Automation
- Power Electronics
- Electric Motors and Generators

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