



PHOTOVOLTAIC POWER PLANTS



WIND FARMS





RENEWABLE ENERGY

Halley Cables is a renewable energy company specialized in wind power generation, photovoltaic and solar thermal energy, which has the capability to provide comprehensive solutions at any phase of our customers' projects.

We are a trusted partner for renewable energy developers, investors and operators worldwide. We can get your systems up and running smoothly and safely, regardless of their size or application.

OUR MISSION

**WE AIM TO CONTINUALLY DELIVER IMPROVEMENTS
TO RENEWABLE POWER SOLUTIONS ACROSS THE GLOBE.**

Our company stands out on the market as a reference name regarding the quality of products and services and our business strategy is to offer the best solutions in terms of desired product customization, design, service, maintenance, both nationally and internationally, as well as flexible payment terms.

OUR VALUES

Value based systems > Professional service > Sustainability > Clean energy > Community focused

We are committed to a free basic order, a fair market economy and free competition. We abide by the laws of the countries in which we are located and respect their cultures.

OUR MAIN ACTIVITIES include:

- wind farms, photovoltaic and solar-thermal power station investments, development and electricity generation;
- supply of wind turbine components and solar systems;
- engineering, procurement, construction and maintenance services of wind farm and solar power stations (both thermal and photovoltaic).

The Green Energy line is the result of the experience of long term cooperation with the manufacturers and users, as well as the consistent and successful fulfillment of customer demands. According to the latest standards concerning the conservation of the environment, **Halley Cables** has been always near to its clients.

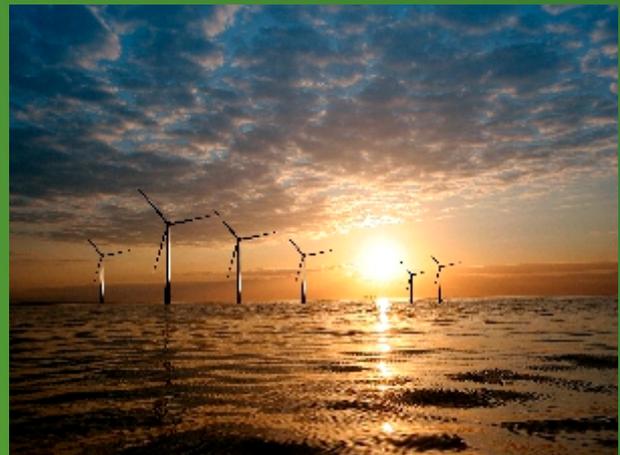
By choosing to work with **Halley Cables** you have the guarantee of an open minded, straightaway partner, whose main goal is to satisfy your needs in the best terms possible. The company exerts every effort to use the best modern domestic and international engineering practice cooperating with the leading engineering institutes, suppliers and new technology developers.



Halley Cables provides a wide range of services to create solutions for your project needs. Our expertise covers every aspect of a project's lifecycle and can develop renewable projects from start to finish.

We can supply high quality products and services which bridge both AC and DC power technologies and deliver comprehensive solutions for both conventional and renewable energy sources as well as for a broad range of demanding and specialist industrial applications where reliability and efficiency are of crucial importance.

The success of our projects depends very much on the research, planning and key strategies within the initial steps. We design systems based on your needs, business plans and analysis and we take into consideration the specification of the project, local conditions and administrative constraints and opportunities.





Renewable energies, reducing carbon emissions

Renewable energies are inexhaustible, clean and they can be used in a decentralised way (they can be used in the same place as they are produced).

Also, they have the additional advantage of being complementary, the integration between them being favorable. For example, solar photovoltaic energy supplies electricity on sunny days (in general with low wind) while on cold and windy days, which are frequently cloudy, the wind generators can supply more electric energy.

Renewable energy plays a key role, reducing CO₂ emissions and, in particular, the installation of solar technology is an effective way of reducing a building's carbon footprint.

Solar technology is great for the environment, as it has no emissions and is assured for the next billion years. It might also be worth nothing that incorporating solar into a property is likely to increase its value.

Installing a **Halley Cables** System has many advantages. Apart from reducing the amount of fossil fuels used and the resultant savings in annual fuel bills, the reduction in harmful emissions will help minimize the long terms effects on Earth's climate.



It is essential that renewable energy sources are increasingly used as a part of the strategy to improve the security of the energy supplies and reduce the impact of energy production and consumption.

Halley Cables has established significant relationships international suppliers.

Photovoltaic Energy

Solar power is a free, inexhaustible resource and presents several advantages that make it one of the most promising renewable energy sources in the world. The earth receives an incredible supply of solar energy.

The sun, an average star, is a fusion reactor that has been burning over 4 billion years. It provides enough energy in one minute to supply the world's energy needed for one year. It provides more energy in one day than our current population would consume in 27 years.



From sunrise to sunset, every day of the year, rain or shine, businesses with solar installations produce clean electricity to power their own operations or to sell to their utilities in exchange for feed-in tariffs. A solar power installation is a great investment for attracting tenants and real estate buyers alike.

If your company's brand image is one of innovation and creativity, an alternative energy solution is a meaningful way to live up to that image and the goals of your corporate responsibility planning.

Our company provides solar power control systems, which comprise modules, solar inverters and solar solutions. We are active on both the upstream and downstream ends of the photovoltaic industry value chain.

on the global solar market which enables us to work with leading

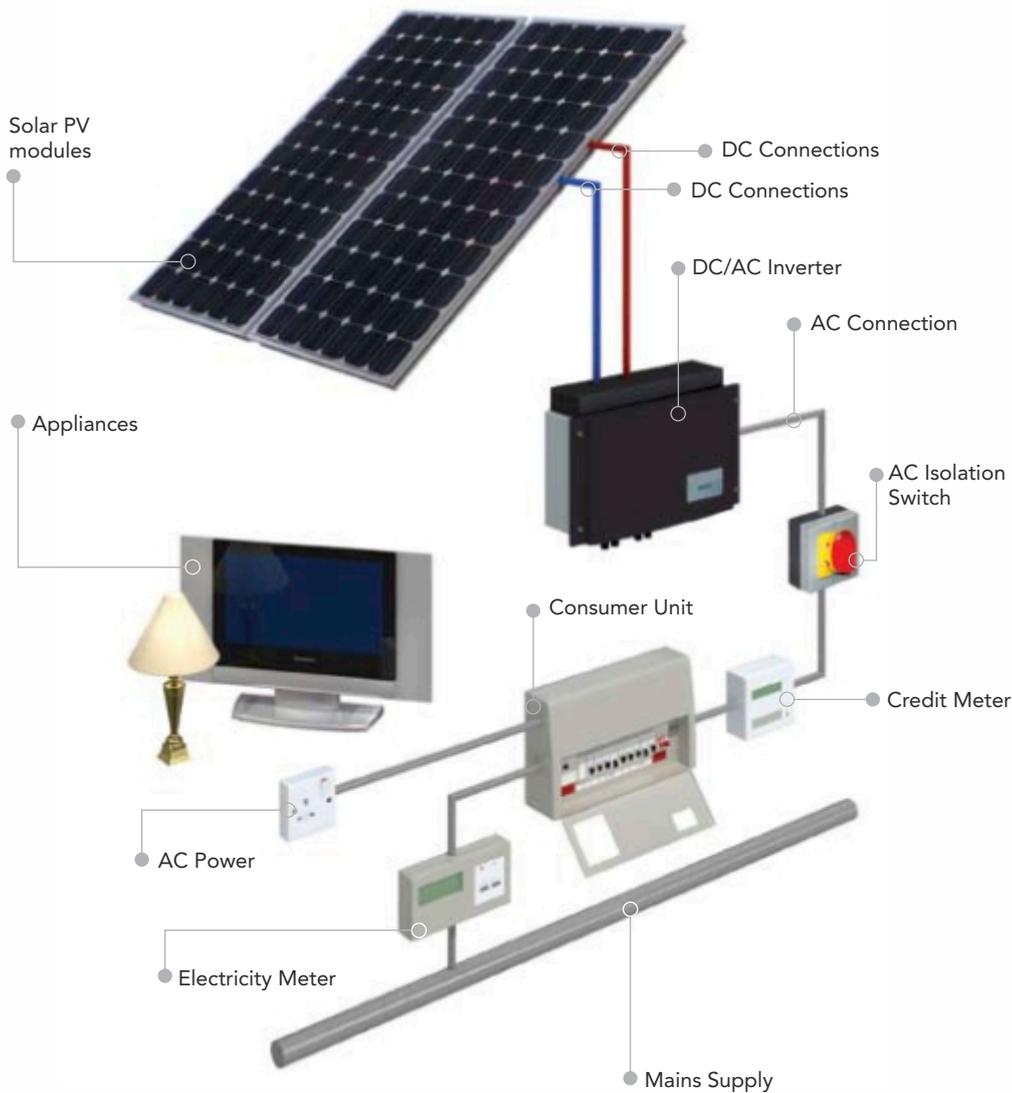
Advantages of PV

- Once the initial capital cost of building a solar power plant has been spent, operating costs are extremely low compared to existing power technologies.
- When grid-connected, solar electric generation can displace the highest cost electricity during times of peak demand (in most climatic regions), can reduce grid loading, and can eliminate the need for local battery power for use in times of darkness and high local demand.
- Solar electric generation is economically superior where grid connection or fuel transport is difficult, costly or impossible.
- Facilities can operate with little maintenance or intervention after initial setup.
- Solar power is pollution free during use. Production end wastes and emissions are manageable using existing pollution controls.

Disadvantages of PV

- Expensive technology. The initial investment of a solar system is high.
- Solar energy panels require additional equipment (inverters) to convert direct electricity (DC) to alternating electricity (AC) in order to be used on the power network.
- The reliance of the sunlight, regarding the quantity of solar radiations. It is variable in each hour and season, depends of the weather conditions and the position on the globe.

System Design



Principle of operation

Photovoltaic conversion attempts to directly transform all the photon energy in light electricity by tacking advantages of the intrinsic photo-effect, which can be best realised in layers of today's semiconductor materials. The efficiency of the photovoltaic conversions process is theoretically close to about 85% if each photon would transfer all its energy into that.

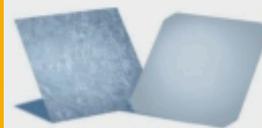
Due to the concept conservation of energy, the excited electrons cannot have greater nor less energy than that of the incident rays from the sun. Photons with less energy than the energy gap will go straight through the semiconductor, and no electrons will be excited. Photons with greater energy than the energy gap will be absorbed, but the difference in energy between the photons and the energy gap is converted into heat by lattice vibration.

From sand



Silicon is the starting point of our solar production cycle.

It is extracted from sand which is made up primarily of silicon dioxide. As the second most common element of the earth's crust, there is an almost endless supply.



In the second production step, pure silicon is

melted into blocks at 1,410 degrees Celsius and it then hardens. These blocks are then formed into square columns. These columns are cut into extremely thin slices, or wafers, using state-of-the-art wire-cutting technology. After cleaning and the final testing, the monocrystalline and polycrystalline wafers form the



The wafers are further processed to solar cells in the third production

step. They form the basic element of the resulting solar modules. The cells already possess all of the technical attributes necessary to generate electricity from sunlight. Positive and negative charge carriers are released in the cells through light radiation causing electrical current to flow.

to PV Energy



Solar cells are merged into larger units – the modules – in module production. They are framed and weather—proofed.

The solar energy modules are the final solar products and ready to generate power. Sunlight is converted to electrical energy in the modules. The direct current produced this way is converted to alternating current by the inverter so that it can be fed into the public grid or, if the unconverted electricity remains in the house, it can also be used directly.



Solar application products are complete systems that the operator of a solar power system can use to generate solar energy and feed into the grid.

Regardless of the size of your planned photovoltaic system, we offer the ideal solution for every



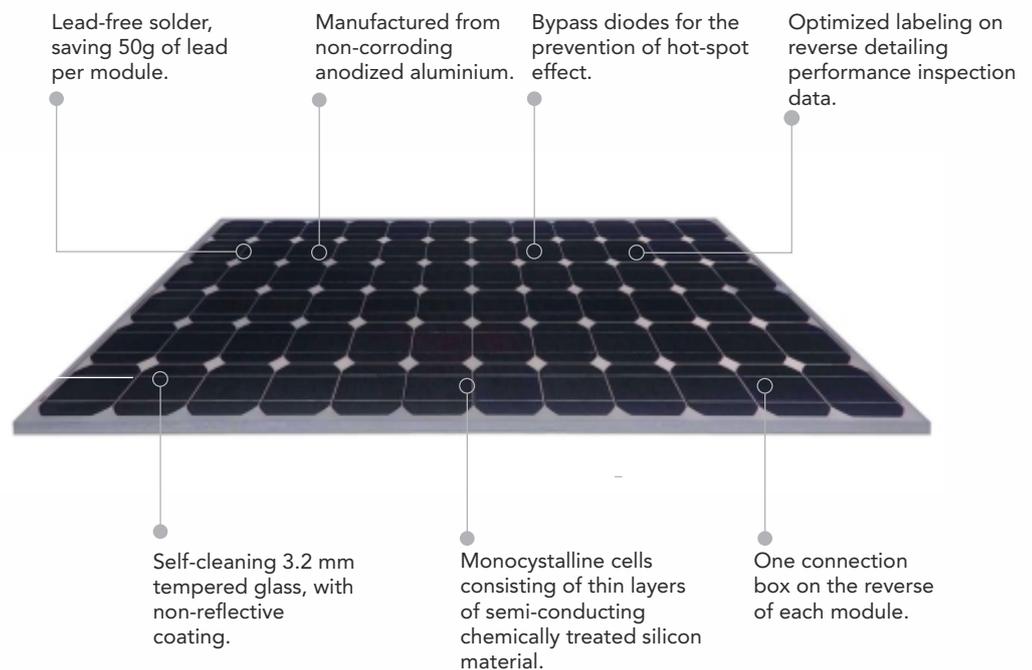
Solar parks can significantly reduce the cost of

electricity from solar power due to economies of scale, the use of less expensive domestically-manufactured components and removal of regulatory hurdles.

The most common 3 application that can use photovoltaic panels are:

- Producing electricity for personal use, in which case can be used battery packs of storing the produced electricity.
- Production of electricity such for persona use as well as for selling the excess energy produced to other customers using a transmission connection to electricity by various beneficiaries (case often met in companies that want a decrease in enertg costs).
- Production of electricity for sale to various customers using a transmission connection to electricity by them (in most cases these parks are larger 1 MWh).

Collector Design



Halley Cables work continues to take us all over the world and we are constantly exploring new markets and new areas of technology, but our goal remains the same every time: every project we undertake must build towards a sustainable future.

Key Elements of Photovoltaic

Halley Cables has always supplied products and solutions designed to protect the environment and climate.

Nowadays, technologies which are proven to help our customers protect the environment are bundled together in the **Halley Cables** portfolio.

Mounting systems

Modules are assembled into arrays on mounting system. For buildings, many different racks have been devised for pitched roofs. For flat roofs, racks, bins and buildings, integrated solutions are used.

Trackers

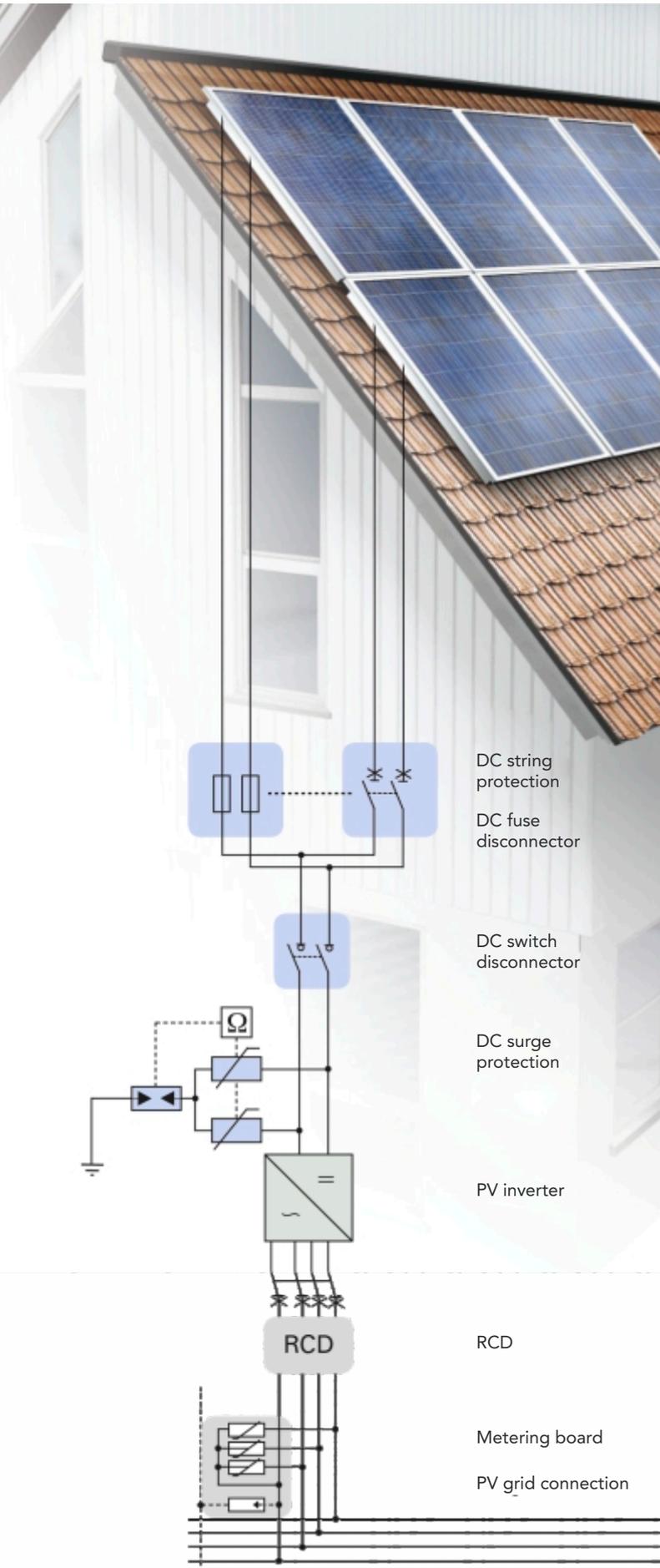
A solar tracker tilts a photovoltaic panel throughout the day. Depending on the type of tracking system, the panel is either aimed directly at the sun or the brightest area of a partly clouded sky.

Trackers are effective in regions that receive a large portion of sunlight directly. In diffuse light (i.e. under cloud or fog), tracking has little or no value. Because most concentrated photovoltaics systems are very sensitive to the sunlight's angle, tracking systems allow them to produce useful power for more than a brief period each day.

Tracking systems improve performance for two main reasons:

- First, when a solar panel is perpendicular to the sunlight, it receives more light on its surface than if it were angled.
- Second, direct light is used more efficiently than angled light. Special anti-reflective coatings can improve solar panel efficiency for direct and angled light, somewhat reducing the benefit of tracking.





Our solar solution also includes solar inverters and an acknowledge expertise in utility – scale equipment, which combined with monitoring systems provides complete balance systems for solar projects.

Inverters

Halley Cables offers a full line of inverters, from string and centralized inverters. Making sure both are optimized for the project is critical given tighter profit margins and regulations string inverters with maximum power-point tracking remain the best option for many applications like MW-sized commercial installations and many residential applications.

There is no universal inverter areas, while string inverters are used for parts that get better insolation. Larger plants require a different type of inverter.

Inverters and integration systems are like a vehicle's transmission and drivetrain, they make power usable.

Coupled with advanced grid integration technologies, they are changing the way solar is implemented. The wide range of inverters and integration tools are increasingly designed to interact with smart grids.

The total power of photovoltaic systems does not only depend on the area of installed PV-modules but also on the adjustment and slope of the modules.

By using **Halley Cables** inverters, maximum power is ensured.

Advantages of Wind Energy:

- Wind Energy is an inexhaustible source of energy and is virtually a limitless resource.
- Wind generation promotes national security by reducing our reliance on foreign and volatile sources of fossil fuels.
- Wind farms can help “save the family farm” by allowing traditional land use revenues to be supplemented by new revenue streams afforded by land leasing agreements. Also, wind farms substantially broaden the tax base in rural communities.
- Wind energy does not pollute at all. It is that form of energy that will exist till the time sun exists. It does not destroy the environment or release toxic gases.



Disadvantages of Wind Energy:

- It can be a threat to wildlife. Birds do get killed or injured when they fly into turbines.
- Wind energy can be harnessed only in those areas where wind is strong enough and weather is windy for most parts of the year.
- Noise pollution problem is usually associated with wind mills.
- Requires large open areas for setting up wind farms.



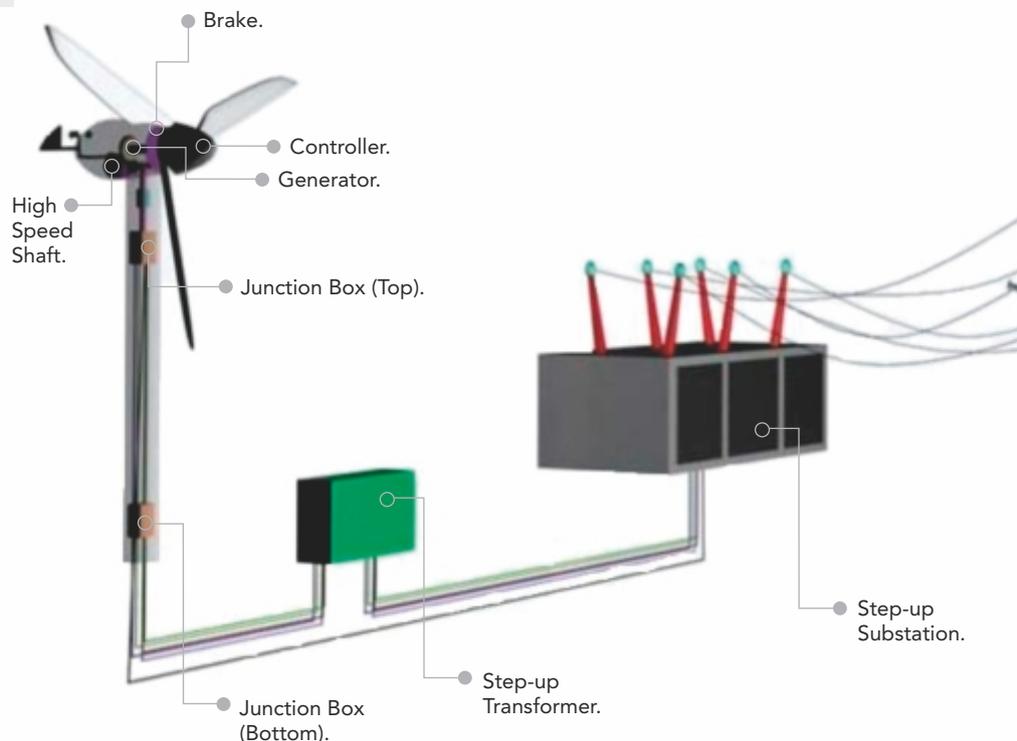
Wind energy

Wind is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth.

Wind flow patterns are modified by the earth's terrain, bodies of water and vegetative cover. This wind flow or motion energy, when "harvested" by modern wind turbines, can be used to generate electricity.

The use of wind power to harness our world's energy is growing by over 35% every year, phenomena that is confirmed by the incredible number of onshore and offshore sites. This is because the wind farms represent an affordable and a reliable green power, without consuming any natural resources or emitting any pollution. Because winds are stronger higher up off the ground, wind turbine towers are about 30 m tall to allow the rotor to use more wind energy.

Although the wind farms are installed in sites where the wind blows constantly, it appears that the climate and environment is variable. In these conditions, the equipment including cables used from turbine to transmission of the power to the distribution network must be resistant to torsion, chemical and thermal stresses.



	Generator	Controller	High-Speed Shaft	Brake	Junction Box (Top)	Junction Box (Bottom)	Step-up Transformer	Step-up Substation	SCADA	Transmission
High-Voltage Power							●		●	
Medium Voltage Power							●	●		
Low Voltage Flexible Power	●				●	●	●			
Low Voltage Power	●	●	●	●	●	●	●			
Low Voltage Control	●	●	●	●	●		●			
Low Voltage Instrumentation	●	●	●	●	●		●	●		
Fiber Optic Cables					●		●	●		

Wind turbines start operating at wind speeds of 4 - 5 m/s and reach maximum power output at around 15 m/s. At very high wind speeds, i.e. gale force winds, (25 m/s) wind turbines shut down. A modern wind turbine produces electricity 70-85% of the time, but it generates different outputs depending on the wind speed.

Wind farms could even be built in water depth of up to 100 and 200 m using floating wind turbine. Floating wind turbines can be erected much more cheaply, because the float and the turbine will be fully assembled in the port or dry dock. From there they are towed to location, where they will be anchored to the seabed using hawsers. To do this, all that is required is large concrete blocks being placed on the seabed.

Removing a floating wind turbine is much easier than disassembling a structure that has been driven into the seabed. The float together with the wind turbine will simply be separated from the mooring hawser and towed back to the port. If the seabed also has to be returned to its original state then it gets a bit more time-consuming, but it is still easier to remove ballast from the bottom of the sea than to pull out foundation piles.

Service and maintenance of offshore wind farms is no easy business. Despite manufacturers' efforts to hone technologies, such as condition monitoring systems and low-maintenance drives designed to minimise outages as much as possible, service teams still have to deal with unexpected failures in addition to scheduled maintenance.



That is why **Halley Cables** always provides you best solutions regarding your demands. We have been always near to our clients, for this reason we assure documentation and technical consulting in a very short time.

Halley Cables Projects



Solar projects

- Grevenon Photovoltaic Power Plant 100 kWp
- Fthiotidas Photovoltaic Power Plant 100 kWp
- Rethymnon Photovoltaic Power Plant 80 kWp
- Xanthi Photovoltaic Power Plant 100 kWp
- Argolidas Photovoltaic Power Plant 100 kWp
- Lassithi Photovoltaic Power Plant 80 kWp
- Kilkis Photovoltaic Power Plant 100 kW
- Pierias Photovoltaic Power Plant 100 kW
- Rooftop Photovoltaic Power Plant Plovdiv
- Rooftop Photovoltaic Power Plant Armitech
- Bulgaria Photovoltaic Power Plant
- Agios Ioannis Of Cyprus Solar Park 150 kWp
- Alexandria of Imathia Solar Park 20 kWp
- Priolo Gargallo Solar Park 3 – 20 kWp
- Chiaramonte Gulfi Solar Park 25 kWp
- Akrafnio of Evia Solar Park 100 kWp
- Gonia of Thesprotia Solar Park 30 kWp
- Vouliki of Pieria Solar Park 100 kWp
- Tsairia of Chalkidiki Solar Park 57 kWp
- Francoforte Solar Park 4-100 kWp
- Yerusalimovo Solar Park 5.1 MWp
- Gorna Mahala Solar Park 3.6 MWp
- Gorsko Novo Selo Solar Park 61 kWp
- Mokresh Solar Park 4.2 MWp
- Palermo Solar Park 3-6 kWp
- Rodos Solar Park 100 kWp
- Sredets Solar Park 1.9 MWp
- Solsbor Solar Park 10 MWp
- Breznik Solar Park 66 kWp



Wind projects

- Wind Farm Electrica Serv 1, Vaslui, Romania
- Wind Farm Moldova Noua, Caras Severin, Romania
- Wind Farm Mihai Viteazu, Constanta, Romania
- Wind Farm Cernavoda, Romania
- Wind Farm Stupina 420 KV, Romania
- Wind Farm Mireasa IEA, Romania
- Wind Farm Casimcea, Romania
- Wind Farm Varlezi, Galati, Romania
- Wind Farm Turda, Cluj, Romania
- Wind Farm Babadag, Tulcea, Romania
- Wind Farm Pantelimon, Ilfov, Romania
- Wind Farm Valea Marului, Galati, Romania

***Halley Cables** team focuses on customer preferences and offers free consulting via e-mail, telephone and to the place of installation of the PV panel or wind turbine.*

***Halley Cables** by its experts in the field sets can provide technical support to choose the best configuration, which features meet the desired application.*

We have collaborated with reputable international companies such as: Siemens, Iberdrola, Vestas, Global Wind Power, Enel Green Power, Energias De Portugal and many others.



Empowering you for a brighter future



HALLEY GREEN ENERGY

SOLAR PARKS & WIND FARMS



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