GREEN PARTICIPATION, GREEN EUROPE

A7 - Introduction of Renewable Energy Sources

HANDBOOK

PROJECT NUMBER : 2023-2-TR01-KA154-YOU-000168735

WHAT IS RENEWABLE ENERGY?

Natural resources that are constantly replenished, such as sunlight, wind, water, geothermal heat, and biomass, are the source of renewable energy.



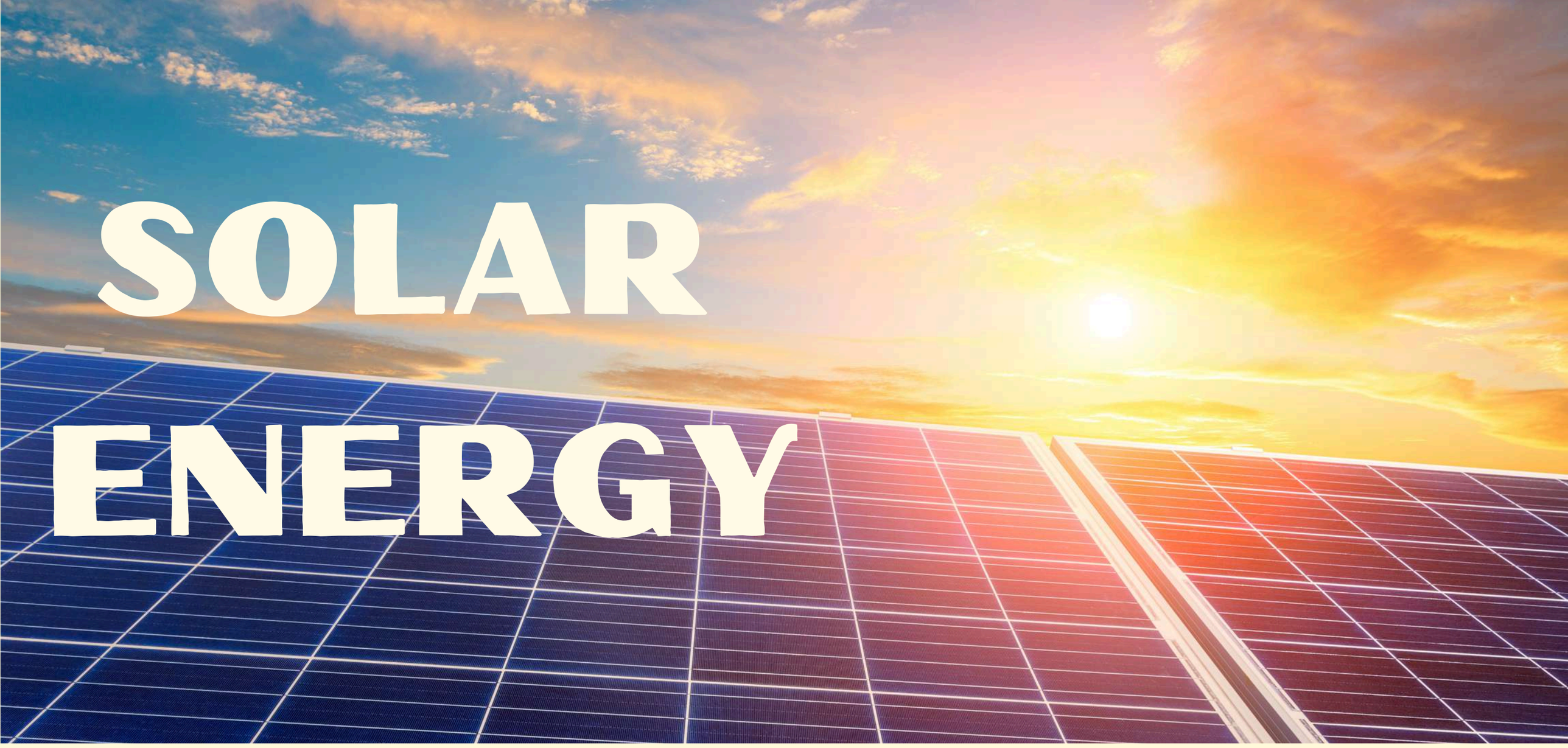


WHY IS IT IMPORTANT?

By offering an environmentally friendly alternative to fossil fuels, it reduces adverse environmental impacts and mitigates climate change.

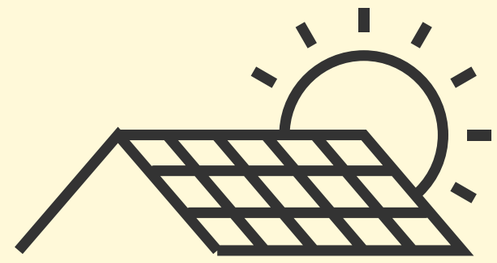




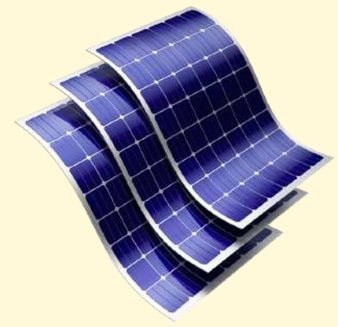


SOLAR ENERGY

- **The sunlight is converted directly into electricity by photovoltaic cells.**



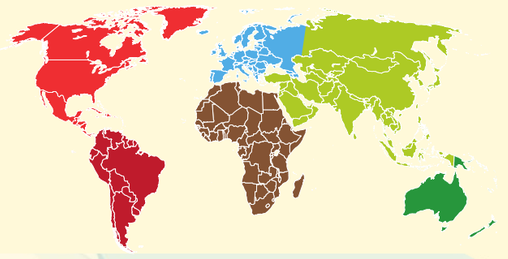
- **Solar panels last about 30 years and come in different shades based on their materials.**



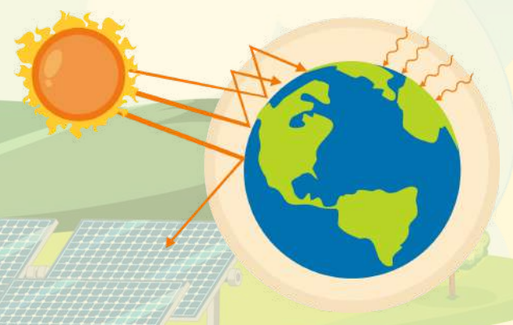
- **Solar panel costs have decreased dramatically, making them highly affordable.**



- **All countries can benefit from solar energy despite differences in sunlight levels.**



- **Earth's solar energy interception exceeds global energy consumption by 10,000 times.**



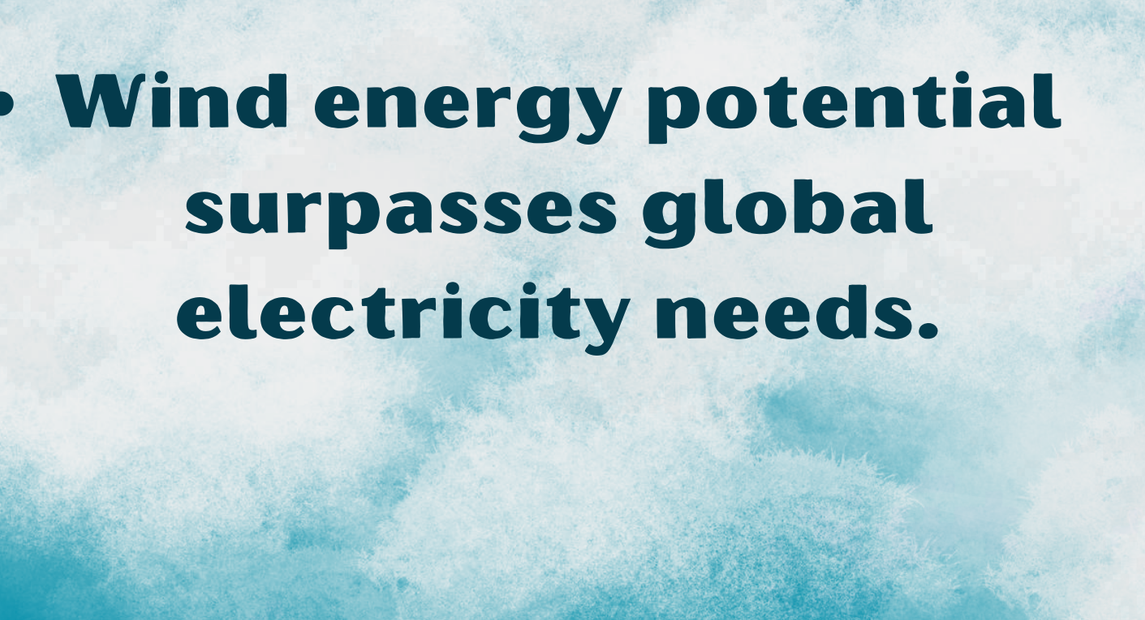
WIND ENERGY

- **Wind turbines harness air's kinetic energy onshore and offshore and convert it into electricity.**

- **Offshore locations offer strong winds and high potential, despite remoteness.**

- **Wind energy potential surpasses global electricity needs.**

- **Taller turbines and larger rotors increase electricity output.**



OCEAN ENERGY

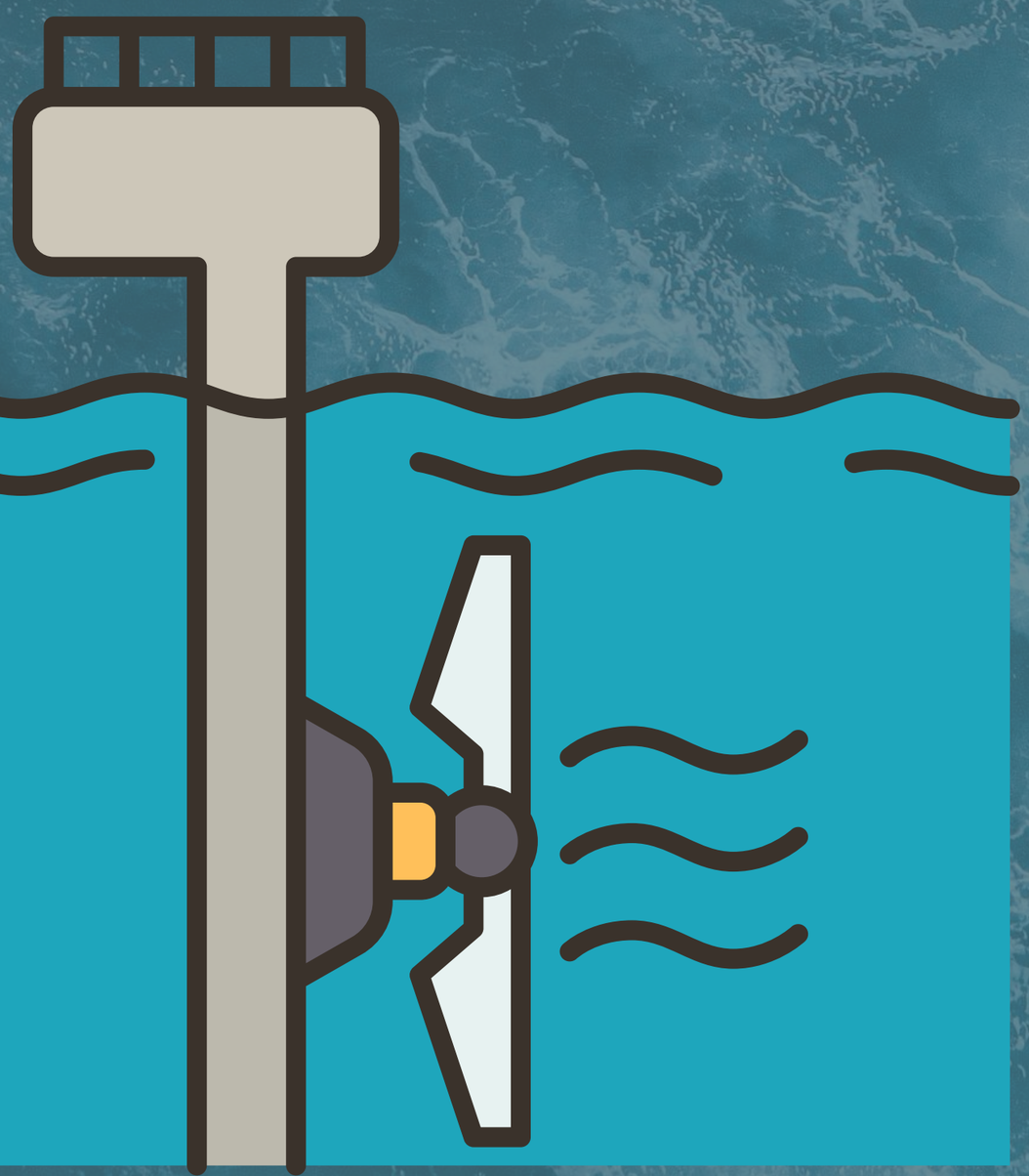


- Ocean energy is generated by capturing the kinetic or thermal energy of seawater, for example, from waves or ocean currents, to produce heat or electricity.



- Although ocean energy technologies are currently in their early stages, their potential is significantly greater than the world's current energy demands.

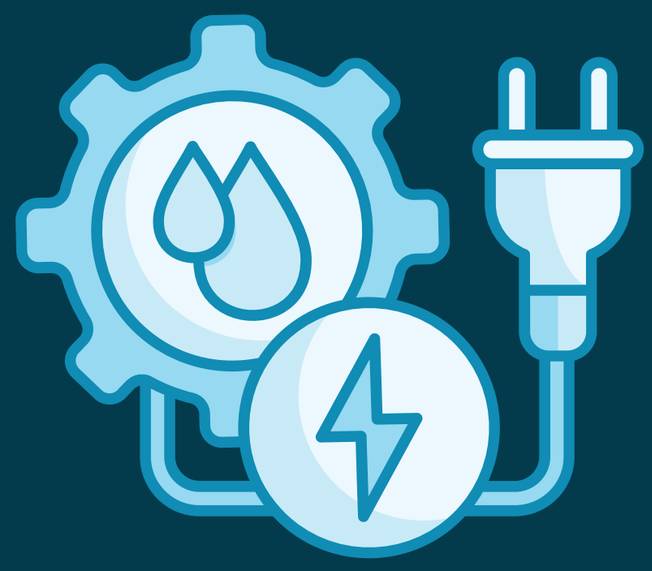








HYDROPOWER



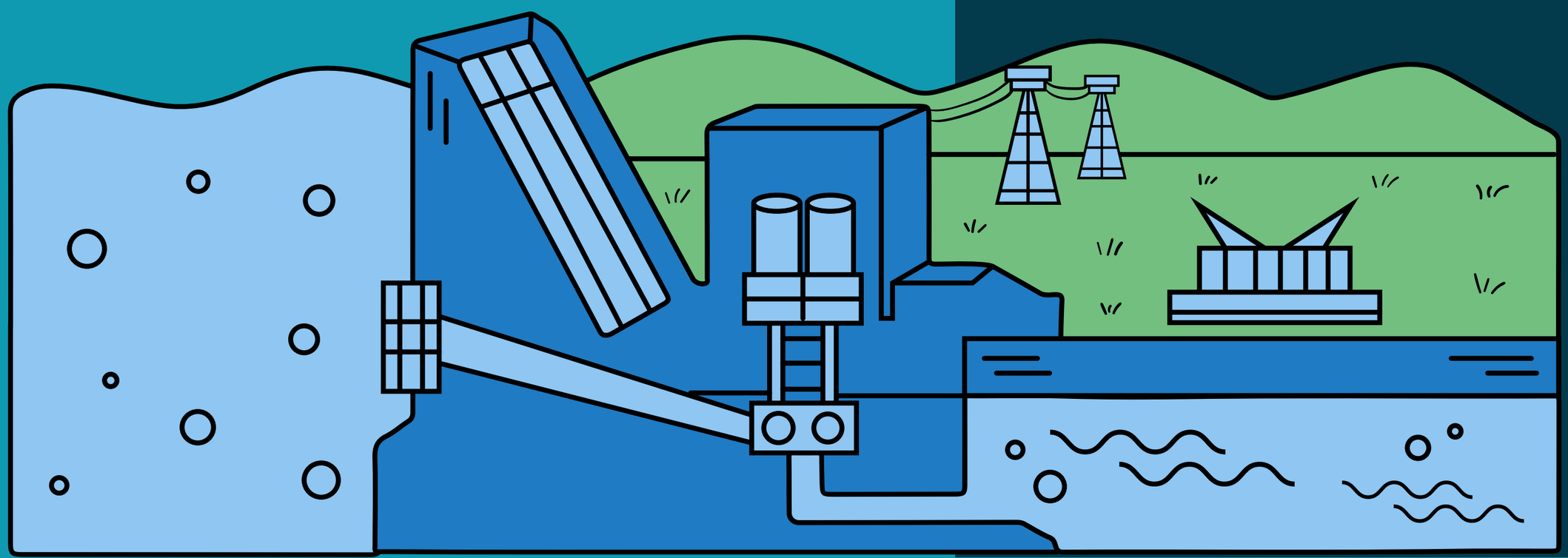
- **Hydropower captures energy from water moving between different elevations, either from reservoirs or rivers.**

- **In addition to providing drinking water, hydropower reservoirs are used for irrigation, navigation, flood and drought control, and energy generation.**

- **The biggest renewable energy source in the electrical industry at the moment is hydropower. It does, however, rely on regular rainfall patterns and may suffer from droughts brought on by climate change.**







GEOTHERMAL ENERGY



- **Geothermal energy taps into the Earth's internal heat, extracting it from underground reservoirs using wells or other methods.**

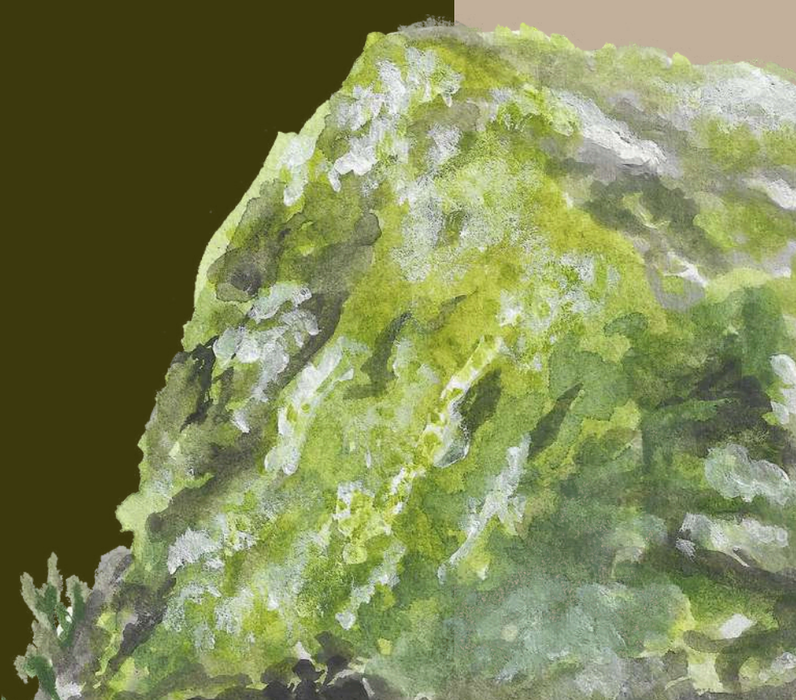


- **Fluids at various temperatures can be harnessed to generate electricity after reaching the surface.**

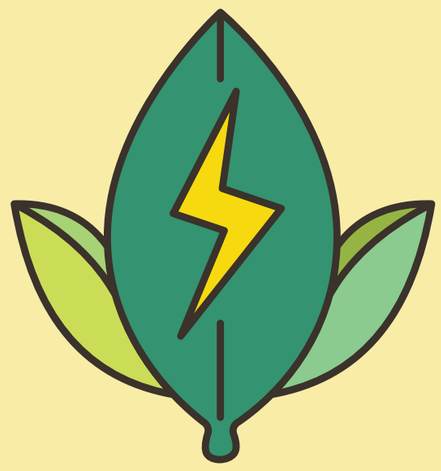
- **Hydrothermal reservoir technology for electricity production is well-established, reliable, and has been in use for over a century.**







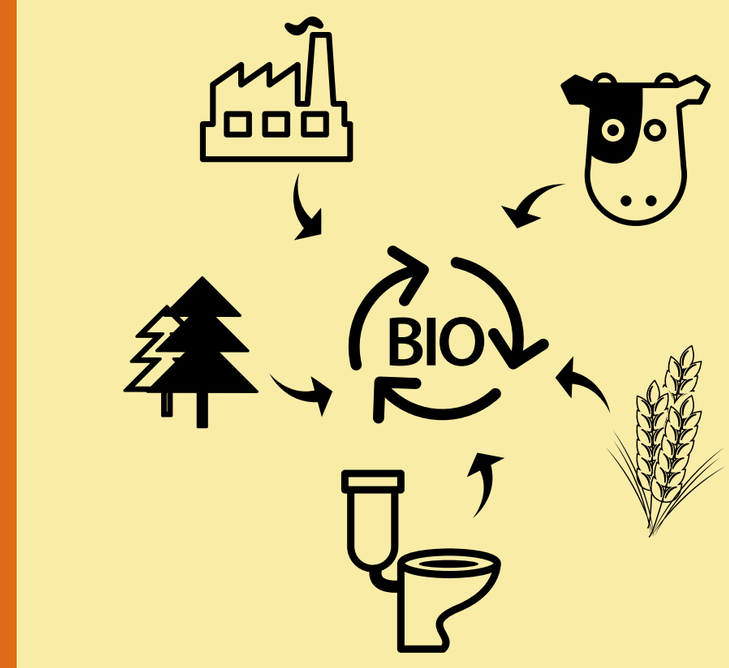
BIOENERGY



- **Bioenergy is produced from biomass, which includes a variety of organic materials such as wood, charcoal, manures, and dung for power and heat, as well as crops for biofuels.**



- **Modern biomass systems consist of dedicated crops or trees, agricultural and forestry residues.**







Bringing Renewable Energy to Your Home



Why?

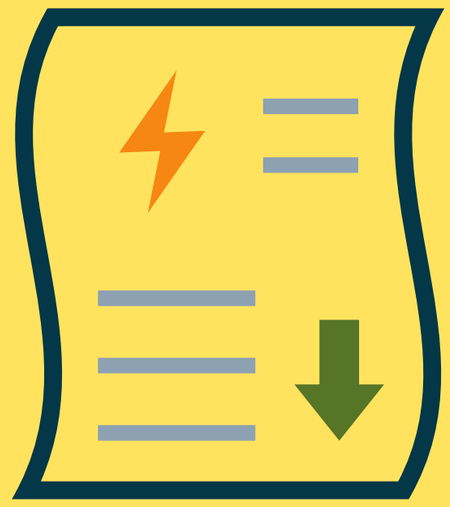
- **Increase energy independence**

With solar panels and a battery, you rely less on the National Grid.



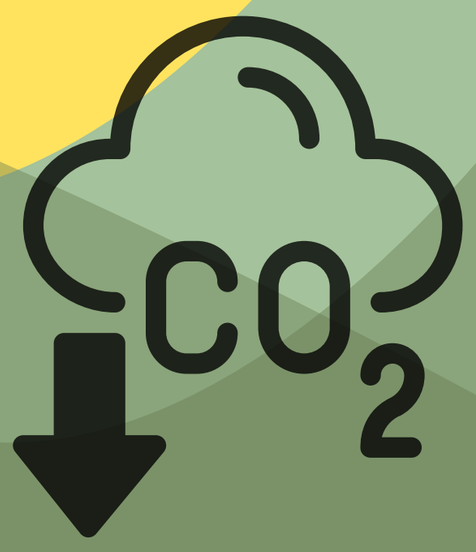
- **Lower your electricity bills**

Installing renewable energy systems like solar panels can help you save up to £525 per year.



- **Reduce your carbon footprint**

There is no carbon dioxide or other dangerous pollutants released by renewable energy sources.

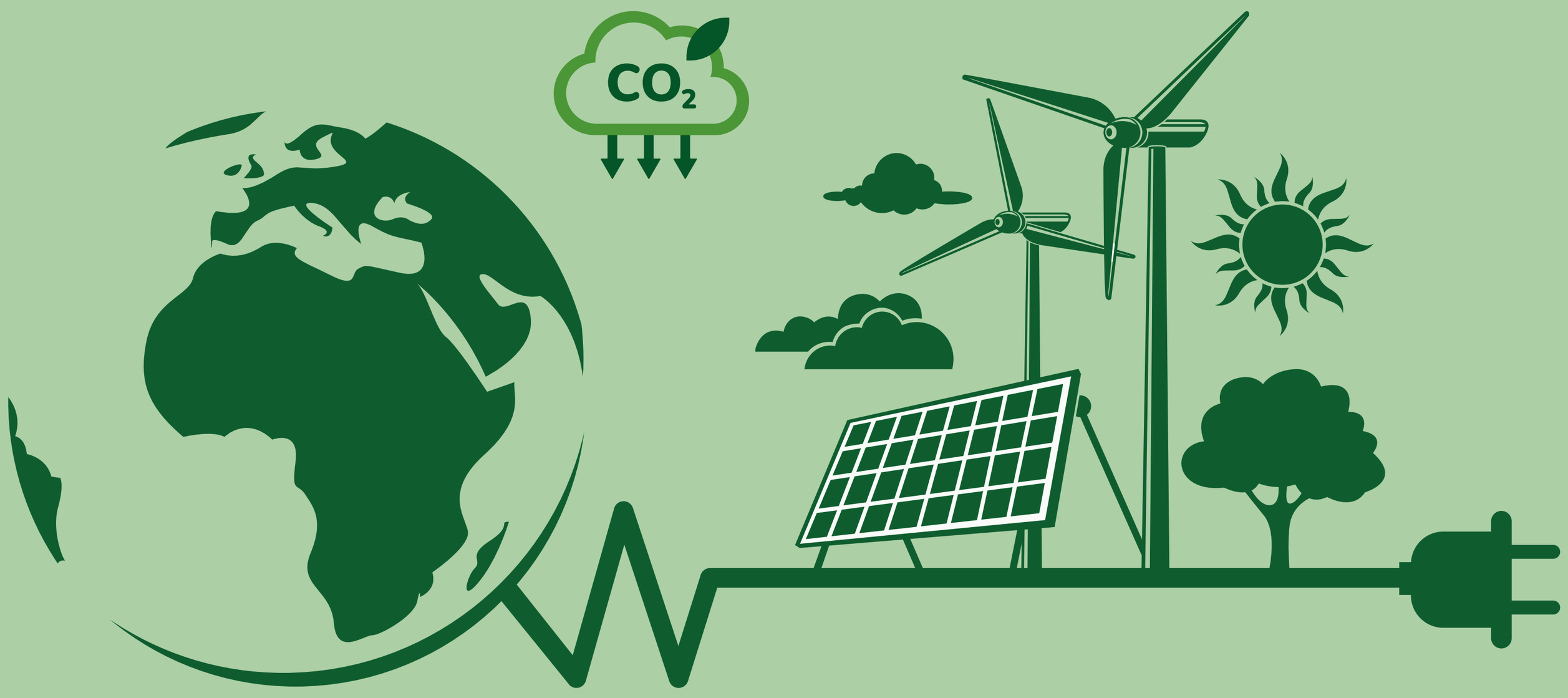


ADVANTAGES OF RENEWABLE ENERGY



Compared to fossil fuels, which continue to be the main cause of climate change, renewable energy has many advantages.

Renewable energy is inexhaustible, reliable, and produces significantly fewer emissions, reducing carbon pollution and improving public health. It also has lower maintenance costs, stabilizes energy prices by decreasing reliance on volatile fossil fuel markets.



DISADVANTAGES OF RENEWABLE ENERGY

While renewable energy offers many advantages, it also has some limitations. Renewable sources are not always available continuously, as solar and wind power depend on weather conditions.

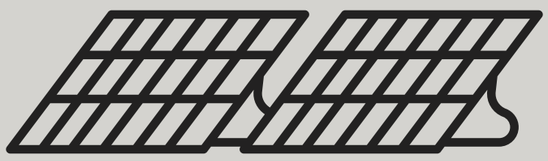
Additionally, the efficiency of renewable technologies is often lower than that of fossil fuels, requiring further advancements to meet growing energy demands. Furthermore, some regions may not be able to afford the early startup expenditures associated with renewable infrastructure.





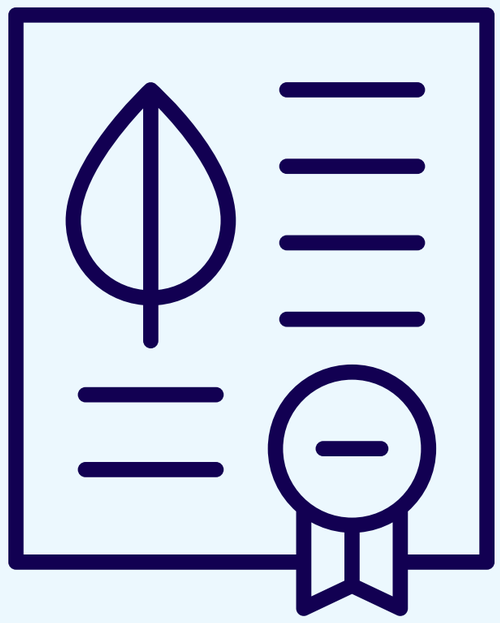






The Renewable Energy Directive (RED II)

The Renewable Energy Directive (2018/2001/EU), introduced under the Clean Energy for All Europeans initiative in December 2018, strengthens the EU's leadership in renewable energy. It aligns with the EU's Paris Agreement commitment to reducing emissions and advancing sustainability.



Within the European Green Deal framework, renewable energy is key to the clean energy transition, offering cost-effective, domestically produced energy that reduces Europe's reliance on external suppliers.

Overall Target

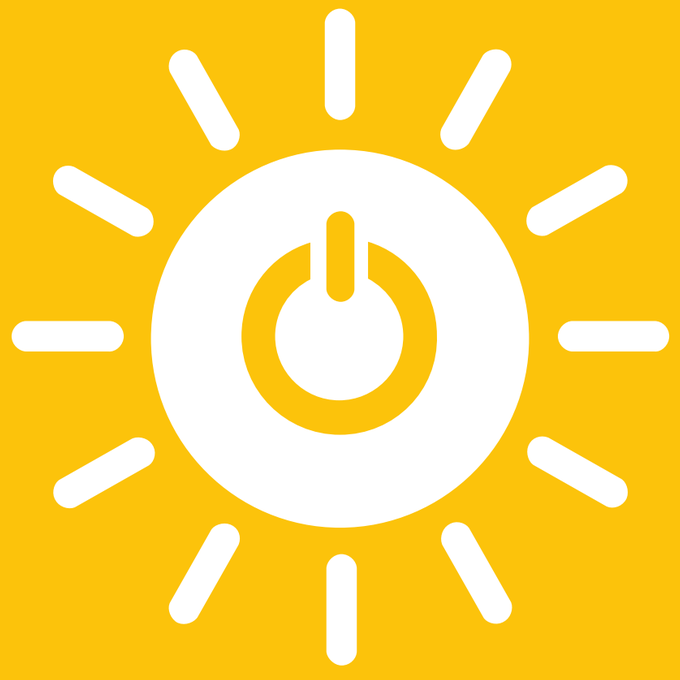
It was adopted in 2018 and establishes binding targets to guarantee that by 2030, a minimum 32% of the energy consumed by the EU originates from renewable sources.



RED II covers areas like electricity, heating, cooling, and transportation, and promotes innovations like bioenergy, wind, and solar. It also encourages the use of advanced biofuels and supports sustainability criteria for bioenergy to ensure environmental protection and resource efficiency.

GOAL 7

AFFORDABLE AND CLEAN ENERGY



KEY TARGETS

- **Universal availability of modern, reliable, and reasonably priced energy services.**
- **Doubling the global rate of improvement in energy efficiency.**
- **Promoting international collaboration for advancing clean energy research and technologies.**

GOAL 13

CLIMATE ACTION



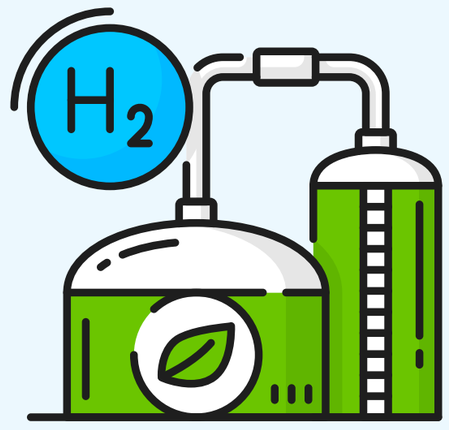
KEY TARGETS

- **Enhancing resistance to natural disasters and risks associated with climate change.**
- **Expanding institutional knowledge and training on systems for early detection, adaptation, and mitigation of climate change.**
- **Mobilizing financial resources to support climate action.**

Companies producing renewable energy

Iberdrola

global pioneer in renewable energy



Iberdrola is a global energy company based in Spain. They focus on renewable energy sources, including wind power, solar power and hydroelectric energy. Iberdrola has operations in several countries, such as Brazil, Mexico, the United States, the United Kingdom, and Spain.



Francisco Pizarro, the largest photovoltaic plant in Europe

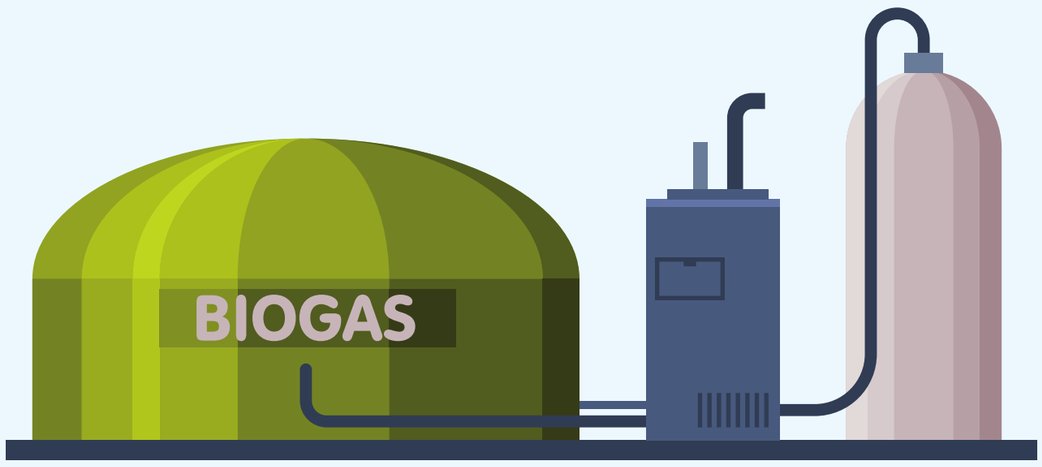


Puertollano, the largest green hydrogen plant for industrial use in Europe

EkoRE

EkoRE focuses mainly on solar and wind energy, while also engaging in biogas energy production. The company utilizes agricultural waste to generate electricity and heat for farms. In addition, EkoRE develops renewable energy projects across these sectors, with an emphasis on green technologies that reduce environmental impact and promote sustainable energy solutions.







Solar panels



Biogas power plant

The Future of Renewable Energy Sources

The future of renewable energy goes beyond simply improving existing wind turbines and solar panels. While refining these technologies remains crucial, researchers and companies are also exploring innovative methods to harness clean energy. With limited available land, often shared with agriculture or located in challenging terrains, finding alternative solutions is key to sustainable energy development.



Bladeless Wind Turbines

Safer, Smaller, More Convenient

Bladeless technology addresses key challenges of wind turbines, such as reducing noise, occupying less space, and being much less harmful to wildlife, particularly birds. Although current bladeless designs generate about 30% of the energy of conventional turbines, they hold promise in locations where turbines are impractical.

Madrid-based Vortex Bladeless is a leading company in this area, developing a tower that harnesses aeroelastic resonance (vortex shedding) for power generation, making bladeless technology a viable alternative in certain applications.

VORTEX Bladeless



Vortex Bladeless Wind Turbine

Floatvoltaics

Saving agricultural land space with floating solar panels

Floatvoltaics offer several advantages by freeing up land for agriculture or housing, while also being more efficient than land-based solar panels due to the cooling effect of water beneath the modules. When combined with hydroelectric systems, these panels can help reduce water evaporation from reservoirs, enhancing dam efficiency, especially in hot, drought-prone regions. This dual benefit makes floatvoltaics an effective solution for both energy generation and water conservation.

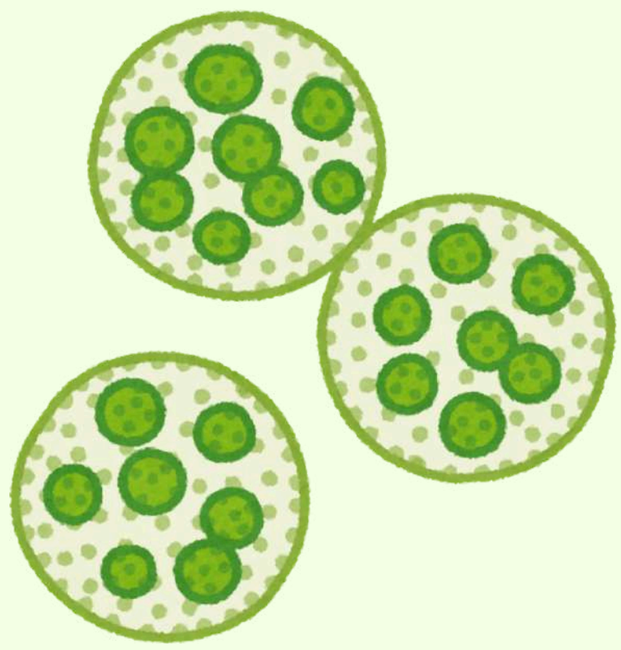


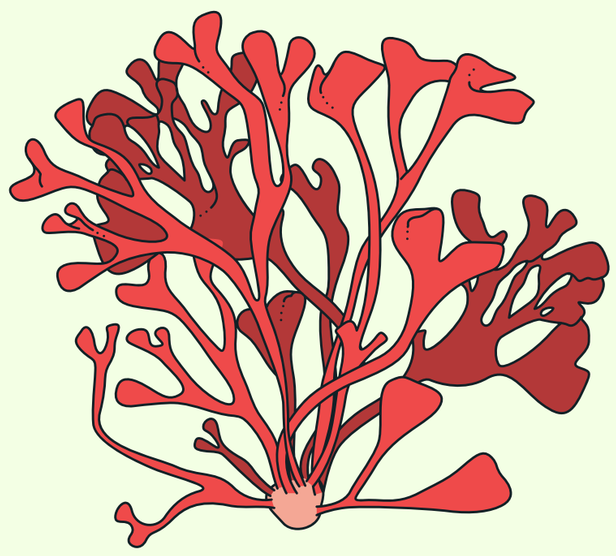
Floatvoltaics

Algae Biofuel Production

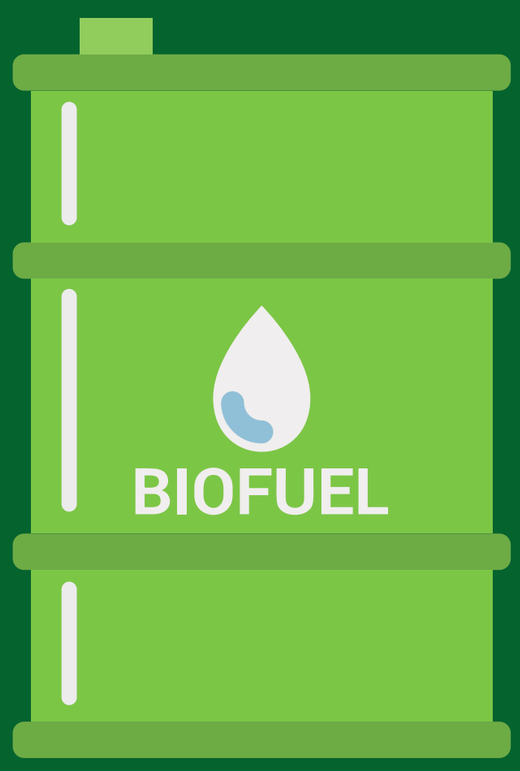
By taking use of certain algae species' high oil content and quick growth, algae biofuel production provides a viable substitute for fossil fuels.

Algae are highly efficient at photosynthesis, converting sunlight into biomass faster than traditional crops. They can be grown in diverse environments, including freshwater, saltwater, and wastewater, reducing land competition with food crops making them a versatile and carbon-neutral biofuel source.











The “Microgrids for Sustainability” study of Siemens

Microgrids are localized energy systems capable of functioning either autonomously or connected to a larger power grid. Siemens, a key player in the microgrid industry, believes that strategically implementing well-designed microgrids, hybrid power plants, and energy parks can greatly accelerate decarbonization efforts. The company demonstrates the potential of microgrids to reduce energy costs, minimize carbon footprints, and maintain resilience against extreme weather, showcasing their importance in creating a sustainable energy future.



SIEMENS



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