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Technological Applications

# Renewable and sustainable energy

## Energia renovável e sustentável

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## ABSTRACT

Faced with the serious challenge that we are facing, it is necessary to care about our environment, and one of the ways is through renewable and sustainable energy. The objective is to exemplify in a simulation the use of wind energy being transformed into electrical energy. It has been proven using a wind turbine that transforms wind energy into electrical or mechanical energy. Concluding that wind energy is viable, we need to invest in this type of renewable and sustainable energy.

**Keywords:** Energy; Renewable; Sustainable; Wind

## RESUMO

Diante deste sério, desafio que estamos enfrentando, de termos energia suficiente para atender a demanda, e de ela também ser sustentável e limpa, é necessário nos preocupar com nosso meio ambiente, e uma das formas é através da energia renovável e sustentável. O objetivo é exemplificar, em uma simulação, o uso da energia eólica sendo transformada em energia elétrica. Usamos um aerogerador, que faz a energia dos ventos se transformarem em energia elétrica ou mecânica, concluindo-se que a energia eólica é viável e que precisamos investir nesse tipo de energia renovável e sustentável.

**Palavras-chave:** Energia; Renovável; Sustentável; Eólica

## INTRODUCTION

Bearing in mind that we need to look for renewable and sustainable energies, we sought to analyze wind energy as one of the energies that has the least impact on

our environment. A study was therefore carried out looking at the whole process of transforming wind energy into electricity. Does wind energy have advantages? What are the disadvantages? How does the process of transforming this energy work? This study will certainly provide us with many answers, clarifying doubts and proving the importance of wind energy for our world, reducing the emission of fossil fuels and being an inexhaustible source of energy. In a practical way, with a project we can observe, analyze and demonstrate the transformation of wind energy into electricity.

> According to the authors Terciote (2002),Welch and Venkateswaran (2009), in recent years wind energy has become a fundamental part of energy generation, especially electricity, due to the great expansion in research and development techniques for transforming wind movement into energy. Currently, this energy source has been described as one of the most important and promising technologies in complementary energy generation, as it is easily accessible and abundant in nature.

The voluntary project “Innovation and Technology” was developed at Colégio Diva Costa Fachin; a full-time public primary and secondary school, lasting three months. There was the participation of three students from the 1st year class of Comprehensive High School, who showed interest in the subject, and were available to research, study and carry out the experiment in practice.

## MATERIALS AND METHODS

The object of study being renewable and sustainable energy, showing through explanatory research, detailing, recording and analyzing the process of transforming wind energy into electrical energy, using experimental methods, with specific results in the research.

**Materials:**

- Square Styrofoam base (52cm x 52cm);
- Adhesive paper to stick to the base;
- Adhesive paper to stick to the toothpicks;
- Glue;

- Nine toothpicks;
- PVC pipe;
- Small pet bottle;
- Fan propeller;
- Nine yellow LEDs;
- Three meters of flexible red wire;
- Three meters of flexible black wire;
- Printer motor;
- A 100 Ω resistor;
- Two tips;

**Methods**

Firstly, research was carried out into how to build a model showing the process of wind energy being transformed into electricity. After this study, they began to gather all the materials needed to build the model. The adhesive paper was placed on the Styrofoam base, then the LEDs were drilled and installed. On the other side, a circuit was set up with the red and black wires, connecting the red wire to the positive pole of the LED (the larger part of the pin) and the black wire to the negative pole of the LED (the smaller part of the pin). The wind turbine was assembled by attaching the fan blades to the printer motor, using a tin soldering machine to solder the negative pole to the 100Ω resistor and then soldering the other side of the resistor to the black (negative) wire in the circuit. The positive pole was soldered to the red (positive) wire in the circuit. Finally, the toothpicks were glued to the Styrofoam base, on top of the LEDs, representing the houses.

## RESULTS AND DISCUSSIONS

To test the model, we used a paint compressor, which, when turned on, made the propellers turn clockwise and lit the LEDs installed in the base, which are inside the houses, representing the residences. Before building the model, we did some research

into how wind energy works. From this study, we were all able to observe the entire process of transforming wind energy into electricity in the model, and everything we had researched was put into practice in the project.

We can see that the blades of the wind turbines are capable of capturing the kinetic energy (movement) of the wind and transferring it to the rotor (hub) of the wind turbine, which transfers the movement of the blades to the central axis, which can be horizontal or vertical, transforming it into mechanical energy. However, the generator is capable of transforming this mechanical energy from the rotation of the shaft into electrical energy. There is a process where kinetic energy is transformed into mechanical energy and mechanical energy into electrical energy. There is a discussion about the fact that wind energy needs to be installed in a suitable location, because there is a risk that if there is no wind, it will not be able to operate and generate energy.


**Figure 1 –** Maquete Experimento

## CONCLUSIONS

It can be concluded that wind energy can have some disadvantages, such as: high cost, noise impact, suppression of vegetation, modification of the landscape and risk to birds. However, it has many advantages as it is a source of a renewable, inexhaustible

natural resource that does not pollute the environment, does not emit polluting gases or generate waste, reduces greenhouse gas emissions and is considered low-cost in terms of its useful life. Wind energy is a sustainable way of obtaining electricity without radically damaging our environment. The model project shows us the whole process, step by step how this transformation of wind energy into electricity is carried out, in a clear and objective way. With this project to transform wind energy into electricity, we can understand the importance of investing in renewable and sustainable energy.

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