



# World Robot Olympiad 2021

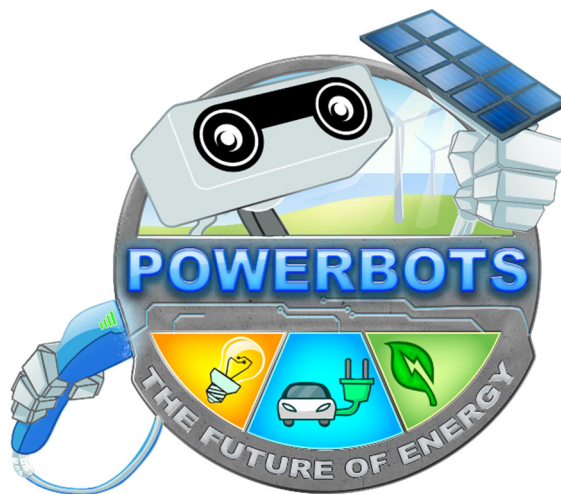
Open Category

## PowerBots – The Future of Energy

Theme for age groups

Elementary, Junior, Senior

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## INTRODUCTION

Since the industrial revolution people are using more and more energy that is not provided by themselves or by animals. Our great-grandparents still worked with oxen, but farmers in many areas are now using machines to work on the land. All the fabric for our clothes used to be woven by hand, but most fabric is now made using big weaving machines. And most of you can go to school by bus or car instead of having to walk.

In some of our houses, we have also automated many things. Many families use a washing machine, a vacuum cleaner and have a shower with hot water. There have also been many inventions that we now use in our daily lives. Radio, television, computers, air conditioning, central heating and of course our mobile phones!

In the last 150 years we have been using a lot of fossil fuels to make this possible. But many people now realize that we cannot do that forever. We need to use more clean and renewable energy. Renewable energy is energy that comes from sources that renew themselves, such as sunlight, wind, rain, tides, waves, and geothermal heat.

But using renewable energy makes that we need to solve new challenges. And that is where we ask you to help.

### Your robot mission

For the WRO Open Category in 2021, your team has the task to **develop a robot or robot model that can help solve challenges that arise from using renewable energy.**

You may choose one of the following three areas (1, 2, 3) to work on. But you can also choose to work on a project focused on a combination of these three areas.

### 1. Energy at your home or your community

Using more renewable energy is an important challenge for the future. We need to use less energy and we can also generate energy ourselves. With solar panels or wind power for example. But the sun doesn't always shine, and the wind doesn't always blow. Sometimes there is a lot of power available, and sometimes no power at all. We need to store the extra power, or we need to make sure that we use the power when there is lots available.

How can robots or robotics **systems** help make sure we have an optimal amount of renewable energy available? And that we use renewable energy in a smart way in our homes or in our communities?

### 2. Energy and transportation

To help reduce the usage of fossil fuels our means of transportation will be using clean motors more and more. Vehicles that drive on zero-Carbon fuels (hydrogen for example) are expected in the future. And for the moment most cleaner vehicles have electrical engines. There are already many electrical busses, cars and motorcycles.

One challenge is to organize the charging of these electrical vehicles. The infrastructure is not available everywhere and charging batteries for electrical vehicles costs time. Busses cannot drive back to the bus station easily during the day. And not all people with an electrical car have a private parking space that they can use. On the other hand, electrical

vehicles also offer opportunities. When they are not used, they can function as batteries to store excess power that is produced by renewable sources.

Other challenges for our transportation lie in introducing other types of fuel and reducing the number of transportation movements.

How can robots or robotic systems help us make the best of our electrical vehicles? And how can they help to improve other parts of our transportation so we will use less carbon-based fuels?

### **3. Energy mix in our daily life**

A special challenge connected to the use of energy sources like wind and solar power is the fact that the amount of power they can provide fluctuates. The amount of sunlight and wind is not always the same. This brings fluctuations in the amount of power that is available on the energy grid. On top of this the energy consumption is fluctuating too. When we get home from school or work, we all turn on the lights, start watching tv and start cooking.

The electrical supply system needs to constantly adapt to these fluctuations. And it is not easy to just power up an extra coal plant if there suddenly is an energy shortage. This means that there is a need to distribute the production and usage of energy in a smart way.

In which way can robots or robotic systems help tune the renewable and fossil parts of the production of energy with each other? And tune that in with the consumption of energy?

## **SPECIAL REQUESTS PER AGE GROUP**

### **Elementary**

If you are in this age group, you will need to explain how your robotic solution will help your community.

### **Junior**

If you are in this age group, you will need to explain the impact of your solution on current issues facing society. Think of questions like: What impact will your robot model have on society? Who will benefit from your solution?

### **Senior**

If you are in this age group, you will have to investigate how your idea can become reality. Describe the possible challenges and demonstrate which problems still have to be solved to get your robot model ready for action. Present your thoughts in an appealing way.

## **INSPIRATION**

For all sub-themes mentioned above you can find a connection and inspiration using the United Nations Sustainable Development Goals. There are multiple goals that support the theme, pending on your project idea:

<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>