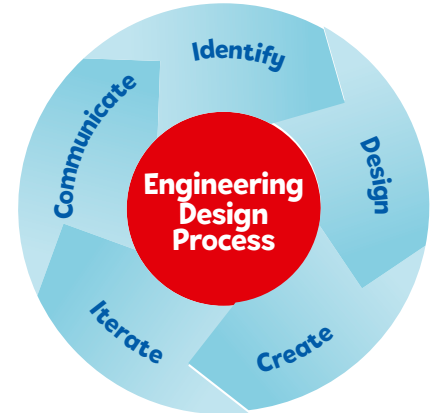




The team will:

- Use and apply the *FIRST* Core Values and engineering design process to develop robot and Innovation Project solutions.
- Identify and research a problem related to the season theme and then design and create an Innovation Project solution.
- Identify a mission strategy and design, create, and code a robot to complete missions.
- Test, iterate, and improve their Robot Design and Innovation Project.
- Communicate their Robot Design and Innovation Project and demonstrate their robot in the Robot Game.



## FIRST<sup>®</sup> Core Values



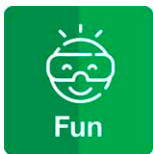
We are stronger when we work together.



We respect each other and embrace our differences.



We apply what we learn to improve our world.



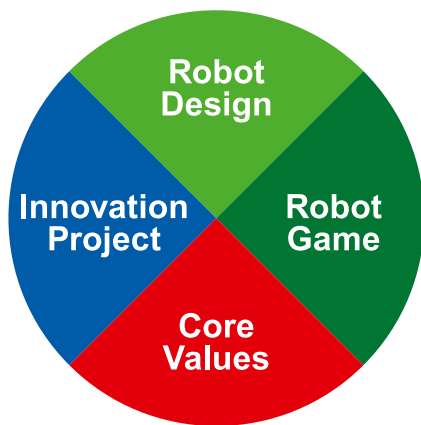
We enjoy and celebrate what we do!



We explore new skills and ideas.



We use creativity and persistence to solve problems.



Each of these four equally weighted parts of *FIRST*<sup>®</sup> LEGO<sup>®</sup> League Challenge accounts for 25% of your total performance at your event.

Check out the rubrics to help you prepare.



Core Values should be demonstrated at the event, where you will showcase your team's amazing work on Robot Design and the Innovation Project. These three parts will be evaluated during the judging session. Your robot's performance will be evaluated during the Robot Game.

**Gracious Professionalism<sup>®</sup>** is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.

**Coopertition<sup>®</sup>** is showing that learning is more important than winning. Teams can help others even as they compete.

We express our Core Values through *Gracious Professionalism*, and this will be evaluated during Robot Game matches.

# FIRST® LEGO® League Challenge Overview

## CORE VALUES

Demonstrate *FIRST*® Core Values in everything you do. Your team will be evaluated during the Robot Game and the judging session.

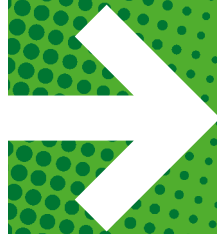


### Your team will:

- Apply **teamwork** and **discovery** to explore the challenge.
- **Innovate** with new ideas about your robot and project.
- Show how your team and your solutions will have an **impact** and be **inclusive!**
- Celebrate by having **fun** in everything you do!

## ROBOT DESIGN

Your team will prepare a short presentation on your robot design, programs, and strategy.



### Your team will:

- **Identify** your mission strategy.
- **Design** your robot and programs and create an effective plan.
- **Create** your robot and coding solution.
- **Iterate**, test, and improve your robot and program.
- **Communicate** your robot design process and everyone's contributions.

## ROBOT GAME

Your team will have three 2.5-minute matches to complete as many missions as possible.



### Your team will:

- Build the mission models and follow the field setup to put the models on the mat.
- Review the missions and rules.
- Design and build a robot.
- Explore building and coding skills while practicing with your robot on the mat.
- Compete at an event!

## INNOVATION PROJECT

Your team will prepare a live, engaging presentation to explain the work you have done on your Innovation Project.



### Your team will:

- **Identify** and research a problem to solve.
- **Design** a new solution or improve an existing one based on your selected idea, brainstorming, and plan.
- **Create** a model, drawing, or prototype.
- **Iterate** on your solution by sharing it with others and collecting feedback.
- **Communicate** your solution's impact.

# Innovation Project

From the machines that move us to the electronics that connect us to the ways we power our cities and towns, energy is essential in our lives. Have you thought about where energy comes from? How it's generated? How it gets to you? How much you're using?



## START

Explore your energy journey. How can you reimagine a better energy future? It starts here, with your critical thinking and innovation leading the way to tomorrow's energized world with **FIRST® ENERGIIZE<sup>SM</sup>** presented by Qualcomm.

### → Identify a specific problem related to improving your energy journey.

An energy journey is where energy comes from and how it is distributed, stored, and used. The Project Sparks (see Sessions 1-4) explore problems related to different energy journeys. Your problem could come from a Project Spark, or it could be a different problem you want to solve.

### → Research your problem and solution ideas.

Explore energy sources and how energy is stored, distributed, and used in your community. Can you find ways to make part of your energy journey better? Can you improve one step to be more efficient, reliable, affordable, accessible, or sustainable? What solutions already exist? Are there any experts or users you could interview?

### → Design and create a solution that could improve your energy journey.

Use your research and explorations to either improve an existing solution used in your energy journey or design a new innovative solution. Can you make different energy technology choices? Make a drawing, model, or prototype of your solution.

### → Share your ideas, collect feedback, and iterate on your solution.

The more you iterate and develop your ideas, the more you will learn. What impact will your solution have on your community?

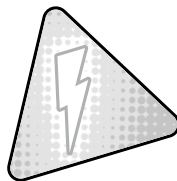
### → Communicate your solution with a live presentation at an event.

Prepare a creative and effective presentation that clearly explains your Innovation Project solution and its impact on others. Make sure your whole team is involved in sharing your progress.

Interested in taking your Innovation Project further? Learn more about implementation and entrepreneurship through the Global Innovation Awards.

 GLOBAL INNOVATION AWARD

# White Energy Journey



## Project Spark

Renewable energy comes from natural sources that will never run out. Amazing new technologies are being developed to capture and store energy from these types of renewable sources.

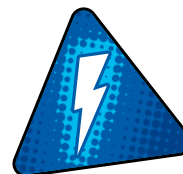


## Think about and research:

- Are renewable energy sources reliable?
- How can we store energy when the wind is not blowing or the sun is not shining?
- How do we make the use of renewable energy technologies more widespread?
- What is the impact of using these renewable technologies?



# Blue Energy Journey

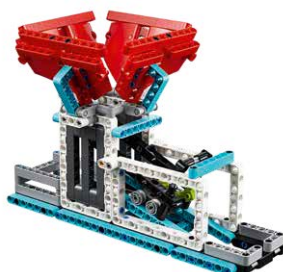


## Project Spark

Hydroelectric stations can generate electricity using moving water. Water that passes through the turbines can be pumped back up to the reservoir at the top of the dam to be used again. This is a good way to use surplus energy that consumers are not using.

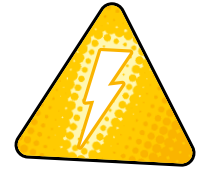
## Think about and research:

- How could surplus energy from renewable sources be used in your community?
- How is energy used in industries and homes?
- How is water in the oceans used to capture energy?
- Could water be used to capture energy where you live?





# Yellow Energy Journey



## Project Spark

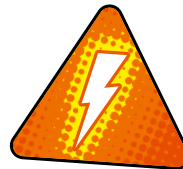
Providing energy when and where it is needed at an affordable cost is a massive challenge. We have become reliant on nonrenewable energy sources because they are convenient and often cost less.

## Think about and research:

- How widespread is the use of nonrenewable resources?
- Why is it difficult to stop using nonrenewable energy?
- What solutions combine the use of renewable and nonrenewable energy sources?
- What are the impacts of using nonrenewable energy sources?
- What carbon capture technologies are being developed?



# Orange Energy Journey



## Project Spark

Energy can come from many different sources, and is used to generate electricity. This energy is transferred into a network grid that distributes electricity to energy consumers.



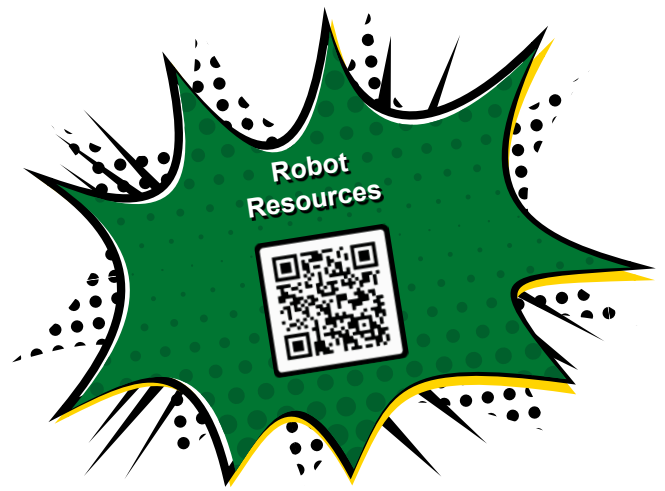
## Think about and research:

- What are smart grids? How do they supply electricity to consumers?
- How could we alter the demand for electricity so that consumers use it when the electricity is abundant?
- How could energy be stored in your community so it is available when you need it?
- How do rechargeable batteries work? Why is this better than using disposable batteries?



# Robot Design and Robot Game

This year's SUPERPOWERED<sup>SM</sup> Robot Game is about collecting energy units from different sources around the mat and distributing them to where the energy will be consumed. Points are scored for releasing energy units from the models and for delivering energy units to target destinations.



## → START

Design and create a robot that will complete missions in the Robot Game. Your innovative Robot Design, clear mission strategy, and functional programs are key in the *FIRST*<sup>®</sup> ENERGIZE<sup>SM</sup> season presented by Qualcomm.

### → Build your mission models and identify your mission strategy.

Each mission and model also provide inspiration for possible solutions to your Innovation Project. You will find four different energy journeys on the mat. You can complete the missions in any order!

### → Design and create your autonomous robot and programs.

Create a plan for your robot design. Build a robot and its attachments using LEGO<sup>®</sup> Education SPIKE<sup>™</sup> Prime or any LEGO Education-compatible set. Code your robot to complete a series of missions autonomously in a 2.5-minute Robot Game to score points.

### → Test and iterate on your robot solution to complete missions.

Iterate on your robot design and programs with continual testing and improvements.

### → Communicate your Robot Design solution at judging.

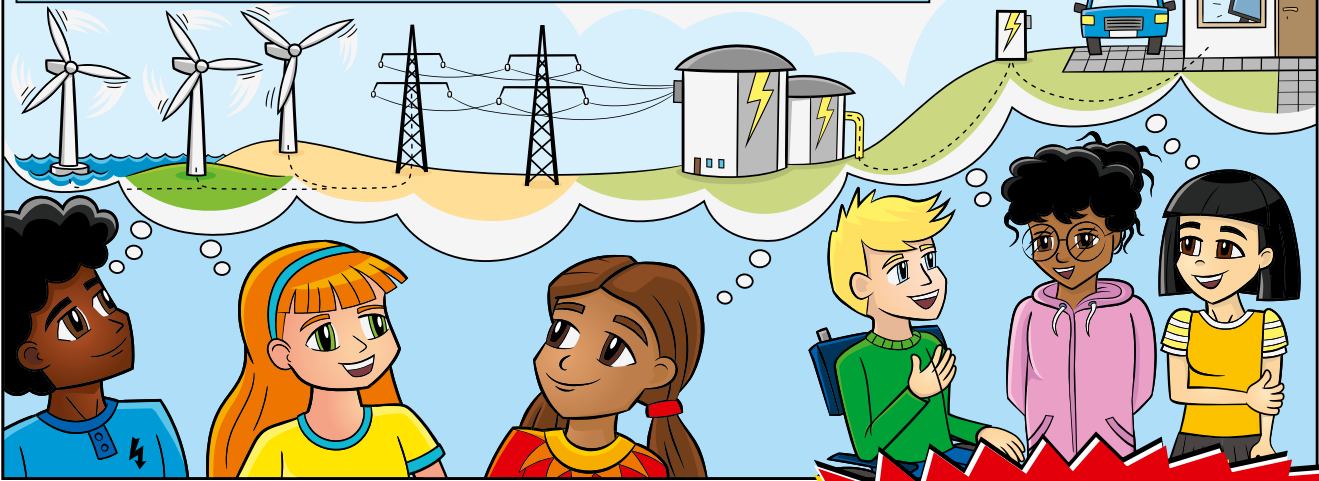
Prepare a short presentation that clearly explains the process your team used to create your robot and programs and how they work. Make sure your whole team is involved.

### → Compete in Robot Game matches.

Your robot starts in a launch area, tries missions in an order of your team's choosing, and returns anywhere into home. You can modify your robot when it is in home before launching it again. Your team will play multiple matches, but only your highest score matters.



Energy is an important part of our lives. Our *FIRST*® *LEGO*® League heroes know the choices we make impact our world.



Let's start with our community – they need our help!

How do we get energy?

How do we distribute and store it?

How do we consume it?

**Your challenge is to improve the energy journey in YOUR community!**



Hmm . . . let's identify a problem and design a solution!

We'll need more heroes.



**You are SUPER POWERED heroes that can change the world!**

