# Brick Educational Robot Contest-Creating Future Contest RULE——ENERGY REVOLUTION

## 1. THEME INTRO

WER Contest has adopted the theme of "Energy Revolution" for the year of 2022. The continuous expansion of the global economy, the great development of science and technology and the robust innovation have brought great convenience and amazing lifestyle to our life.

At the same time, more and more people have realized that the energy crisis caused by excessive use and dependence on non-renewable resources is imminent. The massive consumption of energy has brought about a sharp increase in carbon dioxide emissions, leading to the deterioration of the global climate, for which mankind has also paid a painful price.

The exploitation and use of traditional energy will be unsustainable in the end. The energy problem will become a complex, changeable, uncertain and severe challenge facing the future. We have to turn our attention to the clean energy recycled such as solar energy, wind energy, biomass energy and hydropower. It was once thought that the utilization of renewable energy was out of reach. Today, with the development and iteration of science and technology, we are bound to master the recycling of clean energy and realize carbon neutralization to zero emission.

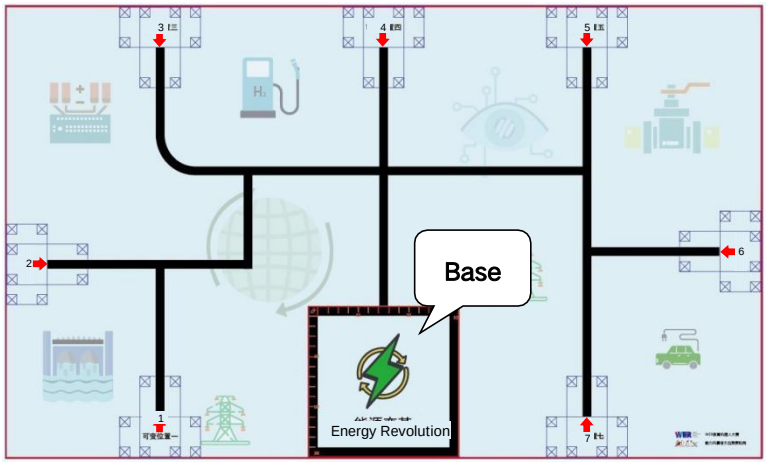
This is the common expectation of mankind; It is also a huge change from non-renewable energy to clean energy. It is a great change that has not been seen in a century.

## 2. Contest Arena and Environment

### 2.1 Arena Setup

The size of the arena map is 90 * 150cm, and the material is PU cloth. The width of the black guide line is 2cm-3cm. At the end of the black guide line is the location box of the task model (task model placement area), and the position is marked with thin outline. Red arrows as shown in the image below points to the front of each location. The location and direction of the model are randomly assigned prior to the contest date. The site has a base with a size of 30 * 30cm, and the robot can travel in and out of the base location for unlimited times.

Arena Map




### 2.2 Arena Environment

The environment of arena placement should have cold light source, low

illumination and no magnetic field interference. However, there are many uncertain factors in the actual contest environment, such as lines and unevenness on the surface of the field, changes in lighting conditions and so on. Teams should consider various countermeasures when designing robots.

## 3. Tasks and Scoring （Total points 470）

The building instructions of the 3 pre-set tasks are published in this rulebook, but the position and orientation will be randomly assigned. The actual placement of task models will be released on the date of contest as well as the 2 on-site tasks. The contestants should design their robot structure and program according to the actual environment.

The preset tasks described below are only simulations of real-life scenarios.

### 3.1 Departure (10 points) ★

The robot should depart the base with its vertical projection completely outside of the base area. One successful departure will be enough to score 10 points.

### 3.2 Wireless Charging Station (50 points) ★★

**3.2.1** The wireless charging station model at its initial position can be placed anywhere on the 7 arena map locations. The red arrow shown below in figure 3-2-1 is pointing toward the same direction as the red arrows on the arena map shown in section 2.1. The model can be placed facing right to the red arrow as shown below, or can be placed facing left to the red arrow.

**3.2.2** 50 points are granted when the robot successfully pushes the electric

vehicle into the charging station with the two magnets attached to each other as shown in figure 3-2-2.

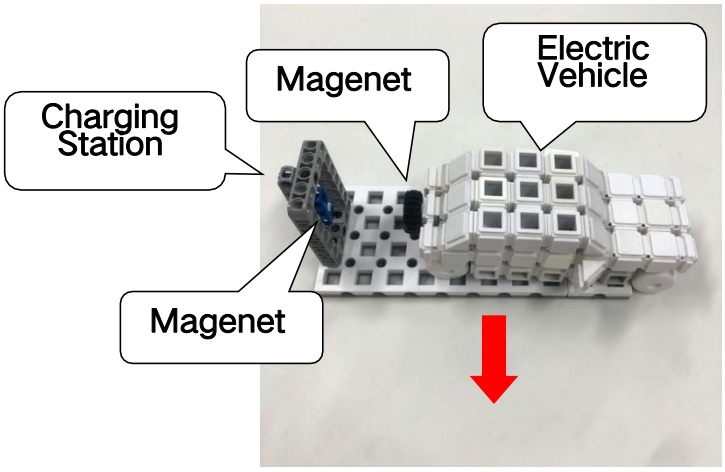



Figure 3-2-1 Initial Position

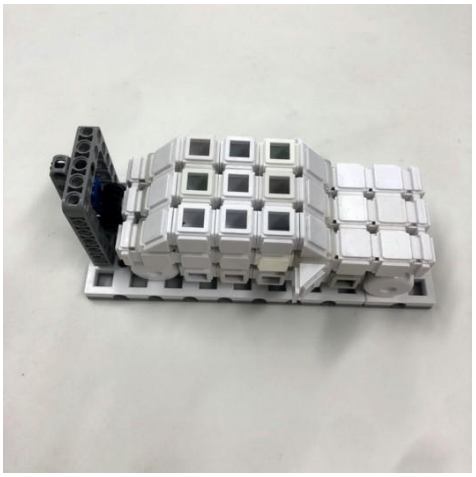


Figure 3-2-2 Finished Position

### 3.3 Ore Mining（70 Points）: ★★★

**3.3.1** Mine model at its initial position can be placed anywhere on the 7 arena map locations. The red arrow shown below in figure 3-3-1 is pointing toward the same direction as the red arrow on the arena map shown in section 2.1. The orientation of the mine model is fixed as shown below in figure 3-3-1. The ore is placed horizontally on the mine model with lever parallel to the ground.

**3.3.2** 30 points are granted when the robot spins the lever to detach the ore from the mine model as shown in figure 3-3-2. Additional 40 points will be given when the robot brings back the ore to the base.

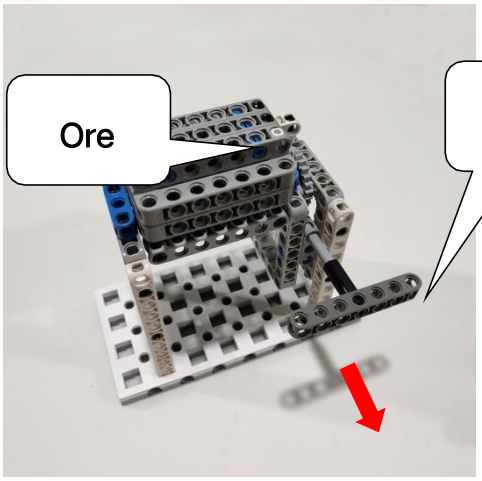



Figure 3-3-1 Initial Position

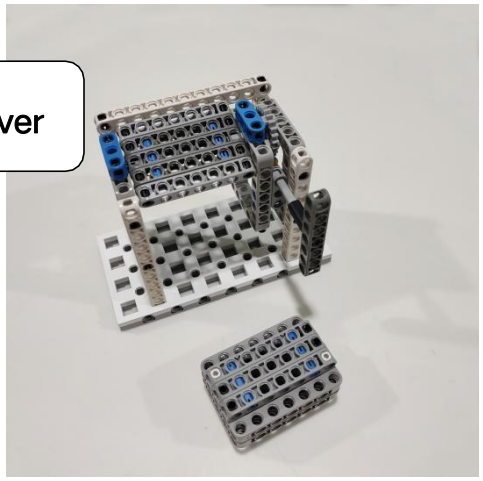


Figure 3-3-2 Finished Position 1

### 3.4 Ore Processing（80 Points）: ★★★★

**3.4.1** Ore processing model at its initial position can be placed anywhere on the 7 arena map locations. The red arrow shown below in figure 3-4-1 is pointing toward the same direction as the red arrow on the arena map shown in section 2.1. The orientation of the ore processing model is fixed as shown below in figure 3-4-1.

**3.4.2** This Task can only be done if the ore was previously brought back to the base in task 3.3.

**3.4.3** 40 points are granted when the robot places the ore onto the processing station as shown below in figure 3-4-2. Additional 40 points are given when the robot splices open the ore, revealing the colored crystals inside as shown in figure 3-4-3.

Figure 3-4-1 Initial Position Figure 3-4-2 Finished Position 1

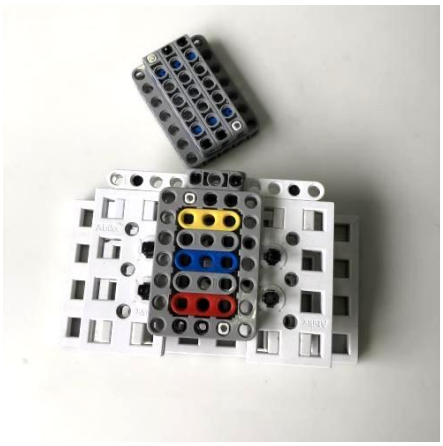


Figure 3-4-3 Finished Position 2

### 3.5 Return（20 Points）: ★★

**3.5.1** 20 points are granted when the robot completes at least one task and return to the base automatically before time is up.

**3.5.2** The return is considered successful when any of the robot’s wheel touches the line marking the base area.

### 3.6 On-site Task #1（100 Points）

On-site tasks will be revealed at the beginning of the contest.

### 3.7 On-site Task #2（100 Points）

On-site tasks will be revealed at the beginning of the contest.

### 3.8 Restart Bonus （40 Points ）

**3.8.1** Restart Bonus is considered after the robot completes at least one task successfully. 40 points are granted if **NO** re-starts were made during the entire round. 30 points are granted if only 1 restart were made. 20 points are granted if 2 restarts were made. 10 points are granted if 3 restarts were made. NO points given when 4 or more restarts were made.

**3.8.2** There are no limitations on how many restarts can be made.

**3.8.3** Time is not stopped nor refreshed after restart is made.

**3.8.4** A restart is made when the robot is returned to base with human help. The robot can autonomously return to base without human aids as many times as possible.

**3.8.5** Contestants are only allowed to be in contact with the robot when the robot is returned to the base, otherwise, it would count as a restart.

**3.8.6** When the robot is returned to the base, contestants may alter the structure of the robot.

## 4 Robot Design Regulations

Robot’s design and building rules and regulations: All robots must be checked before the contest. In order to guarantee fairness, the judge will randomly check

contestants' robots during the contest and request that non-compliant robots are adjusted in line with the regulations. If the robot still doesn't meet the requirement, contestants will be disqualified.

**4.1** Dimension: The dimensions of the robot shall not be larger than 30cm x 30cm x 30cm (Length x Width x Height) before leaving the base. However, the structure of robot can automatically extend after leaving the base.

**4.2** Controller: Each robot can use no more than 2 controllers during the round.

**4.3** Actuator: Digital servo motor shall not be used.

**4.4** Sensor: Type and number of sensors used by each robot is unlimited.

**4.5** Structure: Limit to plastic structures; accessories such as ribbons, screws, rivets, glue, or tapes shall not be applied.

**4.6** Power: Each robot must have individual battery with a voltage less than 9V. External power supply, boost, step-down or regulated power supply shall not be applied.

**4.7** Robot Model: This contest is limiting to Krypton 4, Krypton 6 or Krypton 8 only. For the fairness of the contest, other robot models shall not be admitted.

# 5 Contest

## 5.1 Team

**5.1.1** Each team consists of 2 students and 1 coach.

**5.1.2** Contestants shall respond to all issues in the contest positively and independently. Contestants will respect and interact kindly with teammates, opponents, volunteers, judges and all other personnel who are involved in the contest. Contestants will also make their best effort to demonstrate professionalism.

## 5.2 Rules

**5.2.1** There will be 2 hours of debugging time and then 2 scoring rounds. The time of each scoring round is 180 seconds.

**5.2.2** scores from both rounds will be added together to be the final score of each team.

**5.2.5** It is possible that the organizing committee may alter the rules in response to actual registration and arena environment conditions.

## 5.3 Procedure

**5.3.1** Construct robot, program and debug.

**5.3.1.1** Building and programming can only be conducted in preparation area while debugging can be performed in the arena map.

**5.3.1.2** Contestants can enter the preparation area after registration. Judges needs to check the equipment carried by contestants. Built robots can be carried into the preparation area and all equipment must be in accordance with the contest rules and regulations. Contestants are forbidden to carry telecommunication devices unless approved by the organizing committee. After all contestants are seated in the preparation area, judges will notify teams of diagrams of model distribution and additional task rules.

**5.3.1.3** Contestants should carry portable calculators, repair tools, replacement and spare parts. Contestants are prohibited to surf the internet or download any programs in the preparation area; contestants are also prohibited to shoot the venue by camera or other devices, or contact trainers or parents by any means.

**5.3.1.4** Contestants must debug and prepare in order and trainers shall intervene by no means. Teams who disobey the rules may be warned or even disqualified. Teams shall put robots in the designated place of the sealing area before the end of the debugging time, afterwards, the arena is in closure.

### 5.3.2 Preparation before scoring rounds

**5.3.2.1** Contestants pick up their own robots and are guided by judges into the contest field. Teams who do not show up in the regulated time will be deemed as waiver.

**5.3.2.2** Contestants put their robots in the base, of whose parts and shadows must maintain inside the base.

**5.3.2.3** The present contestants shall complete the preparation within 2 minutes and give a signal to the judge after completion.

### 5.3.3 Start-Up

**5.3.3.1** After the judge confirms the team is ready, they will count down from 3 while contestants can use a hand to slowly approach the robot. When hearing the command “Start”, contestant can touch the button or give the sensor a signal to start up the robot.

**5.3.3.2** Once robot starts up, it will only be controlled by the controller’s in-built programs. Generally speaking, contestants shall not touch robots (Restart is exceptional).

**5.3.3.3** Contestants shall not deliberately detach components or drop components on the ground, and such behaviors with a deliberate intent will be judged as a foul. Any unintentionally dropped components shall be

cleaned out of the arena instantly by the judge. Robot being scored due to detached components shall be invalid. Detached components indicate at a certain moment there is no connection between robot's built-in components and robot's body.

**5.3.3.4** If the carried objects are cast out of the arena accidentally because of the robot's rapid speed or program error, the objects shall not be considered as back to the arena.

### 5.3.4 End of the Scoring Round

**5.3.4.1** After the team accomplishes some tasks, they shall give a signal to the judge if they decide to give up in the contest, the judge will stop timing and keep the currently used time for a single round; otherwise, the team has to wait till the end of the contest (Whistle blown by the Judge).

**5.3.4.2** As soon as judge blows the whistle, contestants must power off the robot instantly and leave the robot and all objects on the arena untouched.

**5.3.4.3** Judges fill in the scoring sheet and inform contestants of their scores.

**5.3.4.4** Contestants clear up the arena and move their robots back to the preparation area.

## 6 Scoring and Disqualification

**6.1** if a team does not show up within 5 minutes, they will be disqualified.

**6.2** Detaching components intentionally is regarded as a foul. The team may be disqualified depending on the seriousness of the situation.

**6.3** If the model is damaged by the robot or contestants in the progress (intentionally or not), contestants will be given a warning. The task, no matter completed or not, will not be scored.

**6.4** Contestants should respect a judge’s final decision. Further quarrels may result in disqualification.

**6.5** Contestants will be disqualified if they secretly contact trainer or parents without permission from the judge.

## 7 Rankings

Each team will be ranked based on their scores in total of both rounds, the higher the score is, the higher the ranking will be. If there are teams which scored the same, see followings to determine the ranking:

1)The team who used less time for all rounds will be ranked higher;

2)The team who restarts less will be ranked higher;

# WER 2022 Brick Educational Robot Contest (3+2) Scoring Sheet

| No. | | Division | | Round | |
|---|---|---|---|---|---|
| Team | | | | | |

| Tasks | | Max Pts | # | Score |
|---|---|---|---|---|
| Departure | The Robot's vertical projection is outside of the base completely | 10 | | |
| Wireless Charging (50 pts. Total) | EV car magnet is attached to the station magnet | 50 | | |
| Ore Mining (70 pts. Total) | Ore detached from the mine model | 30 | | |
| | Ore brought back to base | 40 | | |
| Ore Processing (80 pts. Total) | Ore placed onto the station | 40 | | |
| | Ore completely spliced and all colors of crystal can be seen | 40 | | |
| Return to Base | Any one of the robot wheels is inside of the base | 20 | | |
| On-site Task #1 | TBD | 100 | | |
| On-site Task #2 | TBD | 100 | | |
| Restart Bonus | 40 -（restart #）*10，Minimum 0 | 40 | | |
| Time（S） | | | | |
| Total Score | | | | |

Judge：_ _ _ _ _ _ _ _ _ _ _ _ _ _ Contestants：_ _ _ _ _ _ _ _ _ _ _ _ _ _