

2023 KidWind Challenge in Asia RuleBook

1. INTRODUCTION

The KidWind Challenge is a hands-on design competition that engages students in STEM through the lens of wind and solar energy. Student teams design and construct small wind turbines and solar devices that they test, and then meet with a panel of judges to present their design process and demonstrate their conceptual knowledge on renewable energy. Teams also engage in a variety of Instant Challenges to gauge their on-the-spot teamwork and problem-solving skills.

The KidWind Challenge is a team effort by teachers, students, engineers, and practitioners, all working to make wind energy education and other renewable energy education accessible in classrooms around the world. Since 2009, KidWind Challenge events have been successfully implemented in 37 states in the United States, with roughly 35,000 students competing in 240 events across the country to date.

Last year (2022), with the strong support and collaboration of the government, academia, and industry, the third annual KidWind Challenge in Asia was held at the Sha-Lun Green Energy Technology Demonstration Site. As the epidemic situation improved, a total of eighty teams from high schools, vocational high schools, and middle schools across Taiwan participated in the competition. After the successful conclusion of the competition, there were many enthusiastic feedbacks from participating teachers, students, and various organizations. Plans are now underway to expand the competition in 2023 and invite teams from other countries to participate. The goal is to encourage students to combine their knowledge with their exploration of wind energy and demonstrate their creativity through hands-on activities. This will help promote energy literacy among students and enhance their development of multi-faceted education. The ultimate objective is to promote green energy and energy education by stimulating student creativity through practical experience.

2. ADVISORS:

Bureau of Energy at Ministry of Economic Affairs, Taoyuan City Government, Taoyuan City Council, Tainan City Government

3. ORGANIZERS:

Chang Jung Christian University, Industrial Technology Research Institute, Taiwan Power Company, National Museum of Natural Science, Department of Economic Development at Taoyuan City Government, Bureau of Education at Tainan City Government

4.CO-ORGANIZERS:

KidWind, Vernier Science Education, Shayangye Cultural & Educational Foundation.

5. SPONSORS:

Kuang-Tien International Co., Ltd, Skwentex International Corporation, Skyborn Renewables Taiwan Co., Ltd.

6. PARTICIPANTS

6.1. Elementary group: Ages 10 to 15;

Participants must have been born between January 1, 2008, and December 31, 2013;
Each team must consist of 4 members.

6.2. Senior group: Ages 16 to 18;

Participants must have been born between January 1, 2005, and December 31, 2007;
Each team must consist of 4 members.

7. REGISTRATION

7.1 Please register by team and select one team leader for your team.

7.2 Online registration is required and the registration period is from now until 5:00 PM on October 31st (Tuesday). Those who have not completed the payment by 5:00 PM on November 7th (Tuesday) will be deemed as incomplete registration. The organizer will send the generator and engineering notebook after the completion of registration and payment.

7.3 Registration website: <https://forms.gle/HA2vmW3LmF2Xd1NH9>

7.4 Definition of a Team: Students can only participate as part of a team. A team consists of 1 coach(teacher) and 4 players. Hence, for example, 1 coach(teacher) and 3 players or 5 players will not be recognized as a team.

7.5 Registration Fee:

- i. Team can only use the generator provided by the Organizer (Figure A) to ensure that the electricity generating part is the same for all teams. All other materials can be made by the participating teams themselves.
- ii. Each team's registration and material fee is **US\$100** per team and includes a set of competition-specific generators, lunch on the day of competition for the team, an engineering notebook, and insurance.
- iii. Please keep the generator properly. Each set of generators is checked for proper performance before being sent out. Please take good care of it. If there is a malfunction, please provide the warranty sticker as proof of replacement within seven days after the generator arrives. After the seven-day warranty period, replacement generator can be purchased. If no data can be measured during the competition, it will be considered to be caused by your team, and the team is responsible for any consequences.



Figure A Competition-specific Generator
(Please refer to Appendix I Competition Rules for specifications.)

7.6 Contact Information:

- i. Email : project@calculator.com.tw
- ii. Phone : +886-2-23822027 ext. 14 (Monday to Friday, 10 : 00 – 18 : 00, Taipei Time)

8. DATE, LOCATION & SCHEDULE

8.1 Registration: From now until 5:00 p.m. on October 31st, 2023 (Tuesday).

8.2 Competition Date:

- i. Elementary Group: December 2nd, 2023 (Saturday)
- ii. Senior Group: December 3rd, 2023 (Sunday)

8.3 Competition Location:

Sha-Lun Green Energy Technology Demonstration Site, Tainan, Taiwan (R.O.C.)
(Google Map: <https://goo.gl/maps/zdMChnQZTEpaZDK69>)

8.4 Competition Schedule

Time	Event
8 : 00~8 : 30	Team Check-in
8 : 30~9 : 00	Opening Ceremony and Explanation of Rules
9 : 00~10 : 00	Wind Turbine Setup and Test
10 : 00~12 : 00	First Trial Measurement / Referee Assessment
12 : 00~13 : 00	Break Time
13 : 00~14 : 00	Wind Turbine Setup and Test
14 : 00~16 : 00	Second Trial Measurement / Referee Assessment
16 : 00~16 : 30	Announcement of Result
16 : 30~17 : 00	Awards and Closing Ceremony

9. JUDGING METHOD & CRITERIA

9.1 Judging Method: Please refer to Appendix 2

9.2 Judging Criteria:

- i. Evaluation: The total output of Power generation, wind turbine construction, the content of engineering notebook and on-site presentation
- ii. Judging Panel: The organizer will invite scholars and experts in related fields to serve as expert judges. The weight of scoring items is detailed in the competition rules (Appendix 2).

➤The teams must complete their engineering notebook before the competition and submit it on the day of the competition. There is no restriction on the size of the poster on-site (up to the maximum size of A0), and the constructed wind turbine will be displayed and can be further explained at the venue.

9.3 Award Ceremony and Display of Wind Turbines

- i. The list of winners will be announced and prizes will be awarded on the day of the competition at the venue.
- ii. Winning teams are required to provide detailed information of the exhibit to the organizer for their works.

10. AWARD

10.1 The coach who guides the team to complete the entire competition (including participating in the closing ceremony) will be awarded a certificate of appreciation on the day of the competition to acknowledge their contribution.

10.2 The following awards will be given:

- i. Gold Award (One Team): The Gold Award Certificate from KidWind and a Prize.
- ii. Silver Award (Two Teams): The Silver Award Certificate from KidWind and a Prize.
- iii. Bronze Award (Three Teams): The Bronze Award Certificate from KidWind and a Prize.
- iv. Outstanding (Five Teams): The Outstanding Award Certificate from KidWind

※The number of awards may be adjusted depending on the number of participating teams and their performance. If the quality of the entries does not meet the standards, some awards may be omitted.

※If there are any additional awards, we make an announcement before the competition.

11. OTHER NOTICE

11.1 The teams must ensure that their entries are original and not a plagiarized or counterfeited copy. In the event of a lawsuit due to plagiarism, false research results, or other similar infringements of intellectual property rights, participants should resolve any disputes with the relevant parties on their own and bear any legal responsibilities. The organizers shall not be held liable for any legal responsibilities

11.2 The winner of the competition found to have violated the above rules or lose lawsuits

from to intellectual property disputes will be stripped of the title and all awarded prize money and prizes must be returned to the organizer.

11.3 The competitors who violate the following rules will be disqualified:

- i. Each student is only allowed to register for one team. If it is found that a single student has registered in multiple teams, the organizer has the right to disqualify all involved teams.
- ii. Team members who do not comply with epidemic prevention and competition-related regulations and fail to improve after being advised.
- iii. The use of materials or equipment that are harmful to the human body or have safety concerns such as explosion or sparks.
- iv. Failure to submit the required documents for the competition or delay in submitting them.
- v. Failure of team members to show up on time.
- vi. Winner that are found to have violated the rules or lost in subsequent litigation.

11.4 Competitors must bring one of the following government-issued photo identification cards for verification: student ID, passport, or any other official photo ID from their government.

11.5 Dispute resolution: If there is any dispute related to the competition during the competition period, the team shall submit a request to the organizer on the day of the competition. The competition rules shall be subject to unified review and judgment by the judges, and the chief judge will announce the decision. For legal issues, the parties involved shall follow legal procedures to settle the matter.

11.6 Complain period: For those who have objections to the results, please raise them to the staff of the organizer within one hour after the announcement of the results. If it exceeds one hour or upon leaving the venue, it will be deemed that the organizer's announced results have been accepted.

11.7 After the certificate is awarded, if the information on the certificate is incorrect, a replacement can be made within one hour after the award. If it exceeds one hour or upon leaving the venue, the replacement will not be processed.

11.8 For the purpose of non-profit promotion, and enhancing school teaching purposes, the winning teams should authorize the organizer and its designated third parties for the use the award-winning entries and engineering notes without fee, and for unlimited time, and unlimited occasions. This includes but is not limited to reproduction, distribution, issuance, public display, public broadcast, and public transmission. The teams agree not

to exercise intellectual property rights (including patent and authorship rights) against the organizer and its designated third parties with their winning entries.

- 11.9 The Wind Turbine must be designed by the team and free from plagiarism or outsourcing. If someone reports or exposes specific facts of such violations, the entry will be disqualified. If the Wind Turbine has already won, the award will be revoked, and the prize money and certificate must be returned.
- 11.10 The intellectual property rights of the entries belong to the contestants, and related matters such as copyright authorization, patent application, technology transfer, and rights distribution should be handled in accordance with relevant laws and regulations.
- 11.11 Contestants who violate the rules and regulations of this competition will have their qualifications revoked. If the entry has already won, the award will be revoked, and the prize money and certificate must be returned.
- 11.12 The winning teams must comply with the relevant income tax regulations in Taiwan, the Republic of China.
- 11.13 If there are any issues not covered in the above rules, they will be discussed and resolved in a timely manner by the Organizers.
- 11.14 All participants are deemed to have read and fully agreed to comply with all the regulations of this event.

12. ATTACHMENT

APPENDIX I: Additional Rule of 2023 Kidwind Challenge in Asia

APPENDIX II: The Report of Power Output.

Additional Rule of 2023 Kidwind Challenge in Asia

1. ORGANIZATION :

This competition will appoint one Director who will be responsible for coordinating all judges and referees during the competition. The Competition Director shall oversee three working units (as shown in Figure 1).

1.1 Expert Judge Committee:

Comprised of the Chief Judge and several expert judges, responsible for expert evaluation and scoring of the wind turbine systems of each team.

1.2 Referee Team:

Comprised of the Head Referee and several Assistant Referees, responsible for interpreting the rules and determining whether teams qualify and comply with safety regulations and rules during wind turbine measurement.

1.3 Administrative Team:

Responsible for ensuring the normal operation of the competition, including registration and personnel control, and other administrative work.

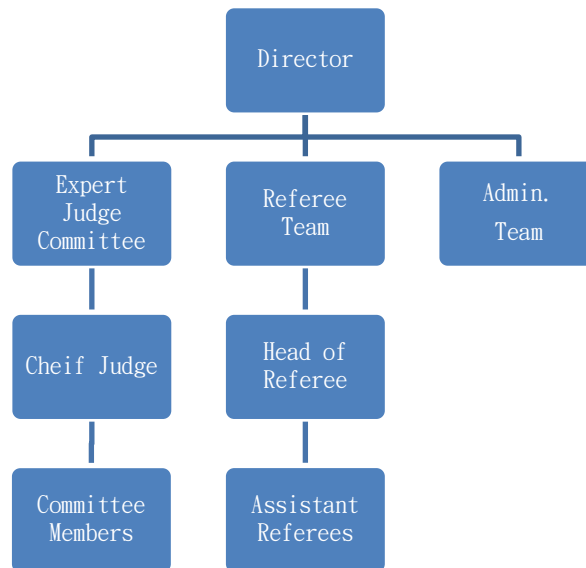


Figure 1 Organization of Kidwind Challenge in Asia

2. ADDITIONAL RULE

2.1 Equipment Instructions:

- 2.1.1 For the competition that requires the use of wind turbines, only the designated generator provided by the competition organizer can be used. The generator has an identification sticker attached, which must be protected intact and displayed prominently during assembly for inspection. If inspection is not possible, the team must immediately dismantle or remove any obstruction for inspection at the end of the second round. Failure to pass inspection will result in immediate disqualification.
- 2.1.2 Unless otherwise specified, the competition organizer reserves the right to disqualify any team that does not use the designated generator as specified.
- 2.1.3 **Wind turbines must be pre-made**, and teams must bring their own stationery and tools, such as a utility knife, cutting mat, scissors, AB glue or instant glue (fast-drying adhesive is a necessary option), pencil, ruler, compass, protractor, sandpaper, etc., to facilitate cutting, bonding, and modifying balsa wood or other materials for competition.
- 2.1.4 Teams should bring their own backup stationery and tools (such as adhesives) as needed when entering the venue.
- 2.1.5 There is a limited number of power supply areas available on-site for contestants use, but tools must be brought by the team.
- 2.1.6 Except for the specified items, other materials are not restricted. The prototype must be fully fitted inside the wind tunnel (Figure 2).
- 2.1.7 The engineering notebook will be sent with the generator to the address after registration and payment completion. Each team must submit it on the day of the competition as part of the scoring criteria. Please be sure to bring it on the day of the competition and submit it to the organizer, who will make a backup copy and return it (or return it on the same day).
- 2.1.8 Design and creative posters can be made in advance and brought to the venue for posting in the review area (the poster size must not exceed A0).
- 2.1.9 **Teams must bring their own eye protection goggles** (This is a personal item and it will not provide by the organizer) and must be worn by each member throughout the measurement period. If warned by the referee and the team refuses to comply, the team will be disqualified.

2.2 Wind Turbine Design Guidelines:

- 2.2.1 This design section will have one chief judge and several expert judges who will question and score your team's wind turbine design during the competition.
- 2.2.2 Each team must have their own generator, turbine, blades, and support structure.

- Sharing with other teams is not allowed.
- 2.2.3 There is no budget limit for turbine design, but part of the judging criteria is the efficient and economical use of resources. Please use materials responsibly.
- 2.2.4 The wind tunnel used for testing the turbine has a space of 120x120x120 cm and is of negative pressure type. The wind turbine must be suitable for the dimensions and leave enough space.
- 2.2.5 During measurement in the wind tunnel, only sandbags or other heavy objects can be used to fix the turbine in place. The use of any flying objects or adhesive tapes is prohibited.
- 2.2.6 Extra space needed for the wind turbine to rotate the blades in the wind tunnel must be considered.
- 2.2.7 Energy output can only be generated through wind power in the wind tunnel.
- 2.2.8 The turbine can be designed with a vertical or horizontal axis.
- 2.2.9 Gearing systems, pulley systems, or similar mechanisms can be used to increase power output. Pre-fabricated gearboxes and other parts can be used, but storing energy in advance to increase energy is strictly prohibited.
- 2.2.10 Pre-cast or pre-made plastic injection products, such as wind turbine blades or airfoils, are not allowed.
- 2.2.11 The wind turbine must be able to stand independently. The organizer will not provide towers or any other supports.
- 2.2.12 Sharp metal objects, glass, and similar blade materials will be strictly prohibited from entering the wind tunnel due to their potential hazards. The use of sharp objects such as staples, thumbtacks, and nails in the blade assembly is also strictly prohibited.
- 2.2.13 In addition to blades, 3D printed components and assemblies are allowed. If used, the judges will want to ensure that the participants fully understand this technology.
- 2.2.14 The use of wind scooper is allowed, but the turbine and scooper must be fully contained within the wind tunnel to meet the requirements. If any part of the wind turbine (including wind scooper) extends outside the wind tunnel during testing, the team will be disqualified.

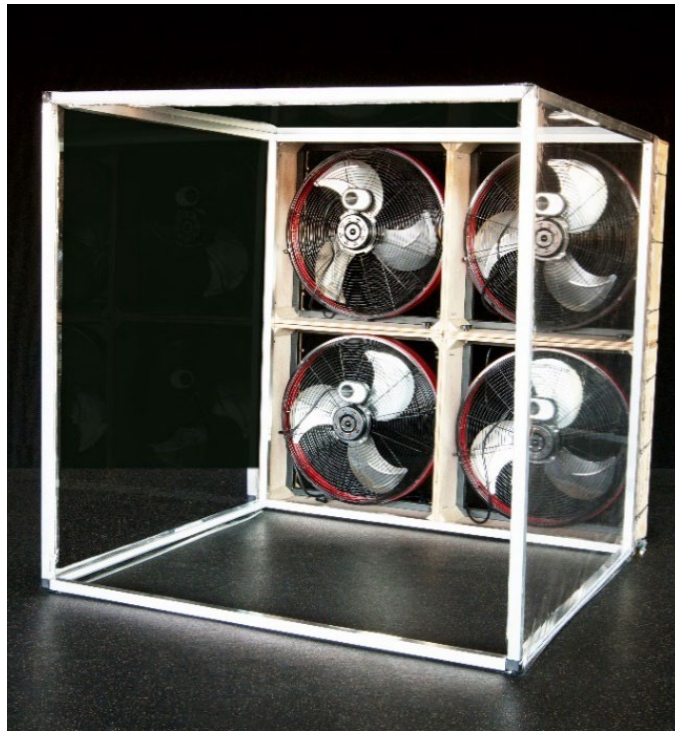


Figure 2 the photo of Wind Tunnel

2.3 The specifications and performance of the generator and wind tunnel:

2.3.1 The specification of the generator

- Voltage output: 0–10 V
- Current output: 0–0.3 A
- Diameter: 1.25 in
- Wire length: 4 ft
- Shaft diameter: 2 mm

2.3.2 The performance of the generator

- Rated Voltage: DC 5.9 V
- Rated Load: 10.0 g-cm
- At no load:
 - Speed = 2000 RPM
 - Current = 0.011 A
- At stall:
 - Torque = 40 g-cm
 - Current = 0.147 A
- At maximum efficiency:
 - Efficiency = 60.851%
 - Speed = 1569 RPM
 - Torque = 8.6 g-cm
 - Current = 0.040 A

- Power = 0.144 W
- At maximum output:
 - Speed = 999 RPM
 - Torque = 20 g-cm
 - Current = 0.079 A
 - Power = 0.214 W

2.3.3 The specification of the wind tunnel : The average wind speed is 3.6 m/s at a distance of 30 cm within the opening. The wind tunnel is of negative pressure (suction) type. (As shown in Figure 3) It generate a uniform flow.

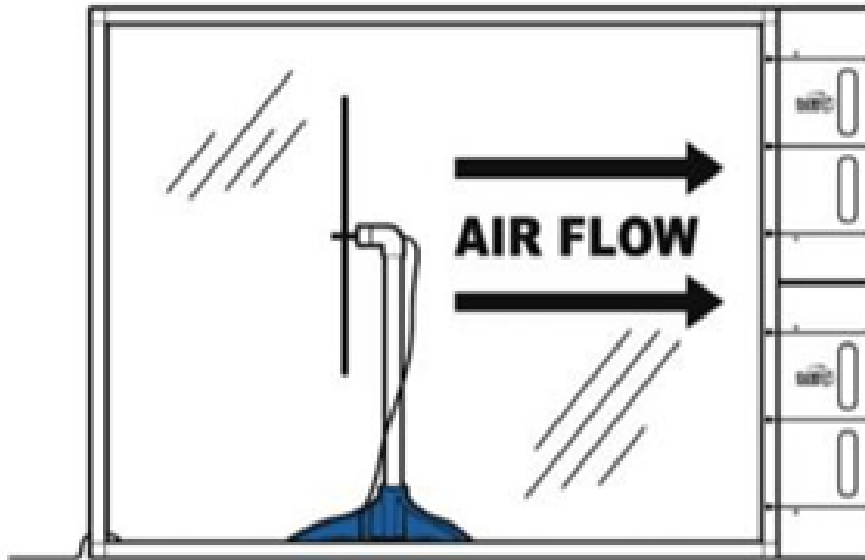


Figure 3 The airflow direction inside the wind tunnel ¹

2.4 Wind turbine testing/measuring rule:

- 2.4.1 There will be one Head of referee and several assistant referee in the wind turbine testing/measuring area.
- 2.4.2 After the test starts, teams will have 3 minutes and 30 seconds to set up their wind turbine in the wind tunnel.
 - a. Assistant referee will remind the teams at 2 and 3 minutes, respectively.
 - b. Teams must start data collection at the beginning of the 3 minutes and 30 seconds.
 - c. If teams complete the setup before 3 minutes and 30 seconds, they may start data collection early.
- 2.4.3 During the test, the wires at the bottom of the turbine will be connected to the circuit of the variable resistor. And its voltage and current will be measured simultaneously.

¹ Please note that the blade orientation should be facing outward. Contestants will not be reminded again during the competition.

- 2.4.4 The default setting of all groups is a zero-ohm resistance value, which will be adjusted by a member of the team.
- 2.4.5 When the wind tunnel is started, the blade of wind turbine must be able to rotate (start) and generate electricity without external assistance.
- 2.4.6 After the wind turbine enters the wind tunnel and is connected to the data acquisition system, the assistant referee will ask the team leader if they want to start the measurement. The test must be started or abandoned within 3 minutes and 30 seconds. The data acquisition device will collect one minute of energy output and power data during the measurement.
- 2.4.7 Throughout the test, the wind tunnel will keep running. The assistant referee will collect one minute of power and energy output data. The energy output will be calculated using the Vernier LabQuest, which can simultaneously collect voltage and current readings.
- 2.4.8 If the wind turbine fractures or overturns during the test, the assistant referee will ask whether the test should be completed. If the team leader answers yes, one minute of test data will still be collected. If the answer is no, the opportunity to collect data for this test will be lost.
- 2.4.9 There are two opportunities in the competition, and only the best of the two test reading will be taken as the final score.
- 2.4.10 After the test is completed, two output energy report forms (Appendix II the Report of Energy Output.) will be printed out by the assistant referee immediately. The team leader should sign and return one copy, and keep the other as a reference.

2.5 Other notice:

- 2.5.1 This competition requires the use of self-prepared cutting tools such as blades and scissors, adhesives, and parts that may scatter during testing, all of which are potentially hazardous. Teachers, parents, and students who wish to participate should evaluate their own abilities and be aware of their own safety.
- 2.5.2 Each contestant must bring their own protective goggles and wear them throughout the entire competition. Glasses cannot be considered as protective goggles, and failure to comply will result in disqualification.
- 2.5.3 Contestants must follow the instructions and arrangements of the organizers on-site, including designated locations and procedures. Failure to do so will result in disqualification.
- 2.5.4 If a team fails to complete the registration within 30 minutes after the registration deadline, the team will be considered as forfeiting the competition.
- 2.5.5 Unless due to force majeure factors, if the number of contestants in a team does not reach four on the day of the competition, the team will be considered forfeiting the competition.

2.5.6 Each team is limited to a one-minute test in the test/measurement area. After the time is up, the next team will test in sequence.

2.5.7 During the competition, teachers and family members are not allowed to enter the competition area, nor are they allowed to instruct participants in any way.

2.5.8 The judges have the final decision-making power on the rulings and disputes in this competition.

3. Scoring Method

The overall score will be divided into two parts: Electricity Production (60%) and Wind Turbine Design (40%).

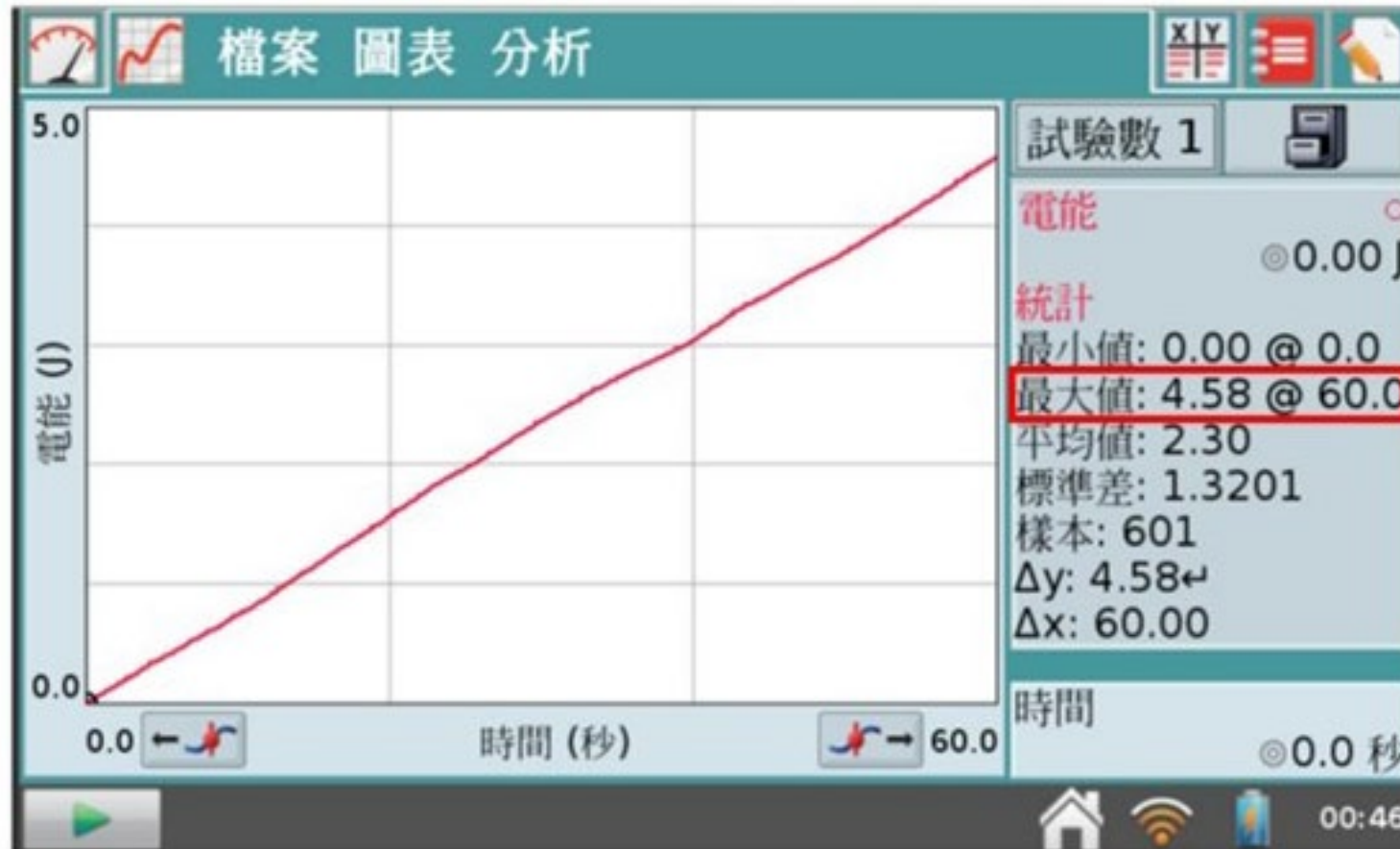
3.1 Electricity Production (60%): A Vernier data acquisition system will be used to collect the total energy output of your turbine during a one-minute test. The energy output of each team will be ranked relative to the other competitors, and the ranking data will be transformed into a score from zero to one hundred using a T-student distribution. Each participating team will receive a score corresponding to their ranking.

3.2 Wind Turbine Design (40%): Expert judges will inspect your team's wind turbine during the competition and testing process. The 3-5 minutes interview is designed to gain a better understanding of the process your team went through during the design and testing of your turbine. You should be prepared to discuss and explain the choices you made during the design. The 40% of the total score will be further divided into the following proportions:

- i. Engineering Thinking/Design
 - 10% Blade Design
 - 10% Power Mechanical Design
 - 10% Structure Design
 - 10% Overall Engineering Thinking
- ii. Professionalism, Innovation and Environmental Protection
 - 10% Ideology, Creativity and Environmental Protection
 - 15% Understanding of Wind Energy Knowledge
 - 10% Presentation Skills
 - 25% Engineering Notebook

2023 Kidwind 風力能源亞洲聯賽電能產出報告

The Report of Energy Output in 2023 Kidwind Challenge in Asia



組別(Group):

隊伍(Team):

選手代表簽名(Representative signature):