



مسابقة الإمارات للتكنولوجيا والابتكار
EMIRATES TECHNOLOGY & INNOVATION COMPETITION

Technical Description

**Renewable Resources: Powering the
Future with Renewables Competition**

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1. Introduction

There is ever increasing global interest in integrating renewable generation -especially wind and Photovoltaic (PV) into power systems to meet the continuously increasing demand for electrical energy. This is happening at a time of diminishing fossil fuel reserves, and a rising awareness of their environmental hazards. In addition, developments in the electric vehicle market have created a ready application for hydrogen-based fuel cells, and these are expected to play an important role in powering the car of the future.

In this competition the students will gain knowledge of how electrical energy can be generated from different types of renewable energy resources, namely wind, solar, and fuel cells and how this energy can be stored in super capacitors. Participants will compete to use their gained knowledge and problem solving skills in building a renewable-based microgrid system (a small electrical network with renewable sources and electric loads) in a number of challenging scenarios.

2. Competency Specification

The contest will run on three days and will test the following:

- 1- Ability to use hands-on skills in following technical manual instructions to assemble renewable-based generation and storage mix.
- 2- Ability to understand the working principles of various generation, measurement and load components.
- 3- Ability to design a working system by integrating the available components to perform the given tasks.

3. Objectives

For the Participants:

- To measure their skills against those of their peers from other institutions.
- To acquire valuable knowledge and experience related to renewable energy.
- To work with cutting edge renewable energy technologies.
- To be seen by potential employers.

For Institutes:

- To appreciate the role of renewable energy in electricity generation.

- To gain visibility in the UAE, regionally and worldwide.

4. Rules & Regulations

4.1. Teams

- a) Teams must register before the deadline.
- b) Each team can register up to 2 members.
- c) The participants' age is in accordance with the *EmiratesSkills* general regulations.
- d) Each institution may have one or more teams.
- e) Total number of teams is 6.

4.2. Competition

- a) The main language of the competition is English and all the provided systems and materials are in English.
- b) The competition will take place during 3 days. The schedule for the competition will be from 9:00 AM to 5:00 PM.
- c) The participants should not leave the competition during the competition time. Otherwise the team will be disqualified.
- d) Use of the Internet is allowed only via the connection provided by the organizers. Access will be restricted to sites relevant to the competition according to the discretion of the judging committee.
- e) Machine-readable versions/devices (computers, pocket calculators, mobile phones, CDs, flash memories, floppy disks, or similar) are not allowed in the contest hall.
- f) The participants will ONLY use the components supplied by the competition organizers. No outside components are allowed.
- g) Judges are solely responsible for determining if the team passes the challenges and the scores it deserves; their decision is final.
- h) Participants requiring any kind of assistance should ONLY communicate with one of the judges.

4.3. General Rules

- a) The organizing committee has the right to update these regulations as it sees suitable. The participants are not to complain about these regulations. It is the participant's

responsibility to check the competition's website for any updates regarding the competition.

- b) Any team attempting to communicate with another team, to tamper with the machines, or disrupt the competition environment in any way will be disqualified.
- c) The participants shall agree to allow the organizers to publish their names as well as photos and videos in which they appear.
- d) Smoking is not allowed in the competition area.
- e) No visitors will be allowed in the competition area other than the participants.

5. Contest Environment

- a) Generation, storage and load components will be provided.
- b) Only components and equipment provided by the organizers are permitted to be used.

6. Competition Structure

The goal of the competition is to design a system using the available renewable resources and/or storage mix to drive a target load to perform a specific task in a timely manner. One or more electric loads might be used in this competition such as lights, motors, DC fans, etc.

The target loads must be powered from the available renewable resources and or storage units. All teams must design and operate the systems using the provided electrical components.

6.1. Competition Days

On the **first day** of the competition, the teams will work on a number of tasks designed to gain familiarity with the different renewable energy resources and how they operate. These task-based training activities will continue during the first session of the **Second Day** of the competition. Teams will be scored on how well they achieve the tasks.

During the second session of the **Second Day** of the competition, the students will use the knowledge they had gained to integrate the various electrical components and design a renewable-based microgrid that would supply low-power electric loads. This will then be put to the test in a competition. On the **Third Day** of the competition, the

students will continue to compete on more challenges. Details of the tasks and competitions will be provided as needed.

The teams will be scored based on the *performance* of their system. The scoring criteria will be explained to the teams and provided at the beginning of each competition day.

6.2. Scoring

1. Scoring will be carried out using a score sheet provided for each task.
2. The final score will be calculated based on the performance over the three days.
3. If two teams get the same score then a final challenge would decide the eventual winner

7. Renewable Kit and Components

The electrical components to be used in the competition are provided in the Horizon Science and Educational Kits as follows;

- **Renewable Energy Science Educational Kit:** this kit includes education models for the horizontal axis wind turbine, Photovoltaic panel, Fuel Cell and electric loads such as fan and lights.



<http://www.horizonfuelcellshop.com/europe/product/renewable-energy-science-kit/?added-to-cart=63>

- **Horizon's Vertical Axis Wind Turbine Science Kit:** Another type of wind turbine models to build participants knowledge on the available wind technologies and their operational performance.



<http://www.horizonfuelcellshop.com/europe/product/vertical-axis-wind-turbine-science-kit/>

- **Thermal Power Science Kit:** It generates electricity by combining hot and cold water with a special thermal power conversion cell (heat exchange).



<http://www.horizoneducational.com/juniorproducts/thermal-power-science-kit/>

- **Renewable Energy Monitor:** To measure the electrical parameters (voltage, current, and power).



<http://www.horizonfuelcellshop.com/europe/product/horizon-energy-monitor/>

- **Salt Water Fuel Cell Science Kit:** combines a saltwater electrolyte with magnesium plates to generate electrical energy.



<http://www.horizeducational.com/juniorproducts/salt-water-fuel-cell-science-kit/>

Additional components would also be provided including but not limited to; electric water pump, electric fans, electric loads, and water tanks, together with the necessary tools to create and design the desired renewable powered systems.