



2020-2021 City Model Slideshow

School/Organization: **Richard H. O'Rourke Middle School**

Educator Name: **Mrs. Katie Duell & Mr. Nick Morocco**

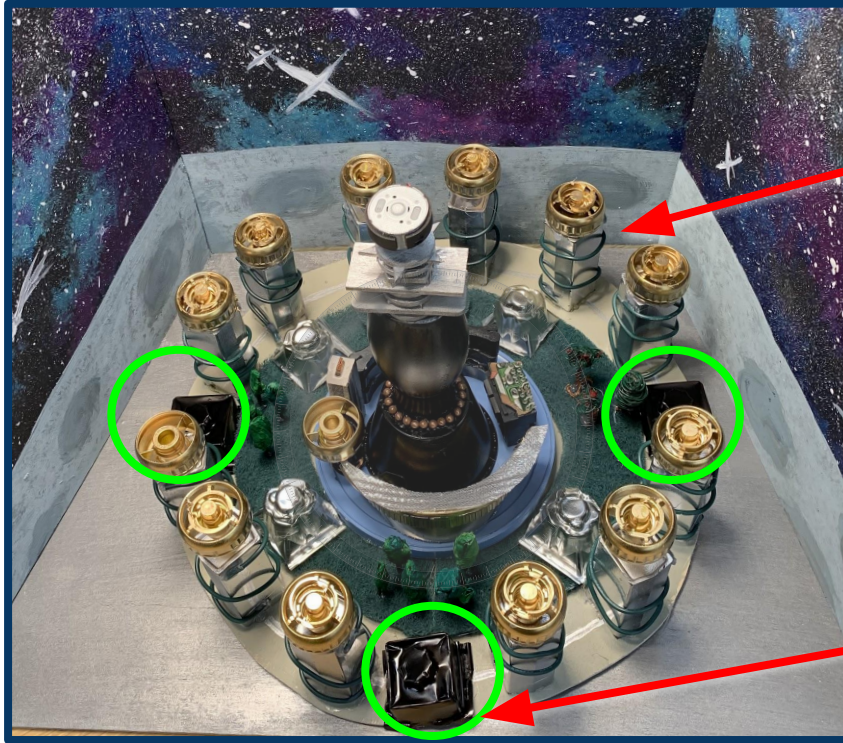
Future City Team Name: **Spartemis City**

Deliverable Details

- This slideshow is your chance to present your model. Whether your team created a single model or multiple segments, here is where you show off the future city you designed to the judges.
- Choose photos of the various segment(s) that best show the requested content.
- Do not change the size of text boxes in this template. All written text must fit within the boxes and *cannot* be smaller than size 14 in Calibri (or equivalent) font.
- When finished, save the slideshow as a PDF and upload to the Online Portal at FutureCity.org.

Section I
CITY DESIGN

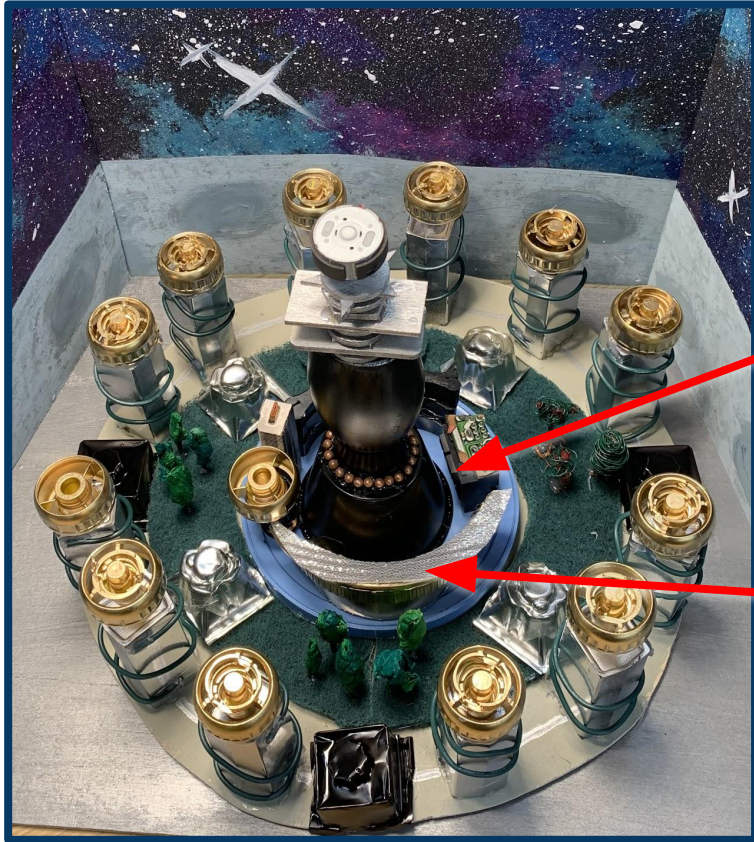
Residential Zone



What is important for the judges to know about your residential zone?:

Residential buildings line the edges of three mixed-use hubs, which are modeled after Fujian Castles with spherical shaped roofs. Residential buildings are primarily composed of pieces from 3-d printed regolith. Residents living in these multilevel apartments can travel via bike or walking to nearby commercial areas, other apartment complexes, or inverse gondola stations using sintered regolith roads.

Commercial Zone

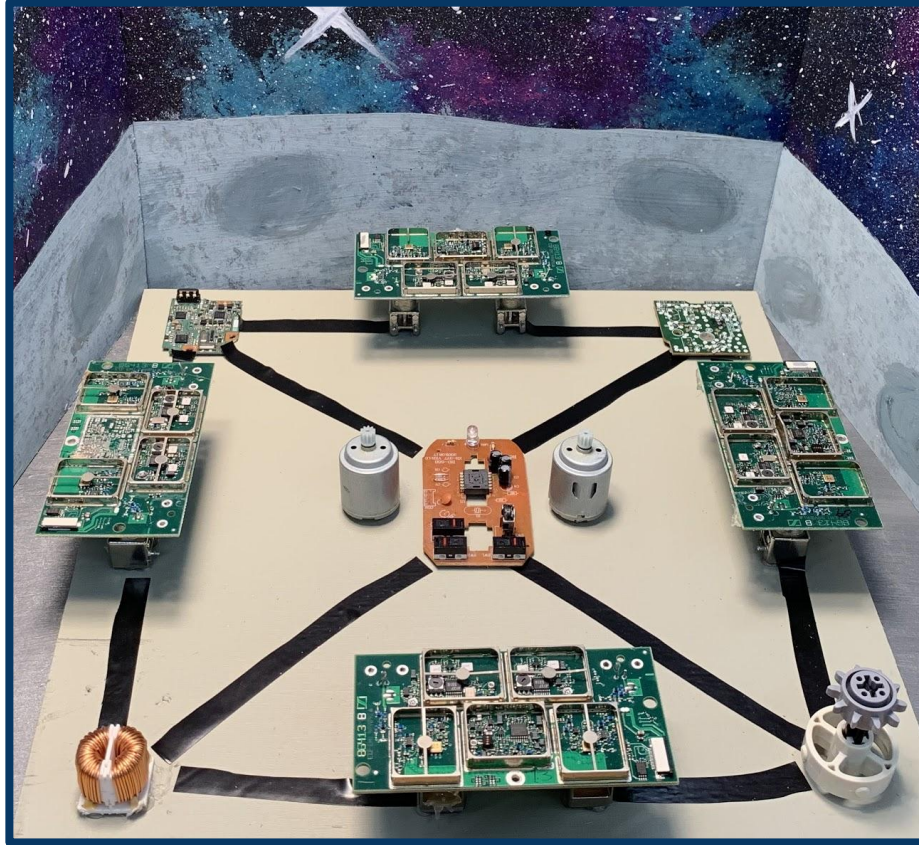


What is important for the judges to know about your residential zone?:

Inside the ring of city green space, the main commercial area surrounds the prominent city services building. The commercial area consists of medical centers, a gym, a mall and more. Different spaces are purchasable in the commercial area for citizens to start self owned business and strengthen the economy. Additionally, the large crescent shaped building is a popular area for citizens to participate in and watch games of spaceball.

Between buildings in the commercial area, sintered regolith roads are in place for citizens to properly travel to separate areas of the city.

Industrial Zone



What is important for the judges to know about your residential zone?:

The primary industrial area in Spartemis City is the city's northernmost hub. Since the various industries in the city are high-tech, there are no emissions to harm the dome air quality.

Some examples of items produced in these factories are aerogel for the hubs, ELLA bikes (**Electric Lithium-Air battery**) for transportation, common appliances and more. Wider regolith sintered roads are in place interconnecting buildings, so workers and equipment can move around smoothly.

Infrastructure Example 1



What type(s) of infrastructure are shown here (water, power, utilities, etc.)?:

Utilities

How are these related to the realities/challenges of living on the Moon?:

This is a regolith 3D printing station. It provides the city with a variety of building materials and parts for construction on the moon. Bringing materials from the Earth to the moon is expensive, takes lots of time, space and wastes the natural resources right in front of us on the moon. Spartemis uses ROSEs (**R**egolith **O**btaining and **S**orting Equipment) to collect and sort the regolith into different metals. These metals are then mixed with a binding agent to create 3D printing substrate.

Infrastructure Example 2



What type(s) of infrastructure are shown here (water, power, utilities, etc.)?:

Power

How are these related to the realities/challenges of living on the Moon?:

Power is vital to work the individual hubs. Many other ways of generating energy were unavailable in the lunar environment, however nuclear fusion, the process of fusing two hydrogen atoms to create a helium atom, was possible. This process creates immense amounts of energy and is especially convenient because of the multiple nearby hydrogen deposits in the Amundsen Crater.

City Services Example 1



What type(s) of city services are shown here (health, education, etc.)?:

[The Spartemis City Institute Building \(Education\)](#)

What do you want the judges to know about your city's operations?:

Education is a hybrid between virtual and in-school, consisting of allocated courses delivered from Earth and locally. The building depicted is where different citizens travel to for in person schooling. Multiple levels of the in-person building serve as separate areas for students to learn. After 20 years in a profession, citizens can continue working full time or they can utilize work release to serve as a teacher to future generations.

City Services Example 2



What type(s) of city services are shown here (health, education, etc.)?:

[Healthcare \(SOCCC\)](#)

What do you want the judges to know about your city's operations?:

One of Spartemis' multiple hospitals is shown here. Our **Slim Optical Cellular-Checking Component (SOCCC)** is a device that monitors citizens health, while staying flush with their ankle. To maintain proper bone mass, calcium supplements extracted from regolith and mixed with other healthy minerals, are distributed to citizens. The plentiful amounts of roads and public gyms serve as areas for citizens to walk or bike, also maintain muscle growth.

Transportation Example 1



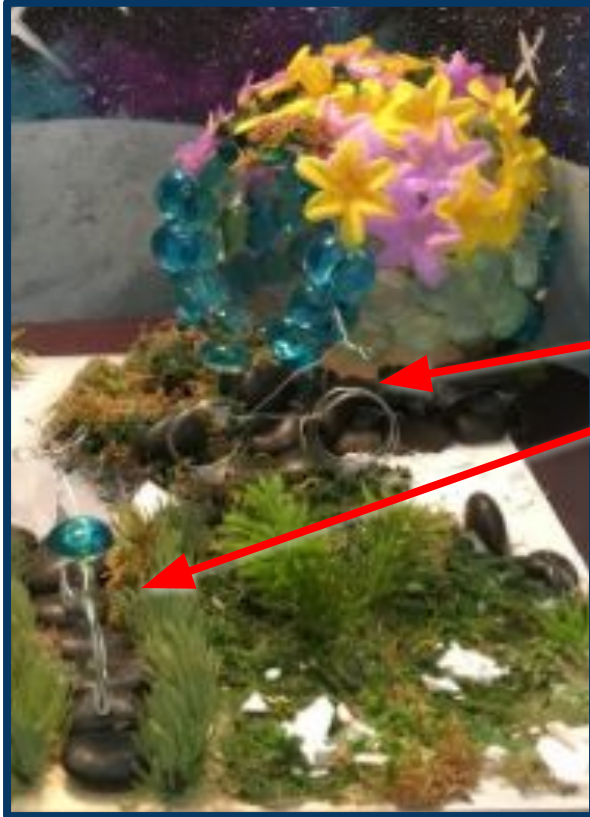
What type(s) of transportation systems are shown here?:

Inverse gondola mass transit system

What do you want the judges to know about your transportation system(s)?:

These small trainlike vehicles follow a track between the city center hub and the three hubs surrounding it. The driving mechanism is similar to a monorail, but the cabin is held above a road surface within tunnels that connect the separate parts of the city. The tunnels have stations at either end that are placed at the outer walls of each hub. Benches line the inside of each gondola, with 20 citizens maximum able to travel in each gondola at once.

Transportation Example 2



What type(s) of transportation systems are shown here?:

Citizen Biking and Walking

What do you want the judges to know about your transportation system(s)?:

Two methods of personal transit are walking and biking. ELLA bikes (Electric Lithium-Air battery) have an electrical assist function to allow cruising at faster speeds.

The electricity is stored in a Lithium-Air battery that gets charged as the bike wheels spin. Walking and biking is encouraged, as it helps to prevent bone loss. Citizens can enjoy biking, walking or running on many of the regolith roads throughout the individual hubs and green space areas to boost morale.

Living on the Moon (Resource #1)

Example 1



Identify the Moon resource shown here:

ROSE collects **Regolith**

What is important for the judges to know about this resource within your city?:

Spartemis' Regolith Obtaining and Sorting Equipment (ROSE) is a vital component to all manufacturing and construction for Spartemis City. Regolith is used to create everything from roads to buildings to tools all through a variety of processing techniques to extract usable metals and form 3D printing substrate. All equipment and structures in Spartemis are constructed with an electrostatic dissipative (ESD) coating to prevent the fine dust-like regolith from interfering with mechanics.

Living on the Moon (Resource #1)

Example 2

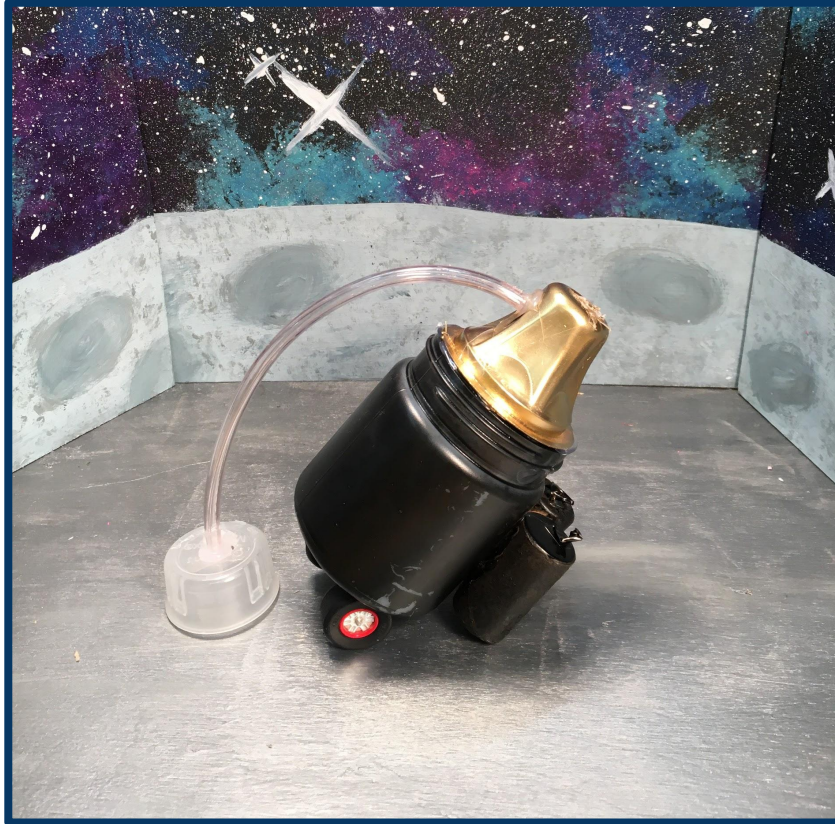


What is important for the judges to know about this element of your model?:

Utilizing a process called metalysis, regolith is combined with calcium chloride and heated to 950 degrees C in advanced solar ovens. An electrical current is then run through the mixture to extract the O_2 gas, leaving metals used for manufacturing. These metals are then taken to the 3D printing factories where they are used to create building materials. The extracted O_2 gas is used to oxygenate the domed environments as well as in the rocket fuel generation process. Regolith is the life-source for Spartemis City -- providing a source of water, oxygen, and shelter to citizens.

Living on the Moon (Resource #2)

Example 1



Identify the Moon resource shown here:

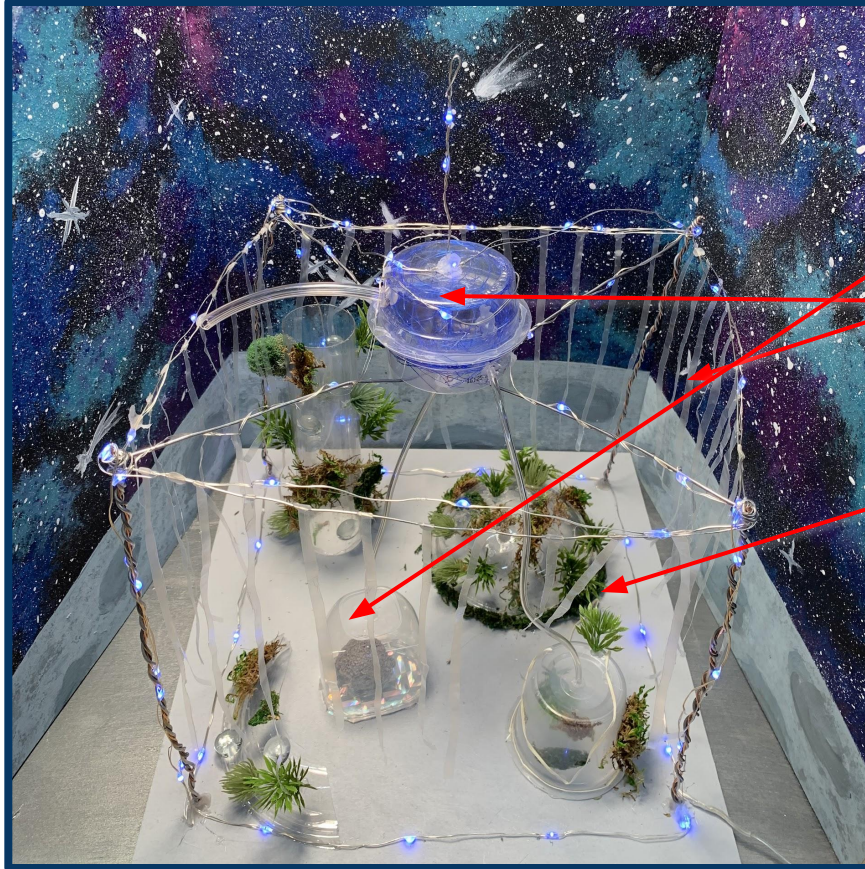
LILAC collects lunar ice/water

What is important for the judges to know about this resource within your city?:

Spartemis' location is near multiple lunar ice deposits in Amundsen Crater. AI enhanced LILACs (Lunar Ice Liquifier And Cleaner) collect these Ice deposits and transport them to advanced solar ovens, which condense water vapor into liquid form. Besides going to the city's water supply, condensed water vapor is also transported to factories to create rocket fuel. As the city is a mecca to all visitors and researchers interested in space travel and cosmic exploration, this rocket fuel is a popular-selling product in Spartemis City.

Living on the Moon (Resource #2)

Example 2



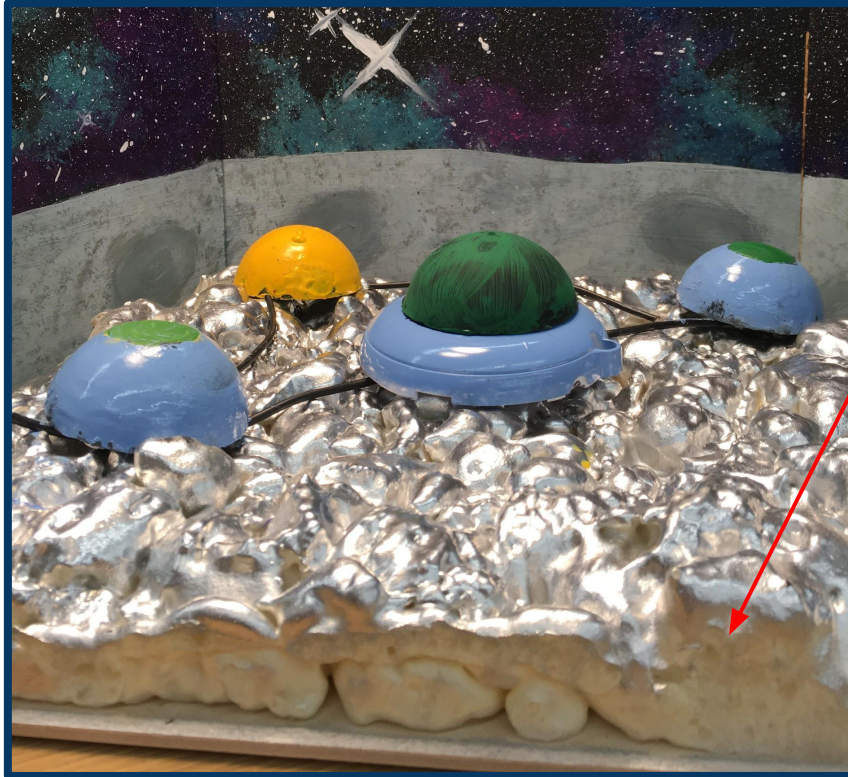
What is important for the judges to know about this element of your model?:

The solar oven extracts regolith mineral hydrate by vaporizing the hydrate water and turns it into a water vapor. The mist is transferred to a water tank, and distributed evenly throughout the aerobic farms. Because of the lack of water on the moon, we conserve lots of our water supply by only using water vapor to water our plants. Some of this mist is condensed into liquid form and distributed to Spartemis City's water supply, while the rest is condensed to create rocket fuel.

Section II

BUILD IT: QUALITY, SCALE, AND MATERIALS

Innovative Material & Use Example 1



Choose one recycled or reused item and describe how you used it creatively in your model:

Leftover cans of spray foam insulation were used to create a moon-like regolith surface for portions of the city. As the spray foam expanded it created the rocky, uneven texture that the moon has. Then, the foam was painted with silver spray paint to mimic the grey tone of the lunar regolith.

The yellow dome represents the industrial Hub.

The blue and green domes represent the Residential and Commercial Mixed-Use Hubs.

Innovative Material & Use Example 2



Choose another recycled or reused item and describe how you used it creatively in your model:

In this part of our model, we used the camera to a baby monitor and attached it with a dowel rod to an old opti-bot toy (optical sensing robot that can detect black/white and follow a black line) which is underneath the cardboard. The top part of the device (baby monitor) resembles our inverse gondola transportation system.

Innovative Material & Use Example 3



Choose another recycled or reused item and describe how you used it creatively in your model:

We took the fan out of an inflatable chub suit costume and used it to model the suction of our ROSE (**R**egolith **O**btaining **S**orting **E**quipment) vacuum. To get the fan to spin the opposite way, we had to rewire it. We tried computer cooling fans and DVD player cooling fans and did not have success finding the correct bevel to the blade. The chub suit fan had great suction, but we needed to reverse the fan spin to get the draw from the bigger side.

Example of Scale



2 cm = 1 foot

Structure 1

An indoor flower area, similar to a smaller botanical garden.

The flower garden is 12 cm tall on the model.

The flower garden would be 6 feet tall in real life.

Structure 2

2 wire bikes can be seen on the sintered regolith path. They represent our ELLA bikes (Electric Lithium-Air)

The bikes are 8 cm long and 6 cm tall on our model.

The bikes would be 4 feet long and 3 feet tall in real life.

Moving Part

We made two moving parts that are shown in the video.

- 1) Inverse Gondola mass transportation. This part was made using an old optical robot toy and a baby monitor. There were a lot of revisions to get the bot to follow a track and get the gondola to balance.
- 2) ROSE (**R**egolith **O**btaining and **S**orting **E**quipment). This moving part was made using a chub suit blower fan that we rewired to reverse the fan direction mounted on a steamer basket. There were a lot of revisions to make fan blades with the correct bevel, get the optimal length and gauge of tube, create a coupler to be able to remove the regolith once obtained. The vacuum action did show up as well in the video as in person.

URL link to team's moving part video:

Google Drive Link to video:

https://drive.google.com/file/d/1z5_JBzrNF8YTJtB28XJ1utYzonDg_K29/view?usp=sharing

YouTube link to video:

https://youtu.be/J5azZJR_ShA

Section III

JUDGE ASSESSMENT OF MODEL

Futuristic Technology Example 1



What is important for the judges to know about this example of technology?:

This futuristic machine is called **ROSE (Regolith Obtaining Sorting Equipment)**. These AI robots use generative design and learn more about their goal the more they are used. These robotic self-driving machines ride along the surface of the moon, collecting regolith with a suction tube. They then sort the regolith through various filters to extract metals and chemicals that we need all throughout Spartemis.

Futuristic Technology Example 2



What is important for the judges to know about this example of technology?:

This is an algae photobioreactor. It converts carbon dioxide into oxygen using algae's process of photosynthesis. It then pumps the oxygen into the hubs through oxygen tanks, so that the humans can breathe. The hub domes also contain a healthy ratio of nitrogen and oxygen to simulate Earth's atmosphere. The bioreactors also have their own closed circuit so they also generate electricity.

The red dot (●) represents the oxygen tank, and the red triangle (▲) represents the hub/dome.