# Concept of Operations for the Establishment of Solar Drapes at the Lunar South Pole

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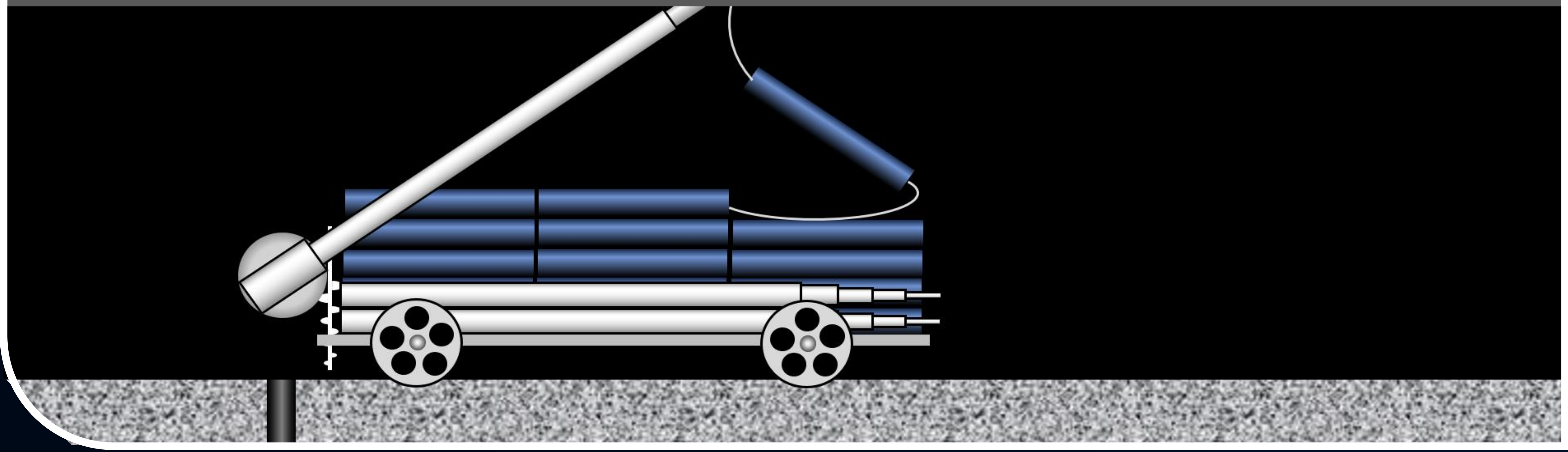
## Introduction

It is well recognized that the lunar south pole would be a good location for the establishment of an initial permanent base due to the presence of permanently shadowed regions near locations with nearly continuous solar illumination. If a permanent base is established and grows into a large international base, high energy activities will require the maximum exploitation of the solar power available at these high sunlight locations. These high energy processes could include: the electrolysis of lunar polar ice for propellant, the growth of food, the production of surface structures, and the extraction of metals from the lunar regolith. The concept of solar drapes is here proposed along with a method for how they could be erected.

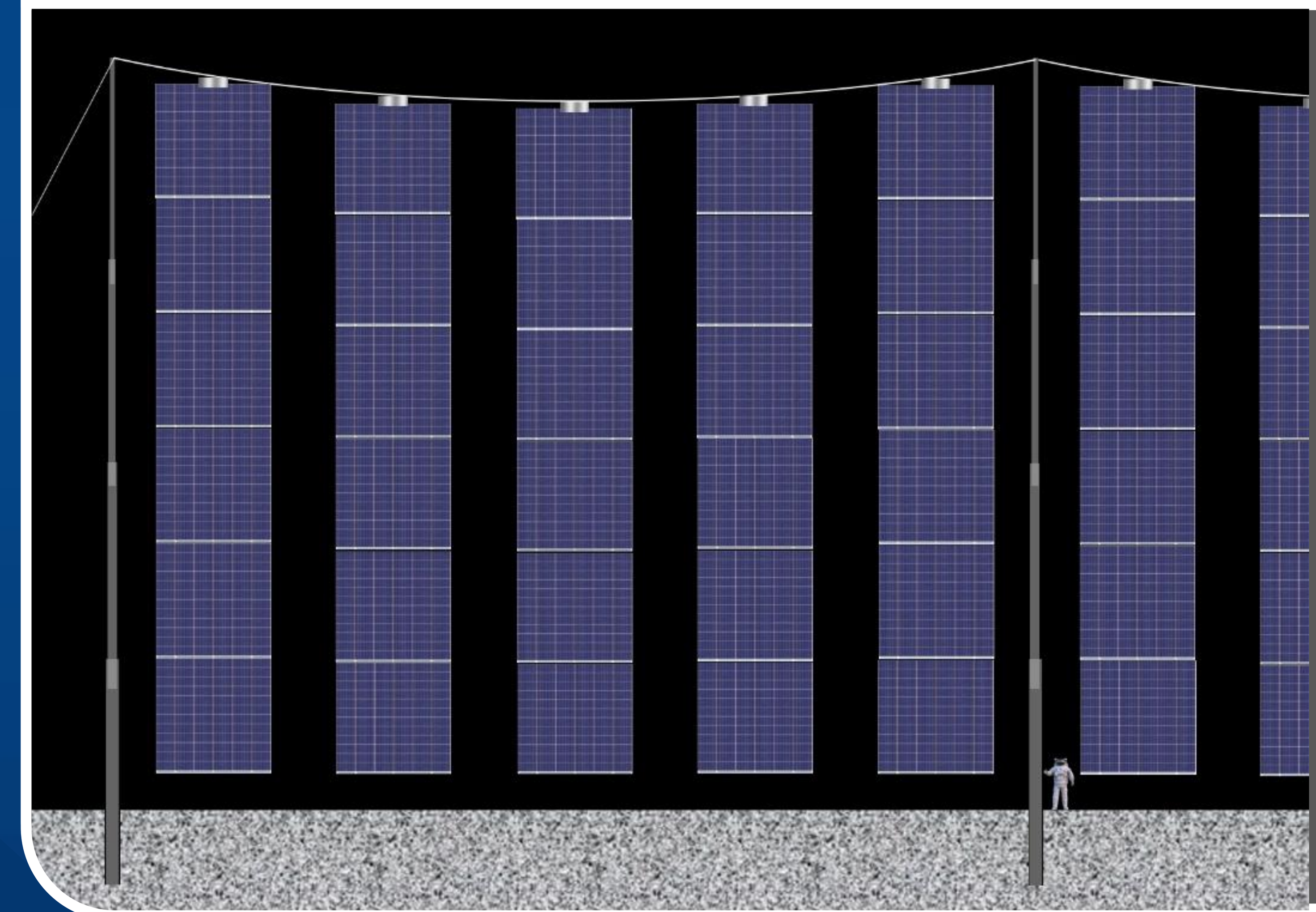
## Delivery & Set-out


A large payload is delivered to the lunar surface via a reusable lander. A motorized wagon with the solar drapes packed within drives out of the lander to the deployment site. An auger located at the back of the wagon drills vertical holes to a depth of approximately 20% of the height of the drapes. Automated mechanisms tilt up the first telescoping pole and places it into the hole. The holes will need to be dug as vertical as possible.

Between the tips of each telescoping pole is a suspension line onto which approximately five solar drapes are attached in series. As the wagon moves forward, the solar drapes are pulled out of the wagon and onto the ground at regular intervals. The wagon then drills the second hole, tilts up and drops the second pole and moves forward, and so on until the entire solar drape payload is set out.



## Erection



The erection of the solar drapes would be as simple as activating the telescoping poles at the same time. The suspension lines between them would begin to pull up and hence deploy all solar drapes at the same time so that a long wall of solar drapes arises simultaneously. Each drape would track the sun by means of a motor between the top of each drape and the suspension line.

## Power Uses

Assume 100 metric ton Starship payload with 50 tons for solar drapes including support and electrical management, 30 tons reserved for surface deployment, and 20 tons of margin during design. We estimate a specific power of 150 W/kg. The total power delivered would thus come to 7.4 MW. Starting at the best lunar south polar peak of persistent light with an average of 86% illumination through the solar year and 20% loss due to self-shading brings the power to 5.1 MW. This amount of power would be able to provide any one of the following capabilities:

The total energy to electrolyze water comes to 17.8 MJ/kg at 90% efficiency, meaning we can electrolyze 37.6 metric tons of water to hydrogen and oxygen per day. If certain metals were to be extracted directly from lunar rocks or regolith then iron can be produced in a molten oxide cell for 15.25 MJ/kg plus heat yielding 28.8 tonnes per day, or aluminum can be produced in a molten salt cell for 55.33 MJ/kg plus heat yielding 7.9 tonnes per day.

Each person consumes about 4.42 kg of food each day. It has been estimated that it takes 22 kW of lighting to produce that amount of food. So, we calculate that the full payload of solar drapes would provide enough lighting to produce food for about 230 residents.

REFERENCES & CALCUALTIONS : DevelopSpace.info/drapecalculations