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

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. 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 thereby laying out the second section of drapes, and so on until the entire solar drape payload is set out.

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.

Calculations are presented detailing the amount of power that a single 100 metric ton payload could provide given assumptions of pole heights, supporting structures, specific power, average solar intensity, and self-shading. This is extrapolated to estimate how quickly propellant could be produced, quantity of regolith processed into metals, and number of crew able to be fed.