Course Project - Scientific Method Research Paper

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In this research paper, I am exploring an Article on pyhsics.org titled “Solar Power Stations in Space That Could Be the Answer to Solar Energy Needs”. The project is based on the idea that giant solar power stations floating in space will beam down enormous amounts of energy to Earth. Hence, helping supply, solve energy problems, and global warming issues.

This idea was first developed by a Russian scientist, Konstantin Tsiolkovsky, in the 1920s. Today researchers and scientists are working on building and funding projects to make this happen. The European Space Agency is now looking to fund projects to develop industrial resources that will allow a space base station that will transmit energy back to earth *(Amanda Jane Hughes, 2020).*

In retrospect, other Renewable Energy Technologies have limitations such as solar and wind. when the sun is not around for 12 hours there is no power to distribute and the wind is not available wind turbines cannot create or distribute energy either. According to the article, the benefits of having a space-based solar power station that could face the Sun for 24 hours at a time would solve our energy crisis. This project is still basically theoretical, but it is being considered and developed using combinations of new technologies, advancements, and methods.

**Question:**

Can we generate energy from space and transmit energy back to earth?

**Hypothesis:**

A hypothesis is an educated guess about how things work. It is an attempt to answer your question with an explanation that can be tested. The idea that could lead to generating energy from space and transmitting it back to Earth is space-based solar power stations.

**Challenges:**

* They will need a solar station made of lightweight material
* They will have design a way to launch the station into space and maintain it
* They will need a way to transmit energy from space back to earth and distribute it wirelessly.
* The expense of the overall project and lightweight materials will be a major. So, funding could cause challenges.
* A single solar power station may have to be as much as 10 kilometers squared in the area—equivalent to 1,400 football pitches *(Amanda Jane Hughes, 2020).*

**Test Experiments:**

Even though this is all theoretical some experiments and technologies have been worked on or developed that will contribute to the hypothesis of building space based solar power stations. Ultimately testing this, we could be more energy sustainable through these types of efforts.

One proposed solution is to develop a swarm of thousands of smaller satellites that will come together and configure to form a single, large solar generator. In 2017, researchers at the California Institute of Technology outlined designs for a modular power station, consisting of thousands of ultralight solar cell tiles*.* They also demonstrated a prototype tile weighing just 280 grams per square meter, similar to the weight of the card *(Caltech , n.d)*.

Recently, developments in 3-D printing with different alloys and high-grade materials have become more abundant. At the University of Liverpool, they are researching new techniques for printing ultralight solar cells on to solar sails. A solar sail is a foldable, lightweight, and highly reflective membrane capable of harnessing the effect of the Sun's radiation pressure to propel a spacecraft forward without fuel *(General, 2020) (ESA, 2020).*

Another major challenge will be getting the power transmitted back to Earth. The plan is to convert electricity from the [solar cells](https://techxplore.com/tags/solar+cells/) into energy waves and use electromagnetic fields to transfer them down to an antenna on the Earth's surface. The antenna would then convert the waves back into electricity. Researchers led by the Japan Aerospace Exploration Agency have already developed designs and demonstrated an orbiter system *(KAYA1, n.d)*.

These methods should enable them to construct power stations in space and possibly maintaining it from the International Space Station or the future Lunar Gateway *(NASA, 2020).*

**Results:**

There is still a lot of work to be done in this field, but the article reports that solar power stations in space will become a reality in the coming decades. They also report that researchers in China have designed a system called Omega, which they aim to have operational by 2050. They report this system should be capable of supplying 2GW of power into Earth's grid at peak performance. To produce that much power with solar panels on Earth, you would need more than six million of them *(Zhang, 2016).*

# References

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