

DEVELOPING AN INTEGRATING MODEL TO ASSESS: THE ENERGY GENERATION DISSIPATION AND UTILISATION IN OUR SOLAR SYSTEM

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Throughout history, as the human race has developed, it has been using more and more energy. For the 200,000 humans have been around on the Earth people have we have come from using close to no energy to depending on it for our existence. In today's world where energy is needed to replace doing basic tasks like walking. As human civilization progresses more and more, the energy needs would grow exponentially. As new technology and the ease of living increases, more energy would be needed by humans to satisfy the demands.

The usage of the conventional means of energy development would not be enough to meet the demands. A better source of energy would be needed for the production of clean energy so that the harm to the environment is minimal. Methods implemented today can be used to generate clean energy, but it would not be enough when humans decide to expand to other planets or conduct experiments to discover the hidden part of the universe.

A source of energy would be needed that can produce enormous amounts of energy with very little damage to the environment, the source of energy should be reliable, the energy production should be more than the consumption at the time it is used and the source should be reliable for all purposes. The energy source should not shut down or stop providing energy as this could stop processes important for humans.

TYPES OF SOURCES OF ENERGY

Sources of energy in the contemporary world mainly include coal natural gas and petroleum, these accounts for more than 80% of the total energy generated.

Renewable sources can be used to support a household but they are not reliable enough to have the needs of the whole planet depend on them. Though the energy sources can be combined to make a more efficient source and more reliable one, this could include merging light energy and wind energy, harnessing both when available and there is a low chance of both of them failing. By having to prepare sources that could interlink we would increase the efficiency of the generator and when one system like light fails to provide energy, the other would be providing the deficient energy.

GENERATION OF ENERGY

To generate energy from any source, most of them would need to rotate a turbine which would convert the rotational energy into electricity. Generation could also be done using heat, solar energy, and geothermal energy. The sun produces energy by nuclear fusion and it generates enormous amounts of energy. Geothermal energy production uses the heat of the Earth to produce steam which goes to rotate the turbine and generate electricity. Hydroelectric generation and wind energy generation have the same process, they would convert the kinetic energy of the stream or wind into rotational energy and then electric energy. These sources do not generate enough energy to support the usage of humans. Energy sources like solar and wind cannot be the main leading source of energy and sources like hydro energy and geothermal energy are reliable sources by which they do not produce large amounts of energy. A new energy source must be used which is reliable, efficient and should be able to provide energy thought the year and should not fail.

The Perfect source of energy would be able to provide energy for the usage in high energy requirement areas like exceeding the amount of energy needed for humans and the source should not affect the human negatively more than its positive effects. The sources may or may not be present on Earth, to create the perfect source we would have to leave Earth and go beyond. The availability of the source is the most important factor, would humans be able to mine the energy in an efficient way, or the energy needed to mine it exceeds the energy produce by the source. For creating an efficient source, we would have to explore outside of the Earth, this would ensure that the source doesn't harm our environment and can generate enormous amounts of energy.

ENERGY SOURCES IN SOLAR SYSTEM

Mercury

This is the closes planet to the sun appears 3 times as large as seen from Earth, the sunlight reaching the planet is seven times the amount experienced on Earth. Setting up the solar energy generation system would be beneficial as the energy generated would be many times greater than the same solar panel greeting on Earth. The temperature on Mercury does not exceed 500°C and this would not be a problem on the planet rather implementing and taking the solar panels on the planet would be a bigger challenge. Mercury is tidally locked with the sun in a 3:2 resonance, this means that for every 1 rotation around the sun mercury makes, it rotates one and a half times on its axis, this would enable the planet to aid in generating more energy and gaining more per rotation of the planet. Mercury has close to no atmosphere, hence it would not have any winds, clouds, or storms; this would be the ideal planet in the solar system to implement the solar-generated energy.

Venus

Venus has a very dense atmosphere, containing carbon dioxide and having clouds of sulphuric acid, solar energy is minimum on the planet. Venus has extreme weather, it experiences wind speeds up 85 m/s or 300 km/h in the upper atmosphere, by going lower in the atmosphere, the wind speeds reduce

up to 2 m/s or 6 km/h, by implementing a wind energy source similar to the Earth, having blades built of carbon fiber and built so that it can handle the immense pressures of Venus's atmosphere. By having the dimensions of the windmill used on Earth, the energy generated is the same or even more than the amount generated by a single windmill on Earth on a windy day. One benefit of the winds in Venus is that unlike Earth winds on Venus are continuously blowing, hence this energy source is reliable and can provide enough energy for the future generations.

Mars

The Planet closest to Earth, Mars is one of the only two planets in the goldilocks zone of the sun, it exists on the outer end of the zone, the temperatures on Mars due to the thin atmosphere and the distance from the sun, the average temperature is -62°C , the magnetosphere of Mars is depleted, high energy particles from the sun directly hit the surface of Mars without any interruption unlike Earth where they get blocked. Settlement on the planet would still be possible by building thick aluminium underground bunkers with rare explorations on the surface. Energy sources on Mars are limited, it contains a very thin atmosphere, no wind energy, only 44% of sunlight observed on Earth is on Mars, Mars has a solid unmoving mantle core, its volcanoes are not active. It might be the perfect place to expand the human space territory and for future space missions.

Jupiter and Saturn

The two biggest planets in the solar system, Jupiter and Saturn are gas giants, so implementing anything on the surface of these planets would be very inefficient as these would be gas giants, and traveling through them even using complex machinery would be next to impossible. Setting up any kind of energy generation available today on Earth would not be beneficial. A new source can be implemented on these gas giants, due to the enormous size of the planets, the gravitational force of planets can be used to generate electricity.

Electricity can be generated using the tidal forces acting upon the moons of the gas giants. The moons of these two planets can be used to build geothermal plants, which uses the internal thermal activity of the planets generated due to the gravitational forces of the Planets on their moons. Due to the gravity the moons are continuously squished and expanded, this would create heat on the planet and this could be harnessed to retrieve geothermal energy.

Energy using Asteroids

The solar system contains large amounts of asteroids that are in stable orbits around the sun. The minerals stored in the asteroids are very valuable to us, by mining them we could potentially get valuable materials that can be used to make tools and machinery that are in need.

To generate electricity from asteroids, we can get the energy produced by colliding them on another planet or with another asteroid in space that is not affected using gravity.

Colliding these asteroids would take enormous amounts of energy to collide them, but using different techniques the amount of initial energy required can be reduced. The energy production by this method could range between several hundred nuclear bombs.

To have this method efficiently produce large amounts of electricity, the experiment, and the collision would be needed to be done very carefully, if done on the planet, there should be close to none human presence on the whole planet and if the collision in the open space it should be properly contained as if the residual particles fly out at enormous speeds, it can give significant damage to any planet.

One of the significant problems with the asteroid energy generation is to build the infrastructure required by the machinery to work. The building or the place of the explosion should be built by a material that can withstand pressures capable to destroy planetary bodies, the heat, and energy released by the explosion could decimate the whole planet into smaller pieces. This can be solved by either building or discovering a material that can withstand these forces or the infrastructure could be made from multiple different layers having their function

The main problem after building the infrastructure of the experiment would be to use the energy to either deflect an asteroid to a planet or having two asteroids speed towards each other at 30km/s. To have the experiment conduct on the surface of a planet we can use thrusters to slightly nudge the trajectory of the asteroid and make it intersect the planet with a speed-dependent upon the size of the planet, 30 km/s for Earth, If the experiment needs to be conducted in space, it would require a larger amount of energy to use proper rocket thrusters and accelerate them. This would not become a bigger factor as the energy output of the machine would be millions or even billions of times larger than the amount initial amount of energy used.

Energy Using the Sun

The sun also known as the energy source of the solar system radiates 3.86×10^{26} watts of energy every second. The Earth receives about 1.74×10^{17} watts which have a difference of 9 orders in its magnitude. Plants on earth use only about 1% of the sun's energy for their survival. We can harness the solar energy of the sun to produce enormous amounts of electricity using solar panels.

One of the ways to build such a machine that can convert 100% of the solar energy into electrical is a Dyson sphere. The Dyson sphere is a structure that encloses the sun

completely, by using this structure, it would be able to absorb all the sunlight emitted by the sun in all directions at all times, the energy needs of the future generations could be fulfilled by the reserves of the last generations. It would be able to generate energy for further developments in science.

To build a Dyson sphere, we can enclose it with small solar panels, this would require a lot of solar panels and the material they would be built from. Although this structure would be very important for any civilization to make itself an interstellar civilization.

The complexity of the sphere is not the only thing that needs to be overcome, some asteroids fly very close to the sun, the closest asteroid has its perihelion at 0.04 AU, to avoid colliding with it, the Dyson sphere we would need either the sphere to be closer than this distance or have the asteroid moved to a stable orbit. To move the structure closer we, the material that would be needed cannot exist, the temperature here would be 1400K, at this temperature most of the metals would melt, even the Earth's crust would be melted.

We could implement to push the asteroid away but that would take very precise aim and having thrusters that can significantly change the orbit so that it goes around the Dyson sphere. Another way to go around this would be to not have a continuous structure rather have millions of smaller satellite orbiting the sun collecting its energy, in this even if a group is harmed it won't destroy the whole structure rather they can be replaced and the structure would work as if it were new.