

CONVERSION ADVANCES IN RENEWABLE ENERGY: FOCUSING ON UNUSUAL METHODS OF ENERGY



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Abstract:

Advances in unusual types of renewable energy are expanding the possibilities for different types of resources that can be used to power electronics, power plants, smartphones, and other technology. Resources such as solar and wind power are most common, but other more unusual types such as cocoa shells, dance floors that convert kinetic energy into electric, and algae lipid oils are going through advances that might make it possible to move away from fossil fuels and focus on resources that are renewable. Common sources of renewable energy such as solar power are being explored in more unique ways such as space-based solar panels. Waves and tidal energy are also experiencing advances through methods of hydro turbines.

Introduction:

Renewable energy sources have been available for some time, but these unusual types of renewable energy are groundbreaking from location to functionality to type.

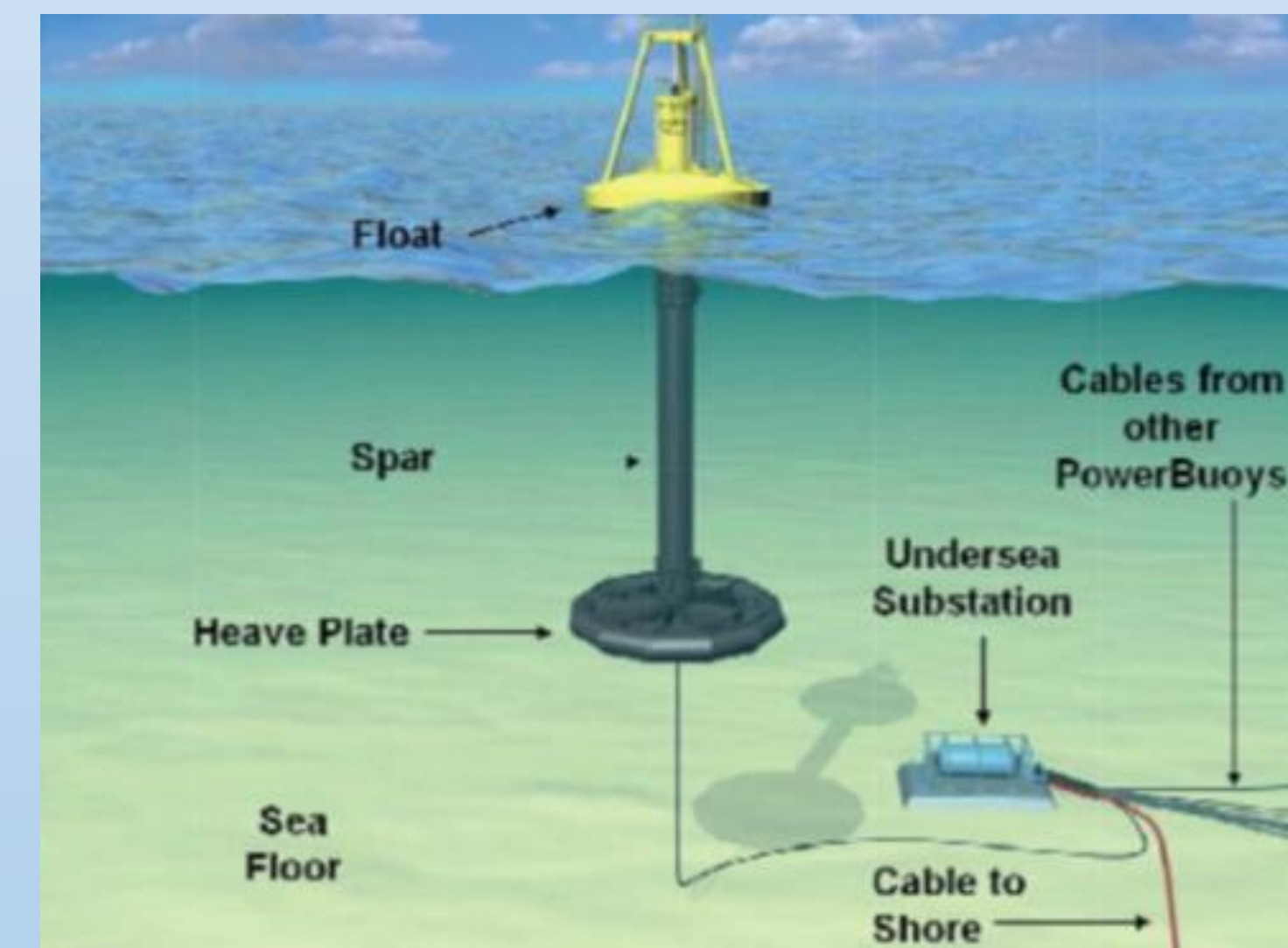
Some, like wave and tidal energy and chocolate biofuel, have functionality and use in the present time, but others, like space-based solar panels, are still in the idea form due to cost and practicality. Researching into different forms of energy and their unusual applications and functions led to the idea that there is a whole market taking common sources of renewable energy and finding applications that are unusual or uncommon and possibly making them more practical.

Objectives:

To give an overview of different unusual renewable energy sources ranging from biofuels to kinetic energy. To rank different unusual renewable energy sources based on functionality, application, cost effectiveness, and practicality.

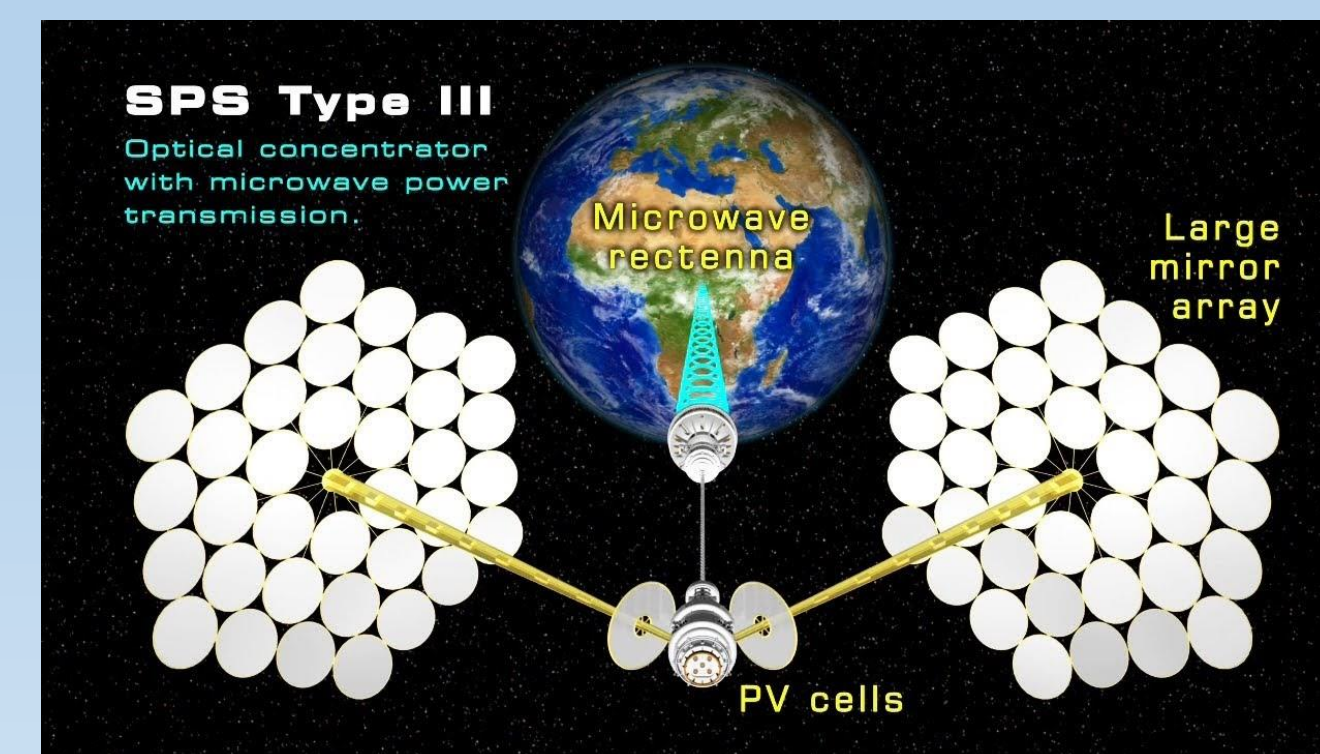
History of Unusual Energy Use:

Some form of solar power has been used since 3rd Century BC in Greek and Roman bathhouses, but solar panels with silicon photovoltaic cells were invented in 1954 and first used in space in 1958. Solar panels are not “unusual,” but using them in an unusual ways is a much more modern idea from the past few years that has not even fully formed yet. Hydropower has been used since 200 BC for water wheels, but the “modern” hydropower turbine was invented in the mid-1700’s in France. However, using hydropower in tidal dams or floating buoys with hydraulic pumps is much more recent as an increase in hydropower sustainability was beginning to be sought after in the early 2000’s. Piezoelectric energy harvesting was first discovered in 1880. Following World War 1, piezoelectric energy had applications with natural crystals, but did not have true commercial success until the Japanese efforts with materials surfaced in the late 1960’s from the 1980’s. Renewable energy sources have consistently been produced but have not always been at the lead. With the current global climate, renewable energy is being given full attention which is opening doors for many new, unusual energy sources, often sprouting from previous ideas.



Wave and Tidal Energy:

There are several different versions of converting wave and tidal energy into usable energy that are currently being tested or conceived. One, using floats and buoys, electricity can be generated through the rise and fall of ocean waves to drive hydraulic pumps. Two, hydropower turbines located either on or offshore use different channels to convert wave energy. Three, tidal dams using hydro turbines can convert tidal energy into kinetic energy. The main issue that has come us is the interference of marine life.

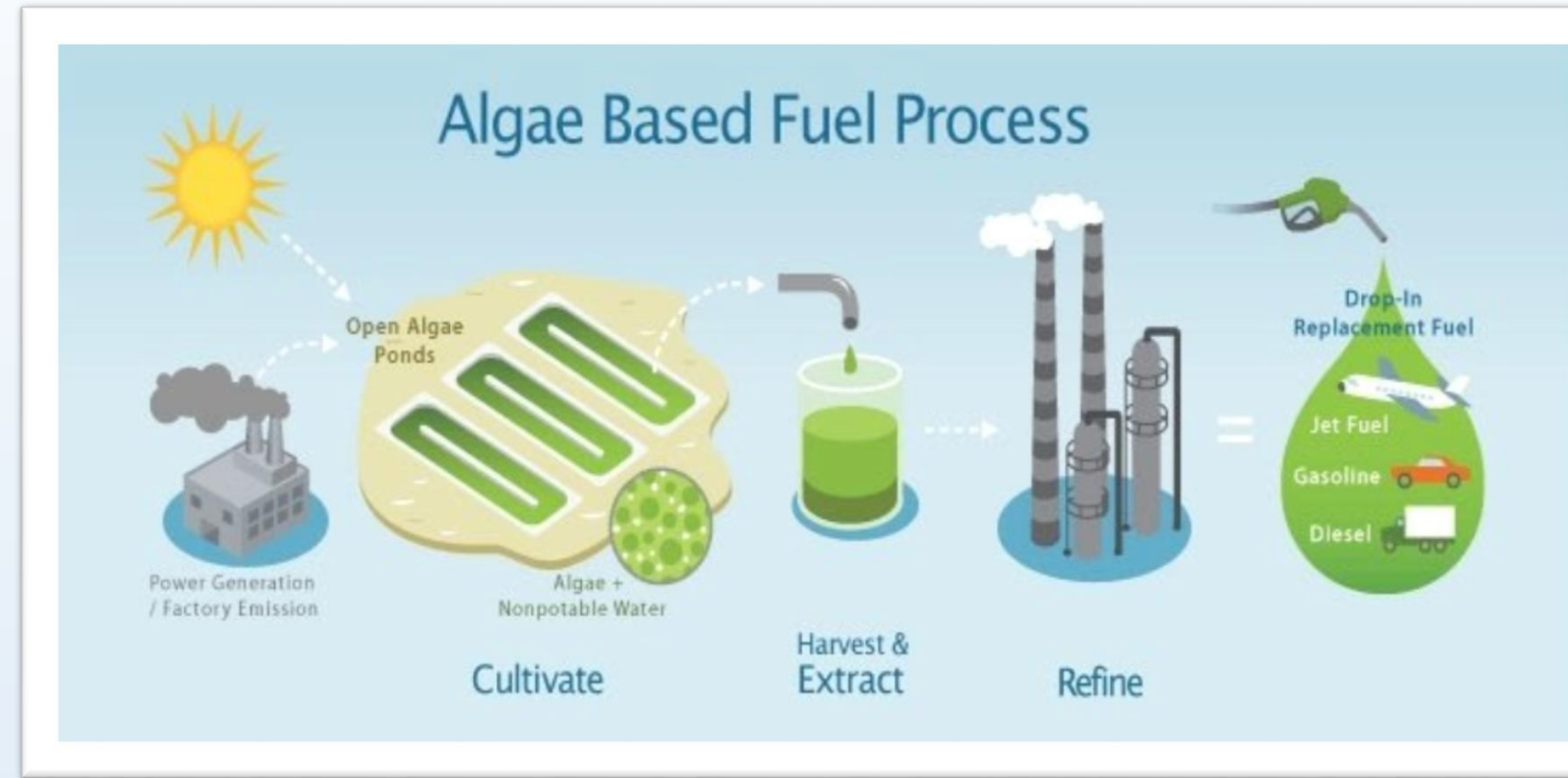


Space-based Solar Power:

Solar panels are not unusual, but a zero carbon emissions, solar panel satellite orbiting the Earth is a little more unusual. It takes up no space on Earth but harvests the sun's energy. This method is flawed due to cost and getting converted energy back to Earth.

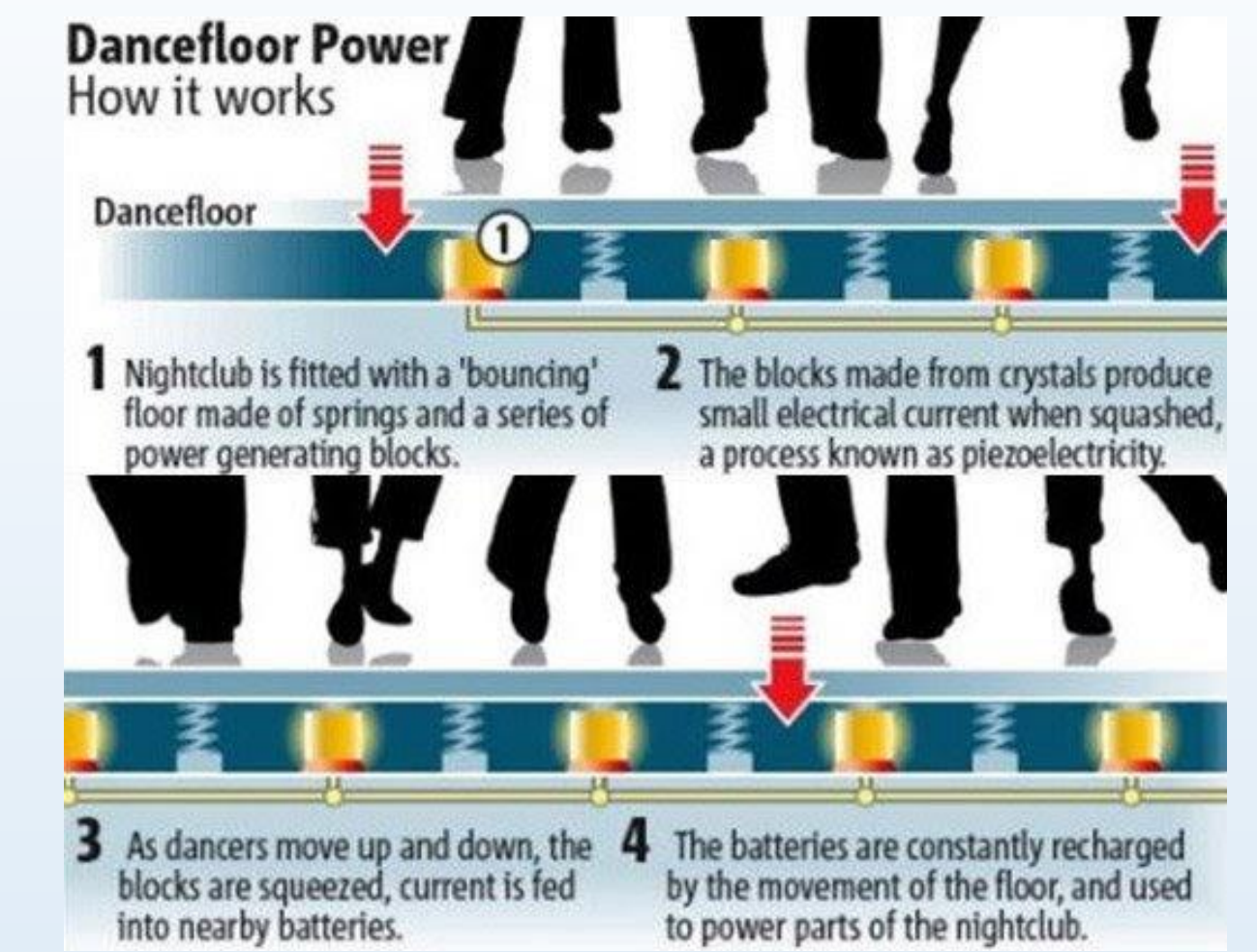
Algae Energy:

Lipid oil in algae can be converted into a biodiesel which is more sustainable than petroleum. The process is relatively simple for a fuel. The problem is the amount of space required to grow enough algae and achieving the optimum conditions to grow enough algae in order to produce enough lipid oils.



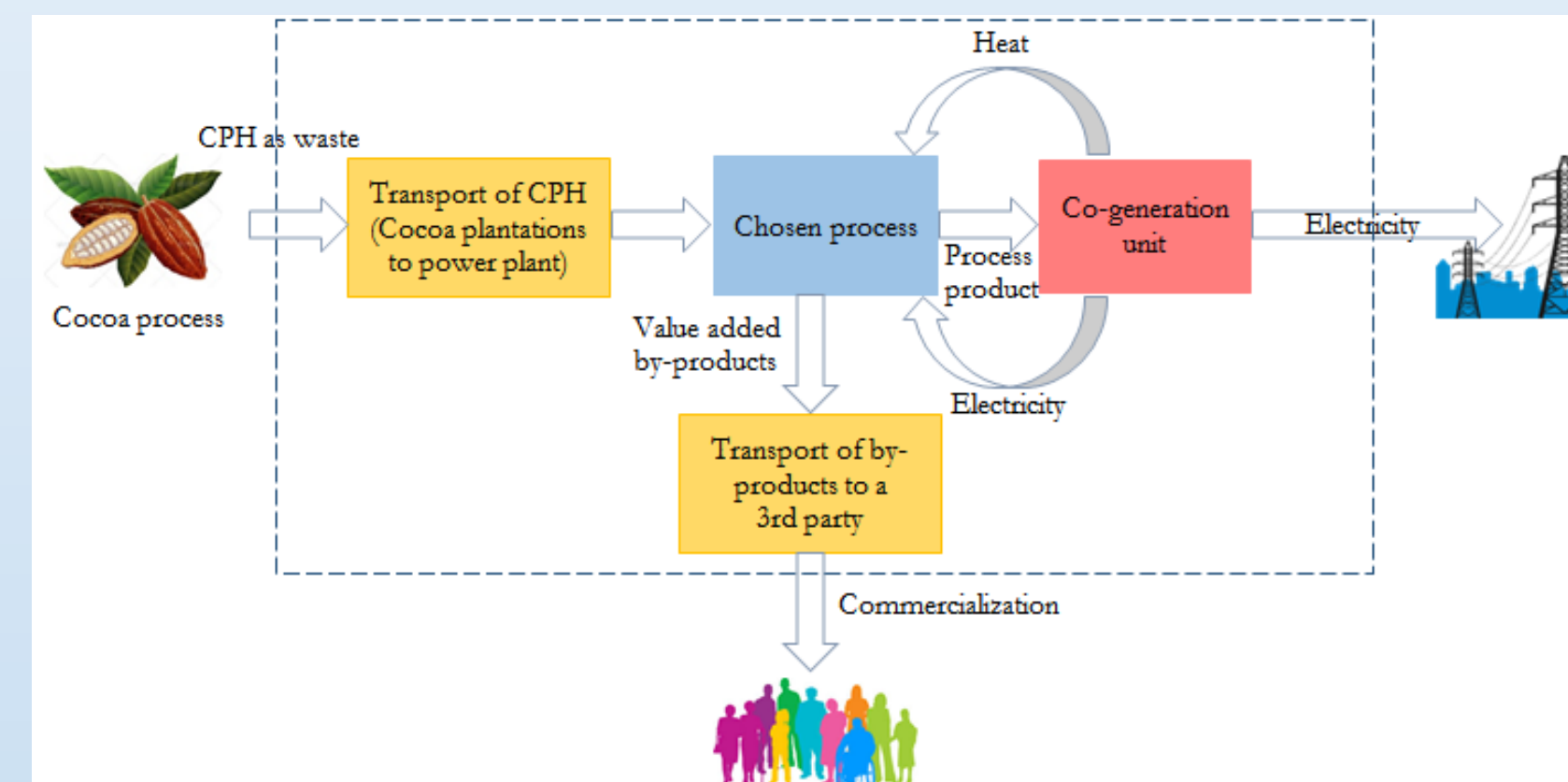
Dance Floor Kinetic Energy:

Dance floor in Japan is using kinetic energy from club goers to power the LED lights in the floor. While this is a fun use of unusual energy, it has possible practical uses for trains and bus stations, or even sidewalks in a large city.



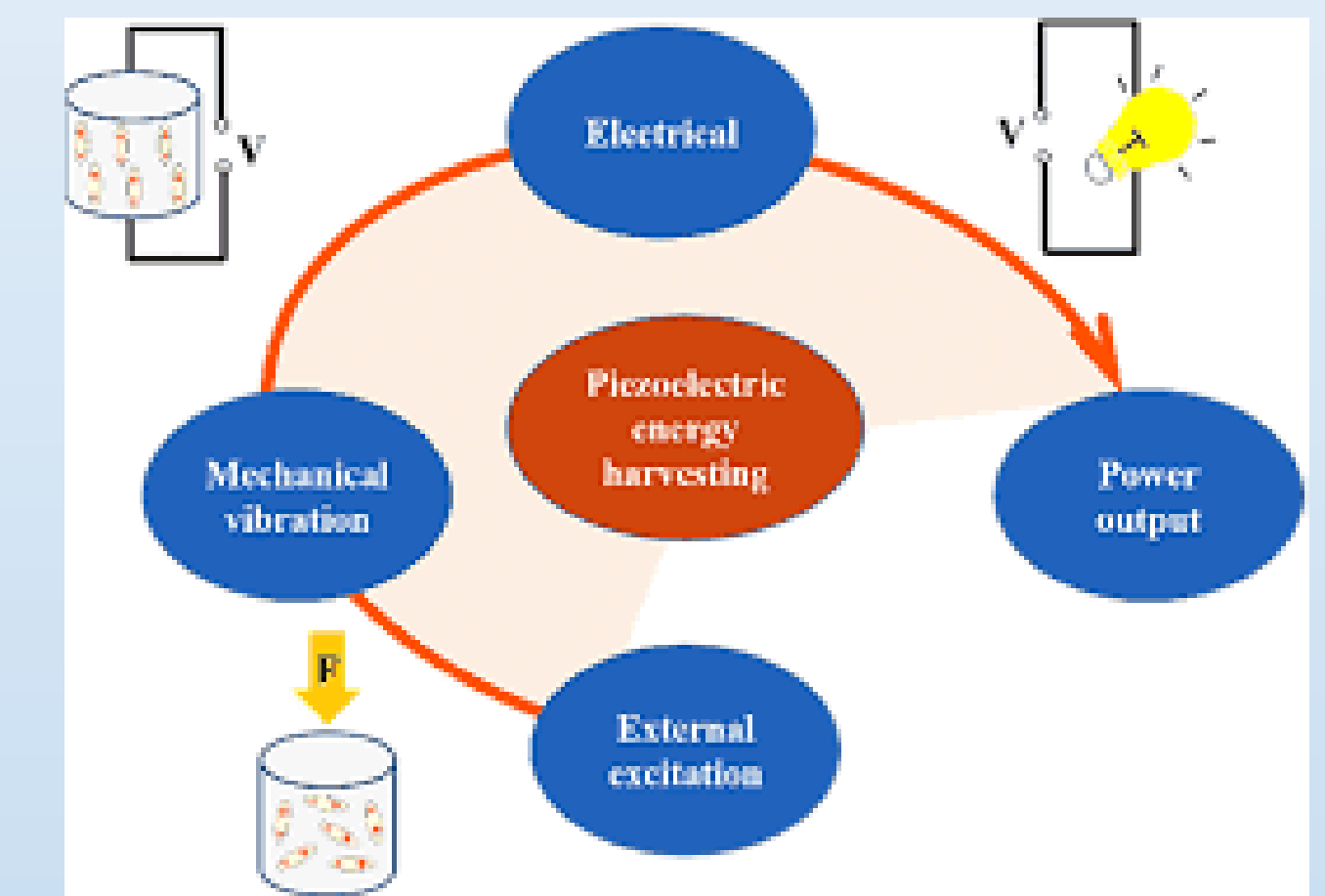
Chocolate Biofuel Energy:

Fat from chocolate and shells of cocoa beans can be converted into biofuel. A chocolate factory in New Hampshire has used waste cocoa beans from production as an additional fuel source to run the factory by using E. Coli bacteria which can be converted to formic acid and then into hydrogen, which is a very easy, sustainable resource to use.



Sound Wave Energy:

Sound can be converted into Piezoelectricity. When put through mechanical stress, piezoelectric materials generate energy. This could be applicable in self-charging mobile phones.



Ranking:

Considering cost effectiveness, functionality, current application, and overall practicality this is an opinionated ranking of the unusual renewable energy sources researched:

1. Chocolate Biofuel Energy- cost effective, relatively easy and productive application
2. Dance Floor Kinetic Energy- self-sustaining application, great possibility of future application, cost effective after initial installment, not including maintenance
3. Algae Energy- sustainable, simple conversion process, but not as cost effective due to space required
4. Piezoelectric Energy: great possible application, but not currently cost effective or fully possible in broad application
5. Wave and Tidal Energy- Could be highly beneficial, but not cost effective or safe to marine life currently
6. Space-based Solar Panels- In theory, this is safe, clean, and beneficial, but not currently cost effective or possible with existing technology

Conclusion:

While some of these unusual renewable energy options may be some time away from being reality, it shows promise for a future that steps away from fossil fuels and unrennewable resources. Biofuel, tidal energy, and lipid oils are just some of the possibilities for ways scientists are looking for better options. These unusual energy sources can fuel homes, public transports, mobile phones, factories, and more.

References:

- Breunig, Tom. "Dance Power: Harvesting Movement Energy." *Cleantechconcepts.com*, 23 Sept. 2017, www.cleantechconcepts.com/2017/09/dancing-to-the-energy-beat/.
- "Chocolate Could Be a New Source of Renewable Energy." *Renewable Energy World*, 9 Sept. 2019, www.renewableenergyworld.com/2006/08/01/chocolate-could-be-a-new-source-of-renewable-energy-45597/#gref.
- "Energy 101: Algae-to-Fuel." *Energy.gov*, www.energy.gov/eere/videos/energy-101-algae-fuel.
- "History of Piezoelectricity." *PIEZO.COM*, piezo.com/pages/history-of-piezoelectricity.
- "Space-Based Solar Power." *Energy.gov*, www.energy.gov/articles/space-based-solar-power.
- "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *Tidal Power - U.S. Energy Information Administration (EIA)*, www.eia.gov/energyexplained/hydropower/tidal-power.php.