

Trapping & Harvesting Lightning Energy

Anindya Anupam

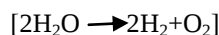
Department of Mechanical Engineering, Amity University (U.P)

Abstract— Energy is available in the universe in different forms. For any work to be done, energy is required. The need and scarcity of energy made the mankind for the search of different forms of energy. For centuries many scientists are in search of energy and have found many forms of renewable and non-renewable source of energy which are being used till date but the problem arises here that the sources which are non renewable (e.g: fossil fuels) are getting over day by day and it cannot be replenished. At this rate if this usage continues then by 2075 it will completely get over. Fossil fuels are given a very huge importance as mankind is completely dependent on this source of energy as 99% of transportation and automation uses fossil fuels. Due to this completion of energy mankind has started search of another source of energy that is sufficient and that can replace fossil fuels. After lots of research and analysis it has been noticed that lightening is a very huge source of energy.

Keywords— *Lightning Energy, Trapping and Harvesting lightning Energy, Source of Energy.*

I. INTRODUCTION

In 1752, Electricity was discovered by Benjamin Franklin during his “Kite Experiment”. Then from late 19th century many research have been done to trap and harvest the energy from lightning. Lightning contains static electricity. The characteristic of this electricity is that it strikes to a point or a small area and just for some milliseconds lightning produces 100,000,000 volts in a single strike which is a very huge amount which has the capacity of running the any country for 2-3 days. As we know H₂O has a very strong bonding and for breaking this bond a huge amount of energy is required and lightning has sufficient energy for the hydrolysis of water and hydrogen is itself a tremendous energy source. Hydrolysis means (“HYDRO= WATER”, “LYSIS= BREAKING”). As its known, from chemical bonding of Hydrolysis of water a large amount of energy is required as hydrogen bonding with oxygen is very strong, from the below reaction, we can analyse that:



So Energy or electricity can be used for Hydrolysis of water where hydrogen and oxygen separates. Hydrogen can be used for diff. purposes.

The main problem is of trapping the lightning energy and previously many methods have been done to trap this energy but were not successful. So, we will know the formation, characteristic of lightning and way to trap and harvest the lightning energy.

II. THEORY

Lightning:

Lightning is the discharge of electrical charges in lower clouds and it is unpredictable. Before trapping and harvesting lightning energy, first we should know how is lightning generated? Basically lightning occurs due to collision. And there are three types of collision occur i.e- IC, CC, CG. On going to the explanation part IC- intra cloud collision, CC- cloud to cloud collision, CG- cloud to ground collision. Out of these three types of collision IC and CC commonly occurs. Most important of these things is that the cloud must be warm and in condensed form, which are generally found in lower heights nearly 4-5 km above the sea level as with increase in altitude the Water droplets in clouds gets converted into ice. As per the investigation done by NASA and geographical researchers there occurs about 50-100 lightning strikes worldwide every second. Lightning are occurred during to the electrons in the clouds and the charged particles. So at that time cloud acts as negative and earth acts as positive. This is basic electrical nature that for the flow of electricity circuit must be completed and opposite terminals must be there. Then the lightning strike is produced. Single strike of lightning creates a very high

temperature in the atmosphere (~50000-60000 degrees). The repeated lightning strikes increase the resultant temperature of the atmosphere (~100000 degrees) then a very huge lightning strike occurs which produces more than 10 million volts.

III. EFFECTS OF LIGHTNING

Mankind has taken lightning under natural calamities as it is very disastrous because it can kill many people and destroy an area on a single strike. Everything in this universe has advantages and disadvantages. Many ways have been found for the protection from lightning. So on neglecting the disadvantages, advantages are much more. As this source has the capacity to fulfill the scarcity of energy and itself a huge amount of energy as when 'n' number generator produces electrical energy that amount of volts is produced by lightning in a single strike.

IV. WAYS OF TRAPPING LIGHTNING ENERGY

On looking to the way of trapping and harvesting lightning energy we need a device that can withstand such high voltage which is near to impossible as this high voltage will destroy the capacitor. First these high voltage current needs to convert to low voltage current. This can be done through using numbers of step down transformers. Basically step down transformers convert high voltage current to low voltage. Then after lowering the current voltage we can use capacitor for storing it.

From years people have been using the earthing process to protect their houses and buildings. Lightning current passes to the ground as this earthing process consists of earthing rod which is made of very good conducting material such as copper which is widely used in electrical industries that provides a low resistance path to flow through. As current always follows the low resistance path to flow.

V. PROBLEMS FACED BEFORE IN TRAPPING OF LIGHTNING ENERGY

Many scientists have been trying to trap the lightning energy but they could not as they faced many problems. First and foremost problem faced generally is that lightning is sporadic and due to its static current type it just strikes to a single point and for some milliseconds which is just impossible to predict the time of occurrence of lightning as well as the place where it will occur. Secondly, current produced from lightning is of very high voltage which can just destroy on trapping it as it produces 10 million volts.

VI. MY PROPOSAL FOR THE WAY AND DEVICE FOR TRAPPING LIGHTNING ENERGY

Instead of letting the lightning energy to pass to the ground we can trap it by earthing process. On going to explanation of earthing process.

6.1 what is earthing process?

It is the process in which it consists of an earthing rod or a bar having a very small surface area made of very good conductor of electricity (copper) which in result provides a low resistance path for the lightning to pass to ground. As the current is passed to the earth so this process is named after that "Earthing Process".

6.2 *Author's Way of Trapping the Lightning Energy

6.2.1 1^Earthing Rod & Its Working

By using earthing rod of 1-2 inch of surface area, surface area should be less as from the principle of electrostatics more positive charges gather at the tips and attract the negative charge in the clouds and must be made up of copper as it is a very good conductor of electricity as it is stated before, followed by n number of step down transformers which will decrease the high voltage current to low voltage current then it will be connected to any stored water or reservoir where water will be hydrolysed, hydrogen and oxygen is separated then after can be separately stored and at the end capacitor will be installed where electricity will be stored and can be used in many ways as well as the hydrogen. Hydrogen is very useful and a very powerful source of energy in itself but due to its scarcity as individual hydrogen is not found in atmosphere so it cannot be used but by this process it solves this problem too.

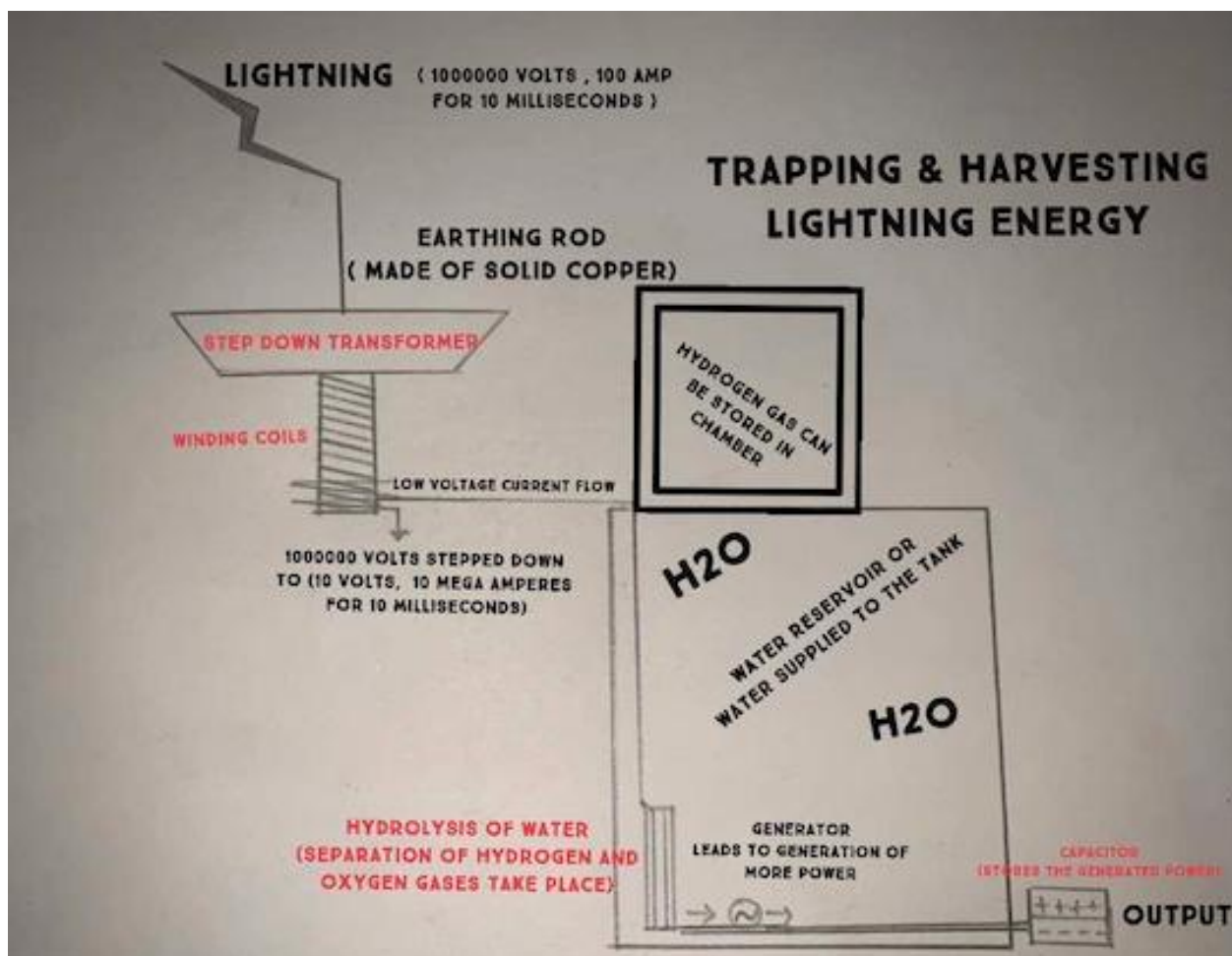


FIGURE 1: Trapping & Harvesting Lightning Energy

6.2.2 2^{nd} Uv Laser Beams in Earthing Rod

By using uv laser in the earthing rod,

Uv laser beams have high wavelengths when on projecting the laser beam to sky/clouds there it will cause ionisation in gas molecules will occur which is necessary otherwise laser doesn't have that criteria of conducting charges, after the ionisation takes place it will create a path way for the negative charges to attract towards the positive charges present on the tip of earthing rod but the power density of the beam must be kept high during the time of operation to ionise the gases. After theses process then general harvesting process of electricity is to be done and stored and used in different purposes later on.

1.	ENERGY - 1.8 JOULES
2.	POWER OF LASER BEAM - 180 MW
3.	TIME- 10 NS
4.	RADIUS OF LASER BEAM- 100 (MU. M)
5.	INTENSITY - 10^{11} W/CM SQ. TO 10^{12} W/CM SQ.

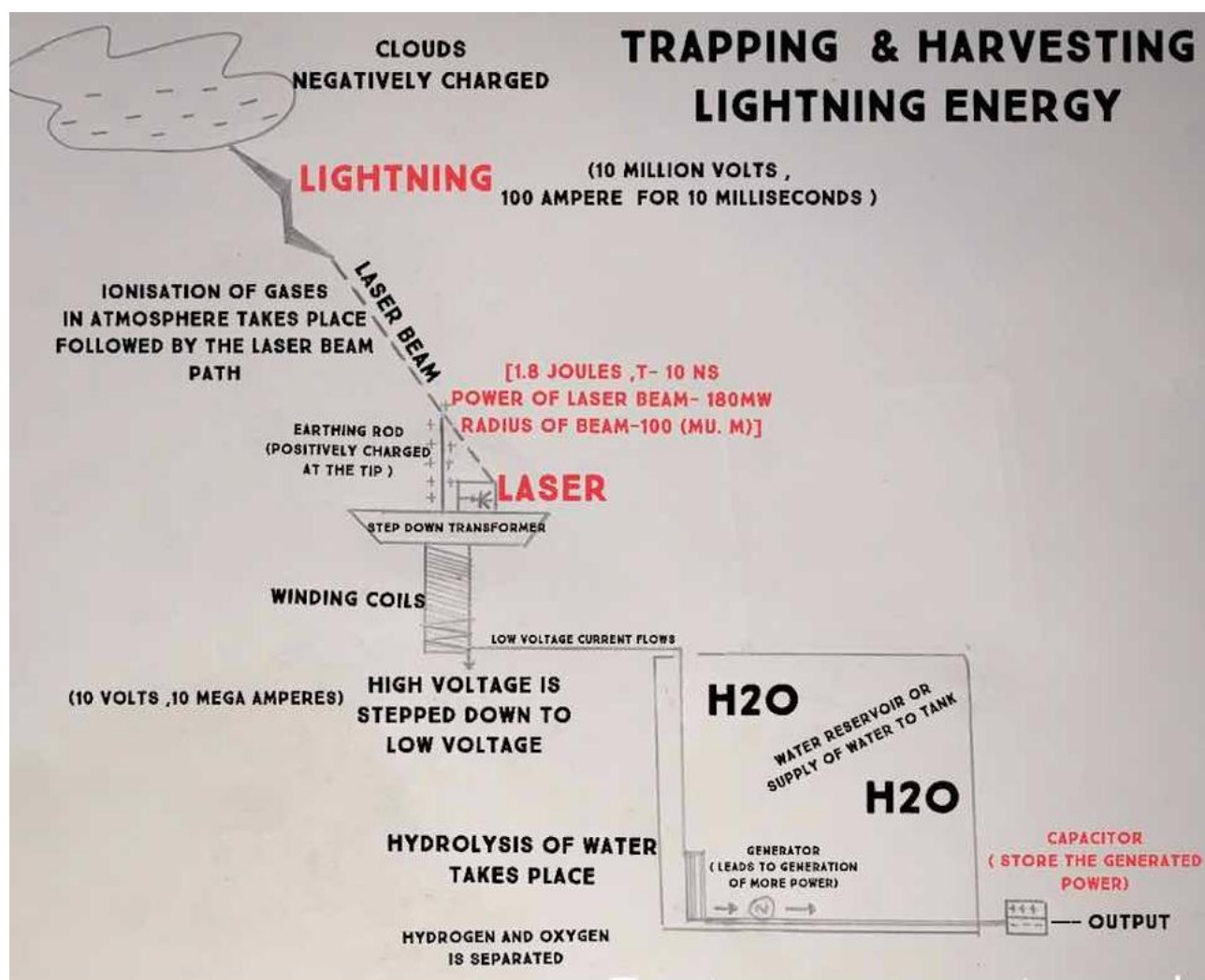


FIGURE 2: Trapping and Harvesting Lighting Energy when clouds negatively charged

VII. CONCLUSION

The search of ways of trapping and harvesting the lightning energy can be lessen to an extent and it can replace the use of fossil fuels and used in many ways, this may not be the end of search of source of energy but it can fulfill upto an huge extent.

REFERENCES

- [1] Plataform SINC.
- [2] Lightning image sensor satellite and data accessed in January, 2020.
- [3] "Annual lightning flash rate" by National Oceanic and Atmosphere Admin, accessed in January, 2020.
- [4] Encyclopaedia of world climatology (ISBN 978-1-4020-3264-6), accessed in January, 2020.
- [5] Map of lightning strikes, accessed in January, 2020.
- [6] NASA "Lightnings in the atmosphere" accessed in January, 2020.