

Artificial Rainmaking By Peta Watt Double Laser System From Ground Initiation Of Endothermic Reactions, As Similar Natural Lightning Phenomena In The Atmosphere

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1. Abstract

In the atmosphere, after lightning, precipitation is formed and heavy rain fall occurs. This Well-known process. This natural lighting phenomenon has been practically demonstrated in the laboratory cloud chamber, as “Laser-induced condensation & water drops formation” and “Water drops formation by each and every laser shot in the cloud chamber”. In this process, lightning/laser creates high temperature which breaks the bonds of N₂ and O₂ to form excited N* and excited O*. Total Heat energy of lightning/laser is completely utilized for breaking the bonds of N₂ and O₂ (Chopkar, 1993). These excited N* and excited O* move to new places by wind and undergo reactions to form NO and O₃ Which are end other mic reactions. Heat energy required for these Reactions Are taken from the surrounding atmospheric clouds. As a result of these reactions, temperature falls, condensation takes place, rain drops ,the raindrops actas natural seeding process, to form another set sofrain drops, seeds are created and rain occurs in analogous way similar to rainscreated in nature by lightning. In this process, white clouds convert into black rainy clouds for rainmaking in the atmosphere.

This process has been practically proved in the laboratory as “Productionof ozone and nitrogen oxides by laser filamentation”. It is believed that“ Laserphotons photo-dissociate atmospheric compounds N₂ and O₂ form ozone (O₃) and nitrogen molecules (NO). “Increase of O₃ and NO concentration after lightning has also been experimentally observed”. This

lightning phenomenon created throughartificial lightning by Petawatt Double laser pulse system can produce rain inthe atmosphere has been practically provedas “Laser-induced water condensationinair”. Scientists have succeeded in obtaining raindrops from an altitude of 75 m of the atmosphere by tera watt mobilelaser.“IRRA Scientist Group propose Peta Wattdouble laser system from ground of specification: 1015watt,800 nm, 500 mJ, 120fs and 10 Hz for this research project”. The results could beof immense benefit to human being.

2. Keywords:

Artificial rain; Atmospheric cloud; Condensation; Endothermic reactions; Lasersystem; Precipitation; Raindrops; Rainfall; Natural Seeding.

3. Introduction

Several attempts have been made by various researchers to create artificial rainbow lasers. Golde (1977) from number radar observations has reported that intenseprecipitation is not even present in the cloudsbefore the first discharge but develo psabruptlyin the sameregion after discharge from whichthe lightning flashes originate. Carls and Brock (1987) heated the atmosphere bya laser pulse upto1600 to 2800K and observed water droplet formation. They predicted that high temperature causes ionization of N₂ and O₂ and, when thisionized air is subjected to more radiation, avalanche breakdown of air can occur.Braun et al. (1995) have observed laser induced condensation and water dropsformation by shooting self-channeling of high- peak power femtosecond laserpulses in the air. Yoshihara et al. (2007) have shown that the pulsed UV-laserirradiation of ambientair induces formation of water drop letsor smallice particles inthe laboratory. They also observed that [O] formed in this process quicklyreacts with O₂ molecules to form O₃. Rohwetter et al. (2010) have shown thationized filament, generated by ultra-short-wave laser pulses induce water-cloudcondensation in the sub-saturated atmosphere in the altitude region between 45mand 75m. A team, called terra-mobile-group (TMG), consisting of scientists from Switzerland, Germany andFrance, have been trying to create artificial rain bylaser (Kasparian etal.2000; 2003; Mejean et al. 2006; Rohetteret al. 2010; Kasparian et al. 2012).

They have done simulation experiments in laboratory cloud chambers andhave observed condensation and water drop formation. They also succeeded in producing tiny water particles lesin moderately humid air in an altitude of 45 to 75m of the atmosphere by terawatt mobile laser. Butthe droplets were about a hundred times too small to fall rain drops; instead, they remained suspended in the air. The team feels that

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it is possible to get larger droplets if the power of the laser is increased to petawatt (10¹⁵ watts) or exawatt (10¹⁸ watts). They further say that the effectiveness of this method is much easier to gauge than traditional cloud-seeding techniques and that it could provide a practical means of triggering rain rainfall". (Search Google As' Laser makes rain ,heavily' 2010). A group of Scientists from Florida University also observed water drop formation by high power laser shooting experiment. It appears from the above that laser has not yet succeeded in producing artificial rain. In this paper, a novel method is described to create artificial rain by laser.

3.1. Condensation is the Basic Need for Water Drops Formation:

IRRA Scientist Group has been successful in experiments in the laboratory, for ' condensation is the basic need for water drop formation'. That condensation is the basic need for water drop formation can be understood by taking two glasses, one filled with normal water and another with ice pieces. After some time one can observe water droplets on the outer surface of the glass which contains ice but not the other. This is due to the condensation process that occurs around ice glass. So, IRRA Scientist Group, proposed a laser system for this research project, to create artificial lightning by initiation of end other mic actions, similar to natural lightning phenomena, for artificial rain making. A result of the reactions, temperature falls, condensation takes place, seeding occurs in a ditransinanan alogous way similar to rains created by lightning. This process as been practically proved in the laboratory and atmosphere "production of ozone and nitrogen oxides by laser filamentation". A number of scientific and practical tests have been conducted in cloud chambers sand in the atmosphere to prove this hypothesis, as "Laser induced condensation and water drops formation by Laser shooting in the laboratory cloud chamber swells the atmosphere". Now the question arises what are the conditions required for condensation. This means that, only and only, end other mic reactions are responsible for condensations, which also produces NO (Nitrogen Oxides) and O₃ (Ozone) after shooting laser beams triggering end other mic reactions, condensation and precipitation. The setiny water drop sactasa natural seeding process, due to acceleration and tribulation by wind force in the atmosphere, to form another set of rain drops with heavy rain falls and lightning rain. End other mic reactions are responsible for condensation. Condensation Is the basic need for water drop formation as above laboratory experiment, "Condensation is the Basic Need for Water Drops Formation".

3.2. Scientific, & Practical background on Rainmaking Technology:

This novel Rain making Technology can be used for white, warm clouds too which get converted into black rainy clouds for rain enhancement. As well as, water drops formation by high power Laser shooting, "Lasermakes rain". The IRRA scientist Group has already demonstrated "Innovative Rainmaking Technology" in the Laboratory cloud's chamber successfully, and results have been published in "Indian Journal of Science & Technology", <http://indjst.org>, vol. 1, No.6(2008). Now, the project proposal, the design of the laser system, the Budget Estimate, and the work plan are ready with IRRA Scientist Group, India. IRRA Scientists ready for demonstration and collaboration with the Government for funding

purposes for project proposal "Artificial rain making by PetaWatt double Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere" In this experiment, Peta Watt(10¹⁵ watt), double laser creates artificial lightning in the atmospheric cloud's regions from ground. These White warm clouds are converted into black rainy clouds with natural seeding for rain enhancement in the atmosphere. Laser plus will be sent To the cloud to initiate endothermic reactions which will create lightning phenomena, as in nature, mentioned above. For example, a German-French group has used a fem to second-tera watt laser to obtain "Laser-assisted water condensations in the atmosphere". They have succeeded in obtaining rain drops from an altitude of 45m to 75m of the atmosphere. In this experiment, intensity of Laser system can't reach above 75 m an altitude in the atmospheric Scientist propose "Artificial rainmaking by Peta Watt (10¹⁵ watt) double Laser system from ground initiation of end other mic Reactions, as similar natural lightning phenomena in the atmosphere" This novel Rain making Technology can be used for white, warm clouds too which get converted into black rain for rain enhancement. *As well as, water drops formation by high power Laser shooting.

"Laser make rain "by Florida University, Scientist Experimentally observed.*As per report, a group of European scientists working on artificial rain said in 2010, "Firing extremely power full laser pulses through humid air can stimulate the formation of clouds, according to a team of European scientists. They say that the effectiveness of this method is much easier to gauge than traditional cloud-seeding techniques and that it could provide a practical means of triggering rainfall". (Search Google as Laser makes rain, heavily 2010). In Indian ancient tradition, there is a mention in Veda Shastra That "Fire arrows are sent to wards the atmospheric clouds which is responsible for immediate rainfall" Our system could be Peta Watt (10¹⁵ watt) double Laser system from ground, its fundamental wave length could be ~800nm. The pulse will have energy of ~500m J, 120fs and repetition frequency of 10Hz. The laser pulse has to propagate with almost high peak intensity in atmospheric clouds. It works when more than 65% humidity presents the atmosphere. Our Findings Could Be used by scientists and engineers to create artificial rain through a new method. The results could be of immense benefit to human beings.

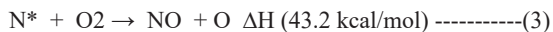
3.3. How Will Laser Create Artificial Rain? Theory:

For creation of rain, according to well established meteorology theory (can be found in any textbook of meteorology), steps are the following: First (i) creation of low temperature → then (ii) condensation then (iii) seed (CCN) formation → then (iv) tiny water drops formation and rain occur in atmosphere. The present methodology is to send a laser pulse to the cloud region of the atmosphere to create high temperature. This High Temperature will break the bonds of O₂ (21%) and N₂ (74%) as follows:

$$\text{N}_2: \text{N} \equiv \text{N} \rightarrow \text{N}^* + \text{N} \text{-----} (1)$$

$$\text{O}_2: \text{O} = \text{O} \rightarrow \text{O}^* + \text{O} \text{-----} (2)$$

In this process N and O in Excited State (N*, O*) will be created. The excited N* and O* are very unstable and immediately come to the ground state through the following reactions.



The occurrence of reactions 3 and 4 and formation of NO and O₃ have confirmation from NASA laboratory experiments [Sanders et al. 2003]. Formation of O₃ NO, after laser shot, has been observed in laser experiments in the atmosphere (Petit et al. 2010). The reactions 3 and 4 are the end other mic and therefore, they need heat energy (amount mentioned in brackets) which is absorbed from the cloud region. As a result, the temperature of the cloud region falls (first step of rain formation is achieved and then other steps follow), condensation takes place, seeds (CCN) will be formed, and tiny water drops will be created. These tiny water drops may act as natural seeds to form other sets of rain drops. This chain process will result in rain fall. Ozone and Nitric Oxide, O₃ and NO (from reactions 3 and 4) will undergo further reaction to form HNO₃ particles and other nitrogen compounds, which will bind water molecules together to create water droplets. These water droplets again will act as natural seeds to form other sets of rain drops. In the atmosphere, due to turbulence, small water drops coalesce and form big raindrops. In addition, ions N₂⁺ and O₂⁺ and electrons formed by cosmic rays can create complex hydrated heavy positive and negative ions... HNO₃·(H₂O)_n (where the value of n could be as large as 50) which can also act as seed to create rain. In short, to create artificial rain by laser, other mic reactions dare to be generated in the cloud region. It has been shown earlier how much heat energy absorbed by end other mic reactions from atmospheric clouds (Chopkar 1993 a, b; Chopkar and Chakrabarty 2008; Chakrabarty et al. 2010; Chopkar et al. 2010).

The energy required to break bonds of 1 molecule of N₂ and 1 molecule of O₂, = 2.25 x 10⁻¹⁸ Joule. A laser pulse of energy 500 mJ can dissociate a column of N₂ and O₂ containing (~0.5/2.25-18) ~10¹⁷ molecules which is much higher than the density in the atmosphere. Lasers can be operated from the ground as well as from an aircraft. In former case, the laser pulse has to propagate a height of ~1 km (cloud height) from the ground. There will be attenuation of energy in this propagation. Kasparian et al. (2012) experimented with terawatt laser from the ground and observed a tiny destiny rain drop at an altitude of 45m to 75m of the atmosphere. To create large water droplets at higher altitudes, the group feels that laser power has to be peta-watt (10¹⁵ watt) or hexa-watt (10¹⁸ watt). If a laser is operated from an aircraft, then attenuation energy will be less. In that case, laser power can reach the cloud region without much attenuation. It can also cover a large area and can move to any place. Turbulence created by the aircraft in the atmosphere can also create small water drops which would collide with each other and form big rain drops. In this research paper, IRRAScientist propose "Artificial rainmaking by Peta Watt (10¹⁵ watt) double Laser system from ground initiation of End other mic Reactions, assimilar natural lightning phenomena in the atmosphere" Artificial rain making method help to increase the green life doxygen and decreasing the pollution. Thus, these methods play a major role in reducing drought and increasing the quantity of drinking water in future.

3.4. Methodology for Artificial Rain making by Laser system from Ground:

In this experiment, Peta Watt (10¹⁵ watt) double Laser System creates artificial lighting in the atmosphere up to 1.2 Km to 2.7 Km altitude in the white warm cloud's regions. These white warm clouds are converted into black rainy clouds with natural seeding for rain enhancement in the atmosphere. A laser pulse will be sent to the cloud to initiate endothermic reactions which will create lightning phenomena, as in nature, mentioned above. The laser technology for this purpose, though not fully developed, yet exists. For example, a German-French group has used a femto-second – terawatt laser to obtain "Laser-assisted water condensations in the atmosphere". They have succeeded in obtaining rain drops from an altitude of 45m to 75 m of the atmosphere. This novel Rain making Technology can be used for white, warm clouds too which get converted into black rainy clouds for rain enhancement. *As well as, water drops formation by high power Laser shooting. "Lasermakesrain" by Florida University, Scientists experimentally observed. *As per a report, a group of European scientists working on artificial rain said in 2010, "Firing extremely powerful laser pulses through humid air can stimulate the formation of clouds, according to a team of European scientists. They say that the effectiveness of this method is much easier to gauge than traditional cloud-seeding techniques and that it could provide a practical means of triggering rain fall". (Search Google as 'Laser makes rain, heavily 2010). In Indian ancient tradition, there is a mention in Veda Shastra that "Fire arrows are sent towards the atmospheric clouds which is responsible for prompt rainfall" Our system could be Peta Watt (10¹⁵ watt), double Laser system, its fundamental wavelength would be ~800nm. The Pulse Will Have Energy Of ~500mJ, 120fs and repetition frequency of 10Hz. The laser pulse has to propagate with almost high peak intensity over a distance of ~1km. It works when more than 65% humidity is present in the atmosphere. Our Findings could be used by scientists and engineers to create artificial rain through a new method. The results could be of immense benefit to human beings.

This laser system can be operated from ground as well as from an aircraft. In this experiment, laser system can be operated from ground, Innovative rain making technology in the atmosphere as shown in Fig.No.1, in this demonstration, Peta Watt (10¹⁵ watt) pulse laser with double coarse Laser (1) primary laser and (2) secondary Laser as shown in fig.No.1. A laser pulse has to be seen the atmosphere reach white warm clouds regions about 1.2 Km to 2.7 Km altitude. It will initiate endothermic reactions which will create lightning phenomena and rain as in nature. These white warm clouds will be converted into black rainy clouds with natural seeding for rain enhancement in the atmosphere. This laser system can be operated from ground as well as from aircraft. Plans to operate from ground are shown in figures No.1. When operated from ground, covered area the ground could be ~5 Km to 7 Km min radius. Fig.1 shows a plan to use two lasers. In this figure, Petawatt (10¹⁵ watt) double Laser Pulse laser with double coarse laser (1) primary laser and (2) secondary laser is shown. In this system, secondary laser energy is used for laser pulse travelling

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purpose and primary laser energy is used for creating artificial lightning in the upper atmosphere up to 1.2 Km to 2.7 Km altitude for initiation of endothermic actions, lot of heat energy absorbed from surrounding atmospheric clouds, condensations take place, water drops form in the atmosphere. It's used as a natural seeding process, to form another set of raindrops, chains process occurs for rain enhancement in the atmosphere.

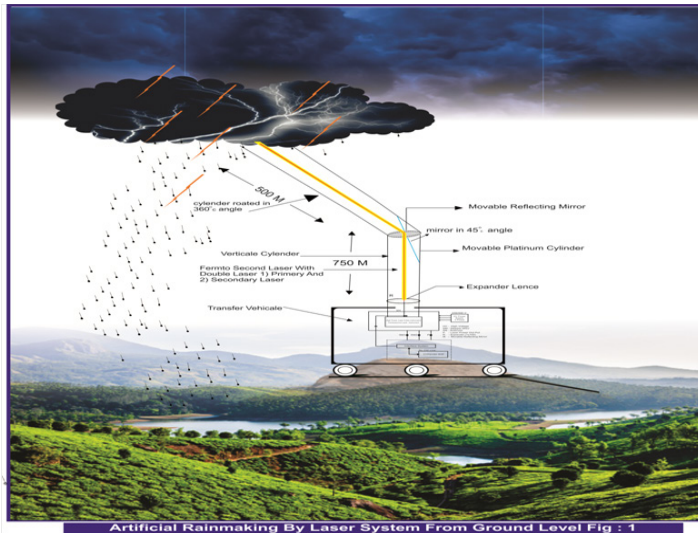


Fig.1

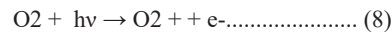
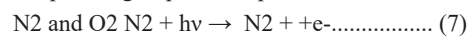
11.0 Figure: Demonstration on Rainmaking Technology by Peta watt double Laser system from Ground:

Innovative rainmaking technology by lasersystem from ground level can be used in the field of farmers. When the crops are on the verge of drying due to lack of rain since one to two months, this experiment can come to aid. It can cover an area of more than 7 km of radius wind direction in the atmosphere as per Fig.No.1. In this experiment, two cylinders for Laser Sending And Travelling, one vertical 750m height, another inclined cylinder 500m rotating around in 360 angles horizontally as shown Fig. No.1. For this experiment, a hilly area must be selected on the field of the farmer, with a high power electric supply point already managed near the experiment site. High power laser system must be placed in a 12-wheel truck so that it becomes easy to transport it from one place to another. When the upper atmosphere is cloudy and more than 65% humidity is present in the atmosphere, the experiment can be started in the field of the farmer. We will measure atmospheric parameters such as humidity, temperature, pressure, wind velocity, wind direction, etc. on ground level as well as in the upper level. For this purpose, a separate unit/ department was established as "Measuring & Maintained Department". After the success of the experiment, all related data must be put in a software computer, for analysis and conclusion, with a fixed perfect Laser design for maximum rain making / rainfall in the atmosphere. In this way, we will use the Laser system from ground as Peta watt (1015 watt) double Laser power with double Laser means primary and secondary laser. Secondary Laser power will be used for travelling purpose and primary Laser power used for

creating artificial lightning in the atmosphere for rain making. Similarly, Laser power has to be peta-watt (1015 watt) or hexa-watt (1018 watt) should be used for creating artificial lightning in the atmosphere for rain making from ground level which is sent as Laser pulse length 2.5 m to 5.0 min repetition processing upper cloud regions as shown in Fig. No.1. Demonstration on project proposal of Innovative Rain making Technology by Laser system from Ground level for Rain enhancement in the Atmosphere by IRRA Scientist Group. "Artificial Rain making Methodology by Laser system from Ground", it's most useful for the green revolution in the whole world for all human beings. In this way "Innovative Rain making Technology by Laser system from Ground", can be used for green revolution in the whole world for all human beings.

4. Discussion

Innovative rain making technology is scientifically and practically proven as "Laser induced condensation and water drops formation in laboratory cloud's chambers as well as in the atmosphere. However, according to Kasparian group, a laser pulse shot in the atmosphere ionizes :



They have observed a lightning phenomenon in the laboratory cloud chamber as "Laser induced condensation and water drops formation in the laboratory cloud chamber by Femto to second – Tera watt mobile laser system". Kasparian (2012) group says that it is the ionized species N_2^{++} and O_2^{++} which produce rain. But these two species are microsize which can not act as seeding agents. Also, N_2^{++} and O_2^{++} radicals are not observed by Kasparian group in laser filamentation experiments but production of O_3 and NO has been observed by the min laser filamentation experiments. Experiments of Kasparian Group Finds Condensation and water drop formation and they say in their ionization theory that N_2^{++} and O_2^{++} act as seeding agents. They also say "Mechanism of laser-induced condensation involves photo dissociation, in which photons break down atmospheric compounds in the atmosphere". This process produces Ozone and Nitrogen oxides, which lead to the formation of Nitric acid particles that bind water molecules together to create water droplets." But there is no seeding and water drop formation is not due to seeding. Small water drops formed by laser in the laboratory cloud chamber are due only to end other mic reactions (cooling) and this is obvious. In the atmosphere, due to acceleration and turbulence, these small sized water drops coalesce to form big rain drops.

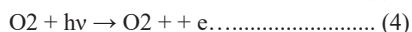
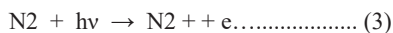
These rain drops act as a natural seeding process to form different sets of rain drops; this chain process continues with heavy rainfall. Calculation For the energy required for dissociation is almost half of that required for ionization. The energy of a laser beam of wavelength λ is $h\nu$ ($\nu = 1/\lambda$ and h is Planck's constant). We will shoot laser pulse in the atmosphere and dissociate (break bonds of) N_2 and O_2 as follows:



Bond energy of $N_2 = 226$ kcal/mole. 1 cal = 4.184 Joule, Avogadro number = 6×10^{23} . Therefore, energy required to break 1 molecule of

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$N_2 = 226 \times 10^3 \times 4.184 / (6 \times 10^{23}) = 1.58 \times 10^{-18}$ Jou Bond energy of $O_2 = 96$ kcal/mole. Therefore, energy required to break 1 molecule of $O_2 = 96 \times 10^3 \times 4.184 / (6 \times 10^{23}) = 0.67 \times 10^{-18}$ Joule. So, the total energy required for breaking 1 molecule of N_2 and 1 molecule of O_2 will be $(1.58 \times 10^{-18} + 0.67 \times 10^{-18}) = 2.25 \times 10^{-18}$ Joule. When a laser pulse is shot in the atmosphere, it may ionize N_2 and O_2 as follows:



Ionizing potential of $N_2 = 15.58$ eV = 2.49×10^{-18} Joule

Ionizing potential of $O_2 = 12.2$ eV = 1.95×10^{-18} Joule

So the total energy required ionizing 1 molecule of N_2 and 1 molecule of O_2 is 2.49×10^{-18} Joule + 1.95×10^{-18} Joule = 4.44×10^{-18} Joule.

The above calculation shows that the energy required dissociating 1 molecule of N_2 and 1 molecule of O_2 is about half of that required to ionize them. The energy required for dissociation is almost half of that required for ionization. That means energy is first used up for dissociation, then the remaining energy (which may not be sufficient for ionization of N_2 and O_2) is delivered for ionization of N_2 and O_2 . Hence dissociation takes place and not ionization. The Kasparian group does not talk about dissociation. It is not only near the IR laser system, Yoshihara, et al. (2007), have discussed in their paper the possibility of creating artificial rain by using lasers. Our methodology is to send laser pulses to cloud regions to break bonds of O_2 and N_2 (by reactions 1 and 2), create other mic reactions and condensation (by reactions 3 and 4) and produce rain in the similar way as in lightning. There is attenuation of energy in operating the laser through Aircraft. Kasparian's group suggests an increase of laser power to petawatt (1015 watt) or exawatt (1018 watt) to create large water droplets. We will operate from an aircraft in the same way as spraying chemicals from Aircraft. A laser pulse of energy 500 mJ is capable of dissociating a column of N_2 and O_2 containing $(\sim 0.5 / 2.25 \times 10^{-18}) \sim 1017$ molecules which much higher than the density in the atmosphere.

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6. Additional Uses

This method can be used for rain harvesting by "rain drain". When huge clouds are present above a lake or dam, a laser beam can be shot into the cloud region; then with a blast of clouds heavy rainfall will occur to fill the lake or dam for future use of water. This method can be used to reduce pollution of the atmosphere by spraying artificial rain on the polluted city. Another use of this method is to stop excess rainfall. Low intensity laser pulse shot into the cloud region will evaporate the clouds from the excess rainfall area. This method can also be used to drive away the rain cloud front region where rain is not needed.

7. Conclusion

"Artificial rainmaking by Peta Watt (1015 watt), double Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere". It covers ~ 16 Km², an area...

It is shown in this article that by initiating endothermic reactions in the cloud region of the atmosphere by a laser, artificial rain can be created. Laser may have the following specification: 1015 watt, 800 nm, 500 mJ, 120 fs and 10 Hz for operation from ground level. This Method Is Economical (one time investment), harmless, eco-friendly and can be switched on and off when desired. It can be used at any place and at any time. It can also be used to fill lakes or dams for storing rainwater for future use (rain harvesting), to reduce pollution by spraying artificial rain on the polluted city, to stop rain in the region where it is not wanted or where rainfall is in abundance. It may not be out of place to state here that in the holy Hindu book "Mahabharata", there is a mention that by firing arrows in the atmosphere, rain was created by Arjun to quench the thirst of God "Bhisma". Artificial rainmaking methods help to increase the green life and oxygen and decrease the pollution. Thus, these methods play a major role in reducing drought and increasing the quantity of drinking water in future.

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IRRA Scientists Research activities

Challenging research activities by IRRA Scientists have developed an “Innovative Rainmaking Technology ” which is scientifically and practically proven in Laboratory cloud chambers and the atmosphere up to 75m altitude as Ref. “Laser induces condensation and water drops formation in laboratory clouds chamber & atmosphere”.

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1. “Artificial rainmaking by Peta Watt (1015watt), double Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere”. “IRRA Scientist Group propose laser system of specification: Peta watt Laser (1015watt), 800nm,

500mJ, 120fs and 10Hz for this research project”. It works when more than65% humidity is present in the atmosphere. It covers ~16 Km2, an area... Estimate cost 9.02 Cr in Indian Rs/ USA 0.72 million Dollar)

2. “Artificial rainmaking by using high power te rawatt mobile Laser Which initiates endothermic reactions, as a similar natural lightning phenomenon, onboard Aircraft with multiple lightning in the atmosphere”.

“IRRA Scientist Group propose laser system of specification: Femto-second mobile Laser 1012watt, 800nm, 500mJ, 120fs and 10Hz for this research project”. It works when more than 65% humidity is present in the atmosphere. It covers ~450 Km2, an area...& estimates cost 230 Cr./ USA dollar 28.75 million. Our findings could be used by scientists and engineers to create artificial rain as a new method. The results could be of immense benefit to human being as well as eco-friendly and cost effective which is the need of the hour.