(Short important information on Project proposal For Rainmaking from Ground)

"Artificial rainmaking by Peta Watt (10^{15} watt), double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena with natural seeding, occur heavy rainfall in the atmosphere"

Innovative Rainmaking Research Association (IRRA Scientist), India.

"IRRA Scientist Group propose laser system of specification: Peta watt Laser (10^{15}watt), 800nm, 500mJ,120fs and 10Hz for this research project".

It's scientifically & practically proven in Laboratory clouds chamber as well as in the atmosphere up to 75m altitude, as "Laser induce condensation & water drops formation in Laboratory clouds Chamber as well as in the atmosphere".

In this natural rainmaking technology, endothermic reactions, condensation, precipitation, water drops formation, natural seeding with heavy rainfall occur in the atmosphere.

This method applicable for white warm clouds to converted black rainy clouds for rainmaking. Condensation is the basic need for water drops formation, natural seeding for heavy rainfall.

IRRA Scientists are ready for discussion any time on Novel Rainmaking Natural Technology. Always, well come to your scientific comments on rainmaking by Laser system.

It works when more than 65% humidity is present in the atmosphere. It covers ~16 Km2, an area... Estimate cost 9.02 Cr / USA 0.72 million Dollar)

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Please visit our YouTube Channel and search "Novel Technology for Artificial Rainmaking". Click here: - https://youtu.be/UYfuH9fAmUs_

More details can be found in Google Search: as "Artificial rainmaking by endothermic reactions" or S.K. Chopkar or on the website: http://www.irraindia.org

(Project proposal For Rainmaking from Ground)

"Artificial rainmaking by Peta Watt (10^{15} watt), double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena with natural seeding, occur heavy rainfall in the atmosphere"

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Abstract:

In the atmosphere, after lightning, precipitation is formed and heavy rainfall occurs. This is a 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 N_2 and O_2 to form excited N* and excited O*. Total heat energy of lightning/laser is completely utilized for breaking the bonds of N_2 and O_2 (Chopkar, 1993). These excited N* and excited O* move to new place by wind and undergo reactions to form NO and O_3 which are endothermic 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 form, these raindrops act as natural seeding process, to form another sets of rain drops, seeds are created and rain occurs in analogous way similar to rains created 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 "Production of ozone and nitrogen oxides by laser filamentation". It is believed that "Laser photons photo-dissociate atmospheric compounds N_2 and O_2 form ozone (O_3) and nitrogen molecules (NO). "Increase of O_3 and NO concentration after lightning has also been experimentally observed". This lightning phenomenon created through artificial lightning by Peta Watt double laser pulse system can produce rain in the atmosphere has been practically proved as "Laser-induced water condensation in air". Scientists have succeeded in obtaining raindrops from an altitude of 75m of the atmosphere by terawatt mobile laser. "IRRA Scientist Group propose Peta Watt double core laser system from ground of specification: Peta Watt (10^{15}watt), 800nm, 500mJ, 120fs and 10Hz for this research project". The results could be of immense benefit to human being.

Artificial rain making methods help to increase the green life and oxygen and decreasing the pollution. Thus, these methods play major role in reducing drought and increasing the quantity of drinking water in future.

Keywords: Artificial rain; Atmospheric cloud; Condensation; Endothermic reactions; Laser system; Precipitation; Raindrops; Rainfall; Natural Seeding.

1.0 Introduction:

Several attempts have been made by various researchers to create artificial rain by laser. Golde (1977) from a number of radar observations has reported that intense precipitation is not even present in the clouds before the first discharge but develops abruptly in the same region after discharge from which the lightning flashes originate. Carls and Brock (1987) heated the atmosphere by a laser pulse up to 1600 to 2800K and observed water droplet formation. They predicted that high temperature causes ionization of N_2 and O_2 and, when this ionized air is subjected to more radiation, avalanche breakdown of air can occur. Braun et al. (1995) have observed laser induced condensation and water drops formation by shooting self-channeling of high- peak power femtosecond laser pulses in the air. Yoshihara et al. (2007) have shown that the pulsed UV-laser irradiation of ambient air induces formation of water droplets or small ice particles in the laboratory. They also observed that [O] formed in this process quickly reacts with O_2 molecules to form O_3. Rohwetter et al. (2010) have shown that ionized filament, generated by ultra-short wave laser pulses induce water-cloud condensation in the sub-saturated atmosphere in the altitude region between 45m and 75m. A team, called terra-mobile-group (TMG), consisting of scientists from Switzerland, Germany and France, have been trying to create artificial rain by laser (Kasparian et al.2000; 2003; Mejean et al. 2006; Rohetteret al. 2010; Kasparian et al. 2012). They have done simulation experiment in laboratory cloud chamber and have observed condensation and water drops formation. They also succeeded in producing tiny water particles in moderately humid air in an altitude of 45 to 75m of the atmosphere by terawatt mobile laser. But the droplets were about a hundred times too small to fall as raindrop; instead, they remained suspended in the air. The team feels that it is feasible to get larger droplets if the power of laser is increased to petawatt (10^{15}watts) or exawatt**(**10^{18}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 to be a***

practical means of triggering rainfall*". (Search Google as 'Laser makes rain, heavily'2010).* A group of Scientists from Florida University also observed water drops 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.***

2.0 Condensation is the Basic Need for Water Drops Formation:

IRRA Scientist Group has been successful experiments in 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 sometime one can observe water droplets on the outer surface of the glass which contains ice but not in the other. This is due to the condensation process that occurs around the ice glass. So, IRRA Scientist Group, proposed a laser system for this research project, to create artificial lightning by initiation of endothermic reactions, similar to natural lightning phenomena, for artificial rainmaking. As a result of these reactions, temperature falls, condensation takes place, seeding occurs and it rains in an analogous way similar to rains created by lightning. This process has been practically proved in the laboratory and atmosphere as "production of ozone and nitrogen oxides by laser filamentation". A number of scientific and practical tests have been conducted in cloud chambers and in the atmosphere to prove this hypothesis, as "Laser induce condensation and water drops formation by Laser shooting in the laboratory cloud chambers as well as in the atmosphere".

Now the question arises that what are the conditions required for condensation. This means that, only and only, endothermic reactions are responsible for condensations, which also produces NO (Nitrogen Oxides) and O_3 (Ozone) after shooting laser beams triggering endothermic reactions, condensation and precipitation. These tiny water drops act as a natural seeding process, due to acceleration and tribulation by wind force in the atmosphere, to form another set of raindrops with heavy rainfall as lightning rain. Endothermic 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".

3.0 Scientific, & Practical background on Rainmaking Technology:

This novel Rainmaking 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, "Laser makes 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 Scientist is ready for demonstration and collaboration with the Government for funding purposes for project proposal on "Artificial rainmaking by Peta Watt double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere"

In this experiment, Peta Watt (10^{15}watt) double core 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.

A laser pulse 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 femtosecond–terawatt laser to obtain "Laser-assisted water condensations in the atmosphere". They have succeeded in obtaining raindrops from an altitude of 45m to 75m of the atmosphere. In this experiment, intensity of Laser system can't reach above 75m an altitude in the atmosphere. IRRA Scientist propose "Artificial rainmaking by Peta Watt (10^{15}watt) double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere"

This novel Rainmaking 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. "Laser makes rain" by Florida University, Scientist experimentally observed.

**As per 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 to be a practical means of triggering rainfall". (Search Google as 'Laser makes rain, heavily'2010). In Indian ancient tradition, there is a mention in Vedshastra that "Fire arrows are sent towards the atmospheric clouds which is responsible for immediate rainfall"*

Our system could be Peta Watt (10^{15}watt) double core Laser system from ground, its fundamental wavelength could 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 in atmospheric clouds. 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 being.

4.0 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 the atmosphere.

The present methodology is to send laser pulse to the cloud region of the atmosphere to create high temperature. This high temperature will break the bonds of O_2 (21%) and N_2 (74%) as follows:

$N_2 : N \equiv N \rightarrow N^* + N$ ---- *(1)*

$O_2 : O = O \rightarrow O^* + O$--------- *(2)*

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

$N^* + O_2 \rightarrow NO + O$ ΔH *(43.2kcal/mole)* .....*(3)*

$O^* + O_2 + M \rightarrow O_3 + M \quad \Delta H\ (67.7 kcal/mole) \quad \ldots\ldots (4)$

The occurrence of reactions 3 and 4 and formation of NO and O_3 have confirmation from NASA laboratory experiments [Sanders et al. 2003]. Formation of O_3 and NO, after laser shot, has been observed in laser experiment in atmosphere (Petit et al. 2010). The reactions 3 and 4 are endothermic and therefore, they need heat energy (amount mentioned in brackets) which is absorbed from the cloud region. As a result, 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 another sets of rain drops. This chain process will result in rainfall. Ozone and Nitric oxide, O_3 and NO (formed in reactions 3 and 4) will undergo further reaction to form HNO_3 particles other nitrogen compounds, which will bind water molecules together to create water droplets. These water droplets again will act as natural seeds to form another sets of rain drops. In the atmosphere, due to turbulence, small water drops coalesce and form big rain drops. In addition, ions N_2^+ and O_2^+ and electrons formed by cosmic rays can create complex hydrated heavy positive and negative ions... $HNO_3^-.(H_2O)_n$ (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, endothermic reactions are to be generated in the cloud region. Its has-been shown earlier how much heat energy is absorbed by endothermic reactions from atmospheric clouds (Chopkar 1993a, b; Chopkar and Chakrabarty 2008; Chakrabarty et al. 2010; Chopkar et al. 2010). The energy required to break bonds of 1 molecule of N_2 and 1 molecule of O_2, = 2.25×10^{-18} Joule. A laser pulse of energy 500mJ can dissociate a column of N_2 and O_2 containing ($\sim 0.5/2.25^{-18}$) ~ 10^{17} molecules which is much higher than the density in the atmosphere.

Laser can be operated from the ground as well as from an aircraft. In former case, laser pulse has to propagate to a height of ~1km (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 tiny raindrops in 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 (10^{15}watt) or hexa-watt (10^{18}watt). If laser is operated from aircraft, then attenuation of energy will be less. In that case, laser power can reach the cloud region without much attenuation. It can also cover 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 project, IRRA Scientist propose "Artificial rainmaking by Peta Watt (10^{15}watt) double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena with heavy rainfall in the atmosphere" Artificial rain making methods help to increase the green life and oxygen and decreasing the pollution. Thus, these methods play major role in reducing drought and increasing the quantity of drinking water in future.

5.0 Methodology for Artificial Rainmaking by Laser system from Ground:

In this experiment, Peta Watt (10^{15}watt) double core 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 femtosecond–terawatt laser to obtain "Laser-assisted water condensations in the atmosphere''. They have succeeded in obtaining raindrops from an altitude of 45m to 75m of the atmosphere.

*This novel Rainmaking 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. "Laser makes rain" by Florida University, Scientist experimentally observed.*

**As per 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 to be a practical means of triggering rainfall". (Search Google as 'Laser makes rain, heavily'2010). In Indian ancient tradition, there is a mention in Vedshastra that "Fire arrows are sent towards*

the atmospheric clouds which is responsible for prompt rainfall"

Our system could be Peta Watt (10^{15}watt) double Laser system, its fundamental wavelength could 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 being.

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 rainmaking technology in the atmosphere as shown in Fig.No.1, in this demonstration, Peta Watt (10^{15}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 sent in the atmosphere to 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 in to 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 on the ground could be ~5 Km to 7 Km in radius. Fig.1 shows a plan to use two lasers. In this figure, Peta Watt (10^{15}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 purpose and primary laser energy is used for creating artificial lightning in the upper atmosphere up to 1.2 Km to 2.7Km altitude for initiation of endothermic reactions, lot of heat energy absorbs from surrounding atmospheric clouds, condensations take place, water drops formations in the atmosphere. It's used as natural seeding process, to form another sets of raindrops, chains process occurs for rain enhancement in the atmosphere.

Innovative rainmaking technology by laser system 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 an aid. It can cover an area of more than 7 km of radius in a wind direction in the atmosphere as per Fig.No.1. In this experiment, two cylinders for Laser sending

and travelling, one is vertical 750m height, another inclined cylinder 500m with rotating around in 360 angles horizontally as shown Fig.No.1.

For this experiment, hilly area must be selected on the field of farmer, with 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 must be established as "Measuring & Maintains Department". After the success of experiment, all related data, must be put it in software computer, for analysis and conclusion, with fixed perfect Laser design for maximum rainmaking / rainfall in the atmosphere.

In this way, we will use Laser system from ground as Peta Watt (10^{15}watt) double Laser power with double Laser means primary and secondary laser). Secondary Laser power will used for travelling purpose and primary Laser power used for creating artificial lightning in the atmosphere for rainmaking. Similarly, Laser power has to be peta-watt (10^{15}watt) or hexa-watt (10^{18}watt) should be used for creating artificial lightning in the atmosphere for rainmaking from ground level which is send as Laser pulses length 2.5m to 5.0m in repetition process in upper cloud regions as shown in Fig.No.1.

Demonstration on project proposal of Innovative Rainmaking Technology by Laser system from Ground level for Rain enhancement in the Atmosphere by IRRA Scientist Group.

"Artificial Rainmaking Methodology by Laser system from Ground", it's most useful for green revolution in the whole world for all human beings.

In this way "Innovative Rainmaking Technology by Laser system from Ground", can be used for green revolution in the whole world for all human beings.

6.0 Discussion:

Innovative Rainmaking Technology is scientifically and practically proven as "Laser induces condensation and water drops formation in Laboratory cloud's chamber as well as in the atmosphere.

However, according to Kasparian group, a laser pulse shot in the atmosphere ionizes N_2 and O_2

$N_2 + hv \rightarrow N_2^+ + e^-$ ..... (7)

$O_2 + hv \rightarrow O_2^+ + e^-$ ..... (8)

They have observed lightning phenomenon in the laboratory cloud chamber as "Laser induced condensation and water drops formation in the laboratory cloud chamber by Femtosecond – Terawatt 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 of micro size which cannot 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 them in 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 agent. 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 condensation and water drop formation is not due to seeding. Small water drops formed by laser in the laboratory cloud chamber are due only to endothermic 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 hv ($v = 1/\lambda$ 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:

$N_2 + hv \rightarrow N^* + N$ ..... (1)

$O_2 + hv \rightarrow O^* + O$ ..... (2)

Bond energy of N_2 = 226 kcal/mole.

1 cal = 4.184 Joule, Avogadro number = $6x10^{23}$

Therefore, energy required to break 1 molecule of

$N_2 = 226x10^3x4.184/ (6x10^{23}) = 1.58x10^{-18}$ Jou

Bond energy of O_2 = 96 kcal/mole.

Therefore, energy required to break 1 molecule of

O_2 = $96x10^3x4.184/ (6x10^{23})$ = $0.67x10^{-18}$ Joul

So, the total energy required for breaking 1 molecule of N_2 and 1 molecule of O_2 will be ($1.58x10^{-18}$ + $0.67x10^{-18}$) = $2.25x10^{-18}$ Joule.

When a laser pulse is shot in the atmosphere, it may ionize N_2 and O_2 as follows:

N2 + hv → N_2^+ + e.....(3)

O2 + hv → O_2^+ + e .....(4)

Ionizing potential of N_2 = 15.58 ev = $2.49x10^{-18}$Joule

Ionizing potential of O_2 = 12.2 ev = $1.95x10^{-18}$Joule

So the total energy required ionizing 1 molecule of N_2 and 1 molecule of

O_2 is $2.49x10^{-18}$ Joule +$1.95x10^{-18}$Joule = $4.44x10^{-18}$ Joule.

The above calculation shows that the energy required dissociating 1 molecule of N_2 and 1molecule 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 UV 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 endothermic 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 (10^{15}watt) or exawatt (10^{18} 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 500mJ is capable of dissociating a column of N_2 and O_2 containing (~$0.5/2.25^{-18}$) ~ 10^{17} molecules which is much higher than the density in the atmosphere.

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8.0 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 blast of clouds heavy rainfall will occur to fill the lake or dam for future use of water. This method can also 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 from the region where rain is not needed.

9.0 Conclusion:

"Artificial rainmaking by Peta Watt (10^{15} watt), double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere".

It is shown in this proposal 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: 10^{15}watt, 800nm, 500mJ, 120fs and 10Hz 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 lake or dam for storing rain water 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 "Bhishma".

Artificial rain making methods help to increase the green life and oxygen and decreasing the pollution. Thus, these methods play major role in reducing drought and increasing the quantity of drinking water in future.

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11.0 Figure:

"Artificial rainmaking by Peta Watt (10^{15} watt), double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere"

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

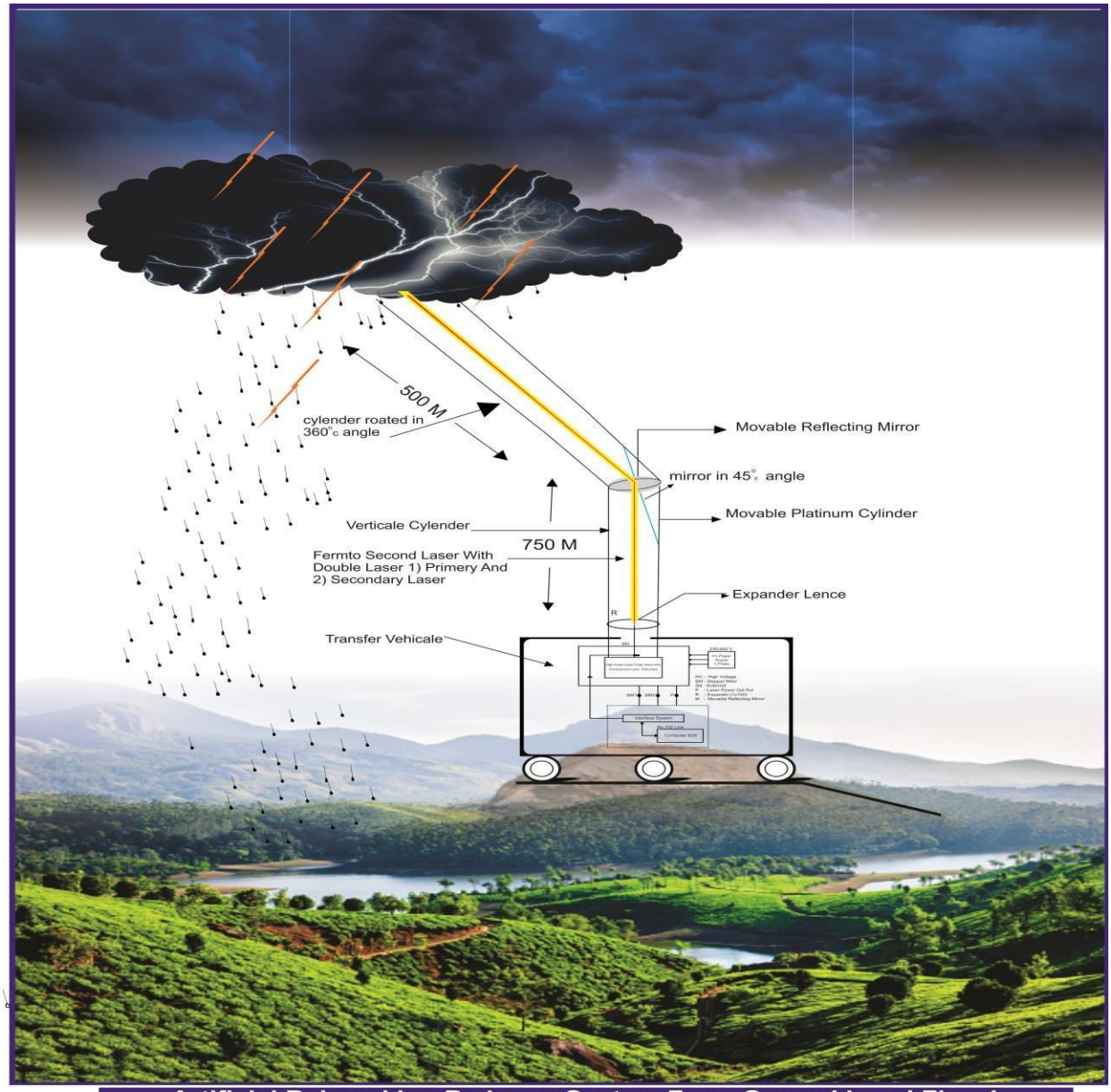

Fig. 1

12.0 Budget for three years:

"Artificial rainmaking by Peta Watt (10^{15} watt), double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere"

(Grand Total Estimate for Rainmaking Project proposal (A+B+C+D+E) – 9.02 Cr in Indian Rs/ USA 0.72 million Dollar)

Demonstrated/experiment for Artificial rainmaking by Peta Watt double Laser system from ground for three years, project proposal estimates cost 9.02 Cr./USA dollar 0.72 million.

Sr.	Item	Budget of Rain Making Project			
		1st Year	2nd Year	3rd Year	Total (In Lakh)
A	*Budget for Salaries of Staff:*	**54**	**54**	**54**	**01,62**
B	*Budget of Equipment Purchase with maintains etc.*	0390	00.05	00,05	04,00
C	*Budget for Consumable Item:*	75	70	70	**02,15**
D	*Budget for Travel Expenses:*	***00,40***	***00,25***	***00,25***	**00,90**
E	*Budget for Patent Filling Expenses*	***00,15***	00,10	00,10	**00,35**
	Total	**574**	**164**	**164**	**09,02**

(Grand Total Estimate for Rainmaking Project proposal (A+B+C+D+E) – 9.02 Cr in Indian Rs/ USA 0.72 million Dollar)

"Artificial rainmaking by Peta Watt (10^{15} watt), double core Laser system from ground initiation of Endothermic Reactions, as similar natural lightning phenomena in the atmosphere"

Demonstrated/experiment for Artificial rainmaking by Peta Watt double Laser system from ground for three years, project proposal estimates cost 9.02 Cr./USA dollar 0.72 million.

A) Budget for Salaries of Staff:

SN	Designation	Pay Scale	Monthly	Nos Of Staff	Budget for Salaries of Staff			
					1st Year	2nd year	3rd Year	Total
1	Senior Scientist (Project Manager)	Class 1	1,20,000	1	14,40,000	14,40,000	14,40,000	**43,20,000**
2	Assistant Scientist	Class 2	80,000	2	19,20,000	19,20,000	19,20,000	**57,60,000**
3	Junior Scientists	Class 2	40,000	2	09,60,000	09,60,000	09,60,000	**28,80,000**
4	Lab Helper with Skilled Labor	Class 3	20,000	3	07,20,000	07,20,000	07,20,000	**21,60,000**
5	Non- Skilled Labor	Class 4	10,000	3	03,60,000	03,60,000	03,60,000	**10,80,000**
	Total				**54,00,000**	**54,00,000**	**54,00,000**	**01,62,00,000**

B) Budget of Equipment Purchase:

SN	Particular	Model	Make	Estimate Cost (In Lakhs)
1	High power laser Instrument with Transportation (Femto-second high power Laser Instrument)	2 Numbers with multiple laser release instruments	Imported	1,60
2	Construction cost for Camp/ guest house /office temporary Shed		Indigenous	70
3	High power electric supply point /Fuel Materials		Indigenous	20
4	Precipitation & Atmospheric parameters measuring instrument etc.		Indigenous	40
5	Purchase Mobile Van/ official materials etc.		Imported	60
6	Scientific equipment purchases as per requirement		Imported	40
	Total			390

C) Budget for Consumable Item:

Budget of Consumable Item					
Sr.	Consumable Items	1st Year	2nd Year	3rd Year	Total (Lakhs)
1	Electric supply for high power laser/Fuel etc.	10	05	05	20
3	Stationary & boarding, mese expenses, another misalliance	45	45	45	135
4	Purchase Equipment for project, office etc.	10	10	10	30

5	**Chemicals for testing or Analysis**	10	10	10	**30**
	Total	**75**	**70**	**70**	**215**

D) Budget for Travel Expenses:

Budget of Travel Expenses					
SN	**Description**	**1st Year**	**2nd Year**	**3rd Year**	**Total (Lakhs)**
1	***Conference for advance technology for discussion and suggestion***	***20***	***10***	***10***	***40***
2	***Visit of top scientists to project for various Suggestion***	***10***	***10***	***10***	***30***
3	***Visit for other institute for research study &discussion***	***10***	***05***	***05***	***20***
	Total	***40***	***25***	***25***	***90***

E) Budget for Patent Filling Expenses:

Budget of Patent Filling Expenses & other					
SN	**Description**	**1st Year**	**2nd Year**	**3rd Year**	**Total (Lakhs)**
1	***National & International Patent file expenditure and advertisement etc.***	***05***	***05***	***05***	***15***
2	***Consultant fees / Expert guidance Service charges***	***10***	***05***	***05***	***20***
	Total	***15***	***10***	***10***	***35***

13.0 Practical Result shows it's positive to "Innovative Rainmaking Technology" scientifically & practically proven as …

1. ***"Laser induces condensation and water drops formation in the cloud's chamber" By J. Kasparian and*** A team, called terra-mobile-group (TMG), consisting of scientists from Switzerland, Germany and France, have been trying to create artificial rain by laser ***(results published in international journal…….)***

2. ***"Laser induce condensation and water drops formation in the atmosphere up to 75m altitudes":*** *This process has been practically proved in the laboratory as* ***"Production of ozone and nitrogen oxides by laser filamentation".*** *It is believed that "Laser photons photo-dissociate atmospheric compounds* N_2 *and* O_2 *form ozone* (O_3) *and nitrogen molecules (NO).* ***"Increase of*** O_3 ***and NO concentration after lightning has also been experimentally observed".*** *This lightning phenomenon created through artificial lightning by a plasma laser pulse or laser system can produce rain in the atmosphere has been practically proved as* ***"Laser-induced water condensation in the air".*** *Scientists have succeeded in obtaining raindrops from an altitude of 75m of the atmosphere by terawatt mobile laser.*

We well know, NO and O_3 ***are endothermic reactions, lot of heat energy is required for these reactions which is subtracted from surrounding clouds…..condensations take place…..condensation is the basic need for water rain drops formations (IRRA Scientists practically proved in Lab).These rain drops act as natural seeding process by wind forces due to acceleration & turbulences to form another sets of rain drops for enhancing rainfall.***

3. ***"Laser makes rain" by Florida University Scientists practically observes …. Ref. (Google search). They further say that the effectiveness of this method is much easier to gauge than traditional cloud-seeding techniques and that it could provide to be a practical means of triggering rainfall****".* By European Scientists (*Search Google as 'Laser makes rain, heavily'2010)*

4. ***Several attempts have been made by various researchers to create artificial rain by laser. Golde (1977) from a number of radar observations has reported that intense precipitation is not even present in the clouds before the first discharge but develops abruptly in the same region after release from which the lightning flashes originate.***

5. ***"Artificial Rainmaking System in a way natural phenomenon" research paper published in journal search on http://www.indist.org,vol.1No.6(Nov. 2008), In this research paper, IRRA Scientists has been published the practical result in a laboratory chamber ….***

6. ***In Indian philosophy, there is mention in 84 Sukkot "Agni ban Badal me Chhodake , parjany vurishti kihi" says Veda Shastra. Veda Shastra's thoughts are true facts in Adhayatm. Means ….as "Fire Rocket launch in the atmosphere for rainfall" …..***

7. ***Now, IRRA Scientists would like to demonstrate "Innovative Rainmaking Technology" on a large scale in the atmosphere, for that's ….."IRRA Scientist Group propose laser system of specification: 10^{15}watt, 800nm, 500mJ, 120fs and 10Hz for this research project".*** *The results could be of immense benefit to human beings.*

8. **Now IRRA Scientists have developed two research project proposals as below…..**

   1) ***"Artificial rainmaking by Peta Watt (10^{15}watt), 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 (10^{15}watt), 800nm, 500mJ, 120fs and 10Hz for this research project". It works when more than 65% 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 terawatt 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 10^{12}watt, 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

9. ***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 andcost effective which is the need of the hour.***

- ***Artificial rain making methods help to increase the green life and oxygen and decreasing the pollution. Thus, these methods play major role in reducing drought and increasing the quantity of drinking water in future.***

By

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Please visit our YouTube Channel search as "Novel Technology for Artificial Rainmaking". Click here:- https://youtu.be/UYfuH9fAmUs

****Please search on Google as S.K.Chopkar or "Rainmaking by Endothermic reactions" or visit our web site http://www.irraindia.org***

Work-Plan

Demonstration on Rainmaking Technology project proposal for Three ***Years Work Planning***

First Year		
1-4 Months	***5-8 Months***	***9-12 Months***
Publishing the advertisement for the appointment of scientists, skilled and non-skilled workers in the reputed newspaper.	***Inviting experts from the concerned area for discussion on the project***	***Organization of two days national conference on the theme of the project***
Demand for different instruments to different venders	***Comparative statements of received quotations for the different instruments.***	***Accessories , assembly and instalment of received instruments on the mobile van and their testing***
Selection of proper site and arrangement of electricity, road, guest house etc.	***Purchase order of proper instrument to proper manufacturing company***	
Second Year		
1-4 Months	***5-8 Months***	***9-12 Months***
carrying experiments on the selected site and recording the observations	***Inviting experts from the concerned areas for table discussion on the observations taken***	***Analysis of the observations taken***
	carrying experiments on the selected site and recording the observations as per the direction given by the experts	***Interpretation of the data***
		Publication of the result in the reputed national and international journals
Third Year		
1-4 Months	***5-8 Months***	***9-12 Months***
Analysis of the observations taken	***Compilation of the data in computer software and commercialization of the same for the benefit of society.***	***Filing the patent for the artificial rainmaking system***
Interpretation of the data		***Appeal to the Indian government and other countries to utilize this project for the benefit of Humankind.***
Publication of the result in the reputed national and international journals		