

Energy Provision by Lightning Harvest

Abstract-- Many people in Democratic Republic of the Congo (DRC) are without a consistent energy source [3]. They also are subjected to frequent lightning and consistent lightning storms throughout the year [2].

It is financially unviable to connect rural areas to the country's main energy infrastructure [1]. Considering these factors we propose the provision of small lightning capture facilities to harness this yet untapped natural, renewable energy source. We believe we can improve the quality of life for the impoverished in these areas by providing them with low cost energy.

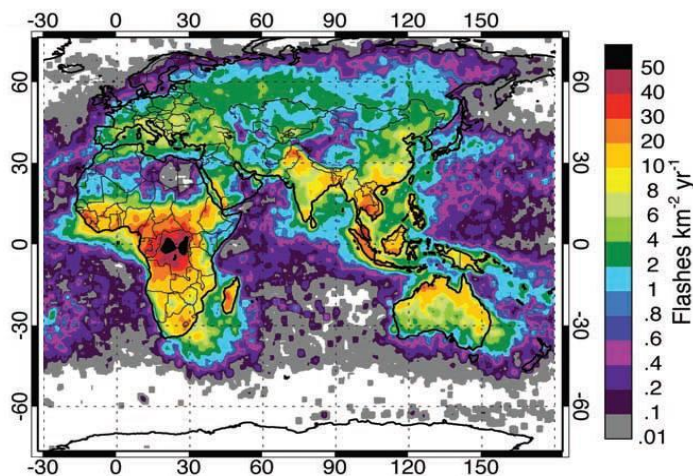
I. FEASIBILITY STUDY

A. What needs to be solved?

Rural communities in central Africa have limited access to energy supply, due to distance from large settlements and the resulting cost. Poverty in such areas means that the communities cannot afford to be connected to existing power transmitters and the population cannot afford to buy electricity.

Electricity supply would be advantageous for these communities as it would supply them with the means for lighting (extending their working and schooling hours), more advanced communication and heating.

Fig. 1. Map of lightning strike variation shows DRC as an area of high activity [2]



B. Why this solution?

We have highlighted central Africa, particularly DRC, because of its seasonally consistent [2] and highly frequent lightning storms (Fig. 1).

The DRC also happens to be in recovery from many years of conflict, and rebuilding infrastructure such as energy supply is a priority in the area. Only 9% of the population [3] currently has access to electricity, and the distribution that is present is unreliable.

DATA

Data	Quantity	Units	Source
Average lightning strike density in DRC per day	~1	km ⁻² week ⁻¹	NASA ^[2]
Area of DRC	2.35 x10 ⁶	km ²	CIA Factbook ^[4]
Population Density	32.2	km ⁻²	CIA Factbook ^[4]
Poverty rate	71%		CIA Factbook ^[4]

C. What research needs to be done?

More research needs to be conducted into the nature of demand for energy in rural areas in DRC, and into the form of storage and distribution most suitable. The technology has been demonstrated under laboratory conditions, we seek to demonstrate its practicality in conditions matching those of a central African thunder storm.

D. What expertise is needed?

This project is firmly in the area of power engineering; both high power and power electronics elements are present. Team members would benefit from enthusiasm in these fields.

E. What limitations are there?

Harvesting lightning strikes is only practical in areas of high aerial electrical activity, such as central Africa. This method would be ineffective as an energy source for large population densities. This idea is not new. Attempts have been made with varied success including some encouragingly successful laboratory experiments [5].

F. What limitations will restrict the project?

The time allocated for this project is two terms, from October to March, within which time we must postulate a method of converting energy from a lightning strike into usable, stored energy.

The provided budget will prohibit the construction of a full working prototype, but we hope to test every element of the model.

REFERENCES

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