ENERGY UNLIMITED PROSPECTUS

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OVERVIEW

The following materials describe an invention potentially capable of supplying complete home, commercial and industrial electrical needs heretofore judged impossible with present day alternative energy technologies. The invention is described in detail to acquaint the reviewer with its potential power-efficiencies and varied commercial uses. A plan for development is outlined, including projected capital requirements, proposed form of business structure and investment strategies.

In addition, a thorough summary of the invention's history and evaluative process is provided along with relevant quotes from its reviewers, followed by information on the Patent rights, relationship with the inventor and short biographies of the inventor and present author.

The appendices are included to substantiate the extensive amount of detailed study and research completed to date on the invention.

STATEMENT OF PURPOSE

A general and widespread consensus exists today regarding the urgent need for a non-polluting, inexpensive source of alternative energy.

Many types of alternative energy devices exist on the market today. None, however, offer the potentially high efficiencies and low materials cost, nor the vast array of commercial and industrial use-possibilities as the device described herein.

In order to support and expedite the widespread and rapid use of soft energy technology in our society, we, the Energy Systems Development Corporation, are developing the device described in this paper through prototype completion and eventual production. We therefore request your careful examination of the present materials.

A substantial number of scientists and engineers involved in the photocell area believe the present solar device warrants immediate and thorough attention toward prototype construction and testing.

Presently standing by are a number of highly qualified scientists and technicians willing to apply their skills toward prototype completion and testing.

This present effort represents the last step in years of research on this concept. Basic research and groundwork have been completed which indicate that this device will be proven fully practical. Success of the remaining effort of prototype completion may be one of the most powerful steps within this century toward improving the quality of life on our planet.

It is within this spirit that we request your careful and thorough study of these materials.

THE INVENTION: BACKGROUND AND EXPLANATION

The invention, termed a Reversible Energy Fluctuation (REF) Converter by its inventor, Joseph C. Yater, first appeared in scientific circles October, 1974, in an article published in Physical Review, considered one of the more well-respected scientific journals in the physical sciences. In this article Dr. Yater explains in detail the physical and mathematical basis for the invention's mechanics, efficiency quotients, design dimensions, power-output potential, etc. This article is attached as Appendix A for the reviewer's interest. A more general and updated description of the REF Converter is supplied as Appendix B.

Inasmuch as fluctuation voltage is basic to this invention, a brief discussion of such would be useful here. In its familiar form, fluctuation voltage is considered an unfortunate occurrence, being the source of amplifier noise which limits the sensitivity of all electronic amplifiers, including radio and TV receivers. In a solid state diode in which the electrons are separated, an electrical potential barrier exists. Due to thermal energy the electrons are moving about, colliding with the walls, each other, and with the potential barrier.

Occasionally in their collisions, a percentage of the electrons gain enough energy to cross the barrier. Fluctuation voltage energy then is defined as the instantaneous voltage difference across a partition (potential barrier) created by an unequal change in the number of electrons on each side of the partition. Similar fluctuation energy occurs with resistors and other electrical circuit components.

The purpose of this invention is to efficiently convert this fluctuation energy voltage resulting from the heated electron motion to a useful, cost efficient form of output power. The heat required to increase the electron motion activity can be supplied by numerous sources. The most abundant, low cost, and non-polluting source of heat for general public purposes is solar energy. In addition, this device has equal if not unlimited potential in the Industrial and Commercial sectors of our society (discussed in Industrial Applications section).

Research into devices similar to the REF Converter was first initiated during the turn of this century. In 1915 the concept of the thermionic energy converter was first suggested, a creative device using high heat sources to convert thermal energy to electric energy by means of release of free electrons. Continued experimental and theoretical investigation on devices of this nature eventually led to development of the photovoltaic or solar cell. These two inventions represent the most common and extensively investigated devices to date for converting thermal energy directly into electric energy. The present state-of-the-art, however, has been limited in achieving highest efficiencies of 15% for thermionic converters and 16% for silicon solar cells. In addition to these limitations on efficiencies, the temperature range over which these devices can work represents a severely restricted limit.

The present invention, the REF Converter, apparently removes these limitations along with providing other improvements in the performance of the direct conversion of thermal to electric energy.

The basic design of the REF converter is to first convert incoming heat in any form into electric energy fluctuations in the heated first layer. This first layer is comprised of microcircuit modules in which the resistors or diodes are exposed to this thermal activity, translating this into fluctuating energy. A continuous second layer of microcircuit capacitors couple these electrical voltage fluctuations from the heated first layer across a vacuum thermal barrier to a contiguous third layer in which ambient (room) temperature microcircuit modules such as diodes convert the electric voltage fluctuations to direct current electric energy.

The available electric fluctuation power of the Converter varies as a function of the circuit size, design variation, and type of solar concentrator utilized. Extensive evaluations affirm that with usage of the sub-micron circuit sizes as proposed, a device one square meter in size could make available between 10 and 100 kilowatts of direct current electrical power per hour, depending on the available solar radiant energy and type of concentrator used. This is certainly much larger than any present known needed practical application, whether for home or small commercial use.

In addition, as a result of the inherent basic design of the converter and its ability to utilize several diode-type systems, 90%+ power conversion is calculated for any temperature and for any temperature difference. This capability makes it possible to achieve energy independence without requiring energy storage for any home or building, whether on cloudy days or at night-time.

The key to the high efficiency of this invention is twofold. One aspect of the REF Converter incorporates a vacuum thermal barrier, preventing the occurrence of thermal conduction from the heated voltage generator, the first layer, to the cooled rectifying diode, the third layer producing the direct current energy. Unlike silicon solar cells, this invention is not limited by the heat losses resulting from the diffusion and thermal conduction processes.

The other key factor facilitating its surprisingly large power potential is the important and fundamental aspect of fluctuation energy output of a circuit component in that it is independent of component size and number of electrons in the component. Therefore, the circuit size of a resistor, for example, can be greatly decreased without at the same time decreasing the available fluctuation power of this circuit component. Given present microcircuitry techniques, a circuit component could theoretically be reduced in size to only a few electrons and would continue to produce fluctuation output efficiencies equal to that of a much larger component. Since this allows the power output per unit volume to increase by decreasing each component's size, it translates as the ability to bring each unit's material costs down to a negligible level.

As a result of the REF Converter having common to each of its design options the heated first layer and the thermal barrier, four theoretical advantages over solar cells become apparent. These advantages are: (1) maximum efficiencies calculated at 82%-91%+ for high power solar energy conversion; (2) maximum power output with available power perhaps thousands of times larger than can

be transferred by thermal radiation to solar cells; (3) minimum material requirements on the order of one-hundredth of the barrier materials for silicon solar cells; (4) the widest operating temperature range for many reversible applications, down to the cryogenic temperature range and upwards approaching the incandescent temperature range.

DEVELOPMENT STATUS

This device has been adjudged theoretically sound by numerous experts in the field, and has generated great excitement within the scientific community as well as Congressional hearings and endorsement by members of Congress. Extensive reviews have demonstrated the REF Converter to be theoretically sound, and project the device will test out substantially as claimed by Dr. Yater. However, the actual working models have not yet been built with which to confirm all calculations. It is the purpose of this working group to build such a prorotype and, presuming the device meets expectations, eventually to manufacture the device for commercial use. Needless to say, if the device performs as expected, the implications for low-cost and pollution-free energy are staggering, and the potential industrial uses are innumerable.

PROPOSED INDUSTRIAL & COMMERCIAL APPLICATIONS

The following applications for the REF Converter are a partial list of its most well-defined and researched areas of use. As a result of the Converter having the capability, compared to the present

solar cell, to operate at a much higher efficiency and at a much higher heat output over a considerably wider temperature range, the following design goals are feasible and practical applications, offering immediate and maximum potential.

(1) Steam Power Plants

Steam power plants are presently limited to 40% efficiency for electric power generation using fossil fuels. Complementing the REF Converter with fossil fuel use, operating furnace temperatures of 1700°F can be achieved enabling theoretical power conversion efficiencies of up to 80% to be realized.

(2) Topping and Tailing -- Cogeneration

The wider temperature operating range of the REF Converter enables it to work off and efficiently utilize the unusable temperature of the waste heat of many other types of power and industrial plants. By utilizing both the wasted heat from initial combustion (topping) and the wasted exhaust heat (tailing), the efficiency of other types of power and industrial plants can be greatly increased. This makes its use with cogeneration technology highly feasible and widely applicable.

(3) Space Solar Power Stations

The high output-power per unit weight of the micro-modules could enable a significant weight reduction over the silicon solar cell, even if only similar efficiencies were achieved.

(4) Heat Pump and Refrigeration

The reversible cycle resulting from the minimization of thermal losses enables the same thermal cycle to be used in a heat

pump mode and a refrigeration in addition to the power conversion mode. By operating the converter backwards, i.e., by simply increasing the voltage at the output terminal so as to reverse the current through the circuit, it will, in theory, transfer heat from the cold side to the hot side, operating as a cooling device.

(5) Home and Commercial Solar Conversion

A high input temperature for the device can be realized by concentrating the solar radiation, to enable efficiencies of 80 to 90 percent to be achieved for electric power conversion. One design, among several, has been formulated for a thin solar concentrator layer which can effectively increase the temperature of the first layer to produce these power efficiencies. Certainly the most far-reaching application, home and small business power generation can, in addition, be supplemented by the converter's us·s for heating and air-conditioning, as inherent in each design application is the same basic innovative circuitry.

PROTOTYPE DEVELOPMENT PROCEDURE

It must be emphasized that the above applications are speculative. However, the invention's theoretical basis has undergone numerous in-depth analyses over the past several years (discussed further under Historical and Supportive Research.) Analysis of the circuit and extensive computations show that the maximum theoretical efficiency can be achieved if significant thermal losses can be prevented from occurring across the thermal barrier. The technology for manufacture of the actual components exists, and the thermal barrier

fabrication is the most significant factor. The greater the temperature differential between the converter's layers, the greater the conversion efficiency of thermal to electric power.

In addition to analyses performed on the thermal barrier, repeated theoretical computations show the converter's basic design can withstand the thermal bending stress, radiation pressure, and gravitational forces to be encountered in delivering the efficiencies calculated.

All design alternatives that were analyzed show that whereas the solution to considerations posed by thermal conduction losses require careful attention, there are apparently no inherent physical limitations to the concept that will prevent the design of a satisfactory thermal barrier. In a conclusion by MIT's Innovative Center at Cambridge, following an extensive and formal second-stage evaluation of Dr. Yater's invention, they concluded, regarding the model's workability, that "The concept is theoretically plausible" and were unanimous in their opinion that "The only way in which these factors can be properly evaluated is to build a model of the device."[1]

In the development of this invention, the first step will be to fabricate and test a model containing the thermal barrier. As the level of technology necessary to design and fabricate the microcircuitry needed for the converter is presently available, actual construction of the thermal barrier will be the decisive and important step required to open the way for parallel development of the model's many applications. "If this first step verifies the theory, then rapid and predictable progress can be expected."[2] (Joseph C. Yater, before a Congressional Hearing, June, 1976.)

Current best estimates for prototype development by the inventor and corroborated by Albert L. Hedrich, Senior Evaluator in the Office of Energy-Related Inventions (Washington), was within a time frame of six to 12 months. Entire efforts during this period would be to focus on and coordinate fabrication and testing of a prototype model. If testing of the converter proves successful, an extensive development effort, including parallel research into all its applications, would be initiated.

In considering longer range goals, it is expected that within two to five years, following successful completion of the working prototype, mass production of the REF Converter's circuits could be fully automated using microfabrication techniques such as X-ray lithography or silk-screened circuits. This would continue to decrease manufacturing costs per unit and increase commercial utility even further, as material costs would remain at a negligible level, thus making the converter available to low-income consumers.

CAPITAL REQUIREMENTS

In order that development of a demonstration model can begin as quickly as possible, initial working capital is necessary.

Areas of needed funding and best projected estimates for sufficient capital over a 12-month period include:

1.	Prototype materials costs.....	$ 61,500
2.	Professional consulting fees--scientific.....	42,800
3.	Professional consulting fees--legal.....	18,000
4.	Technical & engineering fabrication salaries.....	55,000