New Concept for Electric Energy Metering

Originally Developed and Proposed by

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Original Copy of Brief Notes for a Proposed Concept of Electric Energy Metering

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The ideas expressed in these notes are based on the writer's experience in the electrical system in his country (Liberia, West Africa). These ideas are being put forth with the hope that they may stimulate an establishment, i.e. research institute, engineering firm or utility, which may wish to participate in its development. The writer is aware that the commercial development or viability, and the applicability of this concept may require consideration of the prevailing conditions in the electrical systems.

Background:
The energy losses occurring in an electrical distribution system can be classified into two main categories: a) Technical, b) Non-technical or commercial.

Technical: Technical losses occur as a result of power flowing through the network – these include losses occurring in the generation, the transmission and the distribution systems. These losses, while unavoidable, can be controlled by choosing the right parameters in the design of these systems.

Non-technical or Commercial: Non-technical losses occur as a result of human factors that act within the transmission and distribution systems. These factors can range from deliberately bypassing the conventional energy meters installed by electric company either by the consumer or an employee of the company, or someone knowledgeable in this field; a misreading or under-reading of the customer etc.

The electric company in Liberia faces a great burden in curbing the non-technical losses within their system due to the low economic base of the majority of its consumers coupled with the ease with which consumers change residences. As the majority of the consumers are residential, the electric company has to impose a higher tariff on the industrial consumers to augment the losses caused by the impact of the residential. Figures for industrial versus residential consumer loads can be easily obtained from the electric company.

In order to minimize the commercial losses, the electric company has considered various scenarios administratively with little success and the prospect for an improvement in the billing and collection efficiently in the immediate future does not seem likely.

Mode of Generation: At the present the source of electric power in Monrovia and some adjacent cities is derived from gas oil and heavy fuel oil which have to be imported in the country, thus placing a heavy demand on the country's foreign exchange earning which has experienced a severe decline as a result of the current (back in 1992) in the country. Additional to the decline in foreign exchange earning, the hydroelectric power plant which provided over 75 percent of the electric power suffered a major damage and is presently out of service; no definite rescheduling for its re-commissioning has been established. The use of imported oil for its power production

demands that the electric company takes every measure to improve its billing and collection efficiency.

Proposed energy metering system: The system proposed is one in which the supply of electricity to a consumer is controlled by a module which is activated by a magnetic or similar component whose magnetism or otherwise physical properties will decay in proportion to the quantity of electricity consumed. After a complete decay in the physical properties, i.e. magnetism of the component, the system will automatically shut off the supply of electricity to the consumer. Supply to the customer will only be resumed by the replacement of the component with a new one. The component will not be reusable. These components will be the subject for future consideration by the company. The basic principles of the proposed concept are shown in the Figure 1 below.

Advantages:

1. Need for meter readers become unnecessary – hence interaction between meter reader and consumer is eliminated.
2. Consumer pays the electric company for his/her consumption in advance thus providing improved operational funds to the company.
3. The controllability of electricity consumption by the consumer is improved greatly which inevitably leads to efficient use of energy.
4. Non-Technical losses will be minimized drastically
5. Technical implementation of the proposed concept does **not** require advance telecommunication systems. This is an important factor in the view of the fact that in Liberia and also many developing countries, the availability of reliable telecommunication systems for the vast majority of consumers of electricity is obsolete.

Other technical aspects

1. The module will be robust in terms of system operational conditions.
2. Field test will be necessary to verify the design performance.
3. Customer safety and system security will be central in the development process

Cost

At this point (1992), the cost for implementing such a system cannot be determined, as all the technical details for its manufacture and installation have to be established.

The novelty of the proposed concept is the ***independence*** of the module of modern telecommunication systems; the ***applicability*** of this concept in electrical distribution systems in development countries.

In this brief description, only the fundamentals of the modules have been given. An in-depth explanation of the functionalism and manufacturing approach will be presented after results from the first “new product/concept” investigations are obtained, and when a formal patent application is made.

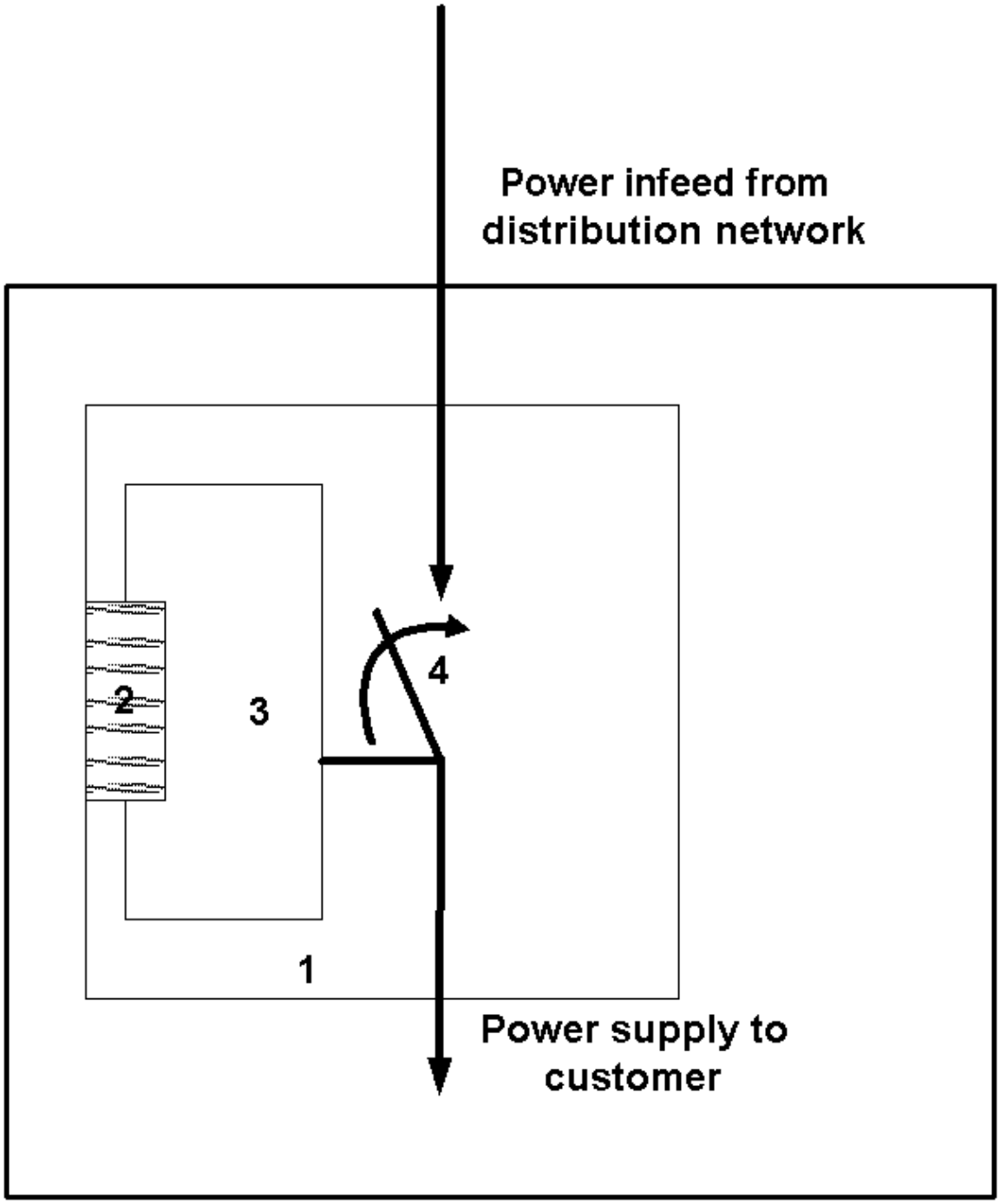

Figure 1. Energy Metering System

Legend:
1 = Energy Metering System;
2 = Input for activating device (magnetic card or similar device)
3 = Electronic circuitry, energizer, digital counters, magnetic or similar device
4 = Relay or similar switching device

About the Author (As written in 1992):
The author, Mr. Emmanuel E. W. Jones is a 1963 graduate of the Regent Street Polytechnic, now the Polytechnic of Central London. Since the completion of his studies he worked with what is now named the Liberia Electricity Corporation in his home country in West Africa. During his employment with the LEC he served in various capacities in both the urban and rural parts of the electric system of Liberia. He requested early retirement from the LEC in 1980 and formed an engineering consulting company (LAUVICOM ASSSOCIATES INC. – Electrical Engineering Services. In 1991 he was appointed non-Executive Chairman of the Board of Directors of the LEC.

Due to proximity and logistical reasons, the author has granted all rights and permission to represent and negotiate on behalf of LAUVICOM ASSOCIATES INC. to his son Mr. Lawrence E. Jones who resides in Sweden and is a student in Electrical Engineering at the Royal Institute of Technology.

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