

MANAGEMENT OF ELECTRICITY TO A COUNTY LIBRARY

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Abstract: *The effects that manifest themselves at the scale of the Organization, in which energy is consumed, are related to the influence of its cost in financial balance. The importance of energy cost depends on the area of activity of the company. There is, however, a high potential for energy saving in most sectors of economic activity and in most institutions. Energy conservation is often a "painless" reduction in operating expenses. This does not imply employment for employees, and the investments required are often reduced and have minimal risk.*

1. INTRODUCTION

In recent years it may find a constant increase in energy costs. Liberalization of energy prices will worsen and more than the increase in the near future. This price increase, particularly in motor fuels contributed to stimulating public interest in reducing consumption and efficient use of energy through the implementation of energy policies.

Energy savings management involves the development of a precise organizational structures within the society concerned, to conduct regularly a series of actions for the functioning of the well-defined with a higher energy efficiency of technological installations.

1.1. Power quality Problem

To ensure the quality of energy delivered at the point of consumption is not easy and there's no way that electricity that does not comply with the standards to be withdrawn from the food chain or refused by the consumer.

High-quality electricity-electricity available permanently (continuously) to the values of the parameters (frequency, RMS, sine shape, symmetry of three-phase system) within limits allowed by the rules. [5] Note that technical parameters are actually blood parameters, do not have the energy or power direct current.

Achieve the level of quality offered by the electricity suppliers cannot be obtained only under conditions ensuring technical and maintenance requirements at the level of the distributor, producer and transporter of electricity. In this way, monitoring quality indicators at the point of interface between carrier and distributor as well as providing the level of quality standard in these points are decisive in ensuring the level of quality offered by the supplier. Knowledge of quality indicators at the point of interface between manufacturer and carrier are of particular interest in assessing the level of quality of electric energy at the point of connection with distributors.

At the same time, the quality of electricity has a significant effect on the economic indicators of the transport network and is a defining parameter for evaluation of its performance.

To a large extent, disturbances that lead to diminishing the level of quality of electric power are determined by consumer activity (unbalance, flicker, harmonics, etc.). But production systems, transportation and distribution, thanks to specific requests occurring (lightning, wind, ice, damage deposits, etc.) may be the source of disturbance in the form of switches, Voltage dips, surges, and voltage variations and frequency. Also at overcoming the tape tension, permitted transmission network can be the source of voltage harmonics, so by downloading the corona as well as the operation of nonlinear characteristic on magnetic circuits.[1]

Power grid development must take into account to ensure the level of quality standard of electricity at the point of interface with the distribution network.

Knowledge of quality indicators, practical determination method, interpretation of the results of their monitoring, knowing the limits of disturbance, presents a particularly interest in securing energy as well as for decisions relating to measures to be taken in order to achieve the required quality level.

2. ENERGY POLICY OF THE INSTITUTION

Regardless of the size or type of organization, the common element of success is the commitment of the entire energy management organisations. [11]

A commitment of the organisation shall be effected by the allocation of staff and financial resources necessary to achieve continuous improvement in energy efficiency. To develop and implement their programme of energy management, the management of the institution must be:

- to establish a dedicated team energy management;
- to set up an energy policy.

Energy policy is the basic document for energy management success. This formalizes the support of senior management and articulates the Organization's commitment to energy efficiency for all employees, shareholders, the community and other stakeholders. [11]

One of the first tasks of the team designated for energy management within the institution will be drafting an energy policy to guide the process of energy management in the following stages.

3. PROCESSING AND ANALYSIS OF DATA

For this analysis the data obtained were processed on the invoices of electricity and natural gas for a period of 12 months, between October 2012 and September 2013. They also obtained data on the consumption of electricity and the Electrical Supply, S.C. Electrica Furnizare S.A. for the period 1 January 2013 to 31 October 2013.

Electricity consumption at the "Petre Dulfu" county library Baia Mare is measured by a single digital counter, which allowed production costs per one-hour intervals, on calendar days. In the period under review, the total consumption of electricity both active power and reactive power was 152.962 MWh, which represents a total cost of 82298.74 RON, at an average price of 0.55 euro/kWh active energy respectively 0.08 lei/ kVARh - reactive energy. Below are presented in graphical form, electricity consumption on different intervals.

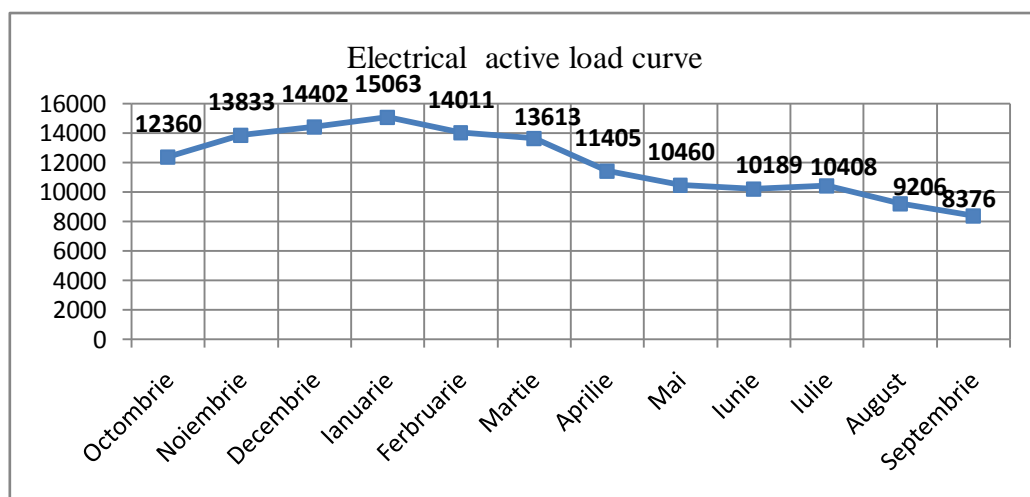


Fig. 1 Load curve-active energy [kWh]

Analyzing the graph with monthly consumption active energy [kWh] (fig. 1) can be noticed an increase in winter and a decrease in the hot season, from April to September

inclusive. This fluctuation of electricity consumption, according to the two periods, and can be explained by the fact that one of the main consumers of this institution, through specific activities, represent the lighting, a longer period of operation rises about 4 hours in cold season, also during summer Saturdays is non-working day and more than 70 % of its staff, schedule a part of summer vacation.

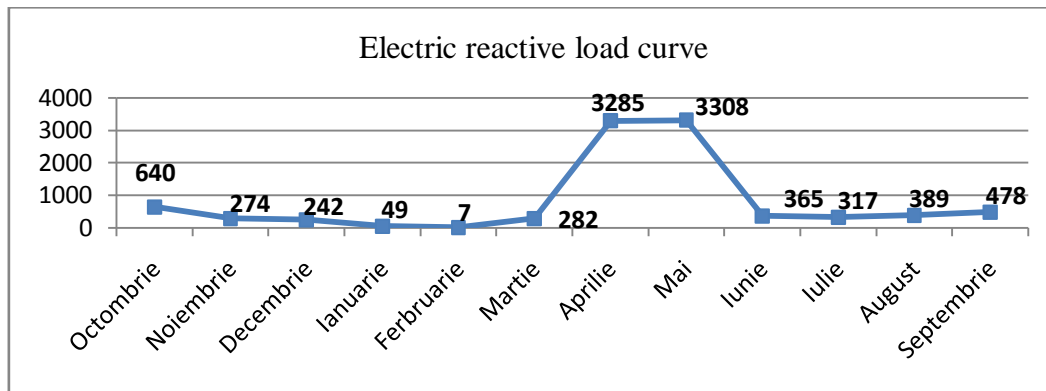


Fig. 2 Load curve-reactive energy [kVARh]

3.1. Energy intensity

The common parameter used to characterize the energy efficiency is energy intensity, defined as the ratio of resource consumption (energy) and the value of products (services) is achieved. In the case of public institutions, which are not productive units, energy consumption may be reported on the surface or the number of clerical staff.

In this case the relationship of energy intensity can be written in the form:

$$I = \frac{W}{S} \tag{1}$$

W – energy consumption [kWh];

S – the working surface [m²]

In the case of energy intensity will be library:

$$I = 100.54 \text{ kWh/m}^2$$

or

$$I = 31.87 \text{ kBTU/sq.ft (to compare with the similar institution in the U.S.A.)}$$

To ascertaining the whereabouts of placed the library of energy efficiency it is necessary to compare the value of energy intensity with a similar institution. Energy audits in Romania is in its infancy, there is no data in this sector of activity, as a result will be used as a reference a public library in the United States of America.

The equivalent energy intensity in the United States is Energy Use Intensity (EUI) and is measured in kBTU/sq. ft. It should be noted that in the United States use two distinct values of the EUI Website: Energy Intensity, and the Source Energy Intensity.

Site Energy Intensity is the amount of energy (electricity and natural gas) consumption on one foot square (square foot) carpet surface, which is measured by counters located at the institution.

An analysis of load curve of reactive power consumption [kVARh] (Fig. 2) shows an average of about 400 kVARh, with a jump of over 8 times in April and may. In discussions with the administrator of the institution and with the electricity supplier has appeared that over that period there was a crash at the battery of capacitors, mounted in the library building, which has led to the emergence of anomalies in the network and the load graph tip.

An efficient management of energy consumption would have resulted in the failure to promptly remedy arising from the battery of capacitors.

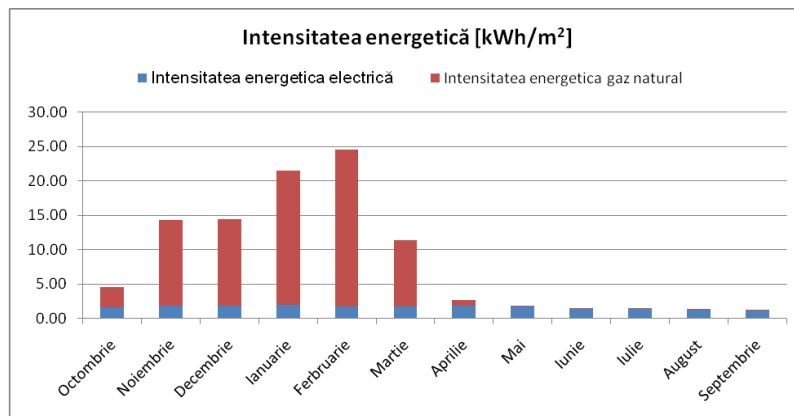


Fig. 3 Monthly energy intensity energy types

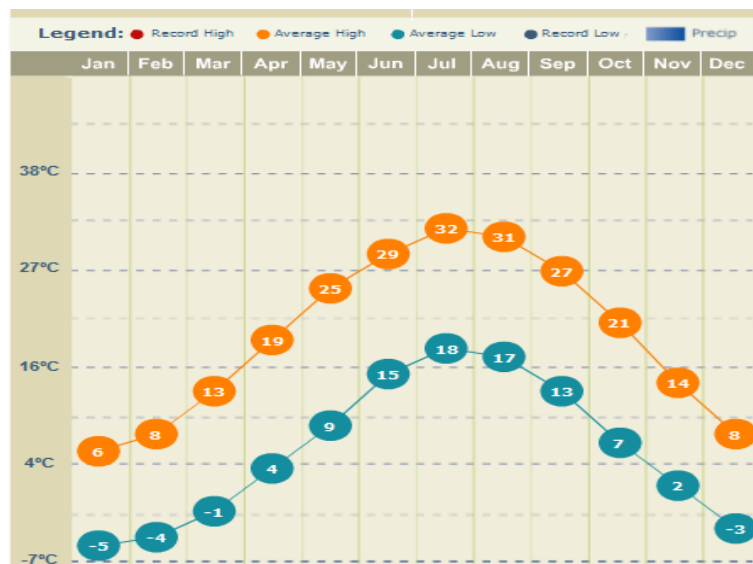


Fig. 4 Graph of average temperatures for Cherry Hill

Source energy intensity and take into account the energy consumption with production, transmission and distribution of electric energy, namely the energy lost to the storage and distribution of natural gas. The national average in the u.s. is: for every BTU of electricity

output used by the end user, it consumes an energy totaling 3.34 BTU for obtaining and transporting it. In the case of natural gas ratio is lower, 1.047, cost only reflected in its price, which is lower. In conclusion, the two may have the same value for energy intensity, but a different value to the source energy intensity. If you use different sources for the supply of electricity or natural gas.

For comparison was chosen at Cherry Hill public library in New Jersey, the main reasons being: public availability of energy intensity data (Library web site) [3], but the monthly average temperatures close to (less than higher) than those of Baia Mare.

3.2. Fluke 435 analyzer measurements

For this analysis were processed data obtained from measurements made with a spectrum analyzer, power quality Fluke 435 model, connected to the main board of the consumer for a period of about 24 hours, thus being covered a whole period of activity of the institution.

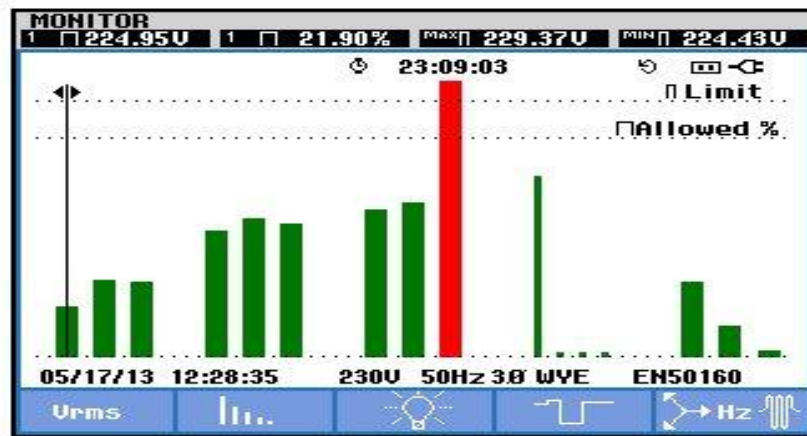


Fig.5 Monitoring power quality energy

During the monitoring of the quality of electric power has been an overrun of the index of severity of flicker, $P_{lt} = 1.3$

MONITOR EVENTS URMS				
START 05/16/13 13:19:32			EVENT 3 / 3	
23:09:03				
DATE	TIME	TYPE	LEVEL	DURATION
05/16/13	15:05:16:153	L2 DIP	203.5 U	0:00:00:280
05/17/13	03:10:47:125	L3 DIP	186.4 U	0:00:00:070
05/17/13	01:19:32:428	L3 Pit	1.3	2:00:00:000

05/17/13	12:28:35	230U	50Hz 3Ø WYE	EN50160
SELECTED		NORMAL		TREND
ALL		DETAIL		BACK

Fig. 6 Monitor events

4. SETTING GOALS

Establish clear and measurable objectives is essential to understanding the desired results, the development of effective strategies and obtain financial gains. [5]

Establish clear objectives help in decision making and are daily base for monitoring and assessment of progress.

Communication and recording goals can motivate staff to support energy management efforts across the institution.

The purpose of the performance goals may require several levels of organization, and various time frames for the completion of specific objectives.

The library will be established both in the institutions and departments. In respect of installations and equipment which are the subject of the process efficiency, these are as follows:

- interior lighting (particularly in the area of reading rooms and stacks of books);
- exterior lighting;
- computing equipment;
- server room.

From the point of view of eşalonării in time of the objectives set for “Petre Dulfu” county library Baia Mare there are two basic categories:

- annual objectives which allow tracking and reporting progress regularly and throughout the conduct of the trial;
- long-term objectives, between 3-10 years.

After analyzing data, the management team of electricity established to achieve the following objectives:

- reduce energy consumption by 10 % over the next two years (2014-2016). In the current annual energy consumption is 784252 kWh, which would supposedly reduce 78.5 MWh by 2016;
- implementation in 2014 has a system for monitoring of electricity consumption, allowing for real-time observation of the occurrence of any failure and fix them in a timely manner; identification of possible sources of financing for the installation on the roof of the buildings of a photovoltaic solar system with a capacity of 10 KW.

5. MEASURES TO REDUCE THE ENERGY CONSUMPTION

Measures to reduce energy consumption (MRCE) are recommendations for public library, based on improvements in conditions at present. As a result of the analysis of data, the following measures have been identified to streamline the energy consumption:

Table 1

No. crt.	MRCE recommended. The investment recovery period 0-5 years
1	Replacement of 48 of filament lamps with compact fluorescent lamps (CFL)
2	Replacement of 16 monitors with CRT monitors LED equivalent
3	Replacement of halogen exterior floodlights 8 with metal iodide lamps
4	Optimisation of consumption in server room
5	Replace the 3 refrigerators (10 years old) with class A models
6	The change has the halogen spotlights with 202 spotlights LED
7	Replacement of 20 desktop computers with thin-client terminals
8	Installation in the reading rooms and stacks of 33 light presence sensor
9	Installation of taps thermostat for 30 radiators
MRCE recommended. The use of energy from renewable sources	
10	The installation of a photovoltaic system on the roof of the building 10 kW

Apart from the measures mentioned above, it is recommended to also:

- the installation of more efficient engines from the energetic point of view at the time that it is necessary to replace them, especially those of higher powers of 1 KW (elevators, circulating pumps of the heating, etc.);
- the repair or replacement of the gaskets with problems from windows;
- the use of a system for real-time monitoring of electricity consumption;
- achieve publicity of the measures implemented and results obtained, both among employees and in the local press.
- employee awareness regarding the efficient management of energy consumption through various campaigns.

5 CONCLUSIONS

Without a doubt, it is found, a must all the more acute for reducing energy consumption, especially in the conditions in which it is increasingly expensive and each kWh saved is a kWh won.

From the analysis made at the county library is found that is justified, in economic terms, the implementation of measures to rationalise energy consumption. Thus it appears that the majority of the proposed measures to save energy have recovery time under 2 years less *MRCE no. 2: replacement of 16 monitors with CRT monitors LED equivalent*, which pays off in about 3.6 years.

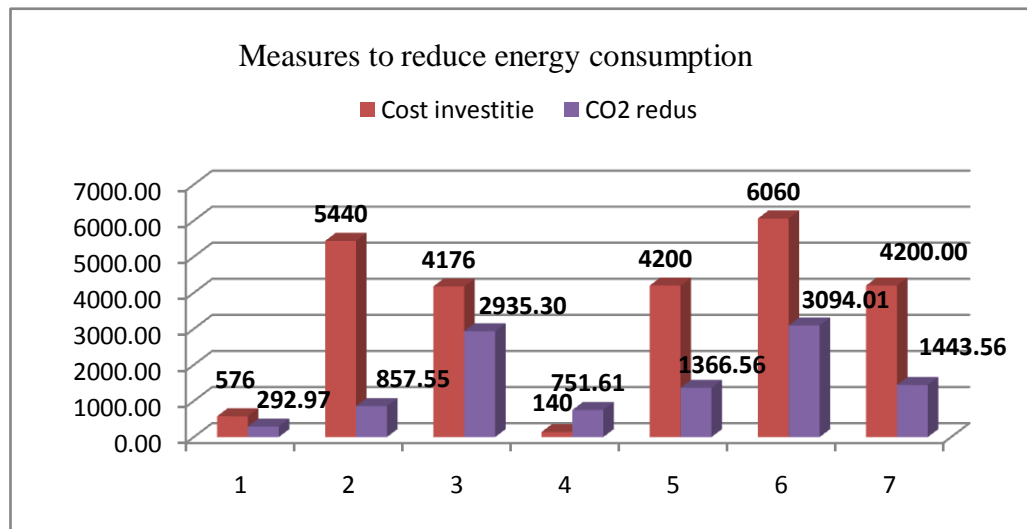


Fig. 7 The analysis of measures to reduce energy consumption

There is a preconception that pollution is caused especially heavy industry and traffic, but currently, an increasingly important role in polluting the atmosphere is getting electricity from conventional sources, especially that produced by burning fossil fuels. In conclusion, a reduction in energy consumption assumes the default mitigation a carbon emissions into the atmosphere.

If the county library, with investments of approximately \$ 25,000 would save over 34 MWh annually, avoiding the emission into the atmosphere over 10741 kg/year CO₂ emissions, equivalent to the amount generated by the 18 cars (Euro Euro 3), within a year.

At the same time carrying out a monitoring system to provide real-time information about electricity consumption, is one of the first steps that should be made for the efficient management of electricity consumption.

Whichever solution is chosen, the institution or solutions, but last but not least the local community will have won, by saving the public money and use the amounts obtained in this way, the purchase of books for the library users.

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