**Bulletin de la Société Royale des Sciences de Liège, Vol.** 85, 2016, *p*. 1070 - 1079

# System of Energy Consumption Information Management of Hamadan University of Medical Sciences

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**Abstract**

The development of management and professional knowledge related to energy consumption efficiency as well as standardization of its consumption in different part of consumer are the most important methods of controlling the energy carriers' consumption methods and protecting the national capitals. Energy management project at the University of Hamadan Medical Sciences with regard to the notable development and expansion of subsidiary departments at the provincial level and a significant consumption of energy and materials in these departments was defined 2011 and it was announced for implementation on behalf of the Energy Efficiency and Consumption Committee of the University for Departments. To stabilize the flow of information and to record them easily, accurately, and reliably, and easily and quickly monitoring the use of peripheral departments, the feasibility of reporting in a variety of formats, exchanging information regardless of geographic location, a reliable safety level in database and protected data, move in line with e-government and the use of computer equipment available at the university level, the system of energy consumption information management was designed and constructed. The useful findings of this study included increased information of managers of the departments related to energy consumption in departments under their management and help to more precise planning in future. The invention of the method will help to greater efficiency of funds in future years.

**Keywords:** Knowledge management, targeting subsidies, system of energy information management

## 1. Introduction

Targeting the subsidies plan was initiated in 2010 in order to further transparency of prices and realistic cost of goods and public and private services, reforming the pattern of consumption and saving in consumption, increased willingness for savings and investment, reduction in national costs due to reduced wastes, improvement in processes and effective use of new technologies, detecting natural level of goods and services price [1]. Dumping the price of subsidized goods including energy carriers leads to more transparency in

market prices and thereby an improvement in the signaling effect of prices in the economy of country. Therefore, it leads to economic transparency [2]. The rule of development of public transport and fuel consumption management (approved by the government in 2007) has been obligated in order to exclude the gasoline and diesel fuel from supporting basket of government. Article16 of the general policies of the system in the Outlook Plan refers to change in the system of subsidies and transfer payments of government and transparency subsidies hidden in the economy of the country, coinciding with the implementation of compensation policies and strengthening comprehensive systems of social security and support of lower classes [3]. In a study conducted by Evian et al (2006) in one of the Japan hospitals, it was shown that electricity energy consumption is associated with ventilation system, lighting, and medical equipment, and energy consumption in hospital buildings is more than other buildings. Generally, the use of renewable energy systems such as solar energy and improving energy management system result in cost and consumption savings [4]. In a study conducted by Bull and Adams (2008) in the United States, it was shown that use of automated systems in the building, improving mechanical and electrical equipment and developing training program and providing data awareness to health sector coworkers have had impact in energy consumption level [5]. In following green management policy [6] of country in the field of the management and optimization of energy consumption, including improving the efficiency of energy, environmental protection and economic efficiency, and energy demand management, research and development in the correct and optimum use of all available resources and facilities and planning, and long-term insight with an emphasis on the realistic executive programs, studies were carried out on designing and construction of system of energy consumption information management, since development of management and professional knowledge related to the optimization of energy consumption in different parts of customer are the most important controlling methods of consumption of energy carriers and protection from energy subsidies of country. as well as standardization taking it in a different part of the most important consumer of controlling the energy carriers consumption methods and safeguard the national capital. With regard to the sums paid in the energy subsidies in the country, optimizing the energy consumption in health system sector, Iran needs to develop, strategic vision and planning.

## 2. Problem statement

Existence of various issues and features currently and between long-term and short-term in universities such as increase in energy prices, diversity of service in the subordinate departments of Medical Sciences universities, various structures in subordinate departments (health centers, clinics, hospitals, educational and research environments, etc.), large geographical dispersion of subordinate departments, different types of energies used by departments such as oil, gas, diesel, gasoline, water, electricity, differences in controlling processes depending on the type of energy carrier used, difficulty of collecting information in terms of accuracy, rate, cost and systematic nature, lack of internal

sensitivity of departments due to lately awareness of consumption and prolonged feedback process, and the lack of local and regional standard consumption pattern, are considered as important cases in the area of energy carriers. Energy management project at the University of Hamadan Medical Sciences with regard to the notable development and expansion of subsidiary departments at the provincial level and a significant consumption of energy and materials in these departments was defined 2011 and it was announced for implementation on behalf of the Energy Efficiency and Consumption Committee of the University for Departments. Hamedan University of Medical Sciences is faced with many dispersion and distribution with 2400 hospital beds in 15 hospitals and 582 health centers and several paraclinical center such as pharmacy, dentistry, and emergency medical centers, that each of them has high energy due to medical facilities available, energy consumption to use equipment, heating, and lighting.

Hospitals and health centers are the most vital organizations in each community and their strategic position in dealing with critical events and their essential roles in increasing the health and well-being level of country. Therefore, to stabilize the flow of information and to record them easily, accurately, and reliably, and easily and quickly monitoring the use of peripheral departments, the feasibility of reporting in a variety of formats, exchanging information regardless of geographic location, a reliable safety level in database and protected data, move in line with e-government and the use of computer equipment available at the university level, it was felt that there is ned for system of energy consumption information management.

## 3. Importance of problem

• The need to change attitudes on using energy as shared heritage among generations and preserving this capital for future generations (religious, national and global doctrines)

• obligating the rule of targeting subsidies to reform energy consumption patterns.

• The inability of medical science universities in the timely payment of the cost of energy carriers' consumption

• promoting a culture of self-assessment and self-control among departments to achieve financial independence in the medium-term time horizon.

• Transparency of energy costs and the need for planning and designing appropriate interventions

## 4. Procedure

• Recognition of the existing situation and studying the current problems.

- Increasing the energy carriers' prices

- Diversity of services in the subordinate departments of the University of Medical Sciences
- Structural variety of subordinate departments (health centers, clinics, hospitals, educational and research environments, etc.)
- Large geographical dispersion of subordinate departments
- Difference in type of energy used such as oil, gas, diesel, gasoline, water, electricity

- Difference in controlling processes in terms of type of energy carrier consumption.
- Difficulty in collecting consumer information in terms of accuracy, rate, cost and systematic nature
- Lack of internal sensitivity of departments due to lately awareness of consumption

- Prolonged feedback to departments to reform consumption pattern
- Lack of consumption pattern due to lack of appropriate scale.

• Reporting on recognition of present situation and announcing the importance of issue to head of university and obtaining the consent and support of the project.
•Formation of a planner and guiding team and environmental collaboration team for division of labor and systematic registration of different cost of energy bills in 2012.

• Designing system of access to energy consumption information before and after the targeting the subsidies rule with guiding views and comments of ministry's budget office

• Collecting energy costs documents of 2009 from the archives of finance in the form of census of all bills pre-designed tables (7974 cases).

• Collecting documents of 2011 from the archives of environmental departments finance office with field investigation.
• Extraction of sample of information in years 2012 and 2013

**5. Design**

The structure of the system is close to the budget concepts of health sector and medical sciences. For this purpose, basic information in six parts of city (including Asadabad, Bahar, Tuyserkan, Razan, Famnin, Kabudrahang, Malayer, Nahavand and Hamadan), budget code (hospitals, emergencies, urban health care centers, rural health care centers, vocational centers, education, welfare, culture and research sector), budget subgroup (including food control laboratory, welfare pharmacy, food-drug deputy, drug store, hospital, health care centers, urban health centers, health center staff, health deputy and network staff) and 922 cost centers were categorized. Since measurement units of energy carriers are based on liters, kWh, and cubic meters as inserted in contents of bills, cost units of water, electricity, gas and gasoline and diesel, and oil were defined. On the other

hand, to separate information that different users will insert in the system, manager of users was defined in the system that included list of users that service officials of hospital departments and health and staff centers received their own password. In addition, users were distinguished by classifications such as budget code, city name and the name of department. The structure of the classification was based on alphabetical letters and type of standard budgetary code used in the country.

### 5-1- Recording the information

Users are entering to their own are with their password and record the file number of counter. Recorded numbers, depending on the type of bill, allows the headquarter controller the possibility that match the information recorded in the system, if necessary, with the information available in the site of water, electricity and gas departments and ensure the correctness of information inserted randomly. In the meantime, this method of retrieving the information allows user and controlling headquarter the possibility to obtain needed information from the relevant sites if bill had not been issued or it has not been delivered to health system. Another point that was used in the design of the system is the use the representing icons of energy carrier such as water, electricity, and gas by selecting the type of carrier, that icon ensures the user that he is on the right path to record information. In the case of information related to gasoline and diesel, the retrieving number is the license plate of the car using the fuel. However, the retrieving number of oil and gasoline used for heating or generator will be 10-digit code. After recording the file number of counter, information of carrier bills will be recorded. For this purpose, forms were prepared that phrases used in it are exactly those have been written in the energy bills. Thus, the user with the lowest difficulty and without any calculation and interpretation records the information immediately against any phrase in the appropriate location in the system and a device is provided for him to reform and record the false information. To complete justification of the users, two workshops were held. One particular workshop was held for service officials of departments in the ear of training working with system and another workshop was held by help of technology management coworkers, special for informatics specialists of departments and they were trained to resolve the system problem in the case of any technical problem.

### 5.2. Reporting

In the reporting part, based on micro information entered to system, micro functions of department per month, the list of university departments and bar graph of departments and pie graph of various outcomes can be obtained. Currently, about 10 thousand bills have been entered to system that different combined reports can be extracted based on needs of managers. Excel output is available for data analysis, in which vast computing is possible.

Separated or combined reports on basis of subsidiary cities departments, type of energy bill, arbitrary budget code, target budget subsidiary, a single department, and classification based on consumption level, and the year and month of consumption are tools providing appropriate reports. These reports show the consumption rate of departments with the lowest cost and spending little time for comparison, even in the farthest point of the university center, and management decisions can be easily adopted.

**5-3- Informing:**

Due to necessity of informing in certain situations, a page has been embedded in the system providing necessary information immediately for users and managers of departments in the least possible time, when necessary.

**5.4. Determining the usage limit:**

Based on consultation made with experts of water, electricity, and gas departments and according to information obtained from cost centers, the consumption limit of centers are under determination. This level is measured depending on the different seasons of the year, geographic location, and cost center area, and managers monitor their energy consumption using these allowed energy consumption limits and prevent from resources waste. Currently, the standard level for home electricity consumption has been determined 100 kW / hours per month. As health workers living and working in these centers, they receive energy subsidies from government, in the case of using electricity more than the allowed level according to certain and approved limit they should pay the excess cost themselves.

**5-5- Advantages of system**

-Working on the Web environment and internal network of university

-Easy to work with the system manually (registration limited bills like hospital bills).

-Full match of the system environment to form water, electricity, gas bill and transfers diesel, oil, and gasoline consumption draft to prevent visual errors

-Ability to control the accuracy of the information entered simultaneously with water, electricity and gas database.

-The ability of entering of recording control steps in the process of investigating the financial documents:

A) Controlling the bills in terms of ensuring of their information entering in the system

(B) Controlling in terms of observing the power usage limit allowed for subordinate departments (including health centers, etc.).

• Identifying consumer unit with identity code based on the program budget code of the Ministry of Health (training departments with training budget code, the health department with health budget code,...).

• Ability to determine usage limit for serving departments with various functions (health center, clinics, etc.)

### 5.6. System facilities

•Obtaining desired reports and charts in various forms.

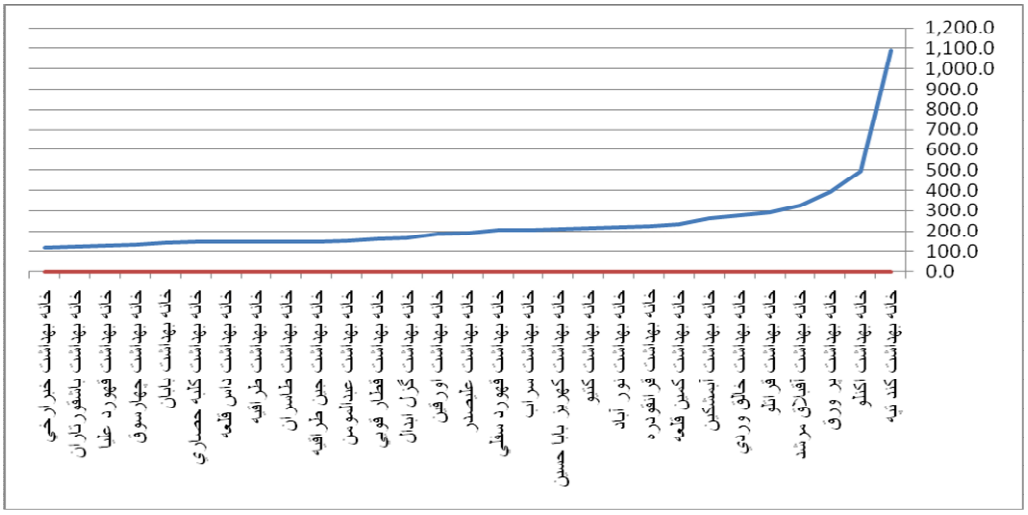
• Ability to develop the system use in other universities of medical sciences

•Ability to use system in other serving organizations with geographically dispersion such as the Ministry of Education and Ministry of Defense and Armed Forces.

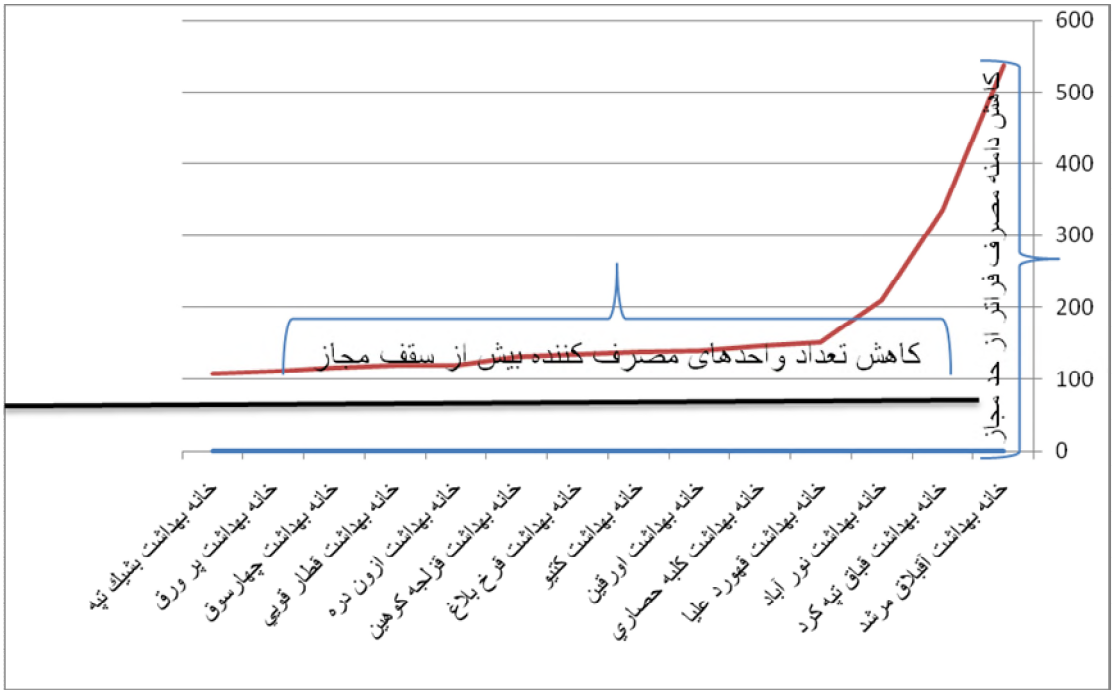
## 6. Conclusion

### 6-1- Findings

Significant reduction in energy consumption level in subsidiary departments




Introducing the health centers using electricity more than the allowed limit approved by Kaboudarahang network in July 2012 by system




Introducing the health centers using electricity more than the allowed limit approved by Kaboudarahang network in July 2013 by system

• Increasing internal sensitivity and self-control of departments to deal with cases using energy more than allowed limit

**Table 1**: Water consumption information of hospitals departments of Hamadan

| Row | Name of hospital | Power consumption (kWh) | | Percentage of consumption growth |
|---|---|---|---|---|
| | | 2012 | 2013 | |
| 1 | Fatemieh | 6101 | 22724 | %272 |
| 2 | Ekbatan | 14782 | 24133 | %63 |
| 3 | Beast | 15706 | 47750 | %204 |
| 4 | Farshchian | 33391 | 10681 | %68- |
| 5 | Shahid Beheshti | 13605 | 9061 | %33- |

**Table 2**: Electricity consumption information of hospitals departments of Hamadan

| Row | Name of hospital | Power consumption (kWh) | | Percentage of consumption growth |
|---|---|---|---|---|
| | | 2012 | 2013 | |
| 1 | Fatemieh | 929298 | 1029425 | %11 |
| 2 | Ekbatan | 868251 | 856200 | %1- |
| 3 | Beast | 8010000 | 8451000 | %6 |
| 4 | Farshchian | 2200340 | 1179820 | %46- |
| 5 | Shahid Beheshti | 846000 | 1706320 | %102 |

**Table 3**: Gas consumption information of hospitals departments of Hamadan

| Row | Name of hospital | Power consumption (kWh) | | Percentage of consumption growth |
|---|---|---|---|---|
| | | 2012 | 2013 | |
| 1 | Fatemieh | 606216 | 337628 | %44- |
| 2 | Ekbatan | 283163 | 258032 | %9- |
| 3 | Beast | 8256798 | 2556933 | %69- |
| 4 | Farshchian | 807417 | 323295 | %60- |
| 5 | Shahid Beheshti | 419623 | 567558 | %35 |

### 6-2- Discussion and conclusion

Expansion of computer facilities and the presence of capable human resources in health care organizations have provided important contribution to the development of new methods of recording and analyzing data in the energy consumption sector of departments. The invention of this method of extraction of costs will lead to efficiency of financial resources in the future years. Increased energy consumption in departments considering the increase in revenue of departments can be due to increased activity and providing health care and their physical development. Another useful finding of this study included awareness of managers of the energy consumption in departments under their management and help to accurate planning in the future. Creating a continuous flow of energy information from departments to headquarters not only specifies the high consumption departments but also makes more realistic budgeting possible for university.

### 6-3- Attention scope of system

• Obtaining the title of "superior experience" in the National Congress of Deputies in the resources development and management of medical sciences universities [7]

• Obtaining the consent and desired opinion of ministry's budget office,

• Third International Conference on Energy Consumption Management in health centers [8],

• Board of Trustees of the University of Medical Sciences,

• Appreciation of Hamadan’s Governor of the project carried out,

•Acceptance in the research week of university.

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