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Managing the computers energy consumption in enterprises and organizations through transforming the vision and man power behavior

مدیریت مصرف انرژی رایانه ها در سازمانها از طریق تحول نگاه و رفتار نیروی انسانی

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Abstract:

Today, the increasing use of technology at enterprises and organizations has led to the growth of electrical energy consumption. Nowadays, of the most important causes of increasing usage of electrical energy within enterprises and organizations are the computers and their equipments such as monitors, scanners, and printers, in a way that their energy consumption is more than lighting energy consumption in enterprises and organizations. If the users become familiar with true and effective use of electrical energy and gain the inner belief of the advantages of economization, they will proceed to change their attitude toward the use of mentioned devices. Of the features of training are acknowledging the personnel about activating different modes with low energy, using black color in desktop, turning off the computers, and making use of screen saver in the best way. The aim of the present article is to evaluate the computers and their equipments energy consumption as a sample in Iran Gas Transferring Company within four different occasions, and to define the rate of energy economization. Finally, some remedies are presented in order to improve the pattern of energy consumption to promote the personnel performance in energy economization while using computers.

Key words: Energy economization, Education, Energy management, Behavior Change

JEL Classification: Q38, Q41, Q43, Q48

Introduction

As energy consumption is an action made by the man, it may be considered as a behavior; therefore, the issue on informing and training the employees may cause a change in the behaviors and attitudes of the organization with respect to the issue of energy consumption optimization. Energy consumption optimization requires gaining knowledge and primary recognition on such behavior and is considered as the first step to gain recognition in establishing a new behavior or changing the previous behaviors in each case such as energy consumption (Ghazanfarinia, Saffarinia, Nouri Khajavi, 2003).

In case of changing people's attitude with respect to the energy consumption management as well as given the fact that any person shall significantly affect in the reduction of energy consumption individually and by correct adoption of the saving methods, a big step shall then be taken towards energy saving. In the very first place, it may be thought that one's performance shall have no certain effect solely in this field, while in case required knowledge is given to people and the saving interests are completely clarified, then any person shall unconsciously be directed towards modifying his/her behavior; meanwhile, in case of striving to make the people to achieve such believe then generally desirable results shall be reached.

Today, the organizations and offices are from amongst the highly- consuming energy utilities centers such as water, power and CNG, while the uncontrolled consumption of such energies may result in wasting as well as generation of environmental contaminants in addition to an increase in the organization's costs. Therefore, pro attitude of knowledge for the employees shall significantly help in decreasing the energy consumption and its optimized utilization. It should be mentioned that discussing on saving for any of such energy sources is quite extensive and each of them has its own exclusive conditions and regulations. Therefore, in this article the purpose is to study the behavior of the consumers and the method of changing their attitudes regarding saving in electrical power consumption by one of the highly-consuming means in the offices and organizations, i.e. the computers and their accessories, inter alia, scanners and printers. Computers are from amongst the most-used means which are used by the employees in most of their working hours. Hence, this issue intensifies the necessity on pro attitude of knowledge in the field of proper using and its effect in decreasing the electrical power consumption.

In this article, first of all the effect of people's attitude on the energy management, the benefits of changing attitude, necessity and training on energy management as well as some points on the low-power consumption models in

the computers and the necessity of users' knowledge on such issues are considered. After that, the level of computers' energy consumption and their accessories in the Iranian Gas Transmission Company headquarters is presented as a sample for assessment and through a process the benefits and level of saving are studied and at the end of the article some suggestions are given to change the employees' behaviors in the field of reducing energy consumption in the computers and their accessories.

History of Study Background both inside Iran and Overseas

1. A study made by Safarinia, Ahadi and Bakhshi (2007) on the effect of behavioral, cognitive and behavioral- cognitive (hybrid) practices on the changing of the attitude and behavior of electrical energy consumption by the students and the model of energy consumption of the family, of which the results were addressed during the 6th national energy conference.

This study indicates that through changing the students energy consumption behavior and examining the electricity bills before and after the independent variable implementation in the above-mentioned three groups, the performance of these groups have meaningful difference comparing to the control group. The final result of this study indicates that psychology of maintaining and practices on changing the attitude and behavior may be used to decrease the energy consumption and protect the state environment.

2. A project was presented by Karimi and Safarinia (2005) on social psychology and changing the attitude of energy consumers during the 5th national energy conference.

In this project, the attitudes and opinions relevant to the formation of the attitudes and its changing methods have been examined and analyzed within the framework of classical conditional, acting, social learning theories as well as the theory of cognitive lack of coordination through emphasizing the energy consumption.

3. Safari and Rezapour (2003) investigated the techniques of the behavioral and social sciences in energy consumption optimization during the 4th national energy conference.
4. A project was completed by Safarnia, Kamkar, Rezapour and Mansouri (2003) on application of educational psychology in changing the Tehran city educational system students energy consumption and the same was addressed in the 4th national energy conference.

This project has been based in this assumption whether the public educations and knowledge-bringing activities made in the Tehran city schools have resulted in an increased in the knowledge and change of attitude and eventually the change in the behavior of the students?

5. J. H. Wang (2011), completed a project, titled (*Behavioral Policy Modeling: Consumer Behavior Impacts on Residential Energy*

consumption); the purpose of this project was to investigate the conformity and using the energy national modeling system and assessing the effects of behavioral policies. Knowledge on the saving in energy is from amongst the different behavioral policies. The considered output for this project includes the energy public and private professional lectures, publications in the magazines as well as publishing the results.

6. In a study, Matrinskainen (2007), through a project called (*Affecting consumer behavior on energy demand Final report to EdF Energy*) studied the domestic energy consumption behaviors and the fact that hw the best behavior may be achieved with the purpose of decreasing the energy consumption as well as the manner on making the required actions to encourage the behavior change.
7. A study was made by (*Department of Alternative Energy Development and Efficiency 2005*), while in TEM project the dialogue between the Thai and Japanese governments have been made to protect and complete the projects by the Thai governments on saving in the energy consumption.

Belief, Attitude and Behavior of the Energy Consumption

Correct and logical utilization of energy is an issue which is relevant to the man's behavior. Although a variety of solutions including but not limited to applying power from the outer environment, threats or compulsion on using the new technologies have been presented, but many of the practitioners consider the volunteering saving practices to be as the better approach; therefore, the methods on encouraging people on reducing the consumption are a major part of the task of social and psychological sciences specialists. Therefore, energy consumption may be considered as an organizational behavior. Te energy consumer may have or have not knowledge on his/her reason of behavior. The people's saving behavior is shaped based on their thoughts, beliefs and attitudes and any change in the sustainable behaviors calls for primitive changes in the attitudes.

The strategies on changing the attitudes and behaviors and the activities relevant to the training and informing were used in Iran, though incomplete, with a decades of delay by the power generation energy productivity organizations as well as the consumption management consultants. The consumers' behavior includes all the actions made by the same relating to the collection of information on low-consuming lamp as well as explaining such lamp and giving some examples on consumer behavior.

Certain notions such as belief, attitude and behavior are highly related to each other. The general term on forming the consumer attitude is often used to describe the relevant field. In fact, in consumer behavioral field, we have the highest level of written works on consumer attitude (Safarinia, 2008, p8).

There are two main classifications in one attitude in the behavioral literature: economic theory and non-economic behavioral sciences.

Historically speaking, the economic attitude includes the residential energy consumption and the scope of information; however, more considering the effect of information in non-economic behavioral sciences literature shall result in growth. In neo-classical economics, it is presumed that the consumers enjoy having complete information as well as various, logical and rational priorities. Whereas in the non-economic behavioral sciences, the scientists are interested in knowing the manner of people interacting with the societies and surrounding environment and their manner of thinking, therefore they easily study the issues on information (Wang, 2011 p3).

The beliefs indicate the recognition and inferences of the consumer on the phenomena and their features and benefits. Our beliefs cover our behavioral cognitive aspect, while such beliefs are not always in conformity with the reality, e.g. considering a product as good or a colleague as honest (Safarinia, 2008, p9).

Beliefs and opinions are expressions considered to be synonym. In fact, the attitude is relevant to the man's sentimental aspect, which also has two other aspects of cognitive and behavioral as well. The former is more affected by beliefs and are able to be relevant to such two issues. For instance, smokers, after being subject to cancer, announce that according to them, smoking is directly relevant to physical health, while before they did not accept such fact. (Luke Bedar et al 2002)

Beliefs have three roots: personal experience, the information obtained from others and inferring. Sometimes, it is possible that a person well describe the actions relevant to energy saving by a factory, as he/she has studied factory energy situation. Sometimes, it is possible that the same assess the actions well, as she/he has heard the description of the performance of such factory from one of his/her engineer friends or read a report on the consumption situation in a newspaper, in which case the personal belief shall be based on the information obtained from others. Finally, it is possible that the person has neither read any report on the factory energy situation nor talk to anybody about it, but the same is the result of his/her own inference. As the performance of such factory has been desirable and been encouraged by the environment protection organization in the field of preventing the environmental consequences, therefore, such factory has also been successful in the field of management of energy consumption (Safarinia, 2008, p10).

Definition of attitude in terms of Psychology

Attitude is a mental and neural state of readiness organized through experience4 and has directive or dynamic effect on one's responses against all the objects or environments relevant to the same.

Attitude is a central part of the man's individuality. Many of the people have even lost their lives due to their attitudes and beliefs. Disagreeing with the animal tests, supporting human rights, supporting environment protection and clean air, supporting recycling materials and control population are all from amongst the different samples of attitudes. Such attitudes may have a variety of aspects; for instance, a personal (supporting environment) or social aspect. Even such attitude may be tangible (using public transport) or intangible (protection of natural resources), (separating wastes), or relevant to the people or groups.

1. Each attitude includes a certain issue, event or position which includes the attitude subject (saving energy consumption helps reducing environment contamination).
2. Second, that usually the attitudes are assessment-oriented (energy consumption management is considered as an effective step to decrease the environment contamination and achieving sustainable development), or positive or negative,
3. Third, that usually the attitudes have considerable stability and durability (i.e. one applies energy saving as a behavior in all the living conditions) (Safarinia 2008, p 12)

Effect of Attitude on the Consumers' Behavior

Attitudes affect behavior; however, such relationship is quite complex. Always the relation is not made directly, while definitely the issue is that one's vision on an issue affects on his/her behavior. In case you have an attitude towards with respect to a party, then most probably you will vote for its candidate.

The consumers' behavior includes all the actions made by the same relating to obtaining, using and withdrawing the goods or services after consumption. Collecting information on low-power consuming lamp, explaining the same and purchasing it are all from amongst the examples on the consumer behavior. The behavioral aspect of the attitude is relevant to the purposes, i.e. the action we show against an issue. Many times, our personal interests and beliefs are not resulted in behavior. Attitudes are considered as an decisive factor of consumers behavior, while there are other determining issues as well. Ejzen (1991, quoted by Berhem and Kasin, 1993) announces in his panned behavior theory that: attitudes affect the behavior based on a volunteering decision which are limited through a process. Therefore, the people of any society do not always show any behavior along with their attitudes especially on energy consuming means and the environment. Such lack of coordination, in addition to the foregoing, may be the result of such reality that the people several, variable and separated environmental attitudes. For instance, the attitudes may be related to population control, energy management, materials recycling, protecting the environment, driving style and other similar issues. Whereas usually such attitudes are separated from each other, they fail to have powerful effect on our environmental and general behaviors (Safarnia 2008, p13).

Methods of changing the Attitude and Behavior of Energy Consumers

Energy consumers Attitude and Behavior changing behavioral approach:

One of the fundamental principles of methods on changing the attitude and behavior is in its classical and acting condition so that the fortifiers presented to change the behavior shall be stronger than those fortifiers which keep the current situation. The response stimulation theory makers that in case they have enough information on the message taker, and enjoy having enough resources, then they shall be able to change the attitudes of any person by taking benefit from the other certain practices and techniques. Also the acting conditional theory makers suggest that through fortifying plans, any behavior may be continued or stopped from continuing.

Changing the Attitude and Behavior or Energy Consumption according to Hawland

In 1950, a social psychological group, headed by Karl Hawland, presented a model to change the attitude. This model is based on learning rules especially classical conditional. According to them, there are three important variables in learning new attitudes, including consideration, understanding and accepting (Safarinia 2008, 32).

Cognitive Approach in changing the Attitude and Behavior of Energy Consumers:

Meanwhile, the cognitive approach may be used to change the attitude and behavior of energy consumption. Usually in such approach the processes of reasoning, decision making, memory and consideration are emphasized.

Message → Consideration → understanding →cognition → increasing changing attitude →changing behavior

Cognitive process in changing attitude and behavior of energy consumption

(Safarinia, 2008, p 55)

Role of training, awareness learning and informing in energy consumption behavior

Awareness learning and informing the organizations members regarding the energy resources limitation, situation of Iran energy consumption comparing the world, presenting certain information on the solutions to decrease energy consumption, management, energy auditing, informing on the crisis and potential lacks include an important part of the process of changing the attitude and behavior of consumers. Because, many of the undesirable behaviors are de to lack of knowledge on the result of desirable behavior and method of achieving the same; therefore, presenting information with a variety of methods, inter alia, direct education such as class-based, face to face and education, and

indirect education by using poster, CD, brochures and educational booklets and combining these two methods shall be quite effective in management of energy consumption.

The educational strategies and awareness learning shall also be better to be followed up by the supervision and supporting of committee who is responsible to saving issue. Commitment causes an increase in the controlling feeling in people (Safarnia 2008, p 55).

During a study made by using the indirect training method, the scholars sent a brochure for the residents of Denver, USA in which the correct methods to use the electrical home appliances. The results of this study indicated that the brochures receivers have had 10 to 18 percent of saving in energy consumption. On average, the receivers indicated 53KW saving. This study shows that the regional power companies may achieve power saving through sending information brochures for their subscribers (Farhem et al 1997).

Generally speaking, it may be said that awareness and cognition relevant to the consuming energies, optimized method of using these energies and knowledge on the positive effects of saving is considered as the most important step in the field of changing the attitude and behavior of the consumers and establish such belief in them that the correct behavior in the field of energy consumption, not only is in favor of the state and organization, but also is in favor of the consumers according to a more precise matter. Such change of attitude and behavior focuses on a certain discussion known as the energy management. Therefore, in this part, we present certain issues in this regard and its relevance to awareness learning.

Energy Management

Protection of the energy is an important issue for the management of the big companies and a certain part of the energy management has been considered (Department of Alternative Energy Development, 2005, p.16).

Definition of Energy Management

Energy is one of the management resources of a company and shall be managed and controlled with a systemic method in coordination with the management of other resources. Energy management is referred to as the management of all types of energy used in the company by making an optimized plan from purchasing, producing and consuming different types of the same based on the general purposes of the company, in short-term and long-term management plans considering the costs, availability, economic issues, etc.
(Department of Alternative Energy Development, 2005, p.16)

In another definition, we have that energy management optimized utilization of existing energy resources and minimizing the energy wastes. The purpose of energy management is to minimize the consumption and energy costs through

implementation of the processes in an organization. Meanwhile, the energy management is a fundamental element in giving quality to the system of each organization (Safarinia, 2008, p 73).

Necessity of Energy Management

Energy management is essentially needed as it affects certain aspects of the company works and activities, which include the following issues:

- Costs of energy affect company's profitability.
- Costs of energy affect the competition in energy market.
- Balance of supply/ demand of national energy
- National commerce and financial balance
- Local and global environments
- Safety and professional health
- Productivity
- Quality (Department of Alternative Energy Development, 2005, p.16)

Main Principles of Energy Management

Three main principles of energy management include:

1. Buying the energy resources with the minimum price
2. System performance with higher productivity
3. Taking benefit from the proper technology (Safarinia, 2008, p 75)

Training energy is the complementary part of the energy management strategy

In the past, energy used to be considered as a totally technical issue, while today many of the organizations consider energy is a managerial issue with technical applications. It should be mentioned that training plays a vital role in energy management. Educational plan shall predict the future changes in the field of energy management (Safarinia 2008, p 78).

Training and learning energy consumption management

In one of the most important classification, training is classified into three fields of sentimental, mental-motor or behavioral (Blom 1956 quoted by Seif 2001, p 82).

The cognitive scope is classified into the level of knowledge, capabilities, mental skills. Therefore, in training the notions of energy management, training solutions of optimization of energy consumption, including but not limited to calculation of the level of consumption of computers, scanners, collected data analysis from the energy audits, etc. are relevant to the education cognitive scope.

Sentimental scope is associated to the interest and motivation and attitude of the learners; therefore, attitude towards the method of consumption and its modes s relevant to the educational sentimental scope.

The mental- motor or behavioral scope emphasizes on the skilful motions and actions such as writing and performing different professions. In energy management training, when the learner is pursing the implementation of the consumption management solutions in the organization, it is in fact relevant to the mental- motor scope. For instance, taking benefit from the low-power modes in the computers or detaching socket from plug, using low-consuming lamp is relevant to the mental-motor scope or behavioral scope of the learner.

Saving energy consumption shall be achieved when the trainings consider the three aforementioned scopes (Safarinia 2008, p 82).

In this part, we focus on studying the level of electrical energy consumption by the computer and their accessories as one of the important factors of electricity demand growth in the offices and the effect of consumers behavioral change effect is well clarified by expressing the level of saving and then the level of energy consumption by the Iran gas transmission company headquarters computers as the sample in the four aforementioned different situations.

Different designed plans and policies have been ratified to decrease the energy consumption of the official appliances in the USA and Europe. The most important and most significant of the same is the ENERGY STAR plan. This plan has been announced during summer 1993. For the time being, many of the different models of computers, monitors and printers as the products are qualified as the conditions mentioned in the existing ENERGY STAR. This plan tries to decrease the electrical energy consumption in different modes (Koomey, Cramer, Piette & Et p.1).

Low Power Modes

In the past, electrical appliances had only the on or active and off modes; however, through progress of electro-mechanic science, the third mode, namely standby, was discovered. Gradually other different modes such as deep sleep and sleep were generated which are between standby and active modes in terms of electrical energy consumption.

Generally speaking, the computers modes are classified into the following four classes:

1. Active mode: when the machine is working, it is in active mode. The consuming power is different as per the type of computer as well as the images shown by the monitor.
2. Standby mode: it is a middle state which tries for saving. In such a state, the machine is temporarily off, so that through pushing a switch or pressing a key or moving the mouse the computer is activated. Also the idle mode is placed in the same level.

3. Suspend mode: this mode has the lowest consuming power without any need for turning the computer off; however, the activation time is longer than the sleep mode. Te hibernate mode is also from amongst this scope
4. Off mode: consuming power when the computer is off is quite low (Koomey, Cramer, Piette & Eto, 1995, p5)

Case Study

Studying the electrical energy saving and computers consumptions in the Iran gas transmission company headquarters which is responsible to transmit the CNG from the production origins to the cities and consumption centers throughout the country. This company has 368 computer and monitor resource company.

Consuming the computers and their accessories in the company are inspected n the following four different states:

1. Active the computers and accessories during office hours, using the idle mode in the accessories in the office hours when they are inactive, placing the computers and their accessories in sleep mode during holidays and non-office hours and non-using the low-power modes in the computers in the working hours when they are not in use.
2. Active computers and accessories in the office hours, using idle mode in accessories when inactive and they turning them off during holidays and non-office hours
3. Active computers and accessories in the office hours, using idle mode in computers and accessories when inactive and they turning them off during holidays and non-office hours
4. Active computers and accessories in the office hours, using sleep mode in computers and accessories when inactive and they turning them off and detaching the socket and plug during holidays and non-office hours

Table 1- number and model of cases, monitors, printers and scanners of the company

No. of scanners	Name of scanner
2	Canon –DR 2050 C
1	CANON DR-3010
11	CanonScan – 4400 F
13	HP- Scanjet 7400 C
1	HP Scanjet G4050 Photo Scanner
1	HP-Scanjet - 8270
1	HP-SCANJET-4370

No. of energy source	Name of energy source
21	ATX p4
5	GREEN – GP 250 E4
327	GREEN 380 W
3	GREEN ATX
9	GREEN GP480A
1	P4 STAR
1	pascal

1	HP Scanjet 3770
31	**total**

1	TVM P4 20 - PIN
368	**total**

Printer

No. of printer	Name of printer
19	Canon - iSenSys MF 4150
1	Canon- LBP - 5000
1	Canon- MP730 PHOTO
3	EPSON – DFX – 8500
4	Epson – LQ-300+II
1	Epson – Photo – 1410 – A3
1	EPSON – PHOTO - R290
2	Epson – PHOTO RX 500
2	Epson DFX-8000
2	EPSON- LQ – 2170
7	Epson- LQ-2180
1	HP – Color Laser Jet 3550
1	HP - Deskjet – 1125 C
1	HP – Deskjet – 1280
2	HP – Laserjet – P2035n
2	HP – LaserJet – P2055 d
1	HP – Laserjet J 4580
2	HP – LaserJet P2014
1	HP Color LaserJet 5550
1	HP- Laser Color CP-1215
2	HP -Laserjet 2200
6	HP –Laserjet 1220 C
9	HP-Laserjet 1300
26	HP-Laserjet 1320

Monitor

No. of monitor	Name of monitor
7	ACER 17"
3	ACER 22"
7	ACER 24"
58	AOC 19"
1	AOC 22"-TACH
4	BenQ 17"
2	CTX 19"
17	LG 17"
1	LG 19"
131	SAMSUNG 17"
87	SAMSUNG 19"
46	SAMSUNG 22"
4	SONY 19 "
368	**total**

2	HP-Laserjet 6P
2	HP-OfficeJet 6313
1	HP-OfficeJet – J4580
1	Printer TALLY T6212
3	SAMSUNG SF-650P
1	TSC – TTP-244 Plus
108	**total**

Electrical power consumed in the different equipment is found from the following relationship:

$$P = \frac{Pi \times hi}{1000}$$

P: energy consumption of i tool kwh/day
Pi: power consumed by i mean in different states in terms of watt
hi: i mean performance hours in terms of hours/day
(Jazini, Fekri 2010)

Table 2- energy consumption in different modes of computers and their accessories in terms of watt

Energy consumption in different modes in terms of watt

Active	Idle	sleep	off	
400	292	6	3	**Computer power source**
41	-	3	2	**Monitor**
13.4	5.3	5.3	0	**Printer**
18.2	6.9	12.2	0	**Scanner**

Table 3- average hours of using computers and their accessories at the company in terms of hours/day

Active	Idle	sleep	off	
41	5	3	16	**Monitor**
13.4	1	7	16	**Printer**
18.2	0.3	0.7	23	**Scanner**

Table No. 4 shows the computers and accessories in Iran gas transmission company In the four different mentioned states. In these calculations, the electricity price has been considered as per the latest bill as Rls. 500

Table 4- energy consumption and saving in four different states

States	Type	Monthly			Annual	
		Consumption	Saving		Saving	
		Kwh/month	Kwh/month	Rial/month	kwh/year	Rial/year
First state	Computers	36,388				
	Monitor	4,151				
	Printer	43				
	Scanner	271				
	Total	41,248				
Second state	Computers	35,858	530	364,960	6,359	3,179,520
	Monitor	3,974	17	88,320	2,120	1,059,840
	Printer	164	275	137,376	3,279	1,648,512
	Scanner	10	261	130,479	3,131	1,565,748
	Total	40,006	1,242	621,135	14,907	7,453,620
Third state	Computers	32,281	4,107	2,053,440	49,283	24,641,280
	Monitor	2,616	1,535	767,280	18,415	9,207,360
	Printer	164	275	137,376	3,297	1,648,512
	Scanner	10	261	130,479	3,131	1,565,748
	Total	35,071	6,177	3,088,575	74,126	37,062,900
Fourth state	Computers	22,279	14,109	7,054,560	169,309	84,654,720
	Monitor	2,363	1,788	894,240	21,462	10,730,880
	Printer	164	275	137,376	3,297	1,648,512
	Scanner	13	258	128,754	3,090	1,545,046

	Total	24,818	16,430	8,214,930	17,158	98,579158

As it may be seen from the above table, the consumptions of the computers and their accessories in the first state is monthly 41248 KWH. In the second state the total consumption is 40006 KWH and the level of monthly and annual saving shall be Rls 621,000 and 7,454,000, respectively. In the third state the total consumption is 35071 KWH and the level of monthly and annual saving shall be Rls 3,089,000 and 37,063,000, respectively. In the fourth state and through applying this situation the total consumption is 24818 KWH and the level of monthly and annual saving shall be Rls 8,215,000 and 98,579,000, respectively. The result is that the fourth state with respect to the three previous states indicates significant level of energy saving due to observant of the energy consumption management issues.

Chart 1- energy monthly consumption in different states

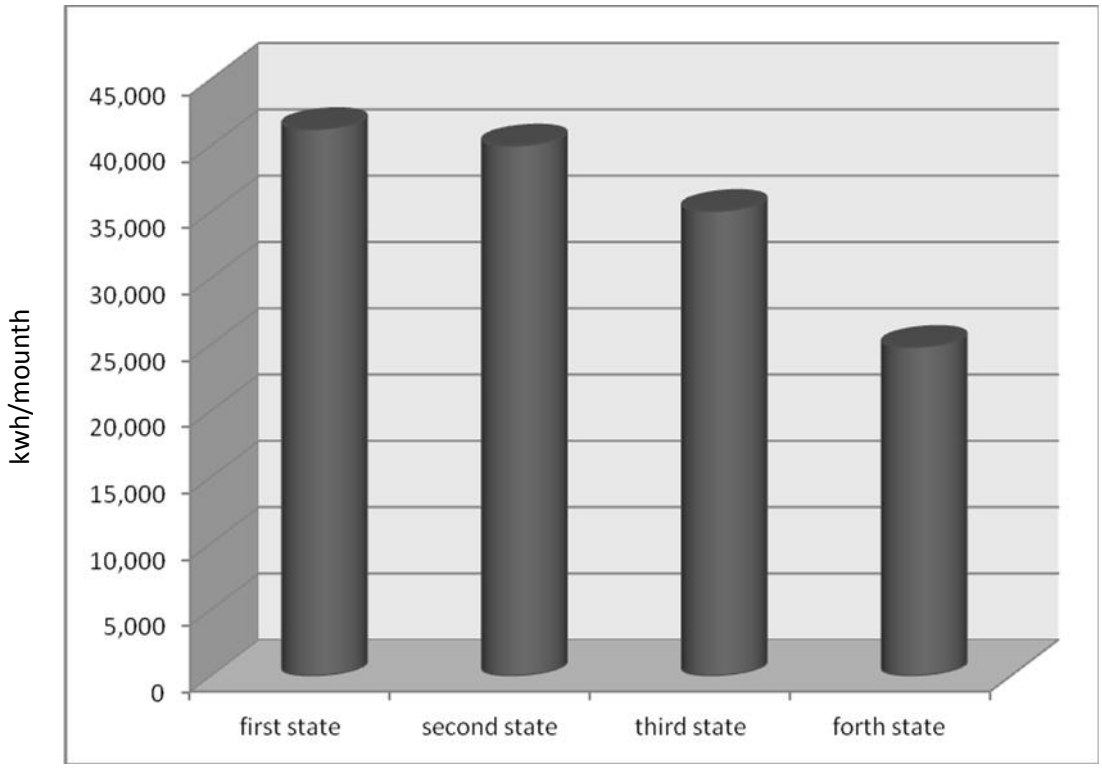
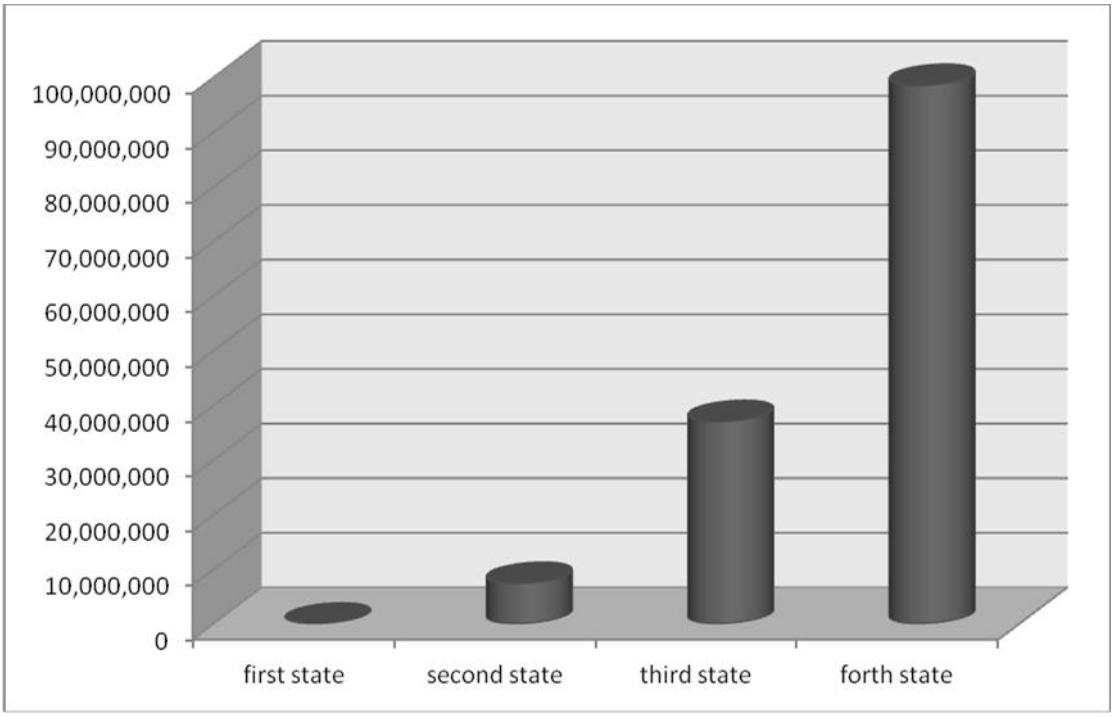


Chart 2- energy annual consumption in different states



Presentation of some suggested Solutions

Some suggested solutions to decrease the energy consumption in the computers and their accessories include the following:

- Establishment of proper basis to generation culture and informing the employees in the field of management of energy and awareness on saving benefits
- Establishment of training courses on applying saving methods in using computers
- Holding conferences on energy management (Safarinia, 2008, p 87)
- Encouraging to prevent excessive consumption and internal stimulation to energy consumption (Safarinia 2008, p 106)
- Using low power modes in the computers and accessories in office hours when they are not used
- Turning the computers off and detaching their socket from plug in non-working hours and holidays
- Turning the monitors off and detaching their socket from plug in non-working hours and holidays as well as turning the button on the monitor off in office hours when they are not used
- Inactivating screen saver; the studies indicate that unlike the general belief, the monitors consumes more energy in screen saving mode in comparison to the standby mode

(Nordman, Piette, Kinney &Webber, 1997)

- Decreasing the display screen brightness through the buttons existed under te monitor (Kedar 2006)
- Setting the sleep mode of the printers and scanners
- Using the multi-purpose machines for scanning, printing and faxing

Conclusion

As it may be seen in the study sample, changing the attitude and behavior of the employees in the field of electrical energy consumption highly affects the reduced costs, while such issue results in optimized utilization of electrical energy as well as decreasing the level of environmental contaminants considering the fact that there are hundreds of offices and companies in Tehran city, and generally speaking throughout the country. Therefore, in general, in case the people gain the needed awareness in the field of management of energy and benefits of saving, when they shall gain correct attitude with respect to use energy sources and shall try to use the energy in an optimized manner. Meanwhile, in case such attitude change is formed for all the consumed energies, then considerable positive results shall be obtained.

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