CONCEPTUAL ASSESSMENT OF INDEPENDENT ELECTRICITY CONSUMER SYSTEM (IECS) FOR SUSTAINABLE DEVELOPMENT

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Abstract: This paper traces convoluted process of the energy crisis of Pakistan, the practices behind such process, and to evaluate perceptive to explain the prospective of Independent Electricity Consumer Systems.

Key words: Independent Electricity Consumer System, Sustainable Development

INTRODUCTION

If social scientists truly wish to understand certain phenomena, they should try to change them. Creating, not predicting is the most robust test of validity-actionability. _Kurt Lewins as quoted in Argyris (1997)

The per capita energy consumption is an index used to measure the socio-economic prosperity in any society---the Human Development Index (HDI) has a strong relationship with its energy prosperity.[i] Statistics also suggest that more than 99 percent of people without electricity live in developing regions, and four out of five live in rural areas of South Asia and sub-Saharan Africa.[ii] The existing energy crisis of Pakistan is correlated to inefficient use of energy resources and corruption in centralized energy management. The acknowledgement by the Water and Power Development Authority (WAPDA) chairman in front of the national assembly's Standing Committee for the Water and Power on June 28, 2011 that electricity load shedding cannot be tackled before 2018 suggests that things will worsen in the years ahead.[iii] Regular demonstrations against the energy crisis often turn violent. Attacks on WAPDA and Karachi Electricity Supply Corporation (KESC) Offices and employees have also become a norm. Clashes between demonstrators and the police have broken out on many occasions; often resulting in heavy casualties and even deaths. The violent protests in Mianwali in the first week of July 2011as the protestors tried to march towards the Chashma nuclear power station resulted in the loss of three lives and two days of utter chaos there. Had the protestors breached the safety zones around the power plant, it could have posed grave implications for the country both nationally and internationally.[iv]

These developments suggest that Pakistan with already volatile internal situation, cannot afford energy related unrest. The primary objective of the study is to present an Independent Electricity Consumer[1] System (IECS) based on the perceptions about its feasibility. It is an entity which produces electricity to consume by itself. Consumer is entitled to produce and consume as per its resources and

[1] The consumer entity can be an individual, community, or organization

desire. The consumer has the opportunity to procure the technology at equitable price. IECS has a dominant consumer benefit component. A consumer is producer, supplier and consumer simultaneously, which composes a system. Following are the distinctions of IECS: (a) IECS matches to the affordability of consumer[2], cost effectiveness[3] of the amount spent on, and satisfaction[4]. (b) IECS produces to consume; but the available energy credits can be preserved or sold. (c) IECS is private ownership with or without legal structure depending on number of consumers. (d) IECS is independent from main grid; smaller grids can be organized to utilize the electricity credits within the system (e) IECS operates according to the consumer management and authority (f) IECS gives maximum choice[5] to consumer

METHODOLOGY

Study design and location

A cross sectional survey based on Delphi Technique was carried out from April to July 2012 of energy experts from Sciences (Specific to Physics and Electrical Engineering) in COMSATS Institute of Information Technology, Abbotabad and Hazara University in Khyber Pakhtunhkuwa in Pakistan. 21 experts having the ability to understand the concept were chosen for this Delphi Technique based assessment. The target population consisted of experienced individuals from energy sector. The research was conducted among academics and experienced individuals in energy sector.

The individuals were briefed on the aim of the study and then consent to participate in the study was obtained. The completion of the questionnaires was conducted in the presence of an expert researcher. This study was approved by the Executive Director COMSATS Headquarters Islamabad.

DATA COLLECTION

The sampling method used was stratified random sampling. Two universities; COMSATS Institute of Information Technology, and Hazara University were regarded as strata. The faculty and students of energy departments were interviewed. After making a charged concept of IECS the individuals were interviewed. The questionnaire consisted of one question associated with seven concepts of IECS. The associated concepts to question helped to provide information related to different perspectives of IECS. The questionnaire was generated specific to this study. The questionnaire, written in English, was pre tested on pilot scale using a sample of 3 experts from WAPDA and COMSATS Islamabad. The final questionnaire was consisted of one question with seven associated concepts. Approximately each respondent took one hour to reflect upon the concept of IECS. Different timings were set for interview so the individuals may be approached vis-à-vis their commitments. On average three attempts were made to find an individual for the purpose.

DATA ANALYSIS

Using SPSS version 13.0, the collected data were analyzed with a significance level at $p < 0.05$

RESULTS

Participants taking part in this study had a mean education of 16 years. The percentage of faculty and students was 65% and 35% respectively. Results are summarized in Table 1. Responses to important questions regarding conceptual knowledge about IECS are as follows: 44% respondents correctly believed that corruption was the most common cause of energy crisis; however, 56% of respondents did not believe that corruption could be mainly responsible for energy crisis. Many (77%) of the respondents were aware that energy crisis grows poverty. The majority (86%) of the respondents were also aware of higher impact of energy crisis on lower and middle class of the society. Greater percentage (42%) of Pakistani population is affected from energy crisis and every energy riot causes injuries or even deaths; was correctly answered by 53% and 44% of respondents, respectively. Energy crisis refers to malign behavior, and Conceptual assessment of IECS may provide a better chance to beat energy crisis- these were correctly answered by 36% and 78 of respondents respectively.

[2] Affordability: Affordability as measured by percentage of income, e-g person "A" and "B" spend Rs. 1000 on monthly energy bill, and their monthly income is Rs. 10,000 and Rs. 5,000 respectively. In this example person "A" is spending only 10% and person "B" is spending 20% of his income on energy bill. It sounds that the IECS may be developed like cell phones available in the market from Rs. 1000, to 100,000 to benefit all the classes of society.

[3] Cost Effectiveness: It compares the relative costs and outcomes (effects) of two or more courses of action relative to socio-economic position of the consumer.

[4] Satisfaction: A consumer may opt for quality (energy or energy and capacity) and quantity (1-2 electricity points); a consumer may opt for 10 hr or 14 hr supply of energy as per its satisfaction.

[5] Choice: A consumer will have a choice to decide peak hr or routine hr utility.

Table 1: Responses of participants to various questions

	Questions	Correct percentage	Wrong percentage
1	Corruption is the foremost cause of energy crisis	44	56
2	Energy crisis grows poverty	77	23
3	High impact of energy crisis on lower and middle class of society	86	14
4	Greater percentage of Pakistani population is effected from energy crisis in South Asia	53	47
5	Every energy riot causes injuries or even deaths	44	56
6	Energy crisis refers to malign behaviour	36	64
7	Conceptual assessment of IECS may provide a better chance to beat energy crisis	78	22
8	Centralized energy system is one of the important determining factor of energy crisis	40	60
9	History of energy resources development one of the important determining factor of energy crisis	46	54
10	Governance practices is one of the important determining factor of energy crisis	41	59
11	Security situation is one of the important determining factor of energy crisis	41	59
12	IECS may reduce the energy crisis	53	47
13	Frequent energy riots can lead to anarchy	48	52
14	The feeling of sleeplessness and bumps in daily routine are the most normally appropriately recognized symptoms of energy crisis	49	51
15	People can enjoy happy life after having IECS	58	42
16	IECS seems Social Science fiction	62	38
17	Commitment can create IECS	50	50

Responses to important questions regarding knowledge of energy crisis determining factors and indicators were as follows: The respondents who responded correctly that Centralized energy system, History of energy resources development, Bad governance practices, Security situation, are important determining factors of energy crisis were 40%, 46%, 41%, 41%, respectively. Also, 53% of the respondents were correct in the view that IECS may reduce the energy crisis. Frequent energy riots can lead to anarchy was also correctly answered by 48% of respondents. The feeling of sleeplessness and bumps in daily routine are the most normally appropriately recognized symptoms of energy crisis by 49% of the respondents. People can enjoy happy life after having IECS was suggested by 58% of respondents. 62% of respondents believed that IECS seems Social Science fiction in a developing country like Pakistan. All above mentioned responses (results) were significantly ($p < 0.05$) different from their corresponding oppositions i. e. difference between correct and wrong answers were significant ($p < 0.051$).

DISCUSSION

Less comprehension of sustainability of developed energy resources vis-à-vis growing demand of energy is the determining factor of energy crisis in Pakistan is confirmed by our conclusion.[v] Despite energy crisis the elite class of the society; political, civil and military bureaucracy are not expected to seek any sort of resolution of energy crisis as it may not affect their functioning or cause them any pain. People at the helm of affair have insufficient knowledge and commitment to energy management; thus they increase the economic vulnerability of the lower and middle classes of the society. In treatment of energy crisis IECS may be helpful; this is agreed by 43% of participants. Availability, affordability and certain supply of energy affect the energy management; this is proposed by 50% of participants. Participants of different departments took part in the study. It is controversial concept because of financial costs and

commercial validity. A common identified determining factor was the history of energy resources development. It is necessary to recognize complex determining factors of energy crisis such as corruption and centralization in energy system. Specific education to mitigate energy crisis should be organized for politicians, civil and military bureaucracy.

On energy crisis and about its outcomes, a major number of our study respondents had the right concepts. This study showed the need for improving energy management knowledge and educational programmes through management settings and media. Bad governance practices should be eliminated through ethical education. It is desirable from technocrats to provide proper counseling to governance structure.

The key to success is to start with small-scale and simple designs and to gradually scale them up, both in terms of size and quality. [vi]

LIMITATIONS OF STUDY

Further studies are required for the feasibility of the IECS. This study was conducted only in two institutions; COMSATS Institute of Information Technology and Hazara University of Khyber Pakhtunkhawa which was a limitation of this study. The inclusion of other institutions may produce different results as a result of rounds of Delphi Technique application.

In conclusion, respondents had vast desirability to manage energy crisis but as far as to mitigate energy crisis, not many of the respondents had adequate knowledge and commitment and many of them had stereo thinking to opt for IECS. This study emphasized the urgent need of improving the level of understanding for innovating IECS in all technology circles highlighting development of energy resources for sustainable economic development. Since governance set up in Pakistan continues its corruption IECS may be developed by technology strata of Pakistan with due collaboration at regional and international level.

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