Final Project

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Role of Media and Energy Crises of Pakistan

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Department of Media And Communication

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Preamble

This is our final project of M A Media and Communication, University of Management and Technology .In this project, we have evaluated the energy of Pakistan and also have given some suggestions for improvement after comprehensive study of the current situation. For this purpose we have visited Wapda , UET and interviewed some concerned officials .We tried to identified the real problem and suggested sustainable solutions to these problems.

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ACKNOWLEDGMENT

First we are thankful to ALLAH ALMIGHTY who bestowed us with courage enough to complete this work.

Then we are thankful to University of Management and Technology and its entire staff. Finally we are thankful to our teachers Prof Dr Mujahid Mansuri, and Assistant Prof Tayyab Farooq Bhatti, who gave us all possible guidance and instructions to complete this Project beautifully through out.Last but not least we are also thankful to Wapda and UET for their cooperation with us in data and information collection.

1. IDENTIFICATION

Civilizations depend upon energy to flourish. Technical progress and development are often measured in terms of quantity of energy used. A large increase in global energy use has been observed in last 4 to 5 decades. Conventional energy sources provide more than 85% of the overall quantity of energy and they are being consumed at the rate of knots. Moreover, the energy demand is growing and the conventional energy resources are limited and not to be found everywhere.

The great increase in energy demand, danger of conventional resources being fully consumed and problem of finding alternative sources at a quicker pace have made energy, power sector, renewable energy sources, energy efficiency etc. the most talked about topics in the world.

Pakistan, our homeland is no different in this regard. In fact being a country of third world, It was hit by energy crisis on different occasions and in different forms. Though It is trying to tackle the problem with best of Its efforts but it is evident that It is not coming out of the crisis in foreseeable future.

So a need is strongly felt by the author of this account to try to show the right path to the readers. The following discussion is based on the aforesaid intention.

1.1 A Question:

Just for a quick survey, the reader is requested to ask the following question to some of the people around him:

" If a thermal power station having an installed capacity of 1000 MW (Mega Watts) is ready to run but can not be operated due to non-availability of oil or money, does it constitute a power crisis?"

It is surprising that people are often confused, and rightly so. The exact answer to this question is: "This is not only the power crisis but an energy crisis first". Electricity is a form of energy. The energy crisis means "crisis of all forms of energy whether they can be stored or not". Electricity or electrical energy is the form of energy which can not be stored.

The electrical power systems are the most flexible and convenient energy carriers from producers to consumers. The producers (Generation Plants), conveyers (Transmission Lines) & consumers (Domestic & Commercial) are called "Power Sector" of a country. It should also be accepted that electricity is one of the most wanted form of energy in this world. But there are some basic disadvantages associated with this form of energy. It can not be stored on large scale and it is not that economical for most of the people. Furthermore, it is not available to about 25% of the population of this world.

It should also be kept in mind that most of the electrical power is produced through conventional means using oil, coal or gas. The danger of these being dried out

has led to another concept of depending less on conventional sources and find alternative sources for power generation. The renewable energy systems are the brain child of this concept. More emphasis is being given on renewable and environment friendly energy generation system keeping in view the economy, global warming, environmental health, and preservation of conventional energy resources now a days.

So the solution of the problem has to be presented while keeping ourselves within the constraints posed by the current scenario.

1.2 Power Sector Of Pakistan:

The power generation system of Pakistan consists of a reasonable mix of various power generating technologies. A table describing generation capabilities is as under:

Sr. No	**Source**	**Installed Capacity**	**Dependable Capacity**
1	Hydel	6444	6444
2	GENCOs	4840	3580
3	IPPs	6065	5509
4	Nuclear	325	300
5	Rental	285	264
	Total	**17959**	**16097**

The data for Karachi Electric Supply Company (KESC) has not been included because KESC has gained a greater degree of autonomy and it is responsible for most of the generation, transmission and distribution of power within its jurisdiction. Another valid reason for not including KESC is the vulnerability of available figures and statistics pertaining to KESC which can challenge the authenticity of whole data given in this work. However, it must be kept in mind that inclusion or exclusion of KESC as far as demand and supply situation is concerned, does not change the overall scenario.

With rapid increase in demand, there has been immense pressure on the system. The installed capacity which was more than sufficient 6-7 years ago can not fulfill the load requirement now due to many reasons. With the given capacity, the system suffered a shortage of more than 5000 MW both in summer and winter season last year which resulted in load management of more than 12 hours per day. It proved detrimental to commercial as well as domestic consumers and the economy of the

country was greatly affected. Moreover, the price hike of oil forced the government to raise the tariff which resulted in sky rocketing prices of electricity, resulting in a lot of inflation and expensive commodities which proves that it is power which drives economy.

The problem lies in three areas. First area is generation. The recorded maximum peak load was well above 17000 MW last year whereas the capability of generation is below 17000 MW as clear from the above table. Also, the whole system is not available for generation most of the time either due to non-availability of fuel to the thermal stations, or non-availability of sufficient water as in case of Hydel stations or maintenance, overhauling or forced shut downs of generation units. The stoppage of some IPPs due to non payment of dues must also be mentioned.

The second problem is related to National Grid. As the sources of generation are not well scattered, long traveling of power in transmission lines is inevitable. This problem worsens when any critical power station backs out on bars. Long traveling of power in transmission lines results in line losses because too much of reactive power is involved. In such situation, more than 1000 MW can dissipate in National Grid. Such situation arises generally in winter when Hydel generation is at its lowest and load flows from south of the country towards north. Apart from the flow, the load carrying capacity of lines is also a big question. Some times this hampers in supplying power to required destination and results in load shedding. Although this side belongs to the subject of efficiency improvements in power systems, but should be mentioned because it is important and contributes to the power crisis.

Last but not the least; the global concerns must also be kept in mind which mainly focus at system of carbon credits, environmental pollution, global warming and drying out of conventional energy resources. The third world vows, like poverty, debt crisis, disparities of majorities add another dimension to the existing problem. The discussion above makes it crystal clear that a unique, innovative, and multi pronged strategy must be evolved within a due course of time.

As mentioned in beginning, civilizations depend upon energy to thrive, and so the economies. That is why the "Sustainable Solution To Power Crisis" becomes more important than anything else because it is the availability of a vibrant, economical and flexible power sector which ensures a viable economy. With out energy production factories, processing concerns, and domestic consumers suffer equally as per their needs of power.

1.3. Shortage:

The term shortage requires some discussion. Generally it is considered as a noun referring to deficiency or lack. An energy shortage can occur for anyone or more of the following reasons:

a. An energy shortage can occur for everybody whenever the immediate energy supply can not keep pace with current demand. This has happened to Pakistan several times

in past and is going on in present.

b. An energy shortage can occur for some people if the price of energy becomes too high. That is basically a personal shortage because a great sacrifice from the income is needed to pay for the energy and a portion of people simply can not pay for it.

c. An energy shortage can exist when energy exists but it is not in usable form. This happens due to lack of planning. This is a kind of shortage which has got the menace to destroy a country's economy and general public's life style. The massive coal reserves of Pakistan (184 billion tones), the un-tapped potential of hydro power (about 43000 MW) and non-utilization of solar and wind energy come under this category.

1.4. Energy Crisis:

By most modern standards, the energy crisis is defined by either one or two or all of the following shortages.

a. Electricity (Electrical Power)

b. Oil (includes petroleum, natural gas, furnace oil etc.)

c. Fuel Wood

The third factor has always been subjected to change specially after the second world war. During the WW II, there was a severe shortage of steels and the third factor in the above list was steel, then in early nineties (90's) it was replaced by fuel wood because excessive use of fuel wood in third world created a fear that even the fuel wood supply may suffer badly. In near future, experts completely agree that the third factor will become water if speed of global warming is not checked at the right time.

1.5. Basic Concepts:

The issue of demand and supply of energy can be understood through analytical approach. Some basic concepts are of immense importance in this regard. The countries which posses vibrant, efficient, and economical power sectors pay special attention to these concepts. Given the importance of these, they have been mentioned here very briefly. The reader is advised to read more about them from concerned books, journals, or research papers. It is of immense importance to perform a scientific analysis of current demand and supply gap and also to familiarize ourselves with the tools introduced recently in the trade. Some of more important and widely used are as under:

a. Demand-Supply Scatter

b. Exponential Growth

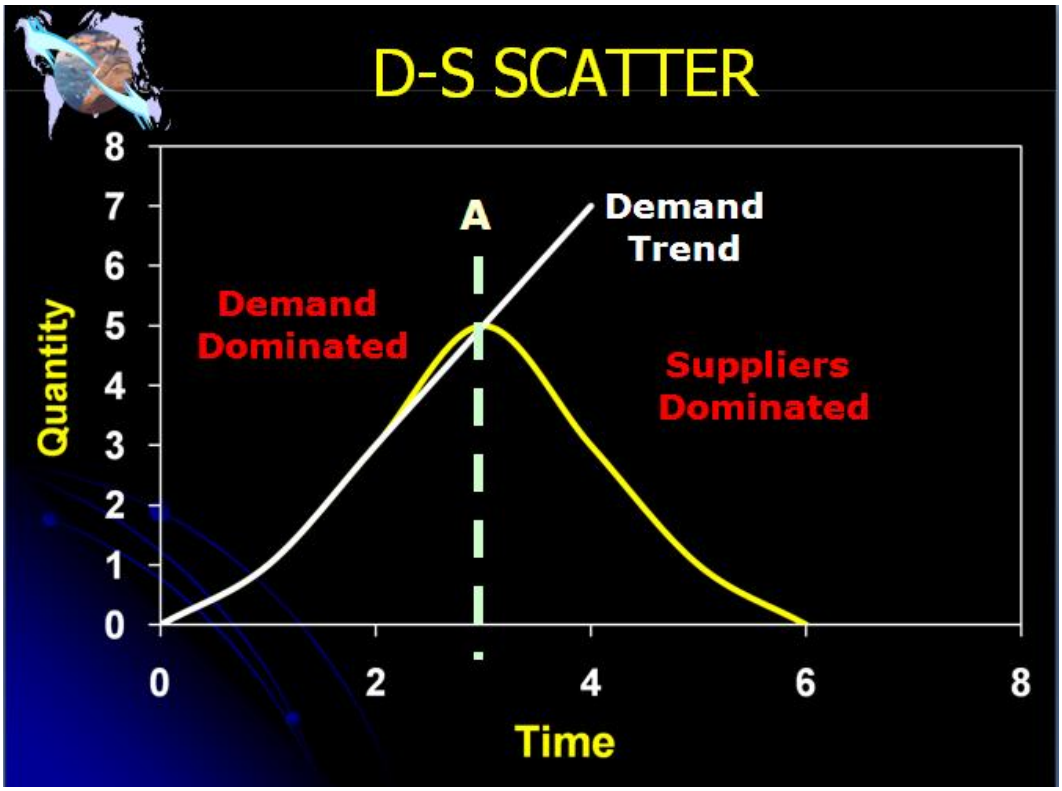
c. Doubling Period

d. Hydel-Thermal Mix (Renewable-Conventional Energy Mix)

e. Forecasting Management

a. Demand-Supply (or D-S)Scatter:

Compares demand side events with supply side events. It clearly indicates from where the situation goes out of hands and supply shortage or price hike takes over.



The area under the dome (or curve) is available energy. As shown, before point A, demand is being met by the available energy. Its after point "A" when the demand keeps on increasing and the energy supply curves downwards. From this point, the availability of energy becomes supplier dominated who can manipulate it. That is why we witness price hikes and less availability of energy. Prior planning will make this dome cover more area on graph at right time i.e. Generation capability will be improved which will cover the demand line for more time period than is being shown in this figure.

Pakistan is currently in the right half of the scatter. The key is to keep our country in left half.

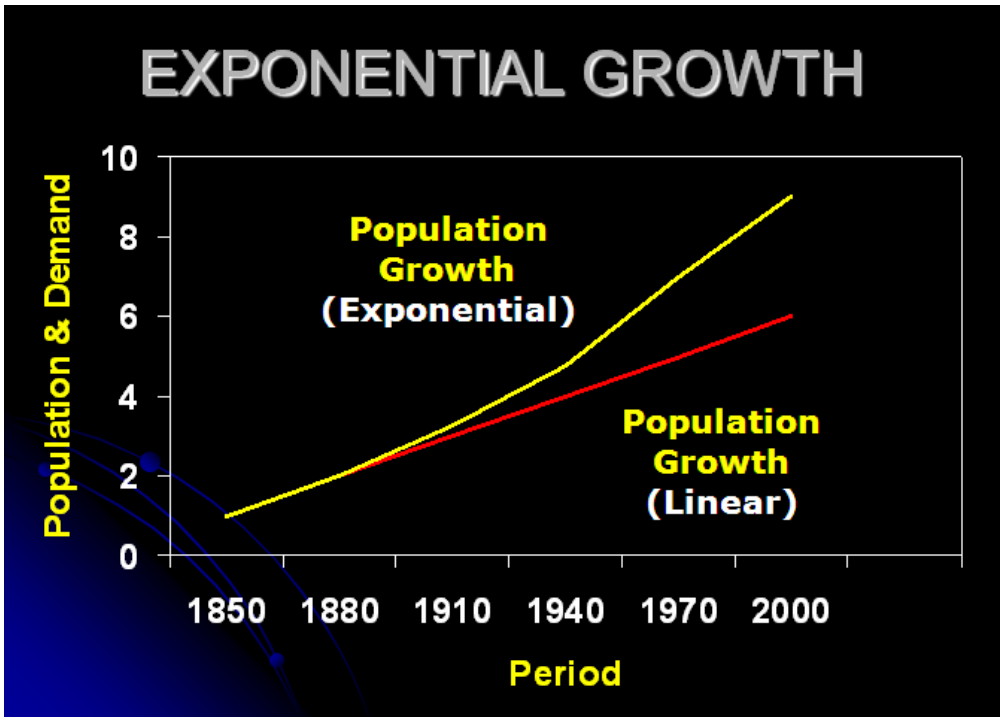
b. Exponential Growth:

Exponential growth focuses on increase in existing capability which is very realistic. Simple addition of a fixed amount to principle quantities (Linear Growth) leads you in wrong direction specially when it comes to population and power demand which are directly related to each other. Suppose load demand of a system increases at a rate of 10 % per year. Comparison of both linear and exponential growth can be seen clearly in the following graph.

Year	SIMPLE GROWTH		EXPONENTIAL GROWTH	
	ACTUAL DEMAND	ANNUAL INCREASE (%)	ACTUAL DEMAND	ANNUAL INCREASE (%)
1	10000	1000	10000	1000
2	11000	1000	11000	1100
3	12000	1000	12100	1210
4	13000	1000	13330	1333
5	14000	1000	14663	1466
6	15000	1000	16130	1613
7	16000	1000	17743	1774

When projected on graph, it is seen that after 3 to 4 fixed periods (whether years or decades or centuries) the exponential line leaves the normal addition line. The difference between the two is very important. This is the quantity which will be shortfall if realistic approach is not adopted. In Pakistan, this gap amounts to 5000 MW as mentioned earlier in this report. The key is to plan future projects on the basis of exponential growth and not with linear growth throughout the world. The graph is given below and it seconds the authenticity of the exponential growth. In addition to this, exponential growth should be calculated in collaboration with rest of concepts mentioned in this section specially forecasting.

Exponential Growth Of Demand


EXPONENTIAL GROWTH
Population & Demand
10
8
6
4
2
0
Population Growth (Exponential)
Population Growth (Linear)
1850
1880
1910
1940
1970
2000
Period

c. Doubling Period:

Indicates time after which the demand of a system will be doubled. It is a very important tool while analyzing the power sector and predicting the future demand. In other words, it gives us the approximate time frame within which you have to complete the projects required to fulfill the future needs of power.

Good thing about this tool is that either it is almost exactly correct or there is an error "in right direction", i.e. either the exact time or slightly less than that. Doubling period tool never gives a result which is longer than actual period resulting in delay of completion of projects and effect the development of power sector in negative sense.

Doubling Period (DP) = 70 / Percentage increase in power demand

Case 1: If increase is at a rate of 8%,

Doubling Period (DP) = 70 / 8 — 9 years

Case 2: If increase is at a rate of 9%,

Doubling Period (DP) = 70 / 9 — 8 years

d. Hydel-Thermal Mix:

The percentage share of conventional and renewable energy in a system, or in case of Pakistan, the proportion of Hydel Power and Thermal Power in system is called Hydel-Thermal Mix. It is mainly related with the cost effectiveness and need for the resources or availability of resources.

Logically, increase in thermal side will result in expensive energy while increase in hydel energy will create problems like load flow because hydel stations are site specific and mostly in northern part of the country, and away from load centers. Completion time for a hydel plant, cost of construction and other financial aspects are also mentionable problems while environmental effects can not be neglected as well.

It has been seen that a Hydel-thermal mix of about 50:50 to 60:40 (in favor of Hydel) always keeps the cost of electricity in manageable range. Increase in proportion of thermal beyond 50 % will result in price-hike, specially for a country like Pakistan which imports major quantity of needed oil.

Proper knowledge of the concept in light of one's own country's situation is very important.

E. Forecasting Management :

The correct forecast in long term planning is vital. Basic knowledge of cycles, cycle frequency, trend lines and curve fitting along with honesty, openness and dedication is very important to keep the power sector safe from dangers of power crisis.

1.6 The Approach

The existing crisis in Pakistan demands an approach which is different or a deviation from conventional strategies which are supply oriented in nature and target mainly on fulfilling the demand regardless of the source which is being used to generate electricity or energy. It is this approach which has led to the harnessing of coal, oil etc. for energy generation to such a large extent that now there is a danger that conventional resources may not be there in near future.

Pakistan is one of the few countries in the world which receive a significant portion of energy i.e. 6444 MW supply from Hydel power (39%). It has got immense solar potential, a significant potential of wind power (50,000 MW identified). At the same time, Pakistan obtains only about 21% of its oil supply domestically, the rest is imported.

The indigenous resources and the imported commodities also play a defining role in a country's energy strategy, energy prices, energy availability and many other important dimensions.

"IMPORTANT NOTE":

On the basis of discussion up till now, we have to adopt following two approaches simultaneously, if we are to come out of the current crisis before it is too late.

1. Integrated Energy Approach

2. Power Sector specific Approach

In the following chapters, both of these approaches are shed light upon. For integrated energy approach which is basically long term solution and focuses on developing human resources, economic structure and introducing social welfare throughout the country; the sources of energy policy, flaws in Pakistan's policy, proposed guidelines for a workable energy policy etc. are considered. For power sector specific approach, the immediate measures which are possible both in conventional and alternative dimension will be discussed as a short term and mid term solution.

Chapter no 2

THE INTEGRATED APPROACH *(THE ENERGY POLICY)*

2. THE INTEGRATED APPROACH *(THE ENERGY POLICY)*

This chapter extends the concept of integrated approach to the next level. Every meaningful state in this world makes energy policy in light of certain phenomena, events, happenings, strategic liberties and constraints, and global issues etc. Ironically, these factors are same for whole the world, but their reflection on various countries and various regions is different. Different countries look at these factors from a different angle which depends on their economic conditions, resources, technological development, and priorities.

"No energy policy can be successful unless it is perceived correctly, framed properly and implemented exquisitely'. So it becomes extremely important to develop a know how about these defining factors before one thinks of an integrated approach towards an energy strategy which will envisage a simultaneous improvement in all critical dimensions. This is the aim of this chapter. After dealing with the aforesaid, the flaws in our existing approach are touched briefly. The purpose is to pave the way for some guidelines for a practical, vibrant, viable and beneficial energy strategy.

So the chapter aims at three purposes:

a. Describe sources of energy policy

b. Indicate common flaws in Pakistan's energy policy

c. A brief guideline for a better energy policy

They are dealt with in the order given above.

Sources of Energy Policy

Because of space constraint, the sources of energy policy are merely touched upon. It is advised to the interested reader to consult other books relating to energy where these points are exᵖlained in detail. Following' universal factors are considered by the countries world over before opting for an economical but effective energy policy. Here they have been looked at with special reference to the third world or the developing countries.

2.1. Consideration of Global Problems:

Energy is a global problem, but it is certainly not the only one. The world is full of other major problems such as poverty, under nutrition, scarcity of developmental capital, environmental degradation, child labor and global warming etc. They are irrelevant if they are not linked with energy. But it has been proved on scientific, socioeconomic, as well as analytic basis that all of them are related to energy in one or the other way. Further penetration of this point is left to the reader because a lot of information about these all global issues is available every where including internet. If