PAPER NO. 220

FACILITATION OF HYDRO-POWER DEVELOPMENT BY INDEPENDENT POWER PRODUCERS

BY

ENGR. RIAZ NAZAR TARAR

FACILITATION OF HYDRO-POWER DEVELOPMENT BY INDEPENDENT POWER PRODUCERS

BY
ENGR. RIAZ NAZIR TARAR[1]

ABSTRACT

It is intention of the Government to create a competitive power market by restructuring / privatizing the existing public sector utilities of WAPDA and KESC. This is proposed to be achieved through the autonomous National Electric Power Regulatory Authority (NEPRA) established in December 1997 through an Act passed by the Parliament. NEPRA will be solely responsible for over-seeing of power sector through licensing for generating , transmission and distribution.

While transformation of power sector into a privatized / competitive industry will evolve over time, in the in-term period it would be necessary to create an environment of facilitating the efforts of independent power producers (IPP's) towards this end and particularly through development of the indigenous hydro-power resource.

The paper examines this issue in the context of : NEPRA's role in the light of latest (July 1998) Government Policy for IPP's ; present status of hydro-power including developable potential and imperatives of national development; and need for facilitation of efforts by IPP's to elicit their active participation in development of the renewable national resource of hydro-power.

NEPRA has already taken an initiative through launching of a study to facilitate the matter. The study aims at proving to the interested IPP's the relevant information in the form of :- hydro-logic data of potential sites: review / evaluation of the existing information and data; evolution of a rational ranking criteria; re-ranking of already identified / engineered projects; and recommend a priority list of the projects which could be offered to IPP's . In order to standardize further hydro-power development by IPP's as well as their uniform scrutiny by various public sector agencies, the study would also provide guidelines regarding : report formats / contents of pre-feasibility and feasibility level studies; requirements of details / design for bankable projects;

---

[1] Senior Consultant, National Electric Power Regulatory Authority (NEPRA), Islamabad.

and tender documents / specifications competitive bidding.

1. INTRODUCTION

1.1 Power System Changes

It is intention of the Government of Pakistan (GOP) to move towards the creation of a competitive power market in the country. It proposes to do so by restructuring and privatizing the existing thermal power generation, transmission and distribution functions and assets of existing public sector utilities (WAPDA /KESC), through an autonomous regulatory body known as National Electric Power Regulatory Authority (NEPRA), and through its future policy for independent power producers (IPP's).

WAPDA's restructuring will involve a corporatization process in which its eight area electricity boards may be converted into eight public limited companies, its 11 thermal power stations into a number of public limited companies and its transmission system into single public limited company. At the apex there may or may not be a holding company, depending upon whether competition is introduced before or during the privatization process. It is GOP's intention to privatize the distribution and thermal generation companies. The transmission company may remain in the public sector in the medium.

WAPDA would revert to its original role as on organization responsible for the maintenance of existing dams, building of additional dams on the main rivers and a generator of electricity from these dams. The restructuring and corporatization process will be accompanied by contractual relationship amongst various legal entities which may be created.

NEPRA Act has been approved by the Parliament and signed into law in December 1997. Consequently, an autonomous and independent regulatory authority has been created. It will be solely responsible for overseeing of power sector and exercise control through its mandate to license power generation, transmission and distribution. It will regulate tariffs for all these activities and perform its functions through transparent processes to be enshrined in the rules being framed. ' Initial Restructured Scenario of Electric Power Industry' under the oversight of NEPRA is expected to assume the shape as depicted in **Annex-1.**

Once the restructuring, corporatization and privatization of WAPDA / KESC's thermal power generation, power transmission and distribution is complete and NEPRA is fully operative , all future investment in power generation, transmission and distribution facilities will become market driven. Investors will deal with purchasers and distribution companies enter into supply contracts with them, develop their projects under NEPRA license, and operate under its oversight. In the interm, however, before this structures is established there is a need for an IPP policy to encourage the private sector to invest in power sector with the support of GOV. This is reflected in July 1998 IPP Policy of GOP.

1.2 Future Power Demand and Generation Targets

1.2.1 Demand Projections

For the purpose of preparing document for Ninth Five Year Plan (1998-99 to 2002-03), a Working Group for the Energy Sector was established by the Planning and Development Division of Government of Pakistan. In its Report of October 1997, the Working Group presented two power demand scenarios through 2017-18 as indicated in **Table-1**.

TABLE -1
POWER DEMAND SCENARIOS

FIVE YEAR PLAN	PERIOD	DEMAND PROJECTIONS			
		Normal Case		High Demand Scenario	
		MW	Growth Rate (%)	MW	Growth Rate (%)
8th	Ending 1997-98	11000	4.9	11000	4.9
9th	1998-99 to 2002-03	15200	6.8	15900	7.7
10th	2003-04 to 2007-08	22700	8.4	24900	9.4
11th	2008-09 to 2012-13	36500	9.9	41800	10.9
12th	2013-14 to 2017-18	56000	8.9	67000	9.9

1.2.2 Generation Targets

To cope with the projected demand, Working Group presented the generation targets of 9th Plan as indicated in **Table-2.**

TABLE-2
GENERATION TARGETS FOR NINTH PLAN

FIVE YEAR PLAN	PERIOD	INSTALLED CAPACITY TARGETS (MW)			
		Public Sector		Private Sector	Total
		WAPDA	KESC		
8th	Ending 1997-98 a)	9,900	2,100	4,700	16,700
9th	1998-99 to 2002-03	1,400 b)	-100 (b)	3,100	4,400
Total	Ending 9th Plan	11,300	2,000	7,800	21,100

a) Actual
b) Net excluding retirements / de-rating

It can be noticed that Ninth Plan is very heavily banking upon IPP's installation. Out of the total target of 4400 MW, 3100 MW would be expected from the private sector

comprising 1700 thermal and 1400 hydel capacity. The basic thrust as per latest Government of Pakistan Policy for IPP's would be to exploit the indigenous resources of hydro and local coal.

1.2.3 Expected Generation Capacity Deficits

Table-I projects that total power demand in the country is expected to range between 23,000 and 25,000 MW by end of 10th Plan in July 2008. The existing generation units and already committed additions to capacity in both the public and private sector are expected to meet the projected increases in the future demand up to the year 2002/2003. Additional capacity, would, therefore, be required beyond these years.

Subsequent to Energy Group Report of October 1997, WAPDA presented another low demand growth scenario of under 4% during the Ninth Plan due to depressed economy. Even if this projection materializes, the occurrence of generation capacity deficit may be pushed beyond 2003 by an year or so without changing the picture basically. In case the ongoing negotiations for supplying up to 1000MW to India materialize, additional capacity installation may have to be advanced.

1.2.4 Need For Expediting Installation

In view of the long lead-time required to bring new power plants on line, particularly those based on hydro, work on new power projects needs to be expedited. It is GOP's intention to solicit from IPP's immediate bids for hydel and indigenous coal-fired projects, which already have feasibility studies. Also, there is need to expedite feasibility study work, as appropriate, on the other identified projects through prescription of standard format and guidelines.

1.3 July 1998 Policy for IPP's

1.3.1 Major Departure From Previous Policy

Pakistan has established a track record of successfully attracting IPP's in the two previous policy rounds. The 1292 MW Hub Thermal Power Project in private sector started construction in 1993 as result of a negotiated tariff essentially based on a "cost plus" approach. The 1994 Private Power Policy and the 1995 Hydel Power Policy - frameworks were based on a tariff announced up-front by the Government and attracted private investment of over 3000 MW of thermal capacity. While up-front tariff approach greatly simplified and accelerated the process of acquiring new capacity in the backdrop of severe load-shedding, it was not based on a competitive framework for acquisition of new capacity. The new Power Policy Framework proposed now is based on setting a tariff as a result of a competitive process through which private sector entrepreneurs will he invited to offer the lowest tariffs.

Previous private power policy framework have predominantly resulted in private investment in-oil and gas fired power plants, mainly based on. imports. The Government will now have to play a proactive role in promoting the use of indigenous

coal and generation under this new power policy. It is intended that the initial invitations to bid will only be for hydel and indigenous coal based projects.

Despatch :

As per 1998 policy, the National Power Control Center (NPCC) will dispatch ants in accordance with optimal criteria (without any bias) on the basis of: lowest Energy Cost Component; transmission line losses; system stability and reliability; and other economic considerations. Because of their very low variable cost, hydel plants are likely to be dispatched with the highest priority.

1.3.2 Institutional Arrangements

NEPRA:

Act XL was passed by the Parliament in 1997. Soon after its enactment, in December 1997 NEPRA was created as an autonomous, independent regulatory authority.

PPIB:

Private Power and Infrastructure Board (PPIB) is already existing at the Federal level with representation from each province and AJK. PPIB is mandated to provide one window support to IPP's. In particular, it will: assist the private sponsors in coordination with the various governmental agencies; carry out negotiations of the Implementation Agreement (IA); issue the Letter of Support (LOS); and monitor/ follow up progress on the projects.

Provincial and AJKPPC's:

One window supports at the Provincial level would be provided by Provincial and AJK Private Power Cells (PPCs) for the projects located in the respective territories. The Provincial or AJK PPC, in consultation with PPIB and the power purchaser, will issue pre-qualification, documents, pre-qualify the bidders, issue bidding documents (prepared by PPIB in consultation with Provincial or AJK PPC) and evaluate the bids. The issuance of Letter of Support (LOS) for each project after approval of tariff by NEPRA will be the responsibility of PPIB. The Provincial or AJK PPC will also assist the private sponsors in coordination with the Provincial Government Agencies to carry out negotiations on the Water Use License/Agreement.

2. ROLE OF NEPRA IN HYDRO-POWER DEVELOPMENT

2.1 Policy Initiatives

NEPRA is undertaking many policy studies and initiatives in order to provide hydro power policy/programmes including: encouragement of development through IPP's; transfer pricing; the role of provinces and other entities in power generation, transmission and distribution; and to safeguard the interests of investors/co sumers by

regulating and controlling electricity prices.

Hydroelectric generation is universally recognized as the lowest levelized price power generation mode and for keeping the power tariffs within affordable and economic levels for the domestic, industrial and agricultural consumers. This has assumed critical importance for Pakistan due to induction of very costly thermal IPP's. Consequently. in keeping with GOP's policy, hydro-power is being given a high priority by NEPRA in respect of initiation of new projects. To achieve this, NEPRA has undertaken a "Desk Study to Facilitate Hydro-power Development by Independent Power Producers'.', which duly falls under it preview as per Act XL of 1997.

2.2 NEPRA's Role

1998 IPP's Policy describes NEPRA s role as below:

NEPRA s role in independent private power production will be to approve a tariff for particular proiect before a Letter of Support is issued bv the Prii,ate Power and Infrastructure Board (PPIB. It may also advise the PPIB or the Provincial or AJK Private Power Cell (PPC) as the case may be o,' the maximum acceptable tariff a project before it is bid. This maximum' tariff may then be specified in the Request for Proposals as the maximum acceptable to the GOP.

2.3 Sole Responsibility For Power Sector

As per Section 7 (1) of the Act, NEPRA; has sole responsibility for the power sector. As a natural corollary to this, NEPRA should also facilitate hydro-power development by independent power producers. To achieve that, it has to exercise oversight and control through:

1. Granting licenses for generation.

2. Prescribing planning criteria for cost effectiveness.

3. Fulfilling the requirements of 1998 Policy for IPP's to: approve the tariff for a particular project before the letter of support (LOS) is issued by PPIB; and to advise on the maximum acceptable tariff for a project before it is bid.

Particularly, the obligations under (ii) and (iii) above could be best discharge if the project is prepared by the sponsors on the basis of guidelines, criteria, standard and specified feasibility study format prescribed by NEPRA in a advance.

ln January 1999, GOP has issued a communication under "New Power Policy'' which stipulates that:

"List of all Hydel and Thermal Projects based on indigenous, fuel for which feasibility studies are already complete should be obtained from provincial/,AJK PPC's,

Planning and Development Division, Chief Engineer HEPO (WAPI)~) a/ d other concerned. NEPRA may be requested to determine the maximum acceptable tariff and ranking of these projects on the basis of financial and economic criteria

3. PRESENT STATUS OF HYDRO POWER

3.1 General Setting

Pakistan is gifted with fast flowing perennial rivers and streams in the north, and canals with significant falls in the upper Indus Plains. This naturally renewable resources is a free gift of God with great potential to generate cheap hydro-power without import of any fuel. Power generation is possible at various sites, as: run-of-river projects on tributaries; and multipurpose storage dam projects on the main stream rivers.

3.2 Hydro-power Potential of Pakistan

According to conservative estimates, Pakistan has a developable hydro-power potential of about 50,000 MW. About 31500 MW has already been identified in the Working Group Report of October 1997 with locational break-up in Table 3.

TABLE 3
BREAK-UP OF IDENTIFIED HYDRO-POWER POTENTIAL

LOCATION	CAPACITY (MW)
Main Stream	19300
Major Tributaries	10800
Nullahs / Canals	1400
Total :	**31500**

So, besides accelerated identification/ investigation of the remaining developable potential, there is need for pursuing active project planning for hydro-power development.

Ad-interim, already identified sites of about 1400 MW on nullahs/canals could be Offered to IPP's for development. -Not only that but special efforts should be made to involve private sector in joint development of medium sized projects with public sector on the major tributaries. In that case, most of the identified potential on major tributaries could be developed through this mode. To break the inertia, the first step should be compilation of the existing related data/information and ensuring its free and easy access to IPP's.

3.3 Hydro Power Planning/Development Strategies

3.3.1 Previous WAPDA Efforts

One of the functions for establishing WAPDA in 1958 was the integrated planning and development of water and power resources of the country through the public sector. In the context of hydro-power, initial WAPDA development efforts related to the multi-purpose storage reservoirs of Mangla and Tarbela as part of the Indus Basin Project.

Starting effort to assess/plan the integrated hydro-power resources was reflected in the 'Indus Special Study' of 1967 by Lieftinck Group of the World Bank. However, this study essentially covered medium/large sized multi-purpose storage reservoirs on the river main stems. Later on, the Power Planning Cell of WAPDA took up the activity but on the hydro-power side it mainly focussed on development of the full potential of Mangla and Tarbela Dam projects.

The first real effort for hydro-power planning in WAPDA started in early 1980's with the establishment of Hydro Electric Projects Organization (HEPO). The basic function of HEPO was to carry out feasibility studies of hydro-electric schemes with large potentials to meet the future power demand in the country. For this purpose, in 1981 the Canadian International Development A;,ency (CIDA) extended the necessary financial/technical assistance. Consequently, Montreal Engineering Company (MECO) was engaged to undertake a study in collaboration with HEPO of WAPDA. The study was completed in two concurrent phases. Phase A covered development of an inventory/ranking of hydroelectric schemes; and Phase B carried out a conceptual feasibility study of the first-ranked or most attractive major, high priority scheme of Basha Dam Project as determined in Phase A.

Scope of work under Phase A of the Study envisaged development of an inventory/ranking of hydroelectric schemes in two parts, first (Al) those schemes with an annual energy capability sufficient to meet at least two years energy load growth; and second (A-2) all other schemes with an annual energy capability in excess of 1000 GWh and providing energy at a cost less than one and a half times that from thermal electric plants. The inventory/ranking included the sites already identified and in addition identified some new sites.

Inventory/ranking under Phase A was completed by MECO in November 1984. This exercise covered the potential major hydroelectric schemes in the northern sector of the country (Indus River Basin above of Tarbela, Jhelum River Basin above Mangla and Kabul/Swat/Chitral Basins; in terms of technical, economic and financial attractiveness and suitability for incorporation into the national electric grid system. It provided reconnaissance level information on capability and cost of individual schemes for use in system power development planning. It also identified priorities for feasibility study and indicated the nature of the field investigations required at individual sites to establish feasibility.

It may be noticed that MECO Study of November 1984 covered only the mall1 rivers and major tributaries for development through public sector.

3.3.2 Integration of Public and Private Developments

So far, WAPDA was charged with the responsibility of power planning, in the public sector. The latest effort was the National Power Plan of April 1994. prepared by WAPDA with the assistance of CIDA. This Plan basically aimed to evolve an integrated power development package (hydro and thermal) to cope with the projected demands through the year 2o17-l8 and its findings are also reflected in the Ninth Plan Document. Thus, it can be assumed that future public sector hydro-power development would duly contribute to the optimal development of this renewable national resource. It is, however, imperative that after the proposed restructuring of WAPDA, the integrated national power planning effort must continue. As NEPRA Act seeks to create an autonomous, independent regulating authority, to be solely responsible for the power sector, it must have an effective say in the future power planning also.

For development of hydro-power through the private sector, it is essential that adequate project selection criteria be prescribed to conform to the overall strategy of optimal development including integration with the public sector efforts. One of the main aims of proposed Desk Study by NEPRA is to provide the guidelines in this regard. In the absence of such information, the private sector may choose to develop such projects which only safeguard the interests of the sponsors in contrast to the national optimality concept..

3.4 Imperatives of National Development Through Hydro-power

In the recent past, balance heavily tilted in favor of thermal generation instead of hydro-power. Further, public sector was excluded from generation and reliance was placed entirely on private thermal power projects. Policy followed for IPP's resulted in almost unbearable energy cost to the consumers besides bringing WAPDA to the brink: of financial disaster. This brought realization on the part of Government, that hydro-power should be given due priority and attention. Consequently work started on construction of Ghazi-BarothalChashma Hydro-power projects and active planning on Neelum-Jl1elum and Kohala projects.

For meeting the projected demands from 9th through 12th Plans, a sizeable contribution is expected from hydro-power as part of GOP's Policy thrust and the, private sector would also have substantive role in this regard. This. in fact, is the thrust of 1998 Policy for IPP's in line with the imperative of national development through emphasis on hydro-power.

Some public sector / international agencies (SHYDO/WAPDA/GTZ of Germany) have carried out identification and preliminary investigation work with focus on less time and cost intensive n~n-of-river site locations with high head on major river tributaries and nullahs (Annex 2). Accordingly, a developable hydro-power potential of about 7100 MW has been already identified.

3.5 Poor Response From IPP's

In response to GOP's 1995 Hydel Policy, letters of support (LOS) for about 268 MW were issued for hydro-power development thorough IPP's (Annex 3). None of these has so far reached the position of financial close and in most cases either the validity of LOS has expired or the sponsors have gone to the court. Only in October 1998, NEPRA received through WAPDA, the proposal for B S Link I (Tail) Hydro-power Project with the proposed tariffs for inclusion in the power purchase agreement (PPA). After initial examination / comments, NEPRA asked for additional information / documentation to process the case. In the meanwhile, validity of its LOS expired on 28 November 1998. Cabinet Committee on Investment (CCOI), in its meeting of 08 January 1999 did not agree to further extension. However, the Ministry of Water and Power has resubmitted the case to CCOI recommending one year further extension of LOS for this project.

The poor response so far by the private sector for hydel generation is basically due to:

i) High up-front investment costs of long gestation type.
ii) Lack of proper institutional arrangements (such as an effective one window operation).
iii) Lack of conducive investment environment.
iv) Prevailing culture, including engineering back-up, for developments through the public sector as opposed to the private sector.
v) Lack of technical information and guidelines including a handy project portfolio backed by proper engineering studies.
vi) Undue scare regarding perceived technical, economic and financial risks.

Reasons (iv) to (vi) above seem to be serious impediments in attracting the private capital for hydel development. The type of the Study now undertaken by NEPRA could be a genuine starting effort towards addressing these impediments.

4. NEED FOR FACILITATION OF IPP's EFFORTS

4.1 Past Studies

A number of studies have been carried out in the past by local and foreign agencies and consultants in this regard, and considerable data is reportedly available. It is, however, difficult to locate the data which is generally in a scattered form, in different formats and at different locations. In many cases, extensive valuable data on site investigations at reconnaissance, pre-feasibility and feasibility levels is apt to be misplaced and not available for reference and subsequent use. On the other hand, for proper project planning including saving of time and cost, it becomes difficult, if not impossible, without ready accessibility of hydro-logic, geologic, techno-economic and other environmental information already collected with great effort.

Unfortunately, despite numerous studies and reports by different agencies in the past, when an effort is made to locate and to make use of data and technical information

collected already at great cost of time and money, serious difficulties are encountered. It is not easy to find the information scattered at different places and with different agencies because archiving and dissemination of this information has not received due consideration.

Some half hearted and disjointed efforts were made by the public sector agencies in the past, but could not reach their logical conclusion, due to loss c; interest along the way. Though some activity is going on now, it is almost at snail pace. Further, whenever completed, it would only fulfil partial requirements. On the other hand, it must be realized that field investigations, research data and related documents are invaluable national assets and should be readily accessable to any interested user.

4.2 Suggested Approach

It has been realized that considerable work is required for listing out and ranking hydro-power projects which can be prioritized and offered to IPP's for development. On the other hand, it is not possible for the private sector to invest in an ir.ventory and planning study of Pakistan hydro-power resources. Main stem river projects, specially involving storage, should be left out for the public sector. For other tributary small stream projects, considerable work already done and data collected by WAPDA, SHYDO, GTZ and Provincial Irrigation & Power Departments (PID's' may be the starting point. Though some of this information is already computerized, b, 'k of it is in scattered reports and on varying formats. It would be necessary to collection reports and documents relating to hydrology, sediment, geology and hydro power development lying at different places and with various agencies. Documents and information thus collected could be archived to serve as handy reference for the interested quarters.

To make an earnest start in this direction NEPRA has taken the initial of creating technical archives through a properly designed and implemented study and work done in the past would be collected and archived at one place. Care would be taken to avoid duplication of the efforts already done by various agencies. In fact, the objecting would be to integrate the work under this exercise. Once established, and located appropriate formation for effective dissemination, all concerned quarters will be requested to send copies of data/reports for their respective projects. This would help c~p-dation and also avoid future repetition of some of the investigations already out by another agency. Further, this would save time and money, and help better evaluation and determination of priorities for hydro-power planning/development.

The study output would be aimed at facilitating hydro-power development by IPP's through dissemination of information on :-

i) Status of engineering on various identified sites.

ii) Attractive projects, ranked on the basis of updated criteria, which could be offered for development through IPP's.

iii) List of projects to be taken up for further studies including:
   (a) Desirable format of pre-feasibility studies.
   (b) Broad guidelines for preparation of bankable projects covering feasibility report formats; detailed designs/specifications; and bidding documents.

Under (iii) above, the Study would facilitate an expeditious and unifonn evaluation of the hydro-power projects at the time of tariff approvals by NEPRA before LOS is issued by PPIB under 1998 IPP's Policy. For fulfilling this obligation, NEPRA would be facilitated if the projects were prepared in accordance with the standard criteria, of format and guidelines. The Study by NEPRA would thus enable achievement of this objective effectively. In addition, it would provide a systematic framework for facilitating hydro-power development by IPP's.

5. STUDY DESCRIPTION

5.1 Scope

This will be essentially a desk study with the scope of:

i) Collection and archiving of the hydro-power related data/studies carried out so far by various agencies.

ii) Creation of Computer based data bank, through collection, collation and compilation of exiting surface water hydro-logic data so that it could be disseminated among the interested groups including use for micro/macro level analysis and system studies.

iii) Out of the material collected under (i) above, compile and review the existing portfolio of tributary /small stream hydro-power projects and:

a. Evolve technical evaluation criteria based on ground realities and identifying gaps in existing studies.
b. Re-rank the projects in line with (a) above
c. Out of the re-ranked projects, suggest a prioritized development list for offering to IPP's.
d. For remaining projects, identify the types of further sh~dies to take them to implementation sta~e This cover :

- Evolution of an appropriate format of pre-feasibility studies.
- Providing broad guidelines for preparing feasibility studies of bankable projects with due consideration of: design; specifications; bidding requirements; and concerns of financers /IPP's/Government regarding various types of risks.

5.2 Archiving of Existing Data and Studies

So far, a number of public section agencies/organizations l~ave been involved in hydro-power investigations and planning. All these and any othe7 related formations will be contacted to obtain the necessary information/data for its organization into systematic and handy to consult archives.

5.3 Creation of Hydro-logic Data Bank

Fortunately, long term discharge data of Indus river and canal systeni ~s available. Particularly, for the purpose of hydro-power, the data of river rim-stations, barrages and canals with significant falls could be very helpful. So far, however, the main use of these data has been for the purpose of surface water distribution-cum-management of Indus Basin Irrigation System (IBIS). If compiled in handy form, it could be beneficially disseminated to the quarters interested in hydro-power developments.

In addition to IBIS data, in early 1960's, WAPDA established own its hydro-met network for the purpose of various planning and investigation studies. Cost of this network is located in the upper river catchments above rim-stations and also covers some major tributaries. This network is being operated by Surface Water Hydrology Project (SWHP) of WAPDA. Besides general purpose hydro-logic data collection, some gauging stations were established from time to time to collect specific project related data. This was most, done by FIEPO of WAPDA and SHYDO of NWFP.

As part of this exercise, a review of the existing hydro-met networks in the upper river catchments would be carried out to:

i. Assess adequacy of coverage for the identified sites ; and
ii Make recommendations for up-gradation/extension to facilitate availability of reliable hydrological data for further hydro-power developments.

To accomplish this task, all these organizations including any other identified later) will have to be visited and basic information obtained for creation of computer based data bank. This data bank will have the facility for periodic updating along with recommendations for the necessary wherewith including institutional arrangements within NEPRA or any other agree agency consider appropriate for effective dissemination.

5.4 Re-ranking Study

5.4.1 Need

As already mentioned, November 1984 Report of MECO essentially covered the river main stems and major tributaries. It summarized the investigation and findings reached and provided an inventory of hydro-power schemes ranked according to the prescribed criteria. It also gave a comparative assessment of each scheme to substantiate the ranking and conclusions.

As planning is a continuous process, MECO Study only provided a starting base. To pursue the process systematically, on a number of subsequent occasions WAPDA prepared PC-II Proformas for up-dation of ranking criteria including expansion of the work scope to smaller river tributaries. However, this did not find approval of Government of Pakistan.

With the changed scenario of emphasis on privatization including restructuring of WAPDA, greater reliance is going to be placed on IPP's for hydro-power generation, particularly on small river tributaries. To facilitate that, it is urgent to evolve a rational ranking criteria so that a prioritized list of projects could be offered to IPP's for optimal development. NEPRA has therefore, taken the initiative through this Study.

5.4.2 Review of Existing Project Portfolio

From the available information, run-of-river projects on high head small streams and low head canals will be reviewed. This exercise will basically use the considerable work already done by WAPDA, SHYDO and GTZ. The following criteria could be adopted for this review:

i) No initial lower limit of installation (MW) and annual energy generation (GWH) due to variations in technical, economic and strategic aspects.

ii) Isolated micro projects to serve certain areas/communities to be excluded.

iii) Identification of viable projects of reasonable size with prospects of pre-feasibility/feasibility/detailed design level studies for rapid development through private sector with due account for:

a.. Availability of essential information /data.
b. Provisions of July 1998 Policy for IPP's (including modifications, if considered necessary).
c. Concerns of IPP's on policy, finances and overall investment climate, etc.

5.4.3 Initial Project Screening

An initial screening of the above identified projects would then be carried out taking into consideration:

a. Existing level of investigation data.
b. Availability and reliability of hydrological data.
c. Level of geo-technical investigations.
d. Regional importance.
e. Connectability to the national grid.
f. Contribution to firm/peak power and its useful absorption in the grid.
g. Level of existing engineering studies such as: identification, concept report,

pre-feasibility report, PC-II, feasibility report, PC-I and expression f active interest by any party.

Based on the above screening, an initial list of prospective projects will be drawn up.

5.4.4 Re-ranking of Projects

The above screened list will then be re-ranked after detailed scrutiny/ examination of the available data and reports with particular reference to:

a. Status of preparedness/investigations of each project.
b. Any data gaps and essential additional work required to reach the level of a bankable project (this should also consider the likely time and cost estimates).

For the projects having already reached feasibility level, the related study will be examined in respect of:

a. Level of adequacy for bankable project.
b. Location: access and logistic support
c. Hydrology: firm power basis including evaluation of supplies during low and high flow periods
d. Sedimentation: aspects including their impact on the type of power station equipment.
e. Geology: natural hazards and their mitigation
f. Seismic aspects
g. Power transmission possibilities
h. Serious adverse environmental aspects
i. Rehabilitation/resettlement (if involved)
j. Classification/categorization of perceived risks (both by the private and public sectors) including their proper evaluation for the purpose of mitigation /allocation.
k. Possibility of phased development (in relatively larger projects)
l. Social aspects
m. Specific locational aspects (if located on a canal)
n. Aspects of self-reliance including local manufacture/construction and community participation in construction/operation etc.

5.4.5 Preparation of Prioritized Project List

Out of the above re-ranked hydro-power projects, a prioritized list (5-10 sites) will be drawn up so that these could be offered for development through IPP's.

To evolve the above list of projects, a uniform prioritization criteria would need to he followed. This would encompass the following basic elements:

i) Feasibility study assessment.

ii) Evaluation of feasibility studies after conversion to common basis.
iii) Financial aspects.
iv) Risk Evaluation.
v) Implementation time frame.

To assure acceptability of the prioritized list by the concerned Federal/Provincial agencies, arrangements are envisaged for standing review during the Study implementation.

5.5 Guidelines for Further Studies

In order to systematize further hydro-power developments by IPP's, as well as their uniform scrutiny by various agencies, out of the re-ranked list the Study would identify potential projects for further engineering studies. This would involve:

i) Evolution of a standard format along with technical contents of pre feasibility and feasibility studies.
ii) Providing broad guidelines regarding:
   a. Requirements of details/design to be covered by feasibility reports to provide bankable projects.
   b. Tender documents including specifications, etc. to facilitate competitive bidding.

6. STUDY IMPLEMENTATION AND OUTPUT DISSEMINATION

6.1 Study Implementation

Though a desk study, it would involve sizeable work input of specialized and multi-disciplinary nature by way of: data/reports collection; reproduction; archiving; review/refining of technical criteria through appropriate level professional inputs; and report writing-cum-documentation.

The Study has just started and is proposed to be completed within a period of 20 months.

6.2 Dissemination of Study Outputs

Effective arrangements will be made by NEPRA for dissemination of study output to the target group of IPP's. In addition, the outputs will be made accessable to the following formations:

1. PPIB
2. PPC's
3. GOP'(Water and Power/P&D Division)
4. HEPO (WAPDA)
5. SHYDO (NWFP)
6. Any Other (on request)

7. CONCLUSIONS AND RECOMMENDATIONS

7. I Conclusions

The nation is now faced with a peculiar energy crises. Whereas there is presently an excess installed capacity in the country, the electricity tariff are getting out affordability level for all categories of consumers. This is primary due large scale induction of thermal IPP's with excessively high cost. On the other hand, to a cope with increasing power demand, the excess installed capacity may not lost long. So to keep the future electricity tariff within reasonable limits, it seems inevitable to lay emphasis on the development of indigenous energy resources. Pakistan is fortunately gifted with a very large potential of developable hydro-power. Only a small part of it has them developed so for and that too in the public sector.

Hydro-power development involves high initial investments and long gestation periods. Therefore, exploitation of hydro potential of main rivers and major tributaries would continue to be handled by the public sector through multi-purpose storage projects. This would mostly fall under the charter of WAPDA. The other primary consideration of integrated surface water operations under preview of the Indus River System Authority (IRSA), would also warrant that these projects remain with the public sector.

Regarding exploitation of sizeable hydro-power potential on the large tributaries with only small re-regulating storages, the projects could be developed under the following criteria:

i. Public sector (large sized projects with heavy investment).
ii. Jointly by the public and private sectors (medium size projects).
iii. By the private sector (medium to small sized less cost intensive projects involving minimum infra-structural facilities).

A special mention needs to be made about the possibility of joint public/private sector development of medium size projects. Despite very liberal (rather lavish) 1995 hydel policy, the response by the private sector has been disappointing. This shyness has been caused by a number of contributing factors such as: poor state of national economy; high up-front investments with long gestation; perceived risks of undertaking projects based on sub-standard engineering and uncertain hydrology; and recent back-tracking of GOP on the sovereign guarantees for thermal IPP's. Thus a serious gap exists between the public and private sector development strategies.

7.2 Recommendations

Hopefully, the proposed initiative of NEPRA through this Study could be an effective step towards bridges this gap. This is, however, the first step. For ready access to the concerned quarters, particularly IPP's the previous reports / studies to be archived this Desk Study would need computerization and inclusion in the national data base. For this purpose, some existing national organization could be approached for necessary help.

Creation of computerized hydro-logic data bank and archives under the Study should be sufficiently detailed and desegregated. This information would become handy for future use and evolution for revised project ranking criteria without further investigation and data collection.

So far there is a general lack of communication between public and private sectors, which breeds mutual mistrust. This is equally true for hydro-power development through IPP's. So there is immediate need for opening of communication channels leading to free exchange of information including sharing of perceptions/apprehensions on both sides. The forums like Pakistan Engineering Congress could provide an effective platform- in this regard by holding seminars/symposia to bring together the interested quarters from both the public and private sectors.

Needless to emphasis that the above recommendations would help in arousing the interest óf private sector in hydro-power development and contribute its due share towards solving the national energy crises.

8. REFERENCES

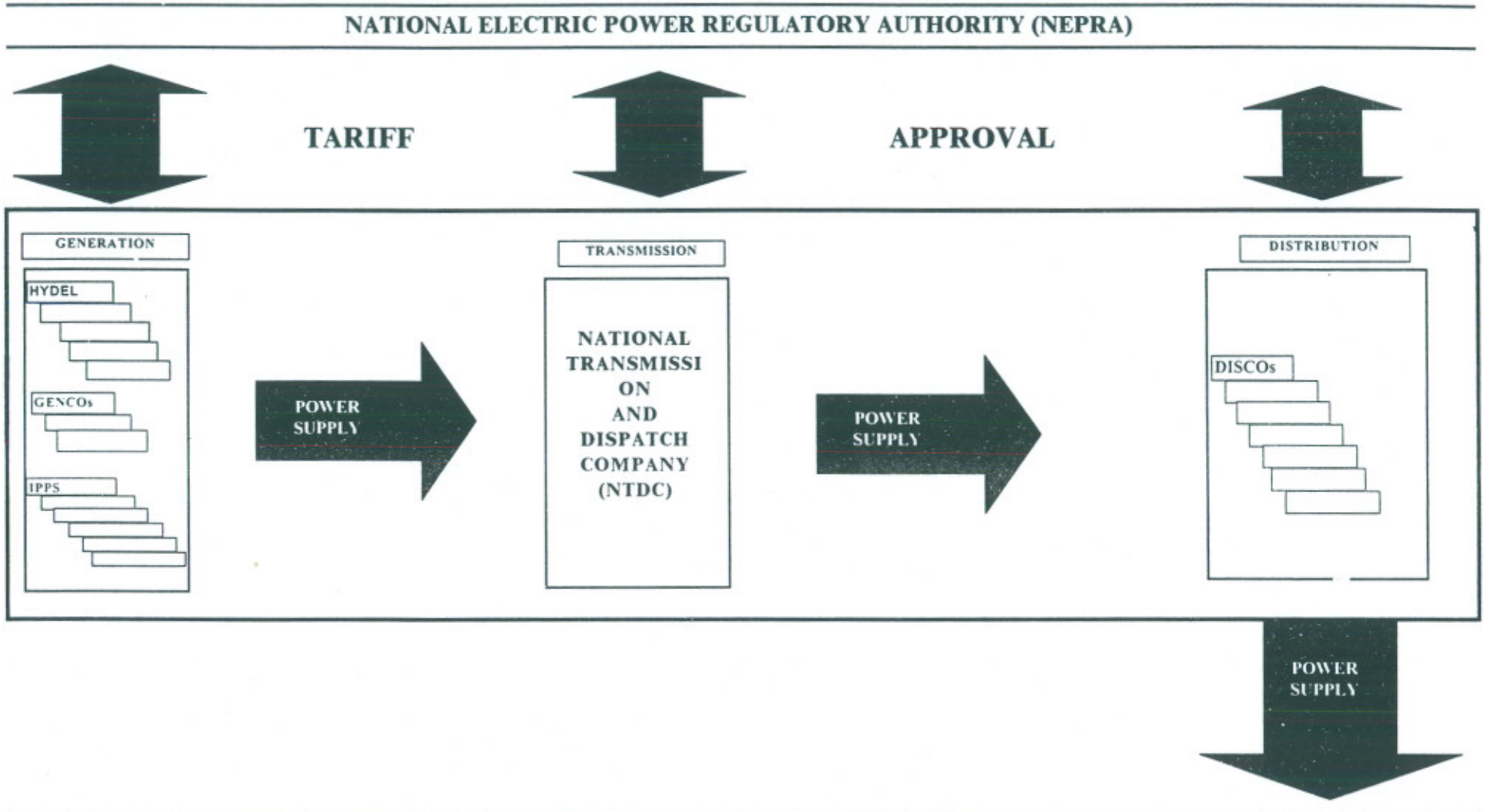
1. Hydroelectric Inventory, Ranking and Feasibility Studies for Pakistan, Phase A- Inventory and Ranking Study by Montreal Engineering Company of Canada, November 1984.

2. WAPDA's National Power Plan prepared with assistance of Canadian International Development Agency (CIDA), April 1994.

3. Report of the Energy Group for Energy Sector for the Ninth Five Year Plan, Planning and Development Division, Government of Pakistan , October 1997.

4. Working Paper on "Desk Study to Facilitate Hydro-power Development by Independent Power Producers", NEPRA, February 1999.

PAKISTAN ELECTRIC POWER INDUSTRY : THE INITIAL RESTRUCTURED SCENARIO



ANNEX-2

HIGH HEAD HYDROPOWER PLANTS PROPOSED BY SHYDO /GTZ

Sr. No.	Promoting Agency	Name	MW	GWh/n	Cost / Million $	H/m	Q/m3 /Sec	Vo :age	Project State		Comissing
711	Shydo-GTZ	Reshun	4	25	6	390	1.6	33	Construction		1998
741	Shydo-GTZ	Battal Khwar	8	45	14	176	6	33	Fc asibility	1994	2001
731	Shydo-GTZ	Summar Gah	28	105	21	400	9	132	Feasibility	1994	2001
751	Shydo-GTZ	Ranolia	11	64	11	403	3.5	33	Feasibility	1994	2000
721	Shydo-GTZ	Shishi	2	15	4	85	3	33	Feasibility	1994	2000
518	WAPDA/HEPO-GTZ	Golen Gol	100	420	100	450	28	132	Feasibility	1994	2006
516	Shydo-GTZ	Matiltan	85	348	94	252	40	132	Feasibility	1994	2003
515	Shydo-GTZ	Daral Khwar	36	150	41	300	15	132	Feasibility	1996	2001
511	Shydo-GTZ	Khan Khwar	72	306	86	253	35	132	Feasibility	1997	2002
512	Shydo-GTZ	Duber Khwar	160	750	147	543/658	35	132	Feasibility	1996	2003
510	Shydo-GTZ	Allai Khwar	140	550	160	696	26	220	Feasibility	1998	2003
509	WAPDA/HEPO	Neelum	969	5254	1245	420	280	500	Feasibility	1998	2006
541	WAPDA/HEPO	Kohala	500	3051	711		220	500	Feasibility	1997	2007
538	WAPDA/HEPO	Chakothi Hattian	139	1122	341	154	120	220	Feasibility	1997	2003
537	WAPDA/HEPO	Hari Giel	53	274	82	316	22	132	PC-2	1995	2004
536	WAPDA/HEPO	Kotli-2	97	597	171	95	130	132	PC-2	1995	2004
539	WAPDA/HEPO	Hariyola	12	70	33	337	47	32	PC-2	1995	2006
241	Shydo-GTZ	Kalam (A1)	105	391	113	170	75	132	PC-2	1995	2007
242	Shydo-GTZ	Kedam (B1)	428	1815	401	435	120	220	PC-2	1995	2007
243	Shydo-GTZ	Madyan (C1)	150	653	212	160	120	132	PC-2	1995	2007
251	Shydo-GTZ	Naran	219	866	720	340	80	220	PC-2	1995	2007
252	Shydo-GTZ	Suki Kinari	652	2797	610	930	90	500	PC-2	1995	2010
261	Shydo-GTZ	Kandiah System	1025	3574	1155	820/552	69/135	500	PC-2	1995	
250	Shydo-GTZ	Chor Nalah / Spa	850	3661	829	610/400	75/70	500	PC-2	1995	
541	WAPDA/HEPO-GTZ	Phandar	87	386	38		44	132	PC-2	1997	
544	WAPDA/HEPO-GTZ	Naltar-III	22	116	14		8	132	PC-2	1997	
545	WAPDA/HEPO-GTZ	Naltar-V	32	164	31		8	132	PC-2	1997	
551	WAPDA/HEPO-GTZ	Basho-II	9	50	6		4	33	PC-2	1997	
554	WAPDA/HEPO-GTZ	Harpo-II	41	219	20		7	132	PC-2	1997	
557	WAPDA/HEPO-GTZ	Doyan	360	1822	195		115	220	PC-2	1997	
546	WAPDA/HEPO-GTZ	Jaglot	16	80	13		2	33	Identification	1997	2008
761	Shydo-GTZ	Bimbal	8	40	8		5	33	Identification	1993	2005
771	Shydo-GTZ	Gande Gah	4	34	6		2	33	Identification	1994	2005
533	Shydo-GTZ	Jahori	8	43	10		8	33	Identification	1992	2005
530	Shydo-GTZ	Korara New	8	41	8		8	33	Identification	1992	2010
543	Shydo-GTZ	Sharmai	155	547	152		69	132	Identification	1993	210
544	Shydo-GTZ	Koto	53	263	89		76	132	Identification	1992	
542	WAPDA/HEPO-GTZ	Baru	30	157	15		12	132	Identification	1997	
543	WAPDA/HEPO-GTZ	Chhantir	16	81	22		7	33	Identification	1997	
547	WAPDA/HEPO-GTZ	Daintar	18	91	9	406	5	132	Identification	1997	
548	WAPDA/HEPO-GTZ	Dltit	250	1248	321	227	140	132	Identification	1997	
549	WAPDA/HEPO-GTZ	Skadu -IV	14	58	13	220	8	33	Identification	1997	
550	WAPDA/HEPO-GTZ	Kachura-V	32	146	51	222	18	132	Identification	1997	
552	WAPDA/HEPO-GTZ	Basho-III	13	67	9	530	3	33	Identification	1997	
553	WAPDA/HEPO-GTZ	Tormic-II	11	221	18	512	10	132	Identification	1997	
555	WAPDA/HEPO-GTZ	Talu	25	129	13	1120	3	132	Identification	1997	
556	WAPDA/HEPO-GTZ	Parishing-IV	13	64	11	162	10	33	Identification	1997	
		Total:	7100	32970	8379						

ANNEX-3

PRIVATE SECTOR
ISSUED LETTERS OF SUPPORT (LOS'S) UNDER 1995 HYDEL POLICY

Sr. No.	Location	Installed Capacity
I.	PUNJAB	
1	B.S. Link (Head	6
2	B.S. Link (Tail)	6
3	Lower UCC, RD 283+400	10
4	Main Line UCC, RD. 133+296	9
	SUB-TOTAL:-	31
II	AJK	
1	New Bong Escape, Mirpur	45
2	Riali, Saidpur	10
3	Madar Batduru, Muzaffarabad	2
4	Jari, Mirpur	1
	SUB-TOTAL :-	58
II	NWFP	
1	Malakand-III	75
2	Ranolia	12
3	Matitan, Swat	84
4	Batal Khwar, Swat	8
	SUB-TOTAL:-	179
	TOTAL (I+II+III):-	268