Impact of International Finance on Public Policy for Water, Food and Energy Security

Naseer Gillani

Chief National Planning Commission Pakistan
Chair Pakistan Water Partnership
156 National Economic Council.

157(1) The President shall constitute a National Economic Council which shall consist of –

(a) the Prime Minister, who shall be the Chairman of the Council;

(b) the Chief Ministers and one member from each Province to be nominated by the Chief Minister;
The National Economic Council shall review the overall economic condition of the country and shall, for advising the Federal Government and the Provincial Governments, formulate plans in respect of financial, commercial, social and economic policies; and in formulating such plans it shall, amongst other factors, ensure balanced development and regional equity and shall also be guided by the Principles of Policy set out in Chapter 2 of Part-II.
CHAPTER 3.- SPECIAL PROVISIONS

153. Council of Common Interests.-

(1) There shall be a Council of Common Interests, in this Chapter referred to as the Council, to be appointed by the President.

89[(2) The Council shall consist of –

(a) the Prime Minister who shall be the Chairman of the Council;

(b) the Chief Ministers of the Provinces; and

(c) three members from the Federal Government to be nominated by the Prime Minister]
Constitutional Provisions for Public Policy Institutional Framework

(4) The Council shall be responsible to Majlis-e-Shoora (Parliament) and shall submit an Annual Report to both House of Majlis-e-Shoora (Parliament).

154. Functions and rules of procedure.–

92[(1) The Council shall formulate and regulate policies in relation to matters in Part II of the Federal Legislative List and shall exercise supervision and control over related institutions.]
Dasu Hydropower Project

Progress of Project Implementation
1. Justification of Dasu Project

The necessity of Dasu Hydropower Project is justified as follows:

- **Contribution to improve the current power shortage** ranging 5,000~ 7,000MW and to meet increasing power demand of 7% per annum
- **Improvement of energy mix ratio from thermal to hydro** since increasing power tariffs is caused by import of fuel for thermal power plants
- **Least cost project** comparing to thermal alternatives and in particular among planned hydropower projects
- **Less social and environmental impact** and high green house gas (GHG) efficiency due to high power density (166 Watt/m$^2$)
Dasu Hydropower Project

Progress of Project Implementation
Dasu Hydropower Project

Progress of Project Implementation
Dasu Hydropower Project

Progress of Project Implementation
Construction of dam and appurtenant structures

- Spillway Gate
- Spillway Chute
- Guard gate
- Regulating gate
- Maintenance gate

0.3m/day
1. No. of resettlement sites to be developed:  
   40 places under 25 villages (R/B=9, L/B=16)

2. Facilities to be provided for each village:
   - Development plan
   - Water supply & sewerage
   - Internal roads
   - Connecting roads from relocated KKH to sites
   - Electricity will be supplied from the Grid Station via 11 kV D/L by a separate contract
   - Communal facilities may or may be provided by Project

3. All resettlement sites are located along the relocated KKH/Right Bank Roads or above relocated KKH/RAR and owned by the villagers who are to be resettled.
Construction of underground powerhouse and tunnels

**Work Section:**

WS 1: Intake to Powerhouse
WS 2: Access Tunnel to Powerhouse
WS 3: Tailrace Tunnel
Traffic Conditions at Peak Time

Vehicle per Day (L=80km)
1,000 → 1,250 VD
Cement/steel/Fuel

Indus River

Recommendation:
(1) Establishment of traffic committee,
(2) provision of layby along KKH from Hasanabdal to Dasu
(3) Training and Strengthen of Traffic police
(4) Application of belt-conveyor system
## Status of Procurement Documents

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<td>- Finalization of PQ documents and bidding documents</td>
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Development of Resettlement Sites
Least Cost Alternative

Unit Cost of Dasu Power Plant (Based on financial cost incl. IDC):

- Capacity cost: Full development=1,850 US$/kW
  Stage -I=2,490 US$/kW
- Energy cost: Full development=2.0~2.4 Usc/kWh
  Stage-I=2.4~3.0 Usc/kWh

<table>
<thead>
<tr>
<th>Project</th>
<th>I.C. (MW)</th>
<th>Capacity cost (US$/kW)</th>
<th>Energy cost (Usc/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neelam Jhelum</td>
<td>969</td>
<td>2,229</td>
<td>4.5</td>
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<tr>
<td>Bunji</td>
<td>7,100</td>
<td>1,710</td>
<td>5.4</td>
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<tr>
<td>Diamer Basha</td>
<td>4,500</td>
<td>2,510</td>
<td>6.6</td>
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<tr>
<td>CCGT</td>
<td></td>
<td>1,227</td>
<td>14.4</td>
</tr>
<tr>
<td>Unit Hydro Cost (2015~2030)</td>
<td></td>
<td></td>
<td>6.5~5.7</td>
</tr>
<tr>
<td>Unit cost of thermal (2015~2030)</td>
<td></td>
<td></td>
<td>12.1~14.2</td>
</tr>
</tbody>
</table>

Source: NTDC
2. Project Scope, Facilities and Cost

Location Map and Access to Site

- Reservoir Area
- Dam site
- Diaper Basha Dam
- KKH (Islamabad/Dasu: 350km)
- Tarbela Dam
Main Technical Issues

1. High Floods due to GLOFs (Glacier Lake Outburst Floods)
2. High Sediment Yield & Concentration
3. Seismic Danger Zone
4. Limited Accessibility to and within the Site

Solutions:

1. **Provision of large spillway gates**: 16.5mx22.4mx8nos
2. **Provision of low level outlets (LLO) and flushing tunnels (FT)**:
   - LLO: D=6.4m, 9nos
   - FT: D=9.4m, 2nos
3. **Application of 3D dynamic computer simulation under a peak acceleration of 0.54g**
4. **Establishment of elaborate traffic management**: Provision of laybys along KKH, application of belt conveyor system, etc.
General Layout of Project Facilities
### List of Project Facilities

<table>
<thead>
<tr>
<th>Facilities</th>
<th>Description</th>
<th>Stage I</th>
<th>Stage II</th>
</tr>
</thead>
</table>
| Dam                 | - 242m high dam  
- 8 spillway with gates  
- 9 LLO with gates  
- 2 flushing tunnels with gates                                                                                     | Completion of all facilities listed in left                                                                     |                                                                                                                  |
| Power Intake & tunnel | - 4 intake and shafts with 4 gates  
- 4 Power tunnel                                                                                                               | - 4 intake and shafts with 2 gate  
- 2 power tunnels                                                                                                          | - Another 2 gates  
- 2 power tunnels                                                                                                   |
| Underground complex | - Cavern for 12-unit GE space and installation of 12 GE units  
- Cavern for 12-unit GIS space and installation of 12 GIS units  
- 4 surge chambers  
- 4 tailrace tunnels incl. these outlets.  
- 4 bays with Control Building                                                                                                                                 | - Cavern for 7-unit GE space and installation of 6 GE units  
- Cavern for 7-unit GIS space and installation of 6 GIS units  
- 2 surge chambers  
- 2 tailrace tunnels incl. there outlet.  
- 2 bay with Control Building                                                                                                                                 | - Cavern for 5-Unit GE space and installation of 6 GE units  
-Cavern for 5-unit GIS space and installation of 5 GIS units  
- two surge chambers,  
- two tailrace tunnels  
-Two bays                                                                                                           |
| T/L                 | - 500 kV T/L, 2 lines, double circuit                                                                                                                                                                     | - 500kV 1 line, double circuit                                                                                   | - second line, double circuit                                                                                     |

**Other than above the following facilities shall be completed before start or during Stage 1:**

- Relocation of KKH (64km)
- Construction of right bank roads with bridges over the Indus river
- Construction of WAPDA O& M Staff colony
- Construction of 132 kV transmission line from Dubair to Dasu Town
- Resettlement and environment mitigation measures
Dam and appurtenant facilities

- Water/Power Intake
- Main Dam
- Diversion Tunnel
- D/S Starter/Coffer
- Flushing Tunnel
- U/S Starter
Overflow section of dam

Spillway Chute
Q=45,100 m$^3$/s

Spillway Gate
W16.5m x H22.4m

Regulating gate
W5.1m x H6.4m

Guard gate
W5.1m x H6.4m

Maintenance gate
W8.4m x H8.4m

Drainage Gallery
Water intake and power tunnel until powerhouse

- Intake trashrack
- Intake gate shaft
  Gate: W9.5m x H12.5m
- Power tunnel
  D=12.5m
- Penstock steel liner
  D=12.5m~5.5m
Perspective View of Power Intake and Powerhouse Complex

- Drain tunnel
- Powerhouse
- Transformer
- Surge chamber
- GIL tunnel
- Access tunnel
- To dam gallery
Stage II
Profile of major underground structures

Powerhouse: W31mxH62mxL4 24m
Transformer: W22mxH34mxL4 24m
Surge chamber D37mxH56m
GIL tunnel to S/Y
Draft tube tunnel L=107m
Plan and 3D model for Tailrace outlet

Tailrace tunnel
W10mxH12.5m

Tailrace outlet gate
W9.0mxH8.0m
Plan for Switchyard

- Take-off Switchyard
- Main Control Building
- Access Tunnel Portal
- New KKH
- Vent Tunnel
- 500 KV Transmission Line
- GIL Tunnel
## Construction costs for staged development

<table>
<thead>
<tr>
<th>Items</th>
<th>Stage I</th>
<th>Stage II</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power and Energy</td>
<td>2,160MW</td>
<td>2,160MW</td>
<td>4,320MW</td>
</tr>
<tr>
<td></td>
<td>12,225GWh</td>
<td>6,207GWh</td>
<td>18,432GWh</td>
</tr>
<tr>
<td><strong>I. Direct Cost</strong></td>
<td><strong>3,006</strong></td>
<td><strong>1,200</strong></td>
<td><strong>4,206</strong></td>
</tr>
<tr>
<td>1) Hydraulic structures incl. gates</td>
<td>1,246</td>
<td>0</td>
<td>1,246</td>
</tr>
<tr>
<td>2) Underground complex incl. gates</td>
<td>626</td>
<td>380</td>
<td>1,006</td>
</tr>
<tr>
<td>3) Generating equipment</td>
<td>530</td>
<td>519</td>
<td>1,049</td>
</tr>
<tr>
<td>4) 500kV T/L</td>
<td>301</td>
<td>301</td>
<td>602</td>
</tr>
<tr>
<td>5) Infrastructures</td>
<td>303</td>
<td>0</td>
<td>303</td>
</tr>
<tr>
<td><strong>II. Social and Environ. Management cost</strong></td>
<td>378</td>
<td>0</td>
<td>378</td>
</tr>
<tr>
<td><strong>III. Administration and ES cost</strong></td>
<td>254</td>
<td>94</td>
<td>348</td>
</tr>
<tr>
<td><strong>IV. Contingencies, tax</strong></td>
<td>640</td>
<td>782</td>
<td>1,422</td>
</tr>
<tr>
<td><strong>Financial Cost except IDC</strong></td>
<td><strong>4,278</strong></td>
<td><strong>2,076</strong></td>
<td><strong>6,354</strong></td>
</tr>
</tbody>
</table>

Note *: Without 500kV T/L, Stage I=3,750MUSD and Stage II=1,540MUSD
# Financial Structure

**Unit: MUS$**

<table>
<thead>
<tr>
<th>Items</th>
<th>IDA Credit</th>
<th>WAPDA</th>
<th>Commercial Finance/Export Credit</th>
<th>NTDC</th>
<th>Total</th>
</tr>
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<td><strong>I. Construction Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Hydraulic structures incl. gates</td>
<td>167</td>
<td>55</td>
<td>1,258</td>
<td></td>
<td>1,480</td>
</tr>
<tr>
<td>2) Underground complex incl. gates</td>
<td>61</td>
<td>53</td>
<td>642</td>
<td></td>
<td>756</td>
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<tr>
<td>3) Generating equipment</td>
<td>46</td>
<td>50</td>
<td>546</td>
<td></td>
<td>642</td>
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<tr>
<td>4) 500kV T/L</td>
<td>270</td>
<td>80</td>
<td></td>
<td></td>
<td>350</td>
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<td>5) Infrastructures</td>
<td>182</td>
<td>163</td>
<td></td>
<td></td>
<td>345</td>
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<td>267</td>
<td>237</td>
<td></td>
<td></td>
<td>505</td>
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<td><strong>III. Administration and ES cost</strong></td>
<td>129</td>
<td>42</td>
<td></td>
<td></td>
<td>171</td>
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<tr>
<td><strong>Total</strong></td>
<td>1,122</td>
<td>600</td>
<td>2,446</td>
<td>80</td>
<td>4,248</td>
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3. CONSTRUCTION SEQUENCE OF MAIN WORKS

River diversion system

① Diversion Tunnel

② Diversion will be carried out when \( Q < 500m^3/s \)

③ Starter Dam

④ Integrated Coffer (H=95m)

③ D/S Coffer
Construction of dam and appurtenant structures

- Spillway Gate
- Spillway Chute
- Guard gate
- Regulating gate
- Maintenance gate

0.3m/day
Construction of underground powerhouse and tunnels

Work Section:

WS 1: Intake to Powerhouse
WS 2: Access Tunnel to Powerhouse
WS 3: Tailrace Tunnel
**Traffic Conditions at Peak Time**

**Vehicle per Day (L=80km)**
1,000 → 1,250 VD
Cement/steel/Fuel

**Recommendation:**
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Social Preparatory Works

- Assistance in Boundary Marking of the Reservoir, Colony, Re-aligned KKH and Access Roads
- Assistance to Revenue Staff in ownership survey of land and other assets in the affecting villages
- Consultation with the affecting community for resettlement options
- Coordination with local district administration regarding local issues
- Participatory resettlement activities
- Survey and identification of resettlement sites in the DHP area and layout planning of the resettlement sites
- Drafting of Land, Trees, Built-up properties, etc. rates in coordination with DC

Note 1. New land rates will be drafted up and submitted to WAPDA/Ministry of Water & Power for approval. Announcement of rates is expected within June.

Note 2. In parallel, DC staff are carrying out ownership survey, and the survey for trees and built-up properties are followed.
Development of Resettlement Sites
DIAMER BASHA DAM PROJECT

Waiting International Finance support
DIAMER BASHA DAM PROJECT (DBDP)
LOCATION MAP

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<th>Location</th>
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<td>Islamabad</td>
<td>415</td>
</tr>
<tr>
<td>Tarbela</td>
<td>315</td>
</tr>
<tr>
<td>Chilas</td>
<td>40</td>
</tr>
<tr>
<td>Gilgit</td>
<td>180</td>
</tr>
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DIAMER BASHA DAM
HISTORY OF THE PROJECT

Initial Feasibility study was completed with technical assistance of CIDA by MONENCO in November 1984.

Feasibility Study revised/updated by a consortium of local firms M/s NEAC consultants in 2002-2004.

Detailed Engineering Design along with preparation of Tender Documents/PC-I was done by DBC, an international consortium of consultants lead by M/s Lahmeyer International Germany during 2005-2008.

In addition International Panel of Experts reviewed documents during Feasibility and Detailed Engineering Design Studies.
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</tr>
</thead>
<tbody>
<tr>
<td><strong>SALIENT FEATURES</strong></td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Maximum Height</td>
</tr>
<tr>
<td>Gross capacity</td>
</tr>
<tr>
<td>Total installed capacity</td>
</tr>
<tr>
<td>Units</td>
</tr>
<tr>
<td>Average annual generation at site</td>
</tr>
</tbody>
</table>

**PROJECT COST**

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<th>PC-I Approved Cost (2009)</th>
<th>US$ 11.18 Billion</th>
</tr>
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<tr>
<td>PC-I Estimated Cost (2014)</td>
<td>US$ 13.96 Billion</td>
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**CONSTRUCTION PERIOD**

9 years with progressive commissioning of power units after 8 years
DIAMER BASHA DAM PROJECT
MAJOR BENEFITS

• Annual Energy Generation
  – At Site 18,100 GWh
  – Additional at Tarbela / Ghazi-Barotha / Chashma 2,433 GWh
  – Total 20,500 GWh
  – Annual Monitory Benefits Rs 205 Billion (@ Rs 10/-per unit)

• Extend useful life of Tarbela reservoir by 35 years

• Additional generation of about 5,000 GWh at Dasu attributable to Diamer Basha.

• Cascading effect on the future downstream upcoming hydropower projects of Pattan (3,800 GWh ) and Thakot (3,500 GWh)

• Local poverty alleviation through direct employment opportunities.
DIAMER BASHA DAM
GoP'S APPROVALS

• PC-I for (AL&R) amounting to US$ 0.75 Billion approved in 2008. This PC-I is a part of Main Project PC-I.

• PC-I of the Project amounting to US$ 11.178 Billion with F.E.C of US$ 3.192 Billion was approved by ECNEC on August 20, 2009.

• Project was approved unanimously by Council of Common Interests (CCI) on 18.07.2010 for National Consensus.
ENVIRONMENT, SOCIAL AND CULTURAL HERITAGE IMPACT ASSESSMENT & MANAGEMENT

- Total villages affected: 32
- Total affected households: 4,228
- Population affected: 30,350
- Agricultural land submerged (acres): 2,660
- Total area to be affected (acres): 37,419
- Existing length of KKH submerged: 100 km
- Relocated Length of KKH: 142 km
- Pre-historic rock carvings inundated: 33,000
DIAMER BASHA DAM
PHYSICAL STATUS

LAND ACQUISITION PROCESS

Land Acquisition and Resettlement works started in 2010 and are in process/progress.

- Land to be acquired 37,419 Acres
- Private Land 18,357 Acres
- Govt. Land (free of cost) 19,062 Acres

LAND ACQUIRED

- Government Land (free of cost) 17,214 Acres (90%)
- Private Land 3,210 Acres (17%)
DIAMER BASHA DAM
PRELIMINARY WORKS

• Project Colony at Thor Valley

• Project Colony for consultants and WAPDA staff (1000 officers/officials) required during construction of Main Dam is under construction through 17 contract packages. 70% work progress achieved.

• Construction of Bypass from Shatial To Thor Nullah To Existing KKH (35 Km) By NHA As WAPDA'S Deposit Work

• During Construction of Main Dam the existing KKH is to be used for construction activities while the Bypass on KKH from Shatial to Thor Nullah being constructed by NHA as WAPDA deposit work, will be utilized for uninterrupted traffic flow. Construction Work is in progress at site.
DIAMER BASHA DAM
PRELIMINARY WORKS

• Resettlement of Affectees in Model Villages

Three (3) Composite Model Villages at Thak Das, Harpan Das and Kino Das with all the amenities shall be developed for resettlement of 4228 affected households / families. Each affected households / families shall be given a residential plot of one kanal free of cost. The construction work of Composite Model Village—I I (Harpan Das) is in progress.

• Environmental, Resettlement Work/Studies

Comprehensive Environmental Management Plan (EMP) and Resettlement Action Plan (RAP) were prepared by DBC Consultants which were reviewed and updated in consultation with ADB.

Two Public hearings on EIAs held, first at Chilas and Gilgit, in GB and second one at Kohistan in KPK.

GB Government issued NOC further persuasion of the policies/ programme alongwith obtaining NOC from KPK is being pursued.
## DIAMER BASHA DAM PROJECT
PROPOSED CONTRACT LOTS FOR IMPLEMENTATION OF CORE PROJECT

<table>
<thead>
<tr>
<th>Lot No.</th>
<th>Description</th>
<th>Cost  (US$ Billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOT 1</td>
<td>Concrete Dam and Related Structures Including Diversion Tunnels and Permanent Access Bridge</td>
<td>2.317</td>
</tr>
<tr>
<td>LOT 2</td>
<td>Underground Works and Related Structures (Left and Right Banks)</td>
<td>0.893</td>
</tr>
<tr>
<td>LOT 3</td>
<td>Hydro-mechanical Equipment and Hydraulic Steel Structures</td>
<td>0.460</td>
</tr>
<tr>
<td>LOT 4</td>
<td>Power Plant Generation Equipment (Left and Right Bank)</td>
<td>1.140</td>
</tr>
<tr>
<td>LOT 5</td>
<td>Electrical High Voltage Equipment and Power Plant Electrical Equipment (Left and Right Bank)</td>
<td>1.189</td>
</tr>
</tbody>
</table>
DIAMER BASHA DAM
FINANCIAL STATUS

GoP FUNDING

• Releases (2009- June 2014)  US$ 0.488 Billion
• Allocation for 2014-15  US$ 0.154 million

Expenditure

• Land Acquisition & Assets  US$ 0.22 Billion

Funds available with WAPDA/Project  US$ 0.25 Billion

WAPDA SELF FINANCING

• Preliminary Civil Works/Administrative Expenditure through WAPDA Self Financing  US$ 0.036 Billion

Total Expenditure  US$ 0.256 Billion
Revised PC-I (AL&R) Cost is US$ 1.04 Billion, containing Land Acquisition and Resettlement, social safeguard, Right Bank Periphery Road, RAP, and EMP being funded by GoP.

Preliminary works project colony at Thor, KKH Bypass Road, Retainer Consultants of Detailed Engineering Design and other Admn. Expenditure are being met through WAPDA self financing.

For the core project, IFIs, FODP, ADB and USAID are being approached at GOP level.
## DIAMER BASHA DAM
### CAPITAL REQUIREMENT & FINANCING OUTLINE

<table>
<thead>
<tr>
<th>Sr. #</th>
<th>Description</th>
<th>Amount (million US$)</th>
<th>Financing Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land Acquisition/Resettlement</td>
<td>1039</td>
<td>Proposed to be financed by GOP as grant.</td>
</tr>
<tr>
<td>2</td>
<td>Project Colony</td>
<td>66</td>
<td>To be financed by GOP as equity.</td>
</tr>
<tr>
<td>3</td>
<td>KKH Bypass</td>
<td>411</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Lot 1 &amp; 2, Physical Contingency and Escalation during Construction</td>
<td>4163</td>
<td>Through Donors/IFIS</td>
</tr>
<tr>
<td>5</td>
<td>Lot 3, 4 &amp; 5, Physical contingency and Escalation during Construction</td>
<td>3741</td>
<td>Through Suppliers Credit</td>
</tr>
<tr>
<td>6</td>
<td>Engineering &amp; Project Monitoring</td>
<td>360</td>
<td>To be financed by Government Funding, Commercial Loans, Bonds, Sukuk, TFC, Public Private Partnership etc.</td>
</tr>
<tr>
<td>7</td>
<td>Duties and Taxes</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>IDC</td>
<td>4070</td>
<td>It will be capitalized and Project after completion shall pay back.</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>13959</strong></td>
<td></td>
</tr>
</tbody>
</table>

1 US$ = Rs 97.67
Project Financing Requirements

Based on proposed financing outline out of total estimated project cost of US$13.96 Billion, base cost (Lot 1-5) including Physical Contingency + Escalation is US$7.904 Billion.

Total cost of Lot 1 & 2 including Physical Contingency + Escalation is US $4.163 Billion; this amount will be utilized during 8 to 9 years construction period (critical path).

Total cost of Lot 3,4 & 5 including Physical Contingency + Escalation US $3.741 Billion, this amount will be required after 3 – 4 years from start of main dam construction (Lot 1 & 2). This amount can be arranged through supplier credit from manufacturers of Electrical and Mechanical Equipment.

IMMEDIATE FINANCING REQUIREMENT
To initiate construction of the main project arrangement of US $4.163 Billion is required over 8 to 9 years period as per phasing given.