

# National Electric Power Regulatory Authority

## MECHANISM FOR DETERMINATION OF TARIFF FOR HYDROPOWER PROJECTS

### Preamble

Conservative estimates show total hydroelectric potential in the country to be 45000 MW. This consists of all categories of hydropower plants, including storage-based, run of the river, high head and low head schemes in the mountainous regions, as well as on rivers and canals in the plains. The present installed hydroelectric capacity of 6,608 MW amounts to less than 15% of the identified potential.

The present shortage and future growth in electricity not only requires induction of new power plants in immediate terms but additional capacity is also needed over medium to long term horizon. Hydroelectric being a renewable form of energy is certainly recognized as one of the most attractive options for the future supply mix.

Due to their unique nature however, hydropower plants present a number of risks which may be seen as hurdles by the prospective investors to invest in hydropower plants relative to investing in other forms of electricity generation.

Cost uncertainty is one of such areas which may render National Electric Power Regulatory Authority (“**NEPRA**”) tariff determinations ineffective. While recognizing cost uncertainty as a genuine problem NEPRA in order to remove such ambiguities, has developed a mechanism (“**Mechanism**”) which provides for determination of tariff and subsequent adjustments at different stages of hydropower project development. In this respect three distinct stages have been identified when costs may differ. These costs are;

- (i) Feasibility Level Costs
- (ii) EPC Level Costs
- (iii) Final Costs which shall be no later than the Commercial Operation Date (“**COD**”)

The Mechanism provides for NEPRA's tariff determination based on costs at feasibility study stage and then at EPC stage, adjustable at COD to reflect those changes which have been permitted in the Mechanism.

The following sections describe NEPRA's Mechanism for determination of tariff for hydropower projects:-

### PART I

#### General

2. **Purpose:-** The purpose of this document is to provide a uniform, transparent, objective and predictable Mechanism and to remove ambiguities, that the sponsors of hydel projects and/or project companies, power procurers and power purchasers might have about the steps to be employed by NEPRA in determination of tariff of hydropower projects. This document shall not be read in a manner which undermines or over-rides any provision of NEPRA Act, Rules, Regulations and other applicable documents and in case of any conflict between this document and the NEPRA laws, the latter shall prevail over the former.

3. **Applicability:-**This Mechanism is available to all hydro licenses or Applicants for generation license for constructing, owning, operating or managing of hydro generation facilities which the sole purpose of power generation, within the jurisdiction of NEPRA.

4. **Definitions:-** For the ease of understanding, key words used in the Mechanism have been defined for a consistent interpretation. These definitions shall not be read to substitute or replace the meaning assigned to them in NEPRA Act, Rules and Regulations.

- (a) **“Act”** means Regulations of Generation, Transmission and Distribution of Electric Power Act (XL) of 1997, as amended from time to time.
- (b) **“Applicant”** means project sponsors or project companies or hydro license for projects located in Pakistan and power purchase or procurer for projects located outside the jurisdiction of NEPRA Act who have filed a petition for tariff determination under NEPRA laws.
- (c) **“Feasibility Study”** means feasibility study conducted in accordance with Section-5 of this Mechanism, in the form and manner acceptable to NEPRA, and, where applicable, approved by the Panel of Experts of Private Power and Infrastructure Board (PPIB) in pursuance of Policy for Power Generation Projects, 2002.
- (d) **“ECC Decision”** means the decision of the Economic Coordination Committee of the Cabinet (ECC) dated 22 January 2008, attached here as Annex.
- (e) **“NEPRA Laws”** means the NEPRA Act and Rules and Regulations framed thereunder, together with codes and documents approved by NEPRA.
- (f) **“Panel of Experts”** means consultant(s) or a team of experts appointed by PPIB or other relevant agency to monitor and approve Feasibility Study in respect of the project for which applicant has filed tariff petition.
- (g) **“Tariff Reopeners”** means related costs of project components as identified in the Feasibility Study, which shall, unless approved otherwise, limited to the following;
  - Cost variation due to geological conditions, limited to tunnel area;
  - Civil works cost escalation, and;
  - Resettlement costs.
- (h) **“Terms of Reference”** means the terms of reference for conducting Feasibility Study of hydel project.
- (i) **“Commercial Operation Date (COD)”** – As defined under the standard Power Purchase Agreement (PPA) calculated [ to be determined on a case to case basis] Months from the Financial Closing, as such date may be extended pursuant to the terms of PPA or by reason of a Force Majeure Event.

## **PART II**

### **Procedural Requirements**

#### **5. Feasibility Stage**

This is the first stage foreseen in the Mechanism for a tariff based on the Feasibility Study of the project.

- 5.1 **Filing of Application for tariff:** The applicant is required to file a petition before NEPRA for determination of its tariff in a form and manner as required under the NEPRA Laws.

5.2 **Completeness of Feasibility Study:-** (a) NEPRA will accept only such Feasibility Study which is complete and accurate and, where applicable, supported with a duly signed statement by the Panel of Experts about the quality of the Feasibility Study and performed following best international practices while satisfying the Terms of Reference and the information required under Schedule III to NEPRA (Application and Modification Procedure Regulation, 1999) (b) In addition to pertinent information, the Feasibility Study must include;

- (i) Item-wise break down of major components of the project, Bill of Quantities (BOQ) and corresponding costs, capacity and energy data and tariff table(s).
  - (ii) A detailed implementation schedule and payment schedule during construction.
  - (iii) Details of Tariff Reopeners.
- (c) For clarity, following format may be used to show relevant costs and quantities to work out final cost break-down. Other formats can also be used, with the objective to demonstrate transparently the costs and corresponding quantities;

No.	Item	Total Cost in US\$		
		Local	Foreign	Total
<b>A</b>	Civil Works			
<b>A-1</b>	Intake			
<b>A-2</b>	Tunnels (If applicable)			
<b>A-3</b>	Power house			
<b>A-4</b>	Penstock			
.....	Tail race			
.....	Roads			
.....				
<b>B</b>	Hydraulic Steel Structure, M&E Works with all sub-items			
<b>C</b>	Engineering and Supervision			
<b>D</b>	Administration costs if any			
<b>E</b>	Resettlement and Mitigation if applicable			
<b>F</b>	Interest During construction			
<b>G</b>	Debt and Equity and Financing costs			
<b>H</b>	Other items			

(d) Corresponding tables of above shall also include quantities in respect of each of the major structures and unit rates for them.

(e) Feasibility Study shall include, among other relevant information, complete details of the geotechnical investigations carried out and the conclusions arrived at regarding the nature, quantities and characteristics of underground rocks or soils along the tunnel. The report shall include a comprehensive classification of the expected rocks or soils.

(f) Feasibility Study shall clearly include, among other relevant information, formulae based on which the Applicant have arrived at unit rates for various activities such as soil excavation, rock excavation, fill, underground excavation, reinforcement etc. Calculations in Form I are included by way of example for tunnel excavation, and other formats may be used in the Feasibility Study document. A schedule of unit rates for constructing the tunnel in the zone of each classification shall be included.

5.3 **Recommendations of Provinces:** Before determining a tariff, NEPRA will invite comments and consider recommendations of the respective province in which the proposed project is located, as required under Section 7(5) of the Act, including comments on resettlement costs and where applicable land costs claimed by the Applicant for resettlement.

6. **Engineering, Procurement and Construction (EPC) Stage:**

All the applicants possessing NEPRA's determined tariff on feasibility costs shall be required to file a tariff petition based on EPC Costs in terms of NEPRA Tariff Standards and Procedure Rules-1998, if they wish to seek revision in tariff on the basis of EPC. NEPRA will allow such adjustments as shown in PART III herebelow, provided that the Applicant substantiates its costs to NEPRA's satisfaction preferably in the form of EPC contracts and/or in a form and manner as determined by the Authority.

While determining tariff;

NEPRA may carry out detailed prudence of costs however, if the Applicant supports its petition by providing competitive bids from a number of reputable contractors, NEPRA may accept the lowest of bids without going in to detailed prudence exercise.

Those Applicants who desire to seek a tariff based on EPC costs without having obtained tariff based on feasibility costs shall also file a tariff petition in accordance with NEPRA Laws.

7. **Commercial Operation Date (COD):** Upon filing of an application for adjustment at COD in terms of NEPRA tariff determination, NEPRA will allow adjustments as elaborated under PART III.

### **PART III**

#### **Tariff Adjustments**

8. **Need for Adjustment**

Recognizing that construction costs of hydel projects cannot be firmed till construction complete date, NEPRA will treat such uncertainties by allowing adjustments to different project components and corresponding costs limited to Tariff Reopeners and other adjustments as allowed by NEPRA. **FORM II** shows different adjustment, which will be allowed by NEPRA.

8.1 **Adjustments at EPC stage:** EPC level costs are understood to be based on more extensive investigations and as a result the nature and scope of work, specifically for the underground tunneling is relatively better known than that at the feasibility level. Similarly costs attributable to Mechanical and Electrical Works (M&E Works) and hydraulic steel structure are considered firm at this stage. Pursuant to ECC's decision (Annex), where applicable, NEPRA will allow the following adjustments;

- (i) Cost variation due to geology in the tunnel(s); (a) the construction cost of tunnel will be subject to variation due to geological conditions confirmed at EPC stage. The cost variation may be either due to unit rate for escalations allowed or changes due to different classification of rocks encountered than those considered at the feasibility level. (b) The overall quantities (length) of tunnel shall not be allowed to vary unless a change in the design, wherever applicable is approved by the Panel of Experts.

**FORM III** shows typical working of cost variation due to geology of tunnel(s).

- (ii) **Civil Works costs escalation:** An escalation in the civil works cost shall be allowed from the date approved by NEPRA when it determined the tariff to a date approved by NEPRA. No revision in the quantities worked out at feasibility level shall be allowed. Typical working of civil works cost escalation is shown in **FORM IV**.
- (iii) **Cost variation in Hydraulic Steel Structure and M&E works:** The costs included in determining the Tariff shall be adjusted to allow costs in EPC contract(s).

## 8.2 Adjustment at COD:

- (i) **Cost variation due to geology in the tunnel(s):** Final revision in costs (arrived after EPC contracts) may be allowed at COD for variation in classification of soil and rocks during actual construction or escalation in unit rates over approved construction period in the following manner;
  - (a) geology related increase in costs shall be subject to provision of verifiable references to NEPRA and;
  - (b) escalation in units rates at actual will be allowed by NEPRA upto the date when the period is scheduled to achieve commercial operation (COD).
- (ii) **Civil Works cost escalation:** escalation in units rates at actual will be allowed by NEPRA up to the date when the project is scheduled to achieve commercial operation (COD).
- (iii) **Cost variation in Hydraulic Steel Structure and M&E works:** Adjustment shall be allowed at EPC/COD on account of hydraulic steel structure and M&E works.
- (iv) **Cost variation due to Resettlement Cost:** The Feasibility Study shall provide details of all items included in the resettlement cost and their schedule of prices. Any variation in resettlement cost and land costs from that given in the Feasibility Study, will be allowed provided the initial schedule of rates and variation in them are certified by the government of the concerned province in which the project is located and approved by NEPRA.

## PART IV

### Monitoring and Verification

- 9. **Verifiable References:** The adjustment on account of Tariff Reopeners will be allowed at COD subject to following of such procedure as contained in respective PPA. NEPRA may require certification by power purchaser/procurer in that respect where applicable.
- 10. **Reference Date:** For the purpose of adjustment of any cost item, the reference date will be determined by NEPRA
- 11. **Effective Date for Adjustment:** (a) For adjustment at EPC stage, price schedules prevailing one months before filing of such request by the applicant shall be considered. (b) For adjustment at COD price adjustment shall be the date that is one month before the scheduled date of completion of the item as given in the construction schedule contained in respective PPA.
- 12. **Source of Prices:** The prices of elements subject to adjustment shall be to the extent possible as given in the Statistical Bulletins published by Statistical Division of the Government of Pakistan. Where necessary statutory notifications and official price from public sector organizations like Pakistan Engineering Council will be used. The same shall be clearly specified in the cost of the project included in the approved Feasibility Study. For a particular escalable item(s), the same source shall be used throughout the construction.
- 13. **Appointment of Consultant/Expert:** NEPRA may appoint consultant or expert to review and comment on any aspect of the project. The applicant shall facilitate any site visits and investigations that the Consultant/Expert may carry out.

**UNIT RATE CALCULATION FOR ROCK CATEGORY A**

Average Unit Rate  $R(A) = P/Z$  say in US\$/meter<sup>3</sup>

**P** = **X+Y** Total Cost of Category "A" rock in US\$

**Z** = Total quantity of Category "A" rock in meter<sup>3</sup>

**X** = **x1+x2+x3.....** Non adjustable Portion of Cost e.g. cost of equipment used, others

**Y** = **y1+y2+y3+y4** Adjustable portion of Cost.

Where,

**Y1=** Wages of labor comprising of wages of skilled labor+wages of unskilled labor+....

**Y2=** Costs related to cement to be used

**Y3=** Costs related to steel to be used

**Y4=** Costs related to Fuel to be used

**Unit rates for rock Category B, Category C etc. and unit rates for civil works for other components can be worked out on similar basis.**

## FOR ILLUSTRATION ONLY

<b>TARIFF ADJUSTMENTS ALLOWED BY NEPRA</b>
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	<b>Item</b>	<b>Risks</b>	<b>Adjustment allowed at EPC stage</b>	<b>Adjustment allowed at Commercial Operation Date (COD)</b>
1	Civil Works other than Tunnel Areas	Escalation in input costs. Quantities like soil excavation volume, concrete etc. may vary	Adjustment allowed only due to escalation in Steel, Cement, Labor and Fuel prices	Adjustment allowed on account of escalation in steel, cement, labor and Fuel prices
2	Tunnel Area	Different Rock categories than foreseen may be encountered Escalation in input costs.	Adjustment allowed due to variation in different rock categories within overall design parameters and escalation in unit rates due to escalation in input costs.	Adjustment allowed due to variation in different rock categories within overall design parameters and escalation in unit rates due to escalation in input costs.
3	Hydraulic Steel Structure and M&E works	Costs may be firmied at EPC contract stage	Onetime adjustment allowed when substantiated preferably by EPC contracts	Adjustment will be allowed on feasibility costs if no adjustment is sough at EPC
4	Resettlement Costs	If applicable, compensation on account of relocation of population and land may change		One time adjustment at COD

**TABLE OF COST OF CONSTRUCTING TUNNEL (FROM FEASIBILITY STUDY)**

Rock or soil classification	Quantity in meter <sup>3</sup> (1)	Unit Rate in ** equivalent US\$ per meter <sup>3</sup> of tunnel (2)	Cost of construction equivalent US\$ according to feasibility report (1) x (2)
Category A	1,000	5,000	5,000,000
Category B	1,200	5,000	6,600,000
Category C	1,500	6,500	9,750,000
Category D	2,000	8,500	17,000,000
<b>Total</b>	<b>5,700 *</b>		<b>38,350,000</b>

\* Total quantity is not allowed to vary. Only changes within different categories are allowed while total quantities remain constant.

\*\* Unit rates may be worked out on format shown in FORM I.

Two options of costs variation are shown here:

- (a) Variation in soil/rock categories with no escalation in unit rates
- (b) Variation in soil/rock categories and escalation in unit rates

**TABLE OF FINAL COST OF CONSTRUCTING TUNNEL CORRESPONDING TO OPTION (a)**

Rock or soil classification	Quantity in meter <sup>3</sup> (1)	Unit Rate in equivalent US\$ per meter <sup>3</sup> of tunnel (2)	Cost of construction in equivalent US\$ according to feasibility (1) x (2)
Category A	800	5,000	4,000,000
Category B	1,000	5,500	5,500,000
Category C	1,600	6,500	10,400,000
Category D	2,300	8,500	19,550,000
<b>Total</b>	<b>5,700 *</b>		<b>39,450,000 (adjusted cost of tunnel)</b>

\* total quantities same as in approved feasibility reports

**TABLE OF FINAL COST OF CONSTRUCTING TUNNEL CORRESPONDING TO OPTION (b)**

Rock or soil classification	Quantity in meter <sup>3</sup> (1)	Unit Rate in equivalent US\$ per meter <sup>3</sup> of tunnel (2)	Cost of construction in equivalent US\$ according to feasibility report (1) x (2)
Category A	800	5,200	4,160,000
Category B	1,000	5,600	5,600,000
Category C	2,000	6,600	13,200,000
Category D	1,900	9,000	17,100,000
<b>Total</b>	<b>5,700 *</b>		<b>40,060,000 (adjusted cost of tunnel)</b>

\* total quantities same as in approved feasibility reports

**WORKING OF CIVIL WORKS COST ESCALATION**

**TABLE OF COST OF CIVIL WORKS (FROM FEASIBILITY STUDY)**

Civil Works for Project Components	Quantity in meter <sup>2</sup> (1)	Unit rate in equivalent US\$ per meter <sup>2</sup> (2)	Cost of construction in equivalent US\$ according to feasibility report (1) x (2)
<b>Intake</b>	1,500	3,000	4,500,000
<b>Power House</b>	3,000	4,000	12,000,000
<b>Penstock</b>	1,000	3,000	3,000,000
<b>Tail Race</b>	1,000	4,000	4,000,000
<b>Roads</b>	2,000	1,000	2,000,000
<b>Total</b>	<b>8,500 *</b>		<b>25,500,000</b>

\* Total quantity is not allowed to vary

\*\* Unit rates may be worked out on format shown in FORM I

**TABLE OF FINAL COST OF CIVIL WORKS**

Civil Works for Project Components	Quantity in meter <sup>2</sup> (1)	Unit rate in equivalent US\$ per meter <sup>2</sup> (2)	Cost of construction in equivalent US\$ according to feasibility report (1) x (2)
<b>Intake</b>	1,500	4,000	6,000,000
<b>Power House</b>	3,000	5,000	15,000,000
<b>Penstock</b>	1,000	4,000	4,000,000
<b>Tail Race</b>	1,000	4,000	4,000,000
<b>Roads</b>	2,000	2,000	4,000,000
<b>Total</b>	<b>8,500 *</b>		<b>33,000,000</b>

\* Total quantity is not allowed to vary

\*\* Unit rates are allowed to vary. Unit rates may be worked out on format shown in FORM I

**ITEM NO. 9**

<b><u>CASE NO. ECC-20/02/2008</u></b> <b><u>DATED: 22.01.2008</u></b>	<b><u>FRAMEWORK FOR IMPLEMENTATION OF</u></b> <b><u>HYDROPOWER PROJECTS UNDER POWER</u></b> <b><u>POLICY 2002</u></b>
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**DECISION**

The Economic Coordination Committee (ECC) of the Cabinet considered the Summary dated nil submitted by the Ministry of Water and Power on “**Framework for Implementation of Hydropower Projects under Power Policy 2002**” and approved the proposals contained in para 6 of the Summary as follows:

- i. ECC’s decision dated 23<sup>rd</sup> May 2007, referred to in para-4 of the Summary viz: “NEPRA should stop the practice of accepting EPC costs on the basis of quotations etc. Instead, they should have their determination on firm (non-reopenable) competitive price duly initialed and signed by the IPP/EPC contractors”, may not apply to hydropower projects.
- ii. NEPRA to determine tariff for hydropower projects based on feasibility studies approved by the Panel of Experts appointed under 2002 Power Policy with re-openers limited to those identified in Para-5 of the Summary. However, the re-openers and views of the Panel of Experts will not be binding on NEPRA.
- iii. Mechanism for determination of tariff for Hydropower Projects shall be issued by NEPRA keeping in view the observations expressed by Planning Division, Finance Division, NEPRA and BOI within one month. NEPRA shall also consider recommendations of the Provincial Government where such generation facility is located.

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