

## NOTE ON COOPERATION WITH BHUTAN

### 1. GENERAL

There are four major river systems in Bhutan namely Torsa, Wangchu (known as Raidak in India), Sankosh and Manas. All these rivers having large snow fed perennial flows, afford attractive possibilities of hydro-electric development. The demand for electricity in Bhutan is expected to be meager in the near foreseeable future as compared to the hydro-electric potential. The hydro-electric potential of Bhutan could be harnessed for the mutual benefits of both India and Bhutan.

Bhutan has a feasible hydro potential of 23,760 MW from 76 hydro schemes (> 10 MW capacity). The present hydro installed capacity in Bhutan is about 2326 MW (9.78%). Out of this 2136 MW has been developed with Indian technical and financial assistance. Further, 2820 MW (11.86%) is under construction and 7285 MW (30.66%) is under various stages of development with Indian technical and financial assistance.

### 2. INSTITUTIONAL ARRANGEMENT

- An agreement concerning co-operation in the field of hydroelectric power was signed between Government of India (GoI) and Royal Government of Bhutan (RGoB) on 28.7.2006. In this agreement, it was decided that for the projects to be implemented jointly by the two Govts. through Joint Ventures or Govt. owned agencies, a suitably Empowered Joint Group would be set up. It was also decided that the Govt. of India agrees to a minimum import of 5000 MW electricity from Bhutan by the year 2020 which was subsequently enhanced to 10000 MW in the protocol signed in the year 2009 between the two Govts.
- Accordingly, an Empowered Joint Group (EJG) has been constituted between GoI and RGoB on 16.03.2009 to fast track the approval of the implementation modalities, financing mechanisms, fund flows, contingencies plans and monitoring of the progress of all activities of preparation of DPRs and construction of the selected hydro power projects. EJG is headed by Minister of Economic Affairs, RGoB with four members from RGoB namely Secretary, Ministry of Economic Affairs, Secretary, Ministry of Finance, Director General, Department of Energy and Chief Executive Officer, Druk Holding & Investment and three members from GoI namely Principal Advisor (Finance), MEA, Joint Secretary (North), MEA and Joint Secretary (Hydro), MOP and Member (Hydro), CEA as permanent Invitee.

### 3. Following H.E. Projects have been developed / are under development under Indo-Bhutan Cooperation

#### A. Projects in Operation

Sl. No.	Name of the project	I.C. (MW)	Total Cost (Rs. Crs)	Funding pattern (Rs. Crores / %)		Design Energy (MU)	Tariff (Rs/kWh)	Year of Commissioning
				Loan	Grant			
1	Chukha	336 (4x84)	246.00	98.40 (40%)	147.60 (60%)	1800	2.55 (w.e.f 01.01.2017)	1986-88
2	Kurichu	60 (4x15)	555.00	222.00 (40%)	333.00 (60%)	399	2.23	2001-02
3	Tala	1020 (6x170)	4125.85	1650.34 (40%)	2475.51 (60%)	3962	2.23	2006-07
4	Mangdechhu (MHPA)	720 (4x180)	5044.89	3531.42 (70%)	1513.47 (30%)	2925	4.12	2019-20
	<b>Total</b>	<b>2136</b>				<b>9086</b>		

## B. Projects under Construction

Sl. No.	Name of Project & Agency	I.C. (MW)	Design Energy (MU)	Project Hard Cost (Rs. Crores)			Tarrif (Rs/kWh)		Likely Comm. & Status/Issues
				Total (P.L)	Gen. Cost	ATS Cost	1 <sup>st</sup> year	Levellised	
1	Punatsangchhu Stage-I (PHPA-I)	1200 (6x200)	5543.54	9375.58 (12/2013)	8499.62	875.96	5.14	4.86	<b>2024-25</b> Project commissioning is being delayed due to movement/subsidence of right bank hill mass in the Dam Area. Treatment/stabilization of the right bank and completion of Dam work under progress. The option of providing a Barrage in the upstream and abandoning of Dam is being studied.
2	Punatsangchhu Stage-II (PHPA-I)	1020 (6x170)	4244.75	7290.62 (03/2015)	7012.15	278.47	3.27 (With 16% ROE)	2.29 (W/o ROE)	<b>2023-24</b> Poor geological strata and shear zone being encountered at left bank and foundation of Dam and HRT. Remedial measures are under progress.
<b>Project under JV Mode:</b>									
3	Kholongchu (KHEL- JV of SJVNL & DGPC)	600 (4x150)	2568.52	4971.08 (03/2019)	4971.08	-	3.78	3.41	<b>2025-26</b> Pre-const. works in progress. Inter-Governmental agreement between RGoB and Gol for implementation of project was signed on 22.04.14. Concessionaire Agreement between KHEL and RGoB signed on 29.06.20. All three main civil work packages have been awarded on 04.03.2021 & project is scheduled to be commissioned by Feb., 2026.
<b>Total</b>		<b>2820</b>	<b>12356.81</b>	<b>20864.41</b>					

## C. Projects for which DPR have been Prepared and cleared by CEA/CWC

### Projects under JV Mode:

Sl. No.	Name of Project and Agency for DPR	I. C. (MW)	Design Energy (MU)	Project Hard Cost (Rs. Crores)			Tarrif (Rs/kWh)		Status
				Total (P.L)	Gen. Cost	ATS Cost	1 <sup>st</sup> year	Levellised	
1	Bunakha H.E. Project THDC	180 (3x60)	707.44	2685.16 (04/2015)	2593.23	91.93	6.84	6.40	•To be developed under JV by THDC/ DGPC.

									<ul style="list-style-type: none"> <li>•DPR appraised by CEA on 30.08.2013.</li> <li>•Issue of sharing of cost component of Bunakha with Wangchhu JV is to be resolved.</li> <li>•Total cost Shared between 4 projects (only civil cost is to be shared) Bunakha – 1110.39 crores (43.5%), Chukha – 339.75 crores (15.5%), Tala – 651 Crores (29.7%) and Wangchhu - 247.69 Crores (11.3%)</li> <li>•Additional Energy Benefits in d/s projects:</li> <li>•Chukha –255.48 MU, Tala – 490.04 MU, Wangchhu-186.51 MU</li> </ul>
2	Wangchhu H.E. Project SJVNL	570 (4x142.5)	2193.62	3291.19 (10/2014)	3283.49	7.70	5.85	5.15	<ul style="list-style-type: none"> <li>•To be developed under JV by SJVNL/ DGPC.</li> <li>•DPR appraised by CEA on 28.02.2014.</li> <li>•Issue of sharing of cost component of Bunakha HEP with Wangchhu JV is to be resolved.</li> <li>•PIB proposal examined in CEA and sent to MoP on 01.09.2015</li> </ul>
3	Chamkharchhu-l (Digala) NHPC	770 (4x192.5)	3344.47	5058.01 (01/2014)	4441.42	616.59	Present: 5.38 Comp.: 7.37	Present: 4.73 Comp.: 6.48	<ul style="list-style-type: none"> <li>•To be developed under JV by NHPC/DGPC.</li> <li>•DPR appraised by CEA on 30.05.2014.</li> <li>•Concessionaire Agreement yet to be signed with Bhutan.</li> <li>•PIB Memo vetted by CEA in Aug,2015.</li> </ul>
<b>Projects under Authority Model:</b>									
4	Sankosh H.E. Project THDC	2585 (8x312.5+ 3x28.33)	6365.39	12382.04 (04/2016)	12382.04	--	5.25	4.57	<ul style="list-style-type: none"> <li>•DPR appraised by CEA on 20.09.2016. Concurrence letter issued on 06.06.2017.</li> <li>•The project is under discussion for implementation under Authority Model.</li> </ul>
	<b>Total</b>	<b>4105</b>	<b>12610.92</b>						

#### D. Projects for which DPR Prepared and cleared by CEA/CWC

Sl. No.	Name of Project & Agency for DPR	I. C. (MW)	Design Energy (MU)	Project Cost (Rs. Crs) (P.L.)	Tarrif (Rs/ kWh)		Status
					1 <sup>st</sup> year	Levelling	
1	Amochu Reservoir H.E. Project NTPC	540 (4x135)	1862.96	3738.37 (09/2011)	<b>IG Mode:</b> 4.088 @6% p.a. 4.664 @15%p.a. <b>JV Mode:</b> 5.911 @6% p.a. 6.808 @15%p.a.	<b>IG Mode:</b> 3.156 @6% p.a. 3.5 @15% p.a. <b>JV Mode:</b> 5.142 @6% p.a. 5.839@15% p.a.	<ul style="list-style-type: none"> <li>DPR appraised by CEA on 29.01.2013.</li> <li>Put in abeyance by MEA due to security concerns.</li> </ul>

#### E. Projects for which DPR has been prepared/under preparation

Sl. No.	Name of Project	I.C. (MW)	Status
1	Kuri Gongri H.E. Project	2640	<ul style="list-style-type: none"> <li>PFR of the project was prepared by NHPC in July, 2012 as per which the alternative having I.C. 2640 MW was considered as most economic alternative by NHPC.</li> <li>In the 12th EJM meeting held on 12.03.2014, WAPCOS has been allotted the work of preparation of DPR of the project for which a part payment of Rs. 12 Crores has been released by MEA on 28.03.2016.</li> <li>DPR is under preparation. The additional funds of INR 12.923 Cr for carrying out additional investigations and studies are required for preparation of bankable DPR of the Kuri Gongri HEP and same to be discussed in proposed EJM meeting. The additional study and geo-technical investigations were identified jointly by the consultants (WAPCOS), DHPS and other stakeholders of Bhutan during a stakeholder meeting held in Jan'2020.</li> </ul>

#### F. Tariff Revision of Chukha Hydroelectric Project

The Chukha agreement signed between the GOI and RGOB provides that Rate of Power for Chukha HEP would be reviewed by the two Governments at the end of each four year period and review would be guided by the criteria mentioned in Article 8 of the Agreement as reproduced below:

- i) *Increases, if any, in the operation and maintenance charges of the Chukha Project,*
- ii) *The average percentage increase in the cost of generation of hydro-electric power during the previous four year in the Eastern-North Eastern Region of India,*
- iii) *Any other factor relevant at that time.*

*No duty, surcharge or any other form of levy will be charged by Bhutan on the power sold by Bhutan to India."*

The tariff structure of power from Chukha has undergone several revisions from time to time as below:

w.e.f. 1st Jan 1990	27 P/unit
1 <sup>st</sup> Revision- w.e.f. 1 <sup>st</sup> Jan 1993(otherwise due from01.01.1994)	37 Punit
2 <sup>nd</sup> Revision - w.e.f. 1 <sup>st</sup> April 1995(otherwise due from01.01.1997)	50 P/ unit
3 <sup>rd</sup> Revision - w.e.f. 1 <sup>st</sup> April 1997(otherwise due from01.01.2001)	100 P/unit
4 <sup>th</sup> Revision - w.e.f. 1 <sup>st</sup> July 1999(otherwise due from01.01.2005)	150 P/unit
5 <sup>th</sup> Revision- w.e.f. 1 <sup>st</sup> Jan 2005)(otherwise due from01.01.2009)	200 P/unit

6 <sup>th</sup> Revision - w.e.f. 01.01.2013	225P/unit
7 <sup>th</sup> Revision – w.e.f. 01.01.2017	255P/unit

- At the time of revision of Chukha tariff in 1999, MEA provided subsidy on Chukha power for the high flow months of June to September. Accordingly, Chukha power was purchased from Bhutan @ Rs. 1.5/ kWh and was supplied to Eastern region constituents @ Rs. 1.0/kWh with the difference being paid as subsidy by MEA.
- After, the tariff of Chukha power was increased from Rs. 1.5/kWh to Rs. 2.0/kWh, MEA continued to bear the additional financial implications following the hike of tariff and continued to provide subsidy of 50 P/ kWh. The entire subsidy was withdrawn in a phased manner with 5 paise reduction from 01.04.2008, 25 paise reduction w.e.f. 01.04.2016 and the balance 20 paise w.e.f. 01.04.2017.
- The Chukha tariff was enhanced from Rs 2.25 per kWh to Rs. 2.55 per kWh w.e.f 01.01.2017 for a period of four years, valid until 31.12.2020. MEA is currently providing a subsidy of 18.84 paisa per kWh w.e.f. 01.01.2017.

#### **Present Tariff Revision:**

- As per criteria mentioned in Article-8 of the Chukha Agreement, the review of tariff is to be guided by O&M Cost apart from increase in generation cost of HE projects in the Eastern and North Eastern Region.
- The combined weighted average rate of power from hydro projects in Eastern and North Eastern Region during 2016-17 to 2019-20 depict a very marginal growth of about 0.0385%, which translates to about 0.1 Paisa/ kWh increase in tariff of Chukha HEP considering the present tariff of Rs. 2.55/kWh.
- Increase in Rate of Sale of Power of Chukha on account of O&M expenses incl. Investment Cost would be of the order of 6.04 P/kWh.
- As such, it can be seen that there is an **overall increase of about 6.14 P/ kWh** in Rate of Sale of Power of Chukha on account of increase in generation cost of HE projects in the Eastern and North Eastern Region and the O&M expenses for the period 2017-2020.

#### **G. Tariff Revision of Tala Hydroelectric Project:**

Revision	Date of Revision	Tariff (paisa/kWh)	Time of Review
Initial Tariff	September, 2006	180	Every 5 years
1 <sup>st</sup> Revision	December, 2011	198	
2 <sup>nd</sup> Revision	December, 2016	212	
3 <sup>rd</sup> Revision	December, 2021	223	

The next tariff revision is due from December, 2026

#### **H. Tariff Revision of Kurichhu Hydroelectric Project:**

Revision	Date of Revision	Tariff (paisa/kWh)	Time of Review
Initial Tariff	1 <sup>st</sup> August, 2002	175	Every time Tala Tariff is reviewed.
1 <sup>st</sup> Revision	1 <sup>st</sup> January, 2008	180	
2 <sup>nd</sup> Revision	December, 2011	198	

3 <sup>rd</sup> Revision	December, 2016	212	
4 <sup>th</sup> Revision	December, 2021	223	

The next tariff revision is due from December, 2026.