



BHUTAN POWER CORPORATION LIMITED



Overview of BPC's Role in Operations of Bhutan - India Interconnections

SARI/Energy - Executive Peer Exchange to Bhutan
Thimphu, October 29, 2007



Royal Government of Bhutan and the Government of India have agreed that the Royal Government of Bhutan shall sell the surplus power available from CHPC, KHPC and THPA to the Government of India, and the Government of India has agreed to purchase all the surplus power.

PPA with GOI

CHPC - Agreement dated 23.03.1974

KHPC - Agreement dated 18.02.1994

THPA - Agreement dated 05.03.1996



Transmission Network





Outgoing feeders to India

Sl. No.	Name	Substation	Voltage	Source
1.	Tala-Siliguri feeder - 1	Tala POTHEAD	400 kV	THPA
2.	Tala-Siliguri feeder - 2	Tala POTHEAD	400 kV	THPA
3.	Tala-Siliguri feeder - 3	Malbase	400 kV	THPA
4.	Tala-Siliguri feeder - 4	Tala POTHEAD	400 kV	THPA
5.	Chhukha-Birpara feeder - 1	Chhukha Switchyard	220 kV	CHPC
6.	Chhukha-Birpara feeder - 2	Chhukha Switchyard	220 kV	CHPC
7.	Chhukha-Birpara feeder - 3	Malbase	220 kV	CHPC
8.	Gelephu-Salakati feeder	Gelephu	132 kV	KHPC



Role of BPC as a Transmission Licensee

As per the Electricity Act of Bhutan, 2001 and Grid Code, 2006 the following functions shall be carried out:

- To undertake transmission of electricity through its transmission system.

 - To discharge all functions of short-term planning and coordination relating to Transmission System with the following:
 - The Ministry;
 - The System Operator;
 - Generation Licensees;
 - Distribution Licensees;
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Role of BPC as a Transmission Licensee

- Other Licensees;
 - The Authority;
 - Any other person notified by the Ministry.
- The Transmission Licensee shall provide access to all existing and potential Users of the Transmission grid on the payment of fees and other charges for the grid services as may be approved by the Authority.





System Operator

BPC being the sole agency involved in the transmission and distribution of the electricity in Bhutan, has also been assigned the responsibility of acting as the System Operator for Bhutan.

The following functions will be carried out as per the Electricity Act of Bhutan, 2001 and Grid Code, 2006 :

- co-ordinate the power supply system to obtain instantaneous balance between generation and consumption of electricity;
 - be responsible for dispatching from generation installations;
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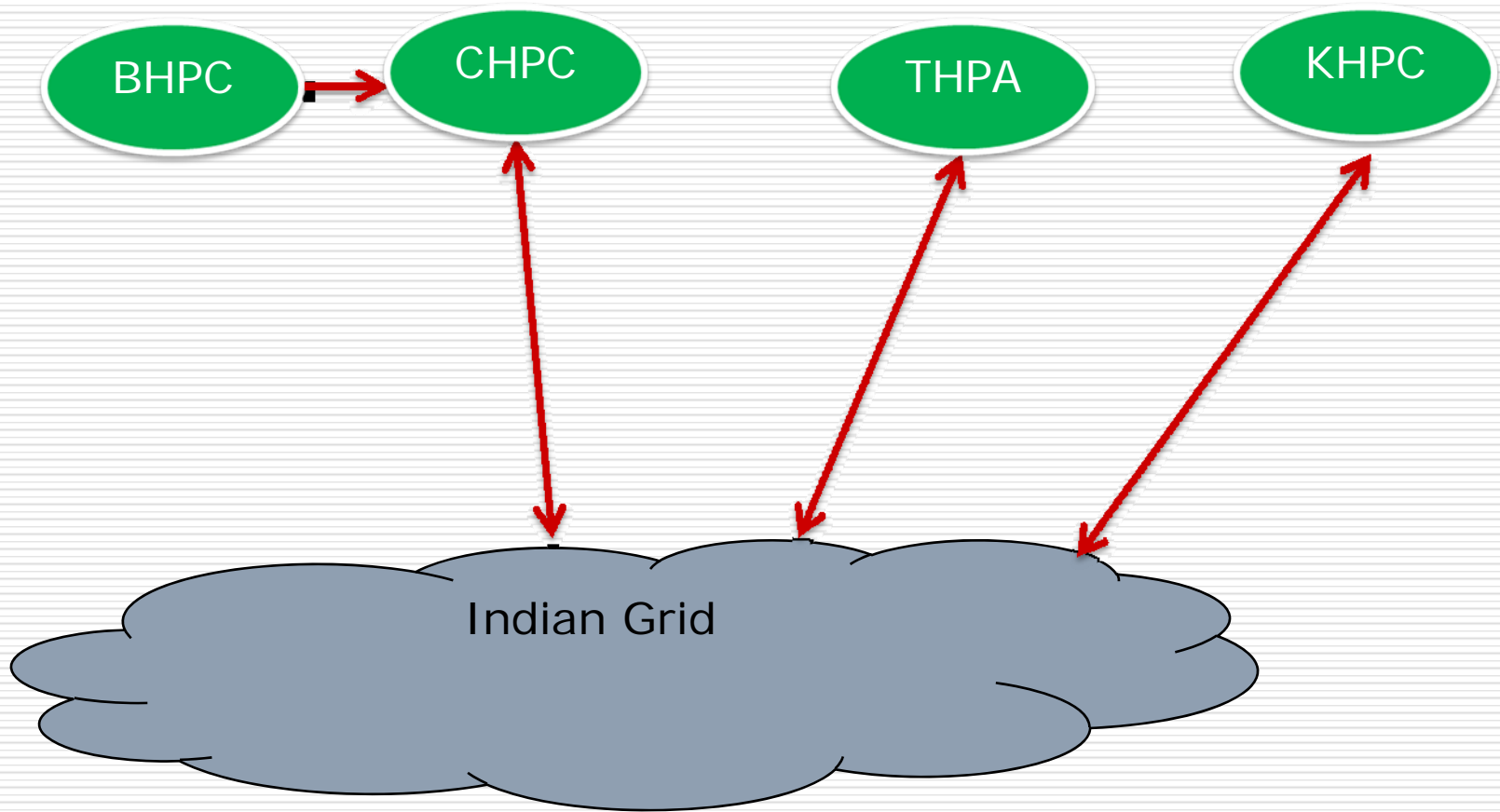


System Operator

- ❑ co-ordinate the transmission outages;
 - ❑ monitor the import and export of electricity;
 - ❑ prepare forecasts of generation requirements;
 - ❑ prepare regulations, with approval of the Authority, for the dispatch from generation installations; and
 - ❑ perform such other functions as may be prescribed by the Authority in the License or by regulations.
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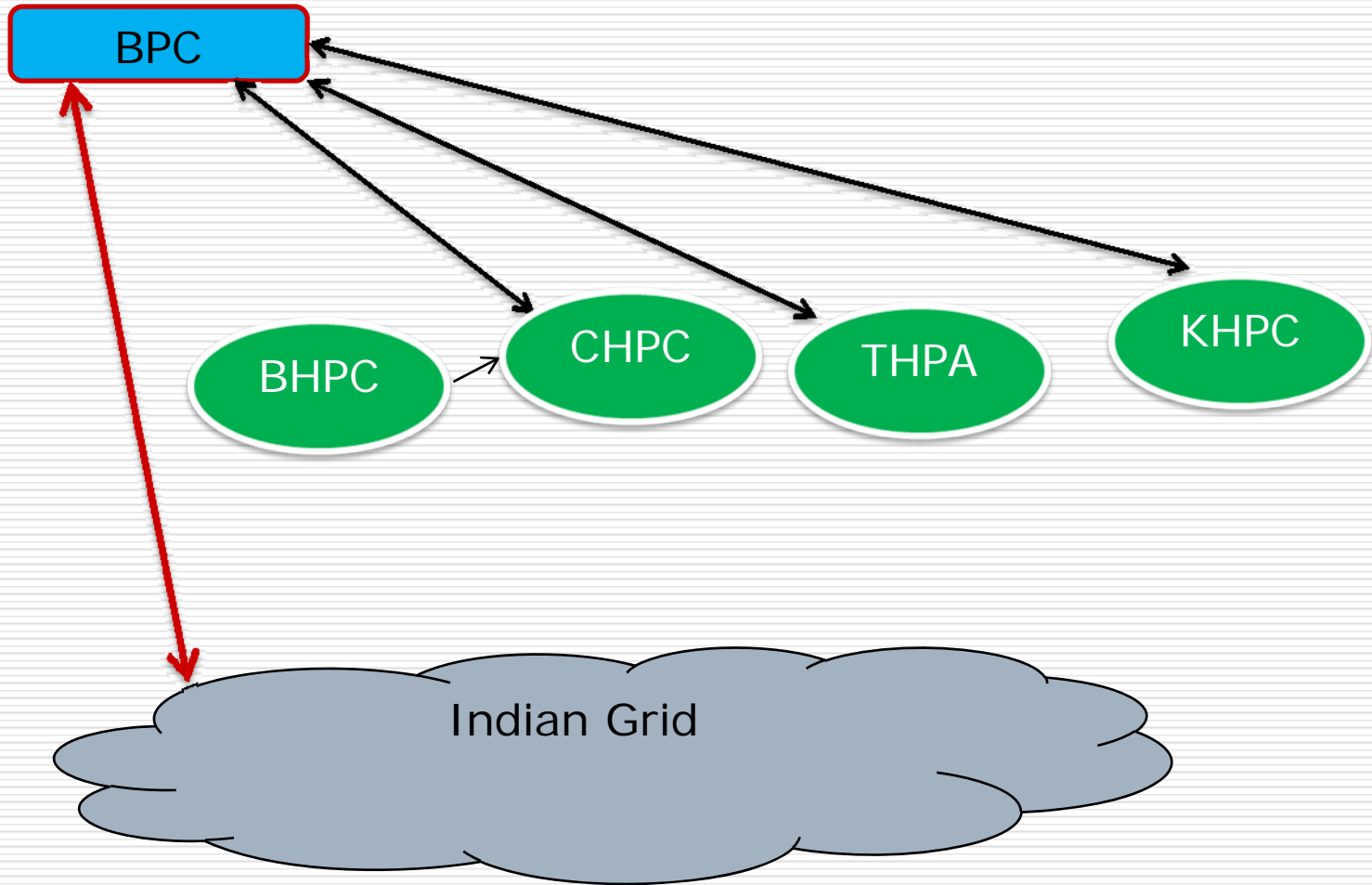


Grid operations without BPC as System Operator





Grid operations with BPC as System Operator





Western Transmission Network

- ❑ MOU on Bulk sale and purchase of electrical energy amongst CHPC, BHPC and BPC signed on July 31, 2006 (MOU effective date - July 31, 2006).
 - ❑ This MOU supersedes the MOU dated August 6, 2005 for electrical energy between CHPC, BPC and BHPC. (with the commissioning of THPA and its interconnected operation with the existing western grid).
 - ❑ MOU on Bulk sale and purchase of electrical energy between THPA and BPC signed on October 10, 2006 (MOU effective date - July 31, 2006) .
 - ❑ Domestic consumption power allocation from the generating stations - BHPC, THPA and then CHPC.
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Western Transmission Network

- ❑ CHPC purchase power from BHPC and then sells the power to BPC for domestic consumption.
 - ❑ Wheeling charges at the rate of Nu. 0.125 per unit (kWh) of net energy exported to India.
 - ❑ BHPC to CHPC power at the rate of Nu. 1.20 per unit (kWh).
 - ❑ Domestic consumption at the rate of Nu. 0.30 per unit for royalty energy allocated (15 % of Mean Annual Generation) and Nu. 1.20 per unit for the additional energy drawn by BPC.
 - ❑ Caters power to the western region of Bhutan from CHPC, BHPC and THPA .
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Eastern Transmission Network

- ❑ MOU on transaction of electrical energy between BPC and KHPC signed on February 19, 2004 (MOU effective date - January 1, 2004).
 - ❑ Wheeling charges at the rate of Nu. 0.125 per unit (kWh) of net energy exported to India.
 - ❑ Domestic consumption at the rate of Nu. 0.30 per unit for royalty energy allocated (15 % of Mean Annual Generation) and Nu. 1.20 per unit for the additional energy drawn by BPC.
 - ❑ Caters power to the eastern and central Dzongkhags (Districts) from KHPC.
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Method of billing and payment (Export)

- ❑ CHPC, KHPC, THPA raise bill for the quantum of energy supplied to PTC as per the agreement signed.
 - ❑ Monthly bill for energy exported during the previous month by the 10th of the succeeding month.
 - ❑ In case of disagreement to the correctness of any bill(s) a written intimation is given without withholding payment. The same is rectified within 30 days and any changes found is adjusted in next/future bill(s).
 - ❑ PTC make the payment within 45 days of the receipt of the bill.
 - ❑ All payments in Indian Currency
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Method of billing and payment (Wheeling)

- ❑ BPC raise bill for net energy wheeled to CHPC, KHPC, THPA as per the agreement signed and based on wheeling statement furnished by Gencos.
 - ❑ Monthly bill raised latest by 10th day of every succeeding month.
 - ❑ In case of disagreement to the correctness of any bill(s) a written intimation is given without withholding payment. The same is rectified within 30 days and any changes found is adjusted in next/future bill(s).
 - ❑ The payment is made within 30 days of the receipt of the bill.
 - ❑ Wheeling charge at Nu. 0.125 per unit (kWh).
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Metering Philosophy

- ❑ Energy meters of uniform technical specification to permit accounting of the energy transactions.
 - ❑ Main and Check energy meters installed.
 - ❑ Joint calibration is done if the reading of Main meter differ from the corresponding Check meter by 1.5% for class 0.5 accuracy meters and 0.6% for class 0.2 accuracy meters.
 - ❑ Meters on 66 kV and above shall be of a minimum accuracy class of 0.2.
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Metering Philosophy

- All the main and check meters shall be tested and calibrated annually.
 - Joint meter reading shall be done at 12:30 hours (BST) on the 1st of every calendar month.
 - CTs & VTs connected to the meter shall have a measurement accuracy class of 0.5 or better.
 - Totally sealed and tamper proof meters with no possibility of any adjustments at site.
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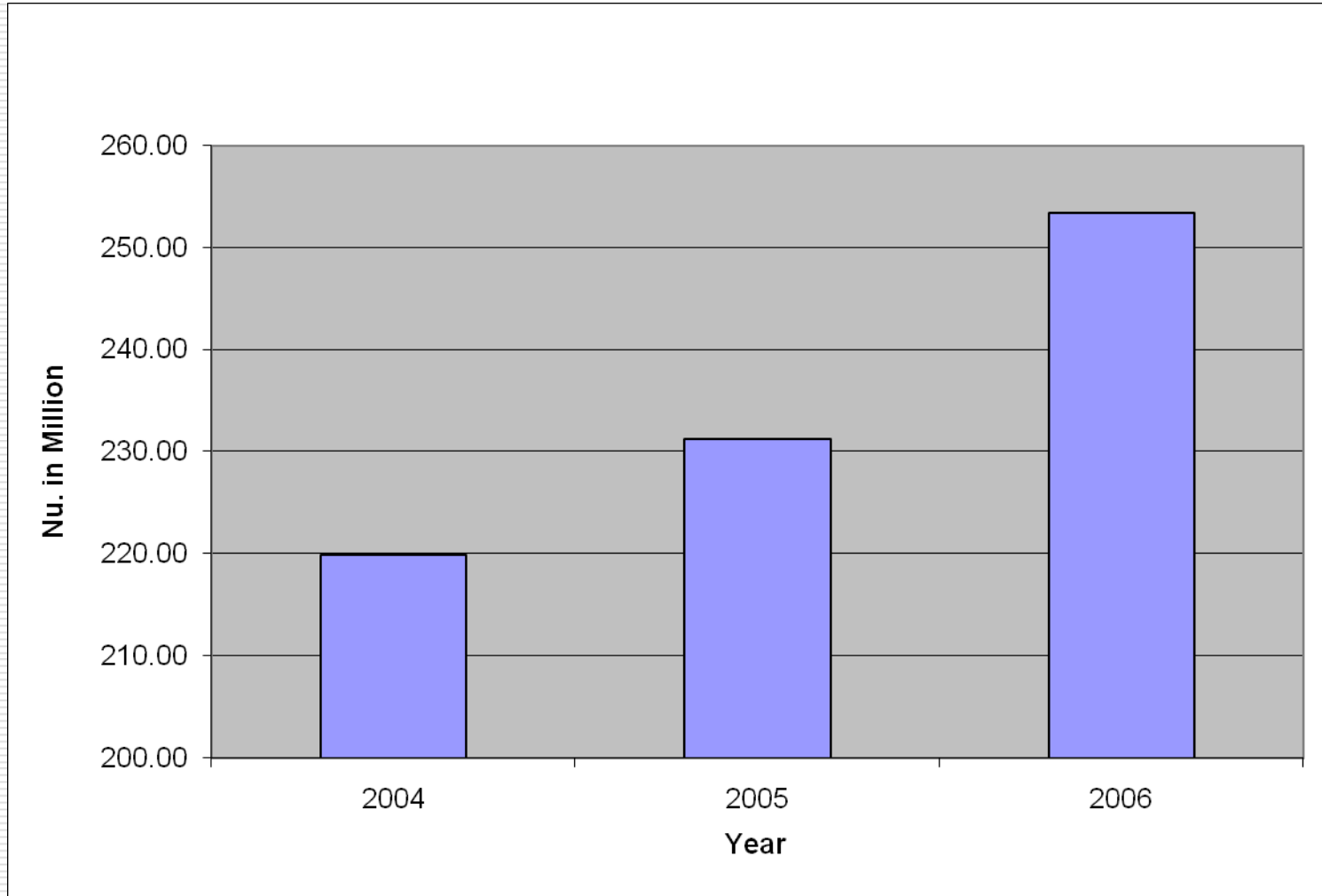


Revenue Earned

Month	2004	2005	2006	2007
January	5743999.50	5790794.38	4752670.00	8456159.63
February	3819558.00	4742416.38	3194392.00	7307443.25
March	6187295.00	7689704.63	3138718.25	10767656.88
April	11449738.50	10380154.88	8420511.50	16149749.50
May	17716762.50	21011969.81	19489312.88	19804105.38
June	28109574.00	21341318.31	31488395.50	27564368.63
July	29013594.00	41604595.19	36651836.38	95325149.53
August	31366830.80	42393170.63	41076148.75	116627263.43
September	33429536.50	39974595.19	40374742.50	113884861.96
October	31214210.50	4769378.51	34235633.50	-
November	14336862.50	20688219.81	18363711.88	-
December	7543534.00	10918295.38	12243821.50	-
Total	219,931,495.80	231,304,613.07	253,429,894.63	415,886,758.16



Revenue Earned





Energy statement year 2005

Net Energy Purchased in kWh		
CHPC 587,539,263.00 kWh	KHPC 59,846,916.00 kWh	BHPC 60,336,696.00 kWh

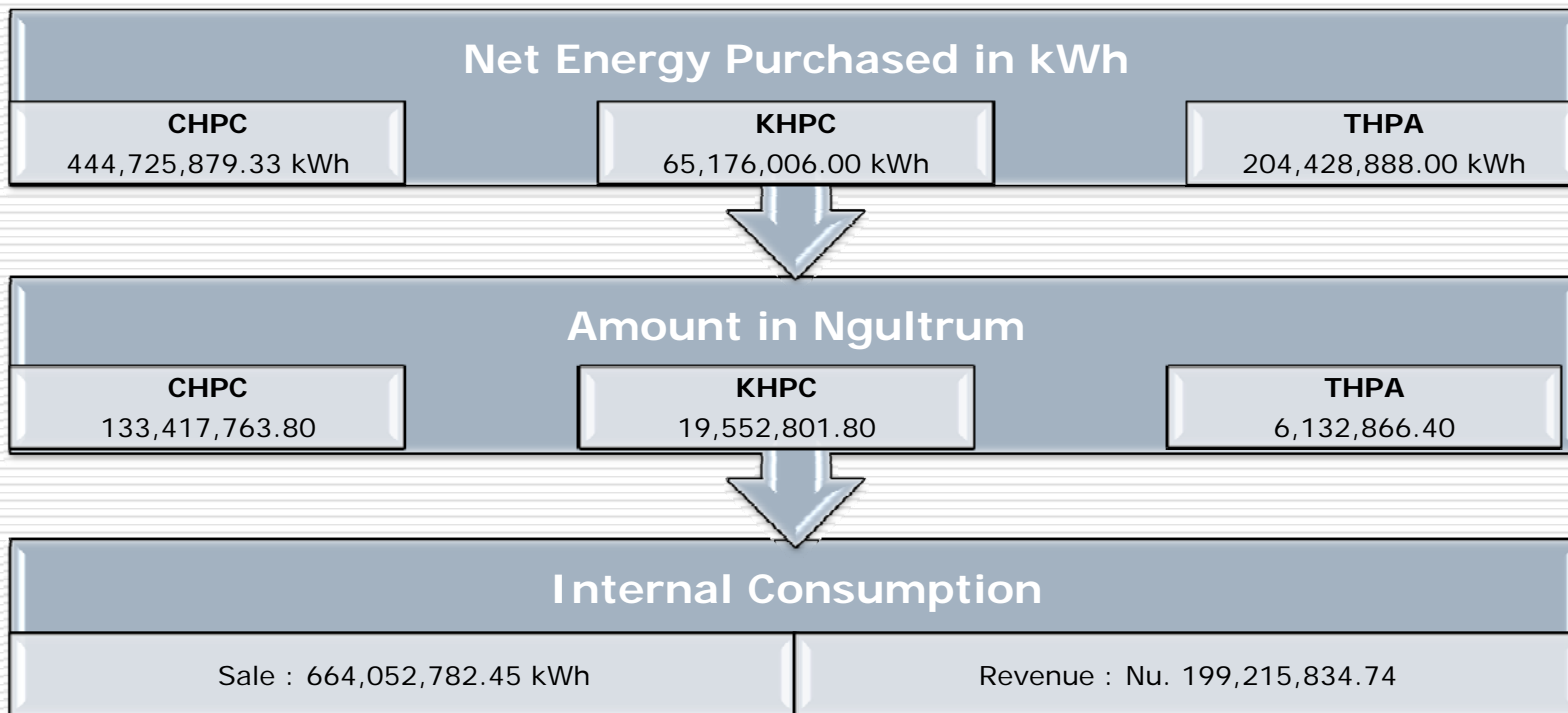
Amount in Ngultrum		
CHPC 176,261,778.90	KHPC 17,954,074.80	BHPC 30,168,348.00

Internal Consumption	
Sale : 633,910,394.54 kWh	Revenue : Nu. 190,173,118.36

- Energy Wheeled for CHPC**
 - Energy Wheeled : 1,456,909,260.00 kWh
 - Revenue Earned : Nu. 182,113,657.50
- Energy Wheeled for KHPC**
 - Energy Wheeled : 275,534,944.50 kWh
 - Revenue Earned : Nu. 34,441,868.06
- Energy Wheeled for BHPC**
 - Energy Wheeled : 18,202,000.00 kWh
 - Revenue Earned : Nu. 2,275,250.00



Energy statement year 2006



Energy Wheeled for CHPC

- Energy Wheeled : 1,729,745,178.00 kWh
- Revenue Earned : Nu. 216,218,147.25

Energy Wheeled for KHPC

- Energy Wheeled : 297,695,984.00 kWh
- Revenue Earned : Nu. 37211998.00



Energy statement year 2007 (up to September 2007)

Net Energy Purchased in kWh		
CHPC 140,389,871.49 kWh	KHPC 48,538,188.00 kWh	THPA 437,703,622.00 kWh

Amount in Ngultrum		
CHPC 42,116,961.45	KHPC 14,561,456.40	THPA 131,311,086.60

Internal Consumption	
Sale : 594,962,878.51 kWh	Revenue : Nu. 178,488,863.55

Energy Wheeled for CHPC	<ul style="list-style-type: none">• Energy Wheeled : 1,448,875,732.00 kWh• Revenue Earned : Nu. 181,109,466.50
Energy Wheeled for KHPC	<ul style="list-style-type: none">• Energy Wheeled : 234,953,052.00 kWh• Revenue Earned : Nu. 29,369,131.50
Energy Wheeled for THPA	<ul style="list-style-type: none">• Energy Wheeled : 1,643,265,281.32 kWh• Revenue Earned : Nu. 205,408,160.16



THANK YOU
