



## **PETITION FOR REVISED GENERATION TARIFF**

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### **NORTHERN POWER GENERATION COMPANY LIMITED (GENCO-III)**

**MARCH 06, 2015**

**TECHNICAL ADVISORS**

**ELAN PARTNERS**

**FINANCIAL ADVISORS**

**GRANT THORNTON  
CONSULTING (PVT) LIMITED**

**LEGAL ADVISORS**

**CORPORATE AND  
LEGAL CONSILIUM**

# Glossary

BTu	British Thermal Unit
CDC	Current Dependable Capacity
Cft	Cubic Feet
COD	Commercial Operation Date
Company	Northern Power Generation Company Limited
CPPA	Central Power Purchase Agency
CPI	Consumer Price Index
CPP	Capacity Purchase Price
CV	Calorific Value
CW	Cooling Water
EPP	Energy Purchase Price
FCC	Fuel Cost Component
FSA	Fuel Supply Agreement
GOP	Government of Pakistan
HHV	Higher Heating Value
HR	Heat Rate
HSD	High Speed Diesel
IPP	Independent Power Producer
Kw	Kilowatt
kWh	Kilowatt hour
LHV	Lower Heating Value
MW	Mega Watt (1,000 kilowatts)
MWh	Mega Watt Hour
NEPRA/ Authority	National Electric Power Regulatory Authority
NTDC/Power Purchaser	National Transmission and Dispatch Company Limited
NPGCL	Northern Power Generation Company Limited
O&M	Operation & Maintenance
OEM	Original Equipment Manufacturer
PES	Pakistan Engineering Services (Pvt.) Limited
Petitioner	Northern Power Generation Company Limited
PKR/Rupees-/Rs.	Pak Rupees, Legal Currency of Pakistan
PPA	Power Purchase Agreement
PSO	Pakistan State Oil
RFO	Residual Fuel Oil
ROE	Return on Equity
Ton	Metric Tonne i.e. 1000 Kg
USAID	U.S. Agency for International Development
WAPDA	Pakistan Water & Power Development Authority
WPI	Wholesale Price Index

# Contents

<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>1 PETITION SUMMARY</b>	<b>3</b>
<b>2 EXISTING TARIFF</b>	<b>7</b>
<b>3 GROUNDS FOR CURRENT GENERATION TARIFF REVISION</b>	<b>9</b>
<b>4 ASSUMPTIONS FOR COMPUTING PROPOSED GENERATION TARIFF</b>	<b>20</b>
<b>5 PETITION FOR REVISION OF TARIFF</b>	<b>21</b>
<b>6 TARIFF STRUCTURE</b>	<b>21</b>
<b>7 ENERGY PURCHASE PRICE</b>	<b>22</b>
<b>8 CAPACITY PURCHASE PRICE</b>	<b>25</b>
<b>9 INDEXATIONS</b>	<b>29</b>
<b>10 RELIEF SOUGHT</b>	<b>30</b>
<b>11 DETERMINATION SOUGHT</b>	<b>30</b>

# Executive Summary

NPGCL under its existing tariff has been incurring significant losses owing to the fact that the tariff determined on a cost plus basis does not fully reflect the actual costs that the company has borne over the past 8 years. A summary of such losses has been tabulated below;

Financial Years	Energy Purchase Price Variance	Capacity Purchase Price Variance	Profit / (Loss) before taxation
	PKR	PKR	PKR
2014	(6,900,725,738)	1,953,058,130	(4,947,667,608)
2013	(5,813,086,627)	1,388,063,319	(4,425,023,308)
2012	(6,667,837,465)	1,774,748,278	(4,893,089,187)
2011	(7,883,484,764)	586,351,810	(7,297,132,954)
2010	(6,714,020,791)	3,766,074,959	(2,947,945,832)
2009	(4,578,848,761)	1,934,074,184	(2,644,774,577)
2008	(2,234,180,277)	3,418,809,986	1,184,629,709
2007	(2,110,359,435)	2,258,571,860	148,212,425

The computations of Energy Purchase Price and Capacity Purchase Price Variances are stated in the paragraph 2.4 of tariff petition.

The following factors, explained more comprehensively within the tariff petition, have contributed to the financial losses;

Aging factor and the change in fuel mix adversely affected the heat rates of Blocks 1, 2, 3 & 7 over the past 8 years, resulting in a substantial increase in the fuel consumed for generating electricity. These heat rates were not coherent with the ones allowed under the existing tariff petition. Pakistan Engineering Services was mandated to conduct heat rate tests for Blocks 1, 2, & 3 and now a revised tariff is being filed with the Authority accordingly.

Transformer, switchyard and metering losses have not been incorporated under the existing tariff determination which amount to 1.84% of generation on average. The proposed tariff also seeks to account for the financial impact due to the difference in cooling water in-let temperatures, which may vary with changes in temperature throughout the year.

NPGCL's generating units have a provision of dual fuel combustion. However, due to non-availability of Natural Gas, since 2007, the Company has been forced to operate its units on RFO, adversely affecting the generation capabilities of the units. Further, NPGCL is involuntarily required to operate its generating units at below base load, hence resulting in lower plant efficiency. The financial impact of this has also been overlooked in the existing tariff determination.



The existing tariff was worked out on a calorific value of 40,800 Btu per Kg whereas the fuel of this CV has never been available for NPGCL. Even as per fuel supply agreement (FSA) signed between PSO and NPGCL in September 2009, the supplier is obliged to provide RFO with a CV of 40,040 Btu per Kg. This difference in CV has also resulted in substantial financial loss to the Company.

Variable O&M allowed under the existing tariff did not fully justify the actual variable operation and maintenance costs that the Company incurred annually. Besides, the variable O&M allowed under the existing tariff determination did not take into account the start-up costs of the generating units. Further, the variable costs were not allowed to be indexed with their respective benchmarks.

NPGCL thus requests NEPRA for a revised tariff which has been structured in the following manner:

Capacity Purchase Price		Proposed Tariff Rs /kW/Month	Indexation	
	Net Dependable Capacity	1472.52 MW		
A	Escalable Component			
	Administration & Establishment cost	218.6350	CPI	
	Insurance and Regulatory cost	2.9892	CPI	
	Other income	(3.3222)	CPI	
		218.3020		
B	Non-Escalable Component			
	Depreciation	60.5789	NIL	
	Interest cost	1.6219	NIL	
	Return on Equity	168.4957	NIL	
		230.6966		
	Total Capacity Purchase Price (A+B)	448.9986		
Energy Purchase Price				
Blocks	Unit	Fuel	Variable O&M	Total
		Rs. kWh		
Block 1	Unit 1	11.0636	0.210	11.2736
	Unit 2	11.1604	0.204	11.3644
	Unit 3	10.8202	0.204	11.0242
Block 2	Unit 4	10.8118	0.143	10.9548
Block 3	Unit 5	11.5132	0.215	11.7282
	Unit 6	11.7560	0.218	11.974
Block 4	Units 5 – 9*	6.302	0.250	6.552
	Units 5 – 8	9.453		9.453
Block 5	Units 1 – 2	13.9831	0.168	14.1511
Block 6	Units 1 – 4	9.826	0.266	10.092

\*Unit 9 is Combined Cycle Plant

# Tariff Petition

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## 1 PETITION SUMMARY

### 1.1 Details of the Petitioner

#### 1.1.1 Northern Power Generation Company Limited (NPGCL),

Registered Office: WAPDA House, Lahore

Mailing Address: Thermal Power Station,  
Mehmood Kot Road, Tehsil & District Muzaffargarh

Telephone: 066-9200151-156

Facsimile: 066-9200166

#### 1.1.2 Licensee details

NPGCL is the licensee of National Electric Power Regulatory Authority (NEPRA) and holds the Generation License bearing No. GL/03/2002 dated 01.07.2002.

#### 1.1.3 Representative of NPGCL

The petition is being filed through Mr. Muhammad Shoaib Rasheed, Chief Executive Officer of NPGCL who has been duly authorized by Board of Directors vide Resolution (Annexure-A) passed in its 61st meeting held on 27th February 2015 to sign and file the Tariff Petition for revision of the Multi Year Tariff of NPGCL.

The following officers of NPGCL shall also appear and/or present any document, in support of the Tariff Petition, as needed and do all acts necessary for completion and processing of the application:-

- Masood Ahmad Finance Director/ Company Secretary
- Muhammad Khalid Alvi Technical Director

The Tariff Petition is being submitted with assistance of the following, and who shall also represent the cause of NPGCL before NEPRA during hearing:-

- Financial: Grant Thornton Consulting (Pvt.) Limited
- Technical: Élan Partners (Pvt.) Limited
- Legal: Corporate & Legal Consilium

016  
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NPGCL (GENCO-III)  
TPS Muzaffargarh

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The Affidavit of the signatory/ CEO is appended as Annexure-B and photocopy of the Bank Draft (tariff petition fees) as Annexure-C.

#### 1.1.4 Grounds for Petition

- Under Section 7 of the "Regulation of Generation, Transmission & Distribution of Electric Power Act, 1997 (hereinafter called as 'NEPRA Act')", the Regulator is responsible for determining tariff, rates, charges and other terms and conditions for the supply of electricity by the generation, transmission and distribution companies.
- NEPRA is also responsible for determining the process and procedures for reviewing tariffs, recommending tariff adjustments, and revision thereof.
- Under Section 15 of the NEPRA Act, the Regulator has granted a Generation License to NPGCL/ Petitioner for a period of 25 years with effect from 01 July 2002 of the NEPRA Act, 1997.
- Later, NEPRA modified the said Generation License vide Letter No. NEPRA /R/ LAG-03/3943-49 dated 18 April 2014 (Annexure- D) and NEPRA /R/LAG-03/13950-54 dated 31 October 2014 (Annexure - E), respectively.
- A Writ Petition is pending against the decision of the Regulator conveyed by aforementioned Orders dated 18.04.2014 in which notices have been issued to NEPRA; as such, to that extent the matter is *sub judice* before the Court of Law.
- Under Rule 6 of the Generation Rules 2000, the licensee can charge only such tariff for provision of electric power as approved by the Authority. Accordingly, NPGCL filed a petition on June 20, 2005 with the Authority for determination of its tariff for sale of its generated electricity.
- NEPRA allowed the Petition by Orders conveyed through letter No. NEPRA/R/TRF-46/NPGCL-2005/3918-20 dated 02.05.2006 (Annexure - F).
- Since that determination, except addition followed by deletion of the rental blocks, no revision has been taken place. In the meanwhile, NPGCL had got conducted Current Dependable Capacity Test, Heat Rate Test and also invested considerable amount for major repair and rehabilitation of its machines. Therefore, the determined tariff needs to be revised by the Authority; hence, this Petition.

#### 1.2 Concise Statement

- ##### 1.2.1
- Consequent upon the restructuring of power wing of Pakistan Water and Power Development Authority, hereinafter referred to as the "WAPDA", its thermal power generation facilities have been split into four (4) independent generation companies,

Page 4 of 30

017  
Chief Executive Officer  
NPGCL (GENCO-III)  
TPS Muzaffargarh

which are known as GENCO(s). Subsequent to this, GENCO – III, or Northern Power Generation Company Limited (NPGCL), was incorporated on October 15, 1998 as a Public Limited Company under the Companies Ordinance of 1984.

- 1.2.2 NPGCL with its cumulative installed capacity of 1921 MW for its four distinctly located generation facilities at Thermal Power Station, Muzaffargarh (TPS Muzaffargarh), Natural Gas Power Station, Multan (NGPS, Multan), Steam Turbine Power Station, Faisalabad (SPS Faisalabad) and Gas Turbine Power Station, Faisalabad (GTPS Faisalabad), commenced commercial operations on November 23, 1998.
- 1.2.3 Since inception, Northern Power Generation Company Limited has been operating power plants in Muzaffargarh, Multan and Faisalabad. Currently, the Company comprises of six blocks in Thermal Power Station Muzaffargarh, Gas Turbine Power Station Faisalabad and Steam Power Station Faisalabad Plant, currently operating with a total installed generation capacity of 1,726 MW. According to the recent CDC and HR Test Report, the Current Dependable Capacity of these blocks is reduced to 1,472.52 MW.
- 1.2.4 The Thermal Power Station (TPS) at Muzaffargarh is located between rivers Indus and Chenab, and approximately 2.5 KM northwest of District Muzaffargarh. At Muzaffargarh, the Company is operating 6 dual fuel based units with a total dependable capacity of 1,184MW that is spread into 3 blocks. The first block comprises of 3 Russian built units with installed capacities of 210 MW each. These Russian units were commissioned during 1993 to 1995. The second block contains one Chinese built unit with an installed capacity of 320 MW which was commissioned in 1997, while the third block has 2 Chinese built units with installed capacities of 200 MW each which were commissioned in 1995. Currently, the entire Muzaffargarh complex is being run on Residual Fuel Oil (RFO) due to shortage of natural gas.
- 1.2.5 The Gas Turbine Power Station (GTPS) Faisalabad is located 10Kms away from Faisalabad City on Faisalabad – Sheikhpura road. At this power plant, the Company is operating 8 German built gas-fired units which were commissioned in 1975 and 1 Chinese Combine Cycle unit which was commissioned in 1994. Each of the gas-fired units has an installed capacity of 25MW, while the Combined Cycle unit has an installed capacity of 44MW. All 9 units are classified into 2 separate blocks and all have provision of dual fuel combustion (Gas and HSD Oil).
- 1.2.6 Steam Power Station (SPS) is also being operated by the Company at the same site in Faisalabad. The power station has 2 identical American built steam powered units that were commissioned in 1967 with an installed capacity of 66MW each. These machines also have a provision for dual fuel combustion (Gas & RFO).
- 1.2.7 NEPRA after reviewing, analyzing and considering the submission made through the above stated Tariff Petition, determined the revised Tariff vide Order No. NEPRA/TRF-46/NPGCL-2006 dated May 02, 2006. The Tariff Components of this Determination were as follows:

018 : Chief Executive Officer  
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TPS Muzaffargarh



Capacity Purchase Price		1,568 MW
		Capacity Purchase Price (CPP) Rs /kW/Month
A	Escalable Component	37.1854
B	Non-Escalable Component	182.1886
Total Capacity Purchase Price (A+B)		219.3739

Blocks	Plant	Energy Purchase Price (EPP) Rs/kWh			
		Fuel			Variable O&M
		RFO	Gas	HSD	
1	Muzaffargarh Units 1-3	5.3015	2.5989	-	0.0250
2	Muzaffargarh Units 4	5.2542	2.5758	-	0.0250
3	Muzaffargarh Units 5-6	5.9747	2.9289	-	0.0250
4	GTPS Faisalabad Units 5-8	-	2.0703	8.6823	0.0250
4	GTPS Faisalabad Units 9	-			0.0250
5	SPS Faisalabad Units 1-2	7.1486	3.4613	-	0.0250
6	GTPS Faisalabad Units 1-4	-	3.7018	15.5239	0.0250

The Reference Tariff was subject to adjustment as per following details:

- The CPP was determined on estimated Net Dependable Capacity of 1,568 MW. The Company was allowed to adjust CPP on the basis of revised Net Dependable Capacity. This was allowed as a one-time adjustment only.
- Escalable Component of CPP has been allowed to adjust against changes in Consumer Price Index (CPI) as notified by Federal Bureau of Statistics (FBS) on July 01 and January 01 each year.
- The Fuel Cost Component of EPP part of the Tariff was computed based on a Calorific Value of 40,800, and heat rates of respective blocks, reference fuel price per unit of residual fuel oil, natural gas and high speed diesel.
- The Fuel Cost Component of EPP part of the Tariff shall be adjusted against the actual Heat Rate of Block 1, 2, 3 and 7. This shall be a one-time adjustment only.
- The Fuel Cost Component of EPP has been allowed to adjust fortnightly on account of fuel price variations.

1.2.8 In 2005-06, the Authority approved heat rates for blocks 4, 5 & 6 of NPGCL. The details of these heat rates are summarized as below;

Blocks	Description	Heat Rate BTU/ kWh	
		As per Previous Determination	As per Existing Determination
4	GTPS Faisalabad Units 5-9	11,701	8,593.65
5	SPS Faisalabad Units 1-2	14,269	14,367.67
6	GTPS Faisalabad Units 1-4	15,746	15,365.97

### 1.3 Key Aims and Features of the Petition

For the reasons mentioned in the petition, NPGCL seeks revision of the determined sale.

019  
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TPS Muzaffargarh

## 2 EXISTING TARIFF

- 2.1 The Authority vide its letter No. NEPRA/TRF-46/NPGCL-2005/7318-7320 dated July 01, 2014 has revised the Escalable Component of the Capacity Price for variation in CPI with effect from July 1, 2014. The existing Capacity Purchase Price is applicable from July 1, 2014 to December 31, 2014.

All Blocks	Plant	Revised Reference	Revised w.e.f 01-07-2014
		Rs / kW/ Month	Rs / kW/ Month
	Escalable Cost Component of CPP		
	Administration & Establishment	81.3309	104.0217
	Insurance and Regulatory	5.9266	7.5800
	Other income	15.4041	19.7017
A	Total Escalable CPP	71.8534	91.8999
B	Non-Escalable CPP	182.1886	182.1886
	Total Capacity Purchase Price (A+B)	254.0420	274.0885

- 2.2 The Authority vide its letter No. NEPRA/TRF-46/NPGCL-2006/9003-9008 dated August 07, 2014 has revised the Fuel Cost Component of the Energy Purchase Price. The details of this revision in Fuel Cost Component of EPP are summarized as below;

Blocks	Description	Revised Fuel Cost Component Rs / kWh 15-07-2014	Revised Fuel Cost Component Rs / kWh 31-07-2014
		<b>Furnace Oil</b>	
1	Muzaffargarh Units 1-3	18.4143	18.3629
2	Muzaffargarh Units 4	18.2500	18.1991
3	Muzaffargarh Units 5-6	20.7526	20.6947

- 2.3 The financial impact of existing tariff on financial performance of NPGCL are tabulated as below;

### Overview of Energy Purchase Price-FY 2007-14

Financial Years	Revenue Element	Cost Element	Energy Purchase Price Variance
	Energy Purchase Price as per NEPRA Determination	Actual Fuel Cost Component & Variable O&M	
	A	B	
	PKR	PKR	PKR
2014	100,554,185,122	107,454,910,860	(6,900,725,738)
2013	84,762,262,363	90,575,348,990	(5,813,086,627)
2012	69,672,235,153	76,340,072,618	(6,667,837,465)
2011	59,619,107,390	67,502,592,154	(7,883,484,764)
2010	76,133,501,194	82,847,521,985	(6,714,020,791)
2009	65,043,079,069	69,621,927,830	(4,578,848,761)
2008	56,959,312,209	59,193,492,486	(2,234,180,277)
2007	40,284,003,552	42,394,362,987	(2,110,359,435)

Source: Audited accounts of NPGCL

### Overview of Capacity Purchase Price-FY 2007-14

Financial Years	Revenue Element	Cost Element	Capacity Purchase Price Variance
	Capacity Purchase Price as per NEPRA Determination	Escalable and Non-Escalable Cost Components of CPP	
	PKR	PKR	PKR
2014	5,080,238,151	3,127,180,021	1,953,058,130
2013	4,957,350,855	3,569,287,536	1,388,063,319
2012	6,124,056,943	4,349,308,665	1,774,748,278
2011	6,594,733,303	6,008,381,492	586,351,810
2010	10,657,667,671	6,891,592,712	3,766,074,959
2009	10,383,435,458	8,449,361,274	1,934,074,184
2008	8,068,063,101	4,649,253,115	3,418,809,986
2007	4,942,803,478	2,684,231,618	2,258,571,860

Source: Audited Accounts of NPGCL

### Overview of Profit/ (Loss)-FY 2007-2014

Financial Years	Energy Purchase Price Variance	Capacity Purchase Price Variance	Profit / (Loss) before taxation
	PKR	PKR	PKR
2014	(6,900,725,738)	1,953,058,130	(4,947,667,608)
2013	(5,813,086,627)	1,388,063,319	(4,425,023,308)
2012	(6,667,837,465)	1,774,748,278	(4,893,089,187)
2011	(7,883,484,764)	586,351,810	(7,297,132,954)
2010	(6,714,020,791)	3,766,074,959	(2,947,945,832)
2009	(4,578,848,761)	1,934,074,184	(2,644,774,577)
2008	(2,234,180,277)	3,418,809,986	1,184,629,709
2007	(2,110,359,435)	2,258,571,860	148,212,425

Source : Audited Accounts of NPGCL

In light of above mentioned facts and figures, financial performance of NPGCL has been continuously deteriorating due to Adverse Energy Purchase Price Variance. Audited financial statements of the company are attached in Annexure G.

## 2.4 Late Payments

One of the key issues creating certain difficulties for NPGCL is that there is continuous late payment of the sold energy by CPPA/ NTDC. This leads to inefficient working capital cycle causing fiscal constraints to NPGCL who, like an IPP, has no sovereign guarantee. Late payment does not allow NPGCL, at times, to do the necessary operational activities, including but not limited to in time repair and maintenance, thereby affecting the overall efficiency of, thus impairs, the operating fixed assets of the Company. As such, the late payments have detrimental ramifications on efficient supply chain management.

To add, the Company does not enjoy financial independence while the non-provision of the Sovereign Guarantee, like that to an IPP, and late payments detailed above, render the Company unable to borrow the money from Banks to supplement the deficit cash flow.

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### 3 GROUND FOR CURRENT GENERATION TARIFF REVISION

Present petition is being made on following grounds;

- 3.1 Revision in fuel cost component based on the latest heat rate test
- 3.2 Transformation and switchyard losses
- 3.3 Ambient conditions correction factor
- 3.4 Part Load Adjustment Charges (PLAC)
- 3.5 Calorific values of fuel purchased
- 3.6 Increase in Variable O&M
- 3.7 Decrease in Net Dependable Capacity
- 3.8 Decommissioning of old Block 7 and use of facility by NTDC
- 3.9 Sustainability charges of GTPS Shahdra (Block 8)
- 3.10 Compensation for System Usage Changes at Muzaffargarh

The above grounds are explained in detail in subsequent paragraphs;

#### 3.1 Revised Heat Rates

The units of Thermal Power Station Muzaffargarh have been commissioned during 1993 to 1997. Since then the units are being operated on dual fuel as per their design till 2007. The routine maintenance had been carried out as recommended by OEM, however these had been deferred by NPCC most of the time due to system constraints. Accordingly, as a natural process, Heat rate of the machines had been deteriorated due to natural wear and tear. In addition due to shortage of gas, these units were mostly being run on furnace oil which had not only adversely affected the loading capability but also affected the heat rate thereby increase in the production cost. This in fact was recognized in the determination dated: May 02 2006. However, the company's delay to comply with the decision of the Authority is primarily due to financial constraints and certain other reasons including but not limited to inadequate fuel stock, non-availability of Gas, delays in major overhauling and annual Boiler inspections. However, the heat rate of all units has now been tested by an Independent consultant hired by USAID, under the grant available from USAID, besides other rehabilitation works that has been done to recapture the loading capability of these units. This Report is attached in Annexure-H.

#### Rationale

As per the directions of the Authority, Heat Rates tests were conducted by Pakistan Engineering Services (PES) for block 1, 2 and 3 of Muzaffargarh Plant under USAID Energy Power Policy after the rehabilitation of the plant. The details of tested heat rates are presented as below:

Blocks	Description	Net Heat Rate as per PES Report at 100% MCR
		Btu/ kWh
1	Muzaffargarh Units 1	10464.90
1	Muzaffargarh Units 2	10606.69
1	Muzaffargarh Units 3	10239.86
2	Muzaffargarh Units 4	10224.66
3	Muzaffargarh Units 5	10887.16
3	Muzaffargarh Units 6	11185.02

Page 9 of 30

022 .  
Chief Executive Officer  
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TPS Muzaffargarh



### 3.2 Transformation & Switchyard Losses

The heat rate tests were to be carried out according to the applicable international codes and standards i.e., ASME PTC- 46 or ASME PTC – 6, according to which Losses of Generator transformer to be counted for as per figure 5.5 ASME PTC 46 (Copy Attached in Annexure - I), showing steam plant test boundary and including generator transformer in the boundary.

At the time of test, the reading of energy meters installed at generator terminal were taken to calculate Net energy exported to NTDC, due to unavailability of Revenue Grade Meters at each unit after the transformer. However as a standard practice net energy export is recorded at the outgoing gantry of power plant switchyard. Backup meter readings at generator terminal and NTDC meter reading at switchyard for TPS Muzaffargarh are attached in Annexure - J.

#### Rationale

The issue was taken up with Independent Engineer (IE) and they agreed with the standard. The independent engineer however required the historical data in this regard which was provided to them. As a result of detailed study/analysis of data provided by NPGCL, they came out with the conclusion that the difference in Net Generation at Generator Terminal and the Net invoiced energy, (including losses of transformer + switchyard + human error + metering error of more than 33 meters) on average comes out to be 1.84 %. The working paper is hereby attached in Annexure - K for ready reference.

M/s PES, the Independent Engineer vide their Office Letter No. Thermal/10/39a/01/15 dated 28.01.2015 (Copy Attached in Annexure - L), has agreed for incorporation of 1.84% transformer and switchyard losses, based on historical record.

This difference of 1.84 % in Net Generation at Generator Terminal and Net invoiced energy is because of construction and design of 220 KV Switchyard at TPS Muzaffargarh (Block diagram attached for ready reference in Annexure - M), in addition to losses of transformer + switchyard + human error + metering error of more than 33 meters. Moreover this construction is quite different as compared to that of IPPs, where only generator feeders are being fed to 220 KV Transmission Line, whereas, at TPS Muzaffargarh the switchyard is being used by NTDC for routing of energy to/from different feeders.

Moreover, it is worth to mention here that 220 KV switch yard is being operated and maintained by NPGCL. The matter has been taken up with NTDC from time to time to takeover this Equipment from NPGCL but they always avoided to do so. This matter has also been brought to NEPRA but NEPRA also conveyed vide Letter No. NEPRA/R/SA (Tech)/LAG-03/14368-69 dated 13.11.2014 (attached in Annexure - N) to operate and maintain this Switchyard by NPGCL.

At present, monthly joint Energy Meter reading is recorded at the meters installed on the 15 Nos. outgoing/incoming feeders which are connected /routed through the 220KV switch yard. The import and export energy readings of all above feeders are recorded and Net Export of TPS Muzaffargarh is calculated as follows;

**Net Electrical Output of TPS M-Garh = Total Export Energy-Total Import Energy**

All the meters are being regularly tested and calibrated by TSG of NTDC. (Calibration Reports are attached in the Heat Rate report submitted by IE).

#### Prayer

NEPRA is requested to incorporate 1.84% transformer and switchyard losses as explained above in the cost of production, keeping in view the applicable codes and Independent Engineer's vetting. The company has been bearing the huge losses for last many years. The adjusted heat rates and

  
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**TPS Muzaffargarh**

auxiliary consumptions, after incorporating the effect of transformer and switchyard losses is tabulated below;

**Break Up of Transformer Losses to BTU conversion:**

**At 100 % MCR**

Unit No	Annex of Test Report	Net Output (KWh)	BTUs Consumed	1.84 % Transformer & Other Losses (KWh)	Net Output Less Transformer Losses (KWh)	Net Heat Rate Before Transformer (LHV)	Net Heat Rate After Transformer (LHV)	Difference in Net Heat Rate (LHV)
		kWh	BTU	kWh	kWh	BTU/ kWh	BTU/ kWh	BTU/ kWh
1	D (3)	175810	1839834873.47	3234.90	172575.10	10464.90	10661.07	196.16
2	E (3)	169108	1793682877.59	3111.60	165997.00	10606.69	10805.51	198.82
3	F (3)	171352	1754623503.20	3152.88	168199.37	10239.86	10431.81	191.95
4	G (3)	247200	2527535562.01	4548.48	242651.52	10224.66	10416.32	191.66
5	H (3)	168091	1830043023.52	3092.89	164998.96	10887.16	11091.24	204.08
6	I (3)	158878	1777054712.96	2923.36	155954.74	11185.02	11394.68	209.66

**At 50 % MCR**

Unit No	Annex of Test Report	Net Output	BTUs Consumed	1.84 % Transformer and other Losses	Net Output Less Transformer Losses	Net Heat Rate Before Transformer (LHV)	Net Heat Rate After Transformer (LHV)	Difference in Net Heat Rate (LHV)
		kWh	BTU	kWh	kWh	BTU/ kWh	BTU/ kWh	BTU/ kWh
1	D (3)	98696.00	1118029459.00	1816.01	96879.99	11328.01	11540.35	212.34
2	E (3)	95100.20	1125607986.00	1749.84	93350.36	11836.02	12057.89	221.87
3	F (3)	99350.10	1094732490.00	1828.04	97522.06	11018.94	11225.49	206.55
4	G (3)	145350.00	1662496245.00	2674.44	142675.56	11437.88	11652.28	214.40
5	H (3)	97040.36	1197687090.00	1785.54	95254.82	12342.15	12573.51	231.35
6	I (3)	97749.11	1187690754.00	1798.58	95950.53	12150.40	12378.16	227.76

### Heat Rates of TPS Muzaffargarh after Losses

Unit No	As per Heat Rate Test Report LHV				After 1.84 % Losses as per Independent Engineer Letter No. Thermal/10/39a/01/15 dated 28.01.2015-LHV		
	Efficiency (%)	HR (BTU/KWh)	CV (LHV) BTU/Lb	CV (LHV) BTU/Kg	Efficiency (%)	HR (BTU/KWh)	CV (LHV)
<b>At 100 % MCR</b>							
1	32.61	10464.90	17288.00	38102.75	32.01	10661.06	38102.75
2	32.17	10606.69	17367.00	38276.87	31.58	10805.51	38276.87
3	33.32	10239.86	17302.00	38133.61	32.71	10431.81	38133.61
4	33.37	10224.66	17290.00	38107.16	32.76	10416.32	38107.16
5	31.34	10887.16	17274.00	38071.90	30.76	11091.24	38071.90
6	30.51	11185.02	17374.00	38292.30	29.95	11394.68	38292.30
<b>At 50%MCR</b>							
1	30.12	11,328.01	17,288.00	38102.75	29.57	11540.35	38102.75
2	28.83	11,836.02	17,367.00	38276.87	28.30	12057.89	38276.87
3	30.96	11,018.94	17,302.00	38133.61	30.40	11225.49	38133.61
4	29.83	11,437.88	17,290.00	38107.16	29.28	11652.28	38107.16
5	27.65	12,342.15	17,274.00	38071.90	27.14	12573.50	38071.90
6	28.08	12,150.40	17,374.00	38292.30	27.57	12378.16	38292.30

### Effect of Transformer Losses on Auxiliary Consumption

At 100 % MCR

Unit No.	Annex of Test Report	Gross Output (KWh)	Net Output (KWh)	Auxiliary Cons. (KWh)	%age Auxiliary Cons. Excluding transformer and switchyard losses (%)	Aux. Consumption with Transformer and Switchyard Losses (KWh)	%age Auxiliary Cons. including transformer and switchyard losses (%)	
	1	2	3	4	5	6	7	
1	D (3)	190000.00	175810.00	2	14190.00	7.47	17424.90	9.17
2	E (3)	182500.00	169108.60	13391.40	7.34	16503.00	9.04	
3	F (3)	183500.00	171352.25	12147.75	6.62	15300.63	8.34	
4	G (3)	272200.00	247200.00	25000.00	9.18	29548.48	10.86	
5	H (3)	181440.00	168091.85	13348.15	7.36	16441.04	9.06	
6	I (3)	173880.00	158878.10	15001.90	8.63	17925.26	10.31	



At 50 % MCR

Unit No.	Annex of Test Report	Gross Output (KWh)	Net Output (KWh)	Auxiliary Cons. (KWh)	%age Auxiliary Cons. Excluding transformer and switchyard losses (%)	Aux. Consumption with Transformer and Switchyard Losses (KWh)	%age Auxiliary Cons. including transformer and switchyard losses (%)
	1	2	3	4	5	6	7
1	D (3)	111500.00	98696.00	12804.00	11.48	14620.01	13.11
2	E (3)	107000.00	95100.20	11899.80	11.12	13649.64	12.76
3	F (3)	110000.00	99350.10	10649.90	9.68	12477.94	11.34
4	G (3)	162050.00	145350.00	16700.00	10.31	19374.44	11.96
5	H (3)	107730.00	97040.36	10689.64	9.92	12475.18	11.58
6	I (3)	109620.00	97749.11	11870.89	10.83	13669.47	12.47

### 3.3 Ambient Conditions Correction Factor

The tests of Thermal Power Station Muzaffargarh were carried out during the month of January 2014 for which the atmospheric conditions to operate the steam power plant are ideal and CW inlet temperature was about 32 degree centigrade whereas in summer this temperature goes up to 50 degree Celsius which severely affects efficiency of the power plant.


The applicable international codes and standards i.e., ASME PTC- 46 or ASME PTC – 6, the correction factor for environmental conditions like Atmospheric Pressure, Ambient temperature, humidity and different correction curves as per ASME PTC 46 Table 5.2 (Copy Attached in Annexure - O) defines correction factor to be applied on various CW in-let temperatures.

#### Rationale

The issue was taken up with Independent Engineer, as at the time of test, correction curves by Original Equipment Manufacturer (OEM) were not provided and accounted for in the Heat Rate. As per demand of IE, the average CW temperature of TPS Muzaffargarh for the year 2013-14 was provided backed up with daily log sheets, which came out to be 38 degree centigrade. Working paper is hereby attached in Annexure – P.

#### Prayer

From the OEM provided curves, Independent Engineer concluded an increase of 148 BTU/KWh as correction factor of CW in-let Temperature and conveyed to us vide their Office Letter No. Thermal/10/39a/01/15 dated 28.01.2015 (attached in Annexure - L). OEM provided curves for CW Temperature effect on Heat Rate of the plant are also hereby attached in Annexure – Q.

  
Chief Executive Officer  
NPGCL (GENCO-III)  
TPS Muzaffargarh  
026 :

We pray to NEPRA for adjustment of Heat Rate keeping in view the ambient conditions correction factor as tabulated below;

Unit No	HR - LHV As per Test Report (BTU/KWh)	HR - LHV After Transformer and S/yard Losses as per 3.3 above (BTU/KWh)	HR - LHV correction on 38 degree cetrigrade CW temp. by PES(BTU/KWh)	Heat Rate - LHV After CW temp correction (BTU/KWh)	Final Heat Rate - LHV(BTU/KWh) Used for FCC
<b>At 100 % MCR</b>					
1	10464.90	10661.06	148.00	10809.064	10809.06
2	10606.69	10805.51	148.00	10953.511	10953.51
3	10239.86	10431.81	148.00	10579.805	10579.81
4	10224.66	10416.32	148.00	10564.320	10564.32
5	10887.16	11091.24	148.00	11239.239	11239.24
6	11185.02	11394.68	148.00	11542.682	11542.68
<b>At 50%MCR</b>					
1	11,328.01	11540.35	148.00	11688.353	11688.35
2	11,836.02	12057.89	148.00	12205.885	12205.89
3	11,018.94	11225.49	148.00	11373.489	11373.49
4	11,437.88	11652.28	148.00	11800.282	11800.28
5	12,342.15	12573.50	148.00	12721.503	12721.50
6	12,150.40	12378.16	148.00	12526.158	12526.16


### 3.4 Part Load Adjustment Charges

The units of TPS Muzaffargarh are designed to be operated on Dual Firing i-e; Gas/Furnace Oil but due to non-availability of Fuel Gas since 2007 and onward, the units are being operated on single fuel against the design i-e; High Sulphur Furnace Oil. The continuous operation of the units on Furnace Oil has created problems and has affected the boiler including heating surfaces of Super Heaters, Flue gas ducts, regenerative Air Heater etc. Boiler heating surface are prone to scale and slag formation due to continuous oil firing and the equipment in flue gas path like regenerative air pre-heaters choke frequently due to continuous oil firing which forces us to operate the plant at part load resulting adverse impact on efficiency and the heat rates.

In addition the NPCC who is responsible for despatch of plant frequently orders the plant operator to increase or decrease load on specific machines under operation. This also results into heat rate deterioration.

#### Rationale

The conventional steam plant is primarily designed for base load operation wherein the load variation is kept at minimum. This gives the best efficiency of the plant. As mentioned above, the system operator tends to frequently vary the load thereby affecting efficiency. Attached in Annexure - R is the table, in which "per hour reading of the loading" of Unit No.1 as a test case is shown.

  
**Chief Executive Officer**  
**NPGCL (GENCO-III)**  
**TPS Muzaffargarh**  
**027**

Further, the average loading of the units for the year 2013-14 is as under,

Block	Block 1			Block 2	Block 3	
Unit	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5	Unit-6
Load (MW)	167	167	170	250	160	158

Reduced load operation increases auxiliary consumption on one hand and heat rate causing decreased efficiency of the machine on the other. This result in high per unit cost of electricity produced. Moreover reduced load causes frequent choking of RAH elements due to less Flue Gases outlet temperature, which in turn aggravates the situation. The figures provided by OEM further strengthen our point (Attached in Annexure – S).

Moreover, in the recent Heat Rate test conducted by the independent engineer M/s PES, and duly witnessed by representatives of NEPRA, CPPA and USAID, the high heat rate can be witnessed in the underneath table:

Block		Block 1			Block 2	Block 3	
Unit		Unit-1	Unit-2	Unit-3	Unit-4	Unit-5	Unit-6
Dependable Capacity (MW)	MCR	190.00	182.50	183.50	272.20	181.44	173.88
	50 %	111.50	107.00	110.00	162.05	107.73	109.62
Net Heat Rate (BTU/Kwh) LHV	MCR	10,464.9	10606.69	10,239.86	10,224.66	10,887.16	11,185.02
	50 %	11,328.01	11,836.02	11,018.94	11,437.88	12,342.15	12,149.2

#### Prayer

The data of OEM and Heat Rate Test have been used to devise "Heat Rate Variation with Load Curves" which is attached in Annexure – T to be used for calculating Heat Rate for partial load adjustment from the equations derived on graphs. The Authority is therefore requested to allow Part Load Adjustment Charges as per the curves and equations mentioned on graphs.

#### 3.5 Calorific Value of Fuel Purchased (HHV)

Reference to NEPRA's determination No. NEPRA/TRF-46/NPGCL- 2006 dated May 02, 2006, the calorific value of furnace oil taken was 40,800 for calculation of Fuel Cost Component (FCC). However, under the Fuel Supply Agreement (FSA) between NPGCL and Pakistan State Oil (PSO) on the directions of Ministry of Water & Power, the fuel supplier offered fuel with the specification of minimum calorific values of 39,672 Btu/ Kg for local and 40,112.8 Btu/ kg for imported fuel with an average calorific value of 39,892.4 BTU/kg.

#### Rationale

On actual, NPGCL received blend of local and imported furnace oil having different calorific values ranging from 40,040 to 40,200 Btu/ Kg. NPGCL has also got 3<sup>rd</sup> party testing results of the calorific

  
**Chief Executive Officer**  
**NPGCL (GENCO-III)**  
**TPS Muzaffargarh**  
**028**



values of the furnace oil received since 2011 to date, which comes out to be average 40,250 BTU/Kg at tankers level. (Attach in Annexure – U)

#### Prayer

As the actual CV of Furnace Oil, being received by TPS Muzaffargarh is averagely 40,191 Btu/Kg at tankers level for last 4 years, and as the decantation of furnace oil requires steaming of tankers/ tank wagons, steaming of storage tanks and tracing of furnace oil pipelines for flow of dense fluid, which lowers the CV of the F.O up to 40040 on average at boiler inlet i-e; at burner level. The CV of F.O tested by PES at the time of test is also tabulated below, which provides the ground realities as explained above,

Blocks	Description	Calorific Value – HHV (Btu/ Kg)	Calorific Value – LHV (Btu/ Kg)
1	Muzaffargarh Units 1	39,755.75	38,103
1	Muzaffargarh Units 2	39,995.99	38,277
1	Muzaffargarh Units 3	39,797.63	38,134
2	Muzaffargarh Units 4	39,762.36	38,107
3	Muzaffargarh Units 5	39,713.88	38,072
3	Muzaffargarh Units 6	40,020.23	38,292

NEPRA is requested to approve the actual on ground calorific values of furnace oil as above, approved by historical record and Heat Rate report conducted in presence of NEPRA representatives.

#### 3.6 Increase in Variable O&M

The VOM as determined in previous tariff approved by NEPRA on dated May 02, 2006 was taken on historical grounds which came to be on lesser sides due to one or more reasons including aging factor and fuel mix at that time. Moreover the following factors were totally ignored in the previous tariff determination;

- i- Start-up costs of machines
- ii- Cost of chemicals and Fuel Additives
- iii- Maintenance of 220 KV Switchyard

#### Rationale

As already has been described that plants of TPS Muzaffargarh were installed during 1993-1997 and due to their continuous operation on F.O had lost their capacity which was regained to some extent through FARA with the help of USAID. However, the plants are expected to deteriorate than past due to aging factor and unavailability of adequate fuel mix. Accordingly variable O&M has been projected keeping in view the major rehabilitation and parts replacements required in future. Moreover the following costs have also been accounted for while projecting Variable O&M,

- i- Start-up costs of machines
- ii- Cost of chemicals and Fuel Additives
- iii- Maintenance of 220 KV Switchyard

The calculations of VOM are under the headings of Tariff Structure

  
**Chief Executive Officer**  
**NPGCL (GENCO-III)**  
**TPS Muzaffargarh**

**Prayer**

Keeping in view the explained facts as above, Authority is hereby requested to approve the VOM costs as calculated, keeping in view the huge losses already incurred in the accounts of NPGCL due to non-incorporation of above mentioned items.

  
**Chief Executive Officer**  
**NPGCL (GENCO-III)**  
**TPS Muzaffargarh**  
**030**



### 3.7 Variation in Net Dependable Capacity

The Authority vide its letter no. NEPRA/R / LAG-03/ 13950-54 dated October 31, 2014 modified Generation License (GL/03/2002) and decided to add the Combined Cycle Power Station at Nandipur with installed capacities of 565.65MW and 473.99 MW on Natural Gas and Furnace Oil, respectively. NPGCL has applied for a separate tariff for Nandipur under Tariff Petition NPGCL/ TRF – 46/ 1984 dated May 20, 2014.

In addition the Authority vide its letter no. NEPRA /R/LAG-03/3943-49 dated April 18, 2014 modified Generation License (GL/03/2002) and decided to decommission Block 7, NPGS, Multan.

#### Rationale

Block 7 has been decommissioned and subsequently Blocks 4, 5 and 6 have the dependable capacities as determined by NEPRA in the Present Determination. For the purpose of this tariff petition, the table below indicates the installed and present Dependable Capacities of Northern Power Generation Company Limited as per report of PES for Blocks 1, 2, and 3 and NEPRA determination for Blocks 4, 5 and 6.

Blocks	Description	Installed Capacity	Last Net Dependable Capacity as per NEPRA	Present Net Dependable Capacity
		MW		
1	Muzaffargarh Units 1-3	630	558	556
2	Muzaffargarh Units 4	320	270	272.2
3	Muzaffargarh Units 5-6	400	360	355.32
4	GTPS Faisalabad Units 5-9	144	117	117
5	SPS Faisalabad Units 1-2	132	97	97
6	GTPS Faisalabad Units 1-4	100	75	75
	Total	1,726	1,477	1,472.52

#### Prayer

The Capacity Purchase Price in Rupees per kW per Month in this Revised Tariff Petition is worked out on the basis of Current Net Dependable Capacity of the NPGCL (1472.52MW). NEPRA is hereby requested to consider the grounds for calculating Net dependable capacity of NPGCL.


### 3.8 Decommissioning of Block 7, use of Facility by NTDC and Sustainability Cost

The Authority vide its letter no. NEPRA /R/LAG-03/3943-49 dated April 18, 2014 modified Generation License (GL/03/2002) and decided to decommission Unit 1, 3 & 4 of Block 7 NPGS, Multan. The details of design data of decommissioning units are presented as below;

Blocks	Description	Installed Capacity	De-rated Capacity
		MW	
7	NPGS Multan Units 1, 3 & 4	195	91

#### Rationale

In order to ensure operations of NPGS Multan, as switchyard for smooth transmission and distribution of Electricity by NTDC, a minimum manpower, equipment, Auxiliary consumption etc are

  
Chief Executive Officer  
NPGCL (GENCO-III)  
TPS Muzaffargarh  
031

being incurred on these plants, which if withdrawn will effect operation of NTDC in proper dispatch of the electricity to the system. NPGCL seeks Sustainability Charges relating to Piraghaib (Multan). These charges have been worked out in Tariff structure.

**Prayer**

The Authority is hereby requested to approve the sustainability charges of NGPS Piranghaib Multan. NPGCL has already borne huge losses in sustainable operation of GTPS Shahdara, Lahore.

**3.9 Sustainability charges of GTPS Shahdara (block 8)**

NPGCL has been maintaining the GTPS Shahdara which was not included in generation license issued by Authority on dated 01 July 2002 due to low efficiency.

**Rationale**

In order to ensure operations of GTPS Shahdara, as switchyard for smooth transmission and distribution of Electricity by NTDC, a minimum manpower, equipment's Auxiliary consumption etc are being incurred on these plants, which if withdrawn will affect operation of NTDC in proper dispatch of the electricity to the system. NPGCL seeks Sustainability Charges relating to GTPS Shahdara, Lahore. These charges have been worked out in Tariff structure.

**Prayer**

The Authority is hereby requested to approve the sustainability charges of GTPS Shahdara Lahore. NPGCL has already borne huge losses in sustainable operation of GTPS Shahdara Lahore.

**3.10 Compensation for System Usage Changes at Muzaffargarh**

The NTDC has been using switchyard of TPS Muzaffargarh to serve 15 different feeders for transmission of electricity. We would request NEPRA to allow compensation to NPGCL on account of system usage charges in line with similar compensation being provided to few identical facilities of DISCOs e.g., MEPCO.

  
Chief Executive Officer  
NPGCL (GENCO-III)  
TPS Muzaffargarh  
032

#### 4 ASSUMPTIONS FOR COMPUTING PROPOSED GENERATION TARIFF

In addition to the financial impact of the technical parameters elaborated in this document, this tariff takes into account the following general assumptions;

- 4.1 No provision for working capital has been assumed on account of delays in payments from NTDC.
- 4.2 Any taxes on any income of the Company, including taxes on sale proceeds from NTDC, general sales tax and all other corporate taxes shall be treated as pass-through.
- 4.3 Withholding tax on supply of plant & equipment or spares has been assumed at zero.
- 4.4 The Company has not assumed any costs that may be incurred for the Worker's Welfare Fund or Workers Profit Participatory Fund. Any such costs shall be considered as pass-through items in the terms and conditions of the PPA.
- 4.5 It has been assumed that any benefits, concessions or incentives made available to other Independent Power Producers (IPPs) or projects, shall also be made available to the Company.
- 4.6 Any additional costs incurred to cater for modification or additions required by the Power Purchaser shall be assumed to be pass-through.
- 4.7 Any changes in these assumptions shall result in a change to the tariff proposed in this document.
- 4.8 Plant factor has been assumed at a 60%.

  
Chief Executive Officer  
NPGCL (GENCO-III)  
TPS Muzaffargarh  
**033**

## 5 PETITION FOR REVISION OF TARIFF

The preceding paragraphs stipulate the grounds which constitute the basis for revision in the Reference Tariff allowed by the Authority vide Order No. NEPRA/TRF-46/NPGCL-2006. A revised tariff petition, therefore, is required to be filed, pursuant to Rule 3 under Section 31 of the Regulation of Generation Transmission and Distribution of Electric Power Act, 1997 (XL of 1997) (the "Act") read with Rule 3 of the National Electric Power Regulation Authority (Tariff Standards and Procedure) Rules, 1998 (the "Tariff Rules") for the revision/modification of the Generation Tariff Determination dated May 02, 2006. Each component of Tariff is discussed below for kind consideration and approval from the Authority.

## 6 TARIFF STRUCTURE

6.1 The proposed tariff has a typical two-part structure comprising of Energy Purchase Price (EPP) based on net generation in kWh and Capacity Purchase Price (CPP) based on the Net Dependable Capacity available for dispatch.

6.2 Energy Purchase Price (EPP) of the tariff consists of the following cost components;

- a) Fuel Cost Component
- b) Variable O&M Component.

6.3 Capacity Purchase Price (CPP) of the tariff consists of the following cost components;

- a) Escalable Cost Component
- b) Non-Escalable Cost Component


6.4 The Petitioner requests the following items to be considered as pass-through items;

- a) Fuel price fluctuations
- b) Indexation of Variable O&M of the Energy Purchase Price and Escalable Cost Component of the Capacity Purchase Price
- c) Payments to Workers Welfare and Profit Participation Funds
- d) Expenditure on modification or expansion of Protective Devices required by NTDC
- e) General Sales Tax
- f) Actual Income/ Turnover tax
- g) Additional Insurance Cost due to change in policy
- h) Electricity duty on in-house consumption of electricity
- i) Any other cost if agreed and identified in the Power Purchase Agreement.

6.5 Fuel Cost Component and Energy Cost Component have been computed on the basis of reference fuel rates provided below. Fuel rates are subject to adjustment on a fortnightly basis.

Furnace Oil Price	Rs. 39,000/ M. Ton
Gas Price	Rs. 588.23/ MMBtu
HSD Price	Rs. 90/ Liter

6.6 Due to non-availability of natural gas for generation, it has been assumed that the power plants shall be run on Furnace Oil only, however the plants are designed on dual fuel.

  
Chief Executive Officer  
NPGCL (GENCO-III)  
TPS Muzaffargarh  
034



## 7 ENERGY PURCHASE PRICE

7.1 The Fuel Cost Component for Thermal Power Station Muzaffargarh has been calculated using the revised Net Heat Rates at Lower Heating Value (100% MCR) provided in the recently carried out Current Dependable Capacity and Heat Rate Tests after taking into account transformer and switchyard losses and incorporation of CW inlet temperature correction factor as explained in clause 3.2 of this petition.

Block	Name of Power Plant	Fuel	Present Heat Rate as per PES-LHV (BTU/KWh)	CV as per actual at the time of test - LHV (BTU/Kg)
1	TPS Muzaffargarh Unit 1	RFO/Gas	10,809.064	38,103
1	TPS Muzaffargarh Unit 2	RFO/Gas	10,953.511	38,277
1	TPS Muzaffargarh Unit 3	RFO/Gas	10,579.805	38,134
2	TPS Muzaffargarh Unit 4	RFO/Gas	10,564.32	38,107
3	TPS Muzaffargarh Unit 5	RFO/Gas	11,239.239	38,072
3	TPS Muzaffargarh Unit 6	RFO/Gas	11,542.682	38,292

7.2 The Fuel Cost Components for Gas Turbine Power Station (GTPS) Faisalabad blocks 4 and 6 has been calculated on historical grounds taking into consideration the respective Heat Rates in accordance with the Present Determination (2006).

Block	Name of Power Plant	Fuel	Present Heat Rate- LHV (BTU/KWh)	CV as per actual - LHV (BTU/Kg)
4	GTPS Faisalabad Unit 5-9 with CCP	Gas	8,903	831*
4	GTPS Faisalabad Unit 5-9 without CCP	Gas	13,355	831*
5	SPS Faisalabad Units 1-2	RFO	12,979	38,164
6	GTPS Faisalabad Units 1-4 Open Cycle	Gas	13,881	831

\*The conversion of 920 BTU/Cft HHV to 831 BTU/Cft LHV, as per NEPRA precedent used for Ruba Energy Pakistan (Pvt.) Ltd (REL), Reference Number NEPRA / R / TRF - 117 / REL - 2008 / 386 - 88, dated October 9, 2008.

- 7.3 Fuel Cost Components (FCC) for all RFO and Gas based units/ blocks have been computed based on the aforementioned Heat Rates and Calorific Values.
- 7.4 The heat rate variation with load curves as provided will be used for partial load heat rate calculation and payment in case the plant load falls below 100 % of tested MCR, as per precedent set by NEPRA in the tariff determination of HUBCO Case No. NEPRA/TRF-92/HUBCO-2008 dated 23.05.2008.
- 7.5 The requirement for RFO and Gas per annum has been computed in-line with the general practice of computing the Net Generation produced from heating the respective fuel required in order to achieve the energy output of the plant based on the thermal efficiency. Net Generation has been computed using a notional 60% plant factor.

  
**Chief Executive Officer**  
**NGCL (GENCO-III)**  
**TPS Muzaffargarh**  
**025**

Fuel Cost Component Thermal Power Station Muzaffargarh		
Block	Unit	Fuel Cost Component (Rs. Per kWh)
1	1	11.0636
	2	11.1604
	3	10.8202
2	4	10.8118
3	5	11.5132
	6	11.7560
Gas Turbine Power Station Faisalabad		
4	Unit 5 – 9 with CCP	6.302
4	Unit 5 – 9 without CCP	9.453
6	1 – 4	9.826
Steam Power Station Faisalabad		
Block 5	Unit 1 – 4	13.983

- 7.6 Variable Operations & Maintenance (O&M) costs incurred by Northern Power Generation Company Limited have been projected on the basis of approved annual budget. These include Repairs & Maintenance; Start-up Costs; and Chemical & Fuel Additives.
- 7.7 Repairs and Maintenance Costs are the costs required to maintain the plant's present efficiency. These costs are a part of the annual budget of Northern Power Generation Company Limited. The budget is prepared by technical experts after a careful analysis of the plant's physical conditions and the expected expenditures required in the future to maintain the plant's efficiency. The budget is then approved by the Board of the Company.
- 7.8 Start-up Costs have been assumed as a pass-through item for the purpose of this tariff. We have computed these costs by multiplying the number of estimated start-ups per year with the quantity of fuel and other start-up components consumed during each start-up. Start-ups have been classified as cold and hot depending upon the time duration for which the unit has been shut down. The numbers of cold and hot start-ups have been estimated using the actual past 10 years' average.
- 7.9 Chemical and Fuel Additives were not part of the present tariff determination. However, they form an essential component for the process of power generation and have been accordingly incorporated in the proposed tariff petition. These costs are also estimated by the technical experts and form a part of the annual budget.

  
**Chief Executive Officer**  
**NPGCL (GENCO-III)**  
**TPS Muzaffargarh**  
**026**

Variable O&M Cost Component Thermal Power Station Muzaffargarh		
Block	Unit	Variable O&M Cost Component Rs. Per kWh
1	1	0.210
	2	0.204
	3	0.204
2	4	0.143
3	5	0.215
	6	0.218
Gas Turbine Power Station Faisalabad		
Block	Unit	
4	5 – 9	0.250
6	1 – 4	0.266
Steam Power Station Faisalabad		
Block	Unit	
5	1 – 4	0.168

037

  
**Chief Executive Officer**  
**NPGCL (GENCO-III)**  
**TPS Muzaffargarh**

## 8 CAPACITY PURCHASE PRICE

The Capacity Purchase Price (CPP) comprising of Escalable and Non-Escalable cost components is tabulated below:

Capacity Purchase Price		Reference Tariff Rs /kW/Month	Present Tariff Rs/kW/Month	Proposed Tariff Rs /kW/Month
	<b>Net Dependable Capacity</b>	<b>1568 MW</b>	<b>1568 MW</b>	<b>1472.52 MW</b>
<b>A</b>	<b>Escalable Cost Component</b>			
	Administration & Establishment	42.0902	102.7642	219.4314
	Insurance and Regulatory	3.0671	7.49	2.9892
	Other income	(7.9719)	(19.46)	(3.3222)
		<b>37.1854</b>	<b>90.7889</b>	<b>219.0984</b>
<b>B</b>	<b>Non-Escalable Cost Component</b>			
	Depreciation	58.2696	58.2696	60.5789
	Interest cost	6.6560	6.6560	1.6219
	Return on Equity	117.2630	117.2630	168.4957
		<b>182.1886</b>	<b>182.1886</b>	<b>230.6966</b>
	<b>Total Capacity Purchase Price</b>	<b>219.3739</b>	<b>272.9775</b>	<b>449.7950</b>

### 8.1 Escalable Cost Component of CPP:

The Escalable cost contains following sub components:

- 8.1.1 Salaries, Wages and Fringe Benefits cost
- 8.1.2 Administration cost
- 8.1.3 Repair and Maintenance cost
- 8.1.4 Insurance
- 8.1.5 Regulatory fee
- 8.1.6 Sustainability charge
- 8.1.7 Other Operating costs
- 8.1.8 Other income

#### 8.1.1 Salaries, Wages and Fringe Benefits cost

The salary and wages expense include basic pay, ad-hoc allowance, cash medical allowance, conveyance allowance, dual charge allowance, entertainment allowance, deputation allowance, group life insurance, house rent allowance, job allowance, livery allowance, local compensatory allowance, special pay, other allowance, overtime, off day wages, qualification pay, shift allowance to the employees of the Company etc. This includes education and training, sports and recreational benefits, EOBI, social security charges, pension charges and free electricity etc. The estimate for the FY 2014-15 is Rs.2,355 Million. This translates into Rs. 133.2675 per kW/Month.



The Breakup of Salaries wages and benefits has been tabulated below:

Description	PKR
<b>Basic Pay:</b>	
Annual Pay	695,986,766
Personal pay	752,760
Annual Increment	29,247,720
<b>Total Annual Basic Pay</b>	<b>725,987,246</b>
<b>Allowances:</b>	
House Rent Allow.	72,992,840
Cash Medical	2,320,800
Muzaffargarh Allow	3,271,932
Sr. Post Allow.	45,000
Conveyance	49,588,149
Qualification	129,500
Gen: Allow	77,678,350
Entertainment	130,600
Special Allow:	5,644,794
50% SRA-2010 (Freeze)	196,709,539
15% SRA-2011 (Freeze)	59,390,316
20% SRA-2012	100,567,903
10% SRA-2013	56,003,319
10% SRA-2014	56,003,319
Shift Allow:	5,012,700
G.L.I	397,586
Other Allowance + Company Secretary Fee	10,839,386
<b>Total Allowances</b>	<b>726,726,032</b>
<b>Basic Pay &amp; Allowance</b>	<b>1,452,713,278</b>
<b>Free Medical</b>	<b>26,026,994</b>
<b>Free Electricity</b>	<b>132,528,783</b>
<b>Leave Encashment</b>	<b>174,846,755</b>
<b>Pension Fund</b>	<b>561,807,005</b>
<b>Pensioners of 1999</b>	<b>6,948,376</b>
<b>Total Establishment Cost</b>	<b>2,354,871,191</b>

The total sanctioned strength of NPGCL is given in the table below:

Name of Formation	TPS, Muzaffargarh	GTPS, Faisalabad	SPS, Faisalabad	CTW, Faisalabad	Head Office	Total
No. of Employees	2307	339	548	120	87	3401

#### 8.1.2 Administration Cost

The Administrative costs include power, light, gas and water, communication charges, office supplies, advertising, subscription and periodicals, refreshment & entertainment, traveling expenses,

039  
Chief Executive Officer  
NPGCL (GENCO-III)  
TPS Muzaffargarh

professional fees, consultancy fee and management fee etc. The average costs incurred during the past four years has been taken as the basis to calculate the current estimate, this amounts to Rs. 827 Million and translates into Rs. 46.8158 per kW/Month.

Administrative Expense	FY 2010 - 2011	FY 2011 - 2012	FY 2012 - 2013	FY 2013 - 2014	Average
Communications	2,320,098	3,059,529	3,229,800	3,573,506	3,045,733
Other supplies	2,726,733	4,739,402	5,248,740	5,677,692	4,598,142
Traveling and conveyance	12,093,773	10,658,360	18,511,293	21,413,509	15,669,234
Transportation	54,940,963	57,999,270	63,422,533	71,984,598	62,086,841
Professional fees	9,719,284	4,324,844	4,226,519	2,320,150	5,147,699
Auditors' remuneration	800,000	950,000	1,250,000	1,100,000	1,025,000
Management fee	9,468,000	7,101,000	5,462,725	3,823,911	6,463,909
Advertisement and publicity	55,922,766	78,615,896	18,039,026	10,764,464	40,835,538
Taxes and licenses	11,021,620	12,740	581,160	812,929	3,107,112
Custom duty written off	557,033,903				557,033,903
Custom, excise & shipping charges	71,030,684	138,293,585			104,662,135
Miscellaneous expenses	8,789,008	33,405,808	36,548,466	15,543,846	23,571,782
<b>Total</b>	<b>795,866,832</b>	<b>339,160,434</b>	<b>156,520,262</b>	<b>137,014,605</b>	<b>827,247,028</b>

### 8.1.3 Repair and Maintenance

The Repair and Maintenance estimates include maintenance of civil works of the power house, general plant facility and the colony etc. The annual estimates of such repairs and maintenance is Rs. 269 Million. This translates into the proposed tariff component of Rs. 15.2080 per kW/Month.

### 8.1.4 Insurance

Similarly, the insurance premium is estimated to be Rs. 41.5 Million and the insurance component amounts to Rs.2.345 per kW/Month based on the past four years average as tabulated below:-

Description	FY 2010 - 2011	FY 2011 - 2012	FY 2012 - 2013	FY 2013 - 2014	Average
Actual Insurance	30,510,351	27,124,046	28,670,459	25,566,099	27,967,739

### 8.1.5 Regulatory fee

The regulatory fee includes annual Authority overheads and Generation license fee which is estimated to be Rs. 25 Million. This translates into proposed tariff of Rs 1.4065 per kW/Month.

### 8.1.6 Sustainability Charge

In pursuance with section 3.9 of this Petition, NPGCL seeks Sustainability Charges relating to Piraghaib (Multan) and Shahdra (Sheikhupura) in order to ensure operations of these complexes as switchyard for smooth transmission and distribution of Electricity by NTDC. These charges amount

to Rs. 333 Million per annum which translates into the proposed tariff component of Rs. 18.8389 per kW / Month.

#### 8.1.7 Other Income

Other income of the company consists of interest income and sale of scrap. NGPCL management computed other income on the basis of average four year historical trend for the purpose of this tariff by excluding abnormal income i.e. recovery of interest on advance payments from rental power projects through Supreme Court and Nation Accountability Bureau. Details are given in the table below:

Other Income	FY 2010 - 2011	FY 2011 - 2012	FY 2012 - 2013	FY 2013 - 2014	Average
Sale of scrap	5,746,492	24,665,340	1,411,062	26,428,547	14,562,860
Miscellaneous Income	44,538,019	42,120,608	41,200,080	48,704,618	44,140,831
Total	50,284,511	66,785,948	42,611,142	75,133,165	58,703,692

#### 8.2 Non-Escalable Cost Component of CPP

The Non-Escalable cost contains following sub components:

- 8.2.1 Depreciation
- 8.2.2 Interest Expense
- 8.2.3 Return on Equity

##### 8.2.1 Depreciation

Depreciation is a component which may change as a result of additions or deletions and hence a leveled depreciation charge has been computed to account for the changes in fixed Assets over the tariff period. The depreciation cost is assessed as Rs. 1,070 million, translating into Rs. 60.5789 per kW/Month. Moreover, the management intends to conduct revaluation of operating fixed assets, therefore, a final depreciation claim shall be requested to be adjusted subject to receipt of the final revaluation certificate.

##### 8.2.2 Interest Expense

Interest Expense resulting from Cash development loans from the government and foreign re-lent loans has been taken on the actual Interest payments levelized over the remaining period of these loans. Subsequently, the Interest expense amounts Rs. 29 Million which translates into Rs. 1.6219 per kW/ Month.

##### 8.2.3 Return on Equity

Using the CAPM model, we have calculated the ROE as 15.95% using a historical beta of 0.43, market risk premium of 7% and a risk free rate of 12.94% (10-Year PIB). We have considered the same equity amount as used in the present tariff determination. Consequently, the ROE amounts to Rs. 2,977 Million translating into the tariff component of Rs 168.4957 per kW/Month for FY 2014-15.



## 9 INDEXATIONS

### 9.1 Escalable Cost Component of CPP

The Escalable Cost Component of the Capacity Purchase Price shall be adjusted against variation in the Consumer Price Index (CPI) as per the following formula:

$$EC (Rev) = EC (Ref) * CPI (Rev) / CPI(Ref)$$

Where:

**EC (Rev)** = Revised applicable Escalable Cost Component of the Capacity Purchase Price

**EC (Ref)** = Reference Escalable Cost Component of the Capacity Purchase Price

**CPI (Rev)** = Revised Consumer Price Index

**CPI (Ref)** = Reference Consumer Price Index

### 9.2 Variable O&M Cost Component of Energy Purchase Price

Similarly, the indexation of the variable O&M Cost Component of the EPP will be carried out pursuant to the following formula:

$$\text{Variable O\&M (Rev)} = \text{Variable O\&M (Ref)} * CPI (Rev) / CPI (Ref)$$

Where:

**Variable O&M (Rev)** = Revised applicable Variable O&M Cost Component

**Variable O&M (Ref)** = Reference applicable Variable O&M Cost Component

**CPI (Rev)** = Revised Consumer Price Index

**CPI (Ref)** = Reference Consumer Price Index

### 9.3 Fuel Cost Component(s)

The Fuel Cost Component of the Energy Purchase Price will be adjusted against the variation in the fuel prices as and when revised by the relevant Authority as per the following formula:

$$FCC (Rev) = FCC (Ref) * FP (Rev) / FP(Ref)$$

Where:

**FCC (Rev)** = The applicable Fuel Cost Component as revised in accordance with the revised fuel price.

**FCC (Ref)** = The Fuel Cost Component as indicated in the reference tariff or that adjusted pursuant to the heat rate tests

**FP (Rev)** = The fuel price as notified by the relevant Authority per unit of fuel (residual fuel oil, and natural gas)

**FP (Ref)** = The reference fuel price per unit of fuel (residual fuel oil, and natural gas)

Chief Executive Officer  
NPGCL (GENCO-III)  
TPS Muzaffargarh

F/B

10 RELIEF SOUGHT

The following Revised Tariff is presented for the approval by the Authority on the basis of the above stated facts, circumstances and assumptions for next thirteen years (13) years up to June 30, 2027, subject to indexation/adjustments as tabled below:

Capacity Purchase Price		Proposed Tariff Rs /kW/Month	Indexation
	Net Dependable Capacity	1472.52 MW	
A	Escalable Component		
	Administration & Establishment cost	218.6350	CPI
	Insurance and Regulatory cost	2.9892	CPI
	Other income	(3.3222)	CPI
		218.3020	
B	Non-Escalable Component		
	Depreciation	60.5789	NIL
	Interest cost	1.6219	NIL
	Return on Equity	168.4957	NIL
		230.6966	
	Total Capacity Purchase Price (A+B)	448.9986	
Energy Purchase Price		Rs. kWh	
Blocks	Unit	Fuel	Variable O&M
Block 1	Unit 1	11.0636	0.210
	Unit 2	11.1604	0.204
	Unit 3	10.8202	0.204
Block 2	Unit 4	10.8118	0.143
Block 3	Unit 5	11.5132	0.215
	Unit 6	11.7560	0.218
Block 4	Units 5 – 9*	6.302	0.250
	Units 5 – 8	9.453	
Block 5	Units 1 – 2	13.9831	0.168
Block 6	Units 1 – 4	9.826	0.266

\*Unit 9 is Combined Cycle Plant

11 DETERMINATION SOUGHT

- 11.1 The learned Authority is kindly requested to approve the Company's generation tariff, along-with the pertinent indexations, in accordance with the parameters & assumptions mentioned above. The Petitioner would be pleased to provide any further information, clarification, or explanation that may be required by the Authority during its evaluation process.

043  
  
 Chief Executive Officer  
 NPGCL (GENCO-III)  
 TPS Muzaffargarh



**Northern Power Generation Company Limited**

Thermal Power Station, Mehmood Kot Road, Muzaffargarh, Punjab

Phone: 066-9200171/9200173 Fax: 066-9200172

*Office of the Company Secretary*

**COPY OF THE RESOLUTION PASSED BY THE BOARD OF DIRECTORS OF  
NORTHERN POWER GENERATION COMPANY LIMITED IN THEIR MEETING  
HELD ON 27/02/2015 AT 15:00 HRS. AT WAPDA HOUSE, LAHORE**

"Resolved that the Application for Determination of Revised Tariff be filed by and on behalf of Northern Power Generation Company Limited (the Company) with the National Electrical Power Regulatory Authority (NEPRA)".

"Resolved further that Chief Executive Officer is hereby authorized to sign and file the application of revised tariff petition to NEPRA and pay tariff filing fee as per current applicable notified rates by NEPRA".

"Resolved further that Chief Executive Officer is authorized to provide any information required by NEPRA from time to time during the course of tariff determination".

"Resolved further that Chief Executive Officer is allowed to nominate any Engineer(s), Officer(s) and/or Consultant(s) who may accompany and assist him during the hearing process in NEPRA.

Muhammad Shoaib Rasheed  
Chief Executive Officer

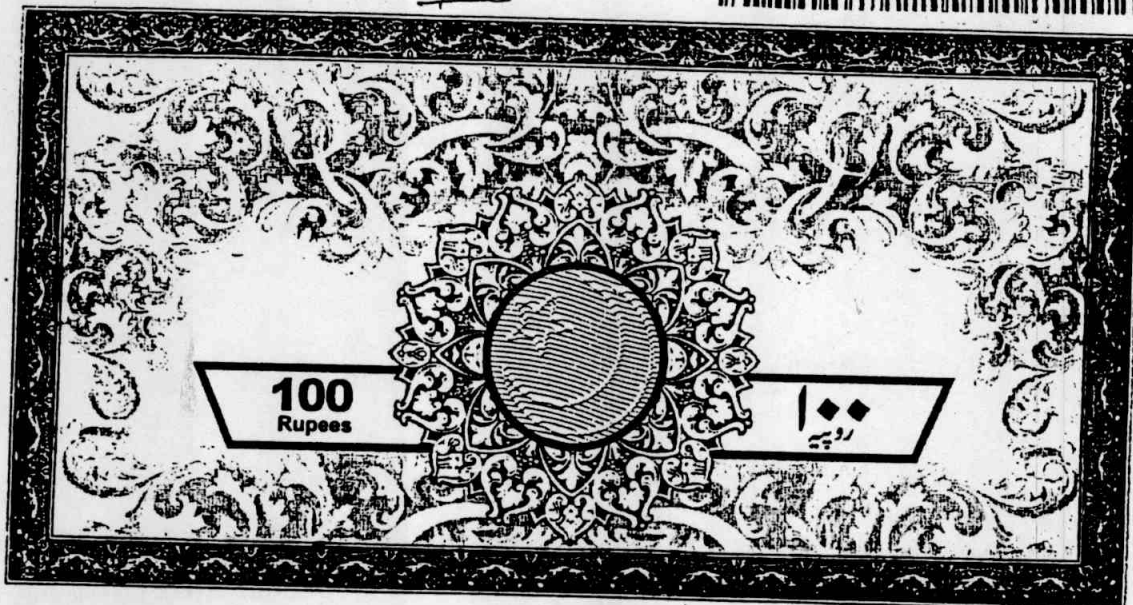
Specimen Signature

Certified True Copy

Company Secretary

Company Seal





## AFFIDAVIT

BEFORE THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY

I, Muhammad Shoaib Rasheed, Chief Executive Officer, Northern Power Generation Company Limited (Generation Licensee # GL/03/2002) being duly authorized representative / attorney of Northern Power Generation Company Limited, hereby solemnly affirm and declare that the contents of the accompanying Petition / application No. CEO/FD/NPGCL/TRF-46/1073 dated 04.03.2015 including all supporting documents are true and correct to the best of my knowledge and belief and that nothing has been concealed. I also affirm that all further documentation and information to be provided by me in connection with the accompanying petition shall be true to the best of my knowledge and belief.

DEPONENT

(Muhammad Shoaib Rasheed)  
Chief Executive Officer

Verified on oath this 4<sup>th</sup> Day of March 2015 that the contents hereof are true and correct to the best of my knowledge and belief and nothing has been concealed.

DEPONENT

(Muhammad Shoaib Rasheed)  
Chief Executive Officer

ATTESTED

Mukhtar Ahmad Khan Sohrani  
Advocate/Commissioner  
Distt Courts M.Garh