

**MCDRO P COMP 1\ PVT.) LTD.**  
**Electricity Generation Using Wind As Fuel**

Registrar  
NEPRA  
NEPRA House,  
Attartuk Avenue, G-5/1,  
Islamabad.

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SA (Tech) - SAT-I  
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Date: 25<sup>th</sup> February, 2019

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Subject: **TARIFF APPLICATION (COST PLUS BASIS)**

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**t**ference to above subject, please find attached tariff application along with required documents as follows.

1. LOI (Annexure-I)
2. Feasibility Approval (Annexure-II)
3. IEE approval (Annexure-III)
4. Grid Study Approval (Annexure-IV)
5. GL & GL Modification Application (Annexure-V)
6. PAR Approval (Annexure-VI)
7. Lenders Term Sheet (Annexure-VII)
8. Wind Power Assessment (Annexure-VIII)
9. EPC Contracts Executed (Annexure-IX)
10. Independent Consultant Evaluation report Selection as per NEPRA guidelines for selection of EPC Contractor 2017. (Annexure-X)
11. Board Resolution (Annexure-XI)
12. Tariff Application Fee/Bank Draft in favor of Registrar NEPRA (Annexure-XII)
13. OEM Equipment Certificate Letter. (Annexure-XIII)
14. OEM Equipment Quality Certificate letter. (Annexure-XIV)
15. New Equipment Undertaking by Project Company. (Annexure-XV)
16. Affidavit / Power Attorney. (Annexure-XVI)

Regards

**MUSTAFA ABDULLAH**

CEO

Moro Power Company (Pvt.) Ltd.

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1963  
25-03-19

**BEFORE**  
**THE NATIONAL ELECTRIC POWER REGULATORY**  
**AUTHORITY**

TARIFF PETITION FOR **REFERENCE TARIFF**

FOR

**IV** **MORO POWER CO PANY (PRIVATE) LIMITED**

**25MW WIND POWER PROJECT**

MORO POWER HEAD OFFICE- 4C, M-1, ITTEHAD LANE 12,  
PHASE-2 EXT., DHA KARACHI.

04March 2019

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# Section 1. PETITIONER'S INFORMATION

## 1.1 Name of Petitioner

**Name:** Moro Power Company (Private) Limited ("MPCL", the "Project Company" or the "Petitioner").

**Address:** Moro Power Head Office- 4c, M-1, Ittehad Lane 12, Phase-2 Ext., DHA Karachi.

**Email:** [oemsindh@gmail.com](mailto:oemsindh@gmail.com) , [mustafa\(@moropowercompany.com](mailto:mustafa(@moropowercompany.com)

**Company Registration No:** 0091537

## 1.2 Project Sponsors

Moro Power Company (Pvt) Ltd	Sponsor
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## 1.3 Representative of the Petitioner

Mr. Mustafa Abdullah	Chief Executive Officer
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## 1.4 Project Advisors

Shafqat Raza	Financial Advisor
Global Environment Management Service	Technical Advisor
Munib Ahmed Khan & Company	Legal Counsel
<ul style="list-style-type: none"><li>• Global Environment Management</li><li>• The Energy Grid, UK</li><li>• Power Planners International</li><li>• Soil Testing services</li><li>• PACE</li><li>• RCE</li></ul>	Environmental Technical Grid Geotechnical Topographic Transport Studies

## **Section 2.**      GROUNDS FOR THE PETITION

### **2.1 Basis for Petition**

This Petition is made to the National Electric Power Regulatory Authority ("NEPRA") under the Regulation of Generation, Transmission and Distribution of Electric Power Act (XL of) 1997 (the "NEPRA Act") and the Tariff Standards and Procedure Rules, 1998 (the "NEPRA Rules") made under the NEPRA Act; and other applicable laws.

Under the NEPRA Act, the Authority is responsible for determining tariffs, rates and other terms and conditions for the supply of electric power services by the generation, transmission and distribution companies and recommending them to the Federal Government for notification. NEPRA is also responsible for determining the process and procedures for reviewing and approving tariffs and tariff adjustments.

### **2.2 About the Petitioner—MPCL**

MPCL is a private limited company registered under the Companies Ordinance, 1984. MPCL is in the process of developing a 25MW wind power project to be located at Jhimpir District Thatta, Sindh. The project site lies within the Gharo-Jhimpir wind corridor. The Project is to be developed under the "Policy for Development of Renewable Energy Projects 2006" (the "RE Policy") issued by the Government of Pakistan.

### **2.3 Process Leading to Tariff Petition**

MPCL obtained the Letter of Intent (L01) from Energy Department, Govt of Sindh (EDGOS) on 01 March 2016 (**Annexure 1**) for the wind power project, having capacity of 25MW (the "Project"). The land for the Project has been allocated by Govt of Sindh for developing the project.

- a) The feasibility study of the Project was submitted to EDGOS for Panel Of Expert (POE) approval on 15 November' 2018. POE meeting was held at EDGOS HQ, Karachi on 25-02-2019. Due to lack of quorum panel of expert meeting, approval decision was postponed to next meeting to be held in 1st week of March' 2019 (**Annexure 2**).

- b) Initial Environmental Examination (IEE) Report was submitted to Sindh Environmental Protection Agency (SEPA) on 15-10-2015. SEPA approved the IEE of the Project on 28-11-2016 (**Annexure 3**).
- c) Grid Interconnection Study (GIS) of the Project was conducted by M/s Power Planners International and submitted to NTDC by the Project for approval on 24-09-18 (**Annexure 4**). GIS was approved by NTDC on 25-09-18. Power Evacuation pending CCOE GOP decision (**Annexure 4-A**).
- d) Generation License (GL) application was submitted to NEPRA on 15-08-2018. NEPRA issued requisite public notice for grant of generation license to the Project on 28<sup>th</sup> September 2018 (**Annexure 5, 5a, & 5b**).
- e) In light of evaluation of the 3<sup>rd</sup> party evaluation of EPC Selection process and selecting a better efficiency European make technology, MPCL filed the Licensee Proposed Modification (LPM) for GL with the Authority on 04 March 2019 (**Annexure 5c**).
- f) Request for issuance of Consent of Power Acquisition Request (PAR) has been made to CPPA (G) is pending subject to CCOE decision of GOP. (**Annexure 6**).
- g) Project debt funding (70% of the project cost) has been arranged from foreign sources (**Annexure 7 & 7a**). Sponsor's equity shall finance the remaining 30% of the project cost.
- h) The Wind Resource Assessment of the selected WTG has been performed and resulting Annual Energy Production number has been taken for tariff calculation (**Annexure 8**).
- i) EPC and O&M Contracts for the Project have been executed on xxx February 2019 (**Annexure 9**).

All requisite information required by NEPRA for processing the Tariff Petition has been annexed herewith; MPCL will be pleased to submit any further information as and when required by NEPRA in connection with the determination.

**Accordingly, it is submitted that the requirements of the regulatory process for applying to NEPRA for the tariff determination of MPCL's 25 MW power generation facility to be located at Jhimpir District Thatta, Sindh have been completed.**

#### **2.4 Request for Tariff Determination - Submission**

In accordance with the requirements of the NEPRA Act, NEPRA Rules and the Policy for Development of Renewable Energy Project 2006 (RE Policy 2006), Petitioner hereby submits this Petition for determination/approval of the Reference Tariff (Negotiated Tariff under Cost-Plus regime) along with adjustments, pass-through items, indexation mechanisms and other terms and conditions for supply of electric power service to CPPA (G) (the "Power Purchaser") from the Project.

Pursuant to the relevant provisions of the NEPRA Act, NEPRA Rules, the RE Policy 2006, MPCL submits herewith before NEPRA, this Petition for approval of (i) the Reference Generation Tariff (Negotiated Tariff under Cost-Plus regime); (ii) the energy production estimates; (iii) the Indexations, Adjustments and Escalations; (iv) Adjustments at Commercial Operations Date (COD) and (v) other matters set out in this Tariff Petition, in each case, for the Project Company's power generation Project to be located at Jhimpir District Thatta, Sindh.

NEPRA (the Authority) is requested to process the Petition at the earliest, thereby enabling the Project Company to proceed further with the development and construction process of the Project.

## Section 3. EXECUTIVE SUMMARY

Project Company	Moro Power Company (Private) Limited		
Sponsors	Mr. Mustafa Abdullah		
Gross Capacity	25MW		
Auxiliary Consumption	-0.375 MW (1.5%)		
Net Capacity	24.625 MW		
Project Location	Jhimpir, District Thatta, Province of Sindh, Pakistan		
Area	240 acres		
Power Purchaser	Central Power Purchasing Agency (Guarantee) Limited		
Wind Turbine Generators	Nordex-Acciona Wind PowerAW125 /3MW Platform		
Annual Energy	84,534,000KWh		
Capacity Factor	38.6%		
Construction Period	18 months		
Concession Period	25 Years		
Project Basis	BOO		
Project Cost	Description		US \$
	EPC Cost		31,100,000
	L/C Confirmation Charges		338,990
	Total EPC Cost		31,438,990
	Project Development Cost		2,800,000
	Duties and Taxes		Pass Through
	Insurance during Construction		155,500
	Financial Fee and Charges		601,904
	Sinosure		2,714,130
	Interest during Construction		1,232,093
Project Financing	Total Project Cost		38,942,617
	Description	Percentage	US \$
	Equity	30%	11 682,785
	Debt	70%	27,259,832
	Total Financing	100%	38,942,617



Tariff Petition  
Moro Power Company (Private) Limited

<b>Financing Terms</b>	Description		Terms	
	Loan Term		Commercial Facility: 15 years	
	Repayment		Bi-Annual Installments	
	L/C Charges		1.09% of EPC Cost	
	Mark-up rate		Commercial facility 6-M LIBOR (2.7%) + Margin (4.5%)	
	Sinosure		6.55% of the debt servicing (loan facility including interest)	
Operational Phase Cost	Description		Year 1-10	Year 11-25
			Million US \$ Million US \$	
	Operations	O & M	1,469,364	1,469,364
	Cost	Insurance	124,400	124,400
	<b>Total</b>		<b>1,593,764</b>	<b>1,593,764</b>
<b>Levelized Tariff</b>	<b>US\$ 6.5578/kWh (100% Foreign Financing)</b>			
<b>Exchange Rate</b>	1 US\$ = PKR 120			
<b>Financial Advisor</b>	Shafqat Raza			
<b>Technical Advisor</b>	Global Environment Management Service			
<b>Legal Counsel</b>	Munib Ahmed Khan & Company			
<b>Summary of EPC Selection Process</b>	<p>Project Company carried out a comprehensive competitive bidding process for selection of EPC contractor for the Project. For this purpose an Invitation to Bid (ITB) was issued to following WTG manufacturers &amp; renowned EPC Wind contractors on 03 August' 2018.</p> <ol style="list-style-type: none"> <li>M/s Power China/ Gamesa Corporacion Tecnologica,</li> <li>M/s Orient Energy/ Gamesa Corporacion Tecnologica,</li> <li>M/s Power China/ Ming Yang</li> <li>M/s TBEA/ Nordex-Acciona</li> <li>M/s CEDC-China Engineering Corp.</li> <li>M/s CNYD-Shenyang Yaunda Tech. &amp; Electric Corn. Ltd.</li> <li>M/s Sany Group of Companies-China.</li> <li>M/s Dong Fang Electric Company</li> <li>M/s Xinjiang Goldwind Science &amp; Technology Co., Ltd.</li> <li>Power China Nuclear Engineering Company-China</li> </ol> <p>Bidders were given the option to participate as lead EPC contractor or to bring in reputed EPC contractors for execution of contracts. Last date for submission of bids was 23 October 2018. All bidders submitted their bids within the period for bid submission.</p>			

	<p>Two (02) envelope bidding procedure was adopted, whereby technical and financial bids were submitted in two separate envelopes. Technical bids were evaluated as per pre-defined criteria and bidders qualifying technical evaluation were eligible for financial evaluation.</p> <p>Based on combined technical and financial evaluation scores, M/s TBEA Xinjiang Sun Oasis Co. Ltd with M/s Nordex Acciona Wind Power, Germany was declared as the Preferred Bidder, EPC terms negotiations with the Preferred Bidder commenced from 03 December' 2018, and accordingly EPC Contract was executed with the Preferred Bidder on 15 February' 2019.</p> <p>In the ongoing process M/s Aleph Systems (SMC-PVT) Ltd was appointed as Independent Consultant, after a transparent and competitive bidding process for selection of Independent Consultant, for evaluation and selection of EPC Contractor. The independent Consultant evaluated and selected the EPC Contractor in accordance with the NEPRA Selection of Engineering, Procurement and Construction Contractor by Independent Power Producers Guidelines 2017 dated <b>19 May 2017</b> for selection of EPC Contractor.</p>
Concession Documents	<ul style="list-style-type: none"> <li>■ Energy Purchase Agreement</li> <li>■ Implementation Agreement</li> <li>■ <u>Government of Pakistan Guarantee</u></li> </ul>
Applicable Policy	<u>RE Policy 2006</u>
Major Tasks Completed	<ul style="list-style-type: none"> <li>■ Letter of Intent</li> <li>■ Land Allotted</li> <li>■ Topographical Study</li> <li>• Transportation Study</li> <li>■ Geo-technical Study</li> <li>■ Wind Resource Assessment Study</li> <li>■ Feasibility Study</li> <li>• Grid Interconnection Study</li> <li>■ Initial Environment Assessment</li> <li>■ EPC and O&amp;M Agreements</li> <li>■ Term sheet from Project Lenders</li> </ul>

## **Section 4. THE PROJECT**

### **4.1 Pakistan's Current Electric Power Shortage**

Pakistan Installed power generation capacity as of 30th June, 2017 stands at 28,399 MW of which 26,186 MW is connected with NTDC system whereas 2,213 MW is connected with K-Electric Limited (KEL) system. Conventional thermal plants (oil, natural gas, coal) account for 62.87%, with hydroelectricity making up 27.17%, nuclear 4.36% and Renewable Energy (Wind, Solar & Bagasse) 5.59% of Pakistan's capacity.

Pakistan's huge energy crisis is jeopardizing its economic progress and social development. The major reasons for the energy crisis are the lack of investment in power sector in the past, non-development of renewable energy sector i.e. hydel, wind and solar etc. and the depleting oil and gas reserves. It is imperative for Pakistan to look for indigenous/inexpensive energy resources such as renewable energy (Wind energy) for sustainable growth through self-reliance.

Pakistan has been facing severe power shortage for the last few years and inclusion of renewable energy in the electrical power system is the optimum solution. Renewable energy is the cheapest form for energy with no environmental impacts. Pakistan has abundant renewable energy resources which should be harnessed to provide affordable electric energy to its people.

### **4.2 Wind Power Projects — A Natural Choice**

To ensure a sustainable energy future for Pakistan, it is necessary that the energy sector be accorded a high priority. It is considered that wind power generation could become a significant contributor to Pakistan's electricity supply in the near future. The development of wind generation projects supports the environmental objectives of the Government of Pakistan by:

- (a) reducing dependence on fossil fuels for thermal power generation;
- (b) increasing diversity in Pakistan's electricity generation mix;
- (c) reducing greenhouse gas emissions through avoidance of thermal power generation; and
- (d) helping in reduction of the exorbitant trade deficit.

Pakistan has a huge wind potential which can be effectively and efficiently utilized for the economical generation of Power. The coastal belt of Pakistan is blessed with a wind corridor that is 60 km wide (Gharo-Kati Bandar) and 180 km long (up to Hyderabad). This corridor has potential of 50,000 MW of electricity generation through wind energy that is ready to be exploited. Currently 23 wind energy projects having a combined capacity of 1234 MW are operational.

#### **4.3 About the Sponsors — Mr. Mustafa Abdullah**

The Sponsor of MPCL 25 MW Wind Power Project is Mr. Mustafa Abdullah. The Company was founded by Mr. Mustafa Abdullah, who has Master's degree from UK and has 35 years of experience in energy business in USA, Middle East and Pakistan. He has in his team reputable consultants including:

1. Muneeb Ahmed Khan ---- Corporate and Legal.
2. Shafqat Raza --- Finance & Accounts.
3. Global Environment Management Services (GEMS) ---Environmental.
4. The Energy Grid, UK --- Technical.
5. Power Planners International ---- Grid.
6. Soil Testing services ---- Geotechnical
7. PACE ---- Topographic.
8. RCE - - Transport Studies.

#### **4.4 About the Project**

The 25MW (gross) Wind Project will be located at Jhimpir, District Thatta, Province of Sindh. The development of the Project is being undertaken, on a Build-Own and Operate (BOO) basis, by MPCL, which is owned 100% by Mr. Mustafa Abdullah. The Project is being implemented on fast track basis.

An efficient and dynamic team of professionals has been engaged to assist in the implementation of the Project. Mr. Shafqat Raza has been appointed as Financial/Transaction Advisor; Global Environment Management Services (GEMS) has been selected as Technical Advisor for advice on all technical matters while Mr. Muneeb Ahmed Khan has been appointed as Legal Counsel.

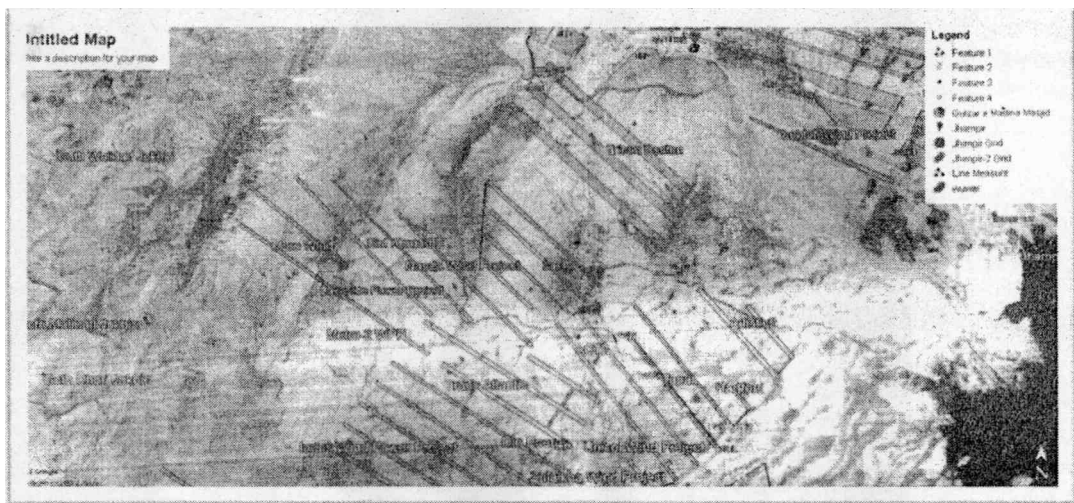
#### **4.5 Project Location**

The site for the implementation of the project has been selected considering (i) location in the wind corridor, (ii) wind conditions at the site, (iii) topographic conditions, (iv) site accessibility, and (v) location of the grid with reference to the site for interconnection.

The site is located within the Gharo-Jhimpirwind corridor identified by EDGOS and the land is allocated to the project sponsors. The site land, 240 acres, is located in Jhimpir, District Thatta, Sindh, which is one of the most promising and suitable area for installing commercially viable wind power projects.

The site is located at Jhimpir, District Thatta, Sindh, approximately 130 km East of Karachi. The National Highway and Superhighway are the major connecting roads to the Project site. The overview of the project site is shown in Figure below:

Map location picture of site



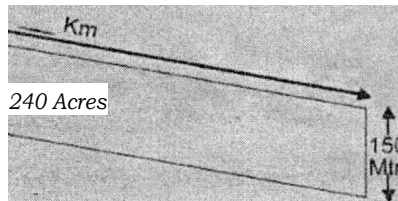
The Project site is exposed to strong south west winds; of the area suggests that 80% wind blows from the south west direction. The terrain of the area is flat with small change in altitude. The proposed site lies under roughness class 1.5 as there is low vegetation. The site is easily accessible through metalled and unmetalled roads. The ground is hard and rocky; the subsurface soil also includes clay and silt.

The coordinates of Wind farm are given in Table below:

	<b>Latitude</b>	<b>Longitude</b>
1	25°2'24.40"N	67° 39' 26.623"E
2	25°2'20.527"N	67° 39' 23.37"E
3	25°0'5.19"N	67° 42' 27.69"E
4	25°0' 9.31"N	67° 42' 30.25"E

## MPCL WIND POWER PROJECT LAND CORDINATES

Borottlaly	Latitude	Longitude
M1	25 2' 24.40" N	6 39' 26.623" E
M2	25 2' 20.52" N	6 39' 23.3" E
M3	25 2' 0' 5.19" N	6 42' 2.69" E
M4	25 2' 0' 9.31" N	6 40' 30.25" E



### 4.6 Annual Energy Production

Annual Energy Production of 84,534,000kWh has been estimated for the project. The table below shows key details relating to power generation from the project.

Total Installed Gross ISO Capacity of the Generation Facility	251V1V
Annual Energy Generation (25-year equivalent Net AEP)	84,534,000kWh
Net Capacity Factor	38.6%

## Section 5. EPC - PROCESS & SELECTION

### 5.1 EPC Bidding

For the purposes of obtaining the most competitive price, the Project Company on 3 August invited WTG Manufacturers having presence in Pakistan to participate in the bidding process for selection of EPC Contractor(s) to execute the contract on turnkey basis as lead EPC Contractor. A Pre-bid meeting for all the invited parties was held on 23 August 2018. MPCL gave its acceptability to allow the bidding parties to participate in the process and submit bid either as a lead EPC contractor or to bring in/partner with a reputable EPC contractor (as lead) for execution of the contracts. The main condition from MPCL for acceptance of this option was that the OEM shall be either an EPC consortium partner or a sub-contractor to the lead EPC contractor for the works related to WTG supply, erection, commissioning and O&M.

On 23 October 2018, after a competitive and comprehensive bidding process, bid submitted by M/s TBEA Xinjiang Sun Oasis Co., Ltd with M/s Nordex Acciona Wind Power, Germany for their WTG model AW125/ 3MW platform turbines was selected as the 1st preferred bid. Thereafter, MPCL according to the practice in Pakistan negotiated the Techno-Commercial terms for Engineering and Construction Contract and Equipment Supply Contract with M/s TBEA Xinjiang Sun Oasis Co., Ltd with M/s Nordex Acciona Wind Power, Germany and executed the EPC Contract on 26th January, 2019. The bidding process adopted by the Project Company is discussed in the following sub-sections.

#### 5.1.1 EPC Bidding Timelines

In order to encourage potential contractors to participate in the EPC bidding process, the Project Company conducted a comprehensive EPC bidding process in line with international best practices. The timelines followed by the Project Company are provided below:

Activity	Date
Circulation of RFP/tender documents for bidding	03 August 2018
Pre-bid meeting with potential bidders	23 August 2018
Clarifications and issuance of addendum to potential bidders for extension of Bid Submission Date	01 October 2018

Submission of bids	23 October 2018
Hiring of consultant for independent EPC evaluation and selection process.	05 November 2019
Clarification on bids and adjustments for uniformity with RFP requirement.	08 November 2018 to 14 December 2018
Final Evaluation of bids	27 December 2018
Identification of preferred bidder	07 January 2019
EPC Contract Term Sheet negotiations	10 to 25 January 2018
Execution of EPC Contract with preferred bidder	26th January, 2019

### 5.1.2 EPC Evaluation Process

To make the whole selection process competitive, efficient, effective and productive, the Project Company prepared a detailed and well drafted Request For Proposal (RFP) for soliciting EPC proposals. RFP was sent to following Wind Turbine Manufacturers:-

1. M/s Power China/ Gamesa Corporacion Tecnologica,
2. M/s Orient Energy/ Gamesa Corporacion Tecnologica,
3. M/s Power China/ Ming Yang
4. M/s TBEA/ Nordex-Acciona
5. M/s CEDC-China Engineering Corp.
6. M/s CNYD-Shenyang Yaunda Tech. & Electric Corn. Ltd.
7. M/s Sany Group of Companies-China.
8. M/s DongFang Electric Company
9. M/s Xinjiang Goldwind Science & Technology Co., Ltd.
10. Power China Nuclear Engineering Company-China

The Project Company adopted the two-envelope bidding procedure and all the Bidders submitted their detailed proposals in two sealed envelopes, i.e. Technical and Financial Proposal. A Pre-bid meeting was held on 23 August 2018.

The evaluation process involved technical and financial evaluation. The Project Company along with its Consultants thoroughly evaluated the Technical Proposals. Bids were evaluated based on detailed criteria bifurcated in various categories and sub-categories covering all the technical aspects and marks were allocated against each criteria accordingly. The criteria for a bidder to qualify for financial proposal evaluation was to score a minimum of 70% (out of 100%) of the total score allocated to technical proposal. Resultantly, the Project Company reviewed the financial bid proposals of the qualified bidders (covering multiple aspects including implications of the technical, commercial and financial offerings on the project, monetary impact of the Bidders submitted deviations RFP requirements and the EPC and O&M strategy being followed by the bidder). After completing the technical and financial evaluation, MPCL selected M/s TBEA Xinjiang Sun Oasis Co., Ltd with M/s Nordex Acciona Wind Power, Germany.



The EPC and O&M Contracts were discussed and negotiated with the selected bidder from 05 January 2019 to 20 January 2019.

The Project Company allowed in the bid documents that each bidder could put forward its own project layout and main building design based on the project topography, geology, and other essential information combined with site visits, instead of strictly limiting the bidders to adopt the one proposed in the project company's feasibility study. This ensured the most optimized and cost effective technical scheme without compromising on the quality of the service to be provided by the bidder.

Furthermore, Aleph systems (SMC-PVT) Ltd was engaged by MPCL on 05 November 2018 as "Independent Consultant" to carry out independent evaluation and selection of EPC Contractor. Independent Consultant carried out a comprehensive evaluation of the bids. The evaluation was properly and thoroughly documented; all the Bidders were given a level playing field; entire selection process was transparent; and in accordance with the international best practices, which also encompass the NEPRA Guidelines.

For details on marking criteria, Technical and Financial bid evaluation and selection of EPC Contractor, please see attached Independent Consultant report (Annex- 5c).

## **5.2 EPC Contractual Arrangement**

MPCL on 26 January 2019 entered into the EPC and O&M Contract(s) with the selected EPC Contractor, which comprised of two (2) separate contracts in accordance with practice in Pakistan, namely:

- a) The Engineering and Construction Contract (the "Onshore Contract");
- b) The Equipment Supply Contract (the "Offshore Contract");
- c) O&M Contract.

Distribution of responsibilities between the contracts is briefly described below:-

- i The Onshore Contract is signed with M/s TBEA XINTE Energy (Pvt) Limited, which includes design, engineering, construction, erection, testing, commissioning and all other works for completion of the Project inside Pakistan.
- ii. The Offshore Contract is signed with TBEA Xinjiang Sunoasis Co., Ltd, which includes but not limited to supplying imported equipment and materials for the Project. All equipment supplied under the Offshore Contract will be warranted by the Offshore Contractor.

The O&M Contract is signed with M/s TBEA XINTE Energy (Pvt) Limited for O&M services. Nordex Pakistan Private Limited (NPPL) will be the sub-contractor to M/s TBEA XINTE Energy (Pvt) Limited for O&M works and services related to WTG operations.

EPC contract provides a lump-sum price, as provided in the below table:

<b>Description</b>	<b>Amount (US \$ Million)</b>
Equipment Supply Contract	23 341909
Construction Contract	7.75809
<b>Total Contract Price</b>	<b>31.100</b>

### **5.3 The EPC Contractor—Nordex-Acciona/TBEA**

With the acquisition of M/s Acciona Wind Power of Spain by NordexSE, Germany, the new entity, M/s Nordex-Acciona holds more than 30 years of experience in designing, constructing and operating wind turbines, delivering more than 21 GW of sustainable energy worldwide. M/s Nordex-Acciona shall install 2x AW125/3MW and 6x AW125/3.15MW 87.5m tower height WTGs for the Project. These turbines are the member of Nordex-Acciona multi-megawatt wind turbine platform which are type certified for IEC class IIb sites AW125/3MW and AW125/3.15MW belong to the platform of which more than 6000 MW have been installed globally.

TBEA Xinjiang Sunoasis Co., Ltd. (TBEA Sunoasis Co., Ltd.), founded in 2000, is the world leading green and smart energy service provider with business in more than 20 countries and areas all over the world to devote to the sustainable development of human society with the drive of smart, efficient and green energy. The company focuses on PV, wind power, power electronics, energy Internet and other fields to provide clients with integrated solution including clean energy project development, investment financing, design, construction, debugging and O&M to build the company into a global excellent green and smart energy service provider. TBEA Xinjiang Sun Oasis Co., Ltd. tops the lists of global wind power/PV EPC and other fields, and ranks No. 32 in The Clean 200 List 2017.

The Company actively practices the national strategy of "the Belt and Road initiative" and is devoted to sharing the advanced electricity construction experience of China with the world. The Company has provided green technology and smart environment-friendly, stable and efficient energy equipment to more than 60 countries, including the United States, Russia, Brazil, Mongolia, Tajikistan, Kyrgyzstan, Pakistan, etc. and supplied the turnkey project and systematic solutions from survey to design, construction, installation and debugging and to training, operation and maintenance to promote the construction of green and efficient power supply and grid, benefit

the people of various countries and promoted the economic development of local areas.

In Pakistan, TBEA first commissioned project as Lead EPC is the 100 MW Quaid-e-Azam solar project. TBEA is also the EPC contractor for the 500Kv sub-station project being constructed in Yamishier area of Pakistan. In china alone, TBEA has been the EPC contractor for more than 1300MW wind/solar projects.

## Section 6. PROJECT COST

The Project Cost is based on the firm EPC Contract comprising of the Offshore Contract and the Onshore Contract. The reference exchange rate used to convert the PKR denominated costs into United States Dollars is US \$ 1 = PKR 120.

A summary of the Project Cost is given below:

<b>Project Cost Items</b>	<b>US \$ Million</b>
EPC Cost	31,100,000
L/C Confirmation Charges	338,990
<b>Total EPC Cost</b>	<b>31,438,990</b>
Project Development Cost	2,800,000
Duties and Taxes	Pass Through
Insurance during Construction	155,500
Financial Fee and Charges	601,904
Sinosure	2,714,130
Interest during Construction	1,232,093
<b>Total Project Cost</b>	<b>38,942,617</b>

### 6.1 EPC Cost

As elaborated in Section 5.2, the scope of work to be carried out by the EPC contractor has been split into two parts, namely, onshore works and offshore works; where offshore works primarily relate to procurement and supply of electrical and mechanical equipment outside Pakistan and onshore works comprise of civil works, erection, commissioning, testing, etc.

The EPC cost for the project is US \$ 31.1 Million. The estimated L/C Confirmation Charges are USD 338,990. The total EPC price is therefore USD 31.438990 Million. As identified above, MPCL adopted an effective and efficient bidding process for procuring the services of EPC Contractor at the most competitive prices. Bidding process allows each bidder to submit its own project layout and design, based on the project topography, geology, and other basic information combined with site visits, so as to provide the

most optimized and effective technical scheme for construction and implementation of the project. The bidders submitted different technical schemes and the most robust and cost effective solution was selected through the bidding process. MPCL believes that the price as contracted with the EPC Contractor is reasonable under the prevailing market conditions.

## **6.2 Project Development Cost**

This head includes the cost for development of Project and includes all costs, fees and expenses incurred or to be incurred for such purpose. A total of US\$ 2.8 million has been estimated under this head. These costs include costs of:

- Feasibility study costs including cost for Topographical survey of land, Geological and geotechnical study, Project layout study, design study, and electrical study; and Transportation study etc.
- Costs related to the performance guarantee to be furnished to EDGOS
- Costs related to the Power Purchaser letter of credit to be furnished to the Power Purchaser pursuant to the provisions of the EPA
- Various regulatory fees to be paid to NEPRA
- Costs incurred during Project Company formation
- Project Company staff salaries, allowances and other benefits, development and running expenses during construction period
- Travelling costs of Project Company staff
- Cost of security arrangement for the Project
- Costs relating to various permits for the Project
- Costs relating to Project advisors, including cost of Local and Foreign Financial Advisors, Insurance Advisor, Audit and Tax Advisors, Security Advisors, Carbon Credit Advisors, etc
- NTDC/EPA related Factory Acceptance Tests (FATs)

MPCL has requested that Project Development Cost of USD 2.8M be allowed.

## **6.3 Duties and Taxes**

Taxes and Customs Duty have been considered as pass-through by the Project Company in accordance with the Power Policy, 2002 as follows:

- a) Custom Duty & Sales Tax @ 5.00% (Five Percent) has been assumed on import of machinery, equipment, goods, spares and materials for the Project, in accordance with the Policy. In case a higher rate of Custom Duty is levied the same shall be charged and adjusted as per actual at COD.

- b) Advance Income Tax @ 6.00% (Six Percent) has been assumed at the time of import of machinery, equipment, goods, spares and materials for the Project.
- c) Sindh Infrastructure Development Surcharge @ 0.95% (zero Point Nine Five) of the imports for the Project has been assumed. The chargeability of Sindh Infrastructure Development Surcharge (the SIDS) is based on (i) the weight of the imported equipment / items, (ii) the distance of the Site from the port and (iii) use of equipment in Sindh.

In case there is any change in any taxes or duties above, or additional taxes, fees, excise duty, levies etc. are imposed, the same shall be treated as pass through item and the EPC/Project cost and the Reference Tariff will be adjusted accordingly.

#### **6.4 Insurance during Construction**

Insurance during Construction cost covers the insurance cost of the Project's assets during the construction period. These cost estimates i.e. 0.5% of the EPC cost plus custom duties have been developed based on the most recent tariff determinations issued by NEPRA for other windpower projects. Authority is hereby requested to allow Insurance During Construction at 0.5 % of EPC cost plus custom duties, as is allowed in case of other wind power projects.

The Project, in view of the practices set by other IPPs in Pakistan and in accordance with the requirements typically set out by the Lenders funding the Project, intends to procure the following insurances during the construction phase of the Project:

- (a) Construction All Risk Insurances (CAR);
- (b) CAR Delay in Start-up Insurance;
- (c) Terrorism Insurance;
- (d) Marine and Inland Transit Insurance;
- (e) Marine - Delay-In Startup Insurances; and
- (f) Comprehensive General Liability.

#### **6.5 Financial Fees and Charges**

Financial Fee & Charges include costs related to Debt Financing of the project. Such costs include fees and charges related to lenders up-front fee, lenders advisors & agents charges, commitment fee, management fee, charges related to various letters of credit to be established in favor of various contracting parties, fees payable and stamp duty applicable on the financing documents, agency fee, security trustee fee, commitment fee and other financing fees cost and charges.

The financial charges requested as part of the Project Cost i.e. 2.5% of the debt arranged, are based on discussions held with the financial institutions and their experience regarding costs incurred on projects of such stature.

Keeping in view the deteriorating country risk profile of the country, long gestation period of the project and prevailing circular debt issue, higher financing cost is required to be incurred for obtaining financing for the project.

#### **6.6 Interest during Construction**

The Interest during Construction ("IDC") has been calculated on the basis of 15 months construction period at US \$ 1.232093Million on the terms offered by financial institutions and banks to the Project at 6-month LIBOR (2.7%)plus a spread of 4.5%.Actual IDC, however, shall be subject to change depending on the fluctuations in base rate, funding requirement (draw-downs) of the Project during the construction period, changes in Project Cost including changes due to Taxes and Duties, and variations in PKR I USD exchange rate. Construction period assumed for IDC calculation is 15 months, which is in line with the construction period agreed with the EPC Contractors.

## Section 7. FINANCING ARRANGEMENT

### 7.1 Project Financing

The Project Cost is envisaged to be funded on the basis of a Debt: Equity ratio of 70:30, however, this shall be firmed up once the financing documents for debt financing have been executed prior to financial close. For the purpose of this Petition, a debt: equity ratio of 70:30 has been assumed, thereby resulting in the following debt and equity injections for the Project:

	Million US \$
Debt	11,682,785
Equity	27,259,832
<b>Total Project Cost</b>	<b>38,942,617</b>

The debt financing of the Project will be sourced 100% through foreign financial institutions. Key terms and condition of financing are provided in the table below:

	<b>Foreign Financing</b>
Base Rate	6M LIBOR (2.7%)
Spread	4.5%
Total Rate	7.3%
Repayment period	15
Repayment basis	Bi-Annual
Sinosure	Sinosure fee applicable (6.55%)

For the purpose of tariff application, the Foreign Commercial Bank financing has been assumed. The Project Company will actively pursue the option of State Bank of Pakistan lending facility for Renewable Energy projects. If the Project Company is successful in attaining the facility, then at true-up of the awarded tariff, relevant tariff components shall be adjusted accordingly.



However this will be firmed up near the time of financial close and intimated to Authority as soon as it is finalized.

Sponsors are planning to inject 30% equity into the Project. The financing structure of 70:30debt: equity might change later on based on mutual arrangement between Banks and Sponsors. In that case, the structure shall be adjusted to meet the updated financing structure requirements, subject to the condition that the equity for the purpose of tariff calculation shall not exceed 30% as required under GOP Guidelines for determination of tariff for IPP projects of November, 2005. However this will be firmed up near the time of financial close and intimated to Authority as soon as it is finalized. Similarly, actual debt composition may be different and if so, the interest rate and repayment terms shall be affected. This too will be firmed up near the time of financial close and intimated to Authority as soon as it is finalized. Authority is therefore also requested to adjust the project cost and relevant tariff components accordingly.

#### **7.1.1 Return on Equity (ROE), ROE during Construction**

The Return on Equity ("ROE") and Return on Equity during Construction ("ROEDC") have been estimated separately and the same are provided under Section 9.

Project Company hereby requests:

- ROE of 14% (IRR based) return on invested equity net of withholding tax.
- ROEDC at a rate of 14% over the remaining life of the Project.

It is pertinent to highlight that the withholding tax component has not been identified as a separate line item in the tariff as the same is assumed to be paid on all equity components i.e. ROE and ROE-DC, at actual as a pass-through item under the tariff.

#### **7.2 Carbon Credits**

Wind Power is a clean form of energy and will reduce CO<sub>2</sub> emission. MPCL intends to register for CDM emission reduction program. In case any income is generated from CDM, the same shall be shared in accordance with the prevailing policy.

## Section 8. OPERATIONS COST

The operational cost of the Project comprises of the operations and maintenance cost, and the cost of the operational period insurances to be taken out by the Project Company. Break-up of the same is provided hereunder:

<b>Total O&amp;M Cost</b>	<b>USD 1,469,364Per Annum</b>
<b>Insurance Cost</b>	<b>USD 124,400Per Annum</b>

### 8.1 O&M Costs

This component caters for the cost of services rendered by the O&M operator. This component also includes cost associated with replacement of parts necessitated due to regular operation / normal wear and tear. MPCL has requested that an annual O&M contracted cost of USD 1,469,362 per annum be allowed. This O&M Cost is divided into two parts as detailed below:-

<b>Total O&amp;M Cost (Foreign)</b>	<b>USD 1,119,364 Per Annum</b>
<b>MPCL own company operating Annual costs (Local)</b>	<b>USD 350,000Per Annum</b>
<b>Total O&amp;M Cost</b>	<b>USD 1,469,364 Per Annum</b>

**MPCL requests that an annual O&M cost (inclusive of local company costs) of USD 1,469,362 per annum be allowed.**

The indexation applicable on O&M cost is specified below:

<b>Sub-component</b>	<b>Indexation</b>
Local	• <u>Pakistan CPI (General)</u>
Foreign	• US CPI (All Urban Consumers) • PKR / USD Indexation

### 8.2 Insurance Cost

The insurance cost consists of operations all risk insurance for the project, as well as business-interruption insurance; these are standard insurances required by all lenders' and also set out under the EPA.

Aforementioned insurances are required to be maintained throughout the life of the Project. Since the Pakistan Insurance/Reinsurance industry does

not have sufficient capacity and expertise to manage such huge risks entirely, therefore this risk is required to be insured/reinsured internationally. The risks to be covered through insurance will include machinery breakdown, natural calamities (like earthquake, floods, etc.), sabotage and consequential business interruption, etc. MPCL has requested that an annual insurance cost at a rate of 0.4% of the EPC cost be allowed.

## Section 9. REFERENCE TARIFF

As the Project is 70 % debt funded with loan tenure of 15 years for repayment, this means that there will be higher debt service cost requirements in the first 15 years of the Project. In the last 10 years of the Project, the tariff will be decreased due to no debt service-related costs.

The proposed tariff is for the life of the Project i.e. term of the EPA, to be signed with the Purchaser, which is 25 years from COD. The tariff is divided into two (02) bands i.e. year 1 — 15 and year 16 — 25 to cover the variations due to the debt repayment period.

A summarized Reference Generation Tariff table setting out the two bands is provided below:

	US Cents/kWh	
Years	1 — 15	16 — 25
O&M	1.7382	1.7382
Insurance	0.1472	0.1472
ROE (incl ROEDC)	1.9432	1.9432
Debt Servicing	3.2571	-
Total	7.0857	3.8286
Levelized Tariff	US Cents 6.5578	

## 9.1 Reference Generation Tariff

Years	O&M	Principal	Interest	ROE excl ROEDC	ROEDC	insurance	Tariff (Rs. / kWh,	Tariff (USc / kWh
1	2.0858	1.3759	2.5326	2.1398	0.1920	0.1766	8.5028	7.0856
2	2.0858	1.4777	2.4308	2.1398	0.1920	0.1766	8.5028	7.0856
3	2.0858	1.5871	2.3214	2.1398	0.1920	0.1766	8.5028	7.0856
4	2.0858	1.7046	2.2039	2.1398	0.1920	0.1766	8.5028	7.0856
5	2.0858	1.8307	2.0778	2.1398	0.1920	0.1766	8.5028	7.0856
6	2.0858	1.9662	1.9423	2.1398	0.1920	0.1766	8.5028	7.0856
7	2.0858	2.1118	1.7968	2.1398	0.1920	0.1766	8.5028	7.0856
8	2.0858	2.2681	1.6405	2.1398	0.1920	0.1766	8.5028	7.0856
9	2.0858	2.4359	1.4726	2.1398	0.1920	0.1766	8.5028	7.0856
10	2.0858	2.6162	1.2923	2.1398	0.1920	0.1766	8.5028	7.0856
11	2.0858	2.8098	1.0987	2.1398	0.1920	0.1766	8.5028	7.0856
12	2.0858	3.0178	0.8907	2.1398	0.1920	0.1766	8.5028	7.0856
13	2.0858	3.2412	0.6674	2.1398	0.1920	0.1766	8.5028	7.0856
14	2.0858	3.4810	0.4275	2.1398	0.1920	0.1766	8.5028	7.0856
15	2.0858	3.7387	0.1698	2.1398	0.1920	0.1766	8.5028	7.0856
16	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
17	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
18	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
19	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
20	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
21	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
22	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
23	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
24	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
25	2.0858			2.1398	0.1920	0.1766	4.5942	3.8285
<b>LEVELIZED</b>							<b>7.8694</b>	<b>6.5578</b>
<b>ED</b>								

*Levelized Tariff (1-25 years) discounted at 10% per annum = US Cents 6.5578 /kWh  
at a reference exchange rate of 1 US\$ = 120Rupees*

## 9.2 Reference Debt Servicing Schedule

Quarter	Base Amount	Repayment	Interest	Closing Balance
1	25,122,648	\$235,865.50	452,475	24,886,782
2	24,886,782	\$240,113.58	448,227	24,646,669
3	24,646,669	\$244,438.18	443,902	24,402,230
4	24,402,230	\$248,840.66	439,499	24,153,390
5	24,153,390	\$253,322.44	435,018	23,900,067
6	23,900,067	\$257,884.93	430,455	23,642,182
7	23,642,182	\$262,529.60	425,810	23,379,653
8	23,379,653	\$267,257.92	421,082	23,112,395
9	23,112,395	\$272,071.40	416,269	22,840,323
10	22,840,323	\$276,971.58	411,369	22,563,352
11	22,563,352	\$281,960.01	406,380	22,281,392
12	22,281,392	\$287,038.29	401,302	21,994,354
13	21,994,354	\$292,208.03	396,132	21,702,146
14	21,702,146	\$297,470.88	390,869	21,404,675
15	21,404,675	\$302,828.51	385,512	21,101,846
16	21,101,846	\$308,282.64	380,057	20,793,564
17	20,793,564	\$313,835.01	374,505	20,479,729
18	20,479,729	\$319,487.37	368,853	20,160,241
19	20,160,241	\$325,241.54	363,099	19,835,000
20	19,835,000	\$331,099.34	357,241	19,503,900
21	19,503,900	\$337,062.65	351,277	19,166,838
22	19,166,838	\$343,133.36	345,207	18,823,704
23	18,823,704	\$349,313.40	339,027	18,474,391
24	18,474,391	\$355,604.76	332,735	18,118,786
25	18,118,786	\$362,009.42	326,331	17,756,777
26	17,756,777	\$368,529.44	319,811	17,388,247
27	17,388,247	\$375,166.88	313,173	17,013,080
28	17,013,080	\$381,923.87	306,416	16,631,156
29	16,631,156	\$388,802.56	299,538	16,242,354
30	16,242,354	\$395,805.14	292,535	15,846,549
31	15,846,549	\$402,933.83	285,406	15,443,615
32	15,443,615	\$410,190.92	278,149	15,033,424
33	15,033,424	\$417,578.72	270,761	14,615,845
34	14,615,845	\$425,099.57	263,241	14,190,746
35	14,190,746	\$432,755.88	255,584	13,757,990
36	13,757,990	\$440,550.09	247,790	13,317,440
37	13,317,440	\$448,484.67	239,855	12,868,955
38	12,868,955	\$456,562.16	231,778	12,412,393
39	12,412,393	\$464,785.13	223,555	11,947,608
40	11,947,608	\$473,156.20	215,184	11,474,452
41	11,474,452	\$481,678.04	206,662	10,992,774

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42	10,992,774	\$490,353.36	197,987	10,502,420
43	10,502,420	\$499,184.93	189,155	10,003,235
44	10,003,235	\$508,175.56	180,165	9,495,060
45	9,495,060	\$517,328.12	171,012	8,977,732
46	8,977,732	\$526,645.52	161,695	8,451,086
47	8,451,086	\$536,130.74	152,209	7,914,955
48	7,914,955	\$545,786.79	142,553	7,369,169
49	7,369,169	\$555,616.75	132,723	6,813,552
50	6,813,552	\$565,623.76	122,716	6,247,928
51	6,247,928	\$575,810.99	112,529	5,672,117
52	5,672,117	\$586,181.71	102,158	5,085,935
53	5,085,935	\$596,739.21	91,601	4,489,196
54	4,489,196	\$607,486.85	80,853	3,881,709
55	3,881,709	\$618,428.07	69,912	3,263,281
56	3,263,281	\$629,566.35	58,774	2,633,715
57	2,633,715	\$640,905.23	47,435	1,992,810
58	1,992,810	\$652,448.33	35,892	1,340,361
59	1,340,361	\$664,199.34	24,141	676,162
60	676,162	\$676,161.98	12,178	(0)

## Section 10. INDEXATIONS & ADJUSTMENTS

### 10.1 Indexations

It is submitted that indexations be made on 1st January, 1st April, 1st July and 1st October respectively, on the basis of latest information available with respect to Consumer Price Index (CPI) (General), as notified by Pakistan Bureau of Statistics, US CPI (for all Urban-consumer) as notified by US Bureau of Labor Statistics and exchange rate as notified by National Bank of Pakistan.

#### 10.1.1 Foreign O&M Cost Component

The Reference Foreign O&M Cost Component of the O&M Cost shall be quarterly indexed to both:

- (a) the USD/PKR exchange rate, based on the revised TT & OD selling rate of USD as notified by the National Bank of Pakistan; and
- (b) US CPI (for all Urban-consumer), as issued by the US Bureau of Labor Statistics.

The applicable formula shall be as follows:

$$\text{O\&M(FRev)} = \text{Relevant Reference Generation Tariff Component} * \frac{(\text{US CPI(Rev)} / \text{US CPI(Ref)}) * (\text{FX USD(Rev)} / \text{FX USD(Ref)})}{1}$$

Where:

O&M(FRev)                      the revised Foreign O&M Cost  
Component applicable for the relevant quarter

US CPI(Rev) = the revised US CPI (for all Urban-consumers) for the month prior to the month in which indexation is applicable, as issued by the US Bureau of Labor Statistics

US CPI(Ref) = the US CPI (for all Urban-consumers) for the month of [insert date], as issued by the US Bureau of Labor Statistics.



FX USD(Rev) = the revised TT & OD selling rate of PKR/USD as on the date on which indexation is applicable, as notified by the National Bank of Pakistan.

FX USD(Ref) = TT & OD selling rate of PKR/USD, prevailing on [insert date] as notified by the National Bank of Pakistan

### 10.1.2 Local O&M Cost Component

The Reference Local O&M Cost Component of the O&M Cost shall be quarterly indexed to the CPI (General) in Pakistan, as notified by the Pakistan Bureau of Statistics based on the following formula:

$$\text{O\&M(LRev)} = \frac{\text{Relevant Reference Generation Tariff Component} *}{\text{CPI(Rev) / CPI(Ref)}}$$

Where:

O&M(LRev) = the revised Local O&M Cost Component applicable for the relevant quarter

CPI(Rev) the revised CPI (General) in Pakistan for the month prior to the month in which indexation is applicable, as notified by the Federal Bureau of Statistics.

CPI(Ref) the CPI (General) in Pakistan for the month of [insert date] as notified by the Federal Bureau of Statistics.

### 10.1.3 Insurance Cost

The Reference Insurance Cost Component shall be annually indexed to USD/PKR exchange rate, based on the revised TT & OD selling rate of USD notified by the National Bank of Pakistan.

#### (a) Indexation Formula

The indexation of the Insurance Cost Component shall be based on the following formula:

$$\text{Insurance(Rev)} = \frac{\text{Relevant Reference Generation Tariff Component}}{\text{FX USD(Rev) / FX USD(Ref)}}$$

Where:

Insurance<sub>(Rev)</sub> = the revised Insurance Cost Component applicable for the relevant year

FX USD<sub>(Rev)</sub> = the revised TT & OD selling rate of PKR/USD as on the  
date on which indexation is applicable, as notified by the National Bank of Pakistan.

FX USD(Ref) = TT & OD selling rate of PKR/USD, prevailing on [insert date] as notified by the National Bank of Pakistan

#### 10.1.4 Return on Equity and Return on Equity during Construction

In line with NEPRA's previous determinations, the ROE and ROEDC the Reference Generation Tariff shall be quarterly indexed to the USD/PKR exchange rate, based on the revised TT & OD selling rate of USD notified by the National Bank of Pakistan.

The applicable formula shall be as follows:

$$\text{ROE(Rev)} = \frac{\text{Relevant Reference Generation Tariff Component}^*}{(\text{FX USD(Rev)} / \text{FX USD(Ref)})}$$

$$\text{ROE-DC(Rev)} = \frac{\text{Relevant Reference Generation Tariff Component}^*}{(\text{FX USD(Rev)} / \text{FX USD(Ref)})}$$

Where:

ROE<sub>(Rev)</sub> = the revised ROE component applicable for the relevant quarter

ROE-DC(Rev) = the revised ROE-DC component applicable for the relevant quarter

FX USD(Rev) = the revised TT & OD selling rate of PKR/USD as on the date on which indexation is applicable, as notified by the National Bank of Pakistan.

FX USD(Ref) = TT & OD selling rate of PKR/USD, prevailing on [insert date] as notified by the National Bank of Pakistan

### 10.1.5 Debt Component

- a) **Foreign Loan:** The principal and interest component of local loan will remain unchanged throughout the term except for the adjustment due to variation in 6 months LIBOR, while spread of 4.5% on LIBOR remaining the same, according to the following formula:

$$I = P(\text{Rev}) * (\text{LIBOR}(\text{Rev}) - r/0)14$$

Where:

DI = the variation in interest charges applicable corresponding to variation in 6-month LIBOR. AI can be positive or negative depending upon whether LIBOR(Rev) > or < [ ]%. The interest payment obligation will be enhanced or reduced to the extent of AI for each period under adjustment applicable on bi-annual basis.

P(Rev) = the outstanding principal on a quarterly basis at the relevant calculation dates.

- b) **In case of SBP Loan:** The principal and interest component of SBP loan will remain unchanged throughout the term except in case where there is any change in SBP rate, the same change shall be adjusted in tariff

### 10.2 Adjustments

The Project Company requests NEPRA to allow adjustment to the total Project Cost for the following items forming part of Project Cost:-

- (a) The Principal Repayment and cost of debt be adjusted at COD as per the actual borrowing composition;
- (b) Interest During Construction be adjusted as per actual based on actual disbursement of loans and prevailing LIBOR rates during the project construction period;
- (c) The specific items of Project Cost to be incurred in foreign currency (US\$) be adjusted at COD based on the PKR / US\$ exchange rate prevailing on the date the transaction was carried out;
- (d) Customs duty and other taxes (including SIDS) be adjusted/allowed as per actual;
- (e) Any negative financial implications resulting from changes in tax rates, duties etc. and currently applicable sales tax structure may kindly be adjusted in the Project Cost.

- (f) Pre-COD Insurance Cost be adjusted at actual subject to a cap of 1.0% of the EPC cost in line with earlier tariff determinations by NEPRA for other IPPs.
- (g) Return on Equity be adjusted at COD in order to ensure an IRR based return of 14% on equity (while treating the project as a Build-Own-Operate type project).
- (h) ROEDC is to be allowed at the time of COD, as true-up adjustment, based on actual equity injections to the MPCL by the Project Sponsors.

## **Section 11.** PASS THROUGH ITEMS &TARIFF ASSUMPTIONS

### **11.1 Pass Through Items**

Authority is requested to allow following cost components as pass-through to MPCL on the basis of actual costs incurred by Project Company or obligated to be paid in relation to the Project pursuant to Laws of Pakistan.

- a) No provision of income tax has been provided for in the tariff. If the Project Company is obligated to pay any type of tax, the same should be allowed to the Project Company as pass through.
- b) No withholding tax on dividend has been included in the tariff. Authority is requested to allow payment of withholding tax on dividend as pass through at the time of actual payment of dividend.
- c) The payments to Workers Welfare Fund and Workers Profit Participation Fund have not been accounted for in the Project budget and have been assumed to be reimbursed as pass-through at actual by the power purchaser.
- d) Zakat deduction on dividends as required under Zakat Ordinance is considered as a pass through;
- e) No tax on income of MPCL (including proceeds against sale of electricity to CPPA) has been assumed. Corporate tax, turn over tax, general sales tax / provincial sales tax and all other taxes, excise duty, levies, fees etc. by any federal / provincial entity including local bodies as and when imposed, shall be treated as a pass through item;
- f) Taxes and Custom duties on the import of plant and equipment under RE Policy including SIDC;
- g) No hedging cost is assumed for exchange rate fluctuations during construction and all cost overruns resulting from variations in the exchange rate during construction shall be allowed as pass through;
- h) Any costs incurred by Project Company, which are required to be incurred by Power Purchaser pursuant to provisions of EPA shall also be treated as pass through.

- i) Except above-mentioned items in this sub-clause 11.1, any other taxes and charges that constitute as part of the Project Cost for construction period and operation period shall be treated as pass through.

### **11.2 Assumptions**

The proposed Reference Tariff is based on the following assumptions. A change in any of these assumptions will necessitate a corresponding adjustment in the Reference Tariff:

- a) Debt for the Project will be sourced from local financial institutions. Exact composition of local debt will be finalized prior to financial close; adjustment against the same will be requested at the time of COD;
- b) An exchange rate of PKR 120 /USD has been assumed. Indexation against PKR / USD variations will be permitted for debt servicing payments and all other project costs denominated in foreign currency. Tariff components shall be respectively indexed for exchange rate variations as discussed in Section 10;
- c) The timing of drawdown of debt and equity may vary from those specified in this Petition; as such, the Project Cost will be adjusted on the basis of actual IDC at COD. Similarly, ROEDC component will also be updated in the Reference Tariff;
- d) Similarly, adjustments in Project Cost due to variation in PKR / USD variations and KIBOR/LIBOR fluctuations will also be catered for at the time of COD;
- e) Withholding tax on supplies and Onshore Contract (the prevailed rate on 31 Aug, 2016), which is the base date stipulated in Bidding document pursuant to the Onshore Contract have been catered for under the Project Cost. No withholding tax is anticipated on the Offshore Contract. In case there is any change in taxes etc., or additional taxes, fees, excise duty, levies, etc. are imposed, the EPC cost and ultimately the Project cost and the Reference Tariff will need to be adjusted accordingly;
- f) The power purchaser will compensate for energy delivered to the power purchaser prior to COD. For this purpose Energy Purchase Price shall be paid for all energy delivered prior to COD. Payments will be invoiced to the power purchaser as per mechanism specified in the EPA;
- g) The power purchaser shall be solely responsible for the financing, engineering, procurement, construction, testing and commissioning of the interconnection and transmission facilities up till the Project gantry point. Said facilities will be made available to the Project at least on or before the

- deadline set out in the EPA. Furthermore, the power purchaser will be solely responsible for operation and maintenance of the said interconnection and transmission facilities;
- h) Project contingency and maintenance reserves are not included in Reference Tariff calculations. If required by lenders, these will be adjusted accordingly in the Reference Tariff;
- i) In case of any unintentional error or omissions, typographic errors, and any genuine assumption being overlooked, the same will be corrected/incorporated and advised to NEPRA as soon as the Project Company becomes aware of it;
- j) Any additional indexation or concession allowed by the GOP, NEPRA or any other Govt. entity to any IPP will be allowed to MPCL without any discrimination.



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**LOI (Annexure<sup>-I</sup>)**

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**LOI (Annexure-I)**

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NO. DAE/Wind/63/2015  
**GOVERNMENT OF SINDH**  
**Directorate of Alternative Energy**  
**ENERGY DEPARTMENT**

Karachi, dated March 01, 2016

**SAY NO TO CORRUPTION**

**Ph: 021-99206449**

**Mr. Mustafa Abdullah,**  
Chief Executive Officer,  
Moro Power Company (Pvt) Limited.  
Mezzanine floor, M1, 4C lane 12,  
Khayabn-e-Ittehad, phase-II, Ext., DHA,  
Karachi.

**Subject: APPLICATION FOR LOI FOR 25 MW WIND POWER PROJECT**

**Reference: Your Proposal dated August 17, 2015.**

In pursuance of the Policy for Development of Renewable Energy for Power Generation 2006 ("Policy"), implemented by Govt. of Sindh under clause 32 of Schedule II, Sindh Govt. Rules of Business 1986, the Directorate of Alternative Energy, Energy Department Govt. of Sindh, (DAE, GoS) hereby confirm its interest in your proposal for establishing an approximately 25 MW Wind Power Generation Project in Sindh. The sponsors may approach the Land Utilization (LU) Department, through Energy Department Government of Sindh for acquisition of land. DAE GoS shall facilitate the sponsors for acquisition of land for project development. DAE GoS acknowledges receipt of Bank Guarantee NO. HMBULG/412/2016 dated February 25, 2016 for the issuance of Letter of Intent ("LOI") NO. DAE/Wind/63/2015/57 in the sum of USD 12,500/- (US Dollars Twelve Thousand Five Hundred only) from Habib Habib Metropolitan Bank Limited, S.I.T.E. Branch having registered office at 3/9-E-2, Metro Chowrangi, S.I.T.E. Karachi and Bank Guarantee has been verified from concerned bank through letter Ref. No. HMBULG/412J2016 dated February 29, 2016.

2. The Sponsor(s) is required to complete the feasibility study and achieve the milestones listed at the Annex-I to this LOI ("LOI Milestones") for the subject project, at no risk and at no cost to and without any obligation on the part of the DAE Energy Department Government of Sindh or any other Provincial (Sindh) agency, within a period of 18 Months from the date of issuance of this LOI.

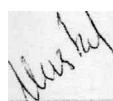
3. The Sponsor(s) is required to carry out and complete the feasibility study in accordance with internationally acceptable standards and in accordance with the terms and conditions stipulated in the Policy and this LOI. The feasibility study must include, inter alia, micro-siting details, detailed power production estimates based on wind speed benchmarks set by DAE GoS/GoP, soil tests reports, technical details pertaining to wind turbines to be used in the wind farm, electrical studies (including but not limited to short-circuit study, power quality study, load flow study and stability study), environmental study, project costing, financing plan, carbon credits, financing terms, tariff calculations and assumptions for financial calculations including economic/financial analysis. The Sponsor is also advised to liaise with Panel of Expert (POE), constituted by DAE, GoS and the power purchaser while determining the site, project layout, sub-station design and layout, the transmission line, interconnection arrangements and other related matters.

4. The validity of this LOI is Eighteen (18) calendar months from the date of its issue, where after it will automatically lapse immediately (unless extended pursuant to clause. 5 or 6), being the **August 31, 2017 (the "Expiry Date")**. Issuance of this LOI or the lapsing of its validity, or your conducting a feasibility study there under, cannot form the basis of any claim for compensation or damages by the Sponsor(s) or the project company or any party claiming through or under them against the Government of Sindh or any of its allied department, employees or consultants on any grounds whatsoever, during or after the expiry of the validity of the LOI.

5. The Sponsor(s) is therefore required to complete the feasibility study and achieve the LOI Milestones for the subject projec within the validity of this LOI. The Sponsor(s) is also required to submit quarterly progress reports to be reviewed by Panel of Experts (POE). Provided the Sponsor(s) meet's the LOI Milestones on the stated dates, the expiry date of this LOI shall be extended on a day-to-day basis for the number of days of delay by which the approval or review by the relevant public sector entity listed in the LOI Milestones is delayed beyond the corresponding period stated in the LOI Milestones. In case there is a delay in completion of the feasibility study within the validity of this LOI for reasons not attributable to a public sector entity, a one-time extension may be granted up...to a maximum period of 180 days, provided that DAE GoS is satisfied that the feasibility study is being conducted in a satisfactory manner and is likely to be completed <sup>f</sup>shortly, and provided the Sponsor(s) enhance the amount of the bank guarantee to twice its original amount and extend its validity for a period six (6) months beyond the extended date of the LOI. Furthermore, if the said feasibility study is technically approved by the Panel of Experts and later the tariff awarded by NEPRA is not agreed by the Sponsor(s) (such decision to be made within 30 days of the award of the tariff, and in any event within the validity of the LOI), the bank guarantee less 10% deduction for administrative and ancillary charges, would be returned to the Sponsor(s).

11) 6. The Sponsor(s) shall apply to NEPRA for award of tariff within the period of validity of this LOI. Upon tariff being given, the Sponsor(s) shall forthwith submit a new Performance Guarantee in the sum of **USD 62,500/** (US Dollars Sixty Two Thousand and Five Hundred) (subject to revision from time to time) and obtain the Letter of Support (Tripartite i.e. AEDB for GoP, Energy Department for GoS and Project Company) from DAE GoS within the validity period of this LOI, provided, if the award of the tariff is delayed beyond the initial validity of the LOI, the Sponsor(s) shall extend the bank guarantee for a further period of six (6) months (or such period as may be determined by DAE GoS in the circumstances) and the validity of this LOI shall be extended *ipso facto* for a further period of six (6) months, and the Sponsor(s) shall obtain the Letter of Support and submit the Performance Guarantee within the extended period afore-said. For avoidance of doubt, the afore-said extension process may be repeated if re tariff is not announced (including any review petition filed by the Sponsor(s), such review (if any) to be filed within the period prescribed in the NEPRA (Tariff Procedures and Standards) Rules up to fifteen (15) days before the then prevailing Expiry Date.

7. In case the Sponsor(s) fails to meet the LOI Milestones or perform any other obligations set forth in the Policy and this LOI, including the extension of the date of expiry of bank guarantee as provided herein, DAE GoS will terminate this LOI and encash the bank guarantee.



8. (A) Pending the nomination of the Main Sponsor per sub-clause (B), the **M/S R.M. Gulistan Engineers & Contractors (Pvt.) Limited** (being the individual or group holding at least 20% equity or participatory interest in the IPP project) is liable for all obligations and liabilities of and on behalf of all other shareholders/ Sponsor(s) (without relieving the other shareholders/Sponsor(s) of their obligations and liabilities under this L01). It is emphasized that the financial and other relevant credentials of **M/S R.M. Gulistan Engineers & Contractors (Pvt.) Limited** were a fundamental consideration for exercise of its shareholding (or other participatory interest, if the project company is not formed by the date of issue of the LOI) in the project or the project company without the prior written approval of DAE, Energy Department GoS, which approval may be declined by DAE, Energy Department GoS in its discretion if the proposed transferee's financial and other relevant credentials are found unsatisfactory.

(B) The Sponsor(s) is advised to nominate the Main Sponsor (being the individual or group holding at least 20% equity} or participatory interest in the 1PP project) no later than the Expiry Date of the L01. In default of nomination as aforesaid, the **M/S R.M. Gulistan Engineers & Contractors (Pvt.) Limited** will be deemed the Main Sponsor for all intents and purposes. The Main Sponsor together with other initial project shareholders/Sponsor(s) (which shall, subject in, each case to sub-clause (A) above, be firmly settled and announced to DAE GoS by the Expiry Date of the L01), must hold 51% of the project equity for a period up to the project's Commercial Operations Date (COD).

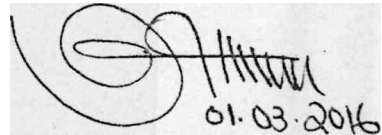
(C) Any actual or purported transfer or assignment of the shares or other participatory interests by the Sponsor(s)/shareholders in contravention of the foregoing restrictions without prior written consent of the DAE GoS shall render this LOI void and the bank guarantee will be encashed in such case by DAE GoS.

9. This LOI is not assignable and non-transferable. This LOI shall be void upon any actual or purported assignment or transfer hereof without the prior written consent of DAE GoS.

10. This LOI is issued in duplicate on the date hereof, and it shall come into effect when one copy is received by DAE, Energy Department GoS after being duly countersigned by you. Nevertheless, this LOI shall lapse if the countersigned copy is not received at DAE, GoS within 15 days of its issuance.

Agreed & Accepted for and on behalf  
**M/S Moro Power Company (Pvt.) Limited**

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Name: M ST1 · VcNI N24L4LL f\l  
Designation: C-E  
3/3/2016

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01.03.2016  
**Engr. Mehfooz Ahmed Qazi**  
Director Alternative Energy  
DAE, Energy Department  
Government of Sindh  
Karachi

**Milestones for the Letter of Intent (L01)**

<b>Sr. No.</b>	<b>Milestones</b>	<b>Time Frame (in Months)</b>
1.	Issuance of Letter of Intent (L01)	To
2.	Completion of Feasibility Study i) Technical study along with project description. ii) Wind data analysis iii) Verification /consent of wind turbine generator (WTGs)	No later than 120 days prior to the expiry date of the LO
3.	Approval of IEE / EIA from SEPA	No later than completion of the feasibility study
4.	Approval of Electrical and Grid Studies by NTDC	<b>45</b> days after submission of the Electrical and Grid Studies
5.	Verification fee	re be submitted within 07 days of written request by DAE, GoS after preliminary approval
6.	Final approval of feasibility study by Panel of Experts	Within 30 days after preliminary approval, provided any requisite modifications are timely made by the Sponsor(s) <b>and the modified</b> feasibility study is resubmitted within 15 days of a letter by DAE, GoS requiring the modifications. (If necessary).
7.	Submission of application to <b>NEPRA</b> for tariff determination and Generation License	Within 15 days of final approval of the feasibility study by DAE, GoS
8.	Award of Tariff and Generation License by NEPRA	Within the validity of the LOI (as may be extended under clause 6)
9.	Posting of Performance Guarantee for Issuance of Letter of Support (LOS)	Atleast 15 days before expiry of LOI
10.	Issuance of Letter of Support (LOS)	Atleast 7 days before expiry of LOI





Ph: 021- 99207148

NO. DAE/wind/63/2015  
GOVERNMENT OF SINDH  
Directorate of Alternative Energy  
ENERGY DEPARTMENT  
Karachi, dated: January 2, 2018

Say No to Corruption

**Mr. Mustafa Abdullah,**  
**Chief Executive Officer,**  
Moro Power Company (Pvt.) Limited  
Mezzanine Floor, M1, 4C Lane 12,  
Khayabn-e-Ittehad, Phase-II, Ext., DHA,  
Karachi

**SUBJECT: EXTENSION IN THE VALIDITY PERIOD OF LETTER OF INTENT (LOI) ISSUED TO M/S MORO POWER COMPANY (PVT.) LIMITED FOR THE DEVELOPMENT OF 25MW WIND POWER PROJECT**

Reference is made to your request dated 28<sup>th</sup> August 2017 on the subject noted above.

2. Directorate of Alternative Energy, Energy Department, Government of Sindh is pleased to convey the extension in the validity period of LOI No. DAE/Wind/63/2015/57 dated March 01, 2016 issued to M/s Moro Power Company (Pvt.) Limited for the development of 25MW Wind Power Project in Jhimpir, district Thatta Sindh up to **February 28, 2019**.

3. All other terms and conditions of LOI No. DAE/Wind/63/2015/57 dated March 01, 2016 shall remain same.

**(Engr. - • Ahmed'Qazi)**  
Director (Alternative Energy)

Copy for information to:

- i) Secretary, Land Utilization Department, Govt. of Sindh
- ii) Registrar, NEPRA, Islamabad
- iii) CEO, Alternative Energy Development Board (AEDB), Islamabad
- iv) CEO, CPPA, Islamabad
- v) GM Planning (Power), NTDC, Lahore
- vi) PS to Secretary, Energy Department, Govt. of Sindh



Ph: 021 99207148

NO. DAE/wind/63/2015  
GOVERNMENT OF SINDH  
Directorate of Alternative Energy  
ENERGY DEPARTMENT  
Karachi, dated: 27th February, 2019

Say No to Corruption

To,

Mr. Mustafa Abdullah,  
Chief Executive Officer,  
Moro Power Company (Pvt) Limited,  
4C, M-1, Ittehad Lane 12, Phase-II Ext.  
DHA, Karachi

Subject: EXTENSION IN THE VALIDITY PERIOD OF LETTER OF INTENT (LOI) ISSUED TO MIS MORO POWER COMPANY (PVT) LIMITED FOR THE DEVELOPMENT OF 25 MW WIND POWER PROJECT.

Reference is made to your letter dated 1st January, 2019 regarding subject matter.

2. Directorate of Alternative Energy, Energy Department, Govt. of Sindh is pleased to convey that the Panel of Experts (PoE) has considered your request for the extension in the validity period of LOI No.DAE/wind/63/2015/57 dated 1st March, 2016 upto 11th July, 2020 for the development of 25 MW wind Power Project in Jhampir Wind Corridor Thatta Sindh, subject to the submission of extended Bank Guarantee for a period of six (6) months beyond the extended date of LOI.

3. You are requested to submit the extended Bank Guarantee valid upto 11th January, 2021 within 15 days of the issuance of this letter for further processing of your request.

(NIAZ AH JAWHI)  
Deputy Director-III

Copy for information to:

1. DS(Staff) / PS to Minister for Energy Govt. of Sindh.
2. PS to Secretary, Energy Department, Govt. of Sindh.
3. PA to Director Alternative Energy, Department, Govt. of Sindh.

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Fear bill       prov    Annexure-II)  
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## MORO POWER COMPANY (PVT) LTD. Electricity Generation Using Wind As Fuel

### REMINDER 3

4<sup>th</sup> January 2019



The Honorable  
Secretary for Energy,  
Government of Sindh  
Karachi.

Subject: SUBMISSION OF FEASIBILITY STUDIES FOR APPROVAL BY ED-GOS FOR 25 MW MORO POWER COMPANY'S WIND PROJECT

.Dear Sir,

Reference to above subject, we would like to inform you that we have obtained LOI from ED-Gas in 2016 and the LOI was subsequent extended upto 28<sup>th</sup> February 2019. Our extension case of LOI was heard by panel of experts on 25/01/2019 in Energy Department Office (GUS).

We have submitted to Director Wind, ED-GOS our complete detail documents for approval of feasibility studies, as we have carried out following activities as required in LOI issued by ED- GOS.

1. Feasibility study carried out by M/s AELPH System (SMC-Pvt.) Ltd.
2. Initial Environmental Examination (IEE) obtained from SEPA. Environmental Studies carried out by consultant M/s. GEMS.
3. Transportation study completed by RCP.
4. Geo Technical Investigation for the land carried out by M/s. Soil Testing Services (STS).
5. Grid Study completed by M/s PPI, Lahore.
6. Grid Evacuation approved by NTDC.
7. Energy Assessment based on Available wind data..
8. Submitted application for generation license to NEPRA (feasibility approval required).
9. RFP for our project called for from EPC contractor as per NEPRA requirement for Tariff.

It may be mentioned that on 12/01/2017 we first informed Director Alternate Energy (copy attached) about completion of formalities for Feasibility Studies by us, as required by LOI. However on 15/11/18 we submitted formal application with complete required (as per LOI) documents for approval of our feasibility by AED-GOS.

Sir, we request you for early approval of our feasibility studies submitted to Director Wind, ED-GOS. As it is required for NEPRA license for which we have already applied.

We plan to apply for cost plus Tariff in February 2019. Approved feasibility report is a pre-requisite for Tariff approval by NEPRA.

Sincerely Yours

**MUSTAFA ABDULLAH**

CEO (Moro Power Company (Pvt.) Ltd.)

f) v(• itk: 0- (.,.;(1; 13

Office: 4C, M-1, ittehad Lane 12, Phase if Ext., OHA Karachi.

Ph: + 92 213 5885007 Cell: +92 322 222 5007, Email: gersindh@gmail.00177



Ph: 021 99206448

NO. DAE/Gen/119/2016 Vol-II *icy*  
**GOVERNMENT OF SINDH**  
 Directorate of Alternative Energy  
 ENERGY DEPARTMENT  
 Karachi, dated: 21st January, 2019

**SAY NO TO CORRUPTION**

**Secretary,** Finance Department, Govt. of Sindh.

**CEO,** Alternative Energy Development Board (AEDB) Islamabad

**GM (Power Planning),** National transmission & Dispatch Company Limited.

**Mr. Irfan Ahmed,** Director Energy Grid (Pvt) Limited.

**SUB: MEETING OF PANEL OF EXPERT COMMITTEE REGARDING RENEWABLE ENERGY POWER PROJECTS.**

Reference is made to the notification No. ED/SO(Admn)/14-9/2014(Const. Comitt) dated 29th May, 2015.

2. I am directed to inform you that meeting of Panel of Expert Committee is scheduled to be held on Friday 25<sup>th</sup> January, 2019 **at 10:00 AM** in Committee room of the Energy Department situated at 3rd floor state Rebuilding no.3, Dr. Ziauddin road (Opposite CM house) Karachi, under the chairmanship of Director Alternative Energy, Energy Department, Government of Sindh, to review the progress of wind/solar/hydro power projects for extension of Las.

3. You are requested to nominate a suitable officer well versant with the subject to attend the said meeting as per time and schedule.

**Agenda of the meeting:**

1. M/s Lootah Energy Pvt Ltd. Phase-I&II, 2x50 MW wind power project, extension of LOI
- 71. M/s Moro Power Company Pvt Ltd, 25 MW wind power project, extension of LOI
3. M/s Technomen Kinetics Pvt. Ltd, 20 MW solar power project, extension of Lot
4. M/s Norinco Int. Thatta Power Pvt Ltd, 100 MW Wind power project, extension of LOI
5. M/s AeroSpace New Energy A&B Pakistan Pvt Ltd, 2x100 MW Wind power project, extension of LOI.
6. M/s Shafi Energy Pvt Ltd, 50 MW wind power project, extension of LOI
7. M/s Master Green Energy Limited, 50MW wind power project, extension of LOI

*Shahzeb Ba Mr*  
**(SHAHZEB BA MR)**  
 Assistant Director-II

**Copy for information to:**

- CEO, M/s Lootah Energy Pvt Ltd. Phase-1&II.
- CEO, Moro Power Company Pvt Ltd
- CEO, Technomen Kinetics Pvt. Ltd.
- Director, M/s Norinco Int. Thatta Power Pvt Ltd
- CEO, M/s AeroSpace New Energy A&B Pakistan Pvt Ltd
- Director, M/s Shafi Energy Pvt Ltd
- CEO, M/s Master Green Energy Ltd.
- Director Alternative Energy, Government of Sindh.
- PS to Minister for Energy, Government of Sindh.
- PS to Secretary, Energy Department Government of Sindh.



Ph: 021 99206448

NO. DAE/Gen/119/2016 Vol-11  
**GOVERNMENT OF SINDH**  
**ENERGY DEPARTMENT**  
 Karachi, dated; 25th February, 2019

**SAY NO TO CORRUPTION**

**Secretary**, Finance Department, Govt. of Sindh.  
**CEO**, Alternative Energy Development Board (AEDB) Islamabad  
**GM (Power Planning)**, National transmission & Dispatch Company Limited.  
**Mr. Irfan Ahmed**, Director Energy Grid (Pvt) Limited.

**SUB: MEETING OF PANEL OF EXPERT COMMITTEE REGARDING RENEWABLE ENERGY POWER PROJECTS.**

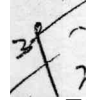
Reference is made to the notification No. ED/SO(Admn)114-9/2014(Const. Comitt) dated 29th May,2015.

2. I am directed to refer this office earlier letter dated 19th February,2019 regarding subject cited above and to inform that the meeting of Panel of Expert Committee is **rescheduled to be held on 1st March,2019 3:00 PM** in the Committee room of Energy Department situated at 3rd floor state life building no.3, Dr. Ziauddin road (Opposite CM house) Karachi, under the chairmanship of Director Alternative Energy, Energy Department, Government of Sindh, to review the progress of wind/solar/hydro power projects for extension of LOIs.

3. You are requested to nominate a suitable officer well versant with the subject to attend the said meeting as per time and schedule.

**Agenda of the meeting:**

1. M/s Iran-Pak Wind Power Pvt Ltd, 50 MW Wind power project, extension of LOI
2. M/s Mustaqim Dyeing & printing industries Pvt Ltd, 50 MW Wind power project, extension of LOI
3. M/s Novatex Ltd, 50 MW wind power project, extension of LOI
4. M/s Greenwable Pvt Ltd., 50 MW Solar power project, extension of LOI
5. M/s NASDA Green Energy Pvt Ltd 50 MW Wind power project, extension of LOI
6. M/s Yunus Wind Power Ltd, 50 MW Wind power project, extension of LOI
7. M/s Lucky Wind Power Ltd, 50 MW Wind power project, extension of LOI
8. M/s Metro Wind Power Ltd, 60 MW Wind power project, extension of LOI
9. M/s Moro Power Company (Pvt Ltd, 25 MW wind power project, Feasibility Approval

**DEPUTY**  **TA Y (POWER)**

**Copy for information to:**

- CEO, M/s Iran-Pak Wind Power Pvt Ltd
- CEO, M/s Mustaqim Dyeing & printing industries Pvt Ltd
- CEO, M/s Novatex Ltd
- GM, M/s Greenwable Pvt Ltd
- CS, M/s NASDA Green Energy Pvt Ltd.
- COO, M/s Yunus Wind Power Ltd
- CFO, M/s Lucky Wind Fewer Ltd
- ;,EO, M/s Artistic Solar Energy Pvt Ltd
- Director, M/s Moro Power Company (Pvt Ltd,
- DS (Staff)/PS to Minister for Energy, Govt. of Sindh
- PS to Secretary, Energy Department, Govt. of Sindh

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# ENVIRONMENTAL PROTECTION AGENCY

## GOVERNMENT OF SINDH

Piot # ST-211, Sector 23, KIA, Karachi-74900

Ph: 5065950, 5065598, 5065637

5065532, 5065946, 5065621

[epasindh@cyber.net.pk](mailto:epasindh@cyber.net.pk)

Facsimile: 5065940

Dated: 28<sup>th</sup> November, 2016

### SUBJECT: DECISION ON INITIAL ENVIRONMENTAL EXAMINATION (WE)

**I. Name & Address of  
Proponent:**

Mr. Mustafa Abdullah  
Director  
Moro Power Company (Pvt.) Ltd  
Karachi

**2. Description of Project:**

Establishment of 50 MW Wind Energy Project

**3. Location of Project:**

Near Super Highway in Deh Kharyo at iharnpir,  
Nooriabad road, District Thatta.

**4. Date of Filing of IEE:**

15-10-2015

5. After careful review and analysis of the Initial Environmental Examination (IEE) report, the Sindh Environmental Protection Agency (SEPA) accords its approval subject to the following conditions:

- i) All mitigation measures recommended in IEE report should be complied with, for achieving negligible impacts on physical, biological, environmental and socio-economic resources of the area. Sindh Environmental Quality Standards (SEAS) shall be followed in letter and spirit.
- ii) A complete code of Health, Safety and Environment (HSE) shall be developed which should include efficient parameters at specific work place. For this purpose HSE setup should be established and supervised by a designated HSE officer at the senior level with sufficient administrative, and technical authority to perform the designated functions. Proponent will make sure that the operating instructions and emergency actions are made available to every worker/labor at the site. Environmental management system shall be made **in place during the operation** of the project needing towards third party environmental audit and for achievement of ISO14000 standards.
- iii) The proponent shall also appoint a reputable research institute or organization to conduct a detailed *cumulative* noise mapping/modeling study of the wind projects in the macroenvironment of project area and its impact on the **sensitive receptors**, if any. The report must be submitted to SEPA within 04 weeks from the date of issuance of this approval.
- iv) The proponent shall be under obligation to compensate for any significant adverse short term, long term and irreversible impact occurred due to windfarm operations.

During the project execution, safe distances of the under mentioned environmental sensitivities will be maintained:

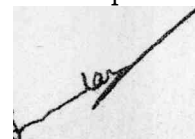
- 500m from communities, industries and main transport network
- 300m from community water well
- 500m from archaeological / cultural site / monument
- Distance will be measured from the tip blade of turbines or / and transmission power lines associated.
- Project activity will not be carried out within buffer zone of any projected area designated under Sindh wildlife protection act.

Employment should be provided to local people and assured for unskilled jobs. Skilled jobs shall be given to locals after providing them proper field training, where a minimum training is required. Local people should be informed and explained well in advance about the operation. Compensation should be provided to inhabitants in case of loss of agriculture land, crop property, etc., in accordance with the rates, that are agreed upon. All conflicting issues regarding compensation etc. should be settled in advance prior to the start of activity. Benefits to local people will be offered under Corporate Social Responsibility (CSR) policy, community development schemes will be decided in consultation with local communities and may be facilitated by involving district I local Government office.

- vi) Local people should be provided with community welfare Schemes i.e., draught relief programmes, educational programmes, and establishment of health units, veterinary/live stock care unit etc., which should benefit them and develop mutual trust. Sustainability of these facilities should be ensured.
- vii) Campsites will be located at least one kilometer away from any settlement to avoid disturbance to the local people.
- viii) No industrial or residential activity will be permitted on the land allocated for wind energy projects.
- ix) The project area will be restored to its original nature to the possible extent. For the purpose, documentation (Photographs) will be kept in record.
- x) The project shall be constructed in the prescribed time strictly as per schedule, which shall be submitted to this office at the start of construction activity.
- xi) Compensation will be provided to the inhabitants in case of loss of agriculture land, crop property, etc., in accordance with the rates, that are agreed upon.
- .ii) The proponent shall ensure facilitation to the EPA officer(s)/official(s) for the regular inspections to verify the compliance of the PEP Act, Rules and Regulations framed there under and the conditions contained in this approval.
- .iii) The proponent shall appoint an Independent Monitoring Consultant (IMC) whose responsibility shall be to monitor the project activities. The IMC shall ensure that the activities at project site are undertaken in environment friendly manner and the

mitigation measures are implemented as per the recommendations of IEE. The report shall include pollutants measurement and analysis reports along with photographic records showing therein the environmental conditions at site during the construction and operation stages of project. The proponent shall be liable to submit monthly environmental monitoring reports to EPA Sindh.

6. This approval shall be treated cancelled if any of the conditions, mentioned in pars-5 above is violated. In follow up of the cancellation of this approval prosecution under the provision of Sindh Environmental Protection Act, 2014 will be initiated against the proponent.
7. This approval does not absolve the proponent of the duty to obtain any other approval or consent that may be required under any other law in force.
8. The IEE report is meant only for proposed activities described in IEE only. Proponent should submit separate approval required under regulations, along with site specific Environment Management Plan for any consequent and subsequent activity for approval of EPA, Sindh.



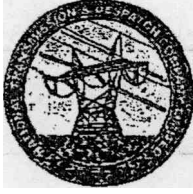
Muhammad Imran Sabir  
Deputy Director (Technical-II)  
For. Director General

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## I Study Approval Annexure

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# NATIONAL TRANSMISSION & DESPATCH CO LTD

General Manager Power System Planning, NTDC

No. GMPSP/CETP/TRP-38°A9 73 7...0

Dated: 25-09-2018

Chief Technical Officer CPPA(G) Ltd.  
Ground Floor, ENERCON Building,  
Seera 0-92, istainabad.

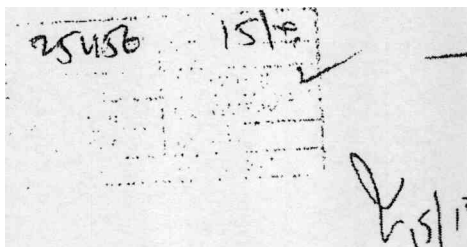
**Sub: Approval of Grid Interconnection Study Report of 25 MW Moro Wind Power Project at Jhimpir, District Thatta by M/s Moro Power Company (Pvt.) Limited.**

Ref: — CPPA(G) letter No. Tech/DGM41/MT WMPCPLI24330-32-d-ated-2-7--08-201-8.

This office received the final grid interconnection study report of the subject 25 MW Wind Power Project (WPP) vide, above referred letter. After the review of the report, it was found that some corrections in the studies were needed which were communicated to M/s Power Planners International (PPI) during a meeting held in this office. Afterwards, M/s PPI re-submitted the said report by incorporating our comments on 24-09-2018. Therefore, the grid interconnection study report of 25 MW Moro Wind Power Project by M/s Moro Power Company (Pvt.) Limited is approved at NTDC end as per assumptions and study results and recommendations presented in the report. The 25 MW Moro Wind Power Project is also an important pre-requisite for the induction of the subject 25 WPP as mentioned in the subject GIS report.

It is intimated that the subject report has been approved only for the interconnectivity aspects of the subject power plant. The consent of power evacuation arrangement for the subject WPP cannot be given at this stage. Any commitment regarding induction of the subject 25 MW WPP and/or for any other purpose should be discussed with/decided by CPPA-G and relevant stakeholders

It is added that during EPA, if there is any major change in the parameters of the subject WPP as used in the interconnection study, and/or any change in the upcoming generation/transmission plan in the vicinity of the subject power plant, then the relevant studies will have to be revised.



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(Engr. Dr. Khawaja Riffat Hassan)  
General Manager Power System Planning

Cc:

M/s Moro Power Company (Pvt.) Limited, Mezzanine Floor, M2, 4C Lane 12, Khayaban-e-Ittehad, Phase-H Ext., DHA, Karachi.

Mr's PPI, 65-1-1/2, WAPDA Town, Lahore, Pakistan. (Fax: 042-35183166)

Master File

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## National Electric Power Regulatory Authority Islamic Republic of Pakistan

NEPRA Tower, Attaturk Avenue (East) G-5/1, Islatilabad

Phone: 9206500, Fax: 2600026

Website: [www.nepra.org.pk](http://www.nepra.org.pk), Email: [info@nepra.org.pk](mailto:info@nepra.org.pk)

OFFICE OF THE  
REGISTRAR

No. NEPRA/R/LAG-436/ E062(

September 28, 2018

Mr. Must. a Abdullah

Authorized Person

oro orn (Pvt) Limited

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Phase 2 ension DHA

Karachi

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Subject: APPLICATION OF MORO POWER COMPANY (PRIVATE) LIMITED FOR GRANT OF GENERATION LICENCE IN RESPECT OF ITS 25.0MW WIND POWER PLANT AT DISTRICT THATTA, SINDHI

Moro Power Company (Private) Limited (MPCPL) has submitted an application for grant of generation licence for its proposed 25.0 MW Wind Power Plant at Thimpir, District Thatta, Sindh. The salient features of the application of MPCPL have appeared in the newspapers on, September 28, 2018 (copies attached). The application filed by MPCPL is available on NEPRA website [www.nepra.org.pk/news.htm](http://www.nepra.org.pk/news.htm)

2. This is for your information.

● End: As above

ftikhar Ali Khan  
Director  
Registrar Off

28-05-2018

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All stakeholders, d/affected person' and the general public are notified that the Authority has admitted the application of Moro Power Company (Private) Limited (MPCPL) for consideration of grant of generation licence for its proposed wind power plant

Brief of prospectus including salient features of the application is as under:-

#### 1. Introduction of Applicant:

MPCPL is a private limited Company incorporated on January 16, 2015 vide Corporate Universal identification No. 0091537 under section.32 of the Companies Act, 1984 (XLVII of 1984). The Business Office of the company. is 4C, M-1, Ittehad Lane 12, Phase II EA, DHA Karachi. According to Memorandum of Association, the objects of the company; inter alia, include business of generation of electric power.

#### Plant Details:

Type. of Generation Facility:	Wind Power Plant
Location::	Jhimpir, District Thatta, Sindh
Installed Capacity:	25,0 MW
Auxiliary Consumption:	0.5%.
No. of Units/Size of each Unit:	5 x 3.2 MW + 3 x 3.0 MW
Wind Turbine Make and Model:	MYSE 3,0 MW and MYSE.3:2 MW (Ming Yang)
Expected COD:	September 2020
Proposed interconnection Arrangement:	Moro Wind Power Plant would be connected by a 13km double circuit of 132kV to Jhimpir-I Grid Station.

#### Project Cost:

total-Project Cost:	USD	35.0 Million
Debt (80%);	USD	28.0 Million
Equity (20%):	USD	07.0 Million

MPCPL has proposed to sell electric power generated from its above mentioned generation facility to CPPA-G.

All stakeholders, interested/affected persons and the general public are invited to submit their comments in favour / or against the grant of generation licence to MPCPL. The comments shall be submitted to the office of the Registrar (NEPRA), Within a period of Fourteen (14) days from the date of this publication. The application along with all submitted documents filed by MPCPL is available on website of NEPRA. Le: [www.nepra.org.pk/news.htm](http://www.nepra.org.pk/news.htm). For any further clarification contact on the addresses follows:

PI 1428/18

رجسٹرڈ آفیسر انچارج ایڈمنسٹریشن (ایسٹ) اسلام آباد  
office@nepra.org.pk 26 00 06

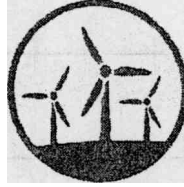
Admission of application for grant of Generation Licence is not to be construed as approval of Licence by NEPRA.

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**PAR Approval (Annexure-VI)**

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## MORO POWER COMPANY (PVT.) LTD.

### Electricity Generation Using Wind As Fuel

Ref: 00101/0125/18

1<sup>st</sup> October 2018

**The Manager Director**  
**National Transmission and Dispatch Company (NTDC)**  
**4<sup>th</sup> Floor, PIA Tower, Egerton Road, Lahore**

**Subject:** Request for Issuance of "Certificate" Confirming Evacuation of Power —25 MW Moro Wind Power Project at Jhimpir, District Thatta, Sindh

Dear Sir,

We write to you in connection with 25 MW Moro Wind Power Project at Jhimpir, District Thatta, Sindh being undertaken by M/s Moro Power Company (Pvt.) Limited. The Project Company has got the approval of the Grid Interconnection Study (GIS) from NTDC vide its Letter No. GMPSP/CETPTIRP-380/5973-75 dated 25-09-2018 (after paying Rs.1 .0 million to NTDC as vetting fee).

Company now intends to apply for Tariff, for which it requires a Power Evacuation Certification. It is intimated that the Project has fulfilled all requirements to immediately apply for the Tariff and now urgently requires the "Certificate" from NTDC.

In view of all above, the NTDC is kindly requested to issue the Certificate, so that the Project continues to maintain h:F. ast pace of development and proceeds towards achievement of financial close.

Best Regards

**MUSTAFA ABDULLAH**

CEO-Moro Power Company (Pvt.) Ltd.

PS: The wind tariff awarded by NEPRA to two wind projects in Jhimpir in August is US cents 4.42-4.44/Kwh compared to current average electricity tariff of Pakistan Rs. 15.5 / Kwh. Wind projects save in import of expensive coal and LNG fuels.

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Lenders Term Sheet (Annexure-V3i

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CHINA MINSHENG BANK 112,10111

## Letter of Interest

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TO: MORO POWER COMPANY (PVT.) LTD. (IEEE)

CC: IDEA Xinjiang Sunoasis Co., LTD.

Dear Sirs:

This refers to your application for a Letter of Interest from China Minsheng Banking Corporation Limited "CMBC" for providing financing for 25MW WIND POWER PROJECT IN JHIMPIR, SINDH, PAKISTAN ("Project").

After reviewing the preliminary information of the Project, we hereby, on behalf of CMBC, sincerely express our interest in financing the Project.

China Minsheng Banking Corp., Ltd., a limited liability company incorporated under the laws of the People Republic of China. The total asset of CMBC is about \$1.2 trillion.

However, this Letter of Interest is neither legally binding nor constitutes any financial commitment but only for your commercial negotiation at the early stage. CMBC's financial support may not be available until all the conditions and requirements are satisfied in accordance with our policy and regulations,

This Letter of Interest is valid until July 31, 2019.

If you have any questions or further requests, please contact us without any delay.

Yours truly,

Zhang Wenchao  
Executive General Manager of Global  
Finance  
Industrial and Commercial Bank of China  
Ltd.

Ren Jinfeng  
Head of Global Finance Department  
China Minsheng Bank Corp., Ltd.



**TBEA 185111111**  
Equip China Powering the world

TBEA XINJIANG SUNOASIS CO., LTO,  
Address: No. 399 Sowtil Changcripi Road, Urumqi, Xinjiang, China  
Pin Code: 830011 <http://www.tbenergy.com>  
TEL: +86(0991)3872515 FM: +86(0991)3872515  
HcOine: +86-400.669.4866

## SUMMARY OF TERMS AND CONDITIONS

The following Summary of Terms and Conditions (the "Terms Sheet") provides the indicative terms and conditions to form the basis of discussions for this facility. This Term Sheet is not meant to be, nor should it be construed as a commitment by **TBEA**, this term sheet should only be valid under the condition of Sinosure insurance coverage.

Purpose:	Proceeds of the Facility shall be used by the Obligor for the 25MW Wind Power Project in Jhimpir, Pakistan ( "the Project").
Obligor:	Moro Power Company (Pvt.) Ltd (MPCL)
Guarantor:	Corporate Guarantee from Parent company subject to acceptance by the Lenders and Sinosure. It is Optional for the Obligor to provide other kinds of Guarantee which is acceptable to the Lenders and Sinosure.
Lender:	Industrial and Commercial Bank of China Limited (ICBC) China Minsheng Banking Corporation (CMBC)
Contractor:	TBEA Xinjiang Sunoasis Co. LTD.
Contract Price:	Refer to the commercial proposal
Insurance:	China Export and Credit Insurance Corporation ("Sinosure") provide insurance covering 95% political risk and 95% commercial risk.
Currency:	USD
Facility Amount:	an amount not exceeding 85% of the EPC Contract Price
Tenor:	The Facility may have a total duration of fifteen (15) years.
Availability Period:	The Facility shall become available for drawdown upon the signing of documentation acceptable to all parties (the "Facility Documents") and compliance with all conditions precedent relating thereto and shall remain available for drawdown for a period of one (1) year thereafter. Any undrawn balance at the expiry of the Availability Period shall be canceled.

**TBEA**

Equip China Powering the world

TBEA XINJIANG SUNOASIS CO, LTO,

Address: No. 399 South Changchun Road, Ltrunql, Xinpang, China

Pin Code: 830011

<http://AwAv.tbce.net/intr..ort>

TEL: +86(0991)3572515

FAX: +86(0991)3872515

IETANE: \*80400,669411166

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**TBEA 1851431**  
Equip China Powering the world

**TBEA XINJIANG SUNQASIS CO LTO,**  
Address: No. 399 South Charvaitin ROM Urumqi, Xinjiang, China  
Pin Code: 830011  
TEL: +86(0901)3672515  
Hotline: +86(0901)3672515  
FAX: +86(0991)3672515  
http://www.tbea.com.cn

Disbursement	Disbursement of advances shall be made directly to the Contractor on the Obligor's behalf.
Repayment:	<p>The Loan shall be repaid in twenty-eight (28) equal semi-annual consecutive installments for a total repayment period of fourteen (14) years.</p> <p>"First Repayment Date" means the first 20th June or 20th December that occurs after the Term Date.</p> <p>"Repayment Date" means each date for the repayment of a Repayment Installment, being the First Repayment Date and each date falling every 6 months after the First Repayment Date to and including the Final Repayment Date.</p>
Final Repayment Date:	The date following fifteen (15) years from the date of the Facility Agreement.
Interest Period:	Interest shall be paid on a bi-annual basis from the commencement date of the Availability Period, being 20th June and 20th December of each year.
Interest Margin:	4.5% per annum
Interest Rate:	6-Month LIBOR plus Interest Margin
Management Fee:	1% flat on the Facility Amount payable to the Lender within a period of sixty (60) days after the Signing Date.
Commitment Fee:	A commitment fee of 1% per annum is payable in arrears on the Facility Amount that is undrawn and not canceled on the last day of each Interest Period during the Availability Period, and if a portion or all of the Facility Amount is canceled, on such canceled amount at the date the cancellation is effective.
Insurance Premium:	At the discretion of Sinasure, an insurance premium is payable up front in lump sum and calculated on the Facility Amount plus the estimated interest. Any Insurance Premium incurred pursuant to the Facility shall be borne by Obligor.
Conditions Precedent:	All conditions precedent to be in form and substance satisfactory to the Lender, acting reasonably. Conditions precedent shall include conditions precedent not limited to:

**TE3EA NEU I**  
**Equip China Powering the world**

**TSEA XINJIANG SUN 1ASIS CO., LTD,**  
 At:Wass:No 399 South Changodon Road Urumqi MIA/1g China  
 Pin Code 830tH I  
 TEL +80(099 1 )36725)5  
 tiodfda:45408-669-6366  
 httrliwW.theitanergY-PPra  
 FAX +86(0991)302518

Duly executed contract for the development of the Project and the Facility Documents;

Legal opinions issued by qualified solicitors in the relevant jurisdictions who are approved by the Lenders and Obligor;

- c. The Insurance Policy issued by Sinasure shall cover 95% of political risk & 95% of commercial risk of the facility amount plus the estimated interest;
- d. An assessment of the creditworthiness of the Project, Borrower and Guarantor by Sinasure, and their receipt and acceptance of reports from independent third parties in respect of due diligence and compliance with base case and downside case debt service coverage ratios in respect of the agreed Project financial model; and
- e. Others may be required by the lender.

**Other Conditions:** Standard Facility documentation satisfactory to all parties incorporating provisions currently standard for facilities of this nature, including but not limited to representations and warranties, undertakings, events of default (including cross default), illegality, severability, assignment, indemnities, waiver of immunity, increased cost, negative pledge and security.

**Governing Law:** English Law

**Jurisdiction:** The London Court of International Arbitration (LCIA )

**Taxes:** All payments shall be made net of any tax, duty, withholding tax or deductions of whatever nature. If any deduction is required, the Obligor shall pay an additional amount necessary to ensure that the recipients receive an amount equal to what they would otherwise have received if no such deductions had been made.

**Costs and Expenses:** All costs and expenses incurred by Lenders in relation to the Facility (except transaction related travel) shall be on account of the Obligor.

**Credit Committee Approvals:** Our firm, final and unconditional commitments to underwrite the above mentioned facility is conditional on satisfaction of the following conditions:

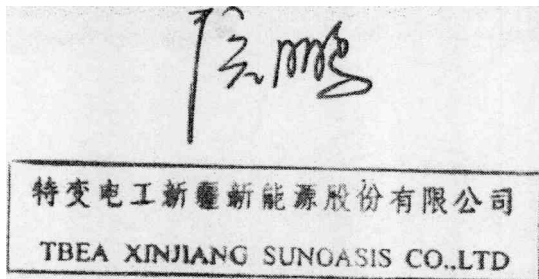
- (i) Signed EPC contract;
- (ii) No material adverse change affecting the Obligor and/or Guarantor and/or the international financial markets;
- (iii) Satisfactory due diligence of all relevant information and documentation; (including financial statements for the latest

**TEIElli QT**  
EquipChino Powering tho w Of Id

**TBEA XINJIANG SUNOAS\$18 CO, LTO.**  
Acorns No 399 South Changchun Road, Urumqi Xinjiang, prima  
Pin Code noon ritlopiAnv tosoenergy.OOM  
TEL +8e(0991)3872515 FAX +88(0991 )34312515  
Flottire +86 400-6694866

- three years, feasibility study report(s) and other documentation  
to be agreed pursuant to the Facility Documents)
- (iv) approval by our relevant credit committee;
  - (v) approval by Sinosure.

Validity: This offer remains valid for 6 months after issuance.





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Wind Powe	sessment	V4:
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**EPC Contracts Executed (Annexure-IX**

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independentConsultant Evaluation report

Selection as per guicielit es or select

Contracttr 201 t exure-X)

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Tariff      ii      ion Fee/Bank Draft in      of

Registrar **NEPRA** (Annexure-X

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JSBANK

JS Bank Limited  
DHA Phase V111 Branch Karachi-9131



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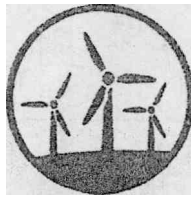




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Board Resolution (Annexure-X1)

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# MORO POWER COMPANY (P L) Lin

## Electricity Generation Using Wind As FLIC:

Reference: **NEPRA/008/2/2019**

15<sup>th</sup> February, 2015

Extracts from the Minutes of Board of Directors Meeting of M/s. Moro Power Company (Pvt.) Limited ("Company") held on dated 14<sup>th</sup> February, 2019 at M/s. Moro Power Company (Pvt.) Limited. Head office: 4C, M-2, Ittehad Lane 12, Phase II Ext., DHA Karachi.

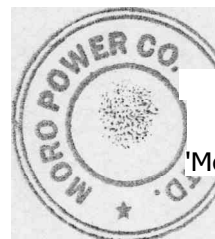
### RESOLUTION

RESOLVED that the Company be and is hereby authorized to file a tariff petition (including any review petitions and any motion for review) to National Electric Power Regulatory Authority for determination of the reference generation tariff in respect of the 25 MW wind power plant of the Company ("Project") and in relation thereto to enter into and execute all required documents, make all filing and pay all applicable fees, of any nature what so ever".

FURTHER RESOLVED THAT in respect of filling a tariff petition including any review petitions and any motion for review for submission to National Electric Power Regulatory Authority, Mr. Mustafa Abdullah he and is hereby authorized and empowered for and on behalf of the Company to:

Review, execute, submit, and deliver the tariff petition (including any review petitions and any motion for leave for review) and any related documentation required by NATIONAL POWER REGULATORY AUTHORITY for the determination of the reference generation tariff, including any contracts, documents, power of attorney, affidavits, statements letters forms, applications, deeds, guarantees, undertakings, approvals, memoranda, amendments, letters, communications, notices, certificates, requests, statements and any other instruments of any nature what so ever.

- (ii) Represent the Company in all negotiations, representations, presentations, hearings, conferences and meetings of any nature what so ever with any entity (including in no manner limited to **NATIONAL POWER REGULATORY AUTHORITY** and private parties, companies, partnerships, individual governmental and /or semi governmental authorities and or any other entity of any nature whatsoever):



MAIRAJ KHAWAJA  
Company Secretary  
Moro Power Company (Pvt.) Ltd.

=====

EM Equipment Certificate Letter. Annexure-XIII)

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**OEM Equipment Quality Certificate letter. (Annexure-XIV)**  
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# Statement of Compliance for the A - Design Assessment

STC — 180501, Rev. 0

This statement of compliance is issued to Acciona Windpower, S.A.

Poligono Industrial Barasoain, Parcela 2.  
31395 Barasoain (Navarra)  
Spain

for the wind turbine

**AW 132/3300 IEC IIB T84 AW64.7-2 50/60 Hz**

This statement of compliance attests compliance with

GL 2010

Germanischer Lloyd, "Guideline for the Certification of Wind Turbines",  
Edition 2010  
- WT Class IIB

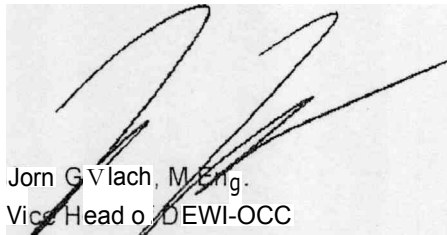
concerning the design. It is based on the evaluation reports listed on page 2 of this statement.

The conformity evaluation was carried out according to Germanischer Lloyd, "Guideline for the Certification of Wind Turbines", Edition 2010.

The main wind turbine characteristics are specified in the annex of this statement of compliance.

Any change in the design is to be approved by DEWI-Occ. Without approval, this statement loses its validity.

Cuxhaven, 2018-05-31

A large, stylized handwritten signature in black ink, appearing to read "J. Vlach".

Jorn G. Vlach, M.Eng.  
Vice Head of DEWI-Occ  
Certification Body for Wind Turbines

## Statement of Compliance for the A - Design Assessment

This statement of compliance STC — 180501, Rev. 0 is based on the following reference documents:

R12147300-1	Load Assumptions	DEWI-OCC, Rev. 0, 2018-02-28
R12147300-2	Safety System and Manuals	DEWI-OCC, Rev. 0, 2018-05-28
R12147300-3	Rotor Blade	DEWI-OCC, Rev. 0, 2018-05-28
R12147300-4	Machinery Components	DEWI-OCC, Rev. 0, 2018-05-25
CR-ADA-GL-IV-1-03508-0	Nacelle Cover	DNV GL, Rev. 0, 2018-04-18
R11990243-4n	Spinner	DEWI-OCC, Rev. 0, 2018-02-26
R12147300-5	Tower	DEWI-OCC, Rev. 0, 2018-05-24
R12147300-5a	Tower	DEWI-OCC, Rev. 0, 2018-05-29
R12147300-6	Electrical System	DEWI-OCC, Rev. 0, 2018-05-23
R11283167-8	Witness Commissioning	DEWI-OCC, Rev. 0, 2016-10-26



## Annex - Wind Turbine Characteristics

### I. General

Manufacturer	Acciona Windpower, S.A. Poligono Industrial Barasoain, Parcela 2 31395 Barasoain (Navarra) Spain
Wind turbine type designation	AW 132/3300 IEC IIB T84 AW64.7-2 50/60 Hz
Type	Horizontal axis wind turbine with variable rotor speed
Wind turbine (generator system) class	II B ""
Design lifetime	20 years
Rated power	3300 kW
Rotor diameter	132 m
Number of blades	3
Power regulation	Pitch
Rated rotational speed	12.35 rpm
Operating range rotational speed	7.00 —14.05 rpm
Hub height	84 m
Rotor type	Upwind
Rotating direction	Clockwise
Cone angle	-5 deg
Tilt angle	5 deg
<i>Electrical network conditions</i>	
Normal supply voltage and range	12kV
Normal supply voltage frequency	50 / 60 Hz
<i>Wind conditions</i>	
50-year reference wind speed (Vref)	42.5 m/s
50-year extreme wind speed (V <sub>e50</sub> )	59.5 m/s
Annual average wind speed (Vave)	8.5 m/s
Characteristic turbulence intensity 115 at v <sub>hub</sub> = 15 m/s	16%
Cut-in wind speed	3 m/s
Rated wind speed	9.6 m/s
Cut-out wind speed (10 min mean)	25 m/s

\*\* Loads acc. to IEC 61400-1:1999-02 ed2.0, "Wind turbines — Part1: Safety requirements", modified February 2004

## II. Main Components

<i>Rotor blade</i>		
	Supplier	Acciona Windpower S.A.
	Type	AW64.7-2
	Blade length	64.7 m
	Material	Glass fiber reinforced epoxy resin
<i>Pitch system</i>		
Pitch cylinder		
Option I		
	Supplier	GLUAL
	Type	Three independent hydraulic pitch system
	Drawing No.	FCE000671
Option II		
	Supplier	GLUAL
	Type	Three independent hydraulic pitch system
	Drawing No.	FCE002214
Option III		
	Supplier	HINE
	Type	Three independent hydraulic pitch system •
	Drawing No.	HR000442
Option IV		
	Supplier	Fluitechnik
	Type	Three independent hydraulic pitch system
	Drawing No.	PL01350
Pitch bearings		
Option I		
	Supplier	Thyssenkrupp Rothe Erde GmbH
	Type	Ball bearing slewing ring
	Drawing No.	090.75.2452.000.49.141D Rev. B
Option II		
	Supplier	Laulagun
	Type	Double row ball bearing
	Drawing No.	F2735MOODST0125VVM Rev. 7

**DEWI-OCC Offshore and  
Certification Centre GmbH  
Am Seedeich 9, D-27472 Cuxhaven**

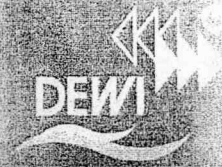
**d1LeCC  
DEWI<sup>WF</sup>**

<i>Hub</i>		
	Drawing-No.	1051571 Rev. 4
	Material	EN GJS 400 18 LT
<i>Rotor shaft</i>		
Option I		
	Drawing-No.	1053083 Rev. 3
	Material	42CrMo4
Option II		
	Drawing-No.	1068449 Rev. 1
	Material	42CrMo4
<i>Main bearings</i>		
Option I		
	Supplier	KOYO
	Type	Front: 240/900RHA, Rear: 231/630RHA
Option II		
	Supplier	SKF
	Type	Front: 240/900 ECA/CNLW33, Rear: 231/630 CA/CNLW33
Option III		
	Supplier	Schaeffler
	Type	Front: F-614596.PRL-WPOS , Rear: F-614595.PRL-WPOS
<i>Main bearing housings</i>		
	Drawing-No.	1011176 Rev. N (Front Bearing Housing) 1006984 Rev. P (Rear Bearing Housing)
	Material	EN GJS 400 18 LT
<i>Gearbox</i>		
	Supplier	Flender GmbH
	Type	PZAB 3500
	Ratio	i=97.2 (50Hz) and i=116.6 (60Hz)
<i>Gearbox supports</i>		
Option I		
	Supplier	ESM
	Drawing-No.	ML06 014 06 Rev. a
Option II		
	Supplier	TMT
	Drawing-No.	0100337 Rev. K

Main frame		
Drawing-No.	1017503 Rev. J	
Material	EN GJS 400 18 LT	
Generator frame		
Drawing-No.	1019056 Rev. I	
Material	S275 J2	
Mechanical brakes and locking devices		
Mechanical brakes		
Option I		
Supplier	ANTEC	
Type	HE-1-75-Z	
Option II		
Supplier	Frenos Iruna	
Type	C75	
Rotor lock		
Rotor Lock Pin		
Drawing-No.	1011056 Rev. G	
Material	34CrNiMo6	
Rotor Locking Sector		
Drawing-No.	1020514 Rev. A	
Material	S355JR	
Couplings		
LSS shrink disc — rotor side		
Option I		
Supplier	TAS-Schafer	
Type	SHS-750	
Option II		
Supplier	Tollok	
Type	TLK 681 750x1200	
Option III		
Supplier	StOwe	
Type	HYD 750-12-7	
Option IV		
Supplier	StOwe	

Type	HSD-750-81-27
HSS speed shaft elastic coupling	
Supplier	KTR
Type	RADEX-N 220, 50 / 60HZ
<i>Yaw system</i>	
Yaw gearbox	
Option I	
Supplier	Bonfiglioli
Type	711T4F + BN100LB (3kW)
Option II	
Supplier	Brevini Power Transmission S.p.A.
Type	VDL2605FA/9024939/IEC-100-112
Yaw bearing	
Option I	
Supplier	Rothe Erde
Drawing-No.	091.45.2899.000.44.1522 Rev. F
Option II	
Supplier	Renogear SL
Drawing-No.	200.1/45.2905.001 Rev. C
Option III	
Supplier	Liebherr
Drawing-No.	KUD968VA802-900 Rev. 3
Option IV	
Supplier	Wafangdian Bearing Group Corp
Drawing-No.	FL-HSW2904D Rev. V4
Option V	
Supplier	Laulagun
Drawing-No.	F3196M2ODTTE125JE Rev. 7
<i>Tower</i>	
Option I	
Supplier	Acciona Windpower S.A.
Type	Tubular steel tower
Drawing-No.	1104884 Rev. 1 & 1041356 Rev. 7
Option II	

Supplier	Acciona Windpower S.A.
Type	Tubular steel tower
Drawing-No.	1103657 Rev. 1
<i>Tower top flange</i>	
Drawing-No.	1041356 Rev. 2
Material	S355NL+Z25
<i>Generator</i>	
Option I (50 Hz)	
Supplier	Indar Electric, S.L.
Type	TAR630XA6IPN5ON
Option II (60 Hz)	
Supplier	Indar Electric, S.L.
Type	TAR630XA61B6ON
Option III (60 Hz)	
Supplier	Indar Electric, S.L.
Type	TAR630XA6IN6ON
<i>Converter</i>	
Option I	
Supplier	Ingeteam
Type	Ingecon® Wind PT0085
Option II	
Supplier	ABB
Type	ACS800-67LC-2035/1125-7
<i>Lightning protection system</i>	
Lightning protection level] LPL I	



# Statement of Compliance for the A - Design Assessment

STC — 181209, Rev. 1

This statement of compliance is issued to Nordex Energy Spain, S.A.U.

Poligono Industrial Barasoain, Parcela 2  
31395 Barasoain (Navarra)  
Spain

for the wind turbine

AW 132/3465 IEC S T84 AW64.7-2 50/60 Hz

This statement of compliance attests compliance with

GL 2010

Germanischer Lloyd, "Guideline for the Certification of Wind Turbines",  
Edition 2010  
- WT Class S

concerning the design. It is based on the evaluation reports listed on page 2 of this statement.

The conformity evaluation was carried out according to Germanischer Lloyd, "Guideline for the Certification of Wind Turbines", Edition 2010.

The main wind turbine characteristics are specified in the annex of this statement of compliance.

Any change in the design is to be approved by DEWI-OCC. Without approval, this statement loses its validity.

Cuxhaven, 2019-01-10

A handwritten signature in black ink, appearing to be "Jörn G. Bch, M.", is written over a light gray rectangular background.

Jörn G. Bch, M /  
Vice head of j f I-OCC  
Certification Body for Wind Turbines

## Statement of Compliance for the A - Design Assessment

This statement of compliance STC — 181209, Rev. 1 is based on the following reference documents:

R12624672-1	Load Assumptions and Control and Safety Concept	DEWI-OCC, Rev. 0, 2018-12-12
R12624672-2	Safety Systems and Manuals	DEWI-OCC, Rev. 0, 2018-12-19
R11654404-3	Rotor Blade	DEWI-OCC, Rev. 4, 2018-12-17
R12624672-4	Machinery Components and Nacelle Cover and Spinners	DEWI-OCC, Rev. 1, 2019-01-09
<b>R12624672-5a</b>	Tower	DEWI-OCC, Rev. 0, 2018-12-19
R12624672-5b	Tcwer	DEWI-OCC, Rev. 0, 2018-12-19
R12606905-6	Electrical System	DEWI-OCC, Rev. 0, 2018-12-15
CR-DE-GL-IV-1-00918-4	Commissioning Witnessing	DNV-GL, Rev. 4, 2017-0 —



## Annex - Wind Turbine Characteristics

### I. General

Designer	Nordex Energy Spain, S.A.U. Poligono Industrial Barasoain, Parcela 2. 31395 Barasoain (Navarra) Spain
Wind turbine type designation	AW132/3465 IEC S T84 AW64.7-2 50/60Hz
Type	Horizontal axis wind turbine with variable rotor speed
Wind turbine (generator system) class	S
Design lifetime	20 years
Rated power	3465 kW
Rotor diameter	132 m
Number of blades	3
Power regulation	Pitch controlled
Rated rotational speed	12.60 rpm
Operating range rotational speed	7.00 - 14.05 rpm
Hub height	84 m
Rotor type	Upwind
Rotating direction	Clockwise
Cone angle	-5°
Tilt angle	5°
<i>Electrical network conditions</i>	
Normal supply voltage and range	12kV
Normal supply voltage frequency and range	50 Hz / 60 Hz
<i>** Loads acc. to IEC 61400-1:1999-02 ed2.0, "Wind turbines — Part 1: Safety requirements", modified February 2004</i>	
<i>Wind conditions</i>	
50-year reference wind speed ( $v_{ref}$ )	42.5 m/s
50-year extreme wind speed ( $v_{e50}$ )	59.5 m/s
Annual average wind speed ( $v_{ave}$ )	8.5 m/s
Characteristic turbulence intensity 115 at $v_{hub} = 15$ m/s	0.16
Cut-in wind speed	3 m/s
Rated wind speed	9.9 m/s
Cut-out wind speed (10 min mean)	25 m/s

Mean air density		1.18 kg/m <sup>3</sup> (1.225 kg/m <sup>3</sup> for EWM and transport, assembly, maintenance and repair load cases)
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## II. Main Components

<i>Rotor blade</i>		
Designer	Nordex Energy Spain, S.A.U.	
Type	AW64.7-2	
Blade length	64.7 m	
Material	Glass fiber reinforced epoxy resin	
<i>Pitch system</i>		
Pitch gearbox / cylinder		
Supplier	GLUAL	
Type	Three independent hydraulic pitch system	
Drawing No.	FCE000671	
	Or	
	FCE002214	
Supplier	HINE	
Type	Three independent hydraulic pitch system	
Drawing No.	HR000442	
Supplier	Fluitechnik	
Type	Three independent hydraulic pitch system	
Drawing No.	PL01350	
Pitch bearings		
Supplier	Thyssenkrupp Rothe Erde GmbH	
Type	Ball Bearing Slewing Ring	
Drawing-No.	090.75.2452.000.49.141 D Rev. C	
Supplier	Laulagun	
Type	Double row ball bearing	
Drawing-No.	F2735MOODST0125WM Rev. 8	
<i>Hub</i>		
Supplier	Nordex Energy Spain, S.A.U.	
Drawing-No.	1051571 Rev. 5	
Material	EN GJS 400 18 LT	

Rotor shaft		
Supplier	Nordex Energy Spain, S.A.U.	
Drawing-No.	1068449 Rev. A	
Material	42CrMo4	
Main bearings		
Supplier	KOYO	
Type	Front: 240/900RHA, Rear: 231/630RHA	
Supplier	SKF	
Type	Front: 240/900 ECA/CNLW33, Rear: 231/630 CA/CNLW33	
Supplier	Schaeffler	
Type	Front : F-614596.PRL-WPOS , Rear: F-614595 PRL-WPOS	
Main bearing housings		
Supplier	Nordex Energy Spain, S.A.U.	
Drawing-No.	1011176 Rev. N (Front Bearing Housing - Machined) 1060575 Rev. B (Front Bearing Housing - Machined) 1060574 Rev. A (Front Bearing Housing - Casted) 1006984 Rev. P (Rear Bearing Housing - Machined)	
Material	EN-GJS-400-18-LT	
Gearbox		
Supplier	Flender GmbH	
Type	PZAB 3500	
Ratio	i=1:97.2 (50Hz) and i=1:116.6 (60Hz)	
Supplier	Moventas Gears Oy	
Type	PPLH 2900.2C	
Ratio	i=1:97 (50Hz) and i=1:116 (60Hz)	
Gearbox supports		
Supplier	ESM	
Drawing-No.	ML06 014 06 Rev. A	
Supplier	TMT	
Drawing-No.	0101003 Rev. B	
Main frame		
Drawing-No.	1017503 Rev. L	
Material	EN-GJS-400-18-LT	

<i>Generator frame</i>	
Drawing-No.	1019056, Rev. I
Material	S275 J2
<i>Mechanical brakes and locking devices</i>	
Mechanical brake	
Supplier	ANTEC
Type	HE-1-75-Z
Supplier	Frenos Iruna
Type	C75
Supplier	KTR
Type	KTR-STOP YAW XS
Rotor lock	
Rotor Lock Pin	
Drawing-No.	1011056 Rev. G
Material	34CrNiMo6
Rotor Locking Sector	
Drawing-No.	1020514 Rev. A
Material	S355JR
<i>Couplings</i>	
LSS shrink disc — rotor side	
Supplier	TAS-Schafer
Type	SHS-750
Supplier	Tollok
Type	TLK 681 750x1200
Supplier	StOwe
Type	HSD-750-81-27
HSS speed shaft elastic coupling	
Supplier	KTR
Type	RADEX-N 220, 50 / 60Hz
Supplier	JAURE
Type	ML-510-0-JFTL, 50 / 60 Hz

Yaw system		
Yaw gearbox		
Supplier	Bonfiglioli	
Type	711T4F + BN100LB (316./V)	
Ratio	1450:1	
No. of drives	6	
Yaw bearing		
Supplier	Rothe Erde	
Drawing No.	091.45.2899.000.44.1522 Rev. F	
Supplier	Rothe Erde	
Drawing No.	091.50.2900_00.190918.D Rev. D	
Supplier	Renogear SL	
Drawing No.	200.1/45.2905.001 Rev. C	
Supplier	Liebherr	
Drawing No.	KUD968VA802-900 Rev. 3	
Supplier	Laulagun	
Drawing No.	F3196M2ODTTE125JE Rev. 7	
Supplier	Laulagun	
Drawing No.	F3196M2ODTTE125UA Rev. 0	
Tower		
Designer	Nordex Energy Spain, S.A.U.	
Type	Tubular Steel Tower	
Drawing-No.	1103657 Rev. 1	
Designer	Nordex Energy Spain, S.A.U.	
Type	Tubular Steel Tower	
Drawing-No	1104884 Rev.2 & 1041356 Rev. 7 & 1100176 Rev. 1	
Tower top flange		
Drawing-No.	1041356 Rev. 2	
Material	S355NL+Z25	

<i>Generator (50/60 Hz)</i>		
	Supplier	Elin
	Type	HRL-071 Z06
	Supplier	Siemens AG
	Type	DFIG — JPRA-630LR-06A A5E53000333 Or A5E53000334 Or A5E53000332
<i>Converter</i>		
	Supplier	Ingeteam Power Technology S.A.
	Type	PT0085 Ingecon® Wind
<i>Lightning protection system</i>		
	Lightning protection level	LPL I

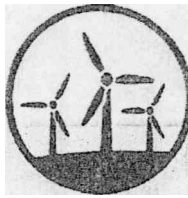
**S**

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v ' Equipment Undertaking by Project Company.

(Annexure-XV)

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**MORO POWER COMPANY (PVT.) LTD.**  
Electricity Generation Using Wind As Fuel

Date: 25<sup>th</sup> February, 2019

To  
Registrar NEPRA,  
Islamabad.

Subject: **CORPORATE UNDERTAKING**

It is hereby undertaken that;

1. Nordex-Acciona Wind Power will supply Wind Turbine Generator of model 2x AW125/3MW and 6x AW125/3.15MW with 87.5m tower height for the 25MW Moro Power Company Limited Wind Power Project located at Jhampir, Distt Thatta, Sindh, Pakistan.

2. The proposed WTGs will be new and comply with the latest IEC and NTDC standards/specifications (Grid Code Compliant) compliance further that the proposed Wind Plant and machinery platform has a proven Experience/track record with more than 4,203 WTGs (8,546 MW) installed and contracted worldwide of which the offered latest model AW3000 kW and AW3150kW accounting for 774 WTGs (2,330 MW).

**Regards**

**MU AFA B ULLAH**

CEO

Moro Power Company (Pvt.) Ltd.



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Affidavi / Power Attorney. (Annexure-XVI

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nice No. 82 G-14, Spanish Homes  
Karachi.

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S... Q. c...a, Attachd...  
Signature ...  
... FREE WILL & DIVORCE PURPOSE)

**SOVA**

BEFORE THE

NATIONAL ELECTRIC POWER REGULATORY ALIIHOR

in ITPTET4: ' ONE HUNDRED A V



**AFFIDAVIT**

(ti):1 \e °try Public

**AFFIDAVIT of MUSTAFA ABDULLAH S/o. AHMED ABDULLAH, Authorize. Representatd%of  
MIS. Moro Power Company (Pvt.) Limited. 4-C, M-1, Ittehad Lane 12, Pha iji 1, HA,  
Karachi, Pakistan.**

I the above named Deponent, do hereby solemnly affirm and declare that:-

1. I am the authorized representative of M/s. Moro Power Company (Pvt.) Limited. 4-C, M-1, Ittehad Lane 12, Phase II, Ext. DHA, Karachi, Pakistan.
2. The contents of the accompanying Tariff Petition for determination of Tariff i.e. 25 MW Wind Power Plant at Jhimpir, Sindh Pakistan Dated 22<sup>nd</sup> February 2019 including all supporting documents are true and correct to the best of my knowledge and belief, and nothing material or relevant there to has been concealed or withheld there from.
3. I also affirm that all further documentation and information to be provided by me in connection with the aforesaid Tariff Petition shall be true and correct to the best of my knowledge and belief.

# MORO (PVT) LIMITED EPC BID EVALUATION REPORT

Prepared by: Ws Aleph Systems (SMC-Pvt) Limited, 230 Chaklala-3,  
Rawalpindi, Pakistan



28 January 2019

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## 1. EXECUTIVE SUMMARY

MORO (Private) Limited ("**MORO**" and/or "**Project Company**") is a Pakistan based company with the sole objective of developing, financing , building and operating an approx. 50 MW wind power project in Pakistan ("**Project**"). The Project is being pursued under the terms of a Letter of Intent ("**L01**") issued by **Government of Sindh ("GoS") LOI No. DAE/Wind/63/2015/51 dated 01 March 2016**. The Project is being developed under the build-own-operate ("**BOO**") scheme, with non- recourse financing.

The Project is being developed on Debt: Equity ratio of 80%: 20%. United Bank Limited (UBL) is acting as the lead arranger for both foreign and local financing. The foreign portion is endeavored to have the Investment Corporation of Dubai (ICD) and Commonwealth Development Corporation (CDC).

The Project is being developed by MORO management. M/s Aleph Systems, Pakistan, is technical consultant for MORO and Mr. Munib is the legal consultant (Collectively referred as "Consultants"). MORO management has a proven track record of developing sustainable and profitable projects both locally and globally.

Wind market in Pakistan is quite developed now and with over 788 MW under operations, over 450 MW under construction and approximately 1200 MW under development clearly shows the confidence of the all the stake-holders in this sector. Almost all of these projects under development are in the process of selecting different models of wind turbines from the pool of manufacturers which are currently active in Pakistan, namely M/s Gamesa CorporaciOn Tecnologica, M/s General Electric, M/s Mingyang Ltd, M/s Nordex SE and M/s Vestas Wind Systems A/S and M/s Goldwind.

Management of the Project Company along with their consultants minutely evaluated the market and assessed all the available options for the Project. After detailed deliberation, it was decided to first shortlist wind turbine manufacturers based on a Wind Resource Assessment (WRA) study carried out by a renowned European consultant M/S Nayxa Energy Services and then invited EPC bidders to submit bids based on shortlisted turbine manufacturers. Mingyang and Nordex turbines were shortlisted after WRA Study.

In order to make the whole selection process competitive, efficient, effective and productive, Project Company decided not to invite any new turbine supplier not active or having no foothold in Pakistan. With support from consultants a detailed and well drafted Request for Proposal ("**RFP**") was prepared for soliciting EPC proposals. RFP was circulated to the following companies (collectively referred as "**Bidders**");

- Ming Yang
- Acciona/Nordex
- OES /Gamesa
- Caoyxi
- Dong Feng Electric
- Sany Group Company Limited
- Vestas
- Powerchina Xiebi Engineering Company

- - Powerchina Nuclear Engineering Company
  - Goldwind Co
  - CEDC; China Energy Engineering Co
  - CEEC; China Gezhouba Group Co
  - CRRC; Zhunzon Institute Co
  - HydroChina Huodong Engineering Co/Gamesa
  - CNYD; Shengyang Yaunda The. & Electrical Co

Bidding was done as per following schedule:

Activity	Date
Circulation of RFP/tender documents for bidding	03 August 2018
Pre-bid meeting with potential bidders	23 August 2018
Clarifications and issuance of addendum to potential bidders for extension of Bid Submission Date	01 October 2018
Submission of bids	23 October 2018
Hiring of consultant for independent EPC evaluation and selection process.	05 Nov 2018
Clarification on bids and adjustments for uniformity with RFP requirement.	08 November 2018 -- 14 December 2018
Final Evaluation of bids	27 December 2018
Identification of 1 <sup>st</sup> preferred bidder	07 January 2019
EPC Contract Term Sheet negotiations	10-23 January 2019
Execution of EPC Contract with 1 <sup>st</sup> preferred bidder	26 January 2019

Wind Turbine Manufacturers were given an option to either bid as lead EPC contractor or form a consortium with any reputable EPC contractor for the EPC work. In addition to the above, Project Company also kept in focus the bankability of the Wind Turbine in particular and EPC Contractor in general.

MORO conducted bid clarification meetings with the bidders before submission of bids. It is observed that Project Company adopted **two envelope** bidding procedure and all the Bidders submitted their detailed proposals in two sealed envelopes, (Technical and Financial Proposal) within the given timeframe.

After submission of the bids, the Project Company thoroughly evaluated the Technical Proposals. It is assessed that a detailed criteria bifurcated in various categories and sub-categories covering all the technical aspects was designed and marks were allocated to various options against each criteria. It is observed that evaluation criteria of Technical proposal consisted of the following broad categories;

- General EPC Contractor experience and capabilities;  
Design basis and method statements;  
WTG ranking, capabilities, components reliability, manufacturing and site suitability,  
Performance and Energy Yield,  
Civil works construction details;  
Electrical Bop equipment and works details;  
Performance Warranties (Availability, Power Curve, Latent and Serial Defects),  
EPC Contractor understanding of key HSE risks, QA/QC plans and project timeline  
schedule

Based on the technical evaluation of the proposals, Project Company shortlisted the following four companies as **"Preferred Bidders"** for Commercial and Financial Bid evaluation and negotiations: -

- Ming Yang/Power China  
Gamesa/Orient  
Acciona/TBEA  
Games/ Hydro China

Management of the Project Company reviewed the Commercial and Financial Bid proposals while keeping the following aspects;

- Technical, Financial and Commercial offering implications on the overall project;  
Commercial terms offered by bidders;  
Contractors submitted deviations from the requested specifications as per RfP and their monetary impact on the offered price;  
Construction and Operations & Maintenance strategy.

Proposals and allocated marks were reviewed in detail. Evaluation of proposals and marking are given in the Report.

TBEA Corporation along with Acciona/Nordex as WTG manufacturer was placed No. 1 on the ranking table of the Project.

NEPRA issued "Selection of Engineering, Procurement and Construction Contractor by Independent Power Producers Guidelines 2017" in May 2017 (**"NEPRA Guidelines"**) whereas MORO started the selection of Engineering, Procurement and Construction Contractor in 2016. However, that MORO has followed the procedure laid down in the NEPRA Guidelines and their selection procedure is aligned with the spirit of the NEPRA Guidelines.

Evaluation is being done and being thoroughly documented and in accordance with the international best practices.

## 2. SCOPE OF WORK OF INDEPENDENT CONSULTANT

The Scope of Work of Independent Consultant is as follows;

- a. Develop an evaluation report for NEPRA to present Project Company's compliance with NEPRA Selection of Engineering, Procurement and Construction Contractor by Independent Power Producers Guidelines 2017.
- b. Coordinate and work with NEPRA, if required, for any clarification required on its Guidelines.
- c. Assist the Project Company in coordinating with NEPRA to get the evaluation report accepted by the Authority.



### 3. INTRODUCTION

Moro (Private) Limited ("**MORO**" and/or "**Project Company**") is a Pakistan based company with the sole objective of developing, financing , building and operating an approx. 50 MW wind power project in Pakistan ("**Project**"). The Project is being pursued under the terms of a Letter of Intent ("**L01**") issued by **Government of Sindh ("GoS") LOI No. DAE/Wind/63/2015/51 dated 01 March 2016**. The Project is being developed under the build-own-operate ("**BOO**") scheme, with non- recourse financing and valid up to 11 July' 2020.

Sponsors of the Project were allotted 240 acres of land for the proposed Project, by LU department-GOS, which is well suited for the development of wind farm. It is located in the Jhimpir Wind Corridor ( in midst of other approved projects of EDGOS) on Super Highway between Karachi and Hyderabad, approximately 100 km away from Karachi, Sindh near Nooriabad on the National Highway.

In recent years, the development of wind power projects in Pakistan has reached maturity where numerous projects are in operations and many projects are either under construction or at an advanced stage of development. Due to these developments, EPC Contractors and Wind Turbine Suppliers have now established quite detailed templates of EPC proposals, which are also easy to review by the consultants.

Project Company solicited proposals from capable contractors for the Engineering, Procurement, and Construction (EPC) for the Project in 2018.

It was expected that the requested parties would accept the risk of encountering adverse ground conditions or environmental conditions at the Site (including wind data) and would be responsible for undertaking any further investigations and analysis of the area, if required for the execution of construction work.

Broadly Scope of Work of the EPC Contractor was comprised of the following:

- Design, engineering, manufacturing / procurement, testing, insurance, packing, shipping, transport, delivery to site, unloading on site storage area, reloading and transport from storage area to final installed position, installation, erection, testing after installation, commissioning, warranty, performance in accordance with the specified performance requirements and within the time schedule agreed upon in the Contract and Energy Purchase Agreement;
- Obtain and maintain all consents necessary to undertake the Project;
- Operate and maintain the plant during testing and commissioning, in accordance with the terms of the Energy Purchase Agreement;
- Operation & Maintenance for two (2) years
- Transfer the plant to the Project Company after successful commissioning and achievement of Commercial Operations as per provisions of the standardized Energy Purchase Agreement within the specified completion time;
- Fulfill warranty obligations in accordance with the contract.
- Apart from the Wind Turbines, the Project alai solicited the following work;
- All civil works such as:

- o site facilities, both temporary and permanent, site vehicles and Site safety and security
  - o access roads,
  - o crane pads,
  - o wind turbine foundations,
  - o All buildings (wind farm substation with control room and offices as well as domicile),
- All electrical works such as:
  - o 132 kV Substation,
  - o Internal electrical grid,
  - o Remote control system,
- Installation and commissioning of the project,  
Inspections, check-out, testing, commissioning and putting into service of all the Works including its initial operation.
- Training for Client's staff.
- Spare Parts:
- A list of Spares, required for the commissioning, operation and maintenance of the Project, as part of the EPC scope
- All special tools necessary for completion of the scope of Works.

#### 4. SUMMARY OF NEPRA'S GUIDELINES FOR THE SELECTION OF AN EPC CONTRACTOR BY AN IPP

In order to bring transparency in the selection of an EPC Contractor by a Project, NEPRA notified NEPRA (Selection of Engineering, Procurement and Construction Contractor by Independent Power Purchaser) Guidelines, 2017 on 19 May 2017 ("**Guidelines**"). These Guidelines shall be applicable to power projects being implemented under NEPRA Interim Power Procurement Regulations, 2005 and a Cost-Plus tariff.

Summary of NEPRA Guidelines is given below;

- Advertisements for the tendering process shall be widely circulated and published in four national newspapers and two international newspapers of repute; and on the website(s) of the company and the relevant agency; and on two international tendering websites.
- At least 15 working days shall be given to bidders for collection of documents following the date of the advertisement. The time required for submission of bids by the bidders shall be in conformity with the nature, scope and magnitude of the project (minimum of two months).
- For eligibility, a bidder shall be a firm, company or body corporate, a private or state-owned entity; or any combination of such entities in the form of a joint venture.
- A bidder shall not have a conflict of interest and any bidder having a conflict of interest shall be disqualified.

- A detailed Request for Proposal (RFP) document shall be prepared by the company calling for bids.
- The pre-qualification criteria shall be based on eligibility, history of non-performance, chronic litigation history, professional competence of staff and equipment, relevant experience and financial capability.
- The evaluation for pre-qualification shall be carried out by an independent consultant.
- At least two bidders must be pre-qualified for the tendering process to proceed.
- A single-stage two envelope bidding procedure shall be adopted for selection of the EPC contractor.
- Bids shall be a single package containing two packages; the "technical proposal" and "financial proposal".
- Technical proposal will be opened first and financial proposal will not be opened before the technical proposal is evaluated. The technical bid shall be evaluated by an independent consultant in the prescribed manner, assessing all the pre-set conditions.

After evaluation of the technical bid, financial bid shall be opened in the presence of authorized representatives of the pre-qualified bidders.

The scoring of both, technical and financial bid, shall be done by an independent consultant following the evaluation criteria.

- The winning bid shall be the bid having the highest combined ranking which shall comprise 40% of the technical score and 60% of the financial score.
- Price negotiation shall only be carried out with the winning bidder in open and transparent manner.

The written record of all activities relating to pre-qualification and the tendering process, including bid evaluation and EPC contract, shall be maintained by the company and made available to authority upon request.

## **EVALUATION CRITERIA**

### **PART [A] — Evaluation of Technical Bid (Total Score: 100)**

- (a) Contractor Experience and Capability (Score: 30):** Evaluation includes experience of executing similar projects, past performance, availability of necessary construction E&P, qualified and experienced personnel, continuity and availability of personnel for the project.
- (b) Design Experience and Capability (Score:10):** Evaluation is based on proven design experience with projects of comparable size, example of design procedure and methodology used for an EPC project in Pakistan, applicable experience of the key design staff.
- (c) Construction Planning and Methods (Score:20):** Evaluation includes well thought out management plan full filling the needs of the contract, technically simple yet effective and proven technology, selection of robust and balanced construction

equipment, work methodology and rate of construction, RCC construction method, sequencing and interfacing of civil works with equipment installations, suitable project site infrastructure plan and contingency plan.

- (d) Electrical and Mechanical Equipment (Score: 15):** Evaluation includes plant layout and suitability of proposed equipment, description of major electrical and mechanical equipment; procurement, delivery and transportation plan, training and O&M service plan.
- (e) Construction Schedule (Score: 20):** Evaluation includes realistic planning and sequencing of works, sufficient detail provided for review of schedule, identification of risk and allocation of float for risk areas, proposed means of mitigating delays in case of unforeseen events, technical feasibility and opportunities for early completion of project, capabilities for mitigation and management of risks to prevent delays and cost increases.
- (f) Health, Safety and Environment (Score: 5):** Evaluation includes demonstrating a corporate commitment to safety, proven solutions, safe working practices and culture, training and supervision. It also includes draft site-specific health and safety plan, acceptable safety statistic for at least one other hydropower project in Pakistan and demonstration of an understanding of key environmental risks.

#### **PART [B] — Evaluation of Financial Bid (Total Score: 100)**

- (a) Bid Price (Score: 70):** The bid price will be evaluated to determine the evaluated bid score using the criteria defined in the notes below.
- (b) Reasonableness of Pricing (Score: 5):** The pricing structure will be reviewed. Highest marks will be awarded to bidders with pricing consistent with the technical proposal.
- (c) Financial Strength (Score: 10):** Higher marks will be awarded for stronger balance sheet, greater financial resources, and larger annual turnover.
- (d) Conditions of Contract/Deliverables (Scores: 15):** Lower marks will be awarded for exceptions to the conditions of Contract/Deliverables specified in the RFP.

**Notes:** The evaluated bid score shall be obtained by adjusting the bid price as follows:

The bid price will be adjusted for correction of arithmetical errors. Price adjustments will be made to account for any quantifiable material nonconformities and work, services, facilities etc. The value of energy and capacity will be determined based on the plant performance/efficiency guaranteed in the bid. Differences in the scheduled completion for the COD will be valued. The value of cash flow proposed by the bidder will be determined by the discounting payments of present value as of the Contract commencement date. The cash flow shall include an allowance for interest during construction. The Evaluated Bid Price shall be obtained by the summation of the effect of the above factors. The lowest Evaluated Bid Price will be awarded and Evaluated Bid Score of 70 points. Other bids will be assigned points on a pro-rata basis as:

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## 5. TECHNICAL EVALUATION

### i. Overview of Tender Document

MORO management along with the input of its Consultants developed a detailed Request for Proposal ("RFP") for soliciting EPC proposals from renowned and international EPC Contractors and Wind Turbine Manufacturers.

Project Company provided site coordinates, soil conditions and topographic survey to the bidders providing them the requisite information about the Project Site. The soil conditions in Jhimpir area for different wind projects are similar and companies working in Pakistan who have worked on even one project have a good idea about the area and the site parameters.

The Project Site is easily accessible. Further, Project Company provided Project's Transportation (Logistic) study along with the RFP where Transportation (Logistic) study clearly states that track to the Site is reliable and feasible for heavy load.

Project Company also provided Grid Study and draft of a Standard Energy Purchase Agreement to be executed with CPPA(G) along with the RfP which provided the Bidders a fair idea about the requirements of the Off-taker thus they can provide most suitable and efficient machines for the Project.

Though RFP covered all the necessary information required to prepare a bid yet RFP provided a mechanism for seeking clarifications and additional information from the Project Company in case of any ambiguity or where RFP requires clarity.

Following is a summary of details when RFP was circulated;

- 1 The Bidder's Scope-of-Work was to;
  - Perform all works and provide all goods and services for the basic and detailed design and engineering, procurement, construction, manufacture, supply, erection, installation, and commissioning, testing, insuring, guaranteeing, operation and maintenance during the Warranty Period of the whole Project on a turnkey basis;
  - Supply major components of the Plant;
    - Act as an integrated supplier of multiple services;
    - Carrying out certain tests during the Warranty Period;
    - Operate and maintain the Project during testing period;
  - Provide operation and maintenance services from the "Taking Over Date" till the date of issuance of the Warranty Period Release Certificate (i.e. during the Warranty Period).

- 2 The Bidder was requested to offer optional services for providing non-recourse project financing (suppliers credit/export credit agencies ("ECA")/ banks/multi-laterals).
- 3 Project Company was responsible for the procurement of insurance for Marine Cargo, Contractor's All Risks, Third Party Liability and other insurances thus insurance cost was not a part of the Bid.
- 4 It was mandatory for the Bidder to procure all WTGs from one WTG Manufacturer in one bid.
- 5 Project Company reserved the right to;
  - a. Respond or not to respond, in whole or in part to any request for a clarification from any Bidder.
  - b. Amend the Tender Documents in writing at any time prior to the deadline for Bid submission. Such amendment to the Tender Documents was to be submitted in writing to all Bidders.
- 6 The Bid was to split into a;
  - a. Technical Proposal;
  - b. Commercial Proposal; and
  - c. The Bid was to remain valid until the expiry of the Proposal Validity Period i.e. a period of 365 days from the date of submission of bid.

It can be concluded that RFP covered all necessary aspects of a tender document and provided information to bidders to provide a meaningful bid for the project and clearly laid out the instructions to Bidders along with the timelines.

## ii. Introduction of Bidders and WTG Manufacturers

Brief introduction of Bidders and WTG Manufacturers is given below;

### **Power China Northwest Engineering:**

Established in 1950, Northwest Engineering Corporation Limited (Power China Northwest) is an important member enterprise of a Fortune Global 500 conglomerate Power China Corporation. After decades of business endeavouring, Power China Northwest has developed into an international (technology-based) engineering corporation, with the integrated capability of Engineering Design, EPC Contracting, and Investment & Operation. With distinctive features in leading technologies of comprehensive utilization of hybrid energy (water, solar, wind and geothermal energies), water eco-environment management, solar thermal power generation, waste disposal & utilization, urban utility tunnels, and regional socio-economic planning, Power China Northwest boasts the full range ability offering integrated engineering solutions for the clients.

POWER CHINA NORTHWEST has accomplished hydropower planning for more than 30 rivers, and performed the survey; investigation, and engineering design services for more than 140 large-or-medium-scale hydropower projects in China and abroad. More than 100

hydropower projects worldwide we participated in have been commissioned or under construction, with an aggregate capacity of 34 GW. The gross capacity of renewable energy projects designed by company ranks No. 1 in China (including 20 GW wind power projects, accounting for 14.7%, 4.5 GW solar PV power projects, accounting for 20%, No. 1 in China). Power China is capable of offering the planning, investigation, engineering design, consultancy and construction supervision services for complex pumped storage power plants.

**Gamesa Corporacion Tecnologica:**

Siemens Gamesa Renewable Energy formerly Grupo Auxiliar Metalurgico, is a Spanish manufacturing company principally involved in the fabrication of wind turbines and the construction of wind farms. It comes with 22 years of experience, with installed capacity of 34.6 GW in 53 countries, four product platforms, expertise in the entire value chain and 21 GW under O&M makes Gamesa one of main worldwide technological leaders. Gamesa claims supervision of the whole production process which involves design and manufacture of wind turbine critical components. The company has partnerships with global suppliers of components. For blades; Gamesa has partnered with LM, TECSIS and TPI, for Towers; Gamesa has partnered with Daniel Alonso, for Gearbox; Gamesa has partnered with ZF, Rexroth and Winergy and for generators; Gamesa has partnered with ABB. Gamesa has manufacturing center in Tianjin. It is the market leader in Spain and the fourth largest wind turbine manufacturer in the world (2011). In 2016, Siemens Wind and Gamesa merged their wind turbine businesses worldwide.

Orient Energy Systems Ltd is new in Wind Business and basically looks after business of M/s Siemens-Gamesa Turbines in Pakistan. Their business in last 20 years or so has been in gas & diesel generators, installation and O&M business for captive power industry.

**Hydro China Huadong Engineering Co., Ltd**

Hydro China Huadong Is the subsidiary of Power China Group. They are mainly involved in project construction, consulting, designing, facility manufacturing of power industry and ranks in "world top 500" and grade A enterprise in China.

For the past 60 years, Hydro China has installed hundreds of large, medium and small stations, over 230 generator units, total installed capacity more than ten million kW including over 300 MW Wind projects in Pakistan.

**TBEA Company Limited**

TBEA is an active participant in the three national strategy new industries of "high-end power transmission and transformation equipment manufacturing, renewable energy and new materials" and has successfully established as TBEA Company Limited (stock code 600089).

The Company actively practices the national strategy of "the Belt and Road initiative" and is devoted to sharing the advanced electricity construction experience of China with, the world. The Company has provided green technology and smart environment-friendly, stable and efficient energy equipment to more than 60 countries, including the United States, Russia, Brazil, Mongolia, Tajikistan, Kyrgyzstan, Pakistan, etc. and supplied the turnkey project and systematic solutions from survey to design, construction, installation and debugging and to training, operation and maintenance to promote the construction of

green and efficient power supply and grid, benefit the people of various countries and promote the economic development of local areas.

The business scope of TBEA covers over 70 countries and regions and over 20,000 employees are working for the Company. In 2015, the total capital of the whole company reached 88.7 billion RMB and the sales revenue was more than 50 billion RMB. The Company has built the only national level UHV transformer engineering technology research center, four national level engineering labs, five national level enterprise technology centers, post doctor research work stations and academicians work stations, which have formed a science and technology innovation platform where production, academy and research are integrated.

TBEA has completed 100 MW Quaid-e-Azam Solar project in Bahawalpur, Pakistan and a 50MW Solar Project in Gharo, Sindh, Pakistan as an EPC Contractor.

#### **Orient Energy System Pvt. Ltd**

It is one of the companies of the Orient Group which is an established Pakistani group having the staff strength of 2800+. It is specialized in sales, application engineering, project Management and most experience in the field of Power Generation having done the EPC of 300+ MW on the Gas Engines side. This is new company with no experience in Wind Project EPC.

#### **iv. Bid Opening**

The Bid was split into two parts;

a) Technical Proposal consisting of *inter alia* the following:

- i. Project Management and Contractor's Programme (Schedule 2, Anx 1 of the Technical Document)
- ii. Site organization and qualification and experience of the people to be posted at the Site (Proposed Resources, Schedule 2, Anx 3 of the Technical Document)
- iii. WTG Specification (Schedule 2, Anx 4 of the Technical Document)
- iv. Civil Works Specification and Design (Schedule 2, Anx 5 of the Technical Document)
- v. Electrical Infrastructure Works (Schedule 2, Anx 6 of the Technical Document)
- vi. SCADA Specification (Schedule 2, Anx 7 of the Technical Document)
- vii. Wind Farm Site certification and design life (Schedule 2, Anx 8 of the Technical Document)
- viii. Warranted Power Curve, Availability and EBOP Losses Tests (Schedule 2, Anx 9 of the Technical Document)
- ix. Health Safety and Environmental plan (Schedule 2, Anx 10 of the Technical Document)
- x. Quality Plan (Schedule 2, Anx 11 of the Technical Document)
- xi. Design Basis and Construction Method Statements (Schedule 2, Anx 12 of the Technical Document)
- xii. Principal Inspections and Tests (Schedule 2, Anx 13 of the Technical Document)



- xiii. Noise Guarantee and Tests (Schedule 2, Anx 14 of the Technical Document)
- xiv. Long Lead Items (Schedule 2, Anx 15 of the Technical Document)
- xv. Layout drawings and sketches with dimensions of equipment (Schedule 2, Anx 16 of the Technical Document)
- xvi. Training Plan and facilities offered(Schedule 2, Anx 17 of the Technical Document)
- xvii. List of spare parts and special tools (Schedule 2, Anx 18 of the Technical Document)
- xviii. Scope of the O&M Services during the Warranty & Post Warranty Period (Schedule 2, Anx 19 of the Technical Document).
- xix. Optional Works and Services provided by Contractor (Schedule 2, Anx 21 of the Technical Document)
- xx. Temporary and Permanent Facilities provided by Contractor (Schedule 2, Anx 23 of the Technical Document)

b) Commercial Proposal containing inter alia, the following:

- i. EPC and O&M Prices with complete break up and Payment Milestones (Schedule 2, Anx 2 of the Technical Document)
- ii. Mode of payment of the respective component of the Contract Price(Schedule 2, Anx 20 of the Technical Document)
- iii. Contractor's references (Schedule 2, Anx 22 of the Technical Document)
- iv. Contractor's last three years annual reports
- v. Documents, brochures, standards, catalogue, as applicable, in support of the scope of supply.

It is observed that Project Company adopted two-envelope bidding procedure and all the Bidders submitted their detailed proposals in two sealed envelopes, (Technical and Financial Proposal) within the given timeframe.

A clear mechanism was provided in RFP to the bidders for seeking clarifications from the Project Company in case of any ambiguity or where RFP requires clarity.

After submission of the bids, the Project Company along with its Consultants thoroughly evaluated the Technical Proposals. It is assessed that a detailed criteria bifurcated in various categories and sub-categories covering all the technical aspects was designed and marks were allocated to various options against each criteria. It is observed that evaluation criteria of Technical proposal consisted of the following broad categories;

- General EPC Contractor experience and capabilities;
- Design basis and method statements;
- WTG ranking, capabilities, components reliability, manufacturing\_ and site suitability, Performance and Energy Yield,

- Civil works construction details;
- Electrical BoP equipment and works details;
- Performance Warranties (Availability, Power Curve, Latent and Serial Defects),
- EPC Contractor understanding of key HSE risks, QA/QC plans and project timeline schedule

#### v. List of submitted documents

Both technical and financial proposals are comprehensive and largely in compliance with the RFP.

The following documents have been submitted by the Bidders

	Price with Complete breakup and payment milestones
	Contractor profile and references
<b>Power China new</b>	Last 3 years audit reports
	WTG Details and specifications
	Technical details
	Price along with price basis, assumptions and payment milestones
	Contractor references
<b>TBEA</b>	Last 3 years audit reports
	WTG Details and specifications
	Technical details
	Price along with price basis, assumptions
	Contractor Profile and references
<b>Hydro China</b>	Last 3 years audit reports
	Projects performances in last 3 years
	WTG Details and specifications
	Technical details

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#### vi. Evaluation Guide and Marking Criteria

<b>Technical</b>	<b>40%</b>
<b>Financial</b>	<b>60%</b>

#### 1. Technical Evaluation

<b>Question / Criteria</b>	<b>Marking Criteria</b>
<b>Contractor experience and capability</b>	
<ul style="list-style-type: none"> <li>Experience of Contractor acting as EPC for wind projects</li> </ul>	<ul style="list-style-type: none"> <li>Worked as lead EPC on three or more Wind Power Projects in international market to get full number.</li> <li>Worked as a lead EPC on one</li> </ul>

	<p>Wind Power Project or lead consortium partner on more than one Wind Power Projects in international market to get 8+ numbers</p>
<ul style="list-style-type: none"><li>• Is Contractor experienced in providing services in Pakistan</li></ul>	<ul style="list-style-type: none"><li>• No experience to get 0 numbers</li></ul>
	<ul style="list-style-type: none"><li>• Worked as lead EPC on three or more Wind Power Projects in Pakistan to get greater credit.</li></ul>
	<ul style="list-style-type: none"><li>• Worked as a lead EPC on one Wind Power Project or lead consortium partner on more than one Wind Power Projects in Pakistan to get 7 numbers</li></ul>

- Availability of resources

- Contractor with sub-office in Pakistan and have experienced wind power projects team to get 7+ numbers
- Contractor with no office in Pakistan but have experienced wind power projects team to get 5 numbers

- Contractor financial strength

- Contractor with financial strength of more than 5 times the project cost to get maximum numbers

#### Generals of Proposal

- Does Contractor understand key HSE Risks and provided HSE Plan

- Contractor who provided detailed HSE Plan along with key HSE Risks to get higher numbers.
- Contractor who provided simple HSE Plan without key HSE Risks to get 5 numbers

<ul style="list-style-type: none"><li>• QA/QC Plan provided</li></ul>	<ul style="list-style-type: none"><li>• Contractor who provided detailed QA/QC plan along with Quality Inspection Plan (QIP) to get maximum numbers.</li><li>• Contractor who provided detailed QA/QC plan only without QIP to get 6+ numbers</li><li>• Contractor who provided simple QA/QC Plan without QIP to get 5 numbers</li></ul>
<div></div> <ul style="list-style-type: none"><li>• Organizational chart and key personnel CVs provided</li></ul>	<ul style="list-style-type: none"><li>• Detailed organizational chart along with detailed CVs of key personnel to get full number</li><li>• Departmental organizational chart along with CVs of key personnel to get 7+ numbers</li><li>• Either Organization chart or CVs are provided to get 5 numbers</li></ul>
<div>Technical Details</div> <ul style="list-style-type: none"><li>• civil works construction details</li></ul>	<ul style="list-style-type: none"><li>• Complete civil works details provided as requested in RFP along with preliminary drawings/plans to get higher numbers</li><li>• Complete civil works details provided as requested in RFP without preliminary drawings to get 6+ numbers</li><li>• Preliminary civil works details provided to get 4+ numbers</li></ul>
<ul style="list-style-type: none"><li>• Electrical Works details</li></ul>	<ul style="list-style-type: none"><li>• Complete E&amp;I works details provided as requested in RFP along with preliminary drawings/ equipment details to get full numbers</li><li>• Complete E&amp;I works details provided as requested in RFP without preliminary</li></ul>

drawings to get 6+ numbers

- Preliminary E&I works details provided to get 4+ numbers

- Design basis and method statements

- Design basis and method statement of complete works and logistics to get higher marks
- Design basis and method statement of major works to get 6+ numbers
- Preliminary method statement of major works to get 4+ numbers

**WTG Specifications and Energy Yield**

- **WTG** Technical Details
- Complete technical details, Type certificate, performance specifications provided to get higher numbers
- Technical details provided to get 2.5-7.5 numbers depending how much details are provided

<ul style="list-style-type: none"> <li>• Energy Yield</li> </ul>		<ul style="list-style-type: none"> <li>• Best energy yield to get higher numbers</li> <li>• 2<sup>nd</sup> and lower positioned vendors to get prorated numbers (rounded to next higher number) as per the annual yield.</li> </ul>
<ul style="list-style-type: none"> <li>• WTG Warranties (Power Curve, noise, latent and serial defects)</li> </ul>	<ul style="list-style-type: none"> <li>• Site based power curve guarantees and detailed description of other guarantees provided to get higher numbers</li> <li>• General power curve guarantee and other guarantees description to get 6+ numbers</li> <li>• Preliminary Power curve guarantee and other guarantees description to get 4+ numbers</li> </ul>	
<ul style="list-style-type: none"> <li>• <b>SCADA Specification</b></li> </ul>	<ul style="list-style-type: none"> <li>• SCADA specified as per RFP to be given higher numbers and others prorated accordingly.</li> </ul>	
<ul style="list-style-type: none"> <li>• O&amp;M Services (during Warranty Period &amp; after WP)</li> </ul>	<ul style="list-style-type: none"> <li>• Site based O&amp;M Plans during and after Warranty Period to be given higher numbers</li> </ul>	

## 2. Financial Evaluation

<b>Price</b>	<b>70%</b>	<ul style="list-style-type: none"> <li>• Lowest price to get full numbers</li> <li>• 2<sup>nd</sup> lower and others to get as per <b>the</b> NEPRA Guidelines</li> </ul>
<b>Commercial Terms (reasonableness of pricing, financial strength)</b>	<b>15%</b>	<ul style="list-style-type: none"> <li>• Commercial terms as per RFP to higher numbers</li> <li>• Contractor agrees to provide all commercial bonds / guarantees with less values as asked in REP to get prorated numbers</li> <li>• The company with highest strength will be given full <b>ten</b> numbers for financial</li> </ul>

<b>Condition of Contract Deliverables</b>	15%	strength.  o Milestone payments as per RFP to get higher numbers Preliminary payment milestones details provided to get 4+ numbers
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## 6. CONCLUSION

Based on the technical evaluation of the proposals, Project Company shortlisted the following two companies as **"Preferred Bidders"** for Commercial and Financial Bid evaluation and negotiations: -

- ° Hydro China Huadong Engineering Corporation / Garnesa
- ° TBEA Corporation / Acciona

Proposals and allocated marks have been reviewed in detail and it is assessed that marking has been done scientifically and accurately. Evaluation of proposals and marking are given in the Report.

**Based on the informaton provided by the Project Company, TBEA Corporation along with Acciona/Nordex as WTG manufacturer was placed No. 1 on the ranking table of the Project.**

Following Table shows the summary of total marks obtained by individual bidder;

Technical Evaluation		PowerChina Northwest group	HydroChina Huodong	TBEA	Orient
		Mingyang	Gamesa	Acciona	Gamesa]
Description	Category Score				
Contrator Experience and Capability	30	18.3	21.6	21.3	18.0
Design Experience and Capability	10	8.0	8.0	6.0	8.0
Construction Planning and Methods	20	16.0	14.0	14.0	12.0
Electrical and Mechanical Equipment	15	11.3	11.3	9.8	9.0
Construction Schedule	20	11.2	12.8	12.8	11.2
HSE	5	3.9	3.5	3.3	3.0
Total	100	68.6	71.15	67.1	61.2

Commercial Evaluation		Mingyang	Gamesa	Acciona	Gamesa
Description	Category Score				
Evaluated Bid	70	68.4	68.0	70.0	68.0
Reasonableness of Pricing	5	4.0	3.0	4.0	3.0
Financial Strength	10	7.0	7.0	8.0	8.0
Condition of Contract Deliverables	15	10.0	10.0	12.0	10.0
Total	100	89.4	88.0	94.0	89.0

<b>Final Combined Bid Score</b>	<b>81.1</b>	<b>81.3</b>	<b>83.2</b>	<b>77.9</b>
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NEPRA issued "Selection of Engineering, Procurement and Construction Contractor by Independent Power Producers Guidelines 2017" in May 2017 ("NEPRA Guidelines") whereas MORO started the selection of Engineering, Procurement and Construction Contractor in 2016. However, it is observed that MORO has already followed the procedure laid down in the NEPRA Guidelines and their selection procedure is aligned with the spirit of the NEPRA Guidelines.

## ANNEXURE 1- BID EVALUATION

Technical Evaluation		Power China Northwest group	Hydro China Huodong	TBEA	Orient
		Mingyang	Gamesa	Acciona	Gamesa
Description	Category Score				
Contrator Experience and Capability	30	18.3	21.6	21.3	18.0
Design Experience and Capability	10	8.0	8.0	6.0	8.0
Construction Planning and Methods	20	16.0	14.0	14.0	12.0
Electrical and Mechanical Equipment	15	11.3	11.3	9.8	9.0
Construction Schedule	20	11.2	12.8	12.8	11.2
HSE	5	3.9	3.5	3.3	3.0
Total	100	68.6	71.15	67.1	61.2

Commercial Evaluation		Mingyang	Gamesa	Acciona	Gamesa
Description	Category Score				
Evaluated Bid	70	68.4	68.0	70.0	68.0
Reasonableness of Pricing	5	4.0	3.0	4.0	3.0
Financial Strength	10	7.0	7.0	8.0	8.0
Condition of Contract Deliverables	15	10.0	10.0	12.0	10.0
Total	100	89.4	88.0	94.0	89.0

Final Combined Bid Score	81.1	81.3	83.2	77.9
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## MORO (Pvt) Limited EPC Bid Evaluation Report

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## MORO (Pvt) Limited EPC Bid Evaluation Report

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# MORO (Pvt) Limited EPC Bid Evaluation Report

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## MORO (Pvt) Limited EPC Bid Evaluation Report

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Term Year

Lesson Model - Year 64



## ANNEXURE 3- TECHNICAL BID EVALUATION SUMMARY

Overall Technical Score (Out of a maximum of 170) **113** 119 113.5 102

Machine Manufacturer	Tender 1	Tender 2	Tender 3	Tender 4
	Mingyang	Gamesa	Acciona	Gamesa
Lead EPC Contractor/Bidder	PowerChina Northwest group	HydroChina Huodong	TBEA	Orient
WTG	3.2/3.0 MW	G3.465MW132	3.15/3.0 MW	2.0MW 114

Energy yield

Overall Evaluation  
Score

kailika4VI

Consortium Experience and Financial Strength

Overall Evaluation



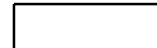
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Organisational Chart & CVs

Overall Evaluation

Project Execution Plan

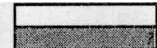
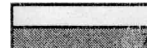
Overall Evaluation  
Score

Proposed Resources and Experience in Pakistan

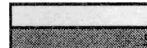
Overall Evaluation

Score

L

WTG Technical Specifications

Overall Evaluation



1

Supplementary WTG Info (Warranties, Power Curies, Noise etc.)

Overall Evaluation

Civil Works

Overall Evaluation

Earm 2:1

Electrical Infrastructure Works

Overall Evaluation

Score

SCADA Specification

Overall Evaluation

Health, Safety and Environment & Plan

Overall Evaluation

Score

Quality Assurance and Quality Control Plan

Overall Evaluation

O&M Services during Warrant Period

Overall Evaluation

O&M Services post Warranty

Overall Evaluation

## ANNEXURE 4- PROJECT COMPANY'S PRE-QUALIFICATION PROCESS

### Pre-Qualification of EPC Contractors

EPC Contractor plays a key role in the successful completion of a project. Therefore, it is quite essential to choose a competent EPC contractor to implement the project. This section reviews the actual criteria used by the Project Company for the selection of EPC Contractor.

Management of the Project Company along with their Consultants minutely evaluated the market and assessed all the available options for the Project. After detailed deliberation, it was decided to first conduct Wind Resource Assessment study of turbine models which are currently active in Pakistan and invite Wind Turbine Manufacturers whose energy yield is more. Wind Turbine Manufacturers were also given an option to either do the entire EPC work themselves or form a consortium with any reputable EPC contractor for the EPC work. In addition to the above, Project Company also kept in focus the bankability of the Wind Turbine in particular and EPC Contractor in general.

In order to make the whole selection process competitive, efficient, effective and productive, Project Company decided not to invite any new turbine supplier not active or having no foothold in Pakistan,

Wind market in Pakistan is quite developed now and with over 788 MW under operations, over 450 MW under construction and approximately 1200 MW under development clearly shows the confidence of the all the stake-holders in this sector. Almost all these projects under development are in the process of selecting different models of wind turbines from the pool of manufacturers which are currently active in Pakistan.

With support from consultants a detailed and well drafted Request for Proposal ("**RFP**") was prepared for soliciting EPC proposals. RFP was circulated to the following companies (collectively referred as "**Bidders**");

- - Ming Yang
  - Acciona/Nordex
  - OES /Gamesa
  - Caoyxi
  - Dong Feng Electric
  - Sany Group Company Limited
  - Vestas
  - Powerchina Xiebi Engineering Company
  - Powerchina Nuclear Engineering Company
  - Goldwind Co
  - CEDC; China Energy Engineering Co
  - CEEC; China Gezhouba Group Co
  - CRRC; Zhunzon Institute Co
  - HydroChina Huodong Engineering Co/Gamesa
  - CNYD; Shengyang Yaunda The. & Electrical Co

Engineering, procurement and construction (EPC) contracts are the most common form of contract used to undertake construction works by the private sector on large-scale and complex infrastructure projects.

Project Company decided to develop a criterion in selecting a contractor to get the best results in term of cost, time, and quality for the equipment.

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## Site Assessment Report

### Moro WF (PK)

2 x AW125/3000 T87.5 IEC 2B  
+ 6 x AW125/3150 T87.5 IEC 2B

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**E0004680272**

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**00**

Created:

**J. Kallinich**

Date:  
**2018-08-31**

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**Wind & Site Assessment**

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**J. Aristegui Lantero**

Confidentiality:  
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AST:  
**20497**

Released:

**M. Nunez Polo**

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### **Revision index**

<b>Rev.</b>	<b>Date</b>	<b>Author</b>	<b>Modification (Section)</b>	<b>AST</b>
00	2018-08-31	J. Kallinich	New	20497

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## 1 Executive Summary

This report presents an assessment of the site specific climatic conditions in order to confirm the structural integrity of 2 x AW125/3000 T87.5 + 6 x AW125/3150 T87.5 at the site Moro WF

The assessed site is located approx. 70 km east of Karachi, in District Thatta, Tehsil Jhampir

In the proposed layout, the WTGs are located at elevations between 145 m and 157 m a.s.l with equal distances of 3.2 D between all WTGs.


The planned WTG types are designed according to 'IEC 61400-1 Ed.2 (1999). For the purpose of this report the structural integrity was evaluated based on this standard.

The average results of the long-term wind and climatic conditions assessed at the turbine positions are listed in table 1.1:

**Table 1.1: Overview of climatic conditions at the planned hub height**

Climatic conditions		Unit	Site average value
Mean wind speed (V)		m/s	7.9
Weibull scale parameter (A)		m/s	8.9
Weibull shape parameter (k)			2.670
Wind shear exponent (a)			0.14
Air density (p)		kg/m <sup>3</sup>	1.153
Effective turbulence intensity at 15 m/s (left 15)		%	10.0
10-min extreme wind speed (Vref)		m/s	22.2
Temperature range (min / max)		°C	1.8 / + 43.4

Based on the assessed climatic conditions, an assessment of the structural integrity by reference to IEC 61400-1 [1] has been performed. The results of this assessment for the planned WTG type in the proposed layout are within the design limits of the assessed WTG type with respect to the design loads for the selected operational mode and therefore the structural integrity is confirmed.

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## 2 Subject Matter of this Report

### 2.1 Scope

Subject matter of this report is the analysis of site-specific wind conditions, climatic conditions and other environmental conditions based on the provided data and, based on such analysis, the determination of the structural integrity of the planned WTG type with respect to the design loads.

A general project overview is given in Table 2.1.

**Table 2.1: Project Overview**

Site (Country)	CAM number (internal)
	YVTG 1441
	lowe tipe(s)
	Certificate(s)/ Edition
	Number of WTGs

Based on the provided wind data and topographic information, Nordex has proposed a wind farm layout.

All coordinates given in this report are in the coordinate system UTM (north)-WGS84 Zone: 42.

The site assessment is valid for all analyzed WTG positions as well as for any reduced number of WTGs at the analyzed positions.

### 2.2 Abbreviations, definitions, symbols

Specific abbreviations used in this report:

<b>a.g.l.</b> = above ground level	<b>n.a.</b> = not available/not applicable
<b>a.s.l.</b> = above sea level	<b>S</b> = South
<b>CCV</b> = Cold Climate Version	<b>SRTM</b> = Shuttle Radar Topography Mission
<b>CT</b> = Thrust coefficient	<b>TI</b> = Turbulence intensity
<b>D</b> = Rotor diameter	<b>v</b> = Wind speed
<b>E</b> = East	<b>W</b> = West
<b>I<sub>eff</sub></b> = Effective turbulence intensity	<b>WTG</b> = Wind turbine generator (Wind turbine)
<b>MCP</b> = Measure-Correlate-Predict	<b>[']</b> = Number of reference
<b>N</b> = North	



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## 2.3 References


Table 2.2: Table of references

	<b>Dpcu int No.; Revist</b>	<b>ion, File name</b>	<b>Description</b>
[1]	NALL01_006131_EN, Rev. 02		IEC 61400-1, Wind turbines - Part 1: Design requirements, Edition 2, 1999-02
[2]	Moro wind Final Report		General project description including information about project area (coordinates for the 4 corners of the rectangular area)
[3]	"Mast 1"		Folder containing 653 files with raw wind data from "mast 1"
T4}	"Mast 2"		Folder containing 656 files with raw wind data from "mast 2"
[5]	E0004680838, Rev. 01 / 28.10.2016 Geo technical Investigation for Moro Power Co. 2016. pdf		STS-report" Geo technical Investigation for construction of 25 MW Wind Power Project in Jhimpir, Sindh"

## 2.4 Input data summary

Table 2.3: Input data summary

<b>Descriptio, of input data</b>		<b>Source</b>
Coordinates of WTGs		<u>Nordex</u>
Topographic map of site and surrounding area		not available
Digital elevation data (radius approx. 20 km) Source: SRTM		Nordex
Information on roughness classes and obstacles (radius approx. 20 km) Source: manually digitized based on Google Earth aerial images		Nordex
Wind data measured at mast:	Mast 1 [3]	Customer
Wind data measured at mast:	Mast 1 [4]	Customer
Long-term reference data, long-term period: 17 years		Nordex
Extreme wind data \i_re! (50 year wind (10 min.))		Nordex
Temperatures (average and extreme data)		Nordex
Air density		Nordex
Information on seismic activity [5]		Customer
Information on soil / ground conditions [5] -		Customer
Additional information		not available

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### 3 Site Description

#### 3.1 Project location

The assessed site Moro WF is located approx. 70 km east of Karachi and 75 km SW of Hyderabad, in District Thatta, Tehsil Jhampir.

Figure 1: Project Overview map

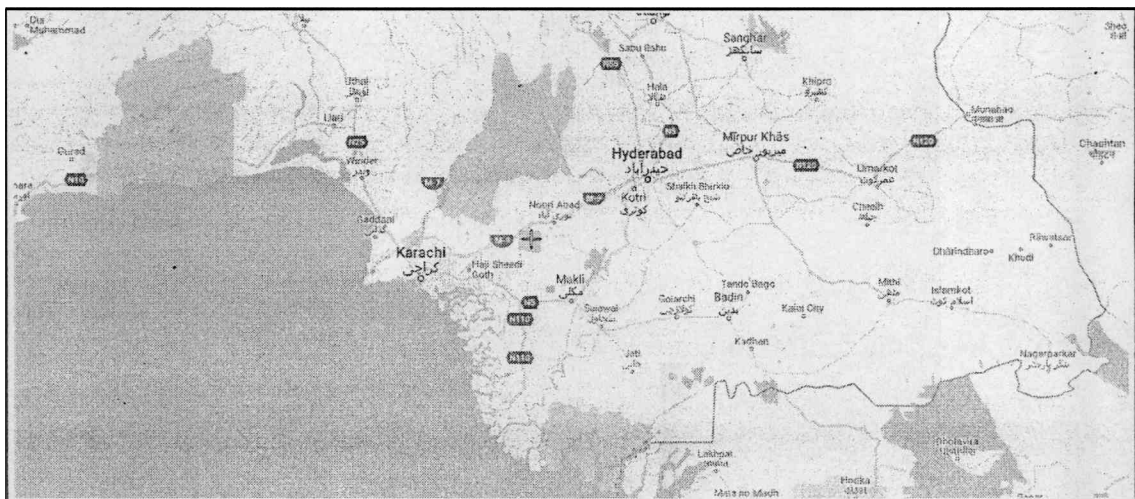
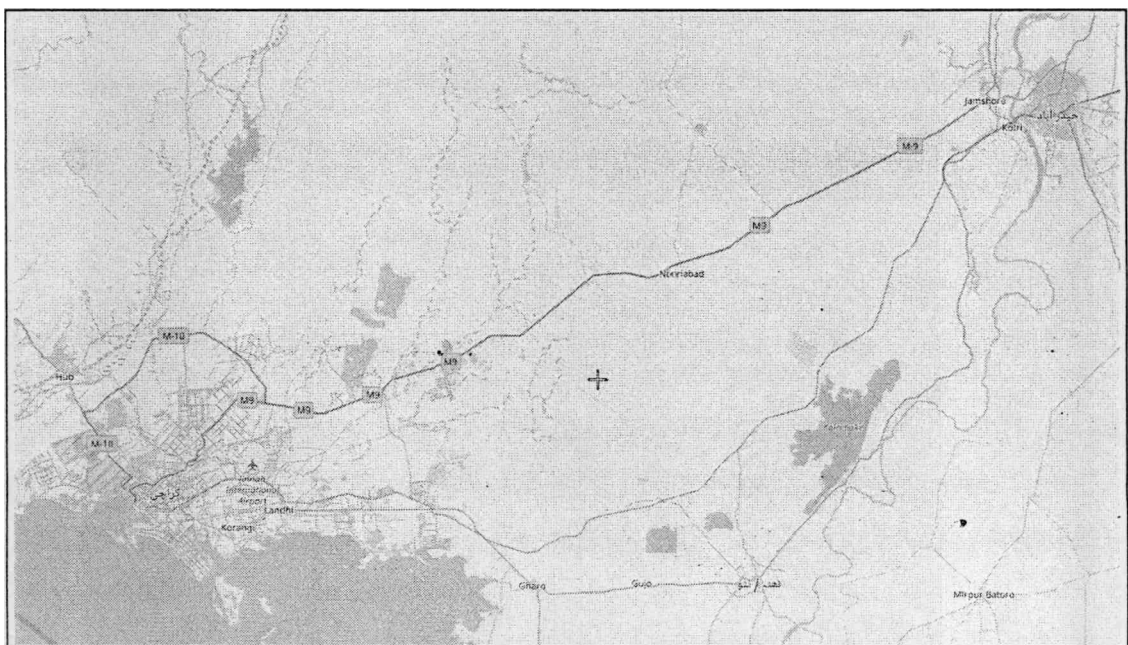


Figure 2: Site map



Further details about the topographic conditions are given in chapter 3.3.

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### 3.2 Wind farm layout

The proposed layout consist of one single row of WTGs with equal distances of 3.2 D between the individual WTGs. It only uses the eastern half of the given project area, in order to avoid the proximity to a mountain ridge in the west (which might disturb the wind flow) and in order to avoid a very widely spread wind farm (to avoid increased costs for roads, cables and increased electric losses due to long cables).


The coordinates and turbine type information of the planned WTGs are listed in appendix A1.2.

The WTGs are located at elevations between 145 m and 157 m a.s.l..

Figure 3: Layout map (the red rectangle shows the project area),



A plot showing the wind farm layout and the met mast positions is presented in appendix A1.1.

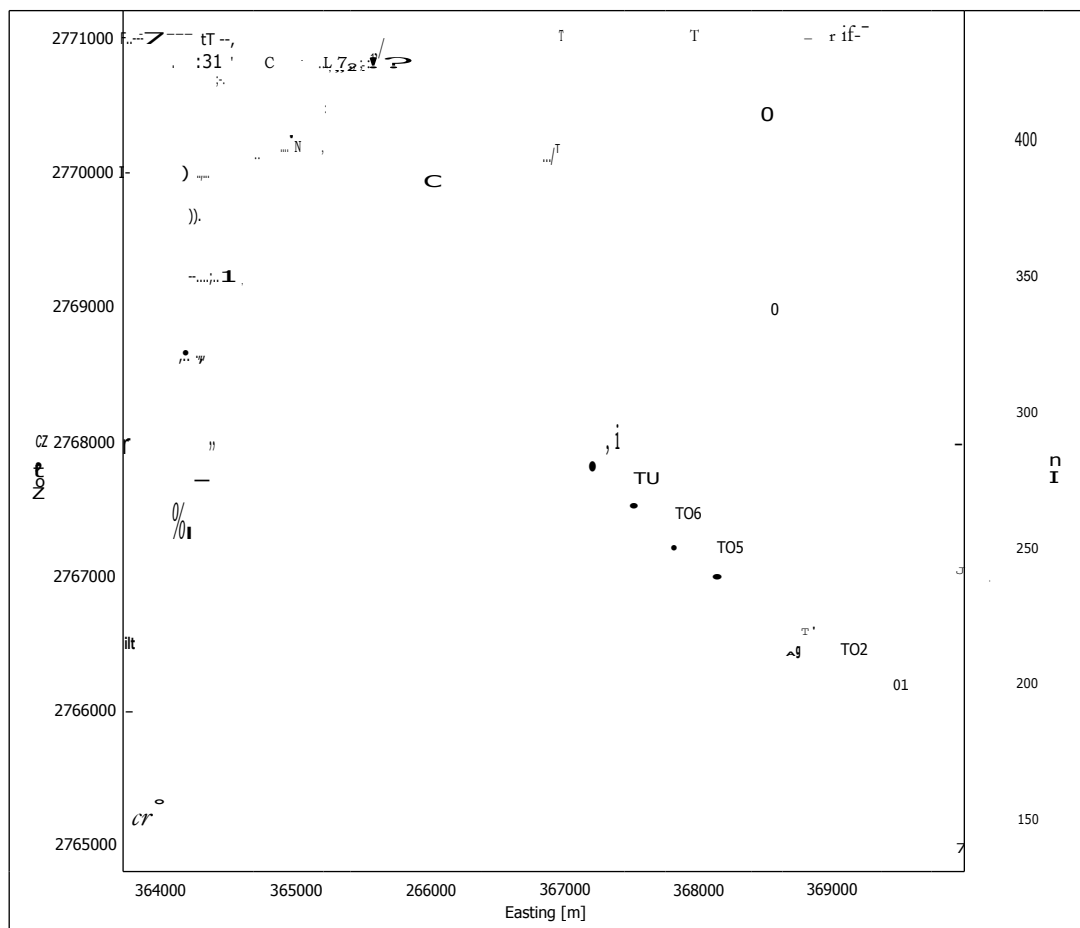
	<p>Site Assessment Report  <b>Moro WF (PK)</b>  2'x AVV125/3000 T87.5 IEC 2B  + 6 x AW125/3150 T87.5 IEC 2B</p>	<p>E0004680272  Revision 00  2018-08-31</p>
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### 3.3 Topographic conditions

#### 3.3.1 Orography

The orographic situation of the site and the planned layout is shown in Figure 4.


**Figure 4: Orographic situation**



The planned wind farm is located in an almost flat low plain. However, approximately 3 to 5 km to the west there is a mountain ridge which rises up to almost 300 m above the elevation of the site.

#### 3.3.2 Roughness

The site is located in a desert area with very sparse vegetation for which roughness class = 1 is assumed in the applied WASP model.

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## 4 Input data and data analysis

### 4.1 Wind data

The customer provided wind data of 2 met masts, "mast 1" and "mast 2". As mast 1 closer to the site and as well represents a slightly longer measurement period, this site assessment is based on mast 1, and data from mast 2 had only been used for comparison and a verification of plausibility of the applied modeling.

The site assessment is based on wind data from the met masts listed in table 4.1.

The applied mast 1 — even though it is closer to the site than mast 2 — is still 8 to 10 km away from the site. The terrain around the mast is similar to the WTG locations. Therefore the conditions measured at the mast might be quite well representative for the site assessment. However it must be noted that the far distance to the mast and the fact that the WTGs are much closer to a nearby mountain ridge, compared to the met mast location, lead to an increased uncertainty of the modelling.

The provided wind data was subject to a quality control procedure by Nordex in order to identify any records which may have been affected by equipment malfunction, icing and other anomalies. As the wind direction data was obviously erroneous in the first 2 months, the data from the affected period has been omitted. Some more data (only very short periods) with implausible data has furthermore been disabled, resulting in a period of 19.3 months with a rather high data availability of > 98%.

An overview of the met mast positions, measurement period and measured mean wind speed is given in Table 4.1, further details of the measurement configuration, quality controlled wind data and wind distribution graphs are summarized in the appendix.

**Table 4.1: Met mast position and measurement height**

Mast	M (north)-WGS84 Zone: 42 asting Northin	Altitude Mee& height a-g	Period [month']	Vmean [m/s]
				7.70

### 4.2 Long-term assessment

To evaluate whether the applicable measurement period is representative for a long-term period, Nordex performed a long-term assessment (MCP method) of the measured wind data. The used reference data set and applied long-term period is documented in table 4.2.

The applied MCP method uses the concurrent period of the site data and the reference data to determine a relationship between both datasets for each sector. Then, these determined relationships are applied to the long-term reference data in order to adapt the data to the site characteristics.

**Table 4.2: Long-term reference data source**

Long-term reference data source		
Data source	Data coordinate	Period

Table 4.3 shows the resulting long-term corrected wind data (Weibull distribution) used for the purpose of this site assessment.

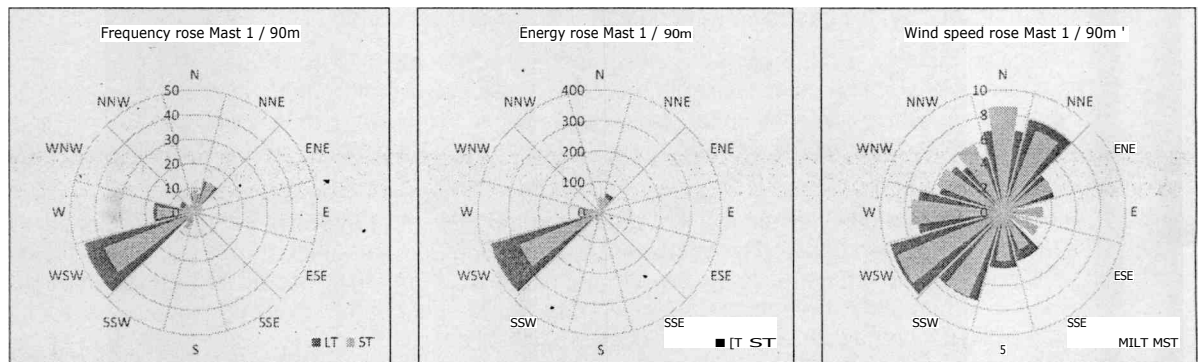
**Table 4.3: Key figures of long-term corrected data**

Met mast	Height	Corr. to ref- erence data %m <sub>0</sub> [m/s] A [in/s1 k [-1 (R)				Prevailing wind direction(s)
Mast 1	90 m	75	8.11	9.12	2.705	WSW / W

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Exemplary graphs for mast Mast 1 showing the wind direction frequency, energy and wind speed distributions for the measurement period and the assessed long-term conditions are shown in Figure 5. Detailed graphs are documented in the appendix.

Figure 5: Wind distributions Mast 1



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## 5 Modeling and Uncertainties

### 5.1 Modeling

#### Normal wind conditions (according to IEC 61400-1 [1])

Normal wind conditions (described by wind speed probability density function, wind distribution, turbulence intensity, wind shear exponent, flow inclination angle) are the typical conditions of the site during normal operation of a wind turbine. In order to calculate the mean wind distribution (wind speed and direction) and the wind shear exponent<sup>\*</sup> at the planned WTG positions, Nordex applies the long-term corrected wind distribution (see 2.3) to a flow model. The model calculates the wind distribution of the whole wind farm area, based on a digital elevation model and roughness description (source see Table 2.2).

In complex terrain conditions the orography may lead to an inclined wind flow. The flow inclination at the planned WTG positions is calculated applying the software WAsP Engineering base on the digital elevation model and a roughness description.

In accordance with the design of the respective WTG type, Nordex applies the representative (IEC 61400-1, Ed.3) resp. characteristic (IEC 61400-1, Ed.2) ambient turbulence intensity measured at the positions of the met masts for the prediction of the effective turbulence intensity at the WTG positions.

In case turbulence intensity data is not available from site measurements, Nordex applies turbulence intensity modelled at the WTG positions with use of the WAsP Engineering software, based on digital height contours and a roughness description.

The effective turbulence intensity<sup>(left)</sup> is calculated by applying the Frandsen model (according to IEC 61400-1) using the turbine type specific  $c_t$ -values. This model takes into account the materials of the wind turbine components in terms of their Wohler exponent.

#### Extreme wind conditions (according to IEC 61400-1 [1])

Extreme wind conditions are defined as having a 50-year recurrence period ( $V_{ref}$ ,  $V_{e50}$ ).

The assessment of extreme wind conditions based on short-term wind measurements are generally affected by high uncertainty. To estimate a reliable extreme wind in a 50-year recurrence period, a measurement period of minimum 7-10 years is necessary.

In order to evaluate the extreme wind conditions, Nordex performs an extreme wind assessment applying industrial standard techniques based on the provided measurement data and on regional reference data. If extreme wind conditions are provided by the customer, Nordex uses the provided data (see references).

#### Other environmental conditions

Other normal and extreme environmental conditions to be assessed according to IEC 61400-1 are defined as temperature, air density, seismic activity, humidity, solar radiation, ice, chemically active substances, mechanically active particles, lightning and salinity.

The temperature distribution and air density is derived from short-term on-site measurements and from long-term reference data (meteorological station / reanalysis data / mesoscale data), corrected to the altitude of the site.

Seismic conditions are evaluated based on local building codes and on data derived from local or global earthquake hazard maps.

#### Load assessment

In case the calculated site specific wind and/or environmental conditions exceed the design class value of the assessed WTG type (according to WTG certification and specification) for any assessed parameter, a site specific load assessment is performed by Nordex to confirm the structural integrity of the assessed WTG type according to section 11.10 of IEC 61400-1, Ed. 3 (2005).

<sup>\*</sup> Calculated in between the lower and the upper tip height.

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## - 5.2 Uncertainties

This site assessment and confirmation of structural integrity is subject to sources of uncertainty which must be taken into consideration for the subject of this report.

The following main categories of uncertainty may occur in the assessed project:

### Measurement uncertainties:

*Measurement equipment/setup:* The wind measurement is affected by uncertainty of the used sensors, calibration and the setup of the wind measurement devices.

*Measurement documentation:* The Nordex assessment relies on the provided measurement documentation. Therefore it had to be assumed that the provided data is correct which could not be verified.

*Wind data availability/quality:* The provided wind data may include periods of gaps, icing events and malfunctions of the used sensors which reduce the data availability of the wind data used for this assessment and which may result in data not covering a complete seasonal un-biased distribution.

*Long-term correction:* Any correction of Ole measurement is affected by uncertainty relating to the accuracy and long-term consistency of the reference data, correlation quality between measurement and reference data and by the method of long-term corrections.

*Weibull fit:* For the probability distribution a Weibull fit of the measured distribution is applied. The quality of this fit defines the error introduced to the probability distribution.

### Modeling uncertainties:

*Terrain model:* A digital terrain model is used to describe the terrain at the site. The uncertainty depends on the accuracy of the used input data (height contours and roughness description).

*Vertical extrapolation:* In case the used measurement height is lower than the proposed hub height, the wind data needs to be vertically extrapolated by the model.

*Horizontal extrapolation:* The proposed windfarm area may cover large distances between the met mast position and the WTG positions. Large distances or elevation differences lead to increased uncertainty of the used flow model for these WTG positions.

*Complex terrain:* If the site is located in a terrain which has to be considered as complex, conditions outside the limits of the used standard flow model may occur.

*Forestry:* In case the WTGs are located within and/or at the edges of forested areas, uncertainty in the calculation of the wind conditions at each individual WTG position may occur. Furthermore, the continuously dynamic changes of the trees' characteristics and the felling and/or restocking plans may contribute to increased uncertainty.


*Met mast position:* The positions of the met masts may not be representative for the turbine positions which results in uncertainty of the modeling results.

*Turbulence assessment:* The assessment of the effective turbulence is based on a measured ambient turbulence at the positions of the met masts. The ambient turbulence distribution at the WTG positions may differ from the turbulence at the met mast which causes uncertainty in the turbulence modeling.

*Extreme wind:* The estimation of extreme winds in this assessment is based on the short-term measurement data only. If the measurement period does not cover the required period of 7-10 years, high uncertainties have to be considered for the extreme wind assessment.

The uncertainty sources described above are combined to an overall uncertainty and may lead to a significant level of uncertainty for the modeling and calculation results of the turbine specific normal and extreme wind conditions.



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Wind shear valid across the rotor diameter

## 6.2 Extreme Wind conditions

Table 6.2: Results of Extreme wind conditions (at hub height)

Extreme Wind conditions 50y 10-min mean ( $V_{re,t}$ )	Unit	Design class value	Average value of all turbines	Range of all turbines
2 x AW125/3000 T87.5	m/s	43.8	22.1	22.0 - 22.1
6 x AW125/3150 T87.5	m/s	43.8	22.3	22.1 - 22.5

Design class values according to IEC 61400-1, corrected to the average air density at the site

	<p style="text-align: center;">Site Assessment Report  <b>Moro WF (PK)</b>  2 x AW125/3000 T87.5 IEC 2B  + 6 x AW125/3150 T87.5 IEC 2B</p>	<p style="text-align: right;">E0004680272  Revision DO  2018-08-31</p>
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## 6 Results

The site specific results in the tables below are predictions based on wind data provided by the customer and based on modeling methods and software applied by Nordex (see 5.1) to fulfil the subject of this report. Depending on the reliability and representativeness of the provided data and additional information, as well as on the applied models, the results may be affected by significant uncertainties (see 5.2).

The planned WTG types 2 x AW125/3000 T87.5 + 6 x AW125/3150 T87.5 are designed according to IEC 61400-1 Ed.2 (1999). An overview over the certification classes of the planned turbine types is given in table 2.1. For the purpose of this report the WTG structural integrity was evaluated based on this standard.

Tables 6.1 and 6.2 give an overview of the conditions in the wind farm. Results for each individual WTG are given in appendix 1

### 6.1 Normal Wind conditions


**Table 6.1: Results of Normal wind conditions (at hub height)**

+ x AW125/3000 T87.5 Parameter	Unit	Design class value	Average value of all turbines	Range of all turbines
Mean wind speed (V)	m/s	8.5	7.9	7.9 - 7.9
Weibull scale parameter (A)	m/s	9.6	8.9	8.8 - 8.9
Weibull shape parameter (k)	-	2.000	2.682	2.678 - 2.686
Air density (p)	kg/m <sup>3</sup>	1.225	1.153	1.153 - 1.153
Effective turbulence intensity (I <sub>eff</sub> ) at 15 m/s (m= 10 )	%	16.0	10.0	10.0 - 10.0
Wind shear exponent (a)	-	0.20	0.15	0.15 - 0.15
Flow inclination	degrees	8	-0.3	-0.3 - -0.3

6 x AW125/3150 T87.5 Parameter	Unit	Design class value	Average value of all turbines	Range of all turbines
Mean wind speed (V)	m/s	8.5	7.9	7.9 - 7.9
Weibull scale parameter (A)	m/s	9.6	8.9	8.8 - 8.9
Weibull shape parameter (k)	-	2.000	2.667	2.658 - 2.674
Air density (p)	kg/m <sup>3</sup>	1.225	1.153	1.152 - 1.153
Effective turbulence intensity (I <sub>eff</sub> ) at 15 m/s (m= 10 )	%	16.0	10.0	9.7 - 10.0
Wind shear exponent (a)	-	0.20	0.14	0.14 - 0.15
Flow inclination	degrees	8	0.1	-0.5 - 0.7

WTG specific values - see appendix

Design class values according to IEC 61400-1 design class of the assessed type

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
### 6.3 Other environmental conditions

Table 6.3: Overview of other environmental conditions

Parameter (symbol)	Unit	Value	Description
Installation altitude	m (a.s.l.)	145 - 157	Base height
Measurement duration for climatic conditions		17.0	year(s)
Source of climatic data		MERRA-2 (N 25.0 / E 67.5)	
Temperature, mean annual (T)	°C	24.3	
Temperature, minimum (T)	°C	1.8	
Temperature, maximum (T)	°C	43.4	
Days with temp. above +40 °C	days/year	3	
Days with temp. below -10 °C	days/year	0	
Days with temp. below -20 °C	days/year	0	
Days with temp. below -30 °C	days/year	0	
Cold climate conditions <sup>2</sup>		no	
Cold climate class		n.a.	
Air density, mean annual (p)	kg/m <sup>3</sup>	1.15	
Air density, minimum (p)	kg/m <sup>3</sup>	1.08	
Air density, maximum (p)	kg/m <sup>3</sup>	1.24	
Humidity, mean relative (rH)	%	n.a.	
Salinity (salt spray present)	-	no	
Lightning (ground strike density)	No./year/km <sup>2</sup>	1.8	
Seismic activity according to UBC-97 [5]	seismic coefficients	Seismic zone factor "Z" = 0.15 For Sc; Ca = 0.18. Cv = 0.25	
Soil profile type according to UBC-97 [5]		Sc	
Forest / trees		no	

Information about other environmental conditions than presented above and listed in IEC 61400-1 is not available. With respect to these parameters it is assumed on the basis of generally available information with respect to the project site and the adjacent areas that this should, in general, not negatively affect the structural integrity of the WTG for the site. If there is any indication that any of these factors might have an impact on the structural integrity of the WTGs, the customer must provide this information for additional assessment purposes.

<sup>2</sup> GL guideline for the certification of wind WTGs, Edition 2003; GL-Wind Technical Note 067: Certification of Wind Turbines for Extreme Temperatures (here Cold Climate), Rev.4,

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## 6.4 Load assessment

Based on the assessed wind and climatic conditions, an assessment of the structural integrity by reference to sections 11.9 and 11.10 of IEC 61400-1, Ed. 3 (2005) has been performed by Nordex.

### Normal wind conditions

In order to evaluate whether the excess of the wind speed probability density function in the range of 0.2-0.4 \* Vref compared to the design values of the assessed WTG type (see table 6.1) leads to an excess of the design loads, a site-specific load assessment for normal wind conditions has been performed according to section 11.10 of IEC 61400-1, Ed. 3 (2005).

The load assessment comes to the conclusion that the mechanical loads for the site specific normal wind conditions are within the design limits in the selected operational mode and therefore the structural integrity of the planned WTG type is confirmed for all planned WTG positions as listed in the appendix.

## 6.5 Conclusions

The planned turbines are designed according to IEC 61400-1 Ed.2 (1999). For the purpose of this report the structural integrity of the WTG in the planned windfarm was evaluated based on this standard.


Nordex's results and conclusions apply to the input data considered in the analysis and are subject to the completeness and accuracy of the data provided by the customer and the used models. Any completion and change to the data provided by the customer shall be notified to Nordex without undue delay and may lead to a change of the results as to the structural integrity of the WTGs for the site considered in this site assessment report.

### Evaluation of structural integrity

Based on the assessed climatic conditions, an assessment of the structural integrity by reference to sections 11.9 and 11.10 of IEC 61400-1, Ed. 3 (2005) has been performed.

The assessment comes to the conclusion that the mechanical loads for the site specific normal wind conditions are within the design limits in standard operational mode and therefore the structural integrity of the planned WTG type is confirmed for all planned WTG positions as listed in the appendix.



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**Appendix**

**Appendix 1**

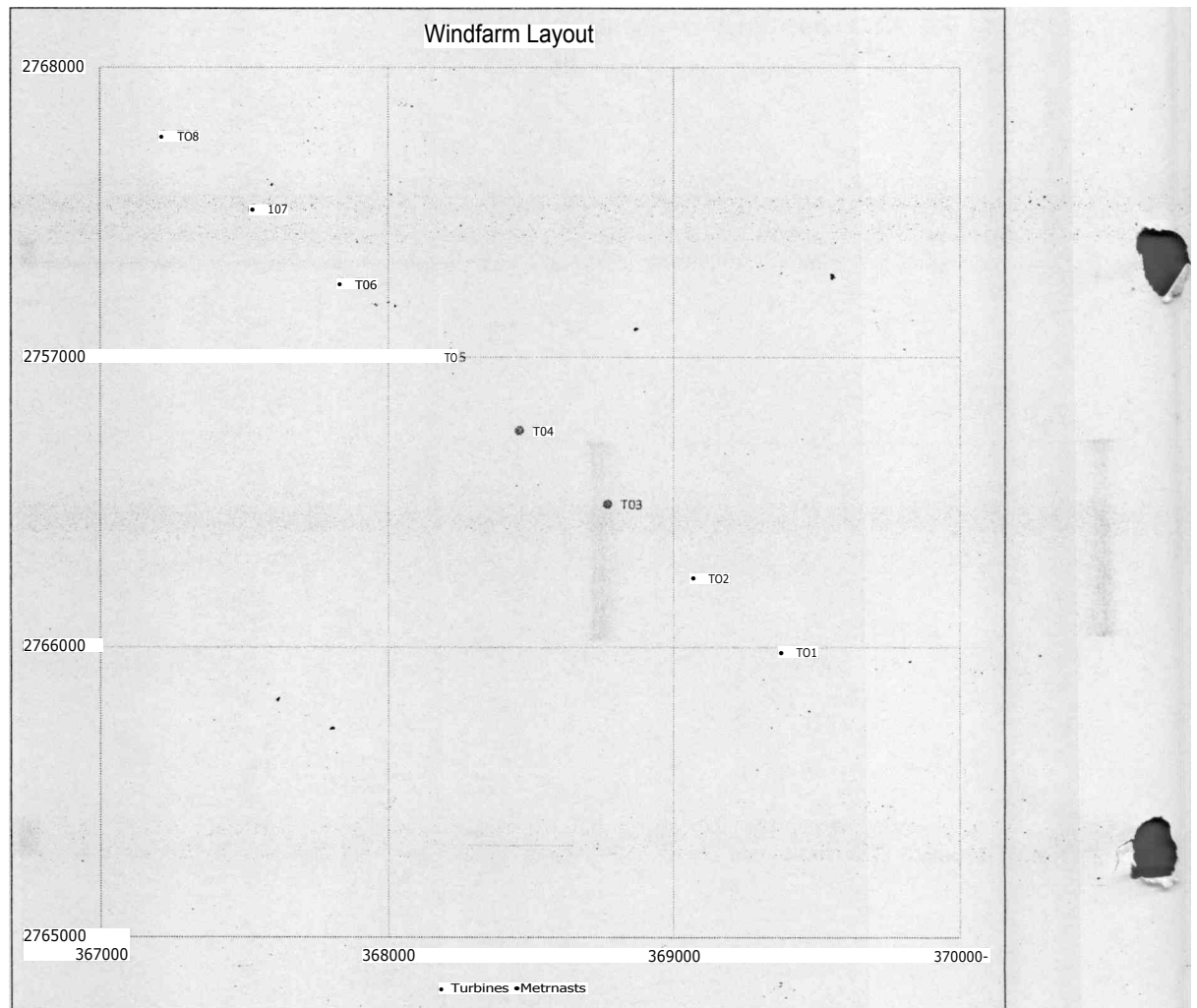
- A1.1    Layout plot**
- A1.2 WTG specific wind conditions**
- A1.3 Met mast wind conditions**

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## Appendix 1

### A1.1 Layout plot



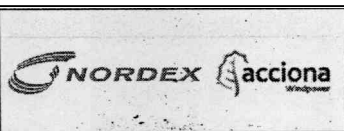
Note: the used met mast is located 8 to 10 km east of the WTG locations, outside of the area shown in the above map.

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## A1.2 WTG locations and specific conditions

Coordinate System: UTM (north)-WGS84 Zone: 42

Turbine Name	Turbine Type	Hub height [m]	East [m]	North [m]	Altitude [m]	Distance to closest WTG [D]	v [m/s]	A [m/s]	k [-]	Wind Shear [-]	Air Density [kg/m <sup>3</sup> ]	max Flow Angle [°]	Direction of max flow angle [°]	TI IEC sub-class	Vret [m/s]	WSM / WVM applied
T01	AW 125/3000	87.5	369384	2765985	145	3.20	7.86	8.84	2.686	0.15	1.153	-0.3	30	B	22.0	
T02	AW 125/3000	87.5	369075	2766239	145	3.20	7.88	8.87	2.678	0.15	1.153	0.3	60	B	22.1	
T03	AW125/3150	87.5	368766	2766493	145	3.20	7.88	8.87	2.674	0.14	1.153	-0.1	0	B	22.1	
T04	AW 125/3150	87.5	368457	2766747	145	3.20	7.87	8.86	2.666	0.15	1.153	-0.3	0	B	22.2	
T05	AW 125/3150	87.5	368148	2767001	145	3.20	7.86	8.84	2.674	0.15	1.153	0.5	150	B	22.1	
T06	AW125/3150	87.5	367839	2767255	150	3.20	7.91	8.90	2.666	0.14	1.153	-0.5	0	B	22.4	
T07	AW125/3150	87.5	367530	2767509	153	3.20	7.91	8.89	2.662	0.14	1.152	0.7	150	B	22.4	
T08	AW125/3150	87.5	367221	2767763	157	3.20	7.93	8.92	2.658	0.14	1.152	0.6	150	B	22.5	



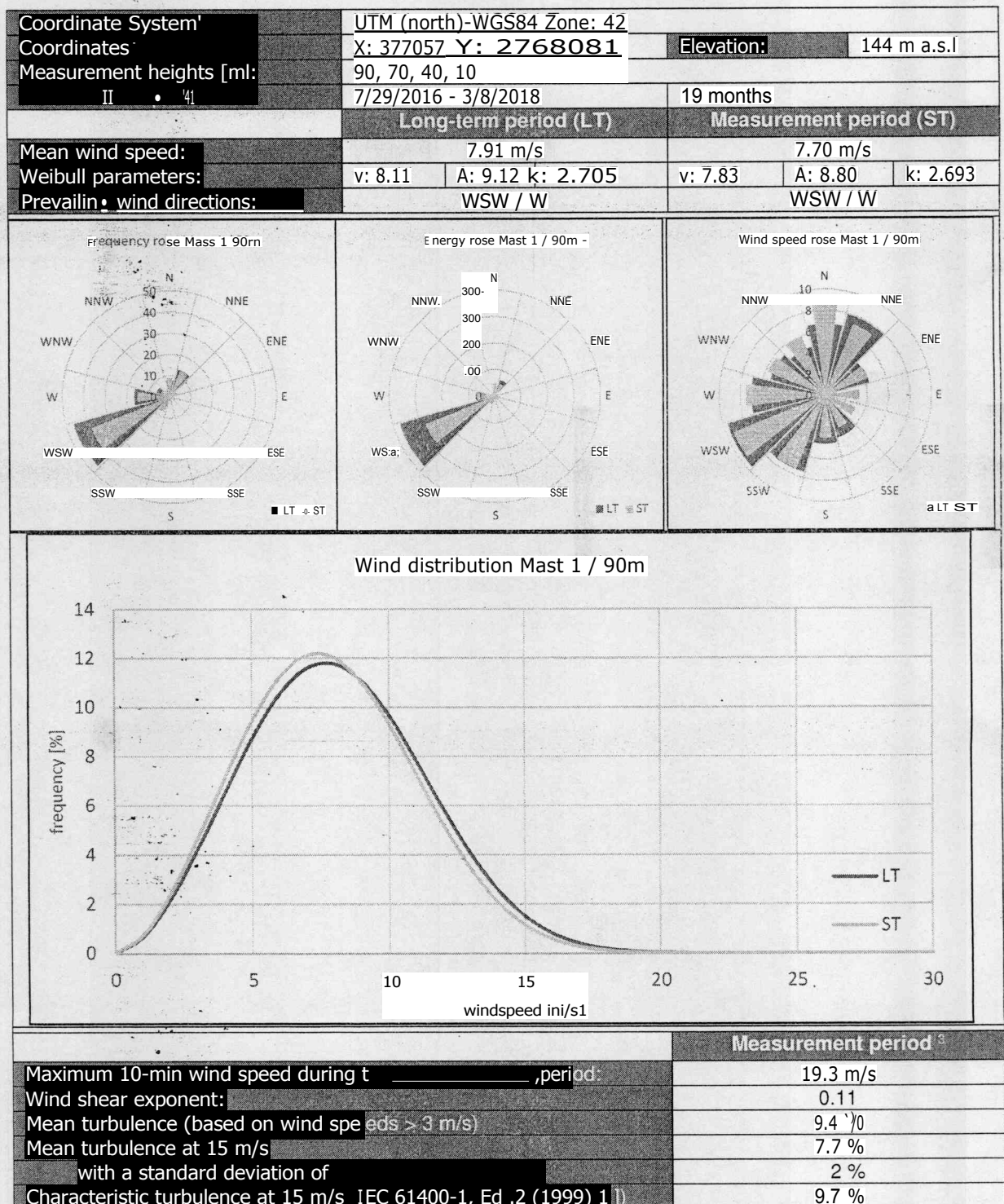
# Site Assessment Report

## Moro WF (PK)

2 x AW125/3000 T87.5 IEC 2B  
+ 6 x AW125/3150 T87.5 IEC 2B

### A1.3 Met mast wind conditions

#### Mast: Mast 1



<sup>a</sup> For turbulence and wind shear only full measurement years are considered.



NOF1DEX / AWP Wind and Site Assessment

Annual Energy Production RESULTS

incl. Uncertainties and Lessee

08111161P %f /MEW

Pro ccl: Morn WF  
Oat station: 2msl s ir A ,1137.56E11.1  
WTG, considered in summary nc Ha  
Su lmetry Includes losses  
Summary Includes WSM losses Yes (na WSM required)

AEP Windterrn summary total d WTGs									
GROSS AEP									52.5%
Wake lossm	-1.2%								
PARK AEP		113.3						4551	11.9%
Curtailment losses	0.0%								
PARK-Curtailment		113.3						4551	51.9%
Other losses *	-7.1%								
NET AEP P50		105.2	105.2					4227	48.2%
P75	-8.6%		96.2		96.8	06.1	95.1		
P90	-16.4%		89.0	87.0	87.3	84.1	87.9	136.0	
P95	21.1%		03.1	82.8	82.2	78.1	83.0	80.6	

AEP Windfann summary (average per WTG)									
Mirr h *									
PARK AEP									
WTG									
WTG									
WTG									
WTG									
WTG									
WTG									
WTG									
WTG									

Losses				Uncertainties			
Wake lossm				Wind measurement			
Availability				Long-term correction			
Wind WM availability				Future wind variability (20y)			
Turbine performance				Modeling			
Performance end lee							
Power P50							
Power P75							
Power P90							
Power P95							
TOTALS Werr							
TOTAL Year							
TOTAL 15 year							
TOTAL 25 year							

Losses dAEP/dWS (Average) 1.55

