National Electric Power Regulatory Authority
Islamic Republic of Pakistan

Registrar

NEPRA Tower, Attaturk Avenue (East), G-5/1, Islamabad
Ph: +92-51-9206500, Fax: +92-51-2600026
Web: www.nepra.org.pk, E-mail: registrar@nepra.org.pk

No. NEPRA/R/LAG-356/15070-76

June 16, 2023

Mr. Adnan Tapal
General Manager (Operations)
Trans Atlantic Energy (Private) Limited
Office No. 1002 10th Floor, Emerald Tower
Near 2 Talwar, Clifton, Karachi

Subject: **Modification Generation Licence No. WPGL/43/2017 (Modification-II)**
Licence Application No. LAG-356
Trans Atlantic Energy (Pvt.) Limited, (TAEPL)

Reference: TAEPL's LPM submitted vide letter No. TAEL/NEPRA/12102022/001 dated 12.10.2022

It is intimated that the Authority has approved Modification - II in Generation Licence No. WPGL/43/2017 dated April 18, 2017 in respect of Trans Atlantic Energy (Pvt.) Limited (TAEPL) pursuant to Section 26 of the NEPRA Act read with Regulation 10 of the NEPRA Licensing Regulations.

2. Enclosed please find herewith determination of the Authority in the matter of Licensee Proposed Modification of TAEPL alongwith additional note of Mr. Mathar Niaz Rana (nsc), Member NEPRA and Modification-II in the Generation Licence No. WPGL/43/2017.

Enclosure: As Above

(Engr. Mazhar Iqbal Ranjha)

Copy to:

1. Secretary, Power Division, Ministry of Energy, 'A' Block, Pak Secretariat, Islamabad
2. C.E.O Alternative Energy Development Board (AEDB), 2nd Floor, OPF Building, G-5/2, Islamabad
3. Managing Director, NTDC, 414 WAPDA House, Lahore
4. Chief Executive Officer, CPPA(G), 73 East, A.K. Fazl-ul-Haq Road, Blue Area, Islamabad
5. Chief Executive Officer, Hyderabad Electric Supply Company, HESCO Headquarters, WAPDA Complex, Hussainabad, Hyderabad
6. Director General, Environmental Protection Department, Government of Sindh, Plot No ST2/1, Sector 23, Korangi Industrial Area, Karachi.

National Electric Power Regulatory Authority
(NEPRA)

Determination of the Authority in the Matter of Licensee Proposed Modification in the Generation Licence of Trans Atlantic Energy (Pvt.) Limited

June 16
~~April~~ , 2023
Case No. LAG-~~358~~
356

(A). Background

(i). In terms of Section-15 (now Section-14B) of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (the "NEPRA Act"), the Authority granted a Generation Licence (No. WPGL/43/2017 dated April 18, 2017) to Trans Atlantic Energy (Pvt.) Limited (TAEPL) for its 48.3 MW generation facility/Wind Power Plant (WPP) to be located at Deh Kohistan, Jhimpir, District Thatta, in the Province of Sindh.

(ii). Under the abovementioned Generation Licence, the generation facility/WPP of TAEPL is proposed to consist of 14x3.45 MW Wind Turbine Generators (WTGs) of Vestas (V126-3.45 MW). The hub height of tower for installation of the WTGs is mentioned as 137m. Further, the term of the Generation Licence is twenty (20) years from the then anticipated Commercial Operational Date (COD) of the generation facility/WPP (i.e. July 31, 2019).

(iii). Later on, through Modification-I dated August 16 2022, the anticipated COD was changed from July 31, 2019 to June 30, 2024; the term of Generation Licence was enhanced from twenty (20) years to twenty-five (25) years from COD; the hub height of the towers was changed from 137m to 87m and the net capacity factor of the WPP was changed from 38.29% to ≥37.10%.

(B). Communication of Modification

(i). TAEPL in accordance with Regulation-10 of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021 (the "Licensing Regulations"), communicated a Licensee Proposed Modification (LPM) in its existing Generation Licence on October 14, 2022.

(ii). In the "text of the proposed modification", TAEPL proposed to (a). change the WTG technology from Vestas (V126-3.45MW) to Goldwind GW155-4.5

MW; (b). increase the Installed Capacity from 48.3 MW to 49.5 MW; (c). change number/size of WTG from 14x3.45 MW to 11x4.50 M; (d). change hub height from 87m to 95m; and (e). change the net capacity factor from ≥37.10% to 38.5%.

(iii). Regarding the "statement of the reasons in support of the modification", TAEPL, *inter alia*, stated that the Company has now decided to choose a technologically advanced, larger and more efficient WTG for the Project, in line with the latest market dynamics. The Company has therefore selected Goldwind GW 155-4.5 MW with a hub height of 95m.

(iv). About the "statement of the impact on the tariff, quality of service and the performance by the Licensee of its obligations under the licence", TAEPL, *inter alia*, stated that the proposed changes in Generation Licence will result in a lower cost of energy. Further, the modification shall not have any adverse impact on quality of service and performance of the project.

(C). Processing of LPM

(i). After submission of all the required information as stipulated under the Regulation-10(1) and 10(2) of the Licensing Regulations by TAEPL, the Registrar under the Regulation 10(3) of the Licensing Regulations published the communicated LPM on October 29, 2022 in one (01) English and one (01) Urdu newspaper, informing the general public about the communicated LPM and invited their comments in the matter, within a period of fourteen (14) days from the date of the said publication.

(ii). Apart from the above, separate letters were also sent to various other stakeholders including Government Ministries and their attached departments, various representative organizations, individual experts, and others on November 01, 2022. Through the said letters, the stakeholders were informed about the communicated LPM and publication of its notice in the press. Further, the said entities were invited to submit their views and comments in the matter, for the assistance of the Authority.

(D). Comments of Stakeholders

(i). In reply to the above, the Authority received comments from two (02) stakeholders, namely Central Power Purchasing Agency (Guarantee) Limited (CPPA-G) and Board of Investment (BoI). The salient points of comments offered by the said stakeholders are summarized in the following paragraphs:

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY NEPRA AUTHORITY

(a). CPPA-G commented that TAEPL has opted for a technologically advanced, larger, and more efficient WTG for the Project, i.e. Goldwind GW 115-4.5. CPPA-G is of the view that the capacity factors may please be assessed by the Authority while considering/utilizing standard globally recognized softwares and by analyzing wind resource and energy yield assessment report carried out by 3rd Party. Moreover, it is highlighted that the determined capacity factors in respect of several operational wind power plants are achievable and several projects are contributing enormous excess energy than estimated/approved. Therefore, it is requested to the Authority for considering Higher Capacity factors than proposed/requested by TAEPL in its application.

(b). BoI has submitted that it is of the view that the request of TAEPL for modification in its Generation Licence may be considered keeping in view of the public interest as well as relevant law/rules in vogue.

(ii). The Authority examined the above comments of stakeholders and considered it appropriate to seek the perspective of TAEPL on the comments/observations of CPPA-G. In this regard, TAEPL submitted that (a). its Project is approved and falls under Category-II of the CCOE decision. The new management team of TAEPL has vast experience of successful development, construction and operations of wind-based IPPs that is proven by their contributions in four (04) projects before TAEPL; (b). the proposed change in WTG model is upgraded to the most recent and best-performing WTGs based on the environmental conditions of the project site; (c). the proposed capacity factor (i.e. 38.5%) is higher than the previous capacity factor (i.e. 37.1%) approved by NEPRA and AEDB; (d). the new management has proposed new turbines which increase the capacity factor to 38.5%, in line with comments of CPPA-G regarding higher capacity factor; (e). the risk of generating power remains with TAEPL as wind risk is borne by the Project company. In the event that such high capacity factor won't be achieved, the entire loss will fall upon TAEPL and will result in a financial loss to the company; (f). on the other hand, it is very important to recognize and consider that if the actual capacity factor is higher than the one approved, the upside heavily goes to CPPA-G, hence producing a lower net tariff. The Lenders take a strong view on the approved capacity factor and do perform an independent assessment and will

not finance anything higher. In this way, 38.5% is considered as a very reasonable number by TAEPL that protects TAEPL and also keeps the net tariff low in case of higher generation.

(iii). In view of the above, the Authority considered it appropriate to proceed further in the matter as stipulated in the Licensing Regulations and the NEPRA Licensing (Generation) Rules, 2000 (the "Generation Rules").

(E). Evaluation/Findings

(i). The Authority has examined the entire case in detail, including the already granted Generation Licence, the communicated LPM, relevant provisions of the Policy for Development of Renewable Energy for Power Generation 2006 (the "RE Policy"), comments of the stakeholder rejoinder by the Licensee/applicant relevant provisions of the NEPRA Act and relevant rules & regulations framed thereunder.

(ii). In this regard, the Authority has observed that originally, the Authority granted a Generation Licence (No. WPGL/43/2017 dated April 18, 2017) to TAEPL for setting up a 48.30 MW generation facility/WPP at Deh Kohistan Jhimpir, District Thatta, Sindh. As per decisions of Cabinet Committee on Energy (CCoE), the project of TAEPL falls under Category-II of the RE projects, and all Category-II projects are allowed to proceed ahead towards the achievement of their requisite milestones as per RE-Policy 2006 and are included in the IGCEP as committed projects.

(iii). Initially, the generation facility/WPP of TAEPL was proposed to consist of 14 WTGs of Vestas (V126-3.45 MW) with a hub height of 137m. Further, the term of the Generation Licence was twenty (20) years from the then anticipated COD of the generation facility/WPP of TAEPL (i.e. July 31, 2019). Later on, through Modification-I dated August 16, 2022, the Authority *inter alia*, allowed to (a). change the anticipated COD from July 31, 2019 to June 30, 2024; (b). increase the term of Generation Licence from twenty (20) years to twenty-five (25) years from COD; (c). change the hub height of the towers was from 137m to 87m and (d) change the net capacity factor of the WPP from 38.29% to ≥37.10%.

(v). Now, through the communicated LPM, TAEPL has proposed to (a). change the WTG technology from Vestas (V126-3.45MW) to Goldwind GW155-4.5 MW; (b). increase the Installed Capacity from 48.3 MW to 49.5 MW; (c). change

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY

number/size of WTG from 14x3.45 MW to 11x4.50 M; (d). change hub height from 87m to 95m; and (e). change the net capacity factor from ≥37.10% to 38.5%.

(iv). Regarding modification in the Generation Licence, the Authority has observed that in terms of Section-26 of the NEPRA Act read with Regulation-9(2) of the Licensing Regulations, the Authority is entitled to modify a licence in accordance with an authority proposed modification or LPM, subject to and in accordance with such further changes as the Authority may deem fit if, in the opinion of the Authority such modification (a). will not adversely affect the performance by the licensee of its obligations; (b). reasonably necessary for the licensee to effectively and efficiently perform its obligations under the licence; (c). is likely to be beneficial to the consumers; or (d). is reasonably necessary to ensure the continuous, safe and reliable supply of electric power to the consumers keeping in view the financial and technical viability of the licensee.

(v). Regarding the proposed WTG technology of Goldwind, the Authority has observed that Goidwind is a global leader of clean energy, energy conservation and environmental protection. Goldwind is a key player in promoting energy transformation to attain access to affordable, reliable and sustainable energy for all, and to drive a renewable future. Specializing in wind power and environmental protection, Goldwind leverages strong scientific research, innovation and best business practices to take renewable energy utilization efficiency to new heights. Goldwind has a strong presence globally as well as in Pakistan, with 92 GW (46000 WTGs) installed globally and 477 MW (278 WTGs) installed in Pakistan.

(vi). The Authority has noted that TAEPL has now decided to go for a technologically advanced, larger and more efficient WTG (Goldwind GW 155-4.5 MW at hub height of 95m) for the Project, in line with the latest market dynamics. The proposed change will increase the net capacity factor of the WPP from ≥37.10% to 38.50% which translates into enhancement of the net annual energy generation (over the project control period of twenty five years) from 156.909 GWh to 166.94 GWh even with less number of WTGs. In this regard, the Authority considers it relevant to mention that although TAEPL has provided the capacity factor as 38.50%, the final capacity factor, energy numbers and sharing mechanism etc., will be elaborated upon and determined while determining the tariff for the project.

(vii). The Authority has observed that the project of TAEPL falls under the Category-II of renewable energy projects. According to the decision of Cabinet

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY

Committee on Energy (CCoE) dated February 27, 2019, all Category-II projects are allowed to proceed towards the achievement of their requisite milestones as per RE-Policy 2006. In this regard, CPPA-G vide its letter dated October 08, 2019 has provided its consent for purchase of power from TAEPL. Further, under the approved IGCEP (IGCEP-2021-30 as well IGCEP-2022-31), the project of TAEPL is in the list of committed projects.

(viii). Regarding the impact of the communicated LPM on the tariff, it is clarified that under Section-7(3)(a) of the NEPRA Act, determining tariff, rate and charges etc. is the sole prerogative of the Authority.The Authority had granted cost-plus tariff to TAEPL through determination No. NEPRA/TRF-443/TAEL-2017/18234-18236 November 20, 2018. However, TAEPL failed to achieve financial close within the stipulated period and resultantly the tariff granted to TAEPL lapsed. As there is no tariff in field for TAEPL, which in turn does not warrant checking of impact of LPM thereon. It is important to mention here that the above mentioned decision of the CCoE further provides that if more than one year has lapsed since determination, then tariff of the Category-II projects will be reviewed by the Authority. TAEPL has filed new petition for determination of tariff, which has already been admitted by the Authority and decision thereon shall be made following due process while applying the check of prudency as prescribed in the relevant rules.

(ix). In view of the above, the Authority is of the opinion that the proposed LPM will not have any adverse effect on the performance of TAEPL of its obligations. The LPM will be beneficial to the consumers in general as more amount of clean electricity will be available to the power purchaser and that too with installation of less number but more efficient WTGs. This will also help to meet the national target of RE in the overall energy mix. The Authority considers that the LPM is reasonably necessary for the Licensee to perform its obligations effectively and efficiently under the Licence. Further to the said, the LPM is necessary to ensure the continuous, safe and reliable supply of electric power to the consumers keeping in view the financial and technical viability of the Licensee.

(F). Approval of LPM

(i). In view of the above, the Authority is satisfied that the Licensee has complied with all the requirements of the Licensing Regulations pertaining to the modification. Therefore, the Authority in terms of Section-26 of the NEPRA Act read

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA AUTHORITY

with Regulation-10(11)(a) of the Licensing Regulations approves the communicated LPM in the Generation Licence of TAEPL (with changes) to the extent of (a). changing the WTG technology from Vestas (V126-3.45MW) to Goldwind GW155-4.5 MW; (b). increasing the Installed Capacity from 48.3 MW to 49.5 MW; (c). changing number/size of WTG from 14x3.45 MW to 11x4.50 M; (d). changing hub height from 87m to 95m; and (e). changing the net capacity factor from ≥37.10% to ≥38.5%.

(ii). Accordingly, the Generation Licence (No. WPGL/43/2017 dated April 18, 2017 with Modification-I dated August 16, 2022) of TAEPL is hereby modified. The changes made in the Generation Licence are attached as annexure to this determination. The approval of the LPM is subject to the provisions contained in the NEPRA Act, relevant rules framed thereunder, terms & conditions of the Generation Licence and other applicable documents.

Authority

Engr. Maqsood Anwar Khan
(Member)

Rafique Ahmed Shaikh
(Member)

Mathar Niaz Rana (nsc)
(Member)

Amina Ahmed
(Member)

Tauseef H. Farooqi
(Chairman)

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY
16/6/23

My additional Comments

Additional Note

National Electric Power Regulatory Authority Licensing (Application) Modification, Extension and Cancellation) Procedure Regulations, 2021 requires submission of the impact, if any, of the proposed modification on tariff for consideration of the Authority. In the instant License Modification it has been observed that it is expected that the modification will have an unfavorable impact on the tariff of the company by upward revision as compared to its original license. Based on the above I differ with the decision taken by the Authority.

Mathar Niaz Rana (nsc)

Member Tariff and Finance

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

National Electric Power Regulatory Authority
(NEPRA)
Islamabad – Pakistan

GENERATION LICENCE

No. WPGL/43/2017

In exercise of the Powers conferred under Section-26 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997, the Authority hereby modifies the Generation Licence (No. WPGL/43/2017 dated April 18, 2017 with Modification-I dated August 16, 2022) granted to Trans-Atlantic Energy (Pvt.) Limited, to the extent of changes mentioned hereunder:

(a). Changes made in **Schedule-I** of the generation licence are attached as **Revised/Modified Schedule-I**.

(b). Changes made in **Schedule-II** of the generation licence are attached as **Revised/Modified Schedule-II**.

This **Modification-II** is given under my hand on this 16th day of ~~April~~ June **Two Thousand & Twenty Three**

Registrar

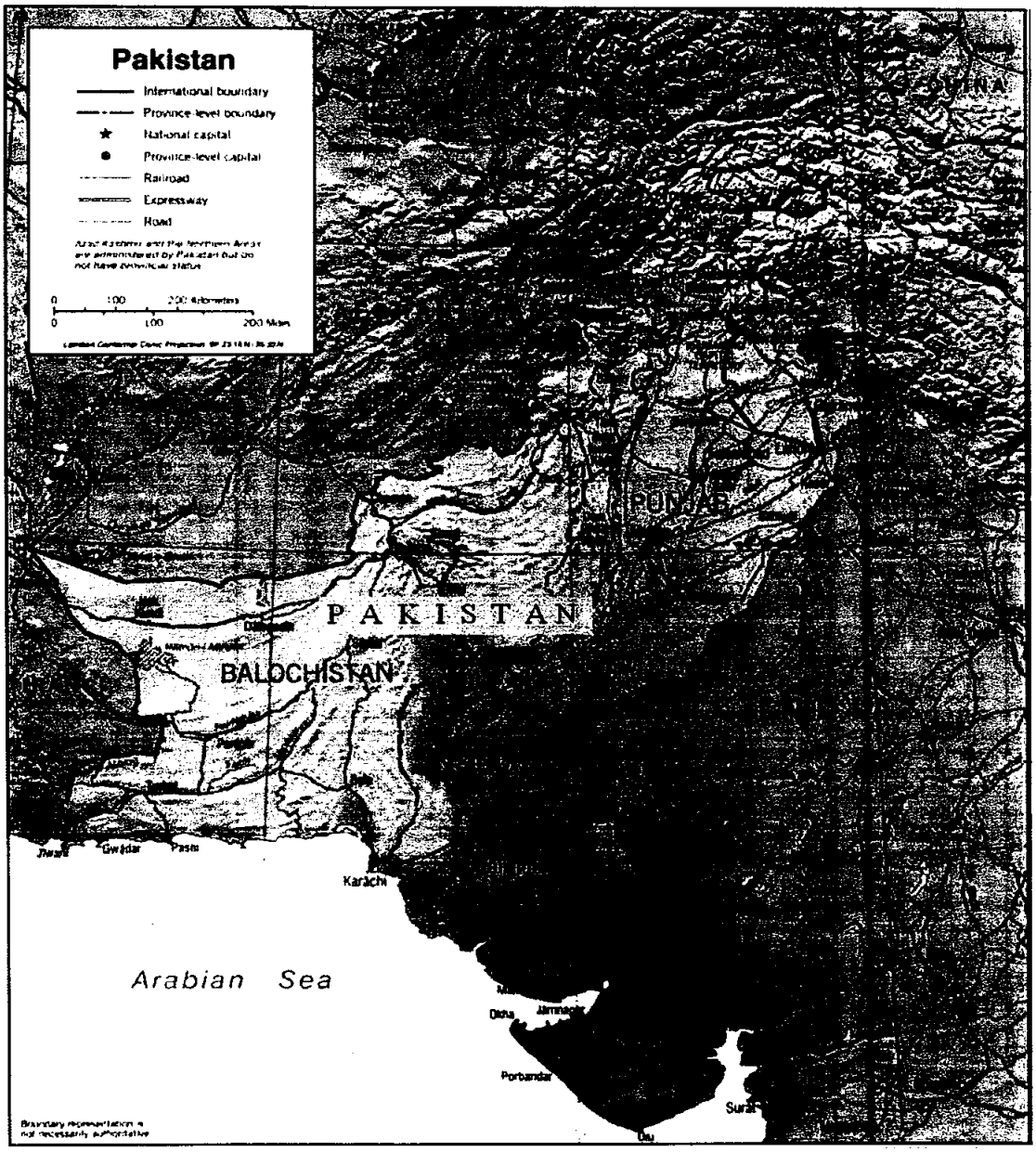
NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

SCHEDULE-I
Revised/Modified

The Type of Technology, Technical/Functional Specifications and other details specific to the Generation Facility/Wind Power Plant/Wind Farm of the Licensee are described in this Schedule.

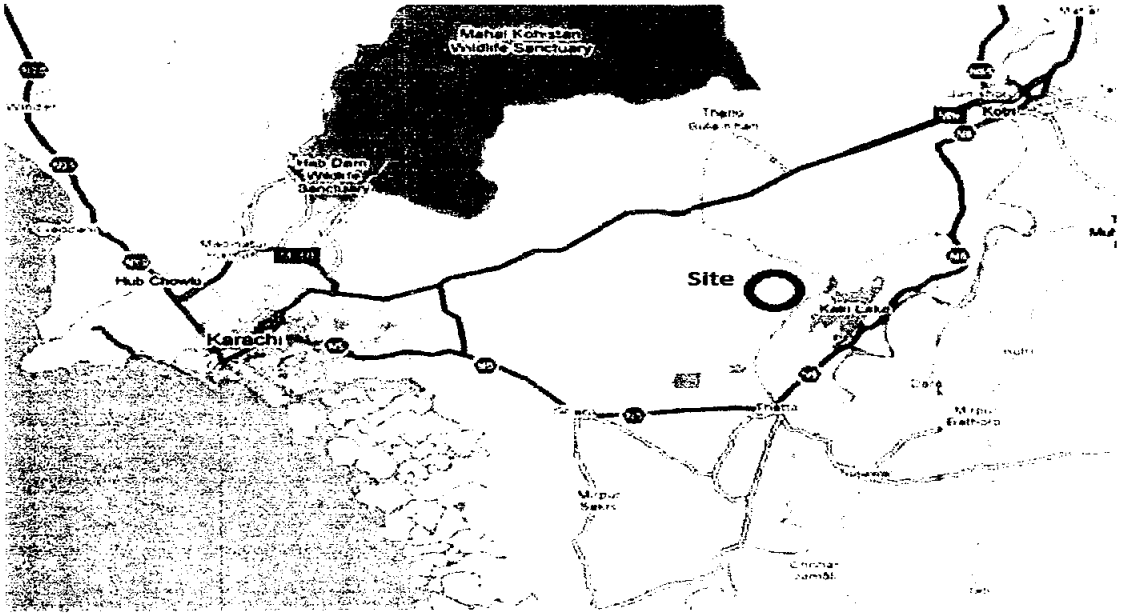
NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

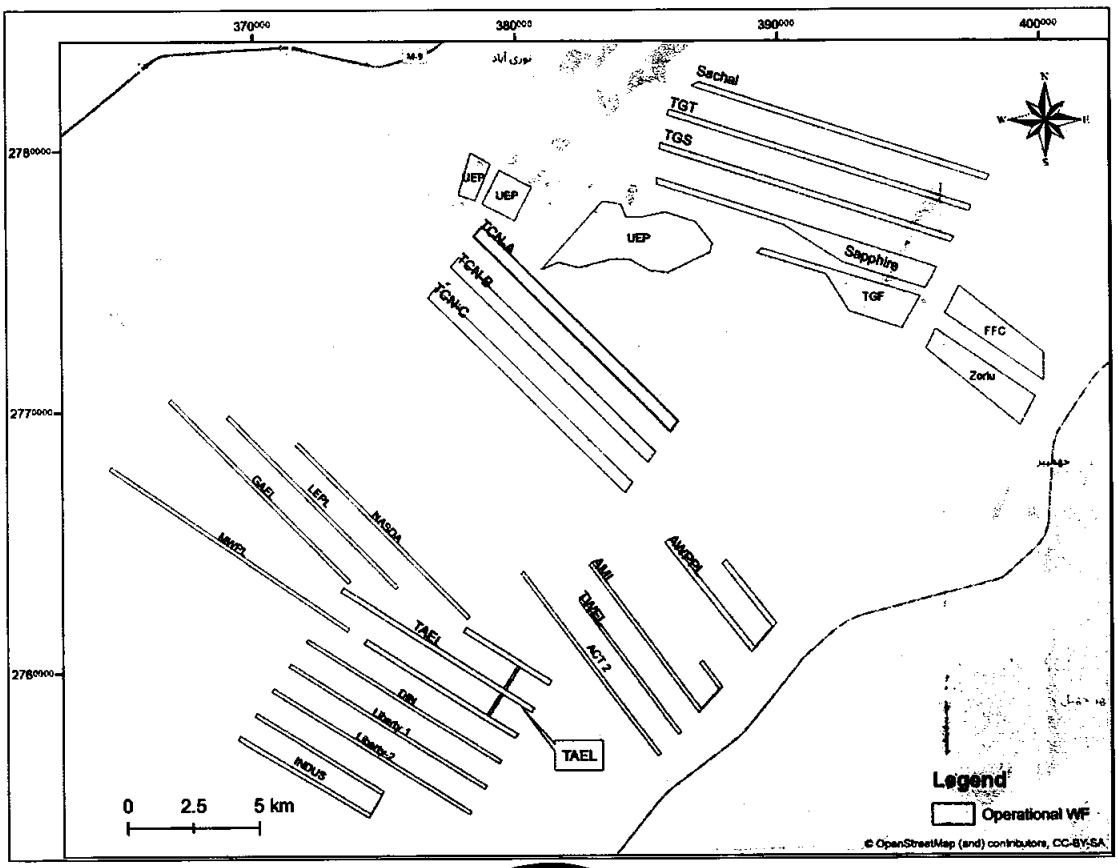
Location Map
Of the Generation Facility/Wind Power Plant/Wind Farm



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY

Site and Layout
of the Generation Facility/Wind Power Plant/Wind Farm



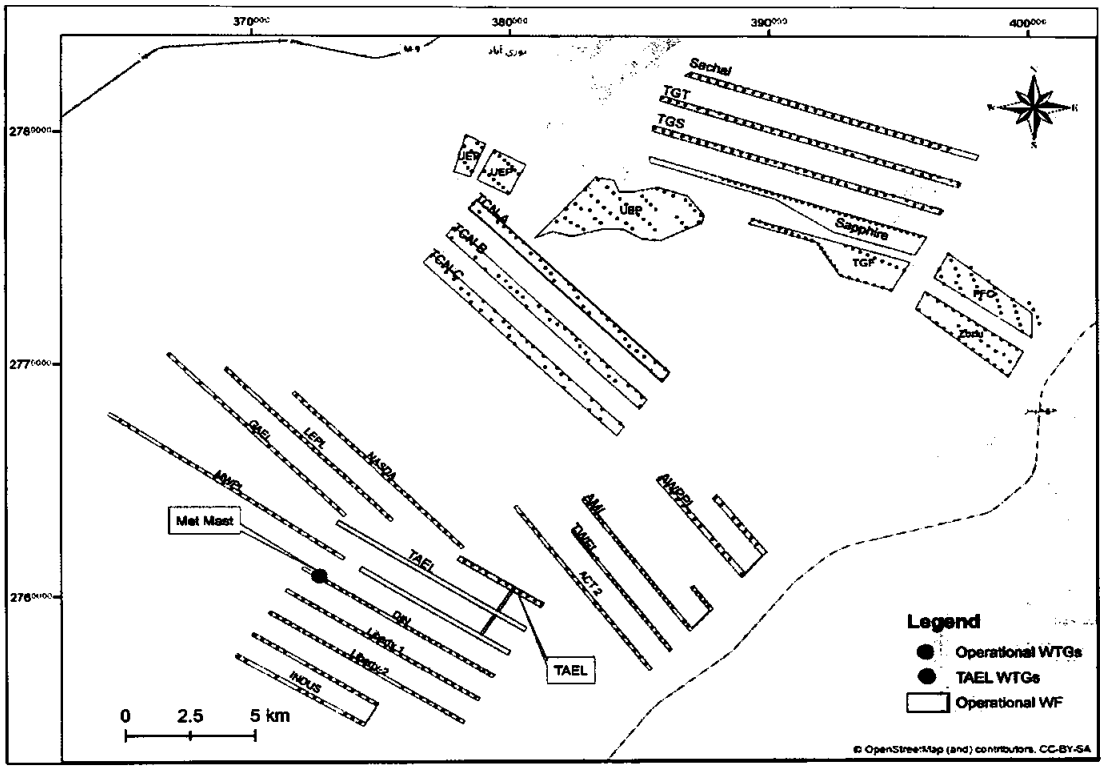


Land Coordinates of the Generation Facility/Wind Power Plant/Wind Farm

	Coordinates (UTM Z42, WGS84) Geodetic Coordinates	
Point No.	Easting	Northing
TA-1	377927.222	2761530.165
TA-2	379980.705	2760223.761
TA-3	379443.934	27593680.033
TA-4	373348.717	2763257.745
TA-5	373241.363	2763088.999
TA-6	379336.580	2759211.287
TA-7	378799.809	2758367.559
TA-8	374231.685	2761273.751
TA-9	374124.331	2761105.005
TA-10	379864.266	2757453.320
TA-11	379971.620	2757622.066
TA-12	378884.182	2758313.882
TA-13	379420.953	2759157.610
TA-14	380508.391	2758465.794
TA-15	380615.745	2758634.539
TA-16	379528.307	2759326.356
TA-17	380065.077	2760170.084
TA-18	381152.516	2759478.267
TA-19	381259.870	2759647.013
TA-20	378034.576	2761698.911

NEPRA AUTHORITY

Micro-Sitting
of the Generation Facility/Wind Power Plant/Wind Farm

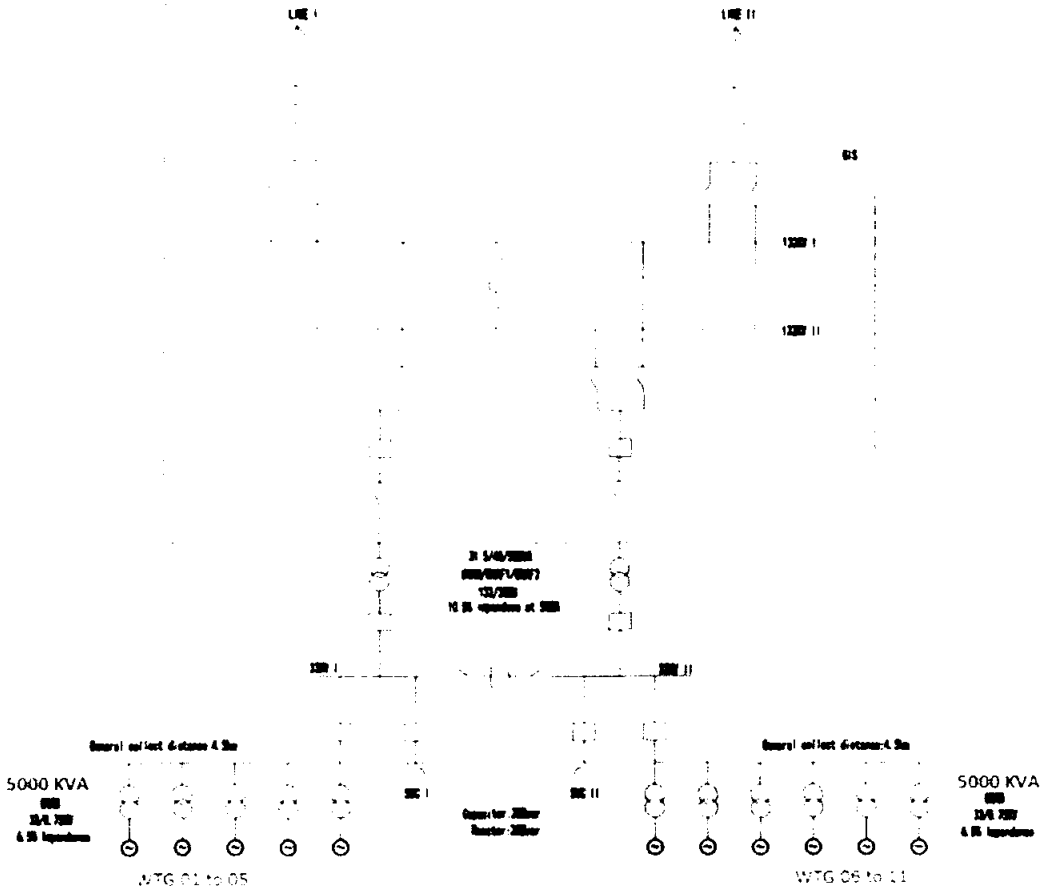


Wind Turbine Coordinates (UTM Z42, WGS 84)

Wind Turbine	Easting [m]	Northing [m]
1	378,008	2,761,619
2	378,310	2,761,409
3	378,620	2,761,204
4	378,939	2,761,005
5	379,258	2,760,804
6	379,573	2,760,602
7	379,898	2,760,402
8	380,214	2,760,192
9	380,542	2,759,991
10	380,859	2,759,786
11	381,160	2,759,565

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

Single Line Diagram (Electrical System) of the Generation Facility/Wind Power Plant/Wind Farm



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

Interconnection Arrangement/Transmission Facilities for Dispersal of Power from the Generation Facility/Wind Power Plant/Wind Farm

The electric power generated from the Generation Facility/Wind Power Plant/Wind Farm of Trans-Atlantic Energy (Private) Limited (TAEPL) shall be dispersed to the National Grid through the load center of HESCO.

(2). The proposed Interconnection Arrangement/Transmission Facilities for dispersal of power from Generation Facility/Wind Power Plant/Wind Farm of TAEPL will consist of the following:-

(a). A 132 KV double circuit transmission line looping in-out between sub clusters of 50.00 MW Wind Power Plants of Act2 Din Wind (Private) Limited and Din Energy Limited to Jhimpir-New 220/132 KV collector substation

(3). The scheme of interconnection of Generation Facility/Wind Power Plant/Wind Farm of TAEPL also proposes the following reinforcement already in place in Jhimpir cluster:-

(a). 220/132 KV Jhimpir-New Substation at suitable location in Jhimpir cluster;
(b). 80 KM long double circuit from Jhimpir-New 220 KV Substation to the existing T.M. Khan Road 220 KV Substation;
(c). A 132KV double circuit of 82 km using Greeley conductor would be constructed to connect Jhimpir-New 220/132 KV Substation with T.M. Khan in HESCO network;
(d). 220/132 KV Gharo-New substation at suitable location in Gharo cluster;
(e). 65 km long 220 KV double circuit from Gharo-New 220 KV Substation to Jhimpir-New 220 KV Substation;
(f). Five sub-collectors groups will be connected to Jhimpir 220/132 KV collector substation through 132 KV double circuits;

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

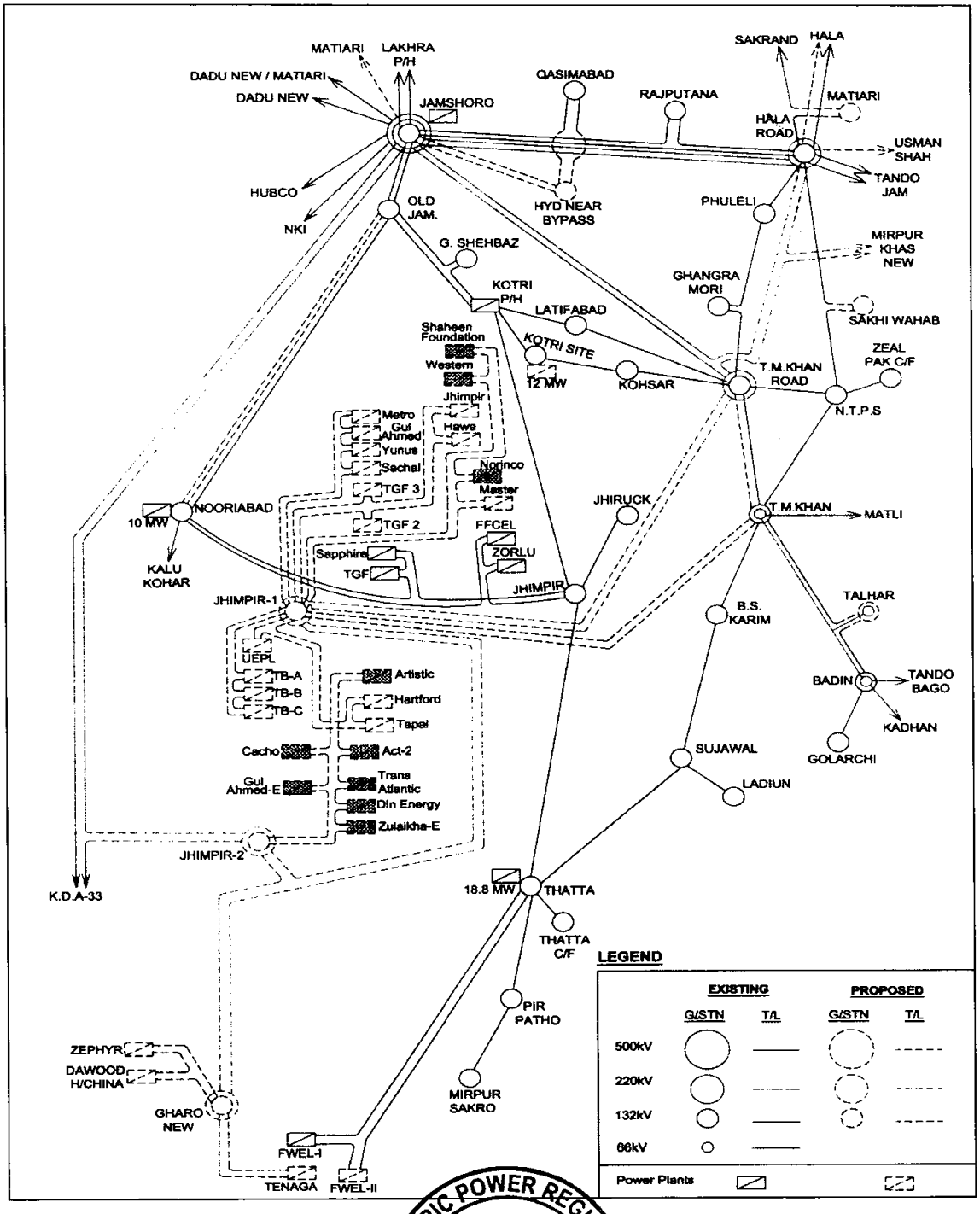
(g). Four Wind Power Plants in the collector system of Gharo 220/132 KV substation;

(h). Rehabilitation of the exiting 132 KV lines in the vicinity of WPP clusters, i.e. Jhimpir-Kotri, Jhimpir-Thatta, Thatta-Sujawal and Nooriabad-Jamshoro Old.

(4). Any change in the above-mentioned Interconnection Arrangement/Transmission Facilities duly agreed by TAEPL, NTDC and HESCO, shall be communicated to the Authority in due course of time.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY

Schematic Diagram of Interconnection Arrangement/Transmission Facilities for Dispersal of Power from the Generation Facility/Wind Power Plant/Wind Farm



Details of the Generation Facility/Wind Power Plant/ Wind Farm

(A). General Information

(i).	Name of the Company/Licensee	Trans Atlantic Energy (Private) Limited
(ii).	Registered/Business Office of the Company	10th Floor, Emerald Tower, Clifton, Block 5, Karachi 75600
(iii).	Location of the Generation Facility	Deh Kohistan, Jhimpir, District Thatta, Sindh
(iv).	Type of Generation Facility	Wind Power Plant

(B). Wind Farm Capacity & Configuration

(i).	Wind Turbine Type, Make & Model	Goldwind (GW155-4.5 MW)
(ii).	Installed Capacity of the Generation Facility	49.50 MW
(iii).	Number of Units/Size of each Unit	11 x 4.50 MW

(C). Wind Turbine Details

(a). Rotor		
(i).	Number of Blades	3
(ii).	Rotor Speed	5.5-9.5 rpm
(iii).	Rotor Diameter	155 m
(iv).	Swept Area	18,869 m^2
(v).	Power Regulation	Variable speed and pitch regulation
(vi).	Cut-in wind speed	2.5 m/s
(vii).	Rated power wind speed	10.8 m/s (air density = 1.225 kg/m^3)

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY

(viii).	Cut-out wind speed	24 m/s
(ix).	Survival wind speed	52.5 m/s
(x).	Pitch regulation	Hydraulic pitch cylinder drives a ring gear mounted to the inner race of the blade pitch bearing
(b). Blades		
(i).	Blade Length	76 m
(ii).	Material	Glass Fiber reinforced epoxy resin composite
(c). Converter		
(i).	Type	Full power Converter
(ii).	Rated Voltage	690 V
(iii).	Rated Current	4800 A
(d). Generator		
(i).	Power	4800 Kw
(ii).	Voltage	760 V
(iii).	Type	Permanent Magnet Synchronous generator
(iv).	Speed	9.5 rpm
(v).	Enclosure class	F-Class
(vi).	Coupling	Friction coupling
(vii).	Efficiency	≥ 97%
(viii).	Weight	8,050 kg
(ix).	Power Factor	0.95
(e). Yaw System		
(i).	Yaw Bearing	Double row ball bearing slewing ring

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY

(ii).	Brake	Friction Brake, motor brake
(iii).	Yaw Drive	Multiple stages geared
(iv).	Speed	0.46 Degree/Sec
(f). Control System		
(i).	Type	CX51 30
(ii).	Scope of Monitoring	Remote monitoring of more than 500 different parameters, e.g. temperature sensors, pitch parameters, speed, generator torque, wind speed and direction, etc.
(iv).	Recording	Production data, event list, long and short term trends
(g). Brake		
(i).	Design	Aerodynamic Break
(ii).	Operational Brake	Aerodynamic brake achieved by feathering blades
(iii).	Secondary Brake	Hydraulic brake
(h). Tower		
(i).	Type	Tapered steel tower
(ii).	Hub Heights	95 m

(D). Other Details

(i).	COD of the Generation Facility (Anticipated)	June 30, 2024
(ii).	Minimum Useful Life of the Generation Facility from COD	25 years

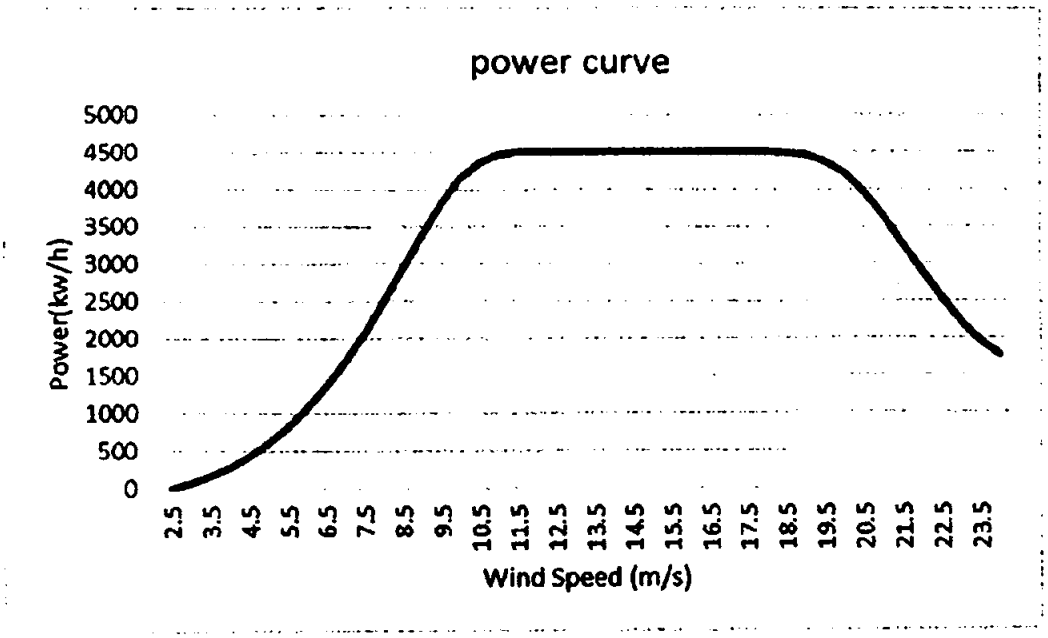
NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY

Power Curve
of Wind Turbine Generator
Goldwind (GW155-4.50 MW)
(Tabular)

Wind speed (m/s)	Power (kW)	Wind speed (m/s)	Power (kW)
2.5	11.06	13.5	4500.00
3	88.08	14	4500.00
3.5	191.55	14.5	4500.00
4	317.60	15	4500.00
4.5	469.88	15.5	4500.00
5	653.02	16	4500.00
5.5	877.23	16.5	4500.00
6	1142.83	17	4500.00
6.5	1459.88	17.5	4500.00
7	1821.08	18	4500.00
7.5	2232.89	18.5	4486.81
8	2675.07	19	4442.83
8.5	3146.57	19.5	4350.96
9	3602.48	20	4186.87
9.5	3998.21	20.5	3915.98
10	4279.55	21	3586.00
10.5	4416.45	21.5	3226.43
11	4486.16	22	2864.70
11.5	4498.97	22.5	2517.18
12	4500.00	23	2192.42
12.5	4500.00	23.5	1958.49
13	4500.00	24	1767.13

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

Power Curve
of Wind Turbine Generator
Goldwind (GW155-4.50 MW)
(Graphical)



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

SCHEDULE-II
Revised/Modified

The Total Installed/Gross ISO Capacity (MW), Total Annual Full Load Hours, Average Wind Turbine Generator (WTG) Availability, Total Gross Generation of the Generation Facility/Wind Farm (in GWh), Array & Miscellaneous Losses (GWh), Availability Losses (GWh), Balance of Plant Losses (GWh) and Annual Energy Generation (GWh) of the Generation Facility/Wind Power Plant/Wind Farm of Licensee is given in this Schedule

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA
AUTHORITY

SCHEDULE-II

(1).	Total Installed Gross ISO Capacity of the Generation Facility /Wind Farm (MW)	49.50 MW
(2).	Total Annual Full Load Hours	3,373 Hours
(3).	Average Wind Turbine Generator (WTG) Availability	99.0%
(4).	Total Gross Generation of the Generation Facility/Wind Farm (in GWh)	≥236.8 GWh
(5).	Array & Miscellaneous Losses GWh	≤56.84 GWh
(6).	Availability Losses GWh	≤7.10GWh
(7).	Balance of Plant Losses GWh	≤5.92 GWh
(8).	Annual Energy Generation (25 years equivalent Net AEP) GWh	≥166.94 GWh
(9).	Net Capacity Factor	≥38.5%

Note

All the above figures are indicative as provided by the Licensee. The Net energy available to Power Purchaser for dispatch will be determined through procedures contained in the EPA.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
NEPRA AUTHORITY