National Electric Power Regulatory Authority
Islamic Republic of Pakistan

Registrar

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No. NEPRA/R/DL/LAG-462/ 967-73 January 17, 2020

Mr. Adeel Ahmed,
Authorized Reprehensive,
P&G Energy (Private) Limited,
3rd Floor, Adeel Plaza, Fazal-e-Haq Road, Blue Area,
Islamabad

Subject: **Grant of Generation Licence No. SPGL/34/2020**
Licence Application No. LAG-462
P&G Energy (Private) Limited (P&GEPL)

Reference: *P&GEPL's application vide letter dated August 29, 2019 (received on August 30, 2019)*

Enclosed please find herewith Determination of the Authority in the matter of Application of "P&G Energy (Private) Limited (P&GEPL)" for grant of Generation Licence along with Generation Licence No. SPGL/34/2020 annexed to this determination granted by the National Electric Power Regulatory Authority (NEPRA) to P&GEPL for its 62.20 MWp Solar Power Plant located Mouza Karwat, Tehsil & District Gwadar, in the province of Balochistan, pursuant to Section 14(B) of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997/ Amendment Act, 2018.

2. Please quote above mentioned Generation Licence No. for future correspondence.

Enclosure: Generation Licence (SPGL/34/2020)

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(Syed Safeer Hussain)

Copy to:

1. Secretary, Ministry of Energy, Power Division, A-Block, Pak Secretariat, Islamabad.
2. Chief Executive Officer, 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, Quetta Electric Supply Company (QESCO), 14-A Zarghoon Road, Quetta.
5. Director General, Environmental Protection Department, Government of Balochistan, Zarghoon Road, Quetta.
6. Chief Secretary, Government of Balochistan, Balochistan Secretariat, Quetta.

National Electric Power Regulatory Authority (NEPRA)

Determination of the Authority in the Matter of Application of P&G Energy (Private) Limited for the Grant of Generation Licence

January 17, 2020
Case No. LAG-462

(A). Background

(i). In order to tap the indigenous potential of the province for power generation, the Government of Baluchistan (GoB) has formulated a policy titled Balochistan Power Generation Policy 2007 (the "Balochistan Power Policy") envisaging the utilization of power potential in the province.

(ii). In this regard, GoB has issued Letter of Intent (LoI) to different project developers/entrepreneurs for setting up power projects. One such LoI has been issued to ib vogt GmbH Germany under the Balochistan Power Policy. The LoI envisaged setting up an approximately 62.20 MW solar based generation facility/Solar Power Plant/Solar Farm at Mouza Karwat Tehsil & District Gwadar in the province of Balochistan. According to the terms and conditions of LoI, the sponsors of the project incorporated a Special Purpose Vehicle (SPV) in the name of P&G Energy (Private) Limited (P&GEPL).

(iii). As per terms and conditions of the LoI, Sponsors hired the services of different world renowned consultant for the preparation of feasibility study of the project. After the completion of the said study, P&GEPL decided to approach the Authority for the grant of generation licence.

(B). Filing of Application

(i). P&GEPL submitted an application on August 30, 2019 for the grant of generation licence in terms of Section-14B of Regulation of Generation,

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Transmission and Distribution of Electric Power Act, 1997 (the "NEPRA Act") read with the relevant provisions of the NEPRA Licensing (Application and Modification Procedure) Regulations, 1999 (the "Licensing Regulations").

(ii). The Registrar examined the submitted application to confirm its compliance with the Licensing Regulations and observed that the application lacked some of the required information/documentation. Accordingly, P&GEPL was directed for submitting the missing information/documentation and the same was finely received on September 04, 2019. The Authority considered the matter and found the form and content of the application in substantial compliance with Regulation-3 of the Licensing Regulations. Accordingly, the Authority admitted the application on October 25, 2019 for consideration of the grant of the generation licence as stipulated in Regulation-7 of the Licensing Regulations. The Authority approved an advertisement to invite comments of general public, interested and affected persons in the matter as stipulated in Regulation-8 of the Licensing Regulations. Accordingly, notices were published in one (01) Urdu and one (01) English newspapers on October 30, 2019.

(iii). In addition to the above, the Authority also approved a list of stakeholders for seeking their comments for assistance of the Authority in the matter in terms of Regulation-9(2) of the Licensing Regulations. Accordingly, letters were sent to different stakeholders as per the approved list on October 30, 2019, soliciting their comments for assistance of the Authority.

(C). Comments of Stakeholders

(i). In reply to the above, the Authority received comments from three (03) stakeholders. These included Engineering Development Board, Ministry of Industries & Production (EDB), Central Power Purchasing Agency (Guarantee) Limited (CPPAGL), and National Transmission and Despatch Company Limited (NTDC). The salient points of the comments offered by the said stakeholders are summarized below: -

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(a). EDB submitted that the information pertaining to the project has been reviewed and it has concluded that the same is not relevant to it. However, it is recommended that all efforts should be made to utilize the indigenous resources available for the implementation of the project;

(b). CPPAGL submitted that according to decision of the Cabinet Committee on Energy (CCoE) dated March 29, 2019 regarding Renewable Energy Project, all future RE investments will have to be dealt with under the RE Policy 2019 which will clearly enunciate a framework in consistent with current international market norms and greater consumer benefits. Once IGCEP by NTDCL determines how much additional power it needs to induct in the system by June 2023 as approved by the Regulator and NTDCL confirms its interconnection including the completion of pre-requisites for the issuance of Power Acquisition Request, AEDB will conduct competitive bidding, one for each technology, for the capacity to be procured under each technology, with risk being borne by the Project. The determination of size of each block will be done by NTDCL within 60 days of the approval of IGCEP and accordingly the capacity of wind, solar and bagasse power to be inducted through competitive bidding shall be intimated to AEDB. Thereafter, AEDB will develop the bidding documents based on the parameters determined by NEPRA. The Authority is requested to consider the future solar power projects in light of the quantum determined through IGCEP for competitive bidding. In light of the provisions of the NEPRA Licensing (Generation) Rules, 2000 (the "Generation Rules"), the Authority is required to

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scrutinize all applications for the generation license on least cost option criteria including, *inter alia*, (a). the costs and rights-of-way considerations related to the provision of transmission and interconnection facilities; (b). the constraints on the transmission system likely to result from the proposed; (c). generation facility and the costs of the transmission system expansion required to remove such constraints; (d). the short-term and the long-term forecasts for additional capacity requirements; (e). the tariffs resulting or likely to result from the construction or operation of the proposed generation facility; and (f). the optimum utilization of various sites in the context of both the short-term and the long-term requirements of the electric power industry as a whole. The Authority is requested to consider the future solar power projects in light of the quantum determined through IGCEP for competitive bidding; and

(c). NTDC remarked that the Grid Interconnection Study (GIS) carried out by the consultant of the project has been submitted and the same is currently under review.

(ii). The Authority reviewed the above comments of the stakeholders and considered it appropriate to seek the perspective of P&GEPL on the observations of EDB, CPPAGL & NTDC. On the comments of EDB, it was confirmed that maximum effort will be made to utilize the indigenous for the execution of the project. About the observations of NTDC, it was stated that only network of Quetta Electric Supply Company Limited (QESCO) exists around the site of the project which has already approved the Grid Interconnection Study.

(iii). About the comments of CPPAGL, it was submitted that GoB awarded LoI under Balochistan Power Policy which is still in force. About

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Competitive Bidding under draft RE Policy 2019, considering the financing cost, EPC costs, country risk, credit rating, etc. the company understands that the cost plus tariffs awarded recently by NEPRA to different solar projects (against different technological solutions) are very competitive. If Govt. of Pakistan can ask the commercial banks, to finance the RE Projects at overall interest rates of 1-2% than current cost plus tariff awarded by NEPRA will be comparable to International Markets. Hence we request Authority to consider all the market specific factors while considering competitive bidding for such solar projects. In addition, the RFPs floated by AEDB for consultation purposes have long timeline and LOS will be awarded to the project after almost 2.8 years. Moreover, on other hand new draft RE Policy sets the RE Generation Targets of 30% by 2030 in overall energy mix. Instead of moving towards target in good pace, the bidding process will eventually slow down overall installation of solar projects in the market. NEPRA may also consider the historic data of development and realization of the solar projects on Cost Plus Tariff basis. In Pakistan, it is to be noted that, on average it take 5-8 years for a project to be on ground in Pakistan (if everything goes to plan). Considering above point we cannot see any big advantage for changing in tariff regime for the current solar projects in Pakistan. The investors will quote same tariff numbers during bidding process and no greater economic benefit will be of gain. Bidding will only slow down the private investment in the solar PV sector. About the various factors of Least Cost Option Criteria given in the Generation Rules, it was submitted that existing the 132kV SDT Pasni-Gawadar transmission line is passing very close to the site of the proposed project and will be connected by making an In/Out of one circuit of the said line measuring only 0.50 km. This confirms that the evacuation of the project will be possible for which there are no transmission constraints and RoW issues. The company has already submitted to the Authority a petition for determination of tariff for the project and a very competitive tariff. Further, QESCO has already issued a consent for Evacuation of Power duly considering its short term and long term requirements.

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(iv). The Authority considered the above submissions of P&GEPL and considered it appropriate to proceed further in the matter as stipulated in the Licensing Regulations and NEPRA Licensing (Generation) Rules 2000 (the "Generation Rules").

(D). Evaluation/Findings

(i). The Authority has reviewed the submissions of P&GEPL including the information provided in its application for the grant of generation licence, comments of the stakeholders and the rejoinder in the matter. The Authority has also considered the feasibility study of the project, interconnection & dispersal arrangement studies etc., provisions of the RE Policy and the relevant rules & regulations.

(ii). The Authority has observed that the main sponsor of the project is is ib Vogt GmbH Germany which develops RE projects and specializes in the development, design, operation and maintenance, engineering, financing, and asset management of solar power plants. The company was established in 2002 as family-owned business company developing and delivering high-quality large-scale turnkey PV plants worldwide. The company has grown exponentially through strong network of local development partners and Multi-source financing solutions including DFIs and ECGs. Now, the company has presence in 55 countries including UK, Netherlands, Spain, Poland, Egypt, USA, Panama, Australia, India, Singapore, Philippines and portfolio of more than 1000 MW_P. According to the latest financial statement, the sponsors has total assets of Euro 188.00 million.

(iii). Based on the financial strength and other evaluation parameters, GoB issued LoI for development of the project. In this regard, the GoB has allocated approximately 230.00 acres of private land located at Mouza Karwat Tehsil & District Gwadar in the Province of Balochistan. As explained above, for the implementation of the project, the sponsor has incorporated a SPV in the

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name of P&GEPL under Section-16 of the Companies Act, 2017 (XIX of 2017), having Corporate Universal Identification No. 0124705, dated October 05, 2018. The Registered/Business office of the SPV is located at is 3rd Floor, Adeel Plaza, Fazal-e-Haq Road, Blue Area, Islamabad. According to the Memorandum of Association, the objects of the company include, *inter alia*, business of power generation and its sale thereof. According to the submitted information, the total outlay of the project will be approximately US $ 56.158 million which will be financed through a combination of debt (US $ 42.119 Million) and equity (US $ 14.039 Million) in a ratio of 75:25 which is in line with the benchmark set out in different determinations of the Authority in similar cases. It has been observed that the sponsors have taken up the matter with multiple banks and other lending institutes which have expressed their interest due to strong footprint of the sponsors in RE for financing the debt portion of the project. In consideration of the said, it is considered that sponsors have strong financial and technical background to carry out the project.

(iv). According to the terms and conditions of the LoI, the sponsors carried out a feasibility study of the project including, *inter alia*, solar power plant equipment details, micro-sitting details, power production estimates based on solar irradiation data of the project site, soil tests reports, technical details pertaining to selected photovoltaic (PV) cells and other allied equipment to be used in the solar power plant, electrical studies, environmental study and project financing etc.

(v). The Authority has reviewed the feasibility study of the project and same has revealed that that the company has considered various world class manufacturers of PV cells including Hanwha Q CELLS Co., Ltd., JA Solar Holdings Co., Ltd, Trina Solar Limited, First Solar, Inc., Jinko Solar Limited, Motech Industries Inc., Tongwei Solar Company Limited, Yingli Solar Limited, Canadian Solar Inc., Shunfeng International Clean Energy Limited and China Sunergy (Nanjing) Co., Ltd (CSNCL) and LONGi Solar Limited (LSL). After duly

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considering various factors including (a). Solar resource position of the proposed location; (b). Capital cost of equipment/PV Cells; (c). Lead time for supply of equipment/PV Cells; (d). Expected energy yield of PV Cells; (e). Reliability and compliance with Grid Code; (f). Availability of suitable operation and maintenance teams (including easiness/availability of spare/replacement parts for PV Cells etc.), the company decided to select LSL. The feasibility study also optimized the size of the proposed generation facility/Solar Power Plant/Solar Farm to approximately 62.233 MW_P, having 172872 x 360 W_P Mono Crystalline PV Modules.

(vi). The Authority has observed that LONGi Solar is a world leading manufacturer of high-efficiency mono-crystalline solar cells and modules. The Company, wholly owned by the LONGi Group (SH601012), has focused on p-mono for 19 years and is today the largest supplier of mono-crystalline products in the world, with total assets above $5.71 billion (2018Q3). LONGi Group has plans to reach 45 GW mono-crystalline wafer production capacity by 2020. The shipment of Solar module of LONGi in 2018 ranked top 4 in the world, and mono module shipment has remained No.1 in the world from 2016 to 2018. In view of the above, it is considered that the sponsors of the project have selected top of the line Tier-I company for supply of the PV panels. Further to said, the technology selected for PV cells for the project is monocrystalline which is a mature technology and is widely used due to its better energy yield to cost ratio. Accordingly, it can be safely said that the selected technology for PV cells is mature, cost effective and time tested. In view of the said, it is considered that the selected technology has distinctive features including versatility, flexibility and good performance.

(vii). In view of the above, the Authority considers that the sponsors of the project have selected top of the line Tier-I company for supply of the PV panels. Further to said, the technology selected for PV cells for the project is monocrystalline which is a mature technology and is widely used due to its better

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energy yield to cost ratio. Accordingly, it can be safely said that the selected technology for PV cells is mature, cost effective and time tested. In view of the said, the Authority considers that the selected technology has distinctive features including versatility, flexibility and good performance.

(viii). The Authority has observed that the sponsors of the project carried out the required GIS to determine the arrangement for dispersal of electric power from the proposed generation facility/Solar Power Plant/Solar Farm. According to the said study, the interconnection arrangement for despatch of electric power will be on 132kV voltage and will be consisting of a 132 kV D/C transmission line (measuring about 0.5 km on AASC CAIRO Conductor) for making In-Out of 132 kV D/C Pasni-Gawadar Transmission Line. In this regard, QESCO has also approved the above mentioned GIS, confirming that all the relevant parameters are within permissible limits of the Grid Code.

(ix). The Authority observes that the proposed project, for which generation licence is being sought, is based on RE source and does not cause pollution as in the case of conventional power plants. However, the operation of the generation facility/Solar Power Plant/Solar Farm may cause soil pollution, water pollution and noise pollution during construction and operation. In this regard, the Authority has observed that P&GEPL carried out the Initial Environment Examination (IEE) study for the project and submitted the same for the consideration and approval of Balochistan Environmental Protection Agency, Government of Balochistan (BEPA). In this regard, BEPA had already issued a No Objection Certificate (NOC) to the company for the construction of the project.

(x). In terms of Rule-3 of the Generation Rules, the Authority may grant a generation licence to any person to engage in the generation business. The said rule stipulates various conditions pertaining to the grant of generation licence as explained in Rule-3(2), Rule-3(3), Rule-3(4) and Rule-3(5) of the Generation Rules. In the particular case under consideration, the Authority considers that conditions of Rule-3(2) and Rule-3(3) stand satisfied as P&GEPL has provided

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details of location, technology, size, net capacity/energy yield, interconnection arrangements, technical limits, technical functional specifications and other details specific to the generation facility/Solar Power Plant/Solar Farm. The provision of Rule-3(4) of the Generation Rules regarding holding a public hearing is not applicable as there was no issue which required this exercise.

(xi). The Rule-3(5) of the Generation Rules stipulates that the Authority may refuse to issue a generation licence where the site, technology, design, fuel, tariff or other relevant matters pertaining to the generation facility proposed in an application for a generation licence are either not suitable on environmental grounds or do not satisfy the least cost option criteria. In this regard, the Rule-3(5) of the Generation Rules also stipulates the conditions pertaining to least cost option criteria which include (a). sustainable development or optimum utilization of the renewable or non-renewable energy resources proposed for generation of electric power; (b). the availability of indigenous fuel and other resources; (c). the comparative costs of the construction, operation and maintenance of the proposed generation facility against the preferences indicated by the Authority; (d). the cost and right-of-way considerations related to the provision of transmission and interconnection facilities; (e). the constraints on the transmission system likely to result from the proposed generation facility and the costs of the transmission system expansion required to remove such constraints; (f). the short-term and the long-term forecasts for additional capacity requirements; (g). the tariff resulting or likely to result from the construction or operation of the proposed generation facility; and (h) the optimum utilization of various sites in the context of both the short-term and the long-term requirements of the electric power industry as a whole.

(xii). The Authority considers that the proposed project will result in optimum utilization of the RE of the province of Balochistan which is untapped, resulting in pollution free electric power. It is pertinent to mention that solar is an indigenous RE resource and such resources should have a preference for the

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energy security. There is a global trend of reduction in the prices of PV Cells which results in lower tariffs as is evident from various determinations of the Authority. These lower tariffs will result in reduction of the overall basket price which will be beneficial to the public at large.

(xiii). As explained in the preceding paragraphs, the sponsor of the project carried out the GIS which concludes that the project will not face any constraints in transmission system. Further, being located at reasonable distance from the thin population of the area, the project will not result in cost and right-of-way issues for the provision of transmission and interconnection facilities. In view of the said, the Authority considers that the project of P&GEPL fulfills the eligibility criteria for grant of generation licence as stipulated in the NEPRA Act, rules, regulations and other applicable documents.

(E). Grant of Generation Licence

(i). The sustainable and affordable energy/electricity is a key prerequisite for socio-economic development of any country. In fact, the economic growth of any country is directly linked with the availability of safe, secure, reliable and cheaper supply of energy/electricity. In view of the said reasons, the Authority is of the considered opinion that for sustainable development, all indigenous power generation resources including RE must be developed on priority basis.

(ii). The existing energy mix of the country is heavily skewed towards thermal power plants, mainly operating on imported fossil fuel. The continuous import of fossil fuel not only creates pressure on the precious foreign exchange reserves of the country but is also an environmental concern. Therefore, in order to achieve sustainable development, it is imperative that indigenous RE resources are given priority for electric power generation and their development is encouraged. Recently, the world market for RE technologies have seen a sharp declining trend in terms of prices, making these technologies very attractive and

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cost effective for generation of electric power. Further, there are developments in the sector which are paving the way to address the intermittency issues of these technologies. In view of the said, the Authority is of the considered opinion that there is a worldwide trend to increase the share of RE in the energy mix of any country and it is very likely that the Govt. of Pakistan will also be considering to increase the share of RE substantially in the coming years.

(iii). The current case under consideration of the Authority is that P&GEPL which plans setting up a PV based solar generation facility/Solar Power Plant/Solar Farm at Mouza Karwat Tehsil & District Gwadar in the Province of Balochistan of an approximate installed capacity of 50.00 MW_P. As explained in the preceding paragraphs the proposed project not only fulfils the eligibility criteria for grant of generation licence as envisaged in the existing regulatory regime but also majority of the stakeholders are in support of the project except CPPAGL which raised certain concerns which the Authority considers appropriate to address through this determination.

(iv). The concerns of CPPAGL includes (a). availability of surplus capacity as stated in SIR-2017; (b). compliance of eligibility criteria for the grant of Generation Licence; (c). impact of stranded cost due to surplus capacity; (d). GCRP has not determined the quota of the future RE projects; (e). in terms of the decision of CCoE dated December 12, 2017, the future RE projects are to be awarded through competitive bidding; and (f). No PAR has been granted for the project. In consideration of the said, the Authority has observed that CPPAGL has made specific reference to SIR-2017 to strengthen its argument of surplus capacity in the years 2018-25. In this regard, the Authority hereby clarifies that the specific provisions of SIR-2017 referred by CPPAGL are based on the data provided by NTDC whereby it has been indicated that there may be some surplus installed capacity due to addition of various types of power generation facilities including coal, gas, wind, solar, bagasse, hydro and nuclear. However, it has been clearly mentioned in Section 1.1 of said report that "...the capacity surplus in the later years i.e.2022 to 2025 may not be available due to multiple issues,

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resulting in uncertainties in completion of large hydro-based power projects..." In this regard, the Authority hereby refers to the linked information contained in Table-31, Table-34 and Table-35 of the above mentioned report which when read together gives the capacity and the expected Commissioning Year of future projects pertaining to hydel projects in the Public Sector, hydel, coal and RLNG Projects being set in the Private Sector solar, wind and bagasse/biomass based generation facilities to be set up in the private sector.

(v). A detailed review of these projects reveals that projects like Dasu (Phase-I), Up-gradation of Mangla and Diamer Bhasha having accumulated installed capacity of 6970 MW, were expected to be commissioned by the year 2024. However, the same are delayed and may not achieve the said timelines due to the fact that a number of milestones pertaining to these projects including acquisition of land, preparation/approval of PC-I and award of contract(s) are facing delays for one reason or the other.

(vi). Similarly, projects of coal and hydel in the private sector namely (a). Kohala; (b). Chakothi-Hattian; (c). Azad Pattan; (d). Kaigah; (e). Mahl; (f). Turtonas-Uzghor; and (g). Athmuqam with accumulated installed capacity of 3810 MW, which earlier envisaged expected Commercial Operation Date (COD) by December 2024 and 2025, are facing delays in Financial Close, thus delay in construction and other related activities. In this regard, the Authority has duly considered the latest update available from PPIB which indicates that the above mentioned projects will not be coming online before December 2028. Further, Imported/Local Coal projects of (a). Grange; (b). Shanghai Electric; and (c). Oracle Thar of accumulated installed capacity of 2803 MW having expected COD between September 2019-2021 are also facing delays. According to the information available, a notice for encashment of Guarantee for the project of Grange has been issued which is under litigation. Further, the expected COD for projects of Shanghai and Oracle Thar will now be at least 2023.

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(vii). Regarding Wind Power Projects (WPPs), the Authority has issued licences and tariff to a number of WPPs which were facing delays due to non-issuance of Letter of Support (LoS) including the projects of (a). Shaheen Renewable Energy 1 (Private) Limited; (b). Western Energy (Private) Limited; (c). Lakeside Energy (Private) Limited; (d). Artistic Wind Power (Private) Limited; (e). Trans Atlantic Energy (Private) Limited; (f). Tricom Wind Power (Private) Limited; (g). Din Energy Limited; (h). Act 2 Wind (Private) Limited; and (i). NASDA Green Energy (Private) Limited, having accumulated installed capacity of 449.3 MW. The said projects were earlier anticipated to be commissioned between 2019-2020, will now be coming online not before September 2021.

(viii). About the various projects pertaining to solar, similar kind of situation is prevailing as the power projects mentioned in the Table-35 of SIR-2017 of (a). Access Solar (Pvt.) Limited; (b). Buksh Solar (Pvt.) Limited; (c). Jan Solar (Pvt.) Limited; (d). Lalpir Solar Power (Pvt.) Limited; (e). Siddiqsons Energy Limited; and (f). Zurlu Energy (Pvt.) Limited of accumulated installed capacity of 191.52 MW have been delayed for same reasons as mentioned in the case of wind power projects.

(ix). With regard to the bagasse based project, the Authority granted generation licences and tariff to different projects including: (a). Hunza Power (Pvt.) Limited; (b). Indus Energy Limited; (c). Faran Power (Pvt.) Limited; (d). Etihad Power Generation Limited; and (e). Bahawalpur Energy (Pvt.) Limited with accumulated installed capacity of 212.90 MW, however, the said projects have shown no progress as Energy Purchase Agreements have not been signed yet due to which these projects are facing delays and their expected COD will now be postponed for at least two (02) years instead of what is given in the SIR 2017.

(x). In view of the above explanation, it is clear that around thirty (30) power projects on different fuels with cumulative installed capacity of around 11000 MW are facing delays due to different problems/issues as explained above and their COD is not certain. In view of the said, the Authority considers that

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instead of making cursory remarks based on the above mentioned report which provides only snapshot of the power sector, CPPAGL and NTDC should carry out a proper demand-supply assessment/analysis truly aligned with the actual implementation schedule of the projects to determine whether practically there is any surplus or not. The Authority is also of the considered opinion that with the delays being experienced by the major projects it is very unlikely that there will be any surplus as being feared by CPPAGL.

(xi). About the comments of CPPAGL of compliance of eligibility criteria for the grant of Generation Licence, the Authority takes a very serious view of the said comments. In this regard, the Authority hereby like to clarify that said comments have been made in total illusion of the previous determinations made in similar cases whereby the Authority had given its proper analysis to justify the grant of generation licenses previously granted. If CPPAGL had reviewed those determinations, it would not have given such irrelevant comments. In this regard, the Authority takes a lenient view of the situation this time and ignore the same which actually may attract penal action for challenging the Quasi-judicial proceedings.

(xii). Regarding the observations of CPPAGL of stranded cost due to surplus capacity, the Authority has serious concerns on this that there may not be any surplus in the system as explained in the preceding paragraphs. In this regard, the Authority is of the considered opinion that CPPAGL in consultation with the XW-DISCOs must make concrete efforts and take necessary steps to stimulate the demand of the end consumers/users including industrial, commercial and domestic consumers, etc. In this regard, the Authority will like to highlight that reportedly about 0.50 million connections are pending and are not being provided electricity for one context or the other. The Authority reiterates that instead of propagating about surplus capacity, efforts must be expedited to clear the pendency of new connections so that the electric density of the country is improved which is currently one of the lowest in the region.

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(xiii). About, the observations of CPPAGL that GCRP has not determined the quota of the future RE projects, the Authority will like to highlight that GoP is contemplating an aggressive plan to increase the share of RE in the energy mix of the country to 20% by 2025 and to 30% upto 2030 from the current level of less than 5%. Therefore, instead of taking the position that GCRP has not determined the quota of RE therefore, the grant of generation Licence may not considered instead CPPAGL must liaison with all the relevant stakeholders so that the share of RE is ascertained in light of initiatives being taken to increase the portion of RE in the overall energy mix of the country which is now very attractive in terms of decreasing cost and will result in reduction of the overall energy cost for the system thus benefitting the end consumers of all kind. About the observations of CPPAGL of future RE Projects to be inducted through Competitive Bidding as per decision of CCoE dated December 12, 2017, the Authority hereby clarifies that it considers competitive bidding the most prudent way to add more capacity however, in this regard necessary framework for carrying out the bidding must be in place which is currently not there. In view of the said the Authority considers its regulatory obligation to continue entertaining applications for the grant of licences as stipulated in the applicable laws.

(xiv). Regarding the binding of decision of the CCoE or otherwise, the Authority in its previous determinations for determining the tariff for the wind projects has given its determination and reiterates the same. About the observations of CPPAGL of not entertaining the PAR for different projects including this one, the Authority hereby clarifies that the same is not a requirement for the grant of generation licence.

(xv). In view of the above, the Authority considers that the proposed project of P&GEPL will help in diversifying the energy portfolio as well increasing share of RE in the country. Further, it will not only enhance the energy security of the country by reducing the dependence on imported fuel but will also help in reducing carbon emissions by generating clean electricity, thus improving the environment.

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(xvi). As explained in the preceding paragraphs, P&GEPL has provided the details of location, technology, size, net capacity/energy yield, interconnection arrangements, technical details and other related information for the proposed generation facility/Solar Power Plant/Solar Farm. In this regard, the Authority has observed that Government of Balochistan has allocated land to P&GEPL for setting up the generation facility/Solar Power Plant/Solar Farm. The said details are being incorporated in the generation licence. The Authority directs P&GEPL to utilize the allocated land exclusively for the proposed generation facility/Solar Power Plant/Solar Farm and not to carry out any other activity on the said allocated land except with the prior approval of the competent authority.

(xvii). The term of a generation licence under Rule-5(1) of the Generation Rules is required to commensurate with the maximum expected life of the units comprised in a generating facility, except where an applicant for a generation licence consents to a shorter term. According to the information provided by P&GEPL, its generation facility/Solar Power Plant/Solar Farm will achieve COD by September 30, 2021 and will have a useful life of more than twenty five (25) years from its COD. In this regard, P&GEPL has requested that the term of the proposed generation licence may be fixed as twenty five (25) years. The Authority considers that said submission of P&GEPL about the useful life of the generation facility/Solar Power Plant/Solar Farm and the subsequent request to fix the term of the generation licence is consistent with international benchmarks therefore the Authority fixes the term of the generation licence as twenty five (25) years from COD of the project.

(xviii). Regarding the tariff, it is hereby clarified that under Section-7(3)(a) of the NEPRA Act, determining tariff, rate and charges etc. is the sole prerogative of the Authority. In this regard, it is pertinent to mention that P&GEPL has filed a tariff petition for determination of its tariff on cost plus basis. The Authority has admitted the same and the same is in advance stage of processing. Further, to the said, Cabinet Committee on Energy (CCoE) through its decision dated April

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04, 2019 has decided that projects of RE at the stage of LoI will be going through Competitive Bidding (CB). In view of the said, it is still not clear whether P&GEPL will be having a cost plus tariff or a tariff through CB. In view of the said, the Authority considers appropriate to direct P&GEPL to charge the power purchaser only such tariff which has been determined, approved or specified by it. In view of the said, the Authority decides to include a specific article in the generation licence. Further, the Authority directs P&GEPL to adhere to the said in letter and spirit without any exception.

(xix). About the compliance with the environmental standards, as discussed in the preceding paragraphs, P&GEPL has provided the NOC from BEPA and has confirmed that the project will comply with the required standards during the term of the generation licence. In view of the importance of the issue, the Authority has decided to include a specific article in the generation licence along with other terms and conditions making it obligatory for P&GEPL to comply with relevant environmental standards at all times. Further, the Authority directs P&GEPL to submit a report on a bi-annual basis, confirming that operation of its generation facility/Solar Power Plant/Solar Farm is in compliance with the required environmental standards as prescribed by the concerned environmental protection agency.

(xx). The proposed generation facility/Solar Power Plant/Solar Farm of P&GEPL will be using RE resource for generation of electric power. Therefore, the project may qualify for the carbon credits under the Kyoto Protocol. Under the said protocol, projects coming into operation up to the year 2020 can qualify for the carbon credits. P&GEPL has informed that the project will achieve COD by September 30, 2021, which is beyond the existing deadline of the Kyoto Protocol. However, it is expected the said deadline may be extended or some alternative mechanism is expected to be in place. In view of the said, an article for carbon credits and its sharing with the power purchaser has been included in the generation licence. Accordingly, the Authority directs P&GEPL to initiate the process in this regard at the earliest so that proceeds for the carbon credits are

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materialized. P&GEPL shall be required to share the proceeds of the carbon credits with the power purchaser as stipulated in the generation licence.

(xxi). In view of the above, the Authority hereby approves the grant of generation licence to P&GEPL on the terms and conditions set out in the generation licence annexed to this determination. The grant of generation licence will be subject to the provisions contained in the NEPRA Act, relevant rules, regulations framed thereunder and other applicable documents.

Authority:

Engr. Rafique Ahmed Shaikh
(Member)

Engr. Rehmatullah Baloch
(Member)

Saif Ullah Chattha
(Member)

Engr. Bahadur Shah
(Member/Vice Chairman)

Engr. Tauseef H. Farooqi
(Chairman)

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17 01 20

National Electric Power Regulatory Authority (NEPRA)
Islamabad – Pakistan

GENERATION LICENCE
No. SPGL/34/2020

In exercise of the powers conferred upon the National Electric Power Regulatory Authority (NEPRA) under Section 14B of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997/Amendment Act, 2018, the Authority hereby grants a Generation Licence to:

P&G ENERGY (PRIVATE) LIMITED

Incorporated Under Section-16
of the Companies Act 2017 (XIX of 2017) Having Corporate Universal Identification No. 0124705, dated October 05, 2018

for its Generation Facility/Solar Farm/Solar Power Plant Located at Mouza Karwat Tehsil & District Gwadar in the Province of Balochistan

(Total Installed Capacity: ≈ 62.20 MW_P Gross)

to engage in generation business subject to and in accordance with the Articles of this Licence.

Given under my hand this on 17th day of January Two Thousand & Twenty and expires on 29th day of September Two Thousand & Forty-Six.

17/01/20

Registrar

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ISLAMABAD

Article-1
Definitions

1.1 In this licence

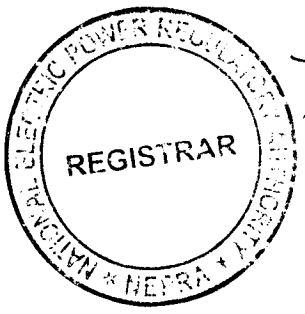
(a). "Act" means the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 as amended or replaced from time to time;

(b). "AEDB" means the Alternative Energy Development Board or any other entity created for the like purpose established by the GoP to facilitate, promote and encourage development of renewable energy in the country;

(c). "Applicable Documents" mean the Act, the rules and regulations framed by the Authority under the Act, any documents or instruments issued or determinations made by the Authority under any of the foregoing or pursuant to the exercise of its powers under the Act, the Grid Code, the applicable Distribution Code, the Commercial Code if any, or the documents or instruments made by the Licensee pursuant to its generation licence, in each case of a binding nature applicable to the Licensee or, where applicable, to its affiliates and to which the Licensee or any of its affiliates may be subject;

(d). "Applicable Law" means all the Applicable Documents;

(e). "Authority" means the National Electric Power Regulatory Authority constituted under Section-3 of the Act;



(f). "Balochistan Power Policy" means the "Balochistan Power Generation Policy 2007" of GoB as amended from time to time;

(g). "BPDB" means Balochistan Power Development Board or any other entity created for the like purpose established by the GoB to facilitate, promote and encourage development of private sector

participation for development of projects for electric power in the province of Balochistan;

(h). "Bus Bar" means a system of conductors in the generation facility/Solar Power Plant/Solar Farm of the Licensee on which the electric power from all the photovoltaic cells is collected for supplying to the Power Purchaser;

(i). "Carbon Credits" mean the amount of Carbon Dioxide (CO2) and other greenhouse gases not produced as a result of generation of electric energy by the generation facility/Solar Power Plant/Solar Farm and other environmental air quality credits and related emissions reduction credits or benefits (economic or otherwise) related to the generation of electric energy by the generation facility/Solar Power Plant/Solar Farm, which are available or can be obtained in relation to the generation facility/Solar Power Plant/Solar Farm after the COD;

(j). "Commercial Code" means the National Electric Power Regulatory Authority (Market Operator, Registration, Standards and Procedure) Rules, 2015 as amended or replaced from time to time;

(k). "Commercial Operations Date (COD)" means the day immediately following the date on which the generation facility/Solar Power Plant/Solar Farm of the Licensee is commissioned;

(l). "Commissioning" means the undertaking of the Commissioning Tests of the generation facility/Solar Power Plant/Solar Farm as stipulated in the EPA;

(m). "CPPA-G" means Central Power Purchasing Agency (Guarantee) Limited or any other entity created for the like purpose;

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(n). "Distribution Code" means the distribution code prepared by the concerned XW-DISCO and approved by the Authority, as may be revised from time to time with necessary approval of the Authority;

(o). "Energy Purchase Agreement (EPA)" means the energy purchase agreement, entered or to be entered into by and between the Power Purchaser and the Licensee, for the purchase and sale of electric energy generated by the generation facility/Solar Power Plant/Solar Farm, as may be amended by the parties thereto from time to time;

(p). "Generation Rules" mean the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000 as amended or replaced from time to time;

(q). "Grid Code" means the grid code prepared and revised from time to time by NTDC with necessary approval of the Authority;

(r). "GoB" means the Government of the province of Balochistan acting through the BPDB which has issued letter of intent to the Licensee for the design, engineering, construction, insuring, commissioning, operation and maintenance of the generation facility/Solar Power Plant/Solar Farm;

(s). "GoP" means the Government of Pakistan acting through the AEDB which has issued or will be issuing to the Licensee a LoS for the design, engineering, construction, insuring, commissioning, operation and maintenance of the generation facility/Solar Power Plant/Solar Farm;

(t). "QESCO" means Quetta Electric Supply Company Limited or its successors or permitted assigns;

(u). "IEC" means "the International Electrotechnical Commission or its successors or permitted assigns;

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(v). "IEEE" means the Institute of Electrical and Electronics Engineers or its successors or permitted assigns;

(w). "Implementation Agreement (IA)" means the implementation agreement signed or to be signed between the GoP and the Licensee in relation to this particular generation facility/Solar Power Plant/Solar Farm, as may be amended from time to time;

(x). "Letter of Support (LoS)" means the letter of support issued or to be issued by the GoP through the AEDB to the Licensee;

(y). "Licensee" means P&G Energy (Private) Limited or its successors or permitted assigns;

(z). "Licensing Regulations" mean the National Electric Power Regulatory Authority Licensing (Application & Modification Procedure) Regulations, 1999 as amended or replaced from time to time;

(aa). "Net Delivered Energy" means the net electric energy expressed in kWh generated by the generation facility/Solar Power Plant/Solar Farm of the Licensee at its outgoing Bus Bar and delivered to the Power Purchaser;

(bb). "NTDC" means National Transmission and Despatch Company Limited or its successors or permitted assigns;

(cc). "Policy" means the Policy for Development of Renewable Energy for Power Generation, 2006 of GoP as amended or replaced from time to time;

(dd). "Power Purchaser" means CPPA-G which will be purchasing electric energy from the Licensee either on behalf of all XW-DISCOs or any single XW-DISCO, pursuant to an EPA for procurement of electric energy;

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(ee). "SCADA System" means the supervisory control and data acquisition system for gathering of data in real time from remote locations to control equipment and conditions;

(ff). "Solar Power Plant/Solar Farm" means a cluster of photovoltaic cells in the same location used for production of electric power;

(gg). "XW-DISCO" means an Ex-WAPDA distribution company engaged in the distribution of electric power".

1.2 The words and expressions used but not defined herein bear the meaning given thereto in the Act or Generation Rules and Licensing Regulations issued under the Act.

Article-2
Applicability of Law

This licence is issued subject to the provisions of the Applicable Law, as amended from time to time.

Article-3
Generation Facilities

3.1 The location, size (capacity in MW), technology, interconnection arrangements, technical limits, technical functional specifications and other details specific to the generation facility/Solar Power Plant/Solar Farm of the Licensee are set out in Schedule-I of this licence.

3.2 The net capacity/Net Delivered Energy of the generation facility/Solar Power Plant/Solar Farm of the Licensee is set out in Schedule-II of this licence. The Licensee shall provide the final arrangement, technical and financial specifications and other specific details pertaining to its generation facility/Solar Power Plant/Solar Farm before its COD.

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Article-4
Term of Licence

4.1 This licence shall become effective from the date of its issuance and will have a term of twenty-five (25) years from the COD of the generation facility/Solar Power Plant/Solar Farm of the Licensee subject to Section 14-B of the Act.

4.2 Unless suspended or revoked earlier, the Licensee may apply for renewal of this Licence ninety (90) days prior to the expiry of the above term, as stipulated in the Licensing Regulations.

Article-5
Licence fee

The Licensee shall pay to the Authority the licence fee as stipulated in the National Electric Power Regulatory Authority (Fees) Rules, 2002 as amended or replaced from time to time.

Article-6
Tariff

The Licensee shall charge only such tariff from the Power Purchaser which has been determined, approved or specified by the Authority.

Article-7
Competitive Trading Arrangement

7.1 The Licensee shall participate in such manner as may be directed by the Authority from time to time for development of a Competitive Trading Arrangement.

7.2 The Licensee shall in good faith work towards implementation and operation of the aforesaid Competitive Trading Arrangement in the manner and time period specified by the Authority. Provided that any such participation shall be subject to any contract entered into between the Licensee and another party with the approval of the Authority.

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7.3 Any variation or modification in the above-mentioned contracts for allowing the parties thereto to participate wholly or partially in the Competitive Trading Arrangement shall be subject to mutual agreement of the parties thereto and such terms and conditions as may be approved by the Authority.

Article-8
Maintenance of Records

For the purpose of sub-rule(1) of Rule-19 of the Generation Rules, copies of records and data shall be retained in standard and electronic form and all such records and data shall, subject to just claims of confidentiality, be accessible by authorized officers of the Authority.

Article-9
Compliance with Performance Standards

The Licensee shall comply with the relevant provisions of the National Electric Power Regulatory Authority Performance Standards (Generation) Rules 2009 as amended or replaced from time to time.

Article-10
Compliance with Environmental & Safety Standards

10.1 The generation facility/Solar Power Plant/Solar Farm of the Licensee shall comply with the environmental and safety standards as may be prescribed by the relevant competent authority from time to time.

10.2 The Licensee shall provide a certificate on a bi-annual basis, confirming that the operation of its generation facility/Solar Power Plant/Solar Farm is in conformity with required environmental standards as prescribed by the relevant competent authority.

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Article-11
Power off take Point and Voltage

The Licensee shall deliver the electric energy to the Power Purchaser at the outgoing Bus Bar of its generation facility/Solar Power Plant/Solar Farm. The Licensee shall be responsible for the up-gradation (step up) of generation voltage up to the required dispersal voltage level.

Article-12
Performance Data

12.1 The Licensee shall install properly calibrated automatic computerized solar radiation recording device(s) at its generation facility/Solar Power Plant/Solar Farm for recording of data.

12.2 The Licensee shall install SCADA System or compatible communication system at its generation facility/Solar Power Plant/Solar Farm as well as at the side of the Power Purchaser.

Article-13
Provision of Information

In accordance with provisions of Section-44 of the Act, the Licensee shall be obligated to provide the required information in any form as desired by the Authority without any exception.

Article-14
Emissions Trading /Carbon Credits

The Licensee shall process and obtain expeditiously the Carbon Credits admissible to the generation facility/Solar Power Plant/Solar Farm. The Licensee shall share the said proceeds with the Power Purchaser as per the Policy.

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Article-15
Design & Manufacturing Standards

The photovoltaic cells and other associated equipment of the generation facility/Solar Power Plant/Solar Farm shall be designed, manufactured and tested according to the latest IEC, IEEE standards or any other equivalent standard in

the matter. All the plant and equipment of generation facility/Solar Power Plant/Solar Farm shall be unused and brand new.

Article-16
Power Curve

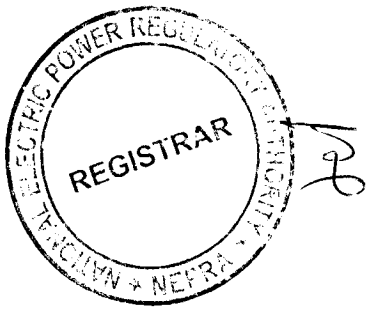
The power curve for the individual photovoltaic cell provided by the manufacturer and as mentioned in Schedule-I of this generation licence, shall form the basis in determining the cumulative power curve of the generation facility/Solar Power Plant/Solar Farm.

Article-17
Compliance with Applicable Law

The Licensee shall comply with the provisions of the Applicable Law, guidelines, directions and prohibitory orders of the Authority as issued from time to time.

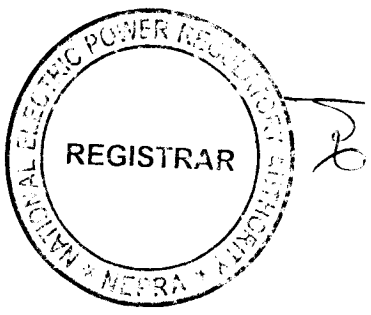
Article-18
Corporate Social Responsibility

The Licensee shall provide the descriptive as well as monetary disclosure of its activities pertaining to corporate social responsibility (CSR) on an annual basis.

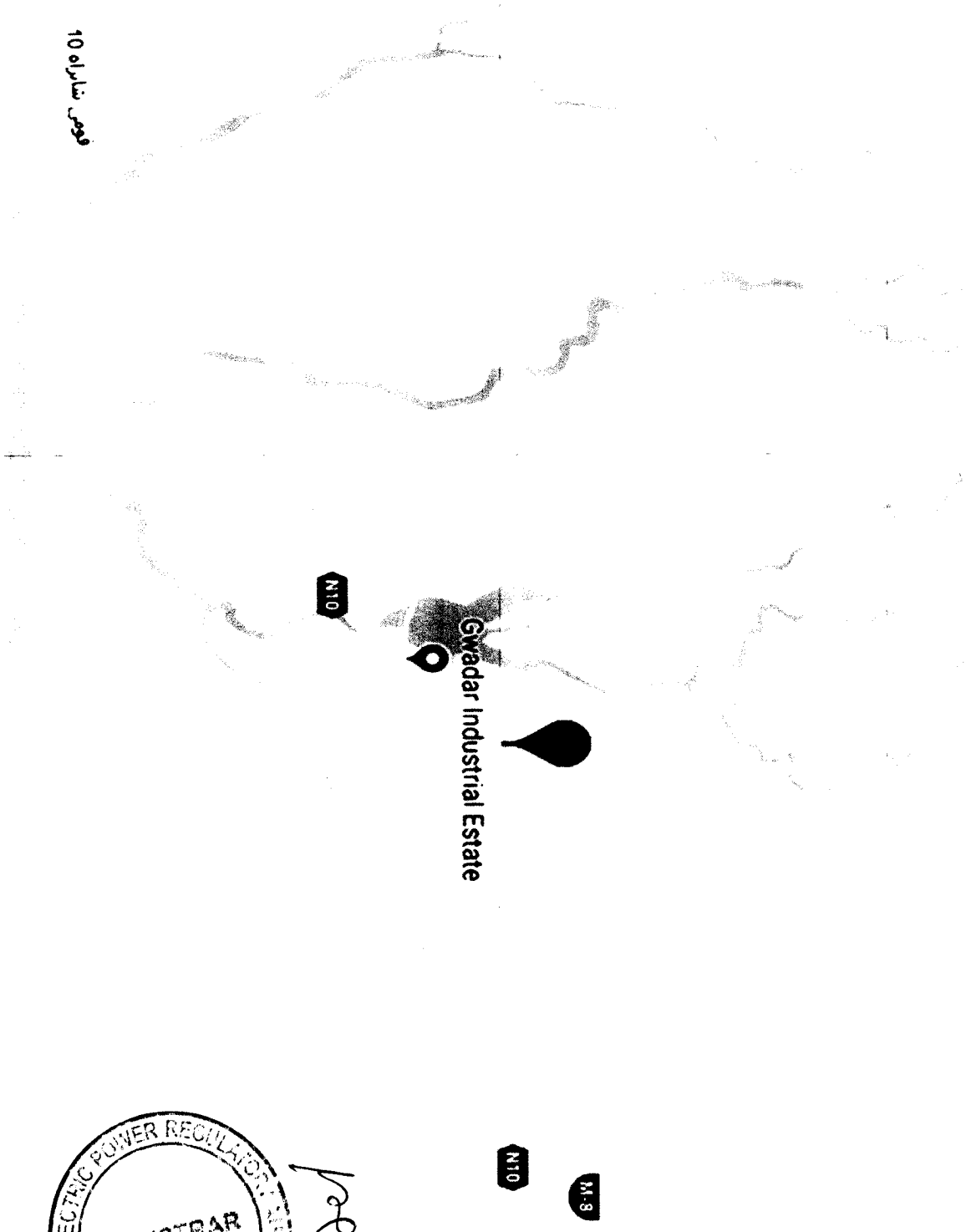


SCHEDULE-I

The Location, Size (i.e. Capacity in MW), Type of Technology, Interconnection Arrangements, Technical Limits, Technical/Functional Specifications and other details specific to the Generation Facilities of the Licensee are described in this Schedule.



Location of the Generation Facility/Solar Power Plant/Solar Farm of the Licensee



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Land Coordinates of the Generation Facility/Solar Power Plant/Solar Farm of the Licensee

P1	Lat 25.3213	Long 62.6368
P2	Lat 25.3239	Long 62.6369
P3	Lat 25.3268	Long 62.6369
P4	Lat 25.3302	Long 62.6369
P5	Lat 25.3302	Long 62.6312
P6	Lat 25.3302	Long 62.6252
P7	Lat 25.3277	Long 62.6245
P8	Lat 25.3277	Long 62.6359
P9	Lat 25.3260	Long 62.6257
P10	Lat 25.3260	Long 62.6286
P11	Lat 25.3266	Long 62.6286
P12	Lat 25.3264	Long 62.6322
P13	Lat 25.3224	Long 62.6318
P14	Lat 25.3199	Long 62.6320

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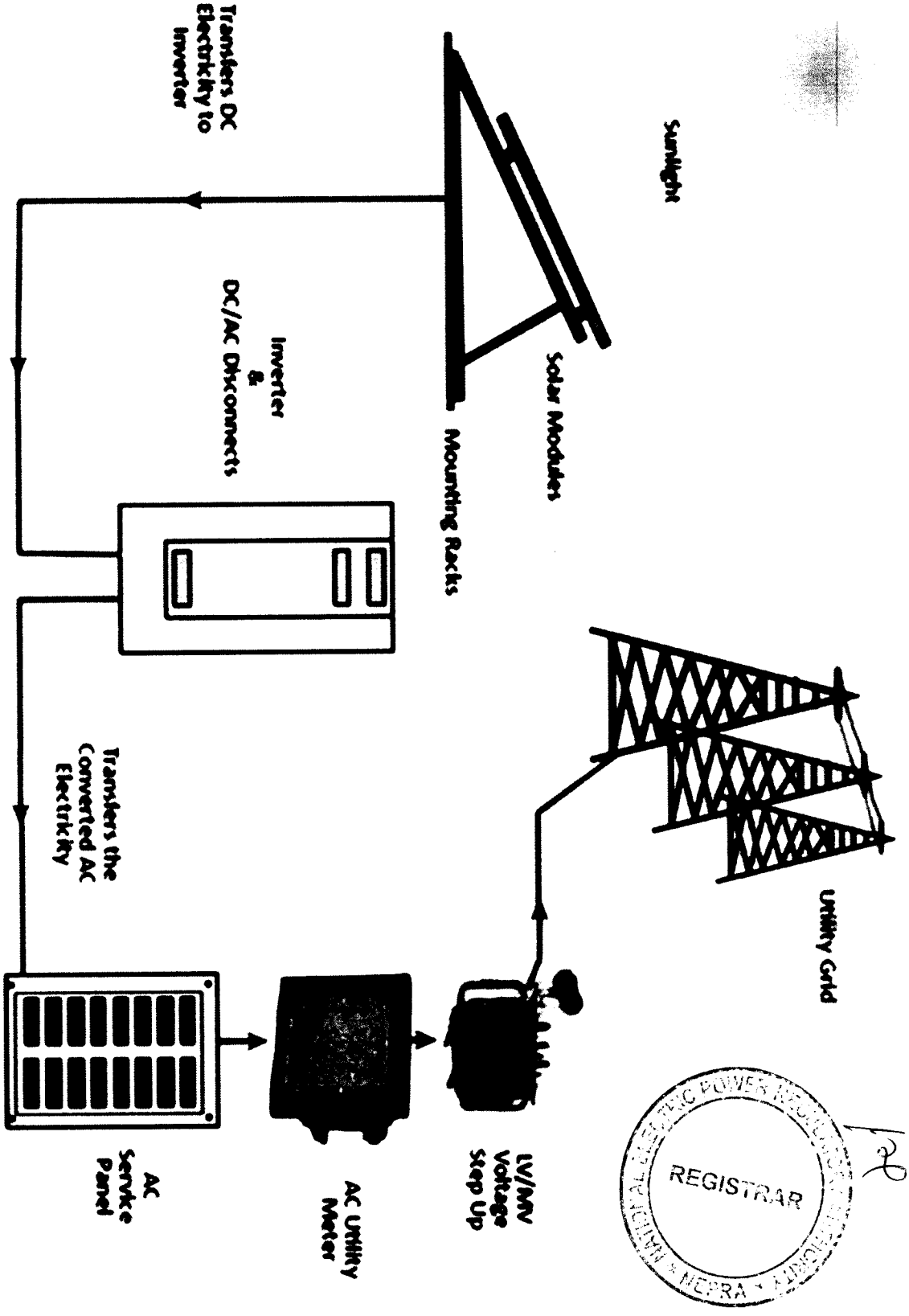
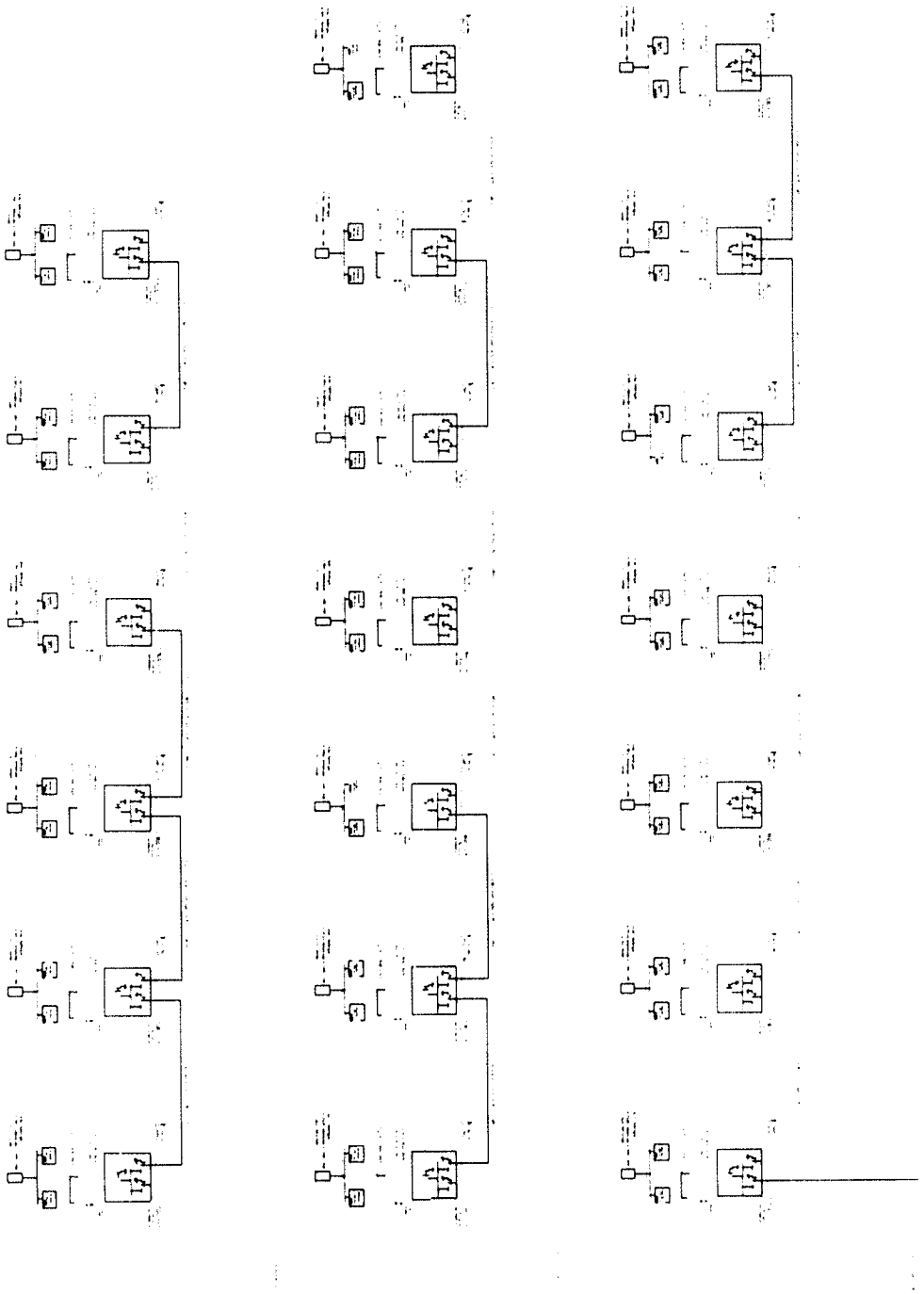
Process Flow Diagram
of the Generation Facility/Solar Power Plant/Solar Farm
of the Licensee



Single Line Diagram
of the Generation Facility/Solar Power Plant/Solar Farm
of the Licensee



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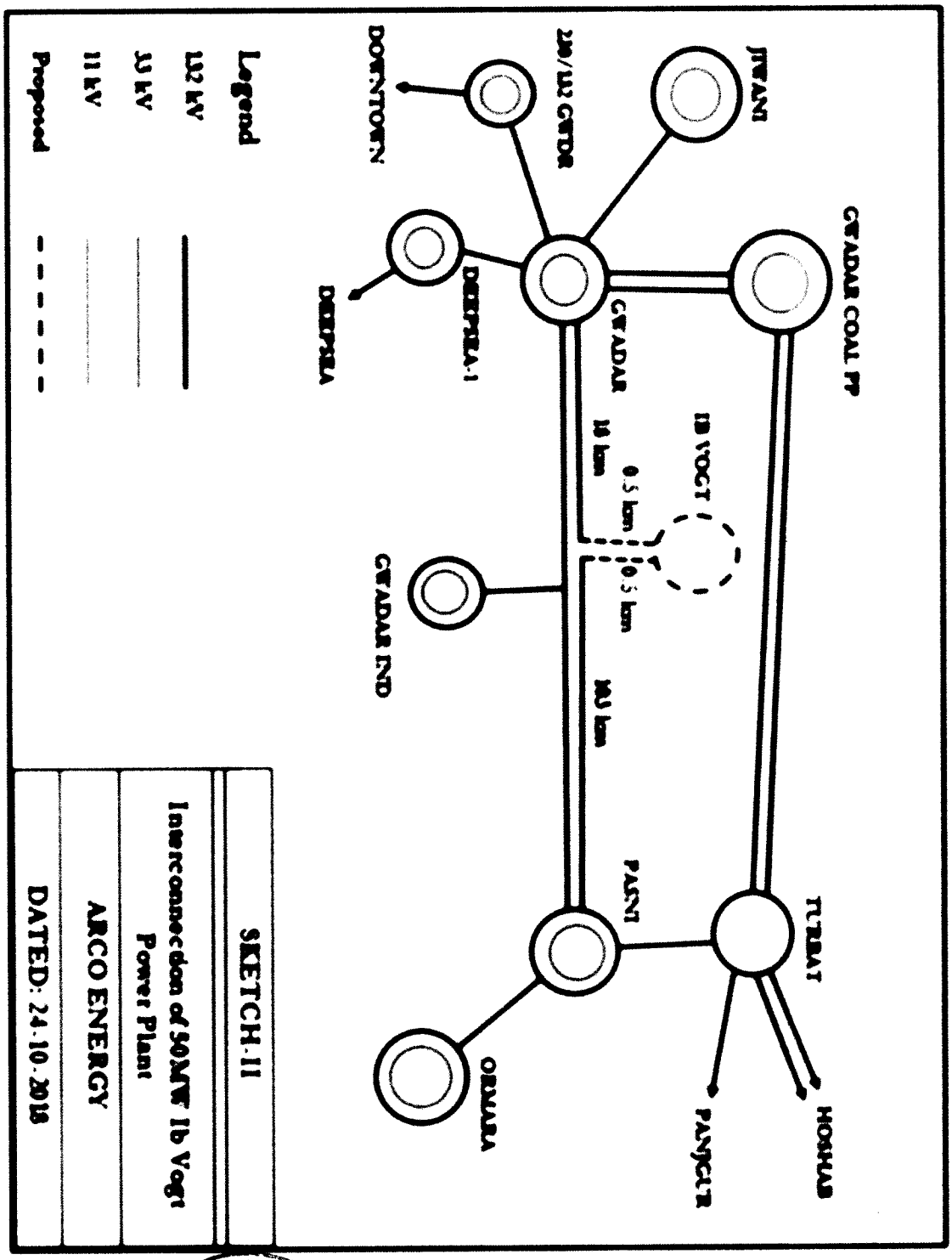
Schematic Diagram of the Interconnection Arrangement/ Transmission Facility for Dispersal of Power from the Generation Facility/Solar Power Plant /Solar Farm



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Interconnection Arrangement for Dispersal of Electric Energy/Power from the Generation Facility/ Solar Power Plant/Solar Farm

The electric power generated from the generation facility/Solar Power Plant/Solar Farm of the Licensee/P&G Energy (Private) Limited/P&GEPL shall be dispersed to the load center of QESCO.

(2). The proposed Interconnection Arrangements/Transmission Facilities for dispersal of power from generation facility/Solar Power Plant/Solar Farm of the Licensee/P&GEPL will consist of the following: -

(i). A 132 kV D/C transmission line (measuring approx. 0.5 KM long on AASC CAIRO Conductor) for making In-Out of one circuit of 132 KV D/C Pasni-Gawadar transmission line at the proposed generation facility/Solar Power Plant/Solar Farm;

(3). Any change in the above Interconnection Arrangement/Transmission Facility duly agreed by Licensee/P&GEPL and QESCO, shall be communicated to the Authority in due course of time.

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Detail of Generation Facility/Solar Power Plant/ Solar Farm

(A). General Information

(i).	Name of the Company/ Licensee	P&G Energy (Private) Limited
(ii).	Registered/Business Office of the Company	712, Al Hafeez Business Centre, 89 B/3, Gulberg 3, Lahore.
(iii).	Location of the Generation Facility/Solar Power Plant/Solar Farm	Mouza Karwat Tehsil & District Gwadar in the Province of Balochistan
(iv).	Type of Generation Facility Solar Power Plant/Solar Farm	Solar Photovoltaic (PV)

(B). Solar Power Generation Technology & Capacity

(i).	Type of Technology	Poly Crystalline PV Cell
(ii).	System Type	Grid Connected
(iii).	Installed Capacity of Solar (MW)	62.23 MW_P

(C). Technical Details of Equipment

(a).	**Solar Panels – PV Modules**		
(i).	Type of Module	LONGi Solar	
(ii).	No of PV Modules	[In Series]	28
		[In Parallel]	6174
(iii).	Total number of PV Modules	No. Modules	172872
		Unit Norm Power	360 Wp
(iv).	Array Global Power	Nominal (STC)	62,234 kWp
		At operating cond.	55,811 kWp (50°C)
(v).		U mpp	992 V

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	Array Operating Characteristics (50°C)	I mpp	56,273 A
(vi).	Total Module Area	340,915 m²	
(vii).	Manufacturer	LONGi Solar	
(viii).	Model	LR6-72BP 355~375M	
(ix).	Panel power	360 Wp	
(x)	No. Of Panels	172,872 solar panels	
(xi).	Panel's Frame	Aluminium	
(xii).	Solar Cells	Silicon monocrystalline	
(xiii).	Panels Warranty	10 years	
(xiv).	Number of Solar Cells used	72 pcs of 6" monocrystalline solar cell	
(xv).	Efficiency of module	19%	
(xvi).	Environment Protection System	Glass lamination	
(xvii).	Panels power generating efficiency	Degradation @ 0.45 %	
(xviii).	Maximum Power (Pmax)	360Wp	
(xix).	Voltage @ (P_{max})	39.8V	
(xx).	Current @ P_{max}	9.16A	
(xxi).	Open circuit voltage (V_{oc})	48.2V	
(xxii).	Short circuit current (I_{sx})	9.72A	
(xxiii).	Output Tolerance	+/-3%	
(xxiv).	Maximum system Voltage	DC1500V	
(xxv).	Series fuse rating	20A	
(xxvi).	Application	DC Class II system	
(xxvii).	System Cell	monocrystalline silicon	
(xxviii).	No. Of cells & connections	72 pcs in series	
(xxix).	Efficiency of module	19%	

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(xxx).	Temperature coefficient of P_{max}	-0.370%/ °C	
(xxxi).	Temperature coefficient of V_{oc}	-0.300%/ °C	
(xxxii).	Temperature coefficient of I_{sc}	+0.060%/ °C	
(b).	**Inverters**		
(i).	Inverters Model	SG2500HV-MV	
(ii).	Manufacturer	Sungrow	
(iii).	Operating Voltage	800-1300Vdc	
(iv).	Unit Nom Power	2500kW AC	
(v).	Number of Invertors	20 units	
(vi).	Total Power	50,000 kW AC	
(vii).	Specification	SG2500HV-MV-S-10/SG2500HV-MV-C-10	
(viii).	Efficiency	Peak Efficiency 99.0% Euro Efficiency 98.7%	
(ix).	Features	(a).	2 MPP Tracker
		(b).	24 DC inputs
		(c).	Anti-PID
		(d).	99% inverter efficiency
(x).	Maximum AC apparent power	2750kW	
(xi).	Maximum DC Voltage	1500Vdc	
(xii).	MPP Voltage Range	800-1300Vdc	
(xiii).	Start-up Voltage	800/840Vdc	
(xiv).	Start-up Power	-	
(xv).	Nominal DC Voltage	800 -1300 Vdc	
(xvi).	Maximum Input Current	3508A	
(xvii).	Power Control	MPP Tracker	
(xviii).	DC Connector	24 DC inputs	

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(xix).	Output Power	2500kW	
(xx).	Maximum Power	2750kW	
(xxi).	Maximum Output Current	2886A	
(xxii).	Output Voltage Range	10-35 kV	
(xxiii).	Nominal Grid Frequency/Grid Frequency Range	50Hz / 45-55Hz , 60Hz / 55-65Hz	
(xxiv).	Power Factor at nominal power/adjustable power factor	>0.99 / 0.8 leading – 0.8 lagging	
(xxv).	Total Harmonic Distortion	<3% (at nominal power)	
(xxvi).	Feed-in phases / Connection phases	3 / 3	
(xxvii).	Mechanical Information	Dimensions (W x L x H)	6058*2896*2438 mm
		Net Weight	17 T
		Packing Size	
		Protection Level	IP54
		Casing Material	Steel
(xxviii).	Environmental Enclosures	Operating Temperature Range	-35°C–60° C
		Storage Temperature Range	-20° C–60° C
		Relative Humidity	0 - 95% non-condensing
		Operating Elevation	1000 m
		Warranty Period	10 years
(xxix).	Invertors protection performance against	(a).	Over voltage both at input & output.
		(b).	Over current both at input & output.
		(c).	Over/under grid frequency.
		(d).	Over temperature.
		(e).	Short circuit.

		(f).	Protection against lightning.
		(h)	Earth Fault protection.
(c).	**Junction Boxes**		
(i).	Specification	DC Distribution (Junction) Box (IP 65)	
(ii).	Number of units	310	
(iii).	Type of Junction Boxes	AC and DC junction Box	
(iv).	Purpose of Junction Box	(a).	Combine groups of modules into independent charging sub-arrays that will be wired into the controller.
		(b).	Provide arrangement for disconnection for each of the groups.
		(c).	Provide a test point for each sub-group for quick fault location.
		(d).	To provide group array isolation.
		(e).	The current carrying ratings of the junction Boxes shall be suitable with adequate safety factor to inter-connect the Solar PV array.
(d).	**AC MP Panel**		
(i).	AC MP Panel Detail	With available AC breakers designed	
(ii).	Number of units	20	
(e).	**Monitoring System**		
(i).	Irradiation meter	12 pyranometers, secondary standard according to ISO 9060-1990	
(ii).	Temperature meter	6 units (Surface temperature, air temperature, ambient temperature)	
(iii).	PC +Monitor	Data logging using software and hardware provided by Gantner	

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(f).	**Transformers**	
(i).	Transformer Power	2500 kVA
(ii).	Type of Transformer	Step-up Out door type
(iii).	Purpose of Transformer	Step up voltage, galvanic isolation and eliminate DC current injection
(g).	**Lightning Protection and Ear thing and Grounding System**	
(i).	Number of Light arrestors	14 (as per design)
(h).	**Testing and measurement Equipment**	
(i).	Multimeter (volt, amp ,resistor)	As per design
(ii).	Irradiation meter	As per design
(iii).	Temperature meter	As per design
(iv).	Mega resistor meter	As per design
(v).	Earth resistor meter	As per design
(i).	**Control Room**	
(i).	Type of Control Room	Container based
(ii).	Data record	Continuous logging with data logging software
(iii).	Control Room System	Computerized data acquisition system
(iv).	Control room System Detail	A/D converter, Multiplexer, De-multiplexors, Interfacing Hardware & Software, Industrial Type PC, which will be robust & rugged suitable to operate in the Control Room environment
(j).	**Mounting Structure**	
(i).	Structure use	Array frames
(ii).	Tilt of Array Frame	Phi angle -60° to 60°
(iii).	Array Specification	Certified for wind and seismic requirements
(iv).	Mounting Structure	Tracker System

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(k).	**Foundation Pillars**	
(i).	No. Of Foundations	14,500
(ii).	Foundation Structure	Pile driven steel post
(iii).	Array Specification	Certified for wind and seismic requirements
(iv).	Mounting Structure	Parallel series generating DC output
(l).	**Grid Connection**	
(i).	Type of Control Room	Container based
(ii).	Data record	Continuous logging with data logging software
(iii).	Control Room System	Computerized data acquisition system
(iv).	Control room System Detail	A/D converter, Multiplexer, De-multiplexors, Interfacing Hardware & Software, Industrial Type PC, which will be robust & rugged suitable to operate in the Control Room environment

(D). Other Details

(i).	COD of the Generation Facility/Solar Power Plant/Solar Farm (Anticipated)	September 30, 2021
(ii).	Expected Useful Life of the Generation Facility/ Solar Power Plant/Solar Farm from the COD	25 Years

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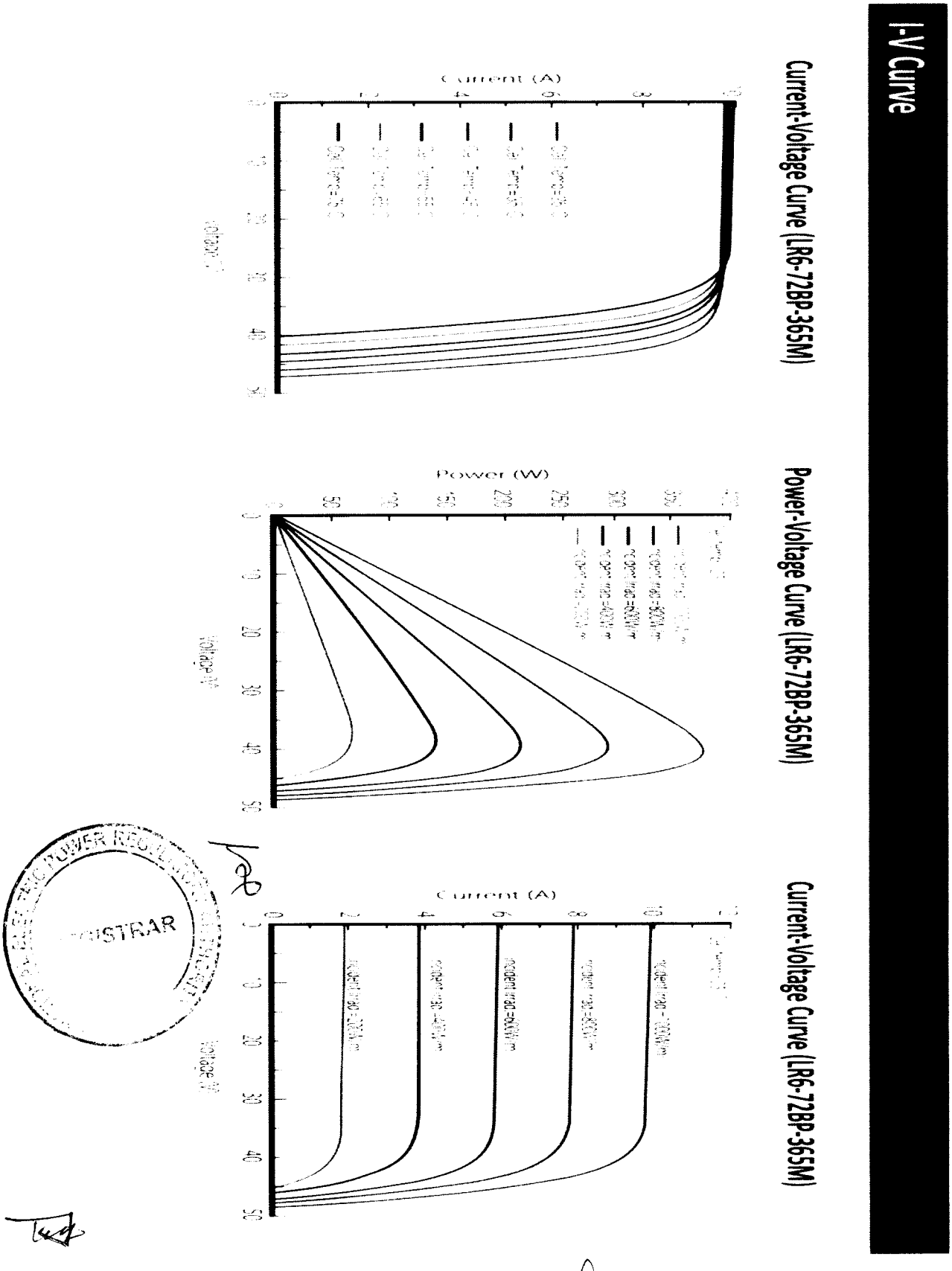
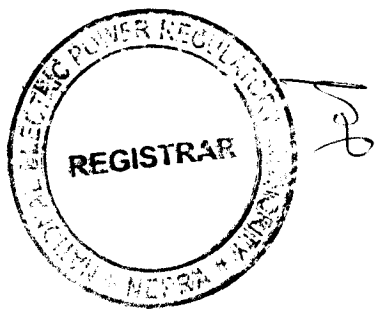
V-I Curve of PV Cell
Proposed to be Installed At the Generation Facility/ Solar Power Plant/Solar Farm



SCHEDULE-II

The Total Installed Gross ISO Capacity of the Generation Facility/Power Plant/Solar Plant (MW), Total Annual Full Load (Hours), Average Sun Availability, Total Gross Generation of the Generation Facility/Solar Farm (in kWh), Annual Energy Generation (25 years Equivalent Net Annual Production-AEP) KWh and Net Capacity Factor of the Generation Facility/Power Plant/Solar Farm of Licensee is given in this Schedule.



SCHEDULE-II

(1).	Total PV Installed Capacity of Generation Facility	≈ 62.20 MW_P
(2).	Average Sun Hour Availability/Day (Irradiation on Inclined Surface)	10.00 Hrs
(3).	Days per Year	365
(4).	PV Plant Generating Capacity Annually (As Per Simulation)	134552 MWh
(5).	Expected Total Generation in 25 years Life Span	3363800 MWh
(6).	Generation per Year from plant keeping 24 Hours Working	62.20 x 24 x 365 = 544872 MWh
(7).	Net Capacity Factor (4/6)	24.32%

Note

All the above figures are indicative as provided by the Licensee. The Net Delivered Energy available to Power Purchaser for dispatch will be determined through procedures contained in the Energy Purchase Agreement (EPA) or the Applicable Document(s).

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