National Electric Power Regulatory Authority
Islamic Republic of Pakistan

Registrar

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No. NEPRA/R/LAG-290/4501-05

March 29, 2022

Mr. Naeem Kasbati
Chief Executive Officer
Lucky Electric Power Company Limited
6-A, A. Aziz Hashim Tabba Street,
Muhammad Ali Housing Society, Karachi

Subject: **Modification Generation Licence No. IGSPL/66/2016 (Modification-II)**
Licence Application No. LAG-290
Lucky Electric Power Company Limited, (LEPCL)

Reference: LEPCL's LPM submitted vide letter No. LEPCL/CEO/353 dated April 15, 2021

It is intimated that the Authority has approved Modification in Generation Licence No. IGSPL/66/2016 dated March 03, 2016 in respect of Lucky Electric Power Company Limited (LEPCL) pursuant to Section-26 of NEPRA Act read with Regulation 10(11)(a) of the NEPRA Licensing (Application and Modification Procedure) Regulation 1999.

2. Enclosed please find herewith determination of the Authority in the matter of Licensee Proposed Modification of LEPCL alongwith Modification-II in the Generation Licence No. IGSPL/66/2016, approved by the Authority.

Enclosure: As Above

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(Syed Safeer Hussain)

Copy to:

1. Managing Director, NTDC, 414 WAPDA House, Lahore
2. Chief Executive Officer, Central Power Purchasing Agency Guarantee Ltd, 73 East, A.K. Fazl-ul-Haq Rd, Blue Area, Islamabad
3. Managing Director, Private Power & Infrastructure Board (PPIB), Ground & 2nd Floors, Emigration Tower, Plot No. 10, Mauve Area, Sector G-8/1, Islamabad
4. Director General, Environmental Protection Agency, Government of Sindh Plot No. ST/2/1, Sector 23 Korangi Industrial Area, Karachi

National Electric Power Regulatory Authority (NEPRA)

Determination of the Authority in the Matter of Licensee Proposed Modification of Lucky Electric Power Company Limited

March 29, 2022
Case No. LAG-290

(A). Background

(i). The Authority in terms of Section-15 (now Section-14B) of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (the "NEPRA Act") granted a Generation Licence (No. IGSPL/66/2016 dated March 03, 2016 to Lucky Electric Power Company Limited (LEPCL) for its 660 MW generation facility/thermal power plant at Deh Ghangario, Bin Qasim Town, at Karachi, in the Province of Sindh.

(ii). The generation facility/thermal power plant of LEPCL was initially envisaged to be operated on imported coal. However, based on the advice of the federal government regarding utilization of indigenous resources/fuels, the primary fuel of LEPCL was changed from imported coal to Thar coal. The same was incorporated in the Generation Licence through Modification-I dated November 20, 2017.

(B). Communication of Modification

(i). In accordance Section-26 of the NEPRA Act read with Regulation-10(2) of the NEPRA Licensing (Application & Modification Procedure) Regulations, 1999 (the "Licensing Regulations"), LEPCL communicated a Licensee Proposed Modification (LPM) in its existing Generation Licence on April 21, 2021.

(ii). In the text of the proposed modification, LEPCL has proposed to (a). change the technology of Steam Turbine/Boiler and allied parameters from Super-critical (SC) to Ultra Super Critical (USC); (b). add Imported Lignite Coal as Primary Fuel in addition to Thar Coal; and (c). change the anticipated COD of the plant from June 30, 2021 to the Third Quarter of 2021.

(iii). Regarding "statement of the reasons in support of the modification", LEPCL, inter alia, stated that LEPCL has stated that "the proposed modification is

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required to be incorporated, to update the configuration of Generation Facility, Plant COD, provision of imported coal under Fuel Details and updating plant characteristics.

(iv). About "statement of the impact on the tariff, quality of service and the performance by the Licensee of its obligations under the licence", LEPCL informed that the tariff, quality of service and the roles, responsibilities and obligations of the licensee under the Generation Licence will not be affected by the proposed modification.

(C). Processing of LPM

(i). After completion of all the required information as stipulated under the Regulation 10(2) and 10(3) of the Licensing Regulations by LEPCL, the Registrar accepted the LPM for further processing. The Registrar published the communicated LPM on May 08, 2021 in one (01) English and one (01) Urdu newspaper, to inform the general public, interested/affected parties, and different stakeholders about the said LPM as required under the Regulation-10(4) of the Licensing Regulations. The Registrar invited comments of the said stakeholders in favor or against the communicated LPM.

(i). Apart from the above, separate letters were also sent to government ministries, their attached departments and representative organizations etc. on May 18, 2021. Through the said letters, the stakeholders were informed about the communicated LPM and publication of notice in the press. Further, the said entities were invited for submitting their views and comments in the matter for assisting the Authority.

(D). Comments of Stakeholders

(i). In response to the above, the Authority received comments from three (03) stakeholders including Private Power & Infra Structure Board (PPIB), Central Power Purchasing Agency (Guarantee) Limited (CPPA-G) and National Transmission and Despatch Company Limited (NTDC). The salient points of the comments offered by the above mentioned stakeholders are summarized in the following paragraphs: -

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(a). PPIB/the relevant executing agency, in is comments supported the LPM. PPIB further submitted that in light of CCOE directives its

board has allowed LEPCL to use imported coal till COD of phase-III of Sindh Engro Coal Mining Company (SECMC). Furthermore COD of the project has been delayed till 3rd quarter of 2021 due to various reasons. In view of the said, NEPRA may proceed with the LPM as per applicable law;

(b). CPPA-G in its comments inter alia submitted that (a). as per CCOE decision dated February 15, 2018, completion of ongoing power projects in the south are required to be ensured within their timelines for availability of requisite power to be evacuated through HVDC transmission line project. Henceforth, keeping in view the COD of ± 660 kV HVDC Transmission Line (i.e., March 01, 2021), RCODs of Thar coal-based projects including that of LEPCL were incorporated in their respective PPAs which in case of LEPCL is March 01, 2021 and may be extended subject to provision stipulated under the PPA; (b). It is recommended that as per standard prudent practice, there should only be 3 ramping rate categories or start-ups i.e. Hot Start, Warm Start and Cold Start which will facilitate the System Operator to optimally utilize the start-ups of LEPCL project in line with the already commissioned coal fired power plants; (c). CPPA-G appreciates the advancement in the project technology from SC to USC as it is assumed that the Complex is now capable to offer more efficient performance parameters such as increased/efficient Ramping Rate, reduction/efficiency in start-up timings viz-a-viz lesser time duration required to synchronize with the Grid System; (d). LEPCL is offering very low Ramping Rate from 30% to 100% MCR which is far very less than the already commissioned SC as well as sub-critical technology-based Power Plants, and therefore the narrated Ramping Rate cannot be accepted from an USC technology-based project. It is recommended that the minimum Ramping Rate for LEPCL should not be less than 1.2% which has already been demonstrated by SC technology based China Power Hub Generation Company Limited (CPHGCL) project, after being approved by the Authority. It is important to mention here that for lower Ramping Rate, the Unit/Complex requires more time to comply with the dispatch instructions and resultantly it increases the consumption of (HSD/coal) fuel burned during the start-up process,

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increases cost of operation and decreases efficiency. Additionally, lower Ramping Rate will also pose additional financial implications on Power Purchaser owing to increased part load adjustment charges on part of Power Purchaser; (e). The time duration for each start-up needs to be categorized explicitly by the Company and the same is required to be approved by NPCC in line with the performance parameters of USC technology and prudent practices; (f). a category of "Very Hot start-up" (a start-up after a shutdown period of not more than two hours) may also be included to facilitate the NPCC in quick restoration during shorter shutdown durations; and (g). any revision/modification in Generation License of LEPCL as approved by the Authority, will also be reflected in the relevant PPA schedules without any further changes; and

(c). NTDC in its comments re-iterated the comments of CPPA-G stating that (a). as per standard prudent practice, there should only be 3 ramping rate categories or start-ups i.e. Hot Start, Warm Start and Cold start which will facilitate the System Operator to optimally utilize the start-ups of LEPCL project in line with the already commissioned coal fired power plants; (b). LEPCL is offering very low Ramping Rate from 30% to 100% MCR which is very less than the already commissioned SC as well as sub-critical technology-based Power Plants, and therefore the narrated Ramping Rate cannot be accepted from an USC technology-based project. It is recommended that the minimum Ramping Rate for LEPCL should not be less than 1% for warm startup and 1.5% for hot startup which has already been demonstrated by SC technology based project of CPHGCL, after being approved by the Authority; (c).The time duration for each start-up needs to be in line with the performance parameters of USC technology and prudent practices specially for warm startup which should not be more that 300 minutes; (d). for dispatch and NTC purpose a category of "Very Hot start-up" may also be included to facilitate the System Operator in quick restoration during shorter shutdown durations.

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(ii). The Authority examined the above comments of the stakeholders and found comments of PPIB in favor of the LPM in the generation licence of LEPCL.

Whereas, CPPA-G and NTDC in their comments have highlighted various issue relating to the LPM. Accordingly, the Authority considered it appropriate seeking perspective of the licensee/LEPCL on the observations of CPPA-G and NTDC.

(iii). In response to the observations of CPPA-G and NTDC, it was submitted by LEPCL that the first and foremost aspect requiring thorough consideration is the technology, design, operating parameters, and efficiency of the Pulverized Coal boiler specifically designed by GE/ALSTOM for Thar coal (Lignite) which has no resemblance with any other boiler in Pakistan. Comparable boilers are installed and being operated in Germany, prior to the recent renewable trend, which operate on lignite coal locally available. It may also be noted that China does not have the licence and expertise to design such USC boiler on Lignite Coal. This specialty still rests with GE-Alstom, Germany however manufacturing is being done in GE-Alstom workshop in Wuhan, China.

(iv). LEPCL further submitted that the composition and analysis of the fuel (coal) and size of the power plant are main driving factors for boiler design and boiler of LEPCL has been designed for optimal performance on Thar coal. Designing a PC boiler on Thar coal with over 39% efficiency is a landmark achievement and an engineering marvel. The USC Pulverized Coal boiler of LEPCL has been designed on indigenous (Thar) coal having high moisture, lower calorific value, and less ash content as compared to the other SC Boilers designed on Sub-bituminous imported coal with much less moisture and twice as much calorific value.

(v). Narrowing down to specific design considerations for a boiler, key impacts are; (a). Moisture Content: influences the sizing of furnace, gas path and recycling of hot gases to dry the feeding coal into the mills in order to get the maximum efficiency through reduction in latent heat losses; (b). Heating Value: influences the overall coal consumption and efficiency. Size of the boiler in terms of footprint area, cross sectional furnace area, and height of the boiler is influenced. The increase in these three parameters, for a lignite PC boiler, is in the range of 41-48% as compared to sub-bituminous PC boiler. The resident time of fuel combustion is twice as much (3-4 seconds) for a PC boiler as compared to (1.5-2 seconds) for a sub-bituminous PC boiler. The auxiliary power consumption is also driven by boiler design and fuel moisture etc. (c). Fuel Ratio: influences ignition properties and hence the required milling fineness and firing system is selected; (d). Ash Content and Composition: influence amount of ash generated hence, ash handling system as well

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as the flue gas path due to erosion has to be designed accordingly. Slagging and fouling of coal ash requires specific design keeping in view ash analysis; and (e). Materials, Construction and Costs: The typical SC PC boiler on sub- bituminous coal is around 90 meters tall whereas USC PC boiler of LEPCL is 136 meter tall. What it really means is more and typical steel/metal and more load for civil works foundation piles. Resultantly the material cost is higher, construction cost is more, and installation time is longer while the project cost or tariff remains the same. The EPC cost of LEPCL due to USC PC boiler on lignite is 7-8% higher than SC PC boiler which was being procured by LEPCL earlier before imposition of ban on imported coal projects.

(vi). LEPCL decided to incur additional cost for a lignite USC PC boiler as it is a step in right direction to achieve national energy security and eliminate foreign exchange requirement. LEPCL has not only taken an extended step to introduce this advanced European technology in Pakistan but also took a calculated risk to support the future of indigenous coal by getting possible highest efficiency and environmentally supportive technology as compared to other CFBs on indigenous coal. The future of Thar mines is associated with success of this technology which is the most viable technical and commercial option other than Thar vicinity and associated water limitations in Thar.

(vii). Advancement in technology from SC to USC must not be considered as an advancement in technical limits such as ramping rates, reduction in synchronization time etc. rather these are as per OEM recommendation considering the technology constraints and not comparable with other coal fired plants in the country. In all fairness the real advantage of this technology should be compared in terms of overall techno-economic model having higher efficiency and less environment emissions as compared to sub-critical boilers (CFB) operating on same fuel (i.e. Thar Lignite). Moreover, since inception this tower type boiler was under consideration and parameters got trued up in-line with PPA requirement after balancing the heat consumption to dry up the coal in order to use it in grinding mills and pulverizes without compromising the OEM recommended limitations on Boiler-Turbine-Generator (BTG) Package. For that very specific reason, LEPCL not only selected GE/ALSTOM boiler but picked BTG package as whole to ensure compatibility to the highest possible performance parameters.

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(viii). On the comments of CPPA-G regarding extension in COD of the project, LEPCL submitted that it concurs with the comment of CPPA-G and is already pursuing for earliest completion of Power Purchaser Interconnection Works (PPIF) as per Section 6.5 of PPA. The 500KV transmission line is still in construction phase therefore, COD has been delayed from March 01, 2021.

(ix). Regarding observations of CPPA-G on the proposed ramping rate arrangement, LEPCL submitted that as a prudent practice, the technical limits provided by OEM should be followed. As elaborated above, CPHGCL or other such SC PC boilers running on sub-bituminous coal are not comparable to LEPCL boiler due to fuel, design, and related technological parameters. The optimal reliability and availability of plant cannot be ensured by system operator dispatch facilitation only rather it can only be achieved by adherence to technical limits defined by the OEM. These curves are provided by the world's well renowned OEM "GE-Alstom" and due to technical limitations on the USC Turbine metallurgy, GE-Alstom has cautiously fixed all ramp rates , especially after hot startup case, to avoid cooling of the turbine metal blades due to the then prevailing steam conditions versus turbine metal temperatures. Even with this, the Authority and CPPA-G may appreciate that LEPCL time for notice to synchronization is significantly lower than others. Ramping rate, startup timing and time to synchronization to grid are key factors for system operator however, overall thermal efficiency, EPP and merit order listing are equally important factors to be considered for optimal performance of the overall system. LEPCL plant is likely to appear among first 3-4 plants on top of merit order and above all, due consideration is required for optimally running the highest thermal efficiency plant on local coal not requiring foreign exchange.

(x). LEPCL further clarified that ramping rate is not the only criterion or driver for USC plant, the performance has to be looked at in totality. LEPCL submits that as a prudent practice, the technical limits provided by OEM must be followed in order to secure the reliability and availability of the plant. As elaborated above, CPHGCL or other such SCPC boiler plants running on sub-bituminous coal are not comparable to LEPCL boiler due to fuel, design, and related technological parameters. It is envisaged that LEPCL plant, being among the top few will run most of the time therefore, number of starts ups and associated cost or part load adjustment etc. are not much relevant. LEPCL agreed with CPPA-G that during normal running of the Plant, ramp rates for step change in dispatched load should be higher. LEPCL has discussed the same with the OEM and are agreed to change this

value to 1.35% of unit load /min i.e., 8.9 MW/Min provided that unit load is greater than 50% and after each step change there should be a holding time of 10 minutes. However, this ramp rate shall not be applied during or right after the hot, warm, and cold or very cold startups.

(xi). LEPCL further submitted the Power Purchaser or NPCC, while categorizing startups times duration must consider the OEM recommendations as prudence. It is not possible to include "Very Hot Startup" as no such curve has been provided by OEM and our Hot Startup includes less than 2 hours' time as well. Hot Startup curve will be applied during shorter shutdowns even. It is not possible for LEPCL to deviate from OEM provided technical limits. Hot startup time required by LEPCL to synchronize is already lower than others.

(xii). The Authority considered/examined above replies/rejoinder of LEPCL to the observations of the stakeholders and found the same plausible. Accordingly, the Authority considered it appropriate to process the LPM of LEPCL as stipulated in the relevant Regulations and 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, earlier modification in the Generation Licence, up-front tariff, information submitted along with the application of LPM and relevant provisions of the NEPRA Act, relevant rules and regulations.

(ii). In this regard, it is observed that originally the Authority granted a Generation Licence (IGSPL/66/2016 dated March 03, 2016 and subsequent modification) to LEPCL for it's of 660.00 MW based on 1x660 MW steam turbine with a SC boiler. Initially, the generation facility LEPCL was proposed to be operated primarily on imported coal.

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(iii). Later on, as per direction/advice of GoP/PPIB regarding utilization of indigenous resources/fuels, LEPCL submitted LPM to change its primary fuel from imported coal to Thar coal. The same was incorporated in the Generation Licence LEPCL through Modification-I dated November 20, 2017.

(iv). Now, through the instant LPM/modification, LEPCL has proposed to (a). change the technology of Steam Turbine/Boiler and allied parameters from SC to USC; (b). add Imported Lignite Coal as Primary Fuel in addition to Thar Coal; and (c). change the anticipated COD of the plant from June 30, 2021 to Third Quarter of 2021.

(v). Regarding LPM in the Generation Licence, it is relevant to mention that Regulation-10(2) of the Licensing Regulations stipulates that a licensee may, at any time during the term of a licence, communicate to the Authority an LPM setting out (a). the text of the proposed modification; (b). a statement of the reasons in support of the modification; and (c). a statement of the impact on the tariff, quality of service and the performance by the licensee of its obligations under the licence.

(vi). In this regard, the Authority in terms of Section-26 of the NEPRA Act read with Regulation-10(5) of the Licensing Regulations, is empowered to modify an existing licence of a licensee subject to and in accordance with such further changes as the Authority may deem fit, in the opinion of the Authority such modification (a). does not adversely affect the performance by the licensee of its obligations; (b). does not cause the Authority to act or acquiesce in any act or omission of the licensee in a manner contrary to the provisions of the NEPRA Act or the rules or regulations made pursuant to it; (c). is or is likely to be beneficial to the consumers; (d). is reasonably necessary for the licensee to effectively and efficiently perform its obligations under the licence; and (e). 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.

(vii). Regarding proposed change in the technology of Steam Turbine/Boiler, it is observed that LEPCL now intends to change the technology from SC to USC technology of GE-Alstom. Pulverized coal combustion (PC) is the most widely used technology in coal-fired power plants globally. The technology's developments in the past decades have primarily involved increasing plant thermal efficiencies by raising the steam pressure and temperature. Based on the differences in temperature and pressure, the technology is categorized into three tiers: subcritical, SC and USC. SC and USC technologies achieve high efficiency and consequently use less coal and result in reduced CO_2 emissions.

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	Main steam pressure, MPa	Main steam temp, °C	Reheat steam temp, °C	Electrical efficiency (%)	CO_2 emissions, g/kWh
Sub-critical	<22.1	Up to 565	Up to 565	Upto 37%	766–789
SC	22.1–25	540–580	540–580	>38%	722
USC	>25	>580	>580	>40%	<722
LEPCL	28.85	603	611.5	>40%	<722

(viii). The efficiency numbers indicate approximation and exact figure depends on coal specifications, technology and several other factors. In case of LEPCL boiler, it is relevant to mention that it is specifically designed considering the low BTU coal of Thar Coal mines and to achieve minimal efficiency of 39% as per tariff requirement however, it is envisaged to give over 40%.

(ix). USC currently is the most efficient technology for producing electricity fueled by pulverized coal. A USC unit operates at supercritical pressure and at advanced steam temperatures of 1,100 °F (593.33 °C). These temperatures and pressures enable more efficient operation of the turbine cycle. This increase in efficiency reduces fuel (coal) consumption, and thereby reduces emissions, solid waste, water use and operating costs.

(x). Along with the change in technology of Steam Turbine and Boiler from SC to USC (GE-Alstom), the allied parameters of the generation facility have also been confirmed. In this regard, the following ramping rates and grid synchronization time have been provided for incorporation in the Generation Licence:

Ramping Rate				
Start Ups	≤30% MCR	>30% to ≤50% MCR	>50% to ≤100% MCR	>50% to ≤100% MCR (during the normal running of the plant)
Hot Start	19 MW/Min	4.0MW/Min	5.0 MW/Min	8.9 MW/Min
Warm Start	9.0 MW/Min	4.0 MW/Min	4.0 MW/Min	
Cold Start	2.5 MW/Min	3.0 MW/Min	4.0 MW/Min	
Very Cold Start	4.0 MW/Min	3.0 MW/Min	4.0 MW/Min	

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Grid Synchronization Time				
Time required to Synchronize to Grid (minutes)	Very Cold Start	Cold Start	Warm Start	Hot Start
	570	470	400	140

(xi). In this regard it is clarified that the technical data provided by the applicants at the time of filing of Generation Licence applications are mostly tentative and according to the feasibility study of the project. The ramping rate and time required for synchronization are design parameters and fixed at the design stage. The same are expected to be finalized at later stages of the project implementation, according to the OEM provided data/design. At the time of grant of Generation Licence (No. IGSPL/66/2016 dated March 03, 2016 and Modification-I dated November 20, 2017), the OEM for the plant equipment was not finalized.

(xii). Accordingly, the Authority considers that finalization of the said parameters as subject matter of PPAs. However, the PPA initialed between CPPA-G and LEPCL did not provide any numbers rather clarifying that these parameters/numbers will be updated/provided by the Company/LEPCL not later than six months prior to COD of the project. This issue has also been considered in the Generation Licences and accordingly a sub-article has been added in the Generation Licences. In this regard, in Article-3 of its Generation Licence, the licensee/LEPCL has been directed to provide the final arrangement, technical and financial specification and other specific details pertaining to its generation facility before its COD. Accordingly, after finalization of design, technology and OEM of the project, LEPCL approached CPPA-G for incorporation of said parameters in the PPA. However, the Power Purchaser opined that these values could only be agreed if these are reflected in the Generation Licence. Accordingly, LEPCL submitted this LPM to *inter alia*, incorporate the said parameter in its Generation Licence.

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(xiii). In this regard, the Authority has observed that previously in similar cases regarding ramping rate and grid synchronization time, the OEM provided data has been and allowed to be incorporated in the generation licences and PPAs (e.g. Huaneng Shandong Ruyi (Pakistan) Energy (Pvt.) Limited (HSRPEPL), China Power Hub Generation Company (Pvt.) Limited (CPHGCPL), Port Qasim Electric Power Company (Pvt.) Limited (PQEPCPL), Engro Powergen Thar (Pvt.) Limited (EPTPL) and Foundation Power Company Deharki Limited (FPCDL). In view of the

said, the Authority considered that the same method/tool can be used as precedent in this case.

(xiv). Regarding the proposed ramping rate, the Authority has observed that there are total of nine (12) scenarios proposed (i.e. three (03) loading range of the complex and three (04) scenarios for each loading range based on hot, warm, cold and very cold start. The comparison of the ramping rate proposed by LECPCL and that of the other coal based units of similar capacity CPHGCPL, PQEPCPL and HSRPEPL reveals that in all the scenarios, the ramping rate proposed by LEPCL are on better side as depicted below:

Comparison of Ramping Rates (%MW/Min)			
Hot Start Length of Shutdown(0≤10h)			
Company/Licensee	**Under 30% MCR**	**>30%≤50% MCR**	**>50%≤100% MCR**
CPHGCPL	≤0.9%	≤0.54%	≤1.2%
PQEPCPL	>0.5%≤1%	>0.7% to ≤1%	1%
HSRPEPL (0-25%MCR)	1.0%	1.0%	0.8%
LEPCL	≤9.64%	1.21% to ≤2.02%	0.76% to ≤2.65%
Warm Start Length of Shutdown(10h≤72h)			
CPHGCPL	≤0.8%	≤0.54%	≤0.54%
PQEPCPL	>0.2%≤0.5%	>0.3%≤0.7%	>0.5%≤1%
HSRPEPL (>25-50%MCR)	0.6%	0.8%	0.3%
LEPCL	≤4.57	1.21% to ≤2.02%	0.61% to ≤2.65%
Cold Start Length of Shutdown(72h≤120h)			
CPHGCPL	≤0.4%	≤0.45%	≤0.45%
PQEPCPL	≤0.2%	≤0.3%	≤0.5%
HSRPEPL (>50-100%MCR)	0.2%	0.3%	0.3%
LEPCL	≤1.27%	0.91% to ≤1.52%	0.61% to ≤2.65%

(xv). Further, from the comparison of the time required to synchronize to the grid proposed by LEPCL, with that allowed to CPHGCPL PQEPCL and HSRPEPL, the Authority has observed that that the time required by LEPCL is lower/better and can be considered for incorporation in the Generation Licence. The comparison is summarized in the following table:

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Comparison of Grid Synchronization time (Minutes)						
CPHGCPL	Length of Shutdown	≤ 2h	>2h ≤10h	>10h≤72h	>72 ≤120	>120h
	Grid synchronization Time (in Min)	≤ 195	≤ 275	≤ 645	≤ 910	≤ 1240
PQEPCL	Length of Shutdown in hours	≤ 2h	>2h ≤8h	>8h≤32h	>32h ≤150h	>150h
	Grid synchronization Time (in Min)	≤ 200	≤ 270	≤ 480	≤ 580	≤ 900
HSRPEPL	Length of Shutdown in hours	V. Hot Start	Hot Start	Warm Start	Cold Start	-
	Grid synchronization Time (in Min)	90	150	480	600	-
LEPCL	Length of Shutdown in hours	≤10h		>10h≤72h	>72 ≤120	>120h
	Grid synchronization Time (in Min)	**140**		**400**	**470**	**570**

(xvi). Regarding the proposed change in type of primary fuel of the generation facility, the Authority has observed that LEPCL intends to incorporate the provision of usage of imported Lignite Coal in the category of primary fuel (along with Thar Coal). LEPCL expects to utilize this option until Phase-III of Thar Coal Block-II being operated by Sindh Engro Coal Mining Company Limited (SECMC) is completed or the local coal is not available for one or another reason as per the decision of the PPIB. Further, as Per Section 5.14 of the PPA, LEPCL is entitled to procure imported coal in case of non-availability of the local coal. In view of the above, the Authority considers to allow the use of imported coal incorporation of the same in Generation Licence of LEPCL, however, this arrangement should be strictly to the extent of non-availability of Thar Coal/subordination to the original fuel supply arrangement/agreement for supply of coal from Thar Coal Mines. Further, the Authority also considers the proposed enhancement in storage capacity of the primary fuel from 500,000 ton to 600,000 ton is also desirable and required to be incorporated in the Generation Licence.

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(xvii). Regarding change in anticipated COD, it is noted that the same was initially expected on June 30, 2021 however due to non-provision of interconnection facility the anticipated COD was proposed to be in the third quarter of 2021. Later on, through its communication dated December 30, 2021 LEPCL

informed that since energization of the 500 kV grid interconnection (double circuit) by NTDC on November 16, 2021, the testing is ongoing. The plant is generating test energy and PPA 8.2 tests have been completed while PPA 8.3 tests are scheduled to take place from January 14 to 27, 2022. LEPCL expects to achieve COD by January 31, 2022. In this regard, PPIB in the progress review meeting on committed projects held on February 18, 2022 informed that commissioning tests of LEPCL are in progress and the project will achieve COD by March 15, 2022. However, LEPCL through its communication dated March 14, 2022 confirmed that the Reliability Run Test (RRT) of the plant is ongoing and COD is expected by March 21, 2022. Accordingly, the Authority considers the anticipated COD of LEPCL as March 21, 2022.

(xviii). Regarding impact of the proposed modification on tariff, the Authority has observed that it had granted an upfront tariff to LEPCL through determination No. NEPRA/TRF-369/LEPCL-2015/5052, dated April 06, 2015 on imported coal basis. Later on, the Authority through its determination No. NEPRA/TRF-369/LEPCL-2015/14430-14432 dated October 20, 2016 granted upfront tariff to LEPCL on local coal basis thereby superseding the earlier determination. In this regard, LEPCL has submitted that since it has opted for upfront tariff, therefore the proposed modification in the Generation Licence will not have any impact on its tariff. In this regards, the Authority has observed that the Heat Rate/efficiency of LEPCL Plant is subject to test at the time of COD and in case the actual efficiency is established >39%, the benefit of higher efficiency shall be shared between the power purchaser and Power Producer in the ratio of 70:30 for 1st 0.5%, 50:50 for next 0.5%, 30:70 for next 0.5% and thereafter 100% to the power producer. In view of the said, the Authority considers that the proposed modification in technology will result in increase of efficiency of the plant of LEPCL and will be beneficial for the power purchaser/consumers.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY ★ NEPRA ★ REGISTRAR

(xix). In view of the above, the Authority considers that LPM will not have any adverse affect on the performance of the Licensee of its obligations. Further, the LPM will not cause the Authority to act or acquiesce in any act or omission of the licensee/LEPCL in a manner contrary to the provisions of the NEPRA Act or the rules or regulations made pursuant to the NEPRA Act. The LPM will be beneficial to the consumers in general as cheaper energy based on indigenous resource using efficient technology will be available to the power purchaser/consumers. The Authority further considers that the LPM is reasonably necessary for the

licensee/LEPCL to effectively and efficiently perform its obligations under the licence. 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 with Regulation-10(11)(a) of the Licensing Regulations approves the communicated LPM in the Generation Licence of LEPCL (with changes), to the extent of (a). change the technology of Steam Turbine/Boiler and allied parameters from SC to USC; (b). addition of imported Lignite coal in the category of primary fuel; and (c). change the anticipated COD of the plant from June 30, 2021 to March 15, 2022.

(ii). Accordingly, the Generation Licence (No. No. IGSPL/66/2016 dated March 03, 2016 and modified on November 20, 2017) of LEPCL 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 there under, terms & conditions of the Generation Licence and other applicable documents.

Authority

Engr. Maqsood Anwar Khan
(Member)

Rehmatullah Baloch
(Member)

Rafique Ahmed Shaikh
(Member)

Tauseef H. Farooqi
(Chairman)

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
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29 03 22

National Electric Power Regulatory Authority
(NEPRA)
Islamabad – Pakistan

GENERATION LICENCE

No. IGSPL/66/2016

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. IGSPL/66/2016 dated March 03, 2016 with Modification-I November 20, 2017) granted to **Lucky Electric Power Company Limited** to the extent of changes mentioned as here under:-

(i). The **expiry date** indicated on the Face Sheet of the Generation Licence is changed from June 29, 2051 to March 20, 2052;

(ii). Changes in Articles of the Generation Licence attached as **Revised/Modified Articles** of the Generation Licence;

(iii). Changes in Schedule-I attached as **Revised/Modified Schedule-I**; and

(iv). Changes in Schedule-II attached as **Revised/Modified Schedule-II**.

This **Modification-II** is given under my hand on 29th **day** of **March Two Thousand & Twenty Two.**

29 03 22

Registrar

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
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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). "Applicable Documents" mean the Act, the NEPRA rules and regulations, 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 codes, 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;

(c). "Applicable Law" means the Act, relevant rules and regulations made there under and all the Applicable Documents;

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

(e). "Bus Bar" means a system of conductors in the Generation Facility/Power Plant of the Licensee on which the electric power of all the generators is collected for supplying to the Power Purchaser;

(f). "Commercial Operations Date (COD)" means the day immediately following the date on which the Generation Facility/ Power Plant of the Licensee is commissioned;

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

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(h). "Generation Facility/Power Plant" means the coal fired generation facility for production of electric power;

(i). "Generation Rules" mean "the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000";

(j). "GoP" means the Government of Pakistan acting through the PPIB which has issued LoS to the Licensee for the design, engineering, construction, insuring, commissioning, operation and maintenance of the Generation Facility/Power Plant and has signed or will be signing an IA with the Licensee;

(k). "Grid Code" means the grid code prepared by NTDC and approved by the Authority, as it may be revised from time to time by NTDC with necessary approval of the Authority;

(l). "IEC" means International Electrotechnical Commission or any other entity created for the like purpose and its successors or permitted assigns;

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

(n). "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/Power Plant, as may be amended from time to time;

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

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(p). "Licensee" means "**Lucky Electric Power Company Limited**" and its successors or permitted assigns;

(q). "Licensing Regulations" mean the National Electric Power Regulatory

Authority Licensing (Application & Modification Procedure) Regulations, 1999 as amended or replaced from time to time;

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

(s). "Power Purchase Agreement" means the power 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/Power Plant, as may be amended by the parties thereto from time to time;

(t). "Power Purchaser" means the CPPA-G purchasing electric power (on behalf of all XW-DISCOs including HESCO) from the Licensee, pursuant to Power Purchase Agreement for procurement of electricity;

(u). "PPIB" means the Private Power and Infrastructure 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;

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

1.2 Words and expressions used but not defined herein bear the meaning given thereto in the Act or rules and regulations issued under the Act.

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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 and functional specifications and other details specific to the Generation Facility/Power Plant of the Licensee are set out in Schedule-I of this Licence.

3.2 The net capacity of the Generation Facility/Power Plant of the Licensee is set out in Schedule-II hereto. The final arrangement, technical and financial specifications and other specific details pertaining to its Generation Facility/Power Plant will be same as provided by the Licensee before COD of the Generation Facility/Power Plant.

Article-4
Term of Licence

4.1 This licence shall become effective from the date of its issuance (i.e. March 03, 2016) and will have a term of thirty (30) years from the COD of the Generation Facility/Power Plant of the Licensee, subject to Section-14B of the Act.

4.2 Unless suspended or revoked earlier, the Licensee may apply for renewal of the 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.

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Article-6
Tariff

The Licensee shall charge the Power Purchaser only such tariff 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. 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.

7.2 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 from time to time.

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Article-10
Compliance with Environmental Standards

10.1 The Generation Facility/Power Plant of the Licensee at all times shall comply with the environmental and safety standards as may be prescribed by the relevant competent authority as amended 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/Power Plant is in conformity with the required environmental standards as prescribed by the relevant competent authority.

Article-11
Power off take Point and Voltage

The Licensee shall deliver power to the Power Purchaser at the outgoing bus bar of its grid station. The up-gradation (step up) of generation voltage up to the required interconnection voltage level will be the responsibility of the Licensee.

Article-12
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-13
Design & Manufacturing Standards

All the components of the Generation Facility/Power Plant shall be designed, manufactured and tested according to the latest IEC, IEEE or any other equivalent standards. All plant and equipment shall be unused and brand new.

Article-14
Corporate Social Responsibility

The Licensee shall comply with the NEPRA Social Investment Guidelines 2021 and provide the descriptive as well as monetary disclosure of its activities pertaining to corporate social responsibility (CSR) on an annual basis.

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SCHEDULE-I
(Revised/Modified)

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

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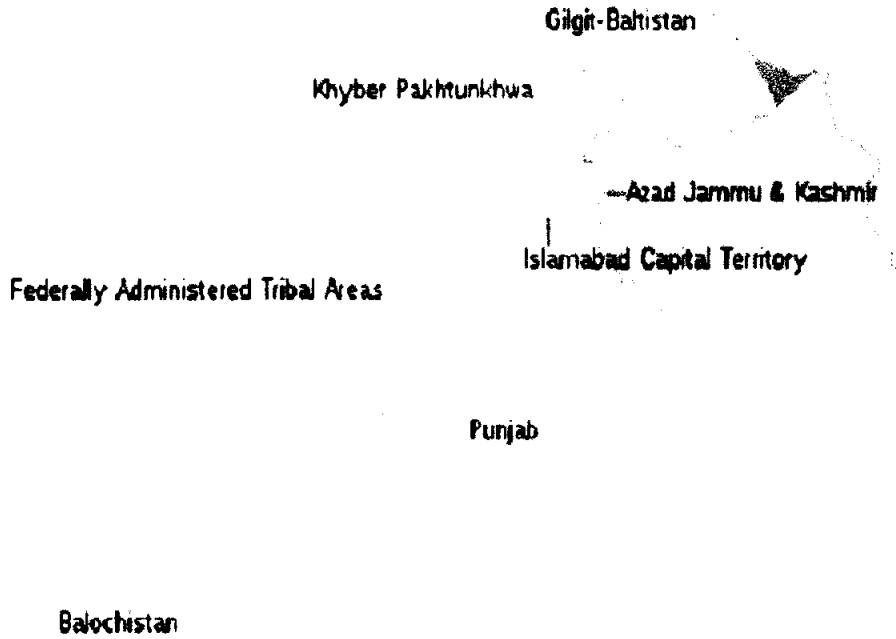
Location of the Generation Facility/Power Plant of Lucky Electric Power Company Limited (LEPCL)



Site Location of 1x660 MW Supercritical CFPP of Lucky Electric Power Company

Deh Ghangario Bin Qasim Town

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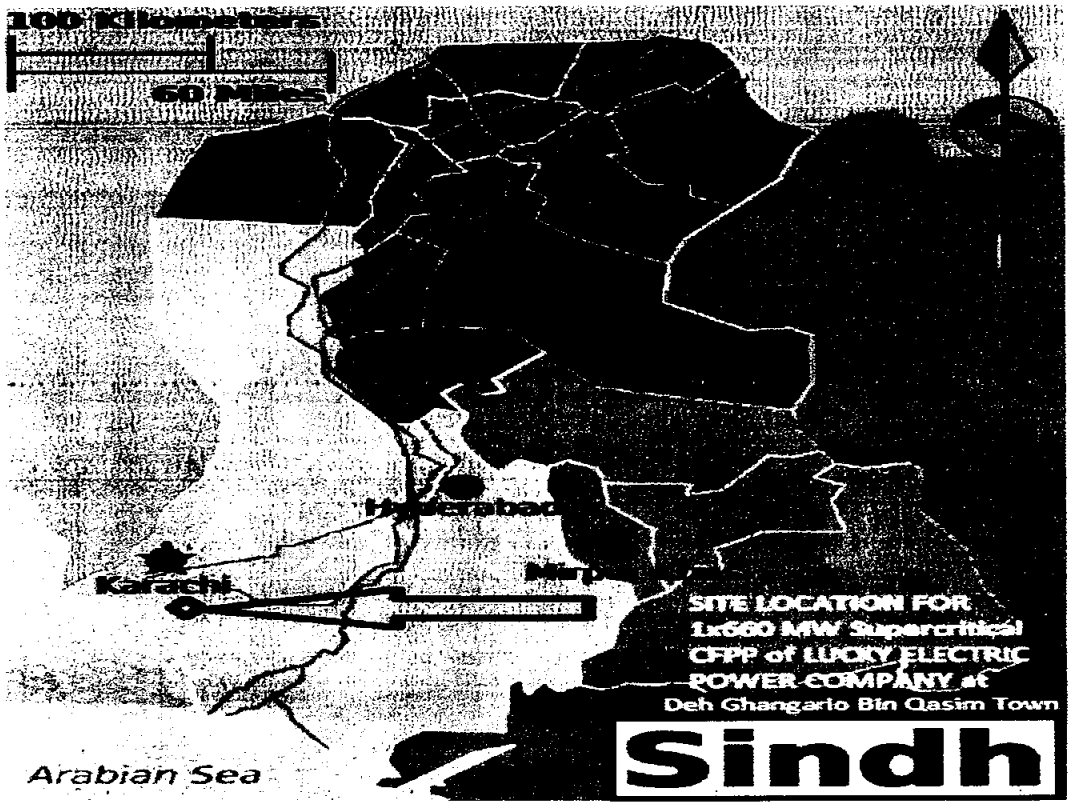
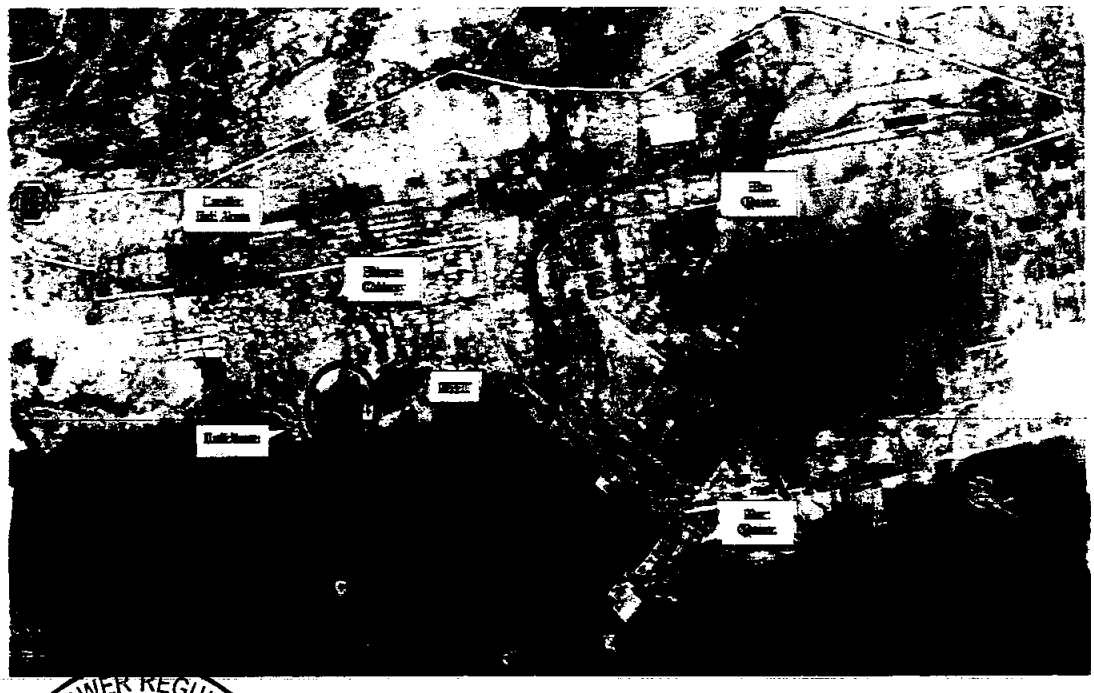
Location of the Generation Facility//Power Plant of LEPCL





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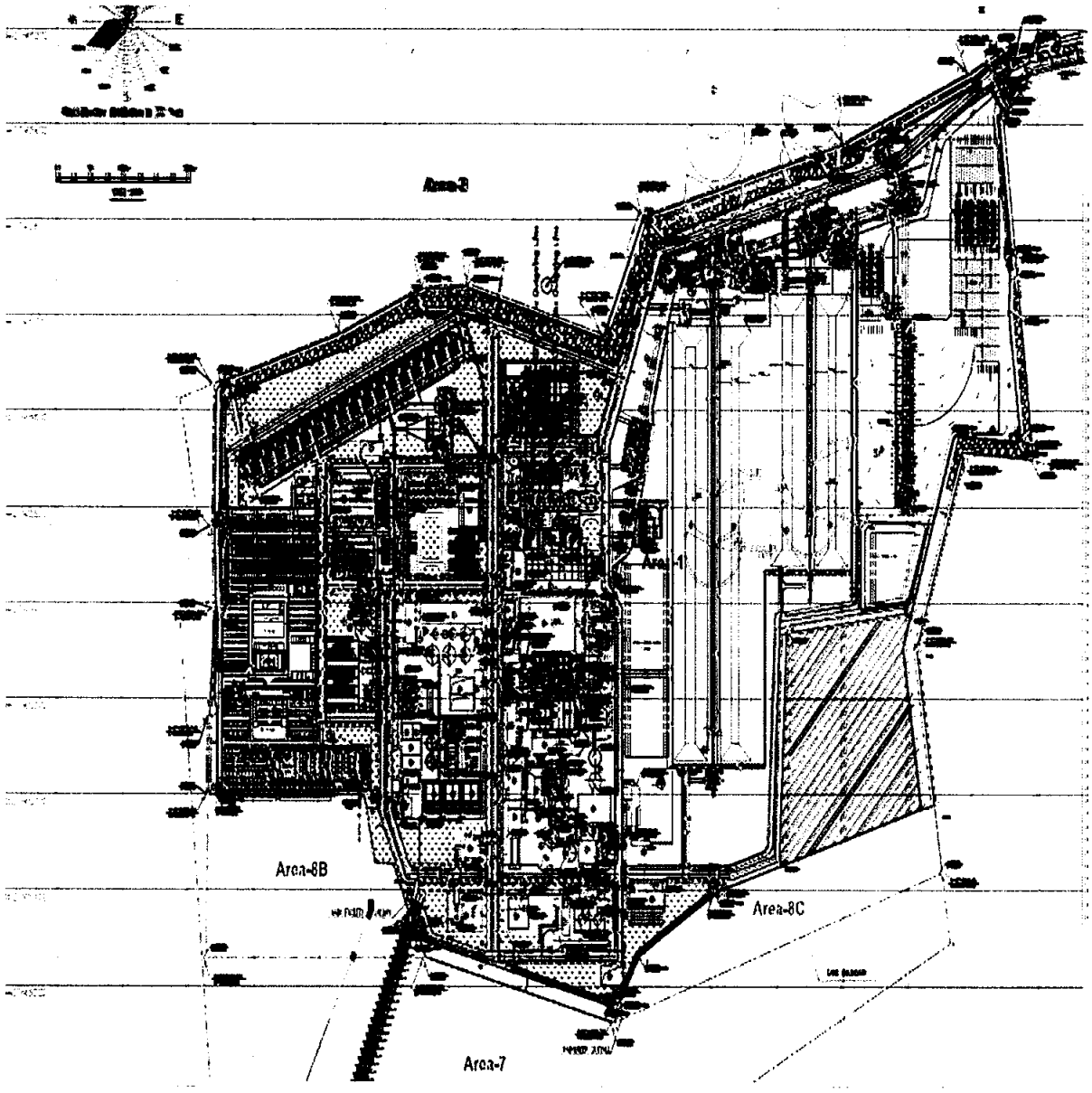
Layout of the Generation Facility//Power Plant of LEPCL



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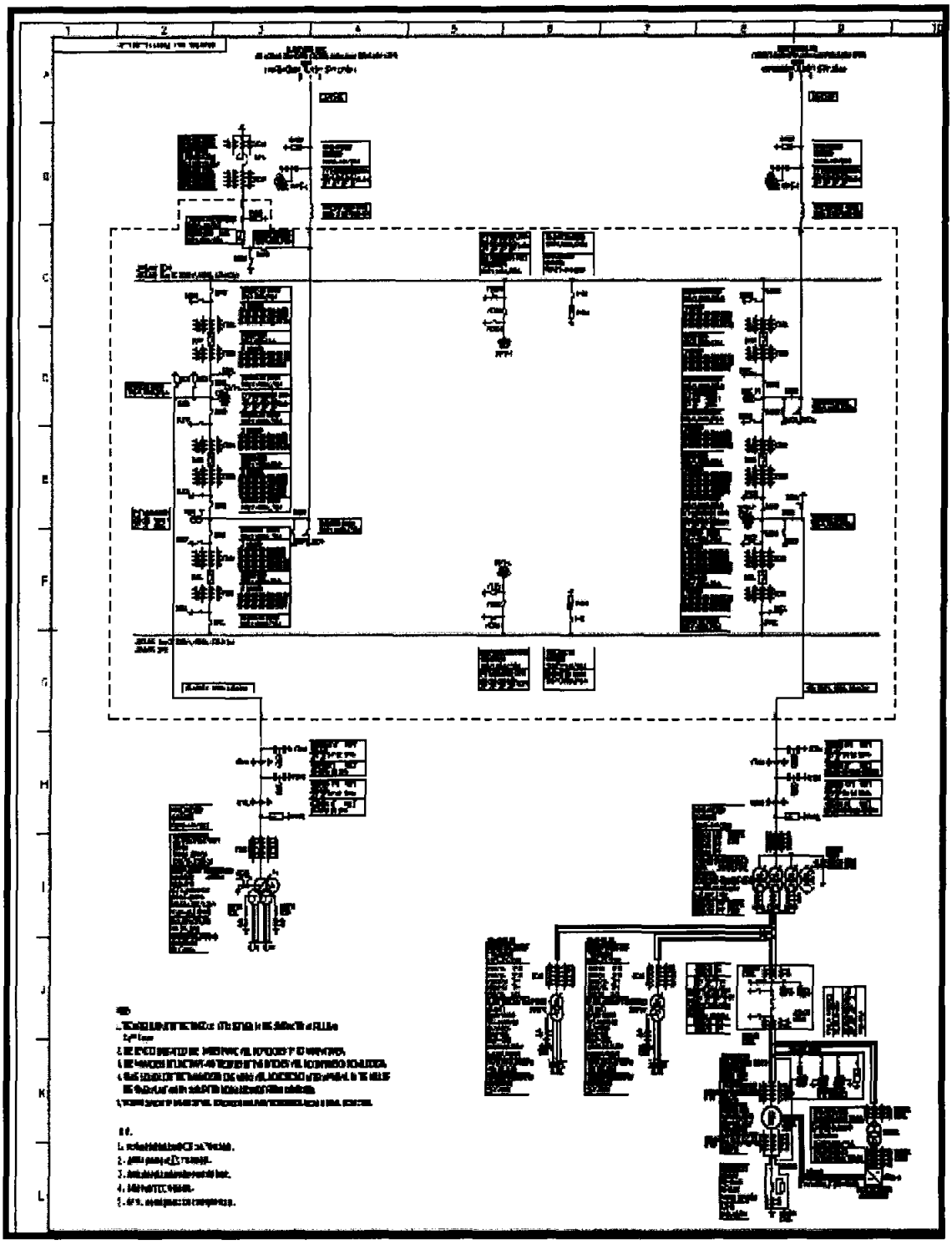
Single Line Diagram
of the Generation Facility//Power Plant of LEPCL



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Interconnection Facilities/ Transmission Arrangements for Dispersal of Power from the Generation Facility//Power Plant of LEPCL

The electric power from the Imported Coal based generation facility/power plant of the Licensee/Lucky Electric Power Company Limited (LEPCL) will be dispersed to the National Grid.

(2). The Interconnection Facilities (IF)/Transmission Arrangements (TA) for supplying to National Grid from the above mentioned generation facility shall be at 500 KV level. The IF/TA for supplying the National Grid will be consisting of looping in-out arrangement of 500kV double circuit transmission line for looping in-out on Port Qasim Coal Fired Power Plant and Matiari Circuit. In this regard, the Licensee shall adhere to the relevant provisions of the Distribution Code/Grid Code to the extent applicable.

(3). Any change in the above mentioned IF/TA for dispersal of electric power as agreed by the Licensee and the Power Purchaser shall be communicated to the Authority in due course of time.

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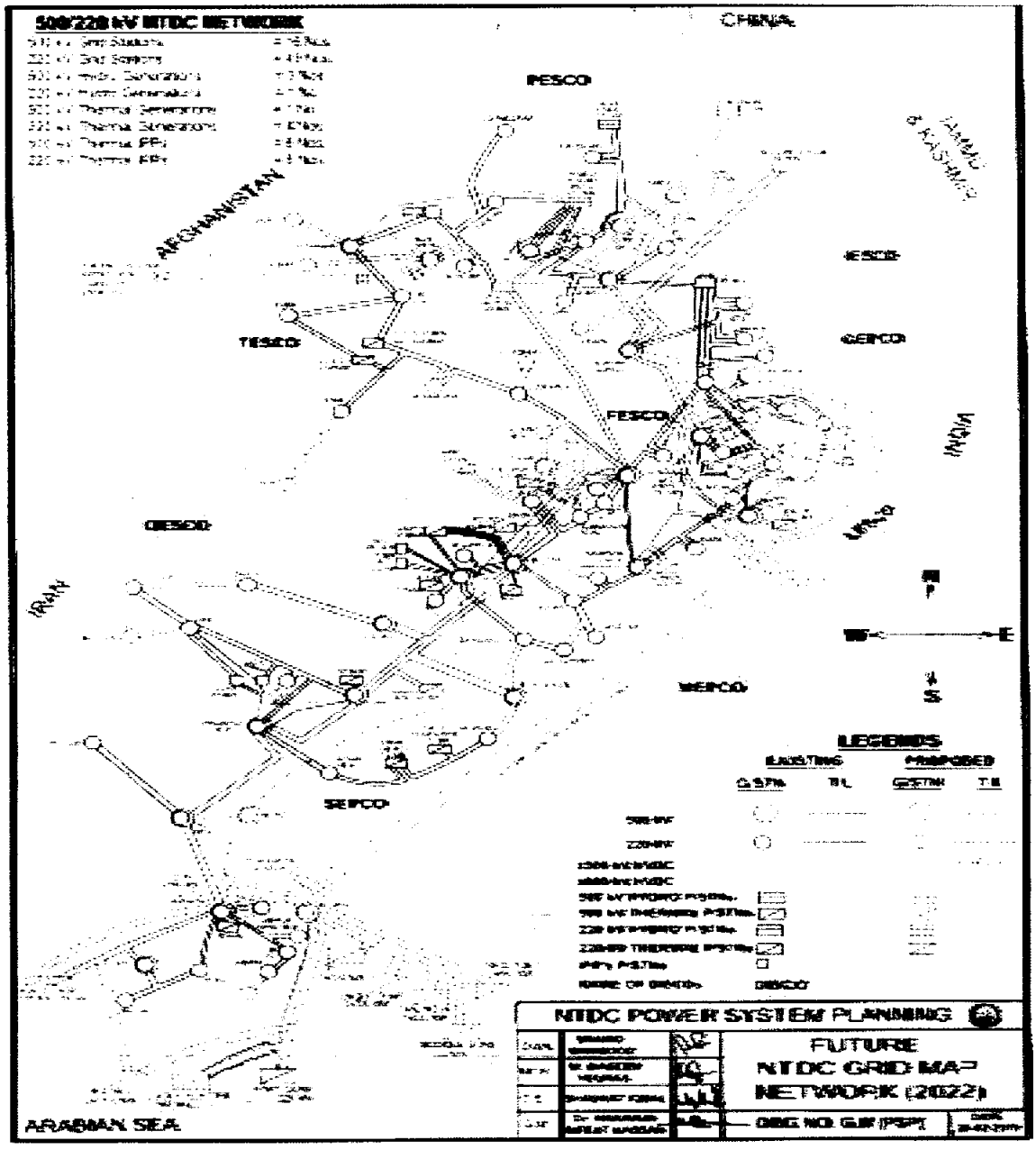
Schematic Diagram of Interconnection Arrangement for Dispersal of Power from the Generation Facility/ Thermal Power Plant



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Detail of Generation Facility/ Power Plant

(A). General Information

(i).	Name of Company/ Licensee	Lucky Electric Power Company Limited
(ii).	Registered/Business Office	6-A, A. Aziz Hashim Tabba Street, Muhammad Ali Housing Society, Karachi-75350, Pakistan
(iii).	Location of the Generation Facility/ Power Plant	Deh Ghangario Bin Qasim Town, Karachi, in the Province of Sindh.
(iv).	Type of Generation Facility/ Power Plant	Thermal Generation Facility

(B). Configuration of Generation Facility

(i).	Installed Capacity/Size of the Generation Facility/ Power Plant	660.00 MW	
(ii).	Type of Technology	Conventional Thermal Power Generation Facility with Ultra-Supercritical Boiler and Steam Turbine	
(iii).	Number of Units/Size (MW)	1 x 660 MW	
(iv).	Unit Make/Model/Type & Year of Manufacture Etc.	Steam Turbine	Ultra-Super-critical, Reheat, Tandem compound four Cylinders, four flow exhausts, condensing Steam Turbine (GE – Alstom)
		Boiler	Ultra-Supercritical steam generator, once-through, single pass, reheat, balanced draft, dry bottom (GE – Alstom)
(v).	Commercial Operation Date (COD) of the Generation Facility/ Power Plant	March 21, 2022 (Anticipated)	
(vi).	Expected Useful Life of the Generation Facility/ Power Plant from COD	30 years	

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(C). Fuel/Raw Material Details

(i).	Primary Fuel	Thar Coal/Imported Coal*	
(ii).	Start-Up Fuel	High Speed Diesel/HSD	
(iii).	Fuel Source for each of the above (i.e. Imported/Indigenous)	Primary Fuel	Start-Up Fuel
		Thar Coal	Indigenous/Imported
(iv).	Fuel Supplier for each of the above	Primary Fuel	Start-Up Fuel
		Sindh Engro Coal Mining Company (SECMC)	Shell Pakistan/Pakistan State Oil/APL or Any other registered OMC Company
(v).	Supply Arrangement for each of the above Fuels	Primary Fuel	Start-Up Fuel
		Through Rail/Road	Through Oil Tankers
(vi).	No of Storage Bunkers/Tanks/ Open Yard	Primary Fuel	Start-Up Fuel
		One open yard	Two oil tank
(vii).	Storage Capacity of each Bunkers/Tanks/ Open Yard	Primary Fuel	Start-Up Fuel
		About 600,000 Tons	2 x 1200 m^3
(viii).	Gross Storage	Primary Fuel	Start-Up Fuel
		About 600,000 Tons	2400 m^3

(D). Emission Values

		Primary Fuel	Start-Up Fuel
(i).	SO_x (mg/Nm^3)	As per NEQS	As per NEQS
(ii).	NO_x (mg/Nm^3)	As per NEQS	As per NEQS
(iii).	CO_2 (%)	As per NEQS	As per NEQS

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* This arrangement should be strictly to the extent of non-availability of Thar Coal and subordination to the original fuel supply agreement for supply of coal from Thar Coal Mines.

(E). Cooling System

(i).	Cooling Water Source/Cycle	The cooling water is from adjacent sea channel of Port Qasim at south of the site. Induced Draft cooling with circulation system will be adopted for cooling water system.

(F). Plant Characteristics

(i).	Generation Voltage	22kV				
(ii).	Frequency	50Hz				
(iii).	Power Factor	0.85 (lagging) / 0.95(leading)				
(iv).	Automatic Generation Control (AGC) (MW control is the general practice)	AGC function is included in the NCS, and AGC can accept load increase/decrease command signal from Despatch. Load increase/decrease command will be transmitted through digital signals (increase/decrease) and load feedback will be read from generator output (MW/MVAR) on SCADA.				
(v).	Ramping Rate (MW/min)	Start Up Type	≤30% MCR	>30% to ≤50% MCR	>50% to ≤100% MCR	>50% to ≤100% MCR (normal running of plant)
		Hot Start	19 MW/Min	4.0 MW/Min	5.0 MW/Min	8.9 MW/Min
		Warm Start	9.0 MW/Min	4.0 MW/Min	4.0 MW/Min	
		Cold Start	2.5 MW/Min	3.0 MW/Min	4.0 MW/Min	
		Very Cold Start	4.0 MW/Min	3.0 MW/Min	4.0 MW/Min	
(vi).	Time required to Synchronize to Grid (Minutes)	Very Cold Start		Cold Start	Warm Start	Hot Start
		570		470	400	140

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SCHEDULE-II
(Revised/Modified)

The Installed/ISO Capacity (MW), De-Rated Capacity at Mean Site Conditions (MW), Auxiliary Consumption (MW) and the Net Capacity at Mean Site Conditions (MW) of the Generation Facilities of Licensee is given in this Schedule

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SCHEDULE-II

(1).	Total Gross Installed Capacity of the Generation Facility/Power Plant	660.00 MW
(2).	De-rated Capacity of Generation Facility/Power Plant at Reference Site Conditions	660.00 MW
(3).	Auxiliary Consumption of the Generation Facility/Power Plant	053.41 MW
(4).	Total Installed Net Capacity of Generation Facility/Power Plant at Reference Site Condition	606.59 MW

Note

All the above figures are indicative as provided by the Licensee. The Net Capacity available to Power Purchaser for dispatch will be determined through procedure(s) contained in the Power Purchase Agreement or any other applicable document(s).

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