National Electric Power Regulatory Authority
Islamic Republic of Pakistan

Registrar

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No. NEPRA/R/LAG-292/7985-87 October 27, 2017

Mr. Song Taiji,
Chief Executive Officer,
Hauneng Shandong Ruyi (Pakistan) Energy (Private) Limited,
House No. 105, Street 10,
Block H, Phase 5, DHA,
Lahore.

Subject: **Modification-I in Generation Licence No: IGSPL/60/2015**
Licence Application No. LAG-292
Huaneng Shandong Ruyi (Pakistan) Energy (Private) Limited (HSRPEPL)

Reference: *HSRPEPL's application vide letter dated August 16, 2017 (received on August 17, 2017).*

It is intimidated that the Authority has approved "Licensee Proposed Modification" in Generation Licence No. IGSPL/60/2015 in respect of Huaneng Shandong Ruyi (Pakistan) Energy (Private) Limited (HSRPEPL), pursuant to Regulation 10(11)(a) of the NEPRA Licensing (Application and Modification Procedure) Regulations 1999.

2. Enclosed please find herewith determination of the Authority in the matter of Licensee Proposed Modification in the Generation Licence of HSRPEPL along with Modification-I in the Generation Licence No. IGSPL/60/2015, as approved by the Authority.

Encl: As above

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(Syed Safeer Hussain)

Copy to:

1. Chief Executive Officer, NTDC, 414-WAPDA House, Lahore
2. Chief Executive Officer, CPPA-G, 6th Floor, Shaheed-e-Millat Sectariat, Jinnah Avenue, Blue Area, Islamabad.
3. Chief Executive Officer, Multan Electric Power Company (MEPCO), NTDC Colony, Khanewal Road, Multan.
4. Director General, Environment Protection Department, Government of Punjab, National Hockey Stadium, Ferozpur Road, Lahore.

National Electric Power Regulatory Authority (NEPRA)

Determination of the Authority in the Matter of Licensee Proposed Modification in the Generation Licence of Huaneng Shandong Ruyi (Pakistan) Energy (Pvt.) Limited

October 27, 2017
Case No. LAG-292

(A). Background

(i). The Authority in terms of Section-15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (the "NEPRA Act") granted a generation licence (No. IGSPL/60/2015 dated June 10, 2015) to Huaneng Shandong Ruyi (Pakistan) Energy (Pvt.) Limited (HSRPEPL) for its 1320 MW imported coal based generation facility/thermal power plant.

(ii). According to the above mentioned generation licence, the generation facility/thermal power plant of HSRPEPL will consist of 2x660 MW steam turbine with a super critical boiler parameters. The generation facility is located at Qadirabad, district Sahiwal, in the province of Punjab.

(B). Communication of Modification

(i). HSRPEPL in accordance with Regulation-10(2) of the NEPRA Licensing (Application & Modification Procedure) Regulations, 1999 (the "Licensing Regulations"), communicated a Licensee Proposed Modification (LPM) in its existing generation licence on August 17, 2017.

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(ii). In the text of the proposed modification, HSRPEPL proposed to modify the ramping rate (MW/min) and time required to synchronize to Grid (HRs) in its generation licence as given below:

Ramping Rate

Unit load range % age	Cold Start (%MW/Min)	Warm Start (%MW/Min)	Hot Start (%MW/Min)
0—<25%	0.2	0.6	1
25— 50%	0.3	0.8	1
50— 100%	0.3	0.3	0.8

Time required to Synchronize to Grid

Time required to synchronize to Grid (Min.)	Cold start	Warm start	Hot start	Very hot start
	600	480	150	90

(iii). Regarding "statement of the reasons in support of the modification", HSRPEPL, *inter alia*, stated that China-Pakistan Economic Corridor ("CPEC") being the Government of Pakistan's ("GOP") top priority has meant significant pressure on CPEC's early harvest projects to be completed at a rapid pace. The project being an early harvest project faced similar pressure and the push to meet the exacting pace resulted in an oversight by the company. This oversight caused erroneous performance data for the ramping rate and the consequent incorrect time required to synchronize to grid being approved in the generation licence. Notwithstanding to the said, higher ramping rate can be achieved using check coal with low calorific value of 4300 kCal/kg. However, NEPRA has fixed minimum calorific value of 5500 Kcal/kg for the plant and present combustion system of the plant cannot support the ramping rate using coal with 5500 Kcal/kg calorific value.

(iv). About "statement of the impact on the tariff, quality of service and the performance by the Licensee of its obligations under the licence", HSRPEPL submitted that the tariff, quality of service and the performance of the company of its obligations under the generation licence will not be affected by the proposed modification.

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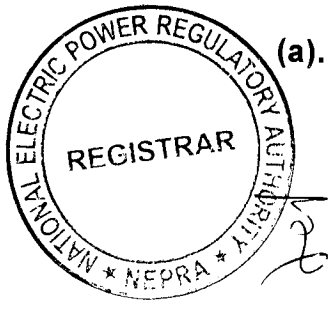
(C). Processing of LPM

(i). After completion of all the required information as stipulated under the Regulation-10(2) and 10(3) of the Licensing Regulations by HSRPEPL, the Registrar published the communicated LPM on August 19, 2017 in one (01) English and one (01) Urdu newspaper (i.e. Business Recorder and Express respectively), to seek comments from the general public, interested/affected parties, and different stakeholders about the said LPM as required under the Regulation-10(4) of the Licensing Regulations.

(ii). Apart from the above, separate letters were also sent to government ministries, their attached departments and representative organizations etc. on August 22, 2017. 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 eight (08) stakeholders including Punjab Power Development Board (PPDB), Central Power Purchasing Agency (Guarantee) Limited (CPPA-G), Punjab Mineral Development Corporation (PbMDC), Directorate General of Mines & Minerals, Govt. of KPK (DGMKPK) National Transmission and Despatch Company Limited (NTDC), China Power Hub Generation Company (Pvt.) Limited (CPHGC),Port Qasim Electric Power Company (Pvt.) Limited (PQEPCPL) and Anwar Kamal Law Associates (AKLA). The salient points of the comments offered by the above stakeholder are summarized in the following paragraphs:



(a). PPDB in its comments appreciated the fast track development of the project by HSRPEPL as the first CPEC project based on imported coal. PPDB has informed that the proposed modification by HSRPEPL is in line with the steam turbine ramping rate of the manufacturer. Further, the six (06) coal crushing mills installed at the plant are required to be started one

by one from initial load to full load and each mill needs some time to start up which causes gradual ramping. In view of the said, PPDB has supported the LPM;

(b). CPPA-G submitted that review of rational for the proposed modification reveals that HSRPEPL has failed to meet requisite design criteria and technical limits as per its generation licence, hence seeking amendments. This kind of practice if allowed will encourage the IPPs to install equipment of their choice and thereafter asking for modification in design parameters. With lower ramping rate the plant will require more time to comply with dispatch instructions. Further, decreasing ramping rate will cause increase in startup cost, as star up cost calculation takes care of quantity of diesel fuel during the startup process thus financial impact. NEPRA has allowed partial load adjustment on the revised contract heat rate, therefore power purchaser has to pay additional payments on account of Partial Load Adjustment Charges (PLAC) for extended ramping period which will ultimately be passed on to the end consumer. Startup time should be on lower side for efficient despatch of the complex. CPPA-G is of the view that even if NEPRA allows ramp time as requested by HSRPEPL, those ramp rates should be limited to the startup process only and for normal operation of the plant, where the system operator demands variation in load, the ramping rate should not be less than 3.0% per minute. CPPA-G supported its concerns regarding the ramping rate and startup time with documentary evidences. However, later on CPPA-G clarified that the documents are mainly based on European standards whereas the plant of HSRPEPL is being commissioned as per Chinese standards. Therefore, CPPA-G is of the view that while determining the ramping rate and time to synchronize with the grid, Chinese standards may also be taken into consideration;

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(c). PbMDC in its comments submitted that it has no objection to the issuance of the LPM to HSRPEPL;

(d). DGMKPK submitted that it has no comments to offer in the instant case;

(e). NTDC commented that the proposed changes and their impact on tariff are related to GM NPCC (System Operator) and CPPA-G (Power Purchaser) respectively;

(f). CPHGC supported the LPM stating that at their same type of coal fired power project, similar problems have encountered. Up to now, the relevant technical data in the Power Purchase Agreement (PPA) of CPHGC have not been finalized. We hope that NEPRA will fully consider these characteristics and will approve reasonable parameters on ramping rate and start up times to ensure safe and stable operation. CPHGC will communicate with NEPRA, based on the specification of the equipment manufacturer and actual situation to verify relevant technical data so that PPA technology schedules can be signed smoothly;

(g). PQEPCPL in its comments supported the proposed modification (on technical grounds) and requested similar changes/upgrades in its generation licence; and

(h). AKLA submitted that NEPRA is required to carry out a detailed study of the proposed modification to confirm its impact on tariff as well as terms and conditions of PPA which affect the tariff, like PLAC charges and start up charges etc.

(ii). The above comments of the stakeholders were examined and except AKLA and CPPA-G, comments of all other stakeholders were found in favor of the LPM in the generation licence of HSRPEPL. Accordingly, it was

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considered appropriate seeking perspective of the licensee/HSRPEPL on the observations of CPPA-G.

(iii). On the comments of CPPA-G, HSRPEPL submitted that equipments of the plant were designed according to the parameters enunciated in the feasibility study and the procurement on the relative design finished by the end of 2015. However, the Authority in its determination regarding fuel price adjustment of the project dated September 23, 2016 fixed the minimum calorific value of coal to 5500kCal/kg. Consequently, the HSRPEPL began to modify its equipment to ensure compliance but in the short term, it has been left with a limited window for procurement of coal due to the scarcity of coal that meets all the conditions of tariff as well as feasibility study. In the said determination, the Authority admitted that before fixing the minimum calorific value for coal power plant, some key factors like availability of good quality of coal and others should be considered. The Authority acknowledged the fact that for compliance to revised calorific value, power plant current design need to be changed which is not feasible for HSRPEPL due to early procurement of all major equipment of the project.

(iv). HSRPEPL has submitted that according to the PPA, it shall provide the data as per manufacturer/EPC loading curves for the complex. If the ramping rate is higher than ramping curves of the complex, the temperature deviation would be enormously high that is a serious risk for different boiler parts and tubes causing degradation of equipment's life as there are metallurgical constraints. Furthermore, frequent high deviation from the normal ramping rate causes slag accumulation inside the furnace which will ultimately damage boiler's water walls and super heater. In view of the said, HRSPEPL is of the view that the ramping rate and the required time to synchronize to grid as mention in the generation licence are on extreme side which are achievable only in case of emergency, but during normal operation the unit should comply with the manufacturer data as the complex/unit works in base load and forbids to operate beyond 1% during normal operation.

(v). On the observation regarding financial impact of the proposed modification, HSRPEPL submitted that in view of the free start-up times for different start-up type proposed by CPPA-G, the company can hardly meet any

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compensation in any agreement year. In net shell, there is not any loss to CPPA-G. Regarding PLAC, HSRPEPL submitted that CPPA-G will pay more in case of increased load but will pay less in case of decrease in load as the ramping rate is relative.

(vi). Regarding comparison of startup time, HRSPEPL submitted that for long term reliability and stability of unit, the start-up time of unit is strictly enforced in accordance with the start up curves as provided by the manufacturer. In this regard, it is clarified that most of the IPPs in Pakistan are oil and gas based with relatively lower capacity. The oil or gas is easy to be combusted and provide the required heat for the furnace. In Pakistan no such type of coal fired plant is operational, as its first of its type. Comparison of HRSPEPL plant with any oil or gas power plant is out of question. The combustion mechanism of coal fired boiler is drastically different from any other type of fuel boiler. On the other hand, coal fired power plant use comparatively less amount of oil to support the ignition of the coal powder. The calorific value of coal is less as compared to those of oil and gas so coal fired power plant needs more time for startup compared with the same capacity oil or gas based power plant.

(vii). Further, once through supercritical technology with direct fired pulverizing system has been used in China for more than ten (10) years. In order to ensure the safe operation of grid and the equipment of the power plant, there is strict enforcement of despatch code which states that the ramping rate of 1% (6.6MW/min) is the limit for unit with direct fired pulverizing system. The plant is expected to operate as a base load plant, but the design will include provisions to allow the units to operate at lower loads if necessary. One such provision will be the capability to operate in a sliding pressure mode allowing more efficient operation and reduced stress on the turbine and boiler parts. The maximum ramping rate stated in the manufacture curve (i.e. 1%) should be complied strictly during normal operation. In this regard, the figures of ramping rate as shown in generation licence No. IGSPL/60/2015 are normal parameters related to other gas or oil power plants. HRSPEPL is the first high parameter and large capacity supercritical unit in Pakistan. Therefore, HSRPEPL is of the view that the Authority should consider its submission as per Article 3.3 of the generation licence. Further, NPCC may provide despatch to HRSPEPL in accordance to the

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manufacturer data. Otherwise, if the unit changes its load above the rated ramping rate, it will result in excessive temperature and erosion thereby decaying overall life of the unit. In order to support it stance, HSRPEPL submitted documentary evidences/certificates from the equipment manufacturers and independent engineers.

(viii). The Authority considered the above reply of HSRPEPL to the comments of CPPA-G and found the same plausible. Further, the Authority also observed that CPPA-G and AKLA have raised certain queries mainly relating to the expected impact of the proposed LPM on the tariff (in terms of startup cost and PLAC). In this regard, the Authority observes that through its determination No. NEPRA/TRF-308/HSRPEL-2015/4385-4387 March 31, 2015, it has already granted an imported coal upfront tariff to HSRPEPL. Further, the generation facility/power plant of HSRPEPL will be operated as base load plant and there will be no frequent startups and partial loading. In addition there is also provision for free starts. Therefore, the Authority considers that impact of the proposed modification on tariff is negligible. In view of the said, the Authority decided to proceed further with the communicated LPM as stipulated in the Licensing Regulations and the NEPRA Licensing (Generation) Rules, 2000 (the "Generation Rules").

(E). Evaluation of the Case

(i). The Authority has examined the entire case in detail including the already granted generation licence and information submitted along with the application of LPM, comments of the stakeholders, replies of HSRPEPL and relevant rules & regulations.

(ii). In this regard, the Authority observes that in terms of Regulation-10(5) of the Licensing Regulations, the Authority is entitled to modify a licence in accordance with an authority proposed modification or LPM, subject to and in accordance with such further changes as the Authority may deem fit if, in the opinion of the Authority such modification (a). 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

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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.

(iii). The main features of the LPM under consideration are that the Authority granted HSRPEPL a generation licence (No. IGSPL/60/2015 dated June 10, 2015) with an installed capacity of 1320.00 MW based on 2x660 MW steam turbine with a super critical boiler. According to the generation licence, the generation facility is to be operated primarily on imported coal.

(iv). According the schedule-I of the above mentioned generation licence, ramping rate of the generation facility was 13.2MW/min under 30% Maximum Continuous Rating (MCR), 19.8 MW/min from 30-50% MCR and 33 MW/min from 50-100% MCR. Further, time required to synchronize with the grid is mentioned as 4.25 Hrs, 2.0 Hrs and 0.75~1.0 Hr for cold, warm and hot start respectively.

(v). Through the communicated LPM, HSRPEPL has proposed to modify the ramping rate (MW/Min) as (a). at unit load range of 0-25%: the proposed ramping rate is 0.2%MW/Min, 0.6%MW/Min and 1.0%MW/Min for cold, warm and hot start respectively, (b). at unit load range of 25-50%: the proposed ramping rate is 0.3%MW/Min, 0.8%MW/Min and 1.0%MW/Min for cold, warm and hot start respectively and (c). at unit load range of 50-100%: the proposed ramping rate is 0.3%MW/Min, 0.3%MW/Min and 0.8%MW/Min for cold, warm and hot start respectively. Further, HSRPEPL has proposed to change the time required to synchronize to grid to10 Hrs, 8 Hrs, 2.5 Hrs and 1.5 Hrs for cold, warm, hot and very hot start respectively.

(vi). In this regard, the Authority observes that the technical data/parameters regarding the projects provided by the applicants at the time of filing of generation licence application are mostly tentative and according to the feasibility studies of the projects. The same are expected to refine and finalized at

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later stages, according to the manufacturer provided data. It is relevant to mention here that this issue has been considered in the generation licences and accordingly a sub-article has been added in the generation licences. In article 3.3 of the existing generation licence of HSRPEPL the licensee has been directed to provide the final arrangement, technical and financial specification and other specific details pertaining to its generation facility before its commercial operation date (COD). HSRPEPL has submitted the LPM before its COD.

(vii). The Authority considers that ramp rate is design parameter and fixed at the design stage. In this regard, the Authority observes that the proposed changes in ramping rate and grid synchronization times are according to the design parameters. Further. HRSPEPL has provided certificates/documents from the equipment manufacturers declaring the proposed amendments technically feasible and necessary for smooth and long term operation of the units.

(viii). The Authority considers that in order to comply with the revised calorific value (i.e. 5500 kcal/kg), power plant current design needs to be changed which is not feasible for HSRPEPL due to early procurement of all major equipment of the project. Further, the PPA envisages that HSRPEPL will provide the data as per manufacturer/EPC loading curves for the complex. In this regard, the Authority observes that the proposed changes in the ramping rate and grid synchronization time are as per manufacturer/EPC loading curves.

(ix). In consideration of the above, the Authority is of the considered opinion that the proposed LPM will not have any adverse effect on the performance of the licensee of its obligations. The LPM will 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 the NEPRA Act. The LPM is reasonably necessary for the licensee to effectively and efficiently perform its obligations under the licence. Further, the LPM is necessary to reduce the supply-demand gap in the country, keeping in view the financial and technical viability of the Licensee.

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Approval of LPM

(i). In view of the above, the Authority is satisfied that HSRPEPL has complied with all the requirements of the Licensing Regulations pertaining to the modification. Therefore, the Authority in terms of Regulation-10(11)(a) of the Licensing Regulations approves the communicated LPM.

(ii). Accordingly, the generation licence (No. IGSPL/60/2015 dated June 10, 2015) is hereby modified. The changes made in the generation licence are attached as annexure to this determination. The approval of the LPM will be subject to the provisions contained in the NEPRA Act, relevant rules & regulations framed there under, terms & conditions of the generation licence and other applicable documents.

Authority

Maj. (R) Haroon Rashid
(Member)

27/10/17

Syed Masood-ul-Hassan Naqvi
(Member)

— ON TOUR —

Himayat Ullah Khan
(Member)

Saif Ullah Chattha
(Member/Vice Chairman)

27.10.2017

Tariq Saddozai
(Chairman)

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Islamabad – Pakistan

GENERATION LICENCE

No. IGSPL/60/2015

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/60/2015 dated June 10, 2015) granted to Huaneng Shandong Ruyi (Pakistan) Energy (Pvt.) Limited, to the extent of changes mentioned hereunder:

(a). Changes made in **Schedule-I** of the generation licence regarding ramping rate and time required to synchronize to grid attached as **Annexure-A**.

This **Modification-I** is given under my hand on this 27th **day** of **October Two Thousand & Seventeen**

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Annexure-A

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Modification-I
in the Generation Licence (No. IFSPL/60/2015, dated June 10, 2015) of Huaneng Shandong Ruyi (Pakistan) Energy (Private) Limited

(A). Details of Generation Facility/Power Plant:

1. At F(v) of schedule-I the detail relating to ramping rate of the generation facility/power plant has been revised/modified as:

Unit load range % age	Cold Start (%MW/Min)	Warm Start (%MW/Min)	Hot Start (%MW/Min)
0—<25%	0.2	0.6	1
25— 50%	0.3	0.8	1
50— 100%	0.3	0.3	0.8

2. At F(vi) of schedule-I the detail relating to time required to synchronize to Grid has been revised/modified as:

Time required to synchronize to Grid (Hrs.)	Cold start	Warm start	Hot start	Very hot start
	10 Hrs.	8 Hrs.	2.5 Hrs.	1.5 Hrs.

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