

National Electric Power Regulatory Authority Islamic Republic of Pakistan

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No. NEPRA/DG(Lic)/LAG-23/3/58-79

March 01, 2024

General Manager (Hydel) Operations Water and Power Development Authority (WAPDA) 186-WAPDA House Shahrah-e-Quaid-e-Azam, Lahore

Subject: <u>MODIFICATION - VI & VII IN GENERATION LICENCE NO. GL(HYDEL)/05/2004</u> GRANTED TO WAPDA FOR ITS HYDEL POWER STATIONS

 Reference:
 i)
 WAPDA letter No. GMHO/CEHO/G-182-NEPRA/19467-69 dated 28.09.2021

 ii)
 WAPDA letter No. GMHO/CEHO/G-182 LPM/11914-15 dated 14.07.2022

It is intimated that the Authority has approved Modification – VI & VII in Generation Licence No. GL(Hydel)/05/2004 dated November 03, 2004 in respect of Water and Power Development Authority (WAPDA) pursuant to the Section 26 of the NEPRA Act read with Regulation 10(11)(a) of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021.

2. Enclosed please find herewith following determinations of the Authority in the matter of Licensee Proposed Modification of WAPDA alongwith Modification-VI & VII in the Generation Licence No. GL(Hydel)/05/2004, approved by the Authority:

- i. Determination of the Authority in the matter of LPM of WAPDA (inclusion of 1530 MW Terbela 5th Extension Hydropower Power Project).
- ii. Determination of the Authority in the matter of LPM of WAPDA (inclusion of 800 MW Mohmand Dam Hydel Power Plant).

Enclosure: <u>As Above</u>

(Engr. Mazhar/Iqbal Ranjha)

Copy to:

- 1. Secretary, Power Division, Ministry of Energy, 'A' Block, Pak Secretariat, Islamabad
- 2. Secretary, Ministry of Finance, 'Q' Block, Pak Secretariat, Government of Pakistan, Islamabad
- 3. Chief Secretary, Government of Punjab, Punjab Secretariat, Lahore
- 4. Chief Secretary, Government of Sindh, Sindh Secretariat, Karachi
- 5. Chief Secretary, Government of Khyber Pakhtunkhwa, KPK Secretariat, Peshawar
- 6. Chief Secretary, Government of Balochistan, Balochistan Secretariat, Quetta
- 7. Managing Director, NTDC, 414 WAPDA House, Sharah-e-Quaid-e-Azam, Lahore
- 8. Chief Executive Officer, CPPA(G), 73 East, A.K. Fazal-e-Haq Rd, Blue Area, Islamabad
- 9. General Manager, System Operation, NTDC, Faiza Ahmed Faiz Road, H-8/1, Islamabad
- 10. Director General, Environmental Protection Agency (EPA), 3rd Floor, Old Courts Building, Khyber Road, Peshawar

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- Chief Executive Officer
 Lahore Electric Supply Company (LESCO)
 22-A, Queen Road, Lahore
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- Chief Executive Officer
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- 21. Chief Executive Officer
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- 12. Chief Executive Officer Gujranwala Electric Power Company (GEPCO) 565/A, Model Town, G.T Road, Gujranwala
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- Chief Executive Officer
 Faisalabad Electric Supply Company (FESCO)
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- 20. Chief Executive Officer
 Hyderabad Electric Supply Company (HESCO)
 HESCO Headquarter
 WAPDA Complex, Hussainabad, Hyderabad

National Electric Power Regulatory Authority (NEPRA)

Determination of the Authority in the Matter of Licensee Proposed Modification of Water and Power Development Authority (WAPDA)

<u>March り</u>, 2024 Case No. LAG-23

(A). Background

(i). The Authority has granted a Generation Licence [No. GL (HYDEL) /05/2004, dated November 3, 2004 and subsequent Modifications made thereto] to WAPDA for a cumulative Installed Capacity of 17367.96 MW.

(ii). The above mentioned Generation Licence has been granted to WAPDA for its twenty four (24) distinctly located Hydel Power Stations in the country.

(B). Communication of Modification

(i). WAPDA in accordance with Regulation-10(2) of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021 ("the Licensing Regulations") communicated a Licensee Proposed Modification (LPM) in its generation licence on October 01, 2021.

(ii). In the "text of the proposed modification", WAPDA submitted that it intends to include 1530 MW Tarbela 5th Extension Hydropower Power Project in its Generation Licence which will increase the total installed capacity from 17,367.96 MW to 18,897.96 MW. Further, it has also proposed to revise/actualize the auxiliary consumption of its 24 Hydel Power Stations from 13.7 MW to 24.2 MW in Schedule-II of its Generation Licence.

(iii). Regarding the "statement of the reasons in support of the modification", WAPDA, *inter alia*, stated that the Technical Committee constituted with the approval of the Secretary, Ministry of Water Resources has recommended to revise the auxiliary consumption of different power stations in light of Audit objections raised by Departmental Accounts Committee regarding excessive



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consumption. Therefore, the proposed modification will address the issue of nonconformity with regards to actual/operational auxiliary consumption limits and NEPRA's recognized auxiliary consumption values, mentioned in Modification-IV of the Generation Licence of WAPDA. It will be helpful for the settlement of all related Draft Audit Paras.

(iv). About the statement of "the impact on tariff", "quality of service (QoS)" and "the performance by the licensee of its obligation under the licence", WAPDA confirmed that the proposed changes will not have an adverse impact on tariff, QoS and the performance of the licensee of its obligation under the existing licence.

(C). Processing of Modification

(i). After completion of all the required information as stipulated under Regulation-10(1) and 10(2) of the Licensing Regulations by the Licensee, the Registrar published the communicated LPM in one (01) English and one (01) Urdu daily newspaper on December 30, 2021, informing the general public, interested/affected parties, and different stakeholders about the said LPM as required under the Regulation-10(3) of the Licensing Regulations.

(ii). The Registrar also invited comments of the relevant Government Ministries, their attached Departments, representative organizations and individual experts etc. for the assistance of the Authority, by sending separate letters to the said stakeholders on December 30, 2021, either in favor or against the communicated LPM of WAPDA, as stipulated in Regulation-11(5) of the Licensing Regulations.

(D). Comments of Stakeholders

(i). In response to the above, the Authority received comments from three (03) stakeholders. These included Central Power Purchasing Agency (Guarantee) Limited (CPPA-G), Private Power & Infrastructure Board (PPIB) and Punjab Power Development Board (PPDB). The salient points of the comments offered by the above-mentioned stakeholders are summarized in the following paragraphs: -



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- CPPA-G remarked that the report submitted by the Technical (a). Committee constituted by WAPDA pointed out metered/unmetered auxiliary consumption of power stations however, proper justification of the losses along with the documentary evidence through firm technical justifications were not mentioned. Therefore, the Authority may get confirmation from WAPDA whether such losses/power is consumed within the power plants or not. If not, then WAPDA may clarify the same keeping in view all the legal and regulatory framework. Further, a technical audit from the third party needs to be conducted to evaluate whether such additional consumption is due to lack of proper Operation & Maintenance of the power plants or otherwise; and
- (b). PPIB has supported the modification in the generation licence of WAPDA pertaining to the increase in total installed capacity from 17367.96 MW to 18897.96 MW and revision of auxiliary consumptions as the same is reasonably well below the consumption allowed by the Authority for other hydropower projects; and
- (c). PPDB commented that on one side the Committee has recommended to increase the auxiliary consumption based on the installed capacity and on the other hand reduced the availability of power plants as approved by the Authority. It is pointed out by WAPDA that consumer tariff will not increase which is against the tariff norms as enhancement of auxiliary consumption as well as outages will further increase the tariff. Further, the powers of the Authority are intended to be used to satisfy Audit objections by enhancing the auxiliary consumption resulting in increased consumer end tariff.



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The Authority reviewed the above mentioned comments of (ii). stakeholders and in view of the observations of CPPA-G and PPDB, considered it appropriate seeking perspective of WAPDA on the same. In response to the comments of CPPA-G, it was submitted that the auxiliary consumption of each hydrower station was not mentioned in the original licence. It was included in Schedule-II of Modification-II and auxiliary consumption limits defined therein were very reasonable and as per actual consumption (approx.) however, the same was not mentioned in Modification-III. Later on, the Authority reduced the auxiliary limits in Modification-IV which is not according to normal practices being allowed to Independent Power Producers (IPPs) recently which is 1-2% of the installed capacity of the generation facility. In this regard, a Technical Committee was constituted by Secretary, Ministry of Water Resource, being Principal Accounting Officer to define the auxiliary consumption limits of all operational Power Houses of WAPDA based on present operational characteristics of the plants, to address the Audit observations. The committee submitted its report and recommended to revise the limits of auxiliary consumption. The committee has thoroughly justified the said limits of each WAPDA Hydel Power Station with all documentary evidence/calculations given in the report. Regarding the query of utilization of auxiliary consumption within power plants or otherwise, it has been confirmed that the auxiliary power including metered/un-metered losses, due to technical limits of the installed equipment is only consumed within the power plant and are not used for any other purpose.

(iii). Further to above, WAPDA submitted that it is a public sector entity and there is neither any precedence/revision nor any financial resources available under the approved tariff for such technical audit. It owns twenty one (21) operational hydel power stations and any such technical audit of each power station shall likely require vigorous measurements at multiple points. So this activity, spanning over a lengthy duration will involve different professionals, having a significant financial impact on WAPDA without yielding any result. It is pertinent to mention that other hydel IPPs are allowed auxiliary consumption to the tune of 1-2 % of the installed capacity of power plant. In this regard, a comparison is made which clearly depicts that the auxiliary limits of WAPDA Power Stations are at par



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with that of hydel IPPs. As long as the power plant remains within the prescribed limit, no such audit is required to be conducted.

(iv). On the observations of PPDB, it was stated that the revision of outage allowance/availability, as proposed by the Committee falls under the Power Purchase Agreement (PPA), and extensive maintenance is required for better reliability of the old generating units. The hydropower plants of WAPDA are the cheapest source of energy so their reliability cannot be compromised for lowering the basket price of the electricity for consumers. The proposed modification will not have any impact on the consumers. The operational characteristics of the WAPDA hydel power stations will remain the same therefore, it will not impact the tariff. It is pertinent to mention that WAPDA Hydel Power Stations are playing an important role for supply of affordable/cheap electricity to the consumers. WAPDA reiterated that it has submitted application for modification in its generation licence keeping in view the provisions of the relevant regulations as NEPRA is the ultimate authority for such modification. Therefore, it is not correct that the Authority's powers are being used to satisfy audit objections.

(v). The Authority examined the above rejoinder and found the same plausible considering the scope of LPM. Accordingly, the Authority considered it appropriate to proceed further as stipulated in the NEPRA Licensing (Generation) Rules, 2000 ("the Generation Rules") and the Licensing Regulations.

(E). Framing of Issues

(i). The Authority considered the comments of the stakeholders, replies of the Licensee and observed that the public interest is involved in the matter. Accordingly, the Authority decided to deliberate the matter further by holding a public hearing in terms of Rule-3 of the NEPRA Licensing (Generation) Rules, 2000 (the "Generation Rules"). In this regard, following issues were framed:

(a). WAPDA was granted licence in 2004 and during this period has got modified auxiliary consumption many times. Why is this being done so frequently? What is the basis of current LPM for modification in generation licence?



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(b). Why did WAPDA not point out the discrepancy in allowed and actual auxiliary limit(s) during the period 2004-2021? Why the same had not been actualized in earlier applications for modification in the generation licence?

(c). Which factors have led to revision/correction of auxiliary consumptions in the current case or the same being done merely on the observation of Audit? Has any third party audit/input has been obtained to arrive at this result?

(d). Most of the hydel power plants have auxiliary consumption of less than or equal to 1% of the installed capacity. How the revision of auxiliary consumption of some WAPDA HPPs beyond 1% is technically justified?

(e). Will the revision/increase in auxiliary consumption lead to decrease in the overall net capacity of WAPDA HPPs for supplying to grid? Whether it will have any impact on PPA or otherwise?

(f). Which forum gave approval for the Tarbela 5th extension (T-5) project? What were the basic parameters of the project when PC-1 was conceived/approved? Is the development of the said project technically and financially justified considering the parameters of the detailed design?

(g). What will be the plant factor of the T-5 project based on the mean monthly discharge data mentioned in PC-1? What will be the proposed tariff of the T-5 project? Whether the same will be beneficial for the consumers keeping in view the said factor and current tariff structure of WAPDA or otherwise? What is the payback period of the said project?

(h). What was the mean monthly discharge of water through Tunnel-5 for the last five years?



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(i). Whether there will be any impact on mean monthly flows of Tunnel-5 after construction of Diamer-Bhasha dam or otherwise?

(j). Whether WAPDA will modify its PPA consequent upon approval of this LPM or otherwise?

(ii). In order to encourage the participation of the general public, interested/affected parties and other stakeholders, notices were published in two (02) different newspapers including the Dawn (English) and daily Express (Urdu) on June 23, 2022.

(iii). Apart from the above, separate letters were also sent to relevant Govt. ministries, their attached departments, representative organizations and individual experts etc. on June 24, 2022 informing them about the date, time and venue of the proposed public hearing.

(F). Public Hearing

(i). The public hearing in the matter was held on July 06, 2022 at NEPRA Headquarter, Islamabad. In the said hearing, WAPDA gave a detailed presentation on the various issues framed in the matter.

(ii). Regarding the observation of auxiliary consumptions why the same were not revised in the previous modification(s), it was submitted that the Authority granted licence to WAPDA in 2004 wherein no auxiliary limits were specified in the relevant Schedule. However, the said limits were defined in Modification-II of the generation licence. Later on, the auxiliary consumption of power plants was reduced in Modification-IV on the basis of five (05) years historical data. In view of number of factors including aging, wear and tear of electrical equipment, extra measures have been taken resulting in increased auxiliary load on which Departmental Accounts Committee had raised Audit objections.

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(iii). Accordingly, a technical committee was formed to actualize the auxiliary consumption limits of all power plants based on present operational characteristics of the plants. The committee submitted its report and based on its recommendations WAPDA applied for modification in its licence to revise the auxiliary limits. On the query of enhancement of auxiliary consumption of some small hydel power plants beyond one percent of the installed capacity, it has been submitted that the same is justified considering their outlived useful life. Further, with the decrease in size of power plant, the unit auxiliary consumption decreases as compared to big power stations however, the other load such as HVAC, lighting etc. remains the same which increases the auxiliary consumption.

(iv). On the observations that an increase in auxiliary consumption will lead to decrease in overall net capacity of WAPDA power plant for supplying to grid, WAPDA was of the view that there will be no impact on overall net capacity of Hydel Power Stations as the net energy being delivered to National Grid will remain same which already takes into account the auxiliary consumption. Further, it has been confirmed that the proposed revision will also not affect the PPA which is based on installed capacity and net energy delivered. WAPDA also informed that amendment no. 04 in its PPA has already been submitted before the Authority the approval of which is still awaited.

(v). WAPDA has proposed to include Tarbela 5th extension in its generation licence on which it has submitted that Tunnel-5 is designated as an irrigation tunnel which will also be utilized for power generation. ECNEC has already approved PC-I of the project on December 20, 2016 with a cost of USD 807.464 million which envisages that it is technically and financially viable. According to the PC-I, the annual Plant Factor of the project will be 10.21% and the proposed tariff will be around 8 cents/KWh whereas, the payback period is 10.80 years. WAPDA has also provided mean monthly discharge data of water through Tunnel-5 for the last five years which reveals that the said tunnel will be operational mainly for three (03) months (May, June and July).



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(G). Evaluation/Findings

(i). The Authority has examined the entire case in detail including the already granted licence, communicated LPM, comments of stakeholders and rejoinder from the Licensee. In this regard, the Authority granted WAPDA a generation licence [No. GL(HYDEL)/05/2004, dated November 03, 2014, subsequent Modification-I dated June 27, 2008, Modification-II dated June 20, 2011, Modification-III dated January 17, 2014, Modification-IV dated January 09, 2015 and Modification-V dated April 07, 2020] for its various distinctly located hydel power stations.

(ii). The Authority has observed that according to the communicated LPM, the Licensee/WAPDA now plans (a). revision of the auxiliary consumption of its sixteen (16) out of twenty four (24) Hydel Power Stations; and (b). addition of 1530 MW Tarbela Fifth Extension in its generation licence. In this regard, the Authority in terms of Section-26 of the NEPRA Act read with Regulation-9(2) of the Licensing Regulations, is empowered to modify a licence as it may deem fit if, in the opinion of the Authority, such modification (a). will not adversely affect the performance by the licensee of its obligations; (b). is reasonably necessary for the licensee to effectively and efficiently perform its obligations under the licence; (c). is likely to benefit consumers; or (d). is reasonably necessary to ensure the continuous, safe and reliable supply of electric power to consumers, keeping in view the financial and technical viability of the licensee.

(iii). According to the communicated LPM, the Licensee/WAPDA intends to revise/modify the auxiliary consumption of its various hydel power stations on the basis that Audit objections were raised by the Departmental Accounts Committee (DAC) on account of excessive auxiliary consumptions as compared to one allowed by the Authority in earlier Modification of the generation licence of WAPDA. The Audit pointed out a major difference between station consumption (as calculated in E-form which is energy generation in MKWH generated minus the net energy sold to NTDC) as compared to Station metered auxiliary consumption.



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(iv). Accordingly, DAC directed to constitute a Technical Committee to probe into the matter of excessive auxiliary consumption/unmetered consumption at different WAPDA Hydel Power Stations. In consideration of the said, a Technical Committee was constituted with the approval of the Secretary, Ministry of Water Resources. The Terms of Reference (TORs) of the said committee, *inter alia*, include: (a). checking the reasons for auxiliary consumption beyond limits specified in Modification-IV; (b). causes and justification for un-metered energy consumption at power stations; (c). rationalize auxiliary limits by duly excluding residential and other Power House requirements.

(v). In consideration of the above, the Technical Committee prepared a comprehensive report which reveals that the said committee reviewed E-Forms and log sheets of all the power stations to analyze energy consumption and losses of power stations. The Committee also compared the consumption allowed in PC-I of the projects with the Authority's allowed limits. The said report mentions that almost 95% of the unit auxiliary of equipment is fed from the auxiliary transformers in a Power plant and is, therefore, metered auxiliary consumption. However, the excitation load of the generator in 99% of Power Plants is branched out prior to auxiliary transformer and is, therefore, unmetered consumption.

(vi). Further, the committee considered that the auxiliary consumption of a station cannot be directly linked with the installed capacity of the station. The auxiliary consumption depends upon the equipment installed & the layout of the Power station. A power plant having less installed capacity may have a higher percentage of auxiliary consumption and vice versa. Further, the Committee was of the view that station consumption is not only metered auxiliary but is the sum of metered/unmetered auxiliaries and losses sustained in the Power Plant till the point of exit of energy from the switchyard. The Committee has taken into consideration the rehabilitation and ageing/maintenance of power stations to be carried out in the future. Regarding the unmetered auxiliary consumption, the Committee noticed that these are within the limits stated in the PC-1 and not a single power station is crossing these limits. In view of the said, the Committee has recommended to enhance metered auxiliary consumption limits of various hydro power stations.



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(vii). In consideration of the above, WAPDA has submitted application for modification in its licence in order to actualize the auxiliary consumption of various hydropower plants. In this regard, the Authority considers that auxiliary consumption of some hydropower plants which WAPDA has proposed to enhance on recommendations of the Technical Committee is on higher side i.e. beyond 1% of the installed capacity being the small and old plants and the Authority has decided to convert the tariff of the same on take & pay basis. However the Authority directs WAPDA to submit the exact auxiliary consumption in GWh/kWh of each plant in its tariff petition for the calculation of tariff accordingly. Further, WAPDA is directed not to exceed the auxiliary consumption beyond permissible limit specified in its generation licence.

(viii). In addition to the above, the Authority has observed that WAPDA also intends to include 1530 MW Tarbela 5th Extension in its generation licence which will increase the total installed capacity from 17,367.96 MW to 18,897.96 MW. The said project is being constructed on Tunnel No. 5 of Tarbela Dam with a total cost of US 807 million dollars. The said tunnel designated for irrigation purposes, will be converted into the power tunnel without affecting irrigation release capabilities. The powerhouse will consist of three 510-MW turbine-generator units. WAPDA has awarded contract of USD 241.1 million for Electro-Mechanical (E&M) works of the proposed project to a joint venture of Harbin Electric International Company and Harbin Electric Machinery Company (HEIC-HEMC) whereas, the contract for civil works was awarded to Power Construction Corporation of China in May 2021 having value of USD 354.6 million.

(ix). The Authority has noted that the project is expected to be commissioned by July 2024 and will provide 1424 GWh of low-cost hydel electricity to the National Grid on the average every year. The International Bank for Reconstruction and Development (IBRD) of World Bank and the Asian Infrastructure Investment Bank (AIIB) are financing the project to the tune of USD 390 million and USD 300 million respectively. Regarding interconnection/ transmission arrangement, it has been submitted that the project will be connected to Islamabad West Substation through 500 kV Double Circuit (D/C) transmission line on quad-bundled Drake conductor of 50 km in length.



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(x). In consideration of the above, the Authority considers that the proposed modification (a). will not adversely affect the performance by the licensee of its obligations; (b). is reasonably necessary for the licensee to effectively and efficiently perform its obligations under the licence as it will enable the licensee to actualize the auxiliary consumption of power stations keeping in view the operational characteristics; (c). is likely to benefit consumers considering the fact that inclusion of Tarbela 5th Extension project will result in the affordable and reliable supply of electric power using indigenous sources; or (d). is reasonably necessary to ensure the continuous, safe and reliable supply of electric power to consumers, keeping in view the financial and technical viability of the licensee.

(H). Approval of LPM

(i). In view of the above, the Authority is satisfied that WAPDA 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 without any changes. 7



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(ii). Accordingly, the Authority allows the modification to the extent of: (a). changes in auxiliary consumption of various hydel power plants; and (b). addition of 1530 MW Tarbela 5th Extension. It is pertinent to mention that the Authority has also approved another modification for inclusion of Mohmand Dam for which separate determination is being issued. The consolidated changes to be reflected in the Generation Licence are attached with the determination for Mohmand Dam. The approval of the LPM will be subject to the provisions contained in the NEPRA Act, relevant rules framed there under, terms & conditions of the Generation Licence and other applicable documents.

<u>Authority</u>

Engr. Magsood Anwar Khan (Member)

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Rafique Ahmed Shaikh (Member)

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Mathar Niaz Rana (nsc)

(Member)

Tauseef H. Faroogi (Chairman)

Amina Ahmed (Member)

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National Electric Power Regulatory Authority (NEPRA)

Determination of the Authority in the Matter of Licensee Proposed Modification of Water and Power Development Authority (WAPDA)

<u>March Of</u>, 2024 Case No. LAG-23

(A). Communication of Modification

(i). WAPDA in accordance with Regulation-10(2) of the NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021 (the "Licensing Regulations") communicated a Licensee Proposed Modification (LPM) in its generation licence on July 15, 2022.

(ii). The proposed modification pertains to inclusion of 800 MW Mohmand Dam Hydel Power Plant (HPP) in its generation licence. Regarding the "statement of the reasons in support of the modification", WAPDA has stated that the Mohmand Dam HPP will be source of cheap and clean electric power without any Carbon dioxide (CO₂) emissions. It will also create job opportunities for the local community which will uplift their living standards. The project will be helpful for GDP growth of the country.

(iii). About the statement of "the impact on tariff", "quality of service (QoS)" and "the performance by the licensee of its obligation under the licence", WAPDA has confirmed that the proposed changes will not have adverse impact on QoS and the performance of the licensee of its obligation under the existing licence however, the exact tariff calculations will be made at the time of filing tariff petition of the project.

(B). Processing of Modification

(i). After completion of all the required information as stipulated under the Regulation-10(1) and 10(2) of the Licensing Regulations by the Licensee, the Registrar published the communicated LPM in one (01) English and one (01) Urdu daily newspaper on August 25, 2022, informing the general public,



interested/affected parties, and different stakeholders about the said LPM as required under the Regulation-10(3) of the Licensing Regulations.

(ii). The Registrar also invited comments of the relevant Government Ministries, their attached Departments, representative organizations and individual experts etc. for the assistance of the Authority, by sending separate letters to the said stakeholders on August 26, 2022, either in favor or against the communicated LPM of WAPDA, as stipulated in Regulation-11(5) of the Licensing Regulations.

(C). Comments of Stakeholders

(i). In response to the above, the Authority received comments from five (05) stakeholders. These included Ministry of States & Frontier Regions (MoSFR), Ministry of Planning, Development & Special Initiatives (MoPD&SI), Faisalabad Electric Supply Company Limited (FESCO), Private Power & Infrastructure Board (PPIB) and Central Power Purchasing Agency (Guarantee) Limited (CPPA-G). The salient points of the comments offered by the above-mentioned stakeholders are summarized in the following paragraphs: -

- (a). MoSFR commented that it does not deal with Federally Administered Tribal Areas (FATA) and Provincial Administered Tribal Areas (PATA) which merged with the provinces of Khyber Pakhtunkhwa and Balochistan. Therefore, the matters of Mohmand Dam HPP do not pertains to it;
- (b). MoPD&SI remarked that Executive Committee of National Economic Council (ECNEC) approved the PC-I of Mohmand Dam on April 26, 2018 and the same is included in Indicative Generation Capacity Expansion Plan (IGCEP) 2021 as a committed project. In light of the said, it has no objection to the LPM of WAPDA for inclusion of the said project in its licence;



- (c). FESCO submitted that the proposed project will provide low cost, durable and clean electric power as compared to other sources of energy due to which it has no reservations in the matter;
- (d). PPIB supported the proposed LPM considering that the project is being developed in Public Sector in the province of Khyber Pakhtunkhwa and the same is also included in the IGCEP 2021 having commercial operation date envisaged as April 2026;
- (e). CPPA-G commented that auxiliary consumption claimed by WAPDA for its Mohmand HPP is 5.6 MW which is required to be evaluated in a way that in case it consumes excess energy in terms of auxiliary load, then it will be liable for financial compensation as being done with other IPPs. Further, it will provide detailed comments on tariff calculations once the petition is admitted by the Authority.

(ii). The Authority examined the above comments of the stakeholders and in view of the observations of CPPA-G, considered appropriate seeking perspective of WAPDA. In response to the said, it was submitted that the auxiliary consumption of Mohmand Dam HPP is already on lower side (0.7% of the installed capacity). It is at par with limits of other HPPs of WAPDA, which have already been submitted to the Authority. Further, the said values are proposed/estimated on the basis of detailed engineering design of the power plant. However, the actual values may differ based upon the actual configuration of the auxiliary system of the power plant.

(iii). The Authority reviewed the above rejoinder of WAPDA and found the same plausible considering the scope of LPM. Accordingly, the Authority considered it appropriate to proceed further as stipulated in the NEPRA Licensing (Generation) Rules, 2000 ("the Generation Rules") and the Licensing Regulations.



(D). Evaluation/Findings

(i). The Authority has examined the entire case in detail including the already granted licence, communicated LPM, comments of stakeholders and rejoinder from the Licensee, Feasibility Study and approved PC-I of the project. In this regard, the Authority has observed that WAPDA was granted a generation licence [No. GL(HYDEL)/05/2004, dated November 03, 2014, subsequent Modification-I dated June 27, 2008, Modification-II dated June 20, 2011, Modification-III dated January 17, 2014, Modification-IV dated January 09, 2015 and Modification-V dated April 07, 2020] for its various distinctly located hydel power stations.

(ii). The Authority has noted that according to the communicated LPM, the Licensee/WAPDA now plans to add 800 MW Mohmand Dam HPP in its generation licence. In this regard, the Authority in terms of Section-26 of the NEPRA Act read with Regulation-9(2) of the Licensing Regulations, is empowered to modify a licence as it may deem fit if, in the opinion of the Authority, such modification (a). will not adversely affect the performance by the licensee of its obligations; (b). is reasonably necessary for the licensee to effectively and efficiently perform its obligations under the licence; (c). is likely to benefit consumers; or (d). is reasonably necessary to ensure the continuous, safe and reliable supply of electric power to consumers, keeping in view the financial and technical viability of the licensee.

(iii). The Authority has observed that the Mohmand Dam was initially conceived in 1963 whereby construction of 400 MW HPP was proposed at that time. Later on, the Licensee/WAPDA conducted a pre-feasibility study in 1992 wherein the capacity of the HPP was updated to 600 MW. In 1995, the Govt. of Pakistan made an official request to the Government of Japan for carrying out detailed Feasibility Study including field investigations, environment impact assessment, design of structures, economic and financial analysis etc. In consideration of the said, Japan International Cooperation Agency (JICA) engaged Nippon Koei Co. Ltd. And Nippon Giken Inc. for preparation of a comprehensive report which was completed in March 2000.



(iv). Later on, WAPDA entered into an agreement with a joint venture of consulting firms i.e. M/s SMEC International Pty Ltd., Australia, (Lead Firm) Nippon Koei Ltd. Japan, National Engineering Services Pakistan (NESPAK), Associated Consulting Engineers (Pvt.) Ltd., Lahore in association with Engineering General Consultants (EGC) (Pvt.) Ltd., Lahore and BAK Consulting Engineers for the Review of Feasibility Study, Preparation of Project Planning Report (PPR), Detailed Design and Tender documents of the Mohmand Dam Project accordingly, detailed engineering design was completed in April of 2017. ECNEC approved the PC-1 of Mohmand Dam amounting to Rs. 309,558.378/- million during a meeting on April 26, 2018. The Contract Agreement was signed with joint venture of CGGC-DESCON on March 26, 2019.

(v). According to the feasibility study of the project, WAPDA intends to develop multi-purpose concrete faced rockfill Mohmand Dam for providing water storage facility, flood control during the rainy season, irrigation of lands and generation of electric power. The said dam is proposed on Swat river which is about 05 km upstream of Munda Headworks in Mohmand Tribal District in Khyber Pakhtunkhwa. The reservoir area of the dam extends upstream to Mohmand, Bajaur and Malakand Agencies. The total length of reservoir is about 56 km and an area of 24 km². The gross water-storage capacity of the project is 1.2 million acre feet (MAF), and besides supplementing 160,000 acres of existing land, more than 16,700 acres (6,773 hectares) of new land will be irrigated. The dam will also be source of drinking water around 300 million gallon per day for people of Peshawar.

(vi). The total installed capacity of the HPP is 800.0 MW consisting of four (04) Vertical shaft type Francis turbines (4 x 200 MW). The said capacity of the project has been optimized keeping in view the annual mean discharge of 233 m³/s (8228.30 Cusecs). The Mohmand Dam HPP is a medium head (maximum gross head of 188.7 m and minimum head of 137.90 m) project with mean annual energy of approximately 2,862 GWh at plant factor of 40.84%. It is pertinent to mention that Mohmand Dam HPP is already included in IGCEP 2021 in the list of committed project having expected commissioning date of April 2026.





(vii). According to the PC-I of the project, the Government of Pakistan would fund the cost for the dam part which is 37% of the total project cost through PSDP Grant which is about Rs. 144.00 billion. For the development of power generation facility, WAPDA will be injecting equity of approximately 20% of the cost of about Rs. 28.997 billion from its own resources whereas, debt of 80% amounting to Rs. 115.99 Billion will be raised through foreign and local financing. In this case, the debt equity ratio would be 20:80 percent which is well within the range allowed by the Authority under the current tariff mechanism. In this regard, Saudi Fund for Development (SFD), Kuwait Fund for Development (KFD), Islamic Development Bank (IsDB), and OPEC Fund will provide financial support Regarding interconnection/transmission arrangement, following schemes have been proposed: (a). A 220 KV Double Circuit (D/C) transmission line, approx. 58 km long, on twin bundled Rail conductor from Mohmand HPP to Nowshera Industrial substation; and (b). A 220 KV D/C transmission line, approx. 52 km long, on twin bundled Rail conductor from Mohmand HPP to Jamrud substation.

(viii). In consideration of the above, the Authority considers that the proposed modification (a). will not adversely affect the performance by the licensee of its obligations; (b). is reasonably necessary for the licensee to effectively and efficiently perform its obligations under the licence as it will increase the generation fleet of WAPDA due to addition of 800 MW Mohmand Dam HPP; (c). is likely to benefit consumers considering the fact that the project will result in affordable and reliable supply of electric power using indigenous sources; or (d). is reasonably necessary to ensure the continuous, safe and reliable supply of electric power to consumers, keeping in view the financial and technical viability of the licensee.

(A). Approval of LPM

(i). In view of the above, the Authority is satisfied that WAPDA 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 without any changes.



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(ii). Accordingly, the Generation Licence [No. GL(Hydel)/05/2004 dated November 03, 2004] is hereby modified to the extent of addition of 800 MW Mohmand Dam HPP. 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 framed there under, terms & conditions of the Generation Licence and other applicable documents.

Authority

Maqsood Anwar Khan (Member)

MA.m.

Rafique Ahmed Shaikh (Member)

maniel

Mathar Niaz Rana (nsc)

(Member)

Amina Ahmed (Member)

Tauseef H. Farooqi (Chairman)

Retired



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Generation Licence Water & Power Development Authority (WAPDA) Wapda House Lahore

<u>SCHEDULE-I</u> (Modified/Revised)

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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LOCATION MAP OF WAPDA HYDEL POWER PROJECTS





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<u>Hydel Power Station</u> <u>Tarbela</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Generation Licence Water & Power Development Authority (WAPDA) Wapda House Lahore





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Hydel Power Station, Tarbela

PLANT DETAILS

1.	Location On Right Bank, of River Indus at Tarbela i Swabi, in the province of Khyber Pakhtunkhy					ela in Distt. Ikhwa				
	2. Plant		Туре		Total Capacity		No. of Units			
2.			Storage		3478 MW		14			
	Head		Maximum		Minimum					
3.			440 ft			190 ft				
4.	Tec	hnology	Francis Turbines							
	Tunnel		No.		Length		Diameter			
	Total No. of Tunnel		5		-		At Intake	At Penstock		
5.	(i).	No. of Power Tunnels	3		T1, T2 = 2400 ft. T3 = 2700 ft.		45.0 ft.	43.5 ft.		
	(ii).	No. of Irrigation Tunnels	2	-	T4 = 27 T5 = 36	T4 = 2700 ft T5 = 3675 ft			36.0 ft.	
6.	Mini Use Ger	imum Expected ful Life of the neration Facility	50 Years							
7.	Pea Ope	king/Base eration	Generally during High Flow Period, the plant is operated for base load where as during Low Flow Period; it is utilized for peaking purpose.					ne plant is Low Flow		
	Plant Characteristics					Units (1-10) = 13.8 KV				
			Generator Voltage		Units (11-14) = 18.0 KV					
8			Power Factor		Units (1-4) = 0.85					
					Units (5-10) = 0.95					
					Units (11-14) = 0.90					
G 2.		I ELECTRON	NEPRA	FIORY AUX	Ar and a second se			Modi	Page 7 of 13 fied/Revised Schedul (Modification-VI &	

		Frequency	50 Hz			
		Automatic Generation Control	Yes			
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	ССТ	Voltage (KV)	Length (KM)		
		Tarbela-GZBR-I	500	073.20		
		Tarbela-GZBR-II 500		076.20		
		Tarbela-Peshawar	500	113.07		
		Tarbela-Rewat	500	110.89		
		Tarbela-Burhan-I	220	035.01		
		Tarbela Burhan-II	220	035.01		
		Tarbela Burhan-II	220	035.04		
		Tarbela-ISPR	220	062.05		
		Tarbela-Mardan-I	220	067.00		
		Tarbela-Mardan-II	220	067.00		

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Hydel Power Station Mangla

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- expected life (f).
- Interconnection with national grid company, length of transmission (g). line(s)
- Peaking/base load operation (h).
- Plant characteristics: generation voltage, power factor, frequency, (i). automatic generation control, ramping rate, control metering and instrumentation





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Generation Licence Water & Power Development Authority (WAPDA) (Wapda House Lahore







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Generation Licence Water & Power Development Authority (WAPDA) Wapda House Lahore



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Hydel Power Station, Mangla

PLANT DETAILS

0	Plant		Туре		Total Capacity		No. of Units	
2.			Storage		1000 MV	N	10	
			Maximum			Minimum		
3. Head		397 ft				195 ft		
4.	Technology		Francis Turbines					
	Tunnel		No.		Length		Diameter	
5.	Total No. of Tunnel		5			At In	At Intake Pens	
	(i).	No. of Power Tunnels	5	1	1560 ft. each		ft.	26 ft.
	(ii).	No. of Irrigation Tunnels	-			-		-
6.	Minin Expe Life o Gene Facili	num cted Useful of the eration ty	50 Year	rs				
7.	Peak Oper	ing/Base ation	Plant is operated for base load generally during High Flow Period, where as during Low Flow Period, it is utilized for peaking.					
	Plant Characteristics		Generator Voltage			Un	Units (1-10) = 13.2 K	
			Power Factor				Units (1-10) = 0.8	
			Frequency				50 Hz	
8.	Char		1	Automatic Generation Control			Automatic Load Frequency Control is installed on Units 3, 4 7&8	
8.	Char		Automa	tic C	Seneration Cont	rol ins	talled o	cy Control is on Units 3, 4 7&8

	Interconnection Arrangements	ССТ	Voltage (KV)	Length (KM)
		Rawalpindi-I (MRB)	132	2.12
		Rawalpindi-II (Gujar Khan)	132	55.00
		Rawalpindi-III (New Rawat)	132	86.91
		Kharian-I (Rajar)	132	48.00
		Kharian-II (NBE-2)	132	7.00
		Kharian-3 (NBE-1)	132	7.00
		Scarp-I (Dinga)	132	71.00
9.		Scarp-2 (Kuthialan Sheikhan)	132	109.00
	length of	Mirpur (MPR-3)	132	7.79
	Transmission Line, voltage level details etc.)	Old Rawat-I (Kallar Syedan)	132	78.00
		Oid Rawat-II (Dudyal)	132	36.60
		Ghakhar-I	220	114.90
		Ghakhar-II	220	113.70
		Ghakhar-III (New Ghk)	220	145.00
		Kalashah Kaku-I	220	173.00
		Kalashah Kaku-II	220	173.00
		Kalashah Kaku-III	220	172.00
		Mangla New Rawat-I	220	79.00
		Mangla New Rawat-II	220	79.00

POWER RE NEPRA ជ AUTHORITY *

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2.
<u>Hydel Power Station</u> <u>Warsak</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Generation Licence Water & Power Development Authority (WAPDA) Wapda House Lahore Page 16 of 135 of Modified/Revised Schedule –I (Modification-VI & VII) in s كور كولاذنذ Wa<u>rs</u>ak Dam 1 \wedge Battagram بنگرام Shabqadar Tarnab ٤. شيفدر Uţmānzai , ŝ الفابزي وكالعدود 2000 ∖_Rajaŕ JUATORY AUT Särdheri سرڈھبری harsadda REG NEPRA A خار سده CFOWER Jorkham طورخم TELECTRY ا سبح لام Ualabela ¢ Mathra Nisatta 21.1 (Landi Kotal ذَلَيْدُي كَوْتُر - ^_ Mian Guji Kandar) Akbar Pura Bakhshi Pu A. ÅН أكبربوره Darmangi Shero Jahngi Wadpagga W-1 ٢ 1 ۰. / iPani Mantal ١,

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Hydel Power Station, Warsak

PLANT DETAILS

1.	Loc	ation	located on right bank of River Kabul, on the boundary of Mohmand and Khyber Agencies						
			Type Total Capa		acity	city No. of Units			
2.	Plar	nt	Run of	River	242.96 M	W	W 06		
ر م	Hoa			Maxin	num		Mi	nimum	
<u> </u>	1100			150	ft		1	30 ft	
4.	Tec	hnology	Francis	s Turbin	e				
	Tun	nel	No.		Length		D	iameter	
	Tota	al No. of Tunnel	1		-	A	Intake	Per	At hstock
5.	(i).	No. of Power Tunnels	1		827 ft.		39 ft.	3	9 ft.
	(ii).	No. of Irrigation Tunnels	-	-			-		-
6.	Mini Use Ger	imum Expected ful Life of the peration Facility	25 Years after completion of rehabilitation.			on.			
7.	Pea Ope	king/Base eration	Generally during normal and high flow p operated for base load whereas during period it is utilized for peaking				v perioo ng lear	ls, it is 1 water	
			Generator Voltage Units (1			its (1-6	6) = 13.2	2 KV	
				Bower Easter			I Inite ($1_{-}(1) - 1$	
_	Plant			Dowor E	actor L			<u> -4/ - </u>	.0
8	Plar	nt	F	Power F	actor		Units (5-6) = 0	.0 .85
8.	Plar Cha	nt iracteristics	F	Power F	actor		Units (50	(1-4) = 1 (5-6) = 0 (1) Hz	.0 .85
8.	Plar Cha	nt Iracteristics	P · Autor	Power F Freque natic G Conti	actor ency eneration rol		Units (50	1-4) = 1 5-6) = 0) Hz No	.0 .85
8.	Plar Cha	nt iracteristics	• Autor	Power F Freque natic G Cont	actor ency eneration rol CCT		Units (50	5-6) = 0) Hz No Voltage (KV)	.0 .85 Length (KM)
8.	Plar Cha	nt iracteristics	· Autor Line:1	Power F Freque natic G Contr Warsak Warsak	actor ency eneration rol CCT Power House	to GSS	Units (50		.0 .85 Length (KM) 03.603
8.	Plar Cha Inte Arra	nt tracteristics rconnection angements	• Autor	Power F Freque natic G Conti Warsak Warsak	actor ency eneration rol CCT Power House	to GSS Shahi B	agh	1-4) - 1 5-6) = 0) Hz No Voltage (KV) 132	.0 .85 Length (KM) 03.603 23.513
9.	Plar Cha Inte Arra (CC leng	nt tracteristics rconnection angements T details, gth of	• Autor	Power F Freque natic G Conti Warsak Warsak GSS W Warsak Sakhi C	actor ency eneration rol CCT Power House arsak to GSS S Power House chashma	to GSS Shahi B to GSS	agh	1-4/ = 1 5-6) = 0 0 Hz No Voltage (KV) 132 132	.0 .85 Length (KM) 03.603 23.513 26.690
9.	Plar Cha Inte Arra (CC leng Trai volt	rconnection angements T details, of nsmission Line, age level details	• Autor Line:1 Line:2	Power F Freque natic G Conti Warsak Warsak GSS W Warsak Sakhi C GSS Sa Shahi E	actor ency eneration rol CCT Power House arsak to GSS S Power House Chashma akhi Chashma t Bagh	to GSS Shahi B to GSS	agh	1-4) = 1 5-6) = 0 0 Hz No Voltage (KV) 132 132	.0 .85 Length (KM) 03.603 23.513 26.690 05.260
9.	Plar Cha Inte Arra (CC leng Trai volta etc.	nt iracteristics rconnection angements T details, gth of nsmission Line, age level details)	• Autor Line:1 Line:2 Line:3	Power F Freque natic G Contr Warsak Warsak Sakhi C GSS S Shahi E Warsak Peshav	actor ency eneration rol CCT Power House arsak to GSS S Power House Chashma akhi Chashma t Bagh Power House var Cantt	to GSS Shahi B to GSS to GSS to GSS	agh	$\frac{1-4}{1} = 1$ 5-6) = 0 D Hz No Voltage (KV) 132 132 132	.0 .85 Length (KM) 03.603 23.513 26.690 05.260 26.315



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<u>Hydel Power Station</u> <u>Ghazi Brotha</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Ghazi Barotha

PLANT DETAILS

1.	Loca	ation	Near Village Barotha 63 KM downstream of Tarbela about 10 KM West of Attock City, Punjab						
	2. Plant		Туре		Total Capacity		No. of Units		
2.			Run of River with small storage for peak Hours.		1450 MW		5		
0			Ma	ximum	1		N	<i>l</i> inimum	
3.	пеа	IO I	74	Meter			e	69 Meter	
4.	Tec	hnology	Francis Turbine						
	Tun	nel	No.	Ler	ngth		Dian	neter	
	Total No of Tunnel		5			- At Int		At Penstock	
5.	(i).	No of Power Tunnel	5	222	Meter	10.6 N	<i>l</i> leter	8.7 Meter	
	(ii).	No. of Irrigation Tunnels	-		-	-		-	
6.	Min Exp Life Ger Fac	imum ected Useful of the neration ility	I 50 Years						
7.	Pea Ope	iking/Base eration	Peak Load Operation						
			Generator Voltage			Units (1-5) = 18 KV			
			Power Factor			Units	Units(1-5) = 0.9		
8.	Plai	nt	Frequency			Frequ	uency	= 50 Hz	
	Characteristics		Automatic Generation Control				Yes		



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	Interconnection	ССТ	Voltage (KV)	Length (KM)
	Arrangements	Barotha Gatti-I	500	308.8
	(CCT details, length of Transmission Line, voltage level details etc.)	Barotha Gatti-II	500	303.7
۵		Barotha Rawat-I	500	108.0
0.		Barotha Rawat-II	500	109.0
		Barotha Tarbela-II	500	76.7
		Barotha Tarbela-I	500	73.2
		Barotha-Sheikh Muhammsdi	220	123.0
		Barotha-Mardan	220	85.0



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Hydel Power Station Chashma

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Chashma

PLANT DETAILS

1.	Location	On Right abutment of Chashma Barrage in Dist. Mianwali, Province of Punjab.					
		Туре	Total Capacity	/ No.	of Units		
2.	Plant	Run of River	184 MW 8				
2 Hoad		Max	imum	Minir	num		
0.		13.8	meter	3 m	əter		
4.	Technology	Bulb type Tu	rbine				
5.	Tunnel	The Power House is fed through 1000 meter long and 136 meter wide Headrace water channel.					
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.					
7.	Peaking/Base Operation	It is run off the river plant and loading generally depends upon the water releases available.					
		Generato	· Voltage	Units (1-8)	= 11 KV		
	i Plant	Power Factor		Units (1-8) = 0.90			
8.		Frequ	ency	50 Hz			
		Automatic C	Seneration trol	No			
	Interconnection		ССТ	Voltage	Length		
	Arrangements	DIKhan		(KV)	(KM)		
a	l length of		ft Bank-II	132	04		
	Transmission	Wanhuchran		132	33.357		
	Line, voltage level details etc.)	Wanbuchran	-II	132	33.357		



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Hydel Power Station Renala

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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2.

Hydel Power Station, Renala

PLANT DETAILS

1.	Location	Located on Lower Bari Doab Canal near Renala Town District Okara.					
		Туре	Total Capacity		No. of Units		
2.	Plant	Run of River	1.1	5			
		Maximun	<u>ו </u>		Vinimum		
3.	Head	10 ft			7 ft		
4.	Technology	Francis Turbine (I	Horizontal	Shaft)			
	Penstock	No.	Ler	igth	Diameter Internal		
5.	Total No. of Penstock	Nil			· · · · · · · · · · · · · · · · · · ·		
6.	Minimum Expected Useful Life of the Generation Facility	30 Years					
7.	Peaking/Base Operation	Meant for local loa	ad of Lift Ir	rigation Pu	umping Stations.		
		Generator Vo	ltage	Units	(1-5) = 3.3 KV		
	Plant Characteristics	Power Fac	tor	Units (1-5) = 0.8			
8.		Frequenc	;у	50 Hz			
		Automatic Gen Control	eration		No		
		ССТ	Voltag	e (KV)	Length (KM)		
9.	(CCT details, length of Transmission Line, voltage level details etc.)	11 KV feeder EHKL	11		60		



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L.

<u>Hydel Power Station</u> <u>Chichoki</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Chichoki

PLANT DETAILS

1.	Location	Located on Upper Chenab Canal (UCC) near village Joyanwala about 20 KMs from Sheikhupura.					
2	Plant	Туре	Total Ca	pacity	No. of Units		
Ζ.	Fidin	Run of River	13.2 N	/\	3		
2	Hoad	Maximu	ım	M	nimum		
J.	Tieau	27.7 f	't		22.3 ft		
4.	Technology	Kaplan Turbine					
	Penstock	No.	Lengt	:h Di	ameter Internal		
5.	Total No. of Penstock	N.A					
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.					
7.	Peaking/Base Operation	Operated as base load according to the water share in the upper Chenab Canal.					
		Generator Voltage		Units (1	-3) = 3.3 KV		
	Plant Characteristics	Power Fa	ctor	Units (1-3) = 0.8			
0.		Frequency		50 Hz			
		Automatic Generation Control			No		
		ССТ		Voltage(KV) Length(KM)		
	Arrangements	Chichokimallian - Attabad (CCK-I)		66	18		
9.	length of	Chichokimallian - Attabad (CCK-II)		66	31		
	Line, voltage level	Outgoing feed	ler (1-A)	11	128		
	details etc.)	Outgoing feed	ier (1-A)	11	0.25		
		Outgoing feed	ler (1-A)	11	80		



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<u>Hydel Power Station</u> <u>Nandipur</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Nandipur

PLANT DETAILS

1.	Location	On Upper Chenab Canal (UCC) about 10 KMs from Gujranwala on Gujranwala Sialkot Road.					
2	Plant	Туре	Total Ca	apacity	No. of Units		
۷.		Run of River	er 13.8 MW		3		
3	Head	Maxim	um		Minimum		
<u> </u>		24.4	ft		19.5 ft		
4.	Technology	Kaplan Turbine)				
-	Penstock	No. Length Diameter					
5.	Total No. of Penstock	N.A					
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.					
7.	Peaking/Base Operation	Operated as base load according to the water share in the upper Chenab Canal.					
		Generator \	/oltage	Units	(1-3) = 3.3 KV		
	Plant Characteristics	Power Fa	actor	Units (1-3) = 0.8			
8.		Frequei	су	50 Hz			
		Automatic Generation Control		No.			
	Interconnection	ССТ	Volt	age (KV)	Length (KM)		
	Arrangements	Nandipur-Dask	a	66	15		
9.	length of Transmission	Nandipur- Gujranwala		66	15		
	Line, voltage level	NDP-4		11	-		
	details etc.)	NDP-5	<u>-</u>	11	-		



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<u>Hydel Power Station</u> <u>Shadiwal</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life

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- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Shadiwal

PLANT DETAILS

1.	Location	On Upper Jhelum Canal (UJC) about 133 KMs Down Stream of Mangla and about 7 KMs from Gujrat						
2	Plant	Type Total Capacity		otal acity	No. of Units		f Units	
		Run of River 13.5 MW		MW		C)2	
3	Head	Maxir	mum	I		Mini	imur	n
0.		24.	5 ft			1	7 ft	
4.	Technology	Kaplan Tur	bine	S				
	Tunnel	No.		Leng (KN	gth 1)		Dia	meter
5.	Total No. of Tunnel			03		At Inta	ake	At Penstock
		01				-		-
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.						
7.	Peaking/Base Operation	Operated as base load according to the water share in the upper Jhelum Canal.						
		Genera	tor V	/oltage		Units (1-2)	= 11KV
	Plant	Power Factor				Units $(1-2) = 0.9$		
8.	Characteristics	Frequency			n			
		Control			11	No.		
	Interconnection Arrangements	(ССТ		Vc (ltage KV)	Le	ength (KM)
9.	(CCT details, length of Transmission Line, voltage level details etc.)	Shadiv	wal-C	Gujrat		132		9.6



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4.

Hydel Power Station Rasul

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Rasul

PLANT DETAILS

1.	Location	On Upper Jhelum Canal (UJC) about 74 KMs Down Stream of Mangla.						
		Type Total Ca		apacity	N	o. of Units		
2.	Plant	Run of River	Run of River 22 M			2		
_		Maximu	um	n	Vlinim	ium		
3.	Head	85.05		80.3	5 ft			
4.	Technology	Kaplan Turbine						
	Penstock	No. Length				Diameter Internal		
5.	Total No. of Penstock	2	281	ft.		21 ft.		
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.						
7.	Peaking/Base Operation	Operated as base load according to the water share in the Canal.						
		Generator Voltage Units (1-2) = 1) = 11KV		
		Power F	actor	s (1-2	2) = 0.88			
8.	Characteristics	Freque	50 Hz					
		Automatic G Contr	eneration rol		No			
	Interconnection	CCT		Voltage	(KV)_	Length(KM)		
	Arrangements	Rasul-Ma	alikwal	66		38.4		
	(CCT details,	Rasul-Mal	ikwal-II	66		38.4		
9.	length of Transmission	Rasul-Khar Bundl	ian (D/C ed)	132		42.0		
	Line, voltage level details etc.)	Rasul-Khariar	(Bundled)	132		42.0		
·	· · · · · · · · · · · · · · · · · · ·	C POWER A	EC					

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<u>Hydel Power Station</u> <u>Dargai</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Dargai

PLANT DETAILS

64 2

1.	Loca	ation	On Upper Swat Canal in Malakand Agency near Dargai Distt. Malakand Agency, Khyber Pakhtunkhwa.							
2	Plant		Type Tot Capa		otal pacity	No. c	of Units			
			Run of River		20	MW		4		
3.	3. Head		Maximum			Minimum				
			243 ft				239 ft			
4.	Technology		Francis Tur	Francis Turbine (Horizontally Mounted)						
	Tun	nel	No.		Len	gth	Dia	meter		
	Tota	al No. of Tunnel	-		-		At intake	At Penstock		
5.	(i)	No of Penstock	04		575 ft.		75 in.	66 in.		
	(ii)	No. of Irrigation Tunnels	-	-						
6.	Min Use Ger	imum Expected ful Life of the neration Facility	25 Years.							
10.	Pea Ope	king/Base eration	Base Opera	ation						
			Generator Voltage			U	nits (1-4) =	= 11 KV		
	Plant Characteristics		Power Factor			l	Units (1-4) = 0.85			
8.			Frequency				50 Hz			
			Automatic Generation Control			ר	No			
	Inte Arra	erconnection angements	CC	СТ		V	oltage (KV)	Length (KM)		
9.	(CC	T details, length	Dargai-	Marc	dan		132	59.27		
	of Transmission		Dargai-	Jabb	ban		66	5.51		
	det	ails etc.)	Danger	hako	dara		132	30.07		
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<u>Hydel Power Station</u> <u>Chitral</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Chitral

PLANT DETAILS

2	Plant Type Total Capacity		No.	of Units					
- .			Run of River 1		1 MW		4		
2	Hood		· · · · · · · · · · · · · · · · · · ·	Maximum	้า	Mir	nimum		
J.				110 ft		1	06 ft		
Л	Technology		Units ²	1&2	OSS	BERGER (C	ross Flow)		
4.			Units 3 & 4		F	rancis (Hori:	zontal)		
	Tunnel		No.	Lei	ngth	Dia	meter		
	Total No. of		02		-				
5.	(i)	No of Penstock	02		-	Unit No 1 & 2 = 3.33			
	(ii)	No. of Irrigation Tunnels	_		-	Unit No 3 &	Jnit No 3 & 4 =3.71 ft.		
6.	Min Exp Life Ger Fac	imum ected Useful of the neration	25 Years.						
		ancy							
10.	Pea Ope	aking/Base eration	Chitral Hy National according routine ar	/del Pow Grid dire to con id peak h	/er House ectly feeds siderable nours.	is not sync s a separate variation in	hronized wit e 11 KV lin load durin		
10.	Pea Ope	aking/Base eration	Chitral Hy National according routine ar Gener	/del Pow Grid dire to con nd peak h ator Volt	/er House ectly feeds siderable nours. age	is not sync s a separate variation in Units (1-4	hronized wit e 11 KV lin า load durin 4) = 415 V		
10.	Pea	aking/Base eration	Chitral Hy National according routine ar Gener Pow	/del Pow Grid dire to con nd peak h ator Volt /er Facto	/er House ectly feeds siderable nours. age	is not sync s a separate variation in Units (1-4 Units (1-4	hronized wit e 11 KV lin load durin 4) = 415 V -4) = 0.96		
10. 8.	Pea Ope Plai	aking/Base eration nt	Chitral Hy National according routine ar Gener Pow	vdel Pow Grid dire to con ad peak h ator Volt ver Facto equency	/er House ectly feeds siderable nours. age	is not sync s a separate variation in Units (1-4 Units (1- 50	hronized wit e 11 KV lin 1 load durin 4) = 415 V -4) = 0.96		
10. 	Pea Ope Plai Cha	aking/Base eration nt aracteristics	Chitral Hy National according routine ar Gener Pow Fri Automat	vdel Pow Grid dire to con ad peak h ator Volt ver Facto equency tic Gene Control	/er House soctly feeds siderable nours. age pr	is not sync s a separate variation in Units (1-4 Units (1- 50	hronized wit e 11 KV lin 1 load durin 4) = 415 V 4) = 0.96 Hz No		
10. 8.	Pea Ope Plai Cha Inte	aking/Base eration nt aracteristics erconnection angements	Chitral Hy National according routine ar Gener Pow Fro Automat	vdel Pow Grid dire to con ad peak h ator Volt ver Facto equency tic Gene Control T Voltage	/er House ectly feeds siderable nours. age or ration	is not sync s a separate variation in Units (1-4 Units (1- 50 N Voltage (KV)	hronized wit e 11 KV lin 1 load durin (4) = 415 V (-4) = 0.96 Hz No Length (KM)		
10. 8. 9.	Pea Ope Plan Cha Inte Arra (CC Iene	aking/Base eration nt aracteristics erconnection angements CT details, gth of	Chitral Hy National according routine ar Gener Pow Fro Automat	vdel Pow Grid dire to con ad peak h ator Volt ver Facto equency tic Gene Control T Voltage	/er House ectly feeds siderable nours. age or ration e	is not sync s a separate variation in Units (1-4 Units (1- 50 N Voltage (KV) 11	hronized wit e 11 KV lin 1 load durin 4) = 415 V 4) = 0.96 Hz No Length (KM) 6.721		
10. 8. 9.	Pea Ope Plai Cha Inte Arra (CC Iene Tra Line deta	aking/Base eration nt aracteristics erconnection angements CT details, gth of nsmission e, voltage level ails etc.)	Chitral Hy National according routine ar Gener Pow Fri Automat	vdel Pow Grid dire to con ator Volt ver Facto equency tic Gener Control T Voltago Line-1	/er House solverable siderable nours. age r ration e	is not sync s a separate variation in Units (1-4 Units (1- 50 N Voltage (KV) 11	hronized wit e 11 KV lin 1 load durin 1) = 415 V 4) = 0.96 Hz No Length (KM) 6.721 7.421		

<u>Hydel Power Station</u> <u>Kurram Garhi</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Kurram Garhi

PLANT DETAILS

1.	Loc	ation	Kurram Ghari Hydel Power Station is located on river Kurram 12 Km North West of Bannu city						
2	Dia		Type To		Total	Capacity	No. of Units		
Ζ.	Fiai	11	Run of River		4	1MW	04		
2	Head			Maximum		Minimum			
з.				60 ft.			60 ft.		
4.	Technology		Francis	Turbine					
	Tun	nel	No.	Leng	th		Dia		
5.	Total No. of Tunnel		-	-		At Intake	At Penstock		
	(i)	No. of Power Tunnel	4	60 ft		1.65 M	1.7 M		
		No of		-					
	()	Tunnel	-			-	-		
	Min	imum		L			• • • • • • • • • • • • • • • • • • •		
6	Expected Useful Life of the Generation		50 Vooro						
0.			ou reals.						
	Fac	ility							
7.	Pea Ope	aking/Base eration	Base Lo	bad.					
			Generator Voltage			Units (1-4) = 11 KV			
	8. Plant Characteristics		Power Factor			Units (1-4) = 0.80			
8.			Frequency			50 Hz			
			Automatic Generation Control		ation	No			
	Inte	erconnection	ССТ		Vol	tage (KV)	Length (KM)		
	Arrangements (CCT details, length of Transmission Line, voltage level details etc.)		Kurram Garhi- Bannu			11/66	30		
9.			Daud Shah			11	48		



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<u>Hydel Power Station</u> <u>Gomal Zam</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Gomal Zam

PLANT DETAILS

1.	Location	Right Bank of Gomal River at Khajuri Kach in South Waziristan Agency about 60KM/ West of District Tank in Khyber Pakhtunkhwa.							
2	Plant	Туре	Total Cap	acity	No.	of Units			
۷.		Storage	17.4 M	W	2				
		Maximu	ım		Minim	lum			
3.	Head	106.5 m (st	age-1)		74.24 m (s	stage-1)			
		113.0 m (stage-2)			90.79 (stage-2)				
4.	Technology	Vertical Francis	Turbines						
		No.	Lengt	h	Dia	ameter			
					At	At			
5.	Tunnel	1	1279.50) ff	Intake	Penstock			
		•			10 ft	10 ft			
6.	Peak/Base Load Operation	The plant will be used for peak load (17.4 MW) as well as base load (8.7 MW) depending on the availability of water							
7.	Minimum Expected Useful Life of the Generation Facility	50 years							
		Generator Voltage Units (1-2) = 11 KV							
	Plant	Power Fa	actor		0.8	5			
8.	Characteristics	Frequer	ncy	50 Hz					
		Automatic Ge Contro	Yes						
	Interconnection Arrangements	ССТ		Voltage Lengt (KV) (KM		Length (KM)			
9.	(CCT details, length of	Gomal Zam	-Tank		132	56			
	Line, voltage level details etc.)	Gomal Zam		132	55				



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2.

Jinnah Hydel Power Station

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life

- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Jinnah Hydel Power Station

PLANT DETAILS

A.

1.	Location	On the Indus River on the right side of the Jinnah Barrage as a bypass arrangement, approximately 5 KM downstream of Kalabagh Town in District Mianwali.							
		Туре	Total Capacity		No. of Units				
2.	Plant	Run of River 96 MW				08			
3.	Head	Maximu	N	Minimum					
•••		6.2 m				3.2 m			
4.	Technology	Bulb (Pit Type)	Turbine						
	Tunnel	No. Length Diameter							
5.	Total No. of Channel	1800 m 1 including Bea Tailrace				ed Width = 133 m			
8.	Peak/Base Load Operation	Base load operation.							
9.	Minimum Expected Useful Life of the Generation Facility	50 years							
		Generator Voltage Units (1-8) = 11 KV							
10.	Plant Characteristics	Power Fa	Units (1-8) = 0.90						
		Frequen	50 Hz						
		Automatic Generation Yes							
	Interconnection Arrangements	ССТ	Volta	Voltage (KV)		Length (KM)			
7.	CCT details, length of	Jinnah-Mari Daudkhel Line-	·I 13	32 KV		7.5			
	Line, voltage level details etc.)	Jinnah-Mari Daudkhel Line-	13	132 KV		7.5			



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<u>Hydel Power Station</u> <u>Allai Khwar</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Allai Khwar

PLANT DETAILS

1.	Locat	ion	On left bank tributary of the River Indus at Beshan Distt. Battagram, in Khyber Pakhtunkhwa.					at Besham,	
2	Plant		Type Total Cap		oacity No. of Unit		. of Units		
۷.	- rian		Storage		121 M\	N		02	
2	Head		Maximum			M	inimum		
5.			697 ו	m		(687 m		
4.	Technology		Pelton W	Pelton Wheel Vertical Shaft Turbines					
	Tunne	el	No.	L	ength		Diar	neter	
	Total No. of Tunnel12.395 KmImage: Constraint of the second secon		1	2.	395 Km	At Intake		At Penstock	
5.			366 Km		2.5 m	2.5 m			
	(ii).	Irrigation Tunnels	Nil						
6.	Peak/ Opera	Base Load	Generally during High Flow Period, the plant will be operated for base load whereas during Low Flow Period, it will be utilized for peaking.						
7.	Minim Expec Life o Gene Facili	num cted Useful f the ration ty	50 years		-				
			Generator Voltage			U	nits (1 - 2) = 11 KV	
	Plant		Power Factor			0.85			
8.	Characteristics		Frequency			50 Hz			
			Automatic Generation Control		neration	Yes		S	
			ССТ			Volta	ge(KV)	Length(KM)	
	Interc	connection	Allai	S/Y-IS	PR-I	2	20	180.5	
	(CCT	details,	Allai	S/Y-IS	PR-II	2	20	180.5	
9.	length of Transmission	n of smission	Allai S/Y-Khan Khwar P/H		n Khwar	1	32	16	
	Line, voltage level details etc.)		Allai S/Y-Duber Khwar P/H		er Khwar	1	32	59	



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<u>Hydel Power Station</u> <u>Duber Khwar</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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A.
Hydel Power Station, Duber Khwar

PLANT DETAILS

1	Locat	ion	On left bank tributary of the River Indus at Besham, Distt. Kohistan in Khyber Pakhtunkhwa.						
2	Plant		Туре		Total C	apacity	No. of Units		
	Fidin		Storage		130	MW		2	
3	Hood		Maximum			N	linimum		
			540.5 m			528 m			
4	Techi	nology	Pelton	Wheel	Turbines	.			
	Tunn	el	No.	Le	ength		Diame	eter	
	Total Tunn	No. of el				At In	itake	At Penstock	
5	(i).	No. of Power Tunnels (Headrace)	1	123	87.6 m	2.6	3 m	2.6 m	
	(ii).	No. of Irrigation Tunnels	Nil						
6.	Peak/Base Load Operation		Generally during High Flow Period, the plant will be operated for base load whereas during Low Flow Period, it will be utilized for peaking.						
7.	Minin Expe Life o Gene Facili	num cted Useful if the eration ty	50 years						
			Generator Voltage				Units (1-2) = 11 KV		
	Plant Characteristics		Power Factor				0.85		
8.			Frequency			50 Hz			
			Automatic Generation Control		n	Yes			
	Intero Arrar	connection agements	ССТ			/oltage (KV)	Length (KM)		
40	(CCT	details,		KHP-I	KHP		132	32.3	
10.	Trans Line, detai	n or smission voltage level ls etc.)	DKHP-AKHP			132	50.5		



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1.

<u>Hydel Power Station</u> <u>Khan Khwar</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Khan Khwar

PLANT DETAILS

100

1.	Location	Right tributary of the River Indus at Besham, Distt. Shangla, in Khyber Pakhtunkhwa.						
0	Diant	Туре	Total Capa	city	No. of Units			
Ζ.	Fiant	Storage	72 MW	3 (2)	x34MW+1x4MW)			
2	Hood	Maxim	num	Minimum				
3.	neau	257	m		247 m			
4.	Technology	Unit (1&2) Fr Unit (3) Turge	ancis Turbine o	e				
	Tunnel	No.	Length	[Diameter			
5. (i).	Total No. of Tunnel			At Intake	At Penstock			
	(i). No. of Power Tunnels (Headrace)	1	4540m	3.80 m	3.25m			
6.	Peak/Base Load Operation	Load Generally during High Fl operated for base load Period it will be utilized fo			the plant will be during Low Flow			
7.	Minimum Expected Useful Life of the Generation Facility	50 Years						
		Generato	r Voltage	Units (1-3) = 11 KV				
0	Plant	Power	Factor	Units (1-2) = 0.85 Units (3) =0.8				
о.	Characteristics	Frequ	lency	50 Hz				
		Automatic (Cor	Generation Itrol	Yes				
	Interconnection	ССТ		Voltage (KV)	Eength (KM)			
9.	Arrangements (CCT details, length of	KKHP-DKHP		132	32.3			
	Transmission Line, voltage level details etc.)	KKHP-AKHP		132	16.5			
		NEPRA		L	Page 92 of Modified/Revised Sched (Modification-VI			

Tarbela Hydel Power Station <u>4th Extension</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c).Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Tarbela Hydel Power Station, 4th Extension

PLANT DETAILS

1.	Location	On Right Bank, of River Indus at Tarbela Distt. Swabi, in Khyber Pakhtunkhwa.							
		Type Total C			Capacity		No. c	of Units	
2.		Storage 1410			0 MV	N	(03	
_		N	laxin	num	Minimur		ım		
3.	Head		137.1	m		75.7 m			
4.	Technology	Francis 7	urb i	nes					
	Tunnel	No.		Leng	gth		Dia	meter	
5.	Total No. of Tunnel	1	1 2997 ft.		At Intake 45.0 ft	At Penstock 36.0 ft.			
6.	Minimum Expected Useful Life of the Generation Facility	35 Years							
7.	Peaking/Base Operation	Plant after construction wi accordance with requirements of			n will ents o	l be op f NPCC.	erated in		
		Generator Voltage		18KV					
	Plant	Power Factor		0.9 (Lagging)					
8.	Characteristics	Frequency			50 Hz				
		Automatic Generation Control		tic Control	Yes				
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	The powerhouse will be connected with existing Tarbela switchyard having six 220 KV and four 500 KV outgoing Transmission Lines.				xisting I four			



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2.

<u>Hydel Power Station</u> <u>Keyal Khwar</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c).Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life

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- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Keyal Khwar

PLANT DETAILS

1.	Loc	ation	Right tributary of the River Indus at Keyal Khwar Distt. Kohistan in KHYBER PAKHTUNKHWA.						
2	Plant		Туре	Total Capad	city	vity No. of Units			
Ζ.			Storage 128 MW		2				
3.	Gross Head		Maxir	num		Mini	mum		
			737.	5 m	721.5 m				
4.	Tec	hnology	Pelton Turbin	e	-				
	Tun	nel	No.	Length		Dia	meter		
	Tota Tun	al No. of nel		-	A	t Intake	At Penstock		
5.	(i).	No. of Power Tunnel	1	7.16 Km		3.2 m	2.2 m		
	(ii)	No. of Irrigation Tunnel	-	-		-	-		
6.	Pea Ope	k/Base Load	Base Load operation as pe			er requirement of NPCC			
7.	Min Exp Life Ger Fac	imum ected Useful of the neration illity	50 Years						
			Generator Voltage			11 KV			
	Dia	nt	Power Factor		0.85				
8.	Cha	aracteristics	Frequency		50 Hz				
			Automatic Generation Control		Yes				
	Inte Arra	rconnection angements	ССТ		1	/oltage (KV)	Length (KM)		
9.	(CC	T details, gth of	Keyal-Duber-I			132	3.00		
	9. length of Transmission Line, voltage leve		Keyal-Duber-II			132	3.00		



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Hydel Power Station Golen Gol

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c).Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Golen Gol

PLANT DETAILS

1

1.	Loca	ition	On Golen Gol Nullah, 25 Km from Distt. Chitral in Khyber Pakhtunkhwa.						
2	Plant		Туре	Tota	al Capao	city	No. of Units		
۷.	Fiaii	L (Run of River	In of River 108 MW			03		
3	Head	4	Gross		Rated				
J.	Techneless		439.3	3 m			423.3	m	
4.	Tech	nnology	Pelton Turbine	es		··			
	Tunnel		No.	i	Length		Diameter		
	Total No. of Tunnel		3		-		At ntake	Steel Liner	
5.	(i)	No of Power Tunnel	3	3	3.81 Km		4.1m	3.2 m	
	(ii)	No of Irrigation Tunnel	-		-		-	-	
6.	Peak Oper	k/Base Load ration	Base Load Operation Plant						
7.	Minimum Expected Useful Life of the Generation Eacility		35 Years						
			Generator Voltage				11 K	V	
	Direct		Power Factor			0.80			
8.	Cha	racteristics	Frequency			50 Hz			
			Automatic Generation Control		ation	Yes			
	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)		ССТ		Voltage (KV)		Length (KM)		
9.s			Golen Gol to Tmergara		132		145		
			Timergara to Chakdara		132			53	



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<u>Hydel Power Station</u> <u>Jabban</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c).Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Jabban

PLANT DETAILS

1

1.	Location	On Swat River in Distt. Malakand, in KHYBER PAKHTUNKHWA.					
2	Plant	Туре	Total Capa	acity	No. of Units		
۷.		Run of River	22 MW	' <u> </u>	04		
		Maxir	num		Minimum		
3.	Неад	614.4	8 m		537.08 m		
4.	Technology	Horizontal Fra	Horizontal Francis Turbines				
	Tunnel	No.	Length	D	iameter		
	Total No. of Tunnel		-	At Intake	At Penstock		
5.	(i) No of Power Tunnel	4	165 m	1.9 m.	1.677 m		
	(ii) Irrigation Tunnel	-	-	-	-		
6.	Peak/Base Load Operation	Base Operation					
7.	Minimum Expected Useful Life of the Generation Facility	50 Years					
		Generator	Voltage	11 KV			
	Plant	Power I	Factor	0.85 (Lagging)			
8.	Characteristics	Frequ	ency	50 Hz			
		Automatic Generation Control		Yes			
	Interconnection Arrangements	ССТ		oltage KV)	Length (KM)		
9.	CCT details, length of Transmission	Jabban to Chakdara	Jabban to Chakdara		19.38		
	Line, voltage level details etc.)	Jabban to Jalala/Mard	an .	132	26.62		



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<u>Hydel Power Station</u> <u>Diamer Basha</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c).Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Diamer Basha

PLANT DETAILS

1.	Location	Diamer Basha Dam, 40 km downstream of Chilas the district headquarter of Diamer in Gilgit-Baltistan						
		Туре	Total Capa	city	No. of	Units		
2.	Plant	Storage	4500 MV	v	12 (375 MW Each)			
3	Head	Maxir	mum		Minimum			
0.		204.	2 m		100.5	m		
4.	Technology	Francis Turbi	nes		1			
	Tunnel (s)	No.	Length		Dian	neter		
	Total No. of Tunnels (Head Races L&R Bank)	04	3477 m (490.6+450.1+ 1165.5+ 1371.0)		At Intake	At Penstock		
5.	No. of Power Tunnels	12	1840 m (160.1x6 + 146.5x6)		7.2 m	7.2 m		
	No. of Irrigation Tunnels (Lowe Level/ Flushing Outlets)	07	1170.4 m (7x167.2)		5x09m& 2x072m	-		
6.	Peak/Base Load Operation	Base Load O			peration			
7.	Minimum Expected Useful Life of the Generation Facility	50 Years						
		Generato	r Voltage	-				
	Plant	Power	Factor	-				
9.	Characteristics	Frequ	iency	50 Hz				
		Automatic (Con	Generation trol	eneration ol		_		
10.	i. To be confirmed as per Feasibility	ССТ	Volta (KV		Itage KV) Length (KN			
	Integrated Power	-	AWE	-	-			
		ACP	UNER RECE		Modif	Page 117 of ied/Revised Sche		

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Evacuation from North.				
ii. Reportedly, the Feasibility Study proposes 4 circuits of 500 kV transmission line comprising two circuits for right bank power house to Mardan via Swat Valley, and two circuits for Right bank power house Via Chilas - Babusar Pass - Kunhar Valley - Monsehra	- -	-	-	
	L			I.



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Hydel Power Station Dasu

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c).Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Dasu

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PLANT DETAILS

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1.	Location	Left bank of Indus River, 7 KM upstream from Dasu Town, District Kohistan, Khyber Pakhtunkhwa					
	Diant	Type Total Capacity		city	No. of Units		
2.		Run of River	4320 MW	7	12		
3	Head	Maxin	num		Minimum		
		179.5	1 m		131.94 m		
4.	Technology	Francis Turbines					
		No.	Length		Diameter		
	Tunnel(s)				At Intake	At Penstock	
5.			450 m (Ea	- h \	12m	5.5m	
		04	450 m (Ead	sn)	12m	<u>5.5m</u>	
					12m	5.5m	
					12m	5.5m	
6.	Peak/Base Load Operation	Base Load Operation					
7.	Minimum Expected Useful Life of the Generation Facility	30 Years					
		Generator Voltage		16.5 KV			
	Plant	Power Factor		0.9(Lagging)			
0.	Characteristics	Frequency		50 Hz			
		Automatic Generation Control		Yes			
	Two (02) Double Circuit 500KV	CCT Vo		oltage (KV) Length (KM)		ngth (KM)	
9.	Transmission Lines. From Dasu	- !		500 140		140	
	to Mansehra	- 500		140			



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<u>Hydel Power Station</u> Tarbela 5th Extension

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c).Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Generation Licence Water & Power Development Authority (WAPDA) Wapda House Lahore

Project Layout Plan





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Hydel Power Station, Tarbela 5th Extension

PLANT DETAILS

1.	Location	Tarbela 5th Extension Project is located on the Indus River, 110 km from Islamabad and falls under jurisdiction of Swabi and Haripur districts, in the province of Khyber Pakhtunkhwa, Pakistan.				
		Type Total C		apacity	No. of Units	
2.	Plant	Storage	1530MW		03 (each of capacity 510MW)	
		Maximun	n	Minimum		
3.	Head	135 m		70.5 m		
4.	Technology	Francis, vertical shaft type				
		No.	Length		Dia	
5.	Tunnel	Tunnel-5 (Tarbela Tunnel-5 designated as irrigation tunnel, is being converted into power tunnel without affecting irrigation release capabilities).	3675 ft	At Intake 45 ft	At Penstock 36 ft	
6.	expected useful life of the Generation Facility	30 Years				
7.	Peaking/Base Operation	Generally, during High Flow period, it will be operated for Base load whereas during low flow period, it will be utilized for peaking.				
	Plant Characteristics	Generator Voltage	Power Factor			
8.		18KV (±, 5%)0.9 (Lagging)Frequency = 50Automatic Control: Control and Instrumentation (C&I) Systems DCS and SCADA system.				



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9.	Length of Transmission Lines	Length of the Transmission line is 50 KM approximately. In addition to this, a 500kV single circuit interconnector will also be constructed between Tarbela 5th Extension and Tarbela 1-4 switchyard having length of 2.8km approximately. The 50km transmission line (T/L) will be 500 kV Double Circuit (D/C) T/L on quad-bundled Drake conductor from Tarbela 5th Ext. HPP Substation to Islamabad West Substation. New switchyard will be constructed with provision of three bays of 500 KV.
10.	500KV Circuit Breaker	The circuit breakers shall be 500 kV SF6 type operated by a spring charged drive mechanism. Provision shall be made for a 3-phase, 400 V supply to drive the motor on each breaker.



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<u>Hydel Power Station</u> <u>Mohmand Dam</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c).Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Mohmand Dam

PLANT DETAILS

	1.	Location	On Swat River approximately 45 km from Peshawar, 05 km upstream of Munda Headworks in Mohmand Tribal District, Khyber Pakhtunkhwa.				
		Туре			Total Capacity	No. of Units	
	2.	Plant	Peaking Hydro Power Project/ Storage Reservoir			800 MW	04 (each of 200 MW)
:	3	Head	Rated Maximum				Minimu m
	J.		162.5		188.7 m		137.9 m
	4.	Technology		Franci	is, vertical sh	aft type	
				No	Ler	ngth	Diameter
	5. Tunnel	Tunnel	Headrace Concrete m Steel Line m	<u>Tunnel</u> lined = 474.41 d = 414.42	888.83 m Manifo Pens	(including old and stock)	13.2 to 12.30 m
			Penstock Unit#1 = 10 Unit#2 = 83 Unit#3 = 63 Unit#4 = 39		02.902 m 3.005 m 3.362 m 0.647 m	10 m to 4.9 m	
	6.	Minimum expected useful life of the generation facility	30 years.				
	7.	Peaking/Base Operation	The plant designed for variable load conditions under different net heads as well as for daily peak operation over a period of up to 04 hours at maximum available station output.				
			Generator Voltage			Power Factor	
			18 KV (+/- 10 %)		0.8 (Lagging)/0.9 (leading)		
	8. Characteristics		Automa Control Frequency = 50 Hz (+/- 05%). Instrum Systems SCADA			Automatic Control Instrumenta systems (I SCADA sys	Control: and ation (C&I) DCS) and stems.
2.	1		COMPLETECT	NEPRA	-	Modified/F (M	Page 134 of 135 o Revised Schedule – Iodification-VI & VII

9.	Length of transmission lines	 A 220 KV Double Circuit (D/C) transmission line, approx. 58 km long, on twin bundled Rail conductor from Mohmand HPP to Nowshera Industrial substation. A 220 KV Double Circuit (D/C) transmission line, approx. 52 km long, on twin bundled Rail conductor from Mohmand HPP to Jamrud substation.
10.	220 KV circuit breaker	The circuit breaker will be 220 KV SF6 Type.
11.	Station Auxiliary Consumption	5.60 MW





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Generation Licence Water & Power Development Authority (WAPDA) Wapda House Lahore

SCHEDULE-II

(Modified/Revised)

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 (Modified/Revised)

Sr. No.	Power Station	Installed Capacity (MW)	Auxiliary Consumption (MW)	Net Capacity (MW)
1.	Hydel Power Station Tarbela	3478	4.0	3,474
2.	Hydel Power Station Mangla	1000	3.0	997
3.	Hydel Power Station Warsak	242.96	1.0	241.96
4.	Hydel Power Station Ghazi Brotha	1450	3.0	1,447
5.	Hydel Power Station Chashma	184	0.90	183.10
6.	Hydel Power Station Renala	1.1	0.1	1.00
7.	Hydel Power Station Chichoki	13.2	0.3	12.90
8.	Hydel Power Station Nandipur	13.8	0.3	13.50
9.	Hydel Power Station Shadiwal	13.5	0.3	13.20
10.	Hydel Power Station Rasul	22	0.4	21.60
11.	Hydel Power Station Dargai	20	0.4	19.60
12.	Hydel Power Station Chitral	1	0.1	0.90
13.	Hydel Power Station Kurram Garhi	4	0.1	3.90
14.	Hydel Power Station Gomal Zam	17.40	0.4	17.0



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Generation Licence Water & Power Development Authority (WAPDA) Wapda House Lahore

15.	Hydel Power Station Jinnah Hydel	96	0.6	95.40
16.	Hydel Power Station Allai Khwar	121	0.5	120.50
17.	Hydel Power Station Duber Khwar	130	0.5	129.50
18.	Hydel Power Station Khan Khwar	72	0.5	71.50
19.	Hydel Power Station Tarbela, 4 th Extension	1410	3.0	1,407
20.	Hydel Power Station Keyal Khwar	128	0.3	127.70
21.	Hydel Power Station Golen Gol	108	0.3	107.70
22.	Hydel Power Station Jabban	22	0.2	21.80
23.	Hydel Power Station Diamer Basha	4500	2.0	4,498
24.	Hydel Power Station Dasu	4320	2.0	4,318
25.	Hydel Power Station Tarbela 5 th Extension	1530	4.0	1526
26.	Hydel Power Station Mohmand	800	5.6	794.4
Grand Total		19697.96	33.8	19664.16



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