SUMMARY OF THE FEASIBILITY STUDY AND ENGINEERING DESIGNS OF THE NATIONAL TRANSMISSION AND DESPATCH COMPANY LIMITED

A. Background

1. Pakistan has recovered its growth trajectory in fiscal year (FY) 2021 and FY2022, posting more than 5% gross domestic product (GDP) growth. GDP growth dipped to 1.19% in FY2019 and –0.38% in FY2020. Energy sector entities, with losses of more than $2 billion per annum, continue to rely on significant regular fiscal transfers and sovereign credit guarantees to maintain their operations, with power distribution companies (DISCOs) being the major recipient—totaling nearly 1.5% of GDP. The trade and export competitiveness of industries impaired by persistent outages in the past are now faced with high power costs.

2. Pakistan's power mix is a combination of thermal, nuclear, hydroelectric, and renewable energy. In FY2020, out of the total of 135,259 gigawatt-hours generated, thermal accounted for 60%, hydro 29%, and renewables 3.2%. Private sector generation plants, having almost 50% contribution of total installed generation capacity at 19 megawatts (MW), accounted for around 45%.[1] In 2012, a gap of 700 MW between demand and supply resulted in extensive load shedding of about 12 hours in urban and industrial areas. Since 2016, significant progress has been made in reducing the gap between supply and demand, primarily through large investments in generation. The bulk of the new investment has been in thermal generation, based on imported fuel. Pakistan has systematically attempted to shift from expensive imported furnace oil to cheaper and more efficient gas generation by importing liquefied natural gas. These investments resulted in an electricity surplus for Pakistan in 2019, for the first time since 2005. Peak demand in the National Transmission and Despatch Company Limited (NTDC) system is projected to increase from 26,252 MW in 2020 to 35,422 MW in 2025 (footnote 1).

3. The country's current power generation mix is deeply skewed toward thermal generation from imported fuel, despite the availability of significant indigenous resources (hydropower, coal, gas, and renewable sources). In 2020, about 60% of the power generation mix comprised imported fuels, with an average generation cost of $0.85 per kilowatt-hour. This imbalance has put severe pressure on the fragile balance of payments, undercut sector governance, consumed sector liquidity, and exasperated the deficit circular debt of $1.830 billion (flow and stock), as of 31 March 2021. Of the independent power producers (IPPs) added since 2013, 70% utilize imported fuels undertake-or-pay power purchase agreements. With the increase in generation by 13,298 MW between 2016–2020, the capacity payments charged in United States dollars ($) increased significantly and was accentuated in Pakistan rupees (PRs) terms by nearly 47% devaluation.[2]

4. On the downstream side, in spite of investments carried out for capacity enhancements in the transmission and distribution (T&D) networks, still the T&D losses averaged about 18.0% in the last 5 years compared with the National Electric Power Regulatory Authority (NEPRA) target of 15.3%. The electricity generated is lost because of theft, faulty metering, aging T&D infrastructure, and inadequate energy accounting. The energy sector's inability to recover its full costs over long periods has spilled over to other sectors in the supply chain, including generators, fuel, and equipment suppliers. The cost of energy delivery to consumers (including generation and T&D) is nearly 30% higher than the revenue recovered from consumers.[3]

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[1] National Electric Power Regulatory Authority (NEPRA). 2020. *State of Industry Report 2020*. Islamabad.

[2] Capacity payments are the payments agreed by the government as a part of Power Purchase Agreement to be paid to private power producers against the available capacity irrespective of usage.

[3] This refers to the gross billing minus the unrecovered amount and unfunded subsidies.

5. **Sector structure and reforms.** Energy sector reform in Pakistan started in 1992 with a plan to unbundle and privatize the Water and Power Development Authority (WAPDA), the government-owned integrated utility at the time. The Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan allowed participation of private IPPs in the sector for the first time,[4] and the government created the Private Power and Infrastructure Board to promote private investment in the energy sector. A new energy (electricity) sector regulator—the NEPRA—was established in 1995 and approved by Parliament in 1997. This was followed by sector unbundling. WAPDA's hydroelectric generation was separated from the thermal operations, which were split into government-owned generating companies. The NTDC was set up to manage the grid, and nine (now 10) DISCOs were established to provide electricity to customers in different parts of the country. All are fully owned by the government except for K-Electric Limited (formally Karachi Electric Supply Company), which is responsible for power generation and distribution in the Karachi area and is privately owned and listed on the Pakistan Stock Exchange. The hydropower plants were retained by WAPDA, which now reports to the Ministry of Water Resources after the bifurcation of the Ministry of Water and Power in 2017. The Alternative Energy Development Board was established in May 2003 to facilitate, promote, and encourage the development of renewable energy in Pakistan. Finally, in 2015, the Central Power Purchasing Agency Guarantee Limited (CPPA-G) was separated from the NTDC to act as the system commercial operator responsible for being the single buyer of electricity from generators and the seller to the DISCOs, while the NTDC focused on the management of the T&D system. NEPRA determines tariffs, issues licenses, and regulates and ensures long-term sector sustainability. For an integrated approach to set sector policies, the Ministry of Energy was created in 2018 by combining the Ministry of Petroleum and Natural Resources and the Power Division from the then existing Ministry of Power and Water Resources.

6. **ADB sector experience and assistance program.** The Asian Development Bank (ADB) support to Pakistan's energy sector has employed an integrated approach that has included investments in projects related to conventional and renewable energy generation, energy efficiency, and power T&D, apart from providing program support for institutional and regulatory reforms. ADB has brought new technology and piloted innovative solutions through sovereign and nonsovereign operations. The current portfolio for the energy sector consists of two multitranche financing facilities (MFFs). The transmission MFF supports network expansion, while the distribution MFF introduces advanced metering infrastructure in the distribution grid. Each MFF includes an Asian Development Fund loan that supports capacity development and performance improvement. In addition to the MFFs, ADB is supporting the development of renewables through the Access to Clean Energy Program and is financing a 660 MW supercritical coal-fired power plant (the Jamshoro Power Generation Project).[5] On the nonsovereign side, ADB contributed with the establishment of the first wind and hydropower plants in the private sector and also supported the setting up of the first liquefied natural gas terminal by the private sector.

7. ADB is working with the government and development partners to implement the $1 billion programmatic approach through the Energy Sector Reforms and Financial Sustainability Program. It builds on earlier policy-based interventions undertaken by ADB and supplemented by development partners. The program assists Pakistan to reduce financial, technical, and governance deficits in the energy sector, which adversely impact sector sustainability and affordability and

[4] Government of Pakistan. 1994. *Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan*. Islamabad.

[5] The project set benchmark for safety and environmental standards, and cost through International Competitive Bidding, as well as aimed to build capacity in the public sector for coal-fired power operations to enable oversight of IPPs.

Pakistan's fiscal balance and macroeconomic stability. These reforms will be underpinned by a strong ongoing and future investment project pipeline, totaling nearly $2 billion during 2022–2024, to support the expansion and metering of T&D systems, generation through indigenous resources, and the development of gas infrastructure and storage to bring efficiency and to ensure continuity and safeguard against sudden import price spikes.

8. **Second multitranche financing facility and its tranches.** In line with the government's Vision 2025; the National Power Policy, 2013; and ADB's sector strategy, the second MFF supports (i) meeting the quality and reliability of power supply standards; (ii) serving the increasing customer demand; and (iii) developing a more balanced generation mix with more renewable energy through expansion and reinforcement of a stronger, smarter, and more climate-resilient transmission system. Its capacity development component supports policy reforms; enhanced sector competition and transparency; and improved institutional efficiency, good governance, planning, project management, and procurement capacities of the NTDC—the transmission system owner and operator.

9. The second MFF comprises four tranches. The government selected the tranches in accordance with the selection criteria set forth in schedule 4 of the Framework Financing Agreement, considering the expansion in relation with geographic coverage. Tranche 1 focuses on the rehabilitation and augmentation of 500-kilovolt (kV) transmission systems in Punjab and Sindh provinces. Through its concessional loan from the Asian Development Fund, Tranche 1 provides capacity development to support the NTDC's organizational restructuring and to enhance its capacity to plan, design, operate, and manage assets throughout the second MFF. Tranche 2 will expand the 220 kV transmission system in the provinces of Sindh and Baluchistan. It will also upgrade the supervisory control and data acquisition system across the national grid to enable the NTDC to monitor and control the grid in real time, and to prevent network outages or reduce their duration, thereby increasing grid stability, reliability, and resilience. Tranche 3 will expand the 500 kV and 220 kV transmission systems to meet demand at load centers in Punjab Province.

B. Project Activities and Components

10. This project is the fourth and final tranche of the Second Power Transmission Enhancement Investment Program MFF II. The project objective is to improve coverage, reliability, and quality of the power transmission service in Pakistan, particularly in Punjab, Khyber Pakhtunkhwa, and Sindh provinces, by expansion and augmentation of power transmission networks. Table 1 summarizes the expected outputs and technical justification.

11. The project consists of the following six subprojects:

(i) Subproject 1 is the turnkey contract for the design, supply, installation, testing, and commissioning of approximately 70 km of 220kV double circuit transmission line for looping in/out of the proposed Hala Road-Jamshoro single circuit transmission line at 220kV Mirpur Khas New substation;
(ii) Subproject 2 is the turnkey contract for the design, manufacture, supply, installation, testing, and commissioning of approximately 20 km of 220kV double circuit transmission line for looping in/out one circuit of the existing 220kV Jamshoro - T.M. Khan double circuit transmission line at Hala Road 220kV Substation;
(iii) Subproject 3 involves the procurement of goods for the addition and augmentation of the six existing grid substations (GS) to remove NTDC system constraints (500kV Dadu

GS, 500kV Faisalabad West GS, 500kV Lahore (Sheikhpura) GS, 500kV New Multan GS, 500kV Rahim Yar GS, 220kV Guddu GS);

(iv) Subproject 4 involves the procurement of goods for the construction of a new 220kV Jamrud grid station and approximately 20 km of the associated 220V Jamrud-Sheikh Muhammadi transmission line in the south-western area of Pakistan;

(v) Subproject 5 involves the procurement of goods for the construction of about 105 km of 220kV Dharki – Rahim Yar and about 150 km of 220kV Rahim Yar – Bahawalpur transmission lines and the extension of 220kV Dharki, 500/220kV Rahim Yar Khan, and 220kV Bahawalpur substations for interlinking of 220kV Dharki – Rahim Yar Khan and Bahawalpur grid stations in the south-eastern area of Pakistan;

(vi) Subproject 6 involves procurement of goods for operation and maintenance of NTDC assets to reduce the substations breakouts (550kV, 245kV, and 145kV circuit breakers and replacement of one 500/220 kV, 450 MVA Auto Transformer Bank (ATB) at the existing 500 kV Rawat grid station

Table 1: Summary of Expected Outputs and Technical Justification

Output	Technical Justification
Output 1: Transmission System Capacity Augmented and Expanded	
1a. New 220 kV double-circuit transmission line for looping in/out of the proposed Hala Road–Jamshoro 220 kV single-circuit transmission line at Mirpur Khas Grid Station commissioned	This transmission line, which emanates from a new 220 kv Mirpur Khas Grid Station, will provide a second source of supply to the existing 220 kV Hala Road Grid Station, bringing improvement in reliability of transmission network in the area.
1b. New 220 kV double-circuit transmission line for looping in/out one circuit of the existing Jamshoro–T. M. Khan 220 kV double-circuit transmission line at Hala Road 220 kV substation commissioned	This transmission line will help to enhance the network expansion in the coverage area of the existing Hala Road Grid Station and will also help in overcoming the low voltage problems in the area.
1c. Additional 2,680 MVA grid station capacity at six grid stations commissioned	The existing six substations will be either augmented (replacement of existing transformer with higher-capacity transformer) or expanded (addition of another transformer). With this addition, the transformation capacity of the NTDC network will not only increase but will also facilitate enhanced power to be evacuated in the major load centers wherein these six substations are located.
1d. Six grid stations augmented and made climate- and disaster-resilient	The additional capacity will help in lessening the burden on existing transformers as well as improve the transmission losses of the network.
1e. New 220 kV grid station at Jamrud and its interconnection with the existing Sheikh Muhammadi, Peshawar Grid Station	This new grid station will further expand the 220 kV network toward the northern part and will also be the first NTDC grid station in the former tribal districts, now merged in Khyber Pakhtunkhwa. It will lessen the transmission losses and overcome the low voltage problems in the area.
1f. 220 kV double-circuit transmission line from Daharki to Rahim Yar Khan to Bahawalpur grid stations (255 km)	This transmission line will help to enhance the network expansion in the coverage area of the existing Rahim Yar Khan and Bahawalpur grid stations. It will lessen the transmission losses and overcome the low voltage problems in the area.
1g. Extension at Daharki, Rahim Yar Khan, and Bahawalpur grid stations	With this addition, the transformation capacity of the NTDC network will not only increase but will also facilitate enhanced power to be evacuated in

	the major load centers wherein these three grid stations are located.
Output 2: Strengthened Gender Capacity of the NTDC Management and Staff	
2a. HR training programs and recruitment plans updated as a result of HR and Gender Diagnostic Assessment	This diagnostic study will help the NTDC HR to take measured and structural steps within their ongoing internal HR reforms.
2b. Female interns increased in: (a) electrical engineering to 90 (50%); 2022 baseline 56 (31%) female interns of total 180 interns; and (b) civil engineering to 5 (33%) (2022 baseline: 2 (13%) female interns of total 15 interns (OP 2.2)	With the increased number of women graduating from engineering universities in Pakistan, the NTDC will be providing them with an opportunity to choose a long-term career in their fields.
2c. At least 20% women staff in technical trainings	This will encourage women employees of the NTDC to improve their skill set and raise their career trajectory.
2d. Increased pool of women technical workers in the energy sector (20 women TVET/university graduates of energy-related courses, supported during the on-the-job training in the NTDC and other energy-related agencies)	This will increase the interaction between the NTDC and academia, resulting in a much better understanding for the students/teachers on the operations of the NTDC.

HR = human resources, km = kilometer, kV = kilovolt, MVA = megavolt-ampere, NTDC = National Transmission and Despatch Company Limited, TVET = technical and vocational education and training.
Source: Asian Development Bank.

Subprojects Detailed Technical Description

12. **Subproject 1:** New 220 kV double-circuit transmission line for looping in/out of the proposed Hala Road–Jamshoro 220 kV single-circuit transmission line at Mirpur Khas Grid Station.

(1) Design Brief

Voltage Level: 220 kV

- No. of circuits: 2
- Tower type: self-supporting latticed steel towers
- Tower design: T, A, D, EG, and AGM towers
- Conductor: 927.2 KCM AAAC ‘Greely’ conductor
- Bundle: twin bundle
- Ground wires: 16 millimeters (mm) diameter 3.0-meter long copper covered ground rods, seven No. 10 mm diameter copper-covered ground wire, and one 24 fiber optical ground wire (OPGW)
- Conductor and ground wire fittings: hot-dip galvanized steel hardware
- Insulators: fog-type toughened glass insulators
- Dampers: spacer damper for conductor and stockbridge vibration dampers for ground

Wires and Conductor

(2) Standards and Construction Methods

(a) Standards

13. Relevant NTDC standards, in conjunction with relevant international standards (i.e., ASTM, IEC, ANSI, NEMA, GB, EN, DIN, ASCE, ITU, IEEE, BS, CISPR), shall be applicable for materials to be procured. However, the supplier may propose an equivalent standard other than that specified.

(b) Construction Methodology

14. Relevant international standards (i.e., ASTM A615, ASTM C33, ASTM C39, ASTM C150, ASTM D1556, ASTM D1557, ASTM D1586, ASTM C989, ASTM C494) shall be applicable for construction. However, the contractor may propose an equivalent standard other than that specified.

(3) Project Associated Facility

15. The NTDC has planned to construct a new 220 kV grid station at Mirpur Khas to meet the growing power requirement of the area and is being funded by ADB under tranche 2 of the Second Transmission MFF. A new 220 kV double-circuit transmission line for in/out of one circuit of existing 220 kV Jamshoro –T. M Khan Road at 220 kV Mirpur Khas has been proposed to provide a source of supply to 220 kV Mirpur Khas Grid Station.

16. This transmission line, when completed, will meet the growing power requirements of the areas, including Mirpur Khas, Mir Wah Gorchani, Sultanabad, Kandiari, Sanghar, Shah Pur Chakar, Jam Nawaz, Tando Jam, Samaro, and T. A. Yar, under the jurisdiction of Hyderabad Electric Supply Company (HESCO).

(4) Project Benefits

17. The benefits associated with this transmission line include (i) improvement in power supply position at/around 220 kV Mirpur Khas, (ii) increase in the system capacity to meet future load demand of the area, (iii) improvement in voltage profile of existing 132 kV grid station in the vicinity of Mirpur Khas, (iv) reduction in transmission system losses, (v) reduction in the loading of 220/132 kV transformers at T. M Khan Road and Jamshoro, and (vi) improvement in reliability of the NTDC and HESCO system networks.

18. **Subproject 2:** New 220 kV double-circuit transmission line for looping in/out one circuit of the existing Jamshoro–T. M. Khan 220 kV double-circuit transmission line at Hala Road 220 kV substation.

(1) Design Brief

Voltage Level: 220 kV

- No. of circuits: 2
- Tower type: self-supporting latticed steel towers
- Tower design: T, A, D, MCT2, MCT30, MCT60, and UC tower family
- Pole type: tubular steel poles
- Pole design: SP-90, SP-MC2, SP-MC30, and SP-MC60 pole family
- Conductor: 927.2 KCM AAAC ‘Greely’ conductor
- Bundle: twin bundle
- Ground wires: 16 mm diameter 3.0 m long copper-covered ground rods, seven No. 10 mm diameter copper-covered ground wire, and one 24 Fiber OPGW
- Conductor and ground wire fittings: hot-dip galvanized steel hardware
- Insulators: fog-type toughened glass insulators
- Dampers: spacer damper for conductor and stockbridge vibration dampers for ground

Wires and Conductor

(2) Standards and Construction Methods

(a) Standards

19. Relevant NTDC standards, in conjunction with relevant international standards (i.e., ASTM, IEC, ANSI, NEMA, GB, EN, DIN, ASCE, ITU, IEEE, BS, CISPR), shall be applicable for materials to be procured. However, the supplier may propose an equivalent standard other than that specified.

(b) Construction Methodology

20. Relevant international standards (i.e., ASTM A615, ASTM C33, ASTM C39, ASTM C150, ASTM D1556, ASTM D1557, ASTM D1586, ASTM C989, ASTM C494) shall be applicable for construction. However, the contractor may propose an equivalent standard other than that specified.

(3) Project Associated Facility

21. A 220 kV double-circuit transmission line for in/out of one circuit of existing Mirpur Khas–T. M. Khan Road at 220 kV Hala Road has also been planned to provide a second source of supply to 220 kV Hala Road Grid Station. This arrangement will form a 220 kV ring among Jamshoro, Hala Road, and T. M. Khan Road substations and will improve the reliability of the NTDC network in the area.

22. This transmission line, when completed, will meet the growing power requirements of the areas, including Mirpur Khas, Mir Wah Gorchani, Sultanabad, Kandiari, Sanghar, Shah Pur Chakar, Jam Nawaz, Tando Jam, Samaro, and T. A. Yar, under the jurisdiction of HESCO.

(4) Project Benefits

23. The benefits associated with this transmission line include (i) a second source of supply to 220 kV Hala Road Grid Station to provide more reliable supply of electricity to the consumers; (ii) enhancement in reliability of the NTDC network and supply of power to HESCO at/around Hala Road; (iii) fulfillment of power demand for rural electrification program and provision of electricity especially to un-electrified areas; (iv) reduction in the 132 kV transmission line and transformer loadings; (v) availability of environment-friendly power for the country; and (vi) improvement in voltage profile at/around M. P. Khas, Jam Nawaz, Kandiari, Sanghar, and Samaro.

24. **Subproject 3:** Equipment for expansion and augmentation of six existing grid stations for removal of the NTDC system constraints.

(1) Design Brief

Voltage Level: 500 kV, 220 kV, and 132 kV

(a) Extension of Transformer Bay at 500 kV Faisalabad West Grid Station comprising of
- 1 x 750 megavolt-amperes (MVA), 500/220 kV ATB
- 500 and 220 kV circuit breaker
- 500 and 220 kV isolators
- 500 and 220 kV instrument transformers
- 444 and 198 kV surge arrestors
- 500 and 220 kV post insulators
- Control and relay panels for the transformer bay
- 500 and 220 kV columns and beams
- AAC, copper conductors, shield wire, and hardware as required

(b) Extension of Transformer Bay at 500 kV Rahim Yar Khan Grid Station comprising of
- 1 x 250 MVA, 220/132 kV ATB

- 220 and 132 kV circuit breaker
- 220 and 132 kV isolators
- 220 and 132 kV instrument transformers
- 198 and 120 kV surge arrestors
- 220 and 132 kV post insulators
- Control and relay panels for the transformer bay
- 220 and 132 kV columns and beams
- AAC, copper conductors, shield wire, and hardware as required

(c) Extension of Transformer Bay at 500 kV Dadu Grid Station comprising of
- 1 x 450 MVA, 500/220 kV ATB
- 500 and 220 kV circuit breaker
- 500 and 220 kV isolators
- 500 and 220 kV instrument transformers
- 444 and 198 kV surge arrestors
- 500 and 220 kV post insulators
- Control and relay panels for the transformer bay
- 500 and 220 kV columns and beams
- AAC, copper conductors, shield wire, and hardware as required

(d) Augmentation of Transformer Bay at 500 kV Sheikhupura Grid Station comprising of
- 1 x 600 MVA, 500/220 kV ATB
- 500 and 220 kV circuit breaker
- 500 and 220 kV isolators
- 500 and 220 kV instrument transformers
- 444 and 198 kV surge arrestors
- 500 and 220 kV post insulators
- Control and relay panels for the transformer bay
- 500 and 220 kV columns and beams
- AAC, copper conductors, shield wire, and hardware as required

(e) Augmentation of Transformer Bay at 500 kV New Multan Grid Station comprising of
- 1 x 450 MVA, 500/220 kV ATB
- 500 and 220 kV circuit breaker
- 500 and 220 kV isolators
- 500 and 220 kV instrument transformers
- 444 and 198 kV surge arrestors
- 500 and 220 kV post insulators
- Control and relay panels for the transformer bay
- 500 and 220 kV columns and beams
- AAC, copper conductors, shield wire, and hardware as required

(f) Augmentation of Transformer Bay at 500 kV Guddu Grid station comprising of
- 1 x 250 MVA, 220/132 kV ATB
- 220 and 132 kV circuit breaker
- 220 and 132 kV isolators
- 220 and 132 kV instrument transformers
- 198 and 120 kV surge arrestors

- 220 and 132 kV post insulators
- Control and relay panels for the transformer bay
- 220 and 132 kV columns and beams
- AAC, copper conductors, shield wire, and hardware as required

(2) Standards and Construction Methods

(a) Standards

25. Relevant NTDC standards, in conjunction with relevant international standards (i.e., ASTM, IEC, ANSI, NEMA, GB, EN, DIN, ASCE, ITU, IEEE, BS, CISPR), shall be applicable for materials to be procured. However, the supplier may propose an equivalent standard other than that specified.

(b) Construction Methodology

26. Relevant international standards (i.e., ASTM A615, ASTM C33, ASTM C39, ASTM C150, ASTM D1556, ASTM D1557, ASTM D1586, ASTM C989, ASTM C494) shall be applicable for construction. However, the contractor may propose an equivalent standard other than that specified.

(3) Project Associated Facility

27. All the six grid stations are located near the prime load centers and function as an independent entity. There is no project associated facility.

(4) Project Benefits

28. The benefits associated with the expansion and augmentation works at the grid station include (i) enhancement of power evacuation and transformation capacity of the NTDC 500 kV and 220 kV networks; (ii) enhancement in reliability of the NTDC network and supply of power to DISCOs in and around these grid stations; (iii) fulfillment of power demand for rural electrification program and provision of electricity especially to un-electrified areas; (iv) reduction in the 500 kV, 220 kV, and 132 kV losses and transformer loadings; (v) availability of environment-friendly power for the country; and (vi) improvement in voltage profile in and around these grid stations.

29. **Subproject 4:** 220kV Jamrud Grid Station and extension at 500kV Sheikh Muhammadi, Peshawar grid station and 220kV double circuit transmission line from Jamrud to Sheikh Muhammadi Peshawar (Khyber Pakhtunkhwa).

(1) Design Brief

Voltage Level: 220 kV and 132 kV

Construction of a new 220/132 kV Jamrud Grid Station comprising of

- 2 x 250 MVA, 220/132 kV ATB
- 220 and 132 kV circuit breaker
- 220 and 132 kV isolators
- 220 and 132 kV instrument transformers
- 198 and 120 kV surge arrestors
- 220 and 132 kV post insulators
- Control and relay panels for the transformer bay
- 220 and 132 kV columns and beams
- AAC, copper conductors, shield wire, and hardware as required

(2) Standards and Construction Methods

(a) Standards

30. Relevant NTDC standards, in conjunction with relevant international standards (i.e., ASTM, IEC, ANSI, NEM, GB, EN, DIN, ASCE, ITU, IEEE, BS, CISPR), shall be applicable for materials to be procured. However, the supplier may propose an equivalent standard other than that specified.

(b) Construction Methodology

31. Relevant international standards (i.e., ASTM A615, ASTM C33, ASTM C39, ASTM C150, ASTM D1556, ASTM D1557, ASTM D1586, ASTM C989, ASTM C494) shall be applicable for construction. However, the contractor may propose an equivalent standard other than that specified.

(3) Project Associated Facility

32. The Jamrud Grid Station is in the proximity of Peshawar and will function as an independent entity. There is no project associated facility.

(4) Project Benefits

33. The benefits associated with setting up a new grid station at Jamrud include (i) enhancement of power evacuation and transformation capacity of the NTDC 220 kV network; (ii) the grid station will help in power evacuation of the under-construction Mohmand hydropower plant, which is expected to be commissioned by 2027; (iii) enhancement in reliability of the NTDC network and supply of power to the DISCOs and Peshawar Electric Supply Company, fulfilling the power demand for rural electrification program and providing electricity especially to un-electrified areas; (iv) reduction in the 220 kV and 132 kV losses and transformer loadings; (v) availability of environment-friendly power for the country; and (vi) improvement in voltage profile in Peshawar region.