Report and Recommendation of the President to the Board of Directors

INTERNAL

Project Number: 51308-009
October 2022

Proposed Loan
India: Tripura Power Distribution Strengthening and Generation Efficiency Improvement Project

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 23 September 2022)

Currency Unit	–	Indian rupee/s (₹)
₹1.00	=	$0.01234
$1.00	=	₹81.0295

ABBREVIATIONS

ACS	–	average cost of supply
ADB	–	Asian Development Bank
ARR	–	average revenue realized
AT&C	–	aggregate technical and commercial
CCGT		combined cycle gas turbine
COVID-19	–	coronavirus disease
EMP	–	environmental management plan
FMAP	–	financial management action plan
GESI	–	gender equality and social inclusion
GHG	–	greenhouse gas
kWh	–	kilowatt-hour
MPI	–	multidimensional poverty index
MW	–	megawatt
NDC	–	nationally determined contributions
PAM	–	project administration manual
RDSS	–	revamped distribution sector scheme
RIPP	–	resettlement and indigenous peoples plan
SHG	–	self-help group
tCO_2e	–	ton of carbon dioxide equivalent
TPGL	–	Tripura Power Generation Limited
TSECL	–	Tripura State Electricity Corporation Limited
TTAADC	–	Tripura Tribal Areas Autonomous District Council
UDAY	–	Ujwal DISCOM Assurance Yojana

NOTES

(i) The fiscal year (FY) of the Government of India and its agencies ends on 31 March. "FY" before a calendar year denotes the year in which the fiscal year ends, e.g., FY2023 ends on 31 March 2023.

(ii) In this report, "$" refers to United States dollars.

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PROJECT AT A GLANCE

1. Basic Data

Project Number: 51308-009

Project Name	Tripura Power Distribution Strengthening and Generation Efficiency Improvement Project
Country	India
Borrower	India
Country Economic Indicators	https://www.adb.org/Documents/LinkedDocs/?id=51308-009-CEI
Portfolio at a Glance	https://www.adb.org/Documents/LinkedDocs/?id=51308-009-PortAtaGlance
Department/Division	SARD/SAEN
Executing Agency	Tripura Power Generation Limited, Tripura State Electricity Corporation Limited

2. Sector

	Subsector(s)	ADB Financing ($ million)
✓ **Energy**	Electricity transmission and distribution	120.000
	Energy efficiency and conservation	100.000
	Total	**220.000**

3. Operational Priorities

- ✓ OP2: Accelerating progress in gender equality
- ✓ OP3: Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability
- ✓ OP5: Promoting rural development and food security
- ✓ OP6: Strengthening governance and institutional capacity

Climate Change Information

GHG reductions (tons per annum)	418,652
Climate Change impact on the Project	Medium

ADB Financing

Adaptation ($ million)	74.440
Mitigation ($ million)	129.710

Cofinancing

Adaptation ($ million)	0.000
Mitigation ($ million)	0.000

Sustainable Development Goals

SDG 5.a
SDG 7.1, 7.3
SDG 13.a

Gender Equity and Mainstreaming

Effective gender mainstreaming (EGM) ✓

Poverty Targeting

General Intervention on Poverty ✓

4. Risk Categorization: Complex

5. Safeguard Categorization

Environment: A **Involuntary Resettlement:** B **Indigenous Peoples:** B

6. Financing

Modality and Sources	Amount ($ million)
ADB	**220.000**
Sovereign Project (Regular Loan): Ordinary capital resources	220.000
Cofinancing	**0.000**
None	0.000
Counterpart	**57.400**
Government	57.400
Total	**277.400**

Currency of ADB Financing: US Dollar

Source: Asian Development Bank

I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan to India for the Tripura Power Distribution Strengthening and Generation Efficiency Improvement Project.

2. The project aims to improve energy security, quality of supply, efficiency, and resilience of the power sector in the state of Tripura. The project will finance the replacement of the aging Rokhia power plant with a highly efficient and state-of-the-art power plant that will reduce greenhouse gas (GHG) emissions through fuel savings. The project will also include investments in the power distribution network to increase the generation capacity, efficiency, and resilience of the power sector against climate change and natural disasters. Further, it will help to strengthen the institutional capacity and business processes of the power utilities and promote gender equality through pilot testing of gender- and socially inclusive workplace practices.

II. THE PROJECT

A. Rationale

3. **The state economy.** Tripura, a landlocked and predominantly agrarian state in northeastern India, is one of the least-developed states in the country. It is bordered to the west, north, and south by Bangladesh, with the Indian states of Mizoram and Assam to the east. This geographic isolation from the rest of India, coupled with difficult terrain, has resulted in weak economic infrastructure. The livelihoods of about 44% of the population depend on agriculture, which contributed 32% of the state's gross domestic product in fiscal year (FY) 2021.[1] About 21% of the population in Tripura is classified as multidimensionally poor,[2] as per the national multidimensional poverty index (MPI)[3] report published in 2021. The economy of Tripura is characterized by high unemployment rates, inadequate infrastructure, and significant impacts from natural disasters (footnote 1). The restrictions and lockdown related to the coronavirus disease (COVID-19) slowed Tripura's economic growth. The gross state domestic product growth rate at constant prices fell to 3.96% in FY2021 from 9.39% in FY2020. The lack of reliable power is one of the major bottlenecks for industrial transformation and a constraint to economic growth.

4. **Power sector structure.** Following the enactment of the Electricity Act, 2003, the Tripura State Electricity Corporation Limited (TSECL) was formed in January 2005. It was originally responsible for power sector planning, generation, transmission, and electricity distribution. Generation activities were unbundled and transferred to a new entity, Tripura Power Generation Limited (TPGL), in January 2015. TPGL and TSECL face institutional and governance challenges, including irregular submission of tariff applications and delayed finalization of the annual accounts. In addition, because TPGL is not administratively and financially separate from TSECL, the revenues and expenditures for power generation are not adequately managed. To improve institutional capacity and corporate governance, TSECL and TPGL have undertaken reforms and initiatives including (i) the creation of an independent vigilance unit and human resource department, (ii) distribution franchising involving private participation, and (iii) information

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[1] Government of Tripura, Directorate of Economics and Statistics Planning (Statistics) Department. 2020. *Economic Review of Tripura 2020–2021*. Agartala.

[2] Government of India, NITI Aayog. 2021. *India: National Multidimensional Poverty Index, Baseline Report*. Delhi.

[3] The MPI uses a range of indicators to calculate a summary poverty figure for a given population, in which a larger figure indicates a higher level of poverty. A larger figure indicates a higher level of poverty. The MPI calculation for India's states follows the formula generated by the Oxford Poverty and Human Development Initiative and the United Nations Development Programme.

technology initiatives such as enterprise resource planning implementation and introduction of a unified smart revenue management system.

5. **Power generation and energy security.** Tripura's power generation is characterized by high costs, inefficiency, lack of flexibility to integrate intermittent renewable energy, and low per capita electricity consumption. Among the few states in India with domestic gas production, Tripura is ranked third. It produced 1,554 million metric standard cubic meters of gas in 2019, accounting for 15% of onshore gas production in India.[4] The state had estimated gas reserves totaling 29.45 billion cubic meters as of 31 March 2020. Despite the availability of gas and hydropower in northeastern India, the cost of power in Tripura is one of the highest in the region. The main reasons for the high power costs[5] are dependency on old and inefficient local generation sources and power purchases from plants outside the state, which involve interstate transmission costs.

6. Tripura's in-state peak demand was 320 megawatts (MW) in FY2020. In addition to the in-state demand, Tripura has power sale agreements to supply 192 MW to Bangladesh and 10.5 MW to Mizoram. Thus, the peak demand including contractually committed power sales is 522.5 MW. Interstate power sales, including power exports to Bangladesh, are a key source of revenue for TSECL. The sales help reduce revenue requirements to be recovered from in-state consumers, thereby minimizing the need for subsidies from the state government. For Bangladesh, power imports from Tripura are a lower-cost alternative to expensive imported natural gas, diesel, and heavy fuel oil.[6]

7. The installed generation capacity owned by the state is 115 MW.[7] However, the available capacity from state-owned generating stations is 80.5 MW because of (i) lower operating efficiency, (ii) unavailability of older power plants, and (iii) unavailability of hydel power during dry seasons. Although Tripura had a capacity allocation of about 477 MW[8] from central generating stations in FY2020, the average power availability from these stations was 400 MW to 420 MW. Power availability was constrained by unplanned shutdowns of aging plants, weather-dependent hydropower plants, and limited interstate transmission capacity for power evacuation, which undermined the reliability of the power system. This means the available generation capacity for Tripura is about 480 MW–500 MW, and the state does not have adequate reserve capacity to meet demand. This has resulted in unplanned power outages and load shedding[9] during the peak

[4] As per Energy Statistics 2021 report by Ministry of Statistics and Programme Implementation, Government of India, (Table 1.2) which provides year-wise data of total reserves, yearly production, and consumption.

[5] The average power purchase cost in FY2021–FY2022 was about ₹4.53 per unit. Of this, the average cost of power from central generating stations was ₹4.57 per unit, while the cost of state-owned generating stations was ₹4.17 per unit (despite the inefficiency in state generation).

[6] The Power Purchase Agreement (PPA) has been signed between National Thermal Power Corporation (NTPC) Vidyut Vyapar Nigam Limited (NVVN) and Bangladesh Power Devbelopment Board (BPDB). NVVN holds the power trading license as per Central Electricity Regulatory Commission (CERC) regulation for tariff negotiations. The PPA is renewed every 5 years and as per the latest PPA which is valid until 16 March 2026, the cost of exported power is ₹6.27 per unit for first year including trading margin of ₹0.01 per unit charged by NVVN with an escalation of 2% every year.This is significantly less than the marginal cost of electricity procured by Bangladesh. The average rate of power procurement of Bangladesh is about ₹21 per unit from diesel, about ₹11 per unit from heavy fuel oil, and about ₹7 per unit from imported gas.

[7] It consists of 63 MW and 42 MW open cycle gas power plants at Rokhia and Baramura, and 10 MW Gumti small hydropower plant.

[8] Of the 477 MW capacity allocation from central generating stations in FY2020, 342 MW was from gas-based power, 62 MW coal power, 68 MW hydropower, and 5 MW solar power. The Palatana central generating station in Tripura supplies 196 MW; the remaining allocations are from generating stations outside the state.

[9] Load shedding is the controlled reduction of electricity to consumers to balance the demand and available supply.

demand periods, which is likely to be exacerbated with the rapid growth projected in in-state demand.

8. The state achieved 100% household electrification (139,090 new connections) in March 2019 under Sahaj Bijli Har Ghar Yojana (Saubhagya) scheme by increasing the consumer base of the state by about 20%.[10] The state's per capita electricity consumption has grown steadily from 325 kilowatt-hours (kWh) in FY2015 to 514 kWh in FY2018—still only about half the national average of 1,181 kWh for the same year.[11] Demand is expected to continue increasing following the growth of Tripura's economy. The average annual growth rate in real terms of gross state domestic product was 8.14% between FY2019 and FY2021, and is expected to increase further in the post COVID-19 recovery phase. Power demand is estimated to grow at about 6% annually with the peak in-state demand projected to rise to 480 MW–525 MW by FY2027 (compared with 320 MW in 2020). Without the addition of low-cost generation capacity, this will result in capacity shortages.

9. **Low-cost generation and energy transition alternative.** TPGL has identified the conversion of the state's inefficient power plants into efficient, modern, and climate-resilient systems as a priority to quickly increase generation capacity, reduce the cost of power, and eliminate power shortages. This will also reduce GHG emissions because of the resulting decrease in power purchased from aging coal and gas-based power plants outside the state. Tripura has limited potential for hydropower and renewable energy development compared with other states in India. Although Tripura may be able to develop small hydropower plants, biodiversity and resettlement issues make their development challenging. Further, these small hydropower plants would not be able to provide firm capacity to meet the base load requirement. Development of wind energy is constrained by poor winds, while solar power is limited by a lack of available land. Hydropower imports from neighboring states are not a viable option because of its limited availability and long gestation period. In addition, meeting the peak demand at night using solar energy with battery storage is not a cost-competitive option. Hence, the project is the only economically and technically feasible clean energy alternative. Highly efficient combined cycle natural gas-based generation is the optimal transition technology to meet the medium-term energy demand of Tripura for the next 25 years, given the availability of domestic natural gas and limited possibilities for renewable energy generation.[12] Over the longer term, with the expected decrease in energy storage cost, the state intends to progressively increase the share of renewable energy sources to displace fossil fuel-based generation.[13]

10. **Power distribution.** Aggregate technical and commercial (AT&C) losses in power distribution are high because of geographic challenges, old assets, low billing efficiency,[14] a weak industrial base, and a large share of domestic consumers dispersed in rural areas. These losses are the main reason why the power sector has been unable to achieve financial sustainability. For FY2020, Tripura's AT&C losses were 39.5%—well above the regulatory norm of 15% allowed by the tariff regulator. Operation and maintenance of the old and overloaded network are also

[10] Under India's Saubhagya scheme, the state achieved 100% electrification by providing last-mile connectivity to rural consumers and subsidized electricity to households below the poverty line.
[11] Government of India, Ministry of Power. 2019. *Electrification of Villages*. Delhi.
[12] TPGL has a long-term gas supply contract with Gas Authority of India Limited under an administered price mechanism for 0.58 million standard cubic meters of gas per day for the existing 63 MW Rokhia open cycle power plant. This gas allocation is sufficient to meet the fuel requirement of the 120 MW combined cycle gas turbine power plant. Fuel price increases or justifiable cost increases will also be reflected in the regular tariff adjustment.
[13] Detailed alternative analysis is in the combined Economic and Financial Analysis and the Supplementary Economic Analysis (accessible from the list of linked documents in Appendix 2).
[14] TSECL's billing efficiency was 67.61% in FY2019 as about half of the consumer meters are outdated, resulting in high commercial losses.

challenging. Lengthy distribution feeders, lack of modern monitoring devices, undersized conductors, inadequate distribution substations, and outdated meters have resulted in high AT&C losses and frequent service interruptions.[15]

11. **Government strategy for the power sector.** The Government of India launched the Ujwal DISCOM Assurance Yojana (UDAY) in 2015, aiming to turn around the distribution sector's finances. Under the UDAY, the state government and TSECL have agreed with the Ministry of Power on several measures to improve the sector's performance.[16] Most UDAY indicators, including AT&C losses, collection, and billing efficiency, improved from 2015 to 2017. However, AT&C losses increased from 2018 onward with the addition of 139,090 new rural electricity consumers under the Saubhagya scheme. The higher losses were driven by poor payment discipline of new consumers and a lack of planning and investments in the upstream distribution network to support the expanded last-mile connectivity. In June 2021, the Government of India launched the revamped distribution sector scheme (RDSS) to improve the poor operational and financial condition of the distribution sector. The broad objectives of RDSS are (i) strengthening institutional capabilities for the modernization of distribution utilities, (ii) lowering AT&C losses to 12%–15% by FY2025, and (iii) reducing the average cost of supply (ACS)–average revenue realized (ARR) gap to zero by FY2025.[17]

12. **Improving operational efficiency and financial sustainability.** Operational inefficiency and inadequate tariffs have undermined the financial sustainability of TPGL and TSECL. Below-cost tariffs for in-state electricity sales have constrained TSECL's profitability. Reduced economic activity because of the COVID-19 pandemic further stressed the utilities because of delayed payments, the downturn in demand from industrial consumers, and no tariff increases in the midst of the pandemic. Despite revenue subsidies of ₹400 million in FY2021, TSECL incurred a loss of ₹1,445 million from in-state power sales, which led to an ACS–ARR gap of ₹1.62/kWh. This ACS–ARR gap in FY2021 drops to ₹0.33/kWh when taking into account interstate power trade (with power sales to Bangladesh), resulting in the reduction in TSECL's annual loss to ₹270 million.[18] Hence, TSECL has been managing adverse circumstances primarily from cash surpluses from interstate energy trade. However, the ability of TSECL to sustain power exports will be affected without the addition of low-cost generation capacity. TSECL also needs to implement measures to improve operational efficiency, reduce AT&C losses, and achieve a cost-recovery domestic tariff in the post-COVID-19 phase.

13. The project will improve the financial sustainability of TSECL and TPGL. The key elements will include (i) reducing electricity costs through (a) completion of a highly efficient combined cycle gas turbine (CCGT) plant, and (b) reduction of AT&C losses through smart metering and distribution strengthening; and (ii) increasing revenues through (a) reduction of commercial losses by implementing smart metering, and (b) improved collection of accounts receivables. The completion of the CCGT plant in particular will significantly improve the financial position of both

[15] In FY2019, service interruptions totaled 142 hours/consumer/year with an average frequency of 341 interruptions/consumer/year.

[16] A tripartite memorandum of understanding signed by the Ministry of Power, the state government, and TSECL on 27 March 2017. The agreed measures include (i) improving the efficiency of state generating units, (ii) reducing transmission losses from 5% in FY2016 to 4% by FY2020, (iii) cutting AT&C losses from 33.8% in FY2016 to 15.0% by FY2020, and (iv) formulating an action plan to eliminate the gap between average cost of supply and average revenue recovery. These targets were not achieved due to poor planning and lack of investments.

[17] The ACS–ARR gap was ₹1.45 in FY2020 and ₹1.62 in FY2021 including the subsidies provided by the state government. The subsidies in FY2020 and FY2021 were ₹400 million each year.

[18] The ACS–ARR gap of ₹1.62/kWh comprised (i) ₹1.06/kWh from commercial losses because of inefficient metering, billing, collection, and pilferage; (ii) ₹0.32/kWh from technical losses because of the overloaded network, long distribution lines, and old assets; and (iii) ₹0.24/kWh because of inadequate tariff revisions.

utilities and reduce the carbon footprint by increasing the efficiency of power generation and facilitating renewable energy integration. A comprehensive financial management action plan (FMAP)[19] containing actions to be taken to improve the financial governance and sustainability of TSECL and TPGL has been prepared with assistance from Asian Development Bank (ADB). Key elements of the plan that will help improve the financial sustainability of TSECL and TPGL include (i) implementing tariff reforms through timely submission of tariff and true-up petitions,[20] the release of government subsidies, and a reduction in the ACS–ARR gap to zero; (ii) improving the timeliness and quality of financial statements through implementation of enterprise resource planning; (iii) preparing a road map for administrative and financial separation of TPGL from TSECL; (iv) improving the management of fixed assets; and (v) supporting the implementation of RDSS.

14. **Consistency with India's nationally determined contributions.** The project is consistent with India's nationally determined contributions (NDC). India revised its climate action targets to the United Nations Framework Convention on Climate Change (UNFCCC) in August 2022. The new targets go significantly beyond India's first NDC submission to the UNFCCC in October 2015. The revised targets have the following main climate actions: (i) achieving 50% of cumulative installed capacity for electricity generation from non-fossil fuel-based energy sources by 2030, (ii) achieving a carbon intensity reduction of 45% from 2005 levels by 2030, (iii) creating an additional carbon sink of 2.5 to 3 billion tons of CO_2 equivalent through additional forest and tree cover by 2030, and (iv) achieving carbon neutrality by 2070.

15. **Alignment with the Paris Agreement.** The project is fully aligned with the Paris Agreement. The project will facilitate aligned investments (mainly in renewable energy) by improving the flexibility of the power system[21] to enable high renewable energy penetration, and the capacity of the state to develop renewable energy. It will also support mitigation actions by (i) reducing imports from heavier polluting coal-fired power plants, (ii) reducing emission factor and carbon intensity of Tripura by producing more energy with the same amount of natural gas, and (iii) reducing technical losses in power distribution and installing of prepaid smart meters that will encourage the efficient use of electricity by consumers. Further, the project will enhance climate adaptation, thereby increasing the resilience of power system against climate events. The project is expected to reduce about 418,652 tons of carbon dioxide equivalent per year (tCO_2e/year) through energy efficiency improvements at the Rokhia power plant and distribution loss reductions. The Rokhia power plant is expected to be decommissioned in 2050 after its operational life. Further, renewable energy and energy storage is expected to be more competitive given India's strong commitment towards renewable energy development, hence the project will diminish any risk of long-term lock-in into fossil fuel-dependent energy supply. This is consistent with India's commitment to achieve net zero GHG emissions by 2070.[22]

16. **Alignment with country priorities and ADB's Strategy 2030.** The project is aligned with the ADB country partnership strategy for India, 2018–2022, specifically the pillars for inclusive

[19] Included in the Project Administration Manual (accessible from the list of linked documents in Appendix 2). Consultants will be hired under the project to support TSECL and TPGL in implementing the FMAP.

[20] True-up petition is a petition required to be filed annually by the utility for reviewing the actual annual revenue requirement on the basis of audited accounts with respect to the figures approved by the Commission on the basis of estimates and determination of surplus or gap to be passed on to the tariff.

[21] The efficient and modern power plant with increased capacity will allow the state power system to respond quickly to intermittencies caused by renewable energy and enable high renewable penetration. The distribution grid strengthening will reduce network losses and support integration of distribution renewables that has high potential in Tripura.

[22] Detailed information is in Alignment of Project with Mitigation of the Paris Agreement (accessible from the list of linked documents in Appendix 2).

infrastructure in hinterlands and low-income states, and addressing climate change and increasing climate resilience.[23] The project will support (i) ADB's Strategy 2030[24] operational priorities (OP) 2: accelerating progress in gender equality; 3: tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability; 5: promoting rural development and food security; and 6: strengthening governance and institutional capacity; [25] (ii) Sustainable Development Goals 5, 7, and 13 by providing affordable, clean, and sustainable energy; and (iii) India's climate change mitigation and adaptation objectives incorporated in the updated NDC commitments announced at COP26.[26]

17. **Alignment with ADB's energy policy.** With the limited zero-carbon options for producing electricity in Tripura, coupled with the availability of domestic gas resources, natural gas will play a transition role as a primary energy source in the state's energy sector. The project will reduce emissions by replacing an aging and inefficient open cycle gas plant and displacing power imports from heavier polluting sources. It will also facilitate greater use of renewable energy from the energy mix imported from other parts of India. A new high-efficiency and low-emissions CCGT power plant with an operational efficiency of 53% will replace an older gas power plant with only 26% operational efficiency. Without the project, the existing inefficient unit would continue to operate without rehabilitation. The incremental capacity will be used to meet expected unserved demand in Tripura.

18. No other low-carbon or zero-carbon technology, or combination thereof, can provide the same service at an equivalent or lower cost at a comparable scale. As the proven gas reserves in Tripura are estimated to last only 25 years at the current utilization rate, and importing natural gas is difficult because the state is landlocked, the project will avoid locking in long-term dependence on fossil fuel. The project is also economically viable considering the social cost of carbon (para. 34). In addition, the project targets high-efficiency and internationally best available technologies for power generation. Thus, the project is fully aligned with ADB's 2021 Energy Policy.[27]

B. Project Description

19. The project is aligned with the following impacts: energy security enhanced, and financial sustainability and resilience of power sector in Tripura improved.[28] The project will have the following outcome: efficiency and reliability of power supply to consumers in Tripura improved.[29]

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[23] ADB. 2017. *Country Partnership Strategy: India, 2018–2022—Accelerating Inclusive Economic Transformation*. Manila.

[24] ADB. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila.

[25] The project supports OP2 by supporting gender-sensitive workplace policies and providing skills training for women, OP3 by supporting project components to improve efficiency and reliability through GHG emission reduction and improved resilience to extreme weather, OP5 by developing rural distribution infrastructure and supporting socioeconomic empowerment of the rural poor, and OP6 by strengthening the institutional capacity and overall business processes of TSECL and TPGL.

[26] United Nations. *Sustainable Development Goals*. *(Goal 5: Gender Equality; Goal 7: Affordable and Clean Energy; Goal 13: Climate Action)*. New York.

[27] ADB. 2021. *Energy Policy Supporting Low-Carbon Transition in Asia and the Pacific*. Manila (August). The detailed information on the project's alignment with ADB's energy policy paper is in the Economic and Financial Analysis, Supplementary Economic Analysis, and Project Alignment with ADB's 2021 Energy Policy. (accessible from the list of linked documents in Appendix 2).

[28] Government of India and Government of Tripura. 2016. *24X7 Power for All*. Delhi; Government of Tripura. Department of Science, Technology & Environment. 2011. *State Action Plan on Climate Change*. Agartala.

[29] The design and monitoring framework is in Appendix 1.

20. **Output 1: Generation capacity of Rokhia power plant increased.** The project will replace the 63 MW inefficient open cycle gas turbines in the Rokhia power plant with a 120 MW climate proofed, highly efficient modern CCGT technology. This will (i) increase the plant's efficiency from 26% to 53%, thereby doubling electricity output yet consuming the same amount of natural gas, (ii) increase capacity from 63 MW to 120 MW without corresponding increase in gas consumption;[30] (iii) reduce the state's dependency on power purchases; (iv) increase the flexibility of the system in integrating larger renewable energy capacity; and (v) enhance system resilience against climate risks by incorporating climate-proofing measures in the project design.

21. **Output 2: Distribution network strengthened, modernized, and climate proofed.** To improve reliability, climate and disaster resilience, and reduce technical losses and system constraints, the project will (i) modernize 27 existing substations, (ii) install 1,560 kilometers (km) of covered conductors and 140 km of underground cables at medium volage level (33 kV and 11 kV), and 900 km of aerial bunched cables at low voltage level, (iii) implement a pilot high-voltage distribution system in one electricity subdivision, and (iv) install modern monitoring and control devices in distribution network. The project will facilitate a reliable power supply in remote and rural areas of Tripura. These will be complemented by gender equality and social inclusion (GESI) and culturally sensitive awareness programs on energy-efficient electrical appliances, safe use of electricity for household chores (including lighting and cooking), and energy conservation for community members including women and girls from villages in the Tripura Tribal Areas Autonomous District Council (TTAADC) project area.

22. **Output 3: Smart meters and advanced metering infrastructure established**. Outdated electromechanical meters will be replaced with smart meters in 100,000 households, and advanced metering infrastructure will be established with online meter reading, billing, and collection. This will increase the collection rates of the state-owned distribution company, improving its financial viability and operational efficiencies. It will also send fair and transparent pricing signals and other useful information to consumers to allow them to improve their management of electricity consumption. Further, this will make meter reading and bill collection in the community more efficient.

23. **Output 4: Institutional capacity of utilities for planning, implementation, financial management, and gender mainstreaming improved.** The project will support the long-term sustainability of TPGL and TSECL through (i) preparation of a renewable energy and distribution sector road map that will outline the policies, strategies, and investments to adopt renewable energy and meet future demand and service standards; and (ii) preparation of financial roadmap and support the implementation of FMAP activities (para. 13). The project will support the preparation of a gender-sensitive workplace policy for TSECL and TPGL and conduct necessary training (footnote 46).[31]

24. **Output 5: Gender- and socially inclusive energy-based livelihood activities promoted.** The project will support at least 150 women from 15 selected women self-help groups (SHGs) under the Tripura Rural Livelihood Mission, targeting socioeconomic empowerment of the rural poor and women of the state in the farming sector. The envisaged activities include (i) training 150 women from 15 SHGs in certified skills (based on a needs assessment) for livelihood-generation activities and business development skills (such as market links and access to finance

[30] TPGL will decommission the existing 63 MW open cycle gas turbines after the commissioning of the 120 MW CCGT power plant. Thus, the plant will keep the same level of fuel consumption.

[31] ADB. 2019. *Technical Assistance to India for Enhancing Capacity to Design and Implement Energy Sector Projects*. Manila (TA 9813-IND) will provide TPGL and TSECL with additional resources to support the implementation of gender-sensitive activities in the project.

and credit to develop and operate energy-based microenterprises), and (ii) providing equipment to at least 15 SHGs to enhance livelihood opportunities in farming (footnote 46).

C. Value Added by ADB and Replication Strategy

25. This project will be ADB's first energy sector intervention in Tripura. ADB has extensive experience financing generation and distribution projects in India, including in the northeastern states[32] of Assam[33] and Meghalaya[34] as well Uttar Pradesh, Madhya Pradesh, and Maharashtra. The project design incorporates lessons learned from previous projects in India and other South Asian countries[35] and the Independent Evaluation Department's evaluation of ADB's energy policy and program.[36] These lessons and experiences will be translated into robust project design and implementation.

26. ADB has supported TSECL in designing the distribution network to improve its efficiency, climate and disaster resilience, and safety with investments covering underground cables, covered conductors, and aerial bunched cables instead of bare conductors. ADB will replicate its strong record in gender equality and social inclusion in the energy sector in Tripura (outputs 4 and 5). Comprehensive smart meter infrastructure incorporating online meter reading, billing, and monitoring of service standards will be installed with the potential to expand coverage across the entire state in the future. ADB has assisted TSECL and TPGL in carrying out baseline surveys, noise modeling for a CCGT power plant, and network simulation in selected areas to support the optimal design of the distribution components. ADB has recommended incorporating technology improvements to mitigate potential environment and social impacts, adapt to extreme weather, and improve the robustness of the system. The project's proposed technological improvements in distribution system design; automatic smart metering infrastructure; and support for distribution, financial, and renewable energy road maps have high potential for replication in other northeastern and Himalayan states. The good practices and design improvements of this project will be disseminated through the Capacity Development Resource Centre of ADB's India Resident Mission, and knowledge sharing events.

27. The project will support the implementation of RDSS, which has a comprehensive road map for the financial recovery of the distribution sector. TSECL has submitted a detailed project proposal, action plan, and investment requirements for RDSS implementation. The distribution network strengthening and smart metering investments under the project will complement RDSS and support the achievement of its envisaged targets by reducing AT&C losses and improving the TSECL's operational efficiency and financial sustainability. The FMAP (para. 13) will also complement the implementation of the RDSS scheme by supporting the achievement of RDSS preconditions and developing an action plan for scheme implementation. The project is also

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[32] The lessons from completed and ongoing projects that are relevant to this project, such as the additional implementation period required because of extreme weather, delays in the fund flow from the state finance department to the project account, the review of technical design, and poor capacity of utilities, have been assessed and incorporated.

[33] ADB. 2020. *Periodic Financing Request Report: Assam Power Sector Investment Program (Tranche 3)*. Manila.

[34] ADB. 2020. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Administration of Grant to India for Meghalaya Sector Improvement Project*. Manila.

[35] Similar project interventions in South Asia include ADB. 2020. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Nepal for Electricity Grid Modernization Project*. Manila; and ADB. 2020. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for the People's Republic of Bangladesh for Power System Enhancement and Efficiency Improvement Project*. Manila.

[36] Lessons and recommendations from the Independent Evaluation Department's evaluation of the energy policy and program that are pertinent to this project, such as focusing on improving access to electricity and the distribution network enhancement, digitization of electricity services, and ensuring long-term financial sustainability of energy entities, were taken into consideration during project design and preparation.

aligned with ADB's forthcoming power sector reform program which is being processed by supporting the implementation of RDSS scheme which is being identified as a key policy action in the proposed program.

D. Summary Cost Estimates and Financing Plan

28. The project is estimated to cost $277.4 million (Table 1).

Table 1: Summary Cost Estimates

Item	Amount [a]
A. Base Cost[b]	
1. Generation capacity of Rokhia power plant increased	110.5
2. Distribution network strengthened, modernized, and climate proofed	119.1
3. Smart meters and advanced metering infrastructure established	16.3
4. Institutional capacity for planning, implementation, financial management, and gender mainstreaming improved and gender- and socially inclusive energy based livelihood activities promoted.[c]	3.1
Subtotal (A)	**249.0**
B. Contingencies[d]	**20.7**
C. Financing Charges[e]	**7.7**
Total (A+B+C)	**277.4**

[a] Includes goods and service taxes of $34.7 million to be financed by the government fund.
[b] In end-2021 prices as of February 2022.
[c] The cost estimates in item A.4 cover outputs 4 and 5. Since the activities in output 4 and 5 are interrelated, the cost estimates are computed together.
[d] Interest during construction for the ordinary capital resources loan has been computed at the 5-year forward-looking secured overnight financing rate plus an effective contractual spread of 0.5%. Commitment charges for the ordinary capital resources loan are 0.15% per year to be charged on the undisbursed loan amount.
[e] Includes interest and commitment fee. Interest during construction for the ordinary capital resources loan has been computed.
Source: Asian Development Bank estimates.

29. The government has requested a regular loan of $220 million from ADB's ordinary capital resources to help finance the project. The loan will have a 20-year term, including a grace period of 5 years; an interest rate determined in accordance with ADB's Flexible Loan Product; a commitment charge of 0.15% per year; and such other terms and conditions set forth in the draft loan and project agreements. Based on the straight-line method, the average maturity is 12.75 years and there is no maturity premium payable to ADB.

30. ADB will finance eligible expenditures in relation to the turnkey contracts, consulting services, and contingencies. The government will finance taxes and duties in relation to turnkey contracts, land acquisition and resettlement cost, environmental and social mitigation cost, project administration cost, a portion of contingencies, and interest during implementation. The government has assured ADB that it will cover any shortfall in financing required to meet the agreed outputs. The summary financing plan is in Table 2.

Table 2: Summary Financing Plan

Source	Amount ($ million)	Share of Total (%)
Asian Development Bank		
Ordinary capital resources (regular loan)	220.0	79.3
Government counterpart fund	57.4	20.7
Total	**277.4**	**100.0**

Source: Asian Development Bank estimates.

31. Climate mitigation is estimated to cost $129.71 million; climate adaptation is estimated to cost $74.44 million. ADB will finance 100% of the mitigation and adaptation costs. By modernizing generation infrastructure and improving the distribution network, the project will contribute to climate change mitigation through more efficient generation and transfer of power. Adaptation costs comprise the introduction of project components and design in the distribution network ($58.24 million) and CCGT generation ($16.20 million) to withstand heavy rainfall, lightning, and high winds in order to adapt to potential climate change risks in the region.[37]

E. Implementation Arrangements

32. The implementation arrangements are summarized in Table 3 and described in detail in the project administration manual (PAM).[38]

Table 3: Implementation Arrangements

Aspects	Arrangements		
Implementation period	September 2022–June 2028		
Estimated project completion date	31 December 2027		
Estimated loan closing date	30 June 2028		
Management			
(i) Oversight body	Power Department, Government of Tripura		
(ii) Executing agencies	TPGL and TSECL		
(iii) Implementing agencies	TPGL and TSECL		
(iv) Implementation unit	Within TPGL and TSECL, supported by consulting firm		
Procurement	Open competitive bidding	7 contracts	$210 million
Consulting services	Quality- and cost-based selection	3 contracts (395 person-months)	$5.5 million
	Quality-based selection	3 contracts (60 person-months)	$1 million
	Individual consultants	3 contracts (20 person-months)	$0.3 million
Retroactive financing and/or advance contracting	The project envisages advance contracting for the turnkey contract and consulting services. Retroactive financing is permissible up to 20% of the loan amount for expenditures incurred before loan effectiveness, but not earlier than 12 months before the signing of the loan agreement.		
Disbursement	Disbursement of the loan proceeds will follow ADB's *Loan Disbursement Handbook* (2017, as amended from time to time) and detailed arrangements the government and ADB agree upon.		

ADB = Asian Development Bank, TPGL = Tripura Power Generation Limited, TSECL = Tripura State Electricity Corporation Limited.
Source: Asian Development Bank.

III. DUE DILIGENCE

A. Technical

33. As part of technical due diligence, ADB supported a detailed network analysis and simulations in selected areas to identify the project components that provide the best option for distribution improvement. The analysis concluded that CCGT technology is the most cost-efficient

[37] Climate Change Assessment and Climate Risk and Adaptation Assessment (accessible from the list of linked documents in Appendix 2).
[38] Project Administration Manual (accessible from the list of linked documents in Appendix 2).

alternative to quickly improve operational efficiency and increase generation capacity. The project will employ internationally best available CCGT technology in terms of efficiency, environment management, and water use. An assessment of power evacuation for the additional generation capacity found the existing system to be adequate. The climate change impact of the project is assessed as *medium* as the project area experiences monsoons and heavy rain. The risks associated with the climate change impacts affecting the project area include damage to distribution lines and substation facilities because of more frequent and more severe extreme events (floods, storms, and lightning). The detailed project design has elements to address these risks.[39]

B. Economic and Financial Viability

34. **Economic viability.** An economic analysis was carried out in accordance with ADB's Guidelines for the Economic Analysis of Projects.[40] Without the project, the old and inefficient system would aggravate the current high losses and lead to insufficient and poor-quality service in remote areas. The project's interventions will directly benefit disadvantaged households in rural areas of Tripura by making available affordable and reliable electricity. The economic benefits of the project derive from (i) fuel savings from increased efficiency, (ii) incremental consumption with increased capacity, (iii) reduced distribution losses, and (iv) associated environmental benefits through lower carbon dioxide emission. An alternative analysis of the power generation upgrade shows the project represents the least-cost option among feasible alternatives. The economic analysis indicates an economic internal rate of return of 19.82% (19.77% for the generation component and 19.88% for the distribution component) considering the social cost of carbon. Given a hurdle rate of 9.00%, the project is economically viable.

35. **Financial viability.** A financial cost–benefit analysis was conducted in accordance with ADB's Guidelines on Financial Analysis and Evaluation.[41] Consumers can get more affordable and sustainable electricity through concessional financing from ADB, while the utility can also benefit from fuel savings and loss reductions. Because of efficiency improvements, Tripura can maximize power output per unit of fuel without increasing domestic gas consumption. The results, confirmed through a sensitivity analysis, indicate a financial internal rate of return of 16.49% for the generation component and 11.50% the for distribution component, which is above the weighted average cost of capital of 10.41%. Thus, the project is financially viable.

C. Sustainability

36. The project will substantially improve the operational efficiency and finances of TPGL and TSECL by doubling generation efficiency and reducing distribution losses in Tripura by about 11%. Tripura has sufficient gas resources to last 25 years (para. 5), the estimated life span of the CCGT plant to be built by the project. Further, TPGL has a long-term fuel agreement with GAIL (India) Limited (footnote 12). Thus, the project is highly sustainable. TPGL has extensive experience and expertise in the operation and maintenance of open cycle gas turbines. TPGL has engaged an engineering consultant to provide technical support during project preparation.[42] Specific financial sustainability improvement actions are included in the FMAP (para. 13). To

[39] Includes siting of facilities away from flood-prone areas, construction of retaining walls, and installation of lightning protection.
[40] ADB. 2017. *Guidelines for the Economic Analysis of Projects.* Manila.
[41] ADB. 2019. *Technical Guidance Note on Financial Analysis and Evaluation*. Manila.
[42] TPGL will also engage project management consultants for implementation support and required training for sustainable operation of CCGT. TPGL will enter a medium-term service contract with the equipment manufacturer to ensure its operational sustainability.

support sustained financial performance, specific financial covenants (for debt service coverage ratio, debt-to-equity ratio, current ratio, and accounts receivable days) are also included in the loan agreement for TSECL.

37. The key impediment to TSECL's financial sustainability is the below-cost tariff (footnote 18). However, interstate energy trade and exports to Bangladesh largely offset the low tariffs. TSECL registered profits in FY2018 and FY2019 despite the below cost-tariffs for in-state energy sales. Because of a lack of appropriate human resource and financial management systems, the finalization of audited financial statements of TSECL and TPGL has been delayed, which is the main reason for irregular tariff filings and tariff determination by the regulator. TSECL and TPGL recently enhanced their human resources capacity, and implementation of comprehensive enterprise resource planning is in progress. TSECL and TPGL have shown significant progress in this regard as their substantial backlog of audited financial statements up to FY2020 was cleared in April 2022, enabling the submission of tariff true-up petitions for FY2018–FY2020 in April 2022. In addition, the project will engage financial road map consultants to assist TSECL and TPGL in streamlining financial statement preparation and the audit process to support timely completion.[43]

D. Governance

38. The pre-mitigation financial management risk of TSECL and TPGL is assessed as *substantial*, mainly because of significant delays in finalizing accounts, irregular tariff filing, qualified audit opinions, incomplete fixed assets management, and a weak internal audit system. To address these issues, TSECL and TPGL have agreed on comprehensive governance measures, including ADB support to enhance corporate governance and financial management.[44] The project will include a road map to rectify capacity problems, including separation of the financial and administration functions of TPGL from TSECL, financial reporting improvements, fixed assets management, technical improvements to reduce system losses, and development of a renewable energy road map to guide Tripura's energy transition. TSECL and TPGL have already shown significant improvement in financial management.[45]

39. A procurement capacity assessment of TSECL and TPGL was carried out as part of ADB's due diligence process. Strategic procurement planning was conducted to maximize the value for money, and the following project procurement arrangements were chosen to lower transaction costs, increase competition, and realize economy and transparency: (i) a life cycle cost evaluation for the CCGT power plant, (ii) strategic contract packaging by grouping several identical sub-packages into one lot for each subdivision, (iii) use of the borrower's e-procurement system, and (iv) qualification criteria based on lowest evaluated cost.

40. Integrity due diligence was also conducted. No significant integrity risks were identified. ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the government, TSECL, and TPGL. The specific policy requirements and supplementary measures are described in the PAM (footnote 38).

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[43] ADB. 2019. *Technical Assistance to India for Enhancing Capacity to Design and Implement Energy Sector Projects*. Manila. (TA 9813-IND) will provide TPGL and TSECL with additional resources to provide guidance and complement the envisaged financial management activities.

[44] Financial Management Assessment Report (accessible from the list of linked documents in Appendix 2)

[45] Includes (i) creation of an independent vigilance unit, human resource department, and information technology unit; (ii) distribution franchising to involve private participation in the sector; (iii) introduction of interim financial statements and smart revenue management system; and (iv) adoption of new strategy and polices for further reforms.

E. Poverty, Social, and Gender

41. **Poverty and social.** The project beneficiaries are electricity consumers in the state. The United Nations identifies access to electricity as particularly beneficial for women and vulnerable people. The poor quality of the electricity supply contributes to low socioeconomic development in Tripura compared with other states. The project will help improve the reliability of the power supply and provide uninterrupted electricity to social infrastructure such as schools and hospitals. Strengthening electricity distribution will promote economic development and reduce poverty through new employment and enterprise opportunities.

42. **Gender.** The project is categorized as *effective gender mainstreaming* based on the Guidelines for Gender Mainstreaming Categories of ADB Projects (2021). A GESI action plan has been prepared that includes activities and measurable indicators. The gender activities[46] are envisaged within the framework of the outputs proposed and are adequately resourced.

F. Safeguards

43. In compliance with ADB's Safeguard Policy Statement (2009), the project's safeguard categories are A for environment and B for involuntary resettlement and indigenous people.[47]

44. **Environment (category A).** An environmental impact assessment including an environmental management plan (EMP), disclosed on 8 March 2022, concluded the CCGT power plant is the most environmentally sensitive component of the project. An initial environmental examination including an EMP, disclosed on 8 July 2022, found the distribution components will have less adverse impacts than the generation component. These were prepared in accordance with national requirements and ADB's Safeguard Policy Statement. TPGL has initiated the process to obtain national environmental clearance before the start of CCGT power plant construction.[48] National environmental clearance is not required for the distribution components of TSECL. Consultations included two public meetings for Rokhia CCGT power plant and small group consultations for distribution components. Grievance redress mechanism will be established by TGPL and TSECL.

45. The major impacts of the Rokhia are GHG emissions, and noise emissions, as well as the risk of fire and explosion. In addition to compliance with national standards, the EMP requires compliance with international good practice emission and discharge levels. It will be designed and operated using best available technology with zero effluent discharge for a life span of 25 years. It will be decommissioned by 2050 in line with the Paris Agreement, well before the Government

[46] The activities include (i) conducting awareness programs for tribal communities in the TTAADC areas on the benefits of energy-efficient electrical appliances, safe use of electricity for household chores (including lighting and cooking), and energy conservation; (ii) preparing and adopting a gender-sensitive workplace policy for TSECL and TPGL, and training TSECL and TPGL staff on gender sensitization, gender gaps in the energy sector, GESI-sensitive workplace policy, and collection and use of sex-disaggregated data for the provision of customer service; (iii) providing contractors with advice and training on enhancing female workforce participation and maintaining sex-disaggregated data on labor; (iv) providing 15 women SHGs with certified skills training for technical and business skills in order to develop and operate energy-based microenterprises; (v) providing 15 women SHGs with equipment to enhance livelihood opportunities in the farm sector; (vi) training a project monitoring unit, project implementation units, and other stakeholders in GESI action plan implementation, monitoring, and reporting; and (vii) nominating a gender focal point in the project management unit to oversee the implementation and report on GESI indicators included in the project performance management system, and to report on GESI action plan implementation.

[47] ADB. *Safeguard Categories*.

[48] As TPGL is securing national environment clearance for the CCGT power plant, obtaining such clearance is a condition for contract award for procurement activities under output 1 (which supports construction of CCGT power plant) in the loan agreement.

of India's pledge to achieve net zero by 2070. Since the project site supports forest habitat, compensatory plantation will be undertaken. Decommissioning of the existing plant under a decommissioning EMP, which must be cleared by ADB, is a condition of the project loan.[49]

46. The routing of distribution lines will be subject to site-specific assessments for clearance by ADB since actual routings will not be available until the engineering, procurement, and construction contractors are on board. However, TSECL has confirmed the lines will avoid internationally and nationally recognized biodiversity sites and physical cultural resources. Use of covered conductors and aerial bundled conductors will reduce health and safety risks to local communities, as well as the risk of bird and bat electrocution. Additional design measures in the EMP will further reduce electrocution risks to perching birds. Compensatory plantation will be undertaken through the Tripura Forest Department for any tree cutting required. The environmental safeguards capacity of TPGL and TSECL will be strengthened through training and consultant support.[50]

47. **Involuntary resettlement and indigenous peoples (category B).** The project has been categorized B for both involuntary resettlement and indigenous peoples. Social safeguards impacts have been adequately assessed through a compliance audit and participatory impact assessment. There are no past or outstanding concerns related to involuntary resettlement and indigenous peoples. The CCGT power plant at Rokhia will be within the TPGL power plant project complex, and the land is in the possession of the Power Department and TPGL and free of all encumbrances. The 33-kilovolt substations will be renovated and modernized within the existing substation site. Social due diligence found the project site to be absent of encroachment and informal settlers. Construction of new 33/11 kilovolt low-tension lines, installation of new distribution transformers, upgrading and replacement of existing bare conductor lines with covered conductors in forest areas will cause only temporary and minimal crop losses.

48. The project is in a tribal area, as recognized by the sixth schedule of the Constitution of India, and administered by TTAADC. Impacts on indigenous people are mostly positive (e.g., better electricity supply) and indirect. Hence, the project is a general intervention for poverty reduction. Other potential negative impacts are expected to be minor and temporary, primarily noise and increased traffic during construction. The project does not involve any land acquisition or physical displacement, and no project lands are claimed as traditional lands by local communities. The project does not involve commercial development of any cultural resources. The project's EMP addresses community health and safety impacts.

49. As the impacts are mostly positive, and any potential adverse impacts stem from involuntary resettlement issues, a combined resettlement and indigenous peoples plan (RIPP) was prepared by TPGL and TSECL. RIPP preparation complied with national and state regulations and ADB's Safeguard Policy Statement. It assesses potential positive and negative impacts and provides mitigation actions for adverse impacts encountered during implementation. Beneficiaries, affected persons, the local community, representatives of indigenous people from TTAADC, and civil society from the Tripura Rural Livelihood Mission were consulted. TPGL and TSECL endorsed the RIPP, which was disclosed on ADB's website on 4 October 2022.

[49] Loan agreement (accessible from the list of linked documents in Appendix 2)

[50] TPGL and TSECL will appoint safeguard staff and engage project implementation consultants including consultants with expertise in environment, and health and safety. Environmental monitoring reports will be submitted as required by ADB. Since the project is category A project for environment, an external environmental monitor will be appointed.

G. Summary of Risk Assessment and Risk Management Plan

50. Significant risks and mitigating measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.[51]

Table 4: Summary of Risks and Mitigating Measures

Risks	Mitigation Measures
Significant delay in finalizing accounts leads to corresponding delays in filing truing-up petitions before TERC and disallowance of expenditure.	The project and technical assistance will assist in the preparation of timely and reliable financial statements to facilitate the process. TSECL and TPGL have shown substantial progress in this area. The project will also provide technical support for implementation of enterprise resource planning system and fixed assets management.
The financial viability of TSECL and TPGL is weak. Their financial position has been aggravated by challenges related to the coronavirus disease.	A comprehensive financial management action plan for improving the financial management and technical capabilities of TSECL and TPGL has been embedded in the project (paras. 13 and 23). The project will bring significant financial benefits by reducing generation costs, system losses, and operation and maintenance costs. It will also support implementation of the RDSS, the government's recent scheme for financial recovery of distribution sector.

RDSS = revamped distribution sector scheme, TERC = Tripura Electricity Regulatory Commission, TPGL = Tripura Power Generation Limited, TSECL = Tripura State Electricity Corporation Limited.
Source: Asian Development Bank.

IV. ASSURANCES

51. The Government of India, the state government of Tripura, TPGL, and TSECL have assured ADB that implementation of the project shall conform to all applicable ADB requirements, including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, financial management, and disbursement, as described in detail in the PAM and loan documents.

52. The Government of India, the state government of Tripura, TPGL, and TSECL have agreed with ADB on certain covenants for the project, which are set forth in the draft loan agreement and project agreement.

V. RECOMMENDATION

53. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve the loan of $220,000,000 to India for the Tripura Power Distribution Strengthening and Generation Efficiency Improvement Project, from ADB's ordinary capital resources, in regular terms, with interest to be determined in accordance with ADB's Flexible Loan Product; for a term of 20 years including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and project agreements presented to the Board.

Masatsugu Asakawa
President

18 October 2022

[51] Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

DESIGN AND MONITORING FRAMEWORK

Impacts the Project is Aligned with (i) Financial sustainability and resilience of power sector in Tripura improved (24X7 Power for All Tripura)[a] (ii) Energy security enhanced (State Action Plan on Climate Change)[b]			
Results Chain	**Performance Indicators**	**Data Sources and Reporting Mechanisms**	**Risks and Critical Assumptions**
Outcome Efficiency and reliability of power supply to consumers in Tripura improved.	By 2028: a. AT&C losses reduced to 28.5%[c] (2020 baseline: 39.5%) (OP 3.1) b. Generation efficiency of state-owned Rokhia power plant increased to 53% (2022 baseline: 26%) (OP 3.1) c. Average duration of outages in project areas with total of at least 100,000 households reduced to 256 hours/consumer/year (2019 baseline: 340 hours/consumer/year) (OP 2.1.4; OP 5.1)	a.–c. TSECL and TPGL project progress reports or annual reports	R: Wind speed and pressure beyond extra high wind zone[d] may damage the project installations.
Outputs 1. Generation capacity of Rokhia power plant increased.	By 2027: a. 120 MW Rokhia combined cycle gas turbine power plant, with climate proofing features[e] commissioned.[f] (2022 baseline: 63 MW open cycle gas turbine) (OP 3.1.3; OP 3.2.5; OP 5.1.1)	1a. TPGL project progress reports or annual reports	R: Increases in prices of equipment and materials exceed contingency and inflation forecasts, resulting in cost overruns and delays in project completion.
2. Distribution network strengthened, modernized, and climate proofed.[e]	a. 27 33/11 kV substations renovated and modernized or extended, and one distribution equipment test facility established (2021 baseline: 0) (OP 3.2.5; OP 5.1.1) b. (i). 1,560 km of medium-voltage (33 kV and 11 kV) distribution lines (new and upgrades) constructed with covered conductors (2021 baseline: 0) (OP 3.2.5; OP 5.1.1) (ii). 140 km of medium-voltage (33 kV and 11 kV) distribution lines (new and upgrades) constructed with underground cables (2021 baseline: 0) (OP 3.2.5; OP 5.1.1) (iii). 900 km of low-voltage existing and proposed distribution lines	2a.–d. TSECL project progress reports or annual reports	R: Unpredictable trajectory of coronavirus disease outbreak causes disruptions to project implementation.

Results Chain	Performance Indicators	Data Sources and Reporting Mechanisms	Risks and Critical Assumptions
	upgraded with aerial bunched cables (2021 baseline: 0) (OP 3.2.5; OP 5.1.1) c. (i). 150 units of medium-voltage feeders installed with auto-reclosures and sectionalizing devices (2021 baseline: 0) (OP 3.2.5; OP 5.1.1) (ii). 2,000 units of fault passage indicators installed in the medium-voltage overhead lines (2021 baseline: 0) (OP 3.2.5; OP 5.1.1) d. High-voltage distribution system pilot commissioned in one electricity subdivision (2021 baseline: 0) (OP 5.1.1) e. At least 200 residents (50% women) in tribal communities under the TTAADC project area reported increased knowledge on climate- and disaster-resilient infrastructure and safe use of electricity for household chores including cooking and energy conservation (2022 baseline: 0) (OP 2.5)	2e. Pre- and post-exit survey and/or training records.	
3. Smart meters and AMI established	a. Electromechanical meter of 100,000 existing households replaced with smart meter (2021 baseline: 0) b. Advanced metering infrastructure with online meter reading, billing, and collection for 100,000 smart meters established. (2021 baseline: 0)	3a.–b. TSECL project progress reports or annual reports	
4. Institutional capacity of utilities for planning, implementation, financial management, and gender mainstreaming improved	a. Distribution sector and renewable energy road maps completed and submitted by TSECL and TPGL to the Power Department for endorsement and publication (2021 baseline: Not prepared) b. Financial road map for the power sector completed and submitted by TSECL and TPGL to the Power Department for endorsement	4a.–c. Copy of distribution and financial road map, and gender-sensitive workplace policy submitted to the Power Department	

Results Chain	Performance Indicators	Data Sources and Reporting Mechanisms	Risks and Critical Assumptions
	(2021 baseline: Not prepared) (OP 6.2.3) c. Gender-sensitive workplace policy prepared and submitted by TSECL and TPGL to power department for endorsement. (2022 baseline: Not applicable) (OP 2.3.2) d. At least 100 staff of TSECL and TPGL (including at least 20 women staff) reported increased knowledge on (i) gender issues in risk mitigation strategies and social safeguards in power generation and distribution, and (ii) use and maintenance of sex-disaggregated data for provision of customer services. (2022 baseline: Not applicable) (OP 2.2, OP 6.1.1)	4d. Pre-and post-training assessment reports.	
5. Gender- and socially inclusive energy-based livelihood activities promoted	a. At least 150 women from 15 SHGs acquired certified skills in farm-based livelihood and business development[g] (2022 baseline: 0 women trained) (OP 2.2) b. At least 15 women SHGs received equipment for farm-based livelihood activities[h] (2022 baseline: 0 women SHGs received equipment) (OP 5.1)	5a. Skills certification awarded by Tripura Rural Livelihood Mission 5b. TSECL and/or TPGL project progress reports or annual reports	

Key Activities with Milestones

1. Generation capacity of Rokhia power plant increased

1.1. Begin tendering of generation efficiency packages (Q3 2022–Q4 2022)
1.2. Award contract for generation efficiency packages (Q1 2023–Q4 2023)
1.3. Undertake detailed survey and quantity estimates by contractor (Q4 2023–Q2 2024)
1.4. Construct generation efficiency packages (Q2 2024–Q2 2027)

2. Distribution network strengthened, modernized, and climate proofed

2.1. Begin tendering of distribution network packages (Q2 2021–Q1 2022)
2.2. Award contract for distribution network packages (Q2 2022–Q4 2022)
2.3. Undertake detailed survey and quantity estimates by contractor (Q3 2022–Q1 2023)
2.4. Construct distribution network packages (Q1 2023–Q1 2027)

3. Smart meters and AMI established

3.1. Begin tendering of smart meter and AMI packages (Q4 2022)
3.2. Award contract for smart meter and AMI packages (Q1 2023–Q3 2023)
3.3. Undertake detailed survey and quantity estimates by contractor (Q2 2023–Q3 2023)
3.4. Install and integrate smart meter and AMI infrastructure (Q3 2023–Q4 2025)

4. Institutional capacity of utilities for planning, implementation, financial management, and gender mainstreaming improved

4.1 Begin recruitment of consulting firm for implementation support (Q2 2022–Q3 2022)
4.2 Prepare submission 1 for consulting firm for implementation support (Q3 2022–Q4 2022)

Key Activities with Milestones

4.3 Begin recruitment of consulting firms for organizational capacity assessment of TSECL, technical (distribution sector and renewable energy), and financial road map (Q3 2022–Q4 2022)
4.4 Prepare submissions 2 and 3 for consulting firm for implementation support (Q4 2022–Q1 2023)
4.5 Prepare submission 1 for consulting firms for organizational capacity assessment of TSECL, technical (distribution sector and renewable energy), and financial road map (Q4 2022–Q1 2023)
4.6 Prepare submissions 2 and 3 for consulting firm for organizational capacity assessment of TSECL, technical (distribution sector and renewable energy), and financial road map (Q1 2023–Q2 2023)

5. Gender- and socially inclusive energy-based livelihood activities promoted

5.1 Recruit consultants to support awareness activities, needs assessment, and livelihood activities (Q3 2022–Q1 2023)
5.2 Begin shopping for items to support awareness activities, needs assessment, and livelihood activities for women SHGs (Q1 2023–Q3 2023)
5.3 Monitor the livelihood activities with the support of consultants and Tripura Rural Livelihood Mission (Q3 2023–Q2 2025)

6. Administrative tasks

6.1 Prepare and submit quarterly progress reports to ADB (Q3 2022–Q4 2027)
6.2 Prepare and submit audited project financial statements and audited entity financial statements to ADB (Q3 2023–Q4 2027)

Project Management Activities

Procurement plan key activities to procure contract packages (Q1 2021–Q4 2023)
Consultant selection procedures (Q2 2022–Q2 2023)
Environmental management plan and gender action plan key activities (Q1 2022–Q2 2027)
Communication strategy key activities (Q2 2022–Q1 2027)
Annual and/or midterm review (Q1 2023–Q3 2027)
Project completion report (Q4 2028)

Inputs

ADB: $220.0 million (regular ordinary capital resources loan)
Government: $57.4 million

ADB = Asian Development Bank, AMI = advanced metering infrastructure, AT&C = aggregate technical and commercial, km = kilometer, kV = kilovolt, MW = megawatt, OP = operational priority, Q = quarter, SHG = self-help group, tCO_2e = ton of carbon dioxide equivalent, TPGL = Tripura Power Generation Limited, TSECL = Tripura State Electricity Corporation Limited, TTAADC = Tripura Tribal Areas Autonomous District Council.

[a] Government of India and Government of Tripura. 2016. *24X7 Power for All.* Delhi.
[b] Government of Tripura. Department of Science, Technology & Environment. 2011. *State Action Plan on Climate Change*. Agartala.
[c] The AT&C loss reduction from 39.5% to 28.5% is only from the ADB project intervention. The state has submitted its proposal and finance requirements to participate in the revamped distribution sector scheme. Hence, the ADB project together with the revamped distribution sector scheme interventions will help TSECL achieve the AT&C loss target of 15%.
[d] Extra high wind zone refers to wind speed up to 55 meters per second and wind pressure up to 960 Newtons per square meter.
[e] Includes civil design and its associated facilities of combined cycle power plant, underground cabling, covered conductors, auto-reclosures, fault passage indicators, strengthening distribution structures, hermetically sealed transformers, high fault rating insulators, and lightning arresters to withstand extreme weather.
[f] TPGL will decommission the existing 63 MW open cycle gas turbines after the commissioning of the 120 MW CCGT power plant. Though the decommissioning of the existing power plant is not within the scope of ADB project, loan covenants are included to ensure government's commitment.
[g] Includes training in certified skills (based on needs assessment) for livelihood generation activities and business development skills (market links and access to finance and credit) to develop and operate energy-based microenterprises.
[h] The equipment for farm-based activities will be identified based on needs assessment.

Contribution to Strategy 2030 Operational Priorities

Expected values and methodological details for all OP indicators to which this operation will contribute results are detailed in Contribution to Strategy 2030 Operational Priorities (accessible from the list of linked documents in Appendix 2). In addition to the OP indicators tagged in the design and monitoring framework, this operation will contribute results for
OP 6.1: Entities with improved management functions and financial stability of entities (2)
Source: Asian Development Bank.

LIST OF LINKED DOCUMENTS

http://www.adb.org/Documents/RRPs/?id=51308-009-3

1. Loan Agreement
2. Project Agreement
3. Sector Assessment (Summary): Energy
4. Project Administration Manual
5. Economic and Financial Analysis
6. Summary Poverty Reduction and Social Strategy
7. Risk Assessment and Risk Management Plan
8. Contribution to Strategy 2030 Operational Priorities
9. Climate Change Assessment
10. Climate Risk and Adaptation Assessment
11. Gender Equality and Social Inclusion Action Plan
12. Environmental Impact Assessment
13. Initial Environmental Examination
14. Combined Resettlement and Indigenous Peoples Plan

Supplementary Documents

15. Sector Assessment
16. Supplementary Economic Analysis
17. Supplementary Financial Analysis
18. Alignment of Project with Mitigation of the Paris Agreement
19. Financial Management Assessment Report
20. Gender Analysis Report
21. Project Alignment with ADB's 2021 Energy Policy