

Executive Summary

1. This standalone Project will be financed by a sovereign loan to the Republic of India, with an AIIB financing amount of USD140.61 million. The objective of the project is to improve the reliability, capacity and security of the power transmission network in the State of Assam. The Assam Electricity Grid Corporation Limited (AEGCL), as well as the State of Assam will serve as the Project Implementing Entity, and implementation is scheduled from January 1, 2026, to December 31, 2029.

2. AIIB supports Assam's transmission sector through a carefully structured, programmatic lending model in partnership with AEGCL. The first phase of the Assam Intra-State Transmission System Enhancement Project (P000302) was approved in 2021. As of November 2025, the project has reached approximately 50 percent physical completion, and remains on schedule for completion by April 2027.

3. This Project constitutes the second and final phase of the overall program. There will be no carryover of activities between Phase 1 and Phase 2. This phase aims to further strengthen the power grid by addressing areas with existing power deficits and supporting the development of emerging industrial corridors. Investments will also prioritize the integration of renewable energy generated from new solar and wind power plants. In addition, the project will enhance the technical capabilities of the local workforce through targeted training programs and implement climate adaptation measures that align with AIIB's sustainability commitments.

4. Beyond financing, AIIB's involvement will enhance the project by ensuring its preparation and implementation follow international best practices. This includes promoting cost-effectiveness, supporting sustainable investments, and maintaining high standards of governance and fiduciary oversight. AIIB's participation will also build AEGCL's institutional capacity and improve overall project quality through the adoption of international environmental and social standards and best practices. Additionally, AIIB will strengthen AEGCL's procurement processes by improving documentation quality, encouraging greater competition, and securing better value for money in accordance with AIIB's procurement policy. Together, these actions will not only elevate the current project's quality but also enhance AEGCL's capability in designing and implementing future projects, ultimately delivering significant benefits to the member.

Project No. and Name	P000862 Assam Intra State Transmission System Enhancement Project Phase II		
AIIB Member	India		
Borrower	Republic of India		
Guarantor	Not Applicable		
Project Implementation Entity	Assam Electricity Grid Corporation Limited; State of Assam, India		
Proposed Amount of AIIB Financing (USDm)	USD140.61	Instrument type (Instrument subtype)	Loan (Direct Sovereign)
		Currency of financing requested	US Dollar
Sector (Subsector)	Energy (Electricity transmission and distribution)	E&S Category and Comments (if any)	B
Project Objective	To improve the reliability, capacity and security of the power transmission network in the State of Assam.		
Project Description	<p>To strengthen the reliability, capacity, and security of Assam's power transmission network, and following a request from the Borrower, AIIB adopted a programmatic approach in 2019. AEGCL, the state's sole transmission utility overseeing the operation, maintenance, and development of Assam's high-voltage power transmission grid, serves as the implementing entity for this program.</p> <p>The first phase of the program, the Assam Intra-State Transmission System Enhancement Project (P000302), was approved in 2021 with AIIB financing of USD304 million and is currently under implementation. The proposed project constitutes the second and final phase of the program, with planned AIIB financing of USD140.61 million. This phase aims to further increase the system's transmission capacity, enabling the grid to accommodate higher loads, reduce congestion, and lower the risk of outages. Additionally, the expanded network will facilitate the integration of renewable energy, supporting Assam's clean energy objectives.</p> <p>Key activities planned under this phase include:</p> <ul style="list-style-type: none"> • Construction of six new high-voltage grid substations with a combined capacity of 870 MVA, along with approximately 128 km of associated transmission lines. • Engagement of consultant to support implementation of the 		

	project, and capacity building for AEGCL employees through targeted training programs in priority technical areas.		
Implementation Period	Start Date: January 01, 2026 End Date: December 31, 2029	Expected Loan Closing Date	April 30, 2030
Co-financing type	Standalone	Following other Financier's E&S Policy?	No
Lead financier		Following other Financier's Procurement Policy?	No
Financing Plan	Total Project Cost: USD171.48 million; AIB: USD140.61 million; State of Assam: USD30.87 million		
Policy Assurance	The Vice President, Policy and Strategy, confirms an overall assurance that the proposed Bank Financing complies with the applicable Bank operational policies.		

Risk	
Key Risks	Mitigation Measures
AEGCL's capacity to perform and review technical design	While AEGCL initially faced challenges in developing technical designs for certain Phase 1 activities, these issues have been resolved. The required substation and tower designs, compliant with IS 802:2015 standards, are now readily available. The PMC will provide additional capacity and support to further strengthen design and implementation efforts.
AEGCL's institutional capacity to implement the project	AEGCL has a proven track record in implementing MDB-supported projects. The AIB-financed Phase 1 is in progress and scheduled for completion by April 2027. The same PMU will oversee Phase 2, with AIB providing ongoing support and monitoring through regular implementation support missions.
Efficient management of procurement packages to minimize performance and contract management issues	The PMU is staffed with personnel possessing sufficient technical and managerial expertise to oversee contract implementation. Additional support and expert guidance from the PMC are expected to strengthen contract management and reduce the risk of disputes.

ES implementation capacity of new PMC to prepare and submit ES instruments prior to commencement of construction works	The PMU is supported by ES officers with experience in AIIB's ESF, and the new PMC will include qualified ES experts. AIIB's ES team will continue to provide implementation support to further strengthen project ES capacity and ensure compliance with all ES requirements.
Project completion without time and cost overrun	Lessons learned from Phase 1 implementation are expected to strengthen AEGCL's capacity to deliver Phase 2 on schedule.
Timely and adequate release of funds and timely submission of project audit reports	State government/AEGCL shall ensure that the adequate funds are released to PMU on a timely basis. PMU shall ensure timely hiring of the auditors in consultation with AIIB.
Timely land availability for construction	Five substation sites have been secured. Three sites are owned by AEGCL, and the remaining two sites have been procured from private owners. For Package E, there are two alternative sites for the sixth substation. The site selection will be finalized by Q1 2026.
Economic Capital (Ecap) Consumption	9.11USDm 6.48%

Strategic Alignment				
Alignment with AIIB's thematic priorities		Green infrastructure; Technology-enabled Infrastructure		
Alignment with AIIB's strategies		Sustainable Energy for Tomorrow Strategy		
Key Outcomes	Indicator	Unit of measure	Baseline (Year)	Target (Year)
Electricity transmission and distribution	Primary energy consumption saved	GWh	0 (2024)	2.00 (2029)
Electricity transmission and distribution	Total T&D capacity added	Megavolt-amperes	0 (2024)	870 (2029)
Electricity transmission and distribution	Length of transmission lines constructed	Kilometers	0 (2024)	128 (2029)

Other Key Financing Requirements	
Conditions of Effectiveness	No additional conditions
Key Conditions for 1st Disbursement	NA
Key Covenants	NA

President	Liqun Jin
Chief Investment Officer	Kim-See Lim
Director General	Rajat Misra
Project Team Leader	Pratyush Mishra, Senior Investment Officer
Project Team Members	Eleni Petri, Climate Specialist Partha Protim Nath, Co-PTL Md Kutub Uddin Bakhtiar Sohag, Economics Officer Jaya Ketaren, Environment Specialist David Hartcher, Finance Officer Yogesh Malla, Financial Management Specialist Chandra Mishra, Procurement Specialist Kezia Paladina, Project Lawyer Charlene d'Almeida, Social Development Specialist



**ASIAN INFRASTRUCTURE
INVESTMENT BANK**

Sovereign-backed Financings

Project Document

**P000862 India: Assam Intra State Transmission System Enhancement Project
Phase II**

Currency Equivalents

As of July 14, 2025

Currency Unit – Indian Rupee (INR)

USD 1.00 = INR 85.98

Fiscal Year

April 1 – March 31

Abbreviations

AEGCL	Assam Electricity Grid Corporation Limited
AIB	Asian Infrastructure Investment Bank
AIS	Air Insulated Substation
CESMP	Construction Environmental and Social Management Plan
CGM	Chief General Manager
CO ₂	Carbon dioxide
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
ES	Environmental and Social
ESIA	Environmental and Social Impacts Assessment
ESMP	Environmental and Social Management Plan
ESMPF	Environmental and Social Management Planning Framework
ESP	Environmental and Social Policy
ESS	Environment and Social Standards
FIRR	Financial Internal Rate of Return
FM	Financial Management
FNPV	Financial Net Present Value
GBV	Gender-based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Gas Insulated Substation
GRM	Grievance Redress Mechanism
IP	Indigenous People
IUFR	Interim Unaudited Financial Report
MDB	Multilateral Development Bank
O&M	Operations and Maintenance
OHS	Occupational Health and Safety
PAA	Paris Agreement Alignment
PDS	Project Delivery Strategy
PIE	Project Implementing Entity
PMC	Project Management Consultant
PMU	Project Management Unit
PP	Procurement Plan
PPM	Project-affected People's Mechanism
PPMS	Project Procurement Management System
RE	Renewable Energy
RPF	Resettlement Planning Framework
SCADA	Supervisory Control and Data Acquisition
WACC	Weighted Average Cost of Capital

Table of Contents

1. Context	1
2. Rationale.....	6
3. Project Description	9
4. Project Assessment	13
A. Technical.....	13
B. Economic and Financial Analysis	15
C. Fiduciary and Governance	16
D. Environmental and Social.....	19
E. Climate Change.....	24
F. Gender Aspects.....	25
G. Operational Policy on International Relations	26
H. Risks and Mitigants	26
Annex 1: Results Monitoring Framework.....	28
Annex 2: Economic and Financial Analysis	29
Annex 3: Paris Agreement Alignment and Climate Finance	37
Annex 4: Country Credit Fact Sheet.....	44

1. Context

Country and Macroeconomic Overview

1.1. India is a lower-middle-income economy with a gross domestic product (GDP) per capita of USD2,700 and a population of about 1.4 billion¹. The fiscal deficit widened significantly to 12.8% of GDP in FY2020 due to the COVID-19 pandemic but has since moderated as the economy gradually recovers. India maintains a BBB- credit rating with a stable economic outlook². Public debt remains sustainable, as it is mostly denominated in domestic currency and has long-term maturities. India's future economic growth depends on continued investment in high-quality, sustainable infrastructure to support its expanding economy and young labor force.

Sector Overview

1.2. **Growing Electricity Demand.** India's rapid economic growth, urbanization, and industrial diversification are driving a steady increase in demand for reliable, affordable, and clean electricity. As the world's third-largest energy consumer, India must invest significantly in expanding and modernizing its infrastructure to meet these needs. According to the Global Infrastructure Outlook (Oxford Economics, 2017), India is projected to require about USD4.5 trillion in infrastructure investment between 2015 and 2040, with more than half allocated to the power sector. This scale of investment highlights the essential role of robust power infrastructure in supporting India's economic growth and social development.

1.3. **Consumption Patterns and Projections.** Over the past decade, total annual national electricity consumption increased from 874,209 gigawatt-hours (GWh) to 1,403,400 GWh, representing a compound annual growth rate (CAGR) of 5.4%³. This robust increase is driven by rapid industrialization, expansion of modern service sectors, and policy-focused rural electrification programs. India's annual per capita electricity consumption in FY2023 was 1.33 megawatt-hours (MWh), less than half the global average⁴. This underscores both the progress made and the significant potential for further growth and improved access to reliable services. Looking ahead, India is projected to lead the world in primary energy demand growth through 2040, according to the International Energy Agency⁵. This trend is propelled by rising incomes, changing consumption patterns, and policies that support manufacturing-oriented economic transformation

1.4. **Policy Response and Grid Development.** The Government of India has proactively responded to increasing energy demands by prioritizing energy security, accelerating renewable energy (RE) deployment, and modernizing the transmission grid. The 2024 National Electricity Plan outlines an ambitious target to add approximately 497,855 megavolt-amperes (MVA) of transmission capacity between 2027 and 2032. This expansion is vital for integrating RE sources, supporting the growth of new industrial clusters, and ensuring efficient, secure, and reliable electricity delivery across the nation. As both public and private

¹ The income group classification is based on World Bank criteria. Data from WEO, April 2025

² Fitch - August 2024

³ Consumption of Energy Resources - Ministry of Statistics and Programme Implementation, India

⁴ India Climate and Energy Dashboard: NITI Aayog

⁵ India to be largest source of energy demand growth to 2040: IEA (Report by Reuters)

investments intensify, adopting innovative grid technologies and enhancing energy storage capabilities will be essential to achieving a resilient, lower-carbon electricity system.

1.5. Access and Sustainability Focus. While electricity availability has improved significantly across India, certain regions, particularly peri-urban and remote areas, continue to experience shortages and affordability challenges. Enhancing the quality and reliability of electricity supply remains a key priority. Equally important is promoting environmentally sustainable practices to support responsible growth. The Asian Infrastructure and Investment Bank (AIIB) is committed to addressing these challenges by advancing projects that meet increasing demand while aligning with India's climate goals and sustainable development commitments.

Regional Context: Assam's Power Sector

1.6. Demand Growth and Economic Potential. Assam, in Northeast India, is recognized for its ecological diversity, complex terrain, distinct culture, and rising economic prospects. Electricity demand in Assam is projected to grow at a CAGR of 6.04% during 2024-25 to 2031-32 (20th Electric Power Survey of India, December 2024), outpacing national averages. This growth is driven by expanding urban centers, industrial development, and ongoing efforts to support the state's economic transformation.

1.7. Renewable Energy Targets and Grid Strengthening. The State Government of Assam, through its Integrated Clean Energy Policy, 2025, aims to establish the state as a key RE hub with a target of 11.7 GW of renewable capacity by 2030. Key allocations include 3,000 MW ground-mounted solar, 1,900 MW rooftop solar, 2,000 MW pumped storage hydro, 1,000 MW battery storage, 3,000 MW solar manufacturing capacity, and 2,000 MWh battery manufacturing ⁶. The remaining capacity includes floating solar, wind, small hydro, biomass/waste-to-energy, off-grid solar, biofuels, and electric vehicle charging stations. Achieving these goals requires substantial investment in modernizing transmission infrastructure, strengthening grid management, and enhancing the technical capacity to integrate variable renewable generation sources such as solar and wind.

1.8. Geographic and Infrastructure Challenges. Assam's geography, characterized by rivers, dense forests, and hilly regions, presents technical and operational challenges for reliable electricity transmission. Tailored solutions are needed to overcome these hurdles and ensure dependable power supply supporting local communities and industries. These efforts align with India's broader development objectives emphasizing sustainability and inclusiveness, enabling economic growth while preserving natural ecosystems.

1.9. Partnerships Driving Clean Energy. Strategic partnerships involving AIIB, the World Bank, and other development agencies are advancing Assam's clean energy transition. Upgrading transmission capacities sets a strong foundation for economic growth and job creation, facilitating the expanded use of low-carbon energy. This enhanced infrastructure will also build resilience against the impacts of climate change, improving Assam's long-term energy security.

⁶ Integrated Clean Energy Policy, 2025 - https://www.apdcl.org/website/docs/acts_and_rules/Assam_%20ICEP_2025.pdf

1.10. Key Institutions of Assam Electricity Sector. The evolution of Assam’s electricity sector has established a strong institutional foundation to meet the state’s targeted goals. Until 2004, the Assam State Electricity Board (ASEB) was the sole entity responsible for generation, transmission, and distribution of electricity. To improve operational efficiency and service delivery, the state unbundled ASEB into three independent state-owned companies: Assam Power Generation Corporation Ltd. (APGCL), Assam Electricity Grid Corporation Ltd. (AEGCL), and Assam Power Distribution Company Ltd. (APDCL). Each entity focuses on a specific segment of the electricity value chain, enabling targeted investment and capacity building. This institutional reform has enhanced the sector’s ability to address growing demand and modernize infrastructure effectively.

1.11. Transmission Utility Company of Assam. AEGCL, the sole transmission utility of the State of Assam, is essential for the efficient and reliable delivery of electricity in the region. As of April 2025, AEGCL operates 4,443 kilometers (km) of Extra High Voltage (EHV) transmission lines across voltage levels ranging from 132 kV to 400 kV. It manages a total of 82 substations, including one at 400 kV, 14 at 220 kV, and 67 at 132 kV, with a cumulative capacity of 10,005 MVA⁷. Serving as the backbone of Assam’s power system, AEGCL is playing a critical role in strengthening the transmission infrastructure, meeting rising electricity demand, and facilitating the integration of RE sources, aligning Assam’s clean energy goals.

AIIB’s Support: Assam Transmission Projects

1.12. Addressing Key Development Challenges: Project Contributions. AIIB supports Assam’s transmission sector through a carefully structured, programmatic lending model in partnership with AEGCL. The Assam Intra-State Transmission System Enhancement Program comprises two investment phases with a combined value of USD444.61 million. This phased approach maximizes operational efficiency and cost-effectiveness while addressing the state’s specific transmission constraints.

1.13. Phase 1 Project. The first phase of the Assam Intra-State Transmission System Enhancement Project (P000302) was approved in 2021 with AIIB financing of USD304 million. As of September 2025, the project has reached approximately 50% physical completion. Initial challenges related to procurement and site access have been successfully addressed. The project remains on schedule for completion by April 2027. Key deliverables include the construction of 10 new substations, upgradation of 15 existing substations, and the integration of digital asset management systems to improve grid reliability and reduce outages. The project is progressing well toward achieving its intended development objectives.

1.14. Phase 2 Planned Expansion. This project constitutes the second and final phase of the overall program. There will be no carryover of activities between Phase 1 and Phase 2. This phase aims to further strengthen the power grid by addressing areas with existing power deficits and supporting the development of emerging industrial corridors. Investments will also prioritize the integration of RE generated from new solar and wind power plants. In addition, the project will enhance the technical capabilities of the local workforce through targeted training programs and implement climate adaptation measures that align with AIIB’s sustainability commitments.

⁷ AEGCL’s Project Planning and Development Wing

2. Rationale

2.1. **Project Objective.** The project objective is to improve the reliability, capacity and security of the power transmission network in the State of Assam.

2.2. **Expected Beneficiaries.** The project is expected to benefit about 1.6 million people in the project area, including around 770,000 women⁸. By reducing load shedding, the project will improve the reliability of electricity supply, enabling households and businesses to enhance their economic, commercial, educational, and entertainment opportunities.

2.3. **Expected Results.** The project is expected to improve the transmission network and reduce transmission losses. The key results will be measured and monitored using the following indicators (Annex 1):

- Primary energy consumption saved (GWh).
- Total Transmission and Distribution (T&D) capacity added (MVA).
- Annual CO₂ emissions reduction after project completion (tCO₂e per year).

2.4. **Strategic Fit for AIIB.** The project is fully aligned with AIIB's corporate strategy: Financing Infrastructure for Tomorrow (June 2025), which advances sustainable, resilient, and future-ready infrastructure. By enhancing the delivery, reliability and efficiency of the power supply while reducing emissions, the project supports AIIB's commitment to economic, social and environmental sustainability. Additionally, the project is consistent with AIIB's Energy Sector Strategy: Sustainable Energy for Tomorrow and is aligned with three of the six principles of the strategy. The principal benefits of the project align with Principle 1: Promote energy access and security by enhancing the strength of transmission infrastructure and improving the reliability of electricity supply, and Principle 3: Improving energy efficiency by reducing losses in the transmission system. The project is also expected to support Principle 2: Support transition to a clean energy system by supporting transition from diesel generation to grid electricity due to new connections and improved quality of power supply that will enable the removal of back-up power. Modernizing power grid infrastructure is recognized in the strategy as vital for promoting connectivity and advancing progress toward Sustainable Development Goal 7 (SDG7), ensuring access to reliable, sustainable, and modern energy by 2030. Through the project, AIIB supports improvements in electricity reliability and quality for productive and societal needs, while making operational efficiency gains across the power supply chain.

2.5. The project supports AIIB's thematic priorities of Green Infrastructure and Technology-enabled Infrastructure. On the Green Infrastructure front, the design incorporates features that support climate mitigation and adaptation, helps to reduce system losses, and drives down carbon emissions in the project area. In line with the priority of Technology-enabled Infrastructure, the project includes advanced technical solutions such as Supervisory Control and Data Acquisition (SCADA) systems, Remote Terminal Units, Intelligent Electronic Devices, substation automation standards (IEC 61850), and digital protection and control systems. While these technologies are increasingly common globally, their deployment in Assam

⁸ AEGCL's Project Planning and Development Wing - July 2025

represents a step-change from conventional, largely manual systems to modern, automated, and remotely monitored operations⁹. This transition strengthens operational efficiency, enhances reliability, reduces outage response time, and positions the network to integrate future innovations, thereby reinforcing the project's alignment with the Technology-enabled Infrastructure thematic priority.

2.6. Paris Agreement Alignment (PAA) and Climate Finance. In line with the AIIB methodology for assessing the alignment with the mitigation and adaptation goals of the Paris Climate Agreement, the project is assessed as aligned. All project components, focused on electricity transmission, substations, and grid strengthening, are listed under the Joint Multilateral Development Bank (MDB) methodology's universally aligned activities for climate mitigation. The project has undergone a detailed climate risk screening and integrates targeted adaptation measures to address material hazards such as flooding, extreme heat and high wind or cyclone risks. These measures are consistent with India's Nationally Determined Contribution (NDC) (2022) and the Assam State Action Plan on Climate Change (SAPCC 2024), ensuring resilience of energy infrastructure. As such, the project is considered aligned with the Paris Agreement's adaptation goals. In line with the Joint MDB methodology for tracking mitigation finance, it is estimated that USD125.73 million of the AIIB financing will contribute to support mitigation; in line with the Joint MDB methodology for tracking adaptation finance, it is estimated that USD5.21 million of the AIIB financing will contribute to support adaptation. The total climate finance amounts to USD130.94 million, representing 93.11% of AIIB financing. Annex 3 contains detailed information regarding the assessment.

2.7. Value Addition by AIIB. Beyond financing, AIIB's involvement will enhance the project by ensuring its preparation and implementation follow international best practices. This includes promoting cost-effectiveness, supporting sustainable investments, and maintaining high standards of governance and fiduciary oversight. AIIB's participation will also build AEGCL's institutional capacity and improve overall project quality through the adoption of international environmental and social (ES) standards and best practices. Additionally, AIIB will strengthen AEGCL's procurement processes by improving documentation quality, encouraging greater competition, and securing better value for money in accordance with AIIB's procurement policy. Together, these actions will not only elevate the current project's quality but also enhance AEGCL's capability in designing and implementing future projects, ultimately delivering significant benefits to the member.

2.8. Value Addition to AIIB. India's ambitious goal to provide clean, reliable, and affordable power to all citizens is expected to inspire similar projects across other states. The successful completion of the Phase 1 project, together with this project, will strategically position AIIB for follow-on investments in India's power sector and broader infrastructure sectors, based on a proven partnership model. Moreover, this project will enable AIIB to further deepen its expertise and enhance its understanding of India's power sector. It will also strengthen AIIB's capacity to support clients in adhering to international standards for ES management, financial management (FM), and procurement.

⁹ Under the directive of Central Electricity Authority (CEA), AEGCL is integrating the SCADA system throughout the transmission network system in Assam: Technical Standards for Construction of Electrical Plants and Electric Lines – 43(4) CEA

2.9. **Lessons Learned.** The project design draws on experience from the ongoing Phase 1 project and insights gained from other AIIB-financed projects in both India and around the globe. Key lessons that have informed current planning include:

- Assigning project management responsibility to the same project management unit (PMU) overseeing Phase 1. This approach aims to avoid previous challenges such as delays in technical design readiness and in the preparation of ES and FM documentation.
- Ensuring that most of the (five out of six substation sites) land acquisition related activities have been completed and that around 90% of procurement packages (amount-wise) have been awarded, thereby improving the project's implementation readiness¹⁰.
- Engaging a project management consultant (PMC)¹¹ at the start of implementation to provide strong support for implementation and monitoring activities¹².
- Maintaining sufficient ES personnel within the PMU to guarantee effective management and compliance with ES safeguard requirements. and
- Employing web-based monitoring tools to track project progress in real time, thereby improving transparency, operational efficiency, and oversight throughout the project lifecycle.

¹⁰ Exceeds Gol's project readiness criterion of 50% land acquisition

¹¹ A separate firm from the Phase 1 PMC will act as an external consultant and deploy 13 experts, including specialists in substations, transmission lines, contracts, civil works, environment, social, SCADA, and finance. In addition, the Phase 2 PMC will deploy 24 support staff to strengthen overall implementation capacity. Reporting directly to the Project Director, the PMC will be responsible for delivering consulting services and supporting the PMU across all project activities, including ES, contract and project management

¹² In line with Gol's project readiness criterion and other AIIB financed projects in India

3. Project Description

3.1. AEGCL is implementing an electrification program aimed at strengthening Assam's existing intrastate transmission network. The program focuses on augmenting the current infrastructure with new networks to deliver affordable, secure, efficient, and reliable 24-hour-seven-days-a-week power supply. This initiative is critical to advancing Assam's long-term energy sustainability. The program is structured in two phases, with Phase 1 currently under implementation¹³.

3.2. **Components.** Phase 2 (the project) comprises the following components:

- **Component A:** Constructing six new high-voltage grid substations with a combined capacity of 870 MVA and approximately 128 km of associated transmission lines.
- **Component B:** Engaging a PMC to support implementation of the project, and capacity building for AEGCL officials by providing focused training on key areas identified as technical priorities, including High Voltage Transmission Design (132 kV and above); Substation Design, Layout, and Equipment Specification; and Transmission System Loss Reduction Techniques.

3.3. Cost and Financing Plan

Table 1: Cost and Financing Plan

Item	Project Cost (USDmn)	Financing Amount (USDmn) and % of Financier's Total Financing			
		AIBB*		State of Assam	
		Amount	%	Amount	%
Component A	152.62	125.15	89.00%	27.47	89.00%
Construction of substation and transmission line		125.15	-	27.47	-
Component B	4.66	4.66	3.31%	-	0.00%
PMC Contract		4.08	-	-	-
Training for Capacity Building		0.58	-	-	-
Contingency	14.20	10.81	7.68%	3.39	11.00%
Total Project Cost	171.48	140.61 (82%)		30.87 (18%)	

Note: Counterpart funds (State of Assam) have been made available through an Administrative Approval¹⁴ from the Power (Electricity) Department of the Government of Assam and will be utilized mostly for the tax payments, compensation for tower footing area and Right of Way (RoW), and other general administrative expenses.

* The expenditure to be covered by AIBB are inclusive of taxes

Implementation Arrangements and Readiness

3.4. **Implementation Arrangements.** AEGCL, a state public sector utility under the Power (Electricity) Department of the State Government of Assam, will serve as the Project

¹³ P000302 Assam Intra State Transmission System Enhancement Project

¹⁴ Approved Number: AA/pe_2025-26(l)_223

Implementing Entity (PIE) along with the State of Assam. With ample experience in managing MDB funded projects and familiarity with development partners' (especially AIIB) requirements, AEGCL is well positioned to support this initiative.

3.5. Project Management Unit (PMU). The PMU, initially established within AEGCL for Phase 1 project, will continue its role for Phase 2. The PMU is led by the Project Director, who concurrently holds the position of Chief General Manager (CGM). The PMU will comprise a multi-tiered management structure including one General Manager, two Deputy General Managers, and five Assistant General Managers. These officers will be responsible for project execution, procurement, contract management, technical supervision, FM and ES compliance. The management team will be further supported by nine Deputy or Assistant Managers, four ES Officers, and two Junior Managers. Additionally, financial oversight is provided by the CGM (Finance & Accounts), who leads a team of four officers within the Finance and Accounts Department, dedicated for Phase 1 project and this project. This team ensures compliance with fiduciary requirements and timely disbursement of funds. AEGCL's institutional experience, established organization structure, and dedicated staffing resources will collectively underpin its capacity to deliver the project efficiently and in accordance with AIIB's operational standards.

3.6. Procurement Arrangements. Procurement of goods, works, and services contracts financed wholly or partly by the AIIB loan will be conducted in accordance with AIIB's Procurement Policy (June 26, 2024) as well as its associated Directive on Procurement Instructions for Recipients (PIR, July 26, 2024). As AEGCL is a state-owned entity, the procurement provisions under the relevant provisions under Section 2, Procurement by Public Entities of the PIR shall apply. These include the general considerations applicable to procurement by public entities, as well as the specific provisions for procurement of goods, works and non-consulting services, and the selection of consulting services by public entities. In line with AIIB procurement policy requirements, all procurement-related documents and contract management data must be uploaded to the AIIB Project Procurement Management System (PPMS).

3.7. Project Delivery Strategy (PDS) and Procurement Plan (PP). The PMU is responsible for the procurement and contract management activities under the project. The PIE has prepared a PDS and a PP, both approved by the AIIB. These documents detail the procurement arrangements, including contract packaging, cost estimates, selection of tender documents, procurement methods, review procedures, and procurement timelines. The PDS and PP will serve as the framework for all project procurement activities. Any revisions to these documents during project implementation will be submitted to AIIB for review and clearance prior to execution.

3.8. Advance Procurement and Retroactive Financing. Any project activities classified as advance procurement or retroactive financing must comply with the requirements of AIIB's procurement and ES policies. Retroactive financing of up to 20% of the loan is available for eligible expenditures incurred not more than 12 months prior to the date of the Loan Agreement. AIIB has reviewed the tender documents for three works contracts (for five substations), perused the tender evaluation, and issued no-objection for contract signing. AEGCL signed these three contracts in July 2025. AIIB has also cleared the draft negotiated contract for the PMC and AEGCL has signed this contract in September 2025.

3.9. FM Arrangements. The PMU will be responsible for the overall project FM. The PMU shall be staffed with additional qualified finance and accounts personnel, responsible for maintaining acceptable levels of project FM. The financial progress of the project will be reported on a quarterly basis through Interim Unaudited Financial Reports (IUFs), within 45 days from the end of each fiscal quarter. The project financial statements will be prepared on a cash basis and will be audited by an independent chartered accountant firm.

3.10. ES Arrangements. The PMU will oversee the management of ES risks and impacts associated with the project, while the PMC will primarily support (i) preparation of the Environmental and Social Impact Assessments (ESIAs), Environmental and Social Management Plans (ESMPs), and Resettlement Action Plans, as required, for each subproject; (ii) monitoring and supervising contractors in the implementation of Construction Environmental and Social Management Plans (CESMPs); and (iii) reporting to the PMU on the ES performance of subprojects. In addition to the ES staff of the PMU, the PMC will be supported by one environmental expert, one social expert, and one health and safety expert. The PMC will be supervised by the PMU. The subproject's relevant ES documents will be submitted for review to the Bank and will be disclosed before the commencement of construction.

3.11. Implementation Period. The project is expected to be implemented from January 1, 2026, to December 31, 2029.

Implementation Readiness

3.12. Detailed Project Report Approval and Feasibility Study. The project preparation is now at an advanced stage. The Detailed Project Report (DPR) and the feasibility study report covering the entire program, including Phase 1 project and this project, received approval in 2019. The Environmental and Social Management Planning Framework (ESMPF) and the technical feasibility analyses specific to this project were completed in July 2024. The project scope was finalized based on available funding, considering allocations for Phase 1 and the findings of the technical feasibility study and updated analyses. As per the revised scope, AEGCL has updated the ESMPF in September 2025.

3.13. Procurement Readiness. The project consists of five packages: four for works and one for consultancy services. AIIB has issued no-objection for the award of three works packages, valued at approximately USD124 million (with proposed AIIB financing of USD102 million). AEGCL signed these three contracts in July 2025. For the consultancy package covering the PMC, the draft negotiated contract has been cleared by AIIB and AEGCL signed the contract in September 2025.

3.14. ES Readiness and Land Availability. AEGCL prepared an ESMPF, updated it in September 2025, which AIIB cleared and AEGCL disclosed in September 2025. ESIAs and ESMPs for the substation part of three packages, covering five substations, have been disclosed. ES documents for the sixth substation will be prepared once its exact location is identified. The relevant ES instruments for the transmission line part will be shared with AIIB after contractors complete their check surveys.

3.15. Monitoring and Evaluation. The PMU will oversee the monitoring of implementation progress and prepare monitoring and evaluation reports, supported by the PMC. The PMC will produce monthly and quarterly progress reports, covering all critical aspects of project implementation. These include contract awards, disbursements, physical progress against predefined key performance indicators, key implementation challenges and corresponding solutions. AEGCL holds overall responsibility for monitoring and data collection of the project's key results indicators.

3.16. AIIB's Implementation Support. During implementation, AIIB will conduct missions to monitor project progress and may undertake additional field visits as necessary. The project team will maintain regular coordination with AEGCL through in-person and virtual meetings. When needed, local consultants may be engaged to carry out more frequent supervision of technical and ES management activities.

4. Project Assessment

A. Technical

4.1. **Project Design.** The State of Assam is undergoing a major transformation in its electricity transmission infrastructure in order to meet rising demand, integrate RE sources, and enhance grid reliability and resilience. AEGCL, the sole state transmission utility and a growth-oriented public sector enterprise, is responsible for planning, operating, and maintaining Assam's transmission network.

4.2. Assam's transmission system is critical to supporting its clean energy ambitions outlined in the Assam Integrated Clean Energy Policy 2025. This policy aims to develop 11.7 GW of new RE capacity, including 1.9 GW of rooftop solar by 2030. To meet these goals and support projected industrial and residential load growth, AEGCL is strengthening the transmission network.

4.3. Current energy demand in the project area is approximately 720 GWh, with projections indicating a significant increase to over 2,000 GWh by 2030¹⁵. This sharp rise highlights the urgent need for capacity expansion to support growing industrial, residential, and RE integration requirements. To address this, the project will construct six new substations across key districts of Assam, adding a total transmission capacity of 870 MVA. These substations will span voltage levels of 220/132 kV, 220/33 kV, and 132/33 kV and will incorporate both Gas Insulated Substation (GIS) and Air Insulated Substation (AIS) technologies. Additionally, the project includes approximately 128 km of new high-voltage transmission lines connecting the proposed substations to the existing grid or adjacent substations.

4.4. **Component A.** Component A entails developing six strategically located substations and associated high-voltage transmission infrastructure under four packages (A, B, D, and E) to enhance grid reliability. AEGCL has selected strategic locations for the substations to maximize efficiency and impact.

4.5. Package A includes constructing a 220/132 kV GIS substation at Rowta, in Udalguri district, with a capacity of 320 MVA. It will connect to the Rangia substation in Kamrup Rural district via a 69 km long (approx.) 220 kV double-circuit transmission line. The Udalguri district is recognized as a key industrial and commercial hub in Assam. By alleviating congestion and voltage issues for commercial centers, the Rowta substation will strengthen the backbone for regional manufacturing activities, agro-processing, and small businesses reliant on steady, quality electricity. This, in turn, will incentivize further investments, job creation, and economic diversification in northern and central Assam.

4.6. Package B comprises two substations: 132/33 kV, 100 MVA AIS substation at Chabua in Dibrugarh district, integrated via a 1.5 km (approx.) loop-in loop-out (LILo) connection to the existing Tinsukia–Dibrugarh line, and 132/33 kV, 100 MVA GIS substation at Titabor in Jorhat district, connected to the Mariani substation through a nine km (approx.) double-circuit transmission line. Both locations are strategic hubs of Assam's tea industry and are central to the state's energy-dependent industrial growth. The newly developed substations in these regions will ensure reliable power supply, reduce production interruptions and enable

¹⁵ AEGCL's Project Planning and Development Wing

advanced machinery use, which will boost competitiveness and support more efficient operations. In Chabua, improved electricity access will benefit not only tea processing and packaging but also logistics and ancillary industries. In Titabor, the shift from diesel to grid power will lower environmental impacts and operational costs, support small businesses, and enhance rural electrification, fostering local entrepreneurship and delivering social and environmental benefits to surrounding communities.

4.7. Package D includes two AIS substations: a 132/33 kV, 100 MVA substation at Dhing in Nagaon district, connected via a 28 km (approx.) single-circuit transmission line to the Nagaon substation; and a 132/33 kV, 50 MVA substation at Serfanguri in Kokrajhar district, linked to Gossaigaon through a 19 km (approx.) double-circuit line. These two locations are key sites for expanding inclusive development through improved power infrastructure. In Dhing, reliable electricity will alleviate chronic shortages, enabling growth in agro-industries, food processing, and rural services, which will boost employment, farm incomes, and community resilience. In Serfanguri, the new substation will support industrial and agrarian growth while advancing social equity by empowering local communities, promoting micro-enterprises, and enhancing access to education, healthcare, and digital services.

4.8. Package E aims to strengthen the grid infrastructure in mid and lower Assam. It includes building a 220/33 kV, 200 MVA AIS substation at Morigaon. Assam's upcoming semiconductor manufacturing facility is under construction in Jagiroad of the Morigaon district¹⁶. This facility is expected to catalyze high-value job creation, investment inflows, and technological advancement, positioning Morigaon as a new industrial hub. Reliable electricity from the new substation will be a key enabler, not only powering the industry but fostering demand in supporting sectors such as transport, services, and housing. This will generate a cascading effect, raise standards of living and deepen economic linkages.

4.9. **Component B.** Under Component B, the project will engage a PMC to support the implementation of the project activities. Additionally, the project will enhance the technical capacity of AEGCL officials by providing focused training on key areas identified as institutional priorities. The project aims to equip technical staff with updated knowledge and practical skills necessary for planning, designing, and operating a modern and resilient transmission network. These may include trainings on High Voltage Transmission Design (132 kV and above); Substation Design, Layout, and Equipment Specification; and Transmission System Loss Reduction Technique.

4.10. AEGCL will implement the project through Engineering, Procurement, and Construction contracts on a turnkey basis. These contracts will cover both the substation development and transmission line construction activities. The PMC, equipped with technical and other experts, will conduct monitoring and supervision activities. AEGCL's institutional experience and project implementation capacity, strengthened through past transmission upgrades, position it to deliver the project effectively and on schedule.

4.11. **Operational Sustainability.** AEGCL implements a well-defined and regionally coordinated Operations and Maintenance (O&M) framework encompassing three regions, the Upper Assam Region, the Central Assam Region, and the Lower Assam Region. Each region

¹⁶ Semiconductor unit at Jagiroad to begin production in 2026 – [Semiconductor unit at Jagiroad to begin production in 2026](#)

is headed by a CGM and structured through a hierarchy of managerial positions to oversee Circle Offices, Divisional Offices, and Grid Substations. The regions are staffed with sufficient personnel to ensure smooth operations, proactive maintenance, and prompt response to grid outages, thereby enhancing the reliability and stability of Assam's power transmission network.

4.12. O&M Activities and Performance. AEGCL's O&M activities cover preventive maintenance measures like regular thermal imaging, detailed visual inspections of towers, conductors, and insulators, and systematic vegetation control to reduce tree-related outages. Condition-based monitoring is facilitated through SCADA systems, which provide real-time tracking of voltage, current, and load variations. Advanced diagnostics techniques, including Dissolved Gas Analysis for transformers and partial discharge testing for cables and switchgear, help anticipate and prevent equipment failures. For emergency readiness, AEGCL maintains rapid response teams, critical spares inventory, and employs auto-reclosers and protection relays for swift fault detection and isolation.

4.13. All operational activities comply with the Indian Electricity Grid Code standards and applicable environmental regulations. Under its asset management strategy, AEGCL continues infrastructure upgrades guided by demand forecasts and actively integrates RE sources such as solar and wind into the transmission system. For the fiscal years 2023-2024 and 2024-2025, AEGCL allocated USD3.61 million and USD3.77 million respectively towards O&M activities; utilized amounts were USD3.10 million and USD3.57 million¹⁷, demonstrating effective financial management and operational performance. These O&M practices of AEGCL and the indicative budgets will be adequate for the O&M activities of Phase 2 project.

B. Economic and Financial Analysis

4.14. Economic Analysis. A project-level cost-benefit analysis was carried out to assess the economic viability of the project by comparing scenarios with and without the project. Financial costs were converted to economic values by removing taxes and applying appropriate conversion factors. These costs included (a) capital costs; and (b) electricity supply costs, encompassing electricity purchasing as well as operation and maintenance of the transmission network. Economic benefits include (a) fuel cost savings associated with reduced transmission losses and displacement of demand previously met by diesel generation and bilateral power purchases (non-incremental benefits); (b) incremental benefits from additional energy transmission enabled by the strengthened, congestion-free grid; and (c) environmental benefits arising from emission reductions due to the avoided power purchases. The analysis indicates that the project is economically viable with an Economic Internal Rate of Return (EIRR) of 23.51% under the base case scenario, significantly exceeding the economic hurdle rate of 9%. The project also yields an Economic Net Present Value (ENPV) of USD172.02 million at this discount rate. Sensitivity analysis involving potential capital cost overruns; increased O&M expenses; lower than expected economic and environmental benefits; and a combined adverse scenario confirms that the project remains viable across all scenarios. Annex 2 presents further details of the economic analysis.

4.15. Financial Analysis. Financial analysis for the project was carried out from the perspective of AEGCL, based on the forecasted project cashflows. Project costs included

¹⁷ AEGCL's Project Planning and Development Wing

capital costs, O&M costs of the transmission network and taxes. All investment costs were expressed in constant prices to maintain consistency. Project benefits comprised incremental tariff revenues from the capitalization of project assets, including incremental return on equity. Based on these assumptions, the Weighted Average Cost of Capital (WACC) was computed as 2.71%, expressed in post-tax real terms. The analysis demonstrated the project’s financial viability with a Financial Internal Rate of Return (FIRR) of 3.73%, also expressed in post-tax real terms, exceeding the WACC. Additionally, the project yielded a Financial Net Present Value (FNPV) of USD14.08 million when discounted at the WACC as the discounting rate. A sensitivity analysis was also carried out to assess the financial viability of the project under varying scenarios. Annex 2 provides additional details on the financial analysis.

4.16. Historical Financials of AEGCL. Between fiscal years 2020 and 2024, AEGCL’s revenues grew significantly, supported by an increase in electricity transmission from approximately 9,127 million units in FY2020-21 to an estimated 11,500 million units in FY2024-25. Regulated tariffs of Rs. 0.57–0.58 per kWh, set by the Assam Electricity Regulatory Commission (AERC) under a transparent multi-year framework, contributed to a compound annual revenue growth rate of 24.71%. AEGCL achieved net profits of USD6 million, USD5 million, and USD23 million in FY2022, FY2023, and FY2024, respectively, with an average net profit margin of 13%. This positive financial turnaround reflects effective tariff rationalization and improved cost recovery.

4.17. AEGCL’s capital structure has strengthened notably over recent years. Long-term borrowings decreased from USD78 million in FY2022 to USD3 million in FY2024 following a strategic government debt-to-equity conversion. Although the company recorded negative operational cash flows from FY2022 and net negative cash flows in FY2020 and FY2024, these were primarily due to ongoing balance sheet restructuring. Liquidity remained stable, with the current ratio ranging from 1.03 in FY2021 to 1.50 in FY2022, and 1.37 in FY2024.

Table 2: Historical Financial Performance of AEGCL (Audited) (in USDmn)

	2020	2021	2022	2023	2024
Profit & Loss statement					
Total Revenue	40	53	63	76	96
Net income	-21	-3	6	5	23
Cashflow statement					
Net cash flow	-9	10	3	2	-2
Cash & equivalents at end of the year	106	117	15	18	16
Balance sheet					
Current assets	171	182	189	161	112
Non-current assets	240	237	254	313	368
Current liabilities	131	177	126	116	82
Long term borrowings	79	33	78	4	3
Ratios					
Current ratio	1.3	1.03	1.5	1.38	1.37
Debt to equity ratio	28:72	14:86	27:73	1:99	1:99

Source: Audited financial statements of AEGCL

C. Fiduciary and Governance

4.18. Procurement. The procurement capacity assessment of AEGCL, including its staffing structure, confirmed that AEGCL has established a dedicated PMU with sufficient personnel

to ensure effective project implementation, further supported by the PMC through a dedicated expert for contract management. In Phase 1, AEGCL is currently managing EPC contracts, with delays arising mainly from site-specific forest clearances and the availability of design standards; these issues have since been resolved, with all necessary clearances obtained and substation and tower designs compliant with IS 802:2015 standards now readily available. The successful management of these challenges and the experience gained under Phase 1 have further strengthened AEGCL's institutional capacity to effectively manage the contracts for Phase 2. The current procurement management systems and institutional capacity are considered adequate to carry out the project's agreed procurement activities as detailed in the procurement plan. With implementation support from AIIB, AEGCL is well positioned to manage procurement in accordance with Bank requirements. Based on AIIB's assessment, the project procurement risk is rated Medium.

4.19. A PDS outlining procurement arrangements, including tendering and contracting strategies, capacity assessment of the PMU, market conditions, potential procurement risks and proposed mitigation measures, has been prepared and uploaded to the PPMS. AIIB has reviewed the PDS and concurs with the procurement arrangements and contracting strategies.

4.20. The project's four works packages have been structured as national competitive tenders. The selection of the PMC has been conducted through international competitive open selection. To date, four procurement packages (three works packages and the PMC contract) out of five have been reviewed and approved in the PPMS.

4.21. **Financial Management.** The FM capacity of AEGCL was assessed, focusing on institutional capacity, staffing, planning/budgeting, funds flow, accounting, internal controls/audit, reporting and external audit systems. AEGCL has prior experience in implementing projects funded by MDBs, including AIIB, and is familiar with their FM requirements. Based on AIIB's assessment, the FM capacity is considered adequate, and FM risk is rated Medium with some proposed mitigation measures.

4.22. **FM Staffing.** The AEGCL finance team is headed by a CGM (Finance) and has experience in implementing MDB-funded projects. Adequate personnel with the necessary skills will be deputed to carry out project FM activities.

4.23. **Planning and Budgeting.** The project will follow AEGCL's standard planning and budgeting procedures. The PMU will prepare an annual budget based on the procurement plan and activity schedule, which will be reviewed and approved by AEGCL. The project budget will then be submitted to the state government for inclusion in the annual state budget under a separate budget line. If a common head of account is maintained for both phases, AEGCL will ensure its segregation based on their annual work program.

4.24. **Funds Flow.** The project will follow the State Government of Assam's treasury system for funds flow from the state government to AEGCL. In Phase 1, some delays or inadequate release of funds have been noted. For Phase 2, AEGCL has confirmed that the state government will release funds for the project on a timely basis to AEGCL as per the administrative approval from the Power (Electricity) Department of the Government of

Assam¹⁸, and AEGCL will release funds to PMU as per the approved annual budget, fund utilization and cash forecast.

4.25. Disbursements. The loan will mainly adopt the reimbursement method of disbursement, with provision for advance payments also available. The state government will commit to provide an adequate budget for its share and pre-finance for payments of eligible expenditures. AEGCL will prepare documents such as the statement of expenditures and the contract summary report for AIIB's share of eligible expenditures (incurred and paid) and submit withdrawal applications through the Controller of Aid, Accounts & Audit to AIIB. Upon receipt of the withdrawal claims, AIIB will review and make disbursement to the appropriate account. The disbursement letter will include a list of authorized signatories, the process of submitting withdrawal applications, and other terms and conditions of disbursements related to the project.

4.26. Accounting, Financial Reporting and Internal Controls. The project financial statements will be prepared on a cash basis as agreed with AIIB. The PMU will maintain a separate project account, including a loan register. AEGCL uses Tally Accounting software for accounts management. For preparation of the financial statements, the head office of AEGCL obtains a monthly trial balance in Excel from the divisional offices, verifies the Tally data and prepares a consolidated trial balance. The PMU will prepare IUFs on a quarterly basis for submission to AIIB within 45 days from the end of each fiscal quarter. In Phase 1, there have been some challenges observed in preparing and submitting IUFs on a timely basis. For Phase 2, these challenges will be met by the PMU by incorporating the lessons learned in Phase 1 and by deputing additional workforce.

4.27. The internal control process of AEGCL will be applied to the project. AEGCL has a dedicated internal audit team for conducting internal audits. The internal audit process covers each office location in a cycle of one to three years instead of all offices on a periodic basis. AEGCL's Audit Committee reviews the internal and external audit reports, provides recommendations on corrective actions, and follows up for resolution of audit observations. The Bank recommends that the AEGCL share project-related internal audit reports on a timely basis.

4.28. External Audit. AEGCL's financial statements are audited annually by an independent chartered accountant firm appointed by the Comptroller and Auditor General. The FY2023-24 audit report was qualified due to the inability to verify capital work in progress, contingent liabilities, and unavailability of valid land title deeds. While these may not directly impact project activities, a time-bound action plan is suggested to resolve these. Phase 1 project audit report submission was delayed due to initial delays in auditor appointment. The auditors highlighted the need to strengthen financial management records for Phase 1. AEGCL is actively addressing these comments and has been advised to hire auditors early for Phase 2, finalize the audit Terms of Reference in concurrence with AIIB, and bear audit costs. The project financial statements, including statements of expenditure, will be audited independently. Audited project financial statements with audit opinion and management letter will be submitted to AIIB within nine months of fiscal year-end each year.

¹⁸ Approved Number: AA/pe_2025-26(l)_223

4.29. **Governance and Anti-corruption.** AIIB is committed to preventing fraud and corruption in the projects it finances. It places the highest priority on ensuring that projects AIIB finances are implemented in strict compliance with AIIB's Policy on Prohibited Practices (2016). The Bank reserves the right to investigate, directly or indirectly through its agents, any alleged corrupt, fraudulent, collusive, coercive, or obstructive practices, and misuse of resources and theft relating to the project and to take necessary measures to prevent and address any issues in a timely manner, as appropriate.

4.30. **Cybersecurity.** The infrastructure financed is not considered Critical Infrastructure.

D. Environmental and Social

4.31. **Environmental and Social Policy and Categorization.** The Bank's Environmental and Social Policy (ESP), including the Environmental and Social Standards (ESSs) and the Environmental and Social Exclusion List, applies to this project. ESS 1 (Environmental and Social Assessment and Management) is applicable to all project activities. ESS 2 (Involuntary Resettlement) is applicable due to the negotiated settlements for two substations, as well as the permanent and temporary restrictions on land use required for the transmission line component for all packages. ESS 3 (Indigenous Peoples, IP) is also triggered as IPs are present in one project site (under Package D). The typology of subproject activities under Phase 2 remains consistent with the nature and scope of activities under Phase 1.

4.32. The project is classified as Category B due to ES risks and impacts related to constructing substations and associated transmission lines. These impacts are site-specific, temporary, reversible, and not unprecedented, and can be effectively mitigated by incorporating ES considerations into engineering design and by applying best industry practices in implementing mitigation measures. Under Phase 1, AEGCL has demonstrated strong commitment in managing the ES risks and impacts, particularly those related to land and biodiversity, through targeted assessments. The PMU has also progressively built capacity to prepare the required ES instruments in a timely manner before commencement of work. The implementation of mitigation measures outlined in the ESMPs is steadily improving with dedicated Bank's support. The GRM at site and project management levels are functioning. Grievances are tracked and reported to the Bank through semi-annual monitoring reports. The continued experience and capacity developed during Phase 1 are expected to inform and strengthen the planning and implementation of Phase 2.

4.33. **Environmental and Social Instruments.** An ESMPF has been prepared and updated as per AIIB requirements. The ESMPF includes model ESIA for selected subprojects, a generic ESMP, a Resettlement Planning Framework (RPF), an Indigenous Peoples Planning Framework, a Gender Action Plan (GAP), and a Climate Risk and Vulnerability Assessment (CRVA). The updated ESMPF and the executive summary in local language are disclosed on the AEGCL website¹⁹, and AIIB website²⁰. Site-specific ESIA and ESMPs for substations with defined locations (three packages comprising five substations) have been finalized incorporating AIIB inputs and disclosed on the AEGCL website. For one subproject location

¹⁹ Available at <https://www.aegcl.co.in/aiib-project-details/>

²⁰ Available at <https://www.aiib.org/en/projects/details/2024/proposed/india-assam-intra-state-transmission-system-enhancement-phase-ii.html>

that is yet to be identified (Package E), the site-specific ESIA-ESMP will be finalized and added to the bidding documents. For the transmission line parts, the ESIA-ESMPs for all packages will be updated as necessary following the completion of surveys conducted by the EPC contractor. This includes updating any potential impacts on informal use of land. The ESIAEs will assess potential land acquisition impacts and determine the need for Resettlement Action Plans (RAPs), which will be prepared prior to commencement of construction. Since the final alignment of the transmission line will be determined based on the contractor surveys, the RAPs will outline the overall process to be followed in the event of any changes in land requirements. This will ensure that any additional land acquisition or impacts, including compensation, identified during implementation, are addressed in accordance with applicable policies and procedures. The RAP will be further updated once surveys have been completed and affected people have been identified. These ES instruments specify measures to mitigate the subprojects' ES risks and impacts consistent with the Bank's ESP and ESSs, and their preparation and disclosure are included as a covenant in the loan agreement.

4.34. Environmental Aspects. The ESMPF and available ESIA-ESMPs have screened potential substation sites and indicative transmission line alignments for the likelihood of overlaps with key biodiversity areas and/or government protected areas. IBAT screening indicated that potential subproject locations financed by the project are neither inside nor crossing ecologically sensitive areas. The sites do not traverse, nor are they located within the buffer zone of the Ramsar site in Assam. Assessments using AVISTEP (Avian Sensitivity Tool for Energy Planning) will be conducted during implementation, once the transmission line corridors become more defined, to identify risks on avifauna (bird) flight paths. Potential residual impacts of bird collisions with conductors during transmission lines operation are mitigated through specific design measures, including line markers, perch rejectors, and bird diverters. The risk of avifauna electrocution is unlikely, as the spacing between conductors is significantly wider than the wingspan of typical bird species in the area.

4.35. The environmental baseline conditions for ambient air, noise, and water quality at potential subproject sites are established in the ESMPF and available ESIA-ESMPs. These serve as references for monitoring the environmental quality during demolition and construction activities. The potential environmental risks and impacts during the construction and operation phases will be managed and controlled through properly designed site-specific mitigation measures under the ESMPs, which will be monitored for adequate implementation during construction.

4.36. The generic ESMP in the ESMPF includes general provisions for mitigating impacts related to air quality, noise, water, pollution control, waste management, occupational and community health and safety, wildlife protection, and labor management. It also outlines institutional arrangements, estimated budgets for implementation, monitoring requirements, and capacity-building measures for project implementation. The available ESMPs outline a comprehensive set of mitigation measures and a monitoring plan to address the environmental risks and impacts during demolition and construction activities. Consultations with nearby communities will continue throughout project implementation, and the existing Grievance Redress Mechanism (GRM) under Phase 1 will remain active to track and address concerns during implementation of Phase 2. The below table highlights the key environmental impacts anticipated during the construction phase, as well as the key mitigation measures, as per the ESMPF and the available ESMPs.

Table 3: Anticipated Environmental Impacts and Proposed Mitigants (Construction Phase)

Topic	Anticipated Impacts	Mitigation Measures
Potential biodiversity impacts	Clearing vegetation during site preparations and transmission lines right-of-way development may lead to some loss of habitats and disruption to wildlife movements and nesting.	Avoid protected areas and/or sensitive environmental hotspots, minimizing clearing of vegetation by incorporating these considerations into the design of transmission lines rights-of-way, and rehabilitating sites after construction.
Emissions	Dust and fugitive emissions generated during demolition and construction activities may affect air quality in and around the subproject sites.	Control dust and fugitive emissions by spraying water on unpaved roads and construction sites, covering trucks carrying loose materials, and regularly maintaining heavy vehicles and equipment to reduce emissions.
Noise and vibration	Demolition and construction works could temporarily disrupt nearby communities. Noise levels are expected to increase during the construction phase, primarily due to the operation of machinery and heavy equipment.	Reduce noise and vibration levels by restricting demolition and construction works to daytime hours in residential areas, using low-noise vehicles and equipment, and providing hearing protection for construction workers.
Runoff and erosion	Site preparation, excavation, and earthworks may lead to runoff, sedimentation, soil erosion, and land degradation, potentially impacting nearby water bodies.	Prevent soil erosion, sedimentation, and water pollution by not scheduling earthworks during rainy seasons, installing stormwater drains and sediment traps, and protecting exposed soils.
Construction waste	When not managed appropriately, it may contaminate water and soil.	Specific construction and demolition waste management plan to manage waste by separating and recycling materials where possible, disposing of hazardous waste in accordance with regulations, and preventing illegal waste dumping.

4.37. The key environmental impacts during the operation phase include potential collisions of avifauna with transmission line conductors, potential effects of electromagnetic fields on surroundings, and hazardous waste disposal. The ESMPF and the available ESMPs have outlined the mitigation measures, which comprise installing bird diverters in the transmission line design, ensuring minimum electromotive force clearances as stipulated in the CEA regulation, are maintained in the design and construction, and collecting and disposing of hazardous waste through approved vendors in accordance with AEGCL Standard Operating Procedures (SOPs) and relevant regulations.

4.38. **Social Aspects.** The project will have positive social impacts such as providing reliable power and job opportunities. The construction of the substations and transmission lines is not expected to have significant adverse social risks and impacts. The main potential social risks and impacts associated with the subproject’s activities are related to potential land acquisition for substations, permanent and temporary restrictions to land use and economic displacement. There are no legacy issues, and physical displacement is not anticipated to occur due to the

subproject's activities. For three out of the five proposed and defined substations, there are no land-related impacts, as these subprojects are located on land owned by AEGCL with no informal land users. For the remaining two defined substations located within tea estates acquired through negotiated settlements, assessments indicate that there have been no adverse impacts on either tea cultivation or workers or communities' livelihoods as the land acquired is of limited scope (1.21 hectares out of a total of 303.61 hectares in one location, and 3.62 hectares out of 1,307.76 hectares in the other). Consultations with estate management and workers confirmed that activities have continued without disruption and that no employment losses or changes in working conditions have occurred because of the land acquisition. For Package E, there are two alternative sites for the sixth substation. The site selection will be finalized around Q1 2026, and ES instruments will be prepared and reviewed accordingly before commencement of construction.

4.39. As part of the ESMPF, the project has prepared an RPF. The RPF provides guidance on land acquisition, restrictions on land use, and involuntary resettlement, including both physical and economic displacement. The actual need for land acquisition, the occurrence of involuntary resettlement, and the extent of impacts from land use restrictions will be determined through site-specific ESIA's and detailed construction designs. Based on these assessments, if required, site-specific RAPs will be prepared, reviewed, disclosed and implemented.

4.40. Other potential risks and impacts are related to labor and working conditions, gender-based violence (GBV), cultural heritage and Indigenous Peoples (IP). These risks and impacts will be further assessed in the respective ESIA's, and mitigations measures will be proposed in the respective ESMPs. In Phase 1, mitigation measures such as implementation of a workers' GRM, a GBV code of conduct, training and awareness raising sessions, chance find procedures, and consultations with IP groups were implemented as required.

4.41. In one substation location (Package D), although IPs are found in the area, adverse impacts on them are negligible, as they were not affected by land nor involuntary resettlement. Meaningful consultations were carried out with IP communities with their views and concerns having been documented in the ESIA. Given the potential negligible impacts, the preparation of an Indigenous People Plan (IPP) is not required. For the transmission lines component, further assessment will be undertaken as part of the ESIA, and IPPs will be prepared, if required, to ensure that any potential impacts are appropriately managed in line with ESS3.

4.42. **Occupational Health and Safety (OHS), Labor and Employment Conditions.** The Borrower's laws and regulations, and relevant ESS requirements on OHS will apply to the project. India's national laws are broadly aligned with International Labor Organization conventions, adhering to international labor standards on labor and employment conditions for project workers including contractors. The key occupational health and safety risks during construction include:

- Construction and demolition related hazards and risks: working at heights, falls, slips, trips, electrical and mechanical hazards, noise, dust, and fire risks, structural instability and related risks.
- Traffic and vehicle-related risks to workers and the public around construction sites.

4.43. The ESMPF and the available ESMPs outline measures to mitigate and manage labor risks related to labor and working conditions in accordance with ESS1 and applicable government laws. These plans also address the management of occupational and community health and safety risks. Key measures include traffic management plan, hiring experienced and trained workers for specialized tasks; providing and ensuring the use of appropriate Personal Protective Equipment (PPE), including fall arrest equipment; fencing and securing construction sites; conducting pre-job safety briefings, inductions, and worker safety trainings; and installing clear safety signage.

4.44. In addition to the mitigation measures outlined in the ESMP, contractors will be required to develop and implement a CESMP tailored to the specific risks of the project as outlined in ESMP. The CESMP will be prepared by the contractor prior to the commencement of construction works and will refer to the ESMP. The CESMP will include, as a minimum:

- Contractor responsibilities for OHS measures.
- Regular pre-job talks and safety meetings to raise awareness and reinforce safety protocols.
- Provision of PPEs for construction workers.
- OHS induction and safety training, particularly on high-risk activities such as working at heights, electrical and mechanical works, and demolition processes.
- Hygiene and sanitation requirements for the provision of temporary accommodation for workers, when applicable.
- Procedures for mitigating noise, fugitive dust, vibration, and water contamination/runoff, collecting and disposing demolition and construction waste.
- Ambient air, noise, vibration and water quality monitoring, sampling and laboratory testing plan.

4.45. OHS risks during operation of substations and transmission lines include electrical hazards (arc flash, electrocution, contact with live lines), transformer fire or explosion, gas leakages, slips and falls, working at heights, and exposure during adverse weather or natural disasters. Measures to mitigate and manage these risks include access control, SOPs and Lock Out and Tag Out (LOTTO) procedures, mandatory use of PPE, fire and surge protection systems, gas monitoring and recovery, preventive and predictive maintenance, safe work-at-heights protocols and training, use of insulated tools and live-line equipment, regular safety training, emergency drills, and periodic audits to ensure safe working conditions. Substations and transmission lines also pose community risks of electrocution, EMF exposure, fire, and structural failure, which will be mitigated through restricted access, warning signage, compliance with safety standards, regular maintenance, and community awareness programs. AEGCL has in place a safety manual for substation and transmission systems operations to adequately manage these risks.

4.46. **Stakeholder Engagement, Consultation and Information Disclosure.** During consultations of ESIA for the five identified substations, affected communities expressed support for the proposed substations, viewing them as a key step toward rural electrification. They were hopeful that the project would resolve issues like low voltage and irregular power

supply and expressed interest in potential job opportunities. Further consultations will take place as part of the preparation of the other subprojects' ESIA's. Under Phase 1, stakeholder engagement has been continuously maintained with affected people through focus group discussions, consultations and the deployment of Community Liaison Officers. The project will continue to engage, through meaningful consultations, with all stakeholders, paying attention to the inclusion of women, and vulnerable and disadvantaged groups. AEGCL has disclosed the relevant site-specific instruments for the three packages (five substations), cleared by the Bank, on their website²¹.

4.47. Project Grievance Redress Mechanism. Under Phase 1, a two-tiered project-specific mechanism has been established to address grievances. In addition, there are multiple communication channels as affected people can submit grievances by phone, via WhatsApp, or in person. Between July and December 2024, a total of 18 grievances were received, most of which were resolved within seven days. The most common issues raised related to dust generation and inadequate lighting. The existing GM will continue to be used for Phase 2, with its information disseminated through consultations, brochures, and posters.

4.48. Bank's Project-Affected People's Mechanism. The Bank's Policy on the Project-affected People's Mechanism (PPM)²² applies to this Project. AIIB has established a PPM to provide an independent and impartial review process for submissions from project-affected individuals or communities who believe they have been, or are likely to be, adversely affected by AIIB's failure to implement its ESP. The PPM is a complementary mechanism for addressing concerns that cannot be satisfactorily resolved through the project-level GRM or the Bank's Management processes. It ensures that project-affected people have an additional avenue for their grievances to be heard and reviewed fairly, independently, and transparently.

4.49. Monitoring and Supervision Arrangements. The project will be managed by the PMU, which is responsible for monitoring and supervising the implementation of the ESMPs. The PMU will be supported by the PMC's ES experts in carrying out this responsibility. The PMU personnel will remain the same for both phases. However, a separate PMC will be engaged for the Phase 2 project. The PMC's terms of reference was reviewed and cleared by AIIB. The PMU, together with the new PMC experts on ES, will be adequate for ES monitoring and supervision. A training plan is being prepared by the PMU for the new PMC on the key requirements of the ESMPF (ES screening, preparation of ES instruments, ES impact assessment, monitoring and reporting). Semi-annual ES monitoring reports will be prepared by the PMU and shared with the Bank. The Bank will undertake its own monitoring through field visits at certain intervals to ensure that these arrangements and the overall ES performance of the project are satisfactory to the Bank. The frequency of supervision missions will be tailored as required based on the findings of the first and subsequent missions.

E. Climate Change

4.50. A detailed climate risk screening and vulnerability assessment, using both national datasets and global tools, identified five material climate hazards for the project: extreme heat,

²¹ AIIB Project Details: <https://www.aegcl.co.in/aiib-project-details/>

²² Project-Affected People's Mechanism: How We Assist You <https://www.aiib.org/en/about-aiib/who-we-are/project-affected-peoples-mechanism/how-we-assist-you/index.html>

flooding, strong winds, wildfire, and landslides. In response, AEGCL has integrated targeted, code-referenced design adaptations to mitigate these risks, including: elevated substation pads (FGL \geq HFL+1 meter)²³, GIS substations, Q10 drainage²⁴, high-temperature low-sag (HTLS) conductors rated to 210°C, lattice towers upgraded to Zone V (180 km/h), deep pile foundations, and 30 meter mineral fire breaks with Flame Retardant Low Smoke Halogen-free (FRLSH) cables. These measures were informed by hazard-specific exposure mapping and site assessments and are locked into detailed engineering designs. Climate mitigation features include the use of low-loss conductors and spare system capacity to reduce transmission losses.

4.51. In addition to enhancing electricity supply capacity and improving system reliability, the project is expected to contribute to climate change mitigation by reducing annual greenhouse gas (GHG) emissions by approximately 29,000 tCO₂e from the first year of operation. Using an incremental CAPEX-based approach, the total climate finance attributable to the project amounts to USD130.94 million, representing 93.11% of AIIB's financing. Of this, USD125.73 million (89.41%) is classified as climate mitigation finance, and USD5.21 million (3.70%) as climate adaptation finance. Annex 3 contains additional details.

F. Gender Aspects

4.52. Female labor force participation in Assam currently falls below the national average, standing at 18.9% in rural areas and 16% in urban areas. Assam also presents an opportunity to improve gender wage parity, with female regular wage and salaried workers earning 55% of male earnings in rural areas and 76% in urban areas. These statistics reflect ongoing challenges related to occupational distribution and pay equity, highlighting areas for continued progress in the labor market.

4.53. Within the AEGCL, women currently make up 14% of the workforce. However, AEGCL aims to allocate higher percentage of new positions to women, support female employees through family-friendly leave policies, and actively encourage the recruitment and professional development of women at all levels.

4.54. Building on Phase 1 achievements, which included a GBV Code of Conduct and awareness sessions on Sexual Exploitation and Abuse, and Sexual Harassment (SEA/SH), Phase 2 will further strengthen efforts to enhance women's participation and access to project benefits. The project will continue collaborating with different stakeholders to advance these initiatives.

4.55. A GAP, disclosed under the ESMPF, outlines targeted measures and indicators. These include encouraging contractors to prioritize hiring local workers and increasing women's involvement in labor-based work, providing technical training to women workers, improving working conditions, and addressing potential vulnerabilities arising from project activities such as land securing and construction-related security concerns. Ongoing ESIA's will further identify gender-related opportunities and risks.

²³ FGL (Finished Ground Level) and HFL (Highest Flood Level)

²⁴ 10th percentile flow

G. Operational Policy on International Relations

4.56. The project is located entirely within the State of Assam, and does not involve international waterways, disputed areas, de facto governments, or any United Nations Security Council measures. Therefore, the Operational Policy on International Relations (OPIR) is not triggered. While Assam shares international borders with Bhutan and Bangladesh, the proposed project interventions are located well within the state's interior, at distances ranging from approximately 70 km to over 100 km from the nearest international borders. As such, no cross-border or transboundary impacts are anticipated.

H. Risks and Mitigants

Table 4: Summary of Risks and Mitigating Measures

Risk Description	Assessment	Mitigation Measures
Program/Project Preparation Risks		
Technical Designs		
<ul style="list-style-type: none"> AEGCL's capacity to perform and review technical design 	Low	<ul style="list-style-type: none"> While AEGCL initially faced challenges in developing technical designs for certain Phase 1 activities, these issues have been resolved. The required substation and tower designs, compliant with IS 802:2015 standards, are now readily available. The PMC will provide additional capacity and support to further strengthen design and implementation efforts.
Program/Project Implementation Risks		
Implementation Capacity		
<ul style="list-style-type: none"> AEGCL's institutional capacity to implement the project 	Medium	<ul style="list-style-type: none"> AEGCL has a proven track record in implementing MDB-supported projects. The AIIB-financed Phase 1 is in progress and scheduled for completion by April 2027. The same PMU will oversee Phase 2, with AIIB providing ongoing support and monitoring through regular implementation support missions.
Land Acquisition and Resettlement		
<ul style="list-style-type: none"> Timely land availability for construction 	Low	<ul style="list-style-type: none"> Five substation sites have been secured. Three sites are owned by AEGCL, and the remaining two sites have been procured from private owners. For Package E, there are two alternative sites for the sixth substation. The site selection will be finalized by Q1 2026.
Financial Management		
<ul style="list-style-type: none"> Timely and 	Medium	<ul style="list-style-type: none"> State government/AEGCL shall ensure

Risk Description	Assessment	Mitigation Measures
<p>adequate release of funds.</p> <ul style="list-style-type: none"> ▪ Timely submission of project audit reports 		<p>that adequate funds are released to PMU on a timely basis.</p> <ul style="list-style-type: none"> ▪ PMU shall ensure timely hiring of the auditors in consultation with AIIB.
Procurement of Large and Complex Packages		
<ul style="list-style-type: none"> ▪ Efficient management of procurement packages to minimize performance and contract management issues 	Medium	<ul style="list-style-type: none"> ▪ The PMU is staffed with personnel possessing sufficient technical and managerial expertise to oversee contract implementation. Additional support and expert guidance from the PMC are expected to strengthen contract management and reduce the risk of disputes.
Time and Cost Overrun		
<ul style="list-style-type: none"> ▪ Project completion without time and cost overrun 	Medium	<ul style="list-style-type: none"> ▪ Lessons learned from Phase 1 implementation are expected to strengthen AEGCL's capacity to deliver Phase 2 on schedule.
E&S Risks and Impacts During Construction and Operation		
<ul style="list-style-type: none"> ▪ ES implementation capacity of new PMC to prepare and submit ES instruments prior to commencement of construction works 	Medium	<ul style="list-style-type: none"> ▪ The PMU is supported by ES officers with experience in AIIB's ESF, and the new PMC will include qualified ES experts. AIIB's ES team will continue to provide implementation support to further strengthen project ES capacity and ensure compliance with all ES requirements.

Annex 1: Results Monitoring Framework

Project Objective	To improve the reliability, capacity and security of the power transmission network in the State of Assam									
Indicator Name	Unit	Baseline	Cumulative Target Values					End Target	Frequency	Responsibility
		2024	2026	2027	2028	2029	2029			
Project Objective Indicators										
1. Primary energy consumption saved ²⁵	GWh	0	0	0	0	2.00	2	Annual	AEGCL	
2. Total T&D capacity added	MVA	0	0	100	200	870	870	Annual		
3. Annual CO ₂ emissions reduction after project completion ²⁶	tCO ₂ e	0	0	0	0	29,000	29,000	Annual		
Intermediate Results Indicators										
1. Length of transmission lines constructed	km	0	0	10	20	128	128	Annual	AEGCL	
2. New substations constructed	Nos.	0	0	1	2	6	6	Annual		
3. Length of optical power ground wire line constructed	km	0	0	15	60	200	200	Annual		
4. Share of women in total annual recruitment of AEGCL	%	14	15	18	20	25	25	Annual		
5. Share of female AEGCL officials trained ²⁷	%	0	0	0	50	50	50	Annual		

²⁵ Reduction of transmission loss * Incremental load of the six substations (comparison between the end of the project load and baseline load)

²⁶ Reduction of transmission loss * Total annual electricity load after project completion * IFI Harmonized Grid Emission Factor (608 tCO₂/GWh)

²⁷ Out of the total number of trained officials of AEGCL under the Component B

Annex 2: Economic and Financial Analysis

Economic Analysis

1. **Introduction.** Economic analysis of the Assam Intra-State Transmission System Enhancement Project (Phase 2) (the project) was carried out in accordance with the guidance note on “Cost-Benefit Analysis of Projects of AIIB” and internationally accepted principles and methodology for economic analysis of infrastructure projects. The analysis was conducted using a “with-project” and “without-project” framework to compare the project’s EIRR against an assumed EOCC (the hurdle rate) of 9%²⁸.

2. **Methodology.** To evaluate the economic viability of the project, two mutually exclusive and alternative scenarios were hypothesized: 1) without-project scenario and 2) with-project scenario. To assess the incremental benefits arising from the construction of the proposed project, a plausible alternative “without-project” scenario was hypothesized where it was assumed that the proposed investments were not undertaken. In “without-project” scenario, O&M expense were expected to increase as the system would require higher repairs and maintenance on account of higher loading of the power systems. However, this incremental cost was excluded from the present analysis for simplicity and conservatism. If these costs were included, the project’s economic viability would have enhanced further.

3. The second scenario or “with-project” scenario considered that all the investments were carried out timely and as planned. The scenario also considered that the benefits over the evaluation period materialized in the same manner as envisaged during the project planning phase. The additional benefits under the with-project scenario, over the without-project scenario were classified into two categories: direct consumer benefits, and environmental benefits. Direct consumer benefits were further categorised into incremental and non-incremental benefits.

4. Economic benefits and economic costs were expressed in real terms at June-2025 prices and EIRR for the incremental economic cashflows was computed using the MS-Excel’s IRR function. This EIRR was compared against the assumed EOCC to assess the economic viability of the project. Further, ENPV of the economic cashflows (net benefits) valued at constant June-2025 prices, was computed at the assumed EOCC using MS-Excel’s NPV function.

5. **Economic Benefits.** Economic benefits of the projects were assessed for the forecast period. Planned project benefits were assumed to arise from 2030, the first year after the construction. Partial benefits were considered for FY2029, as part of the investment planning. To maintain consistency, reasonable O&M expenses were also considered during the years 2028 and 2029. The direct consumer benefits included additional electricity demand met from the grid electricity as a direct consequence of the project. These direct consumer benefits were divided into two categories – non-incremental and incremental.

²⁸ Retained the 9% economic hurdle rate of Phase 1 project, as the risk profile is unchanged and the rate aligns with standard rates for similar development projects

6. **Non-incremental Benefits.** The project's non-incremental benefits (demand that is currently being met by alternative sources to grid electricity) were valued at the average unit price of diesel generation of ₹15/kWh (17.45 cents/kWh)²⁹ and power procured from bilateral traders and power exchange by APDCL for its consumers of ₹7.19/kWh (8.36 cents/kWh)^{30,31}.

7. **Incremental Benefits.** These benefits are result of increased transmission capacity and improved system reliability resulting in lesser outages. The additional demand served through the project on account of incremental benefits were valued at the consumers' willingness to pay (WTP).

a. **Domestic Consumers.** WTP for domestic consumers was considered as average of domestic tariff (up to 5 kW) of ₹ 7.3/kWh (8.49 cents/kWh), lifeline consumer tariff of ₹7.11/kWh (8.27 cents/kWh) and WTP estimated for domestic consumers of ₹ 6.44/kWh (7.49 cents/kWh)^{32,33}. For conservatism, the average was further moderated by a factor of 10% to counter any overestimation errors. The assurance of reliable grid electricity services makes consumers express a willingness to pay a rate nearly double of what they were paying for their current grid connections. Also, consumers' coping cost due to unreliable electricity was extremely high for a much poorer level of (grid) service, when consumers had to rely on kerosene for their lighting needs.

b. **Industrial Consumers.** WTP for industrial consumers was computed as the average cost of a) power generated through diesel genset of ₹15/kWh (17.45 cents/kWh), adjusted downwards by 25% to account for lower usage i.e., curtailment of non-essential usage by the industrial consumers to economize expensive diesel generation costs, and b) average high tension (HT) industrial electricity tariff of ₹ 9.63/kWh (11.20 cents/kWh).

c. **Commercial Consumers.** Consumer behaviour and economic utility of commercial consumers were assumed to fall between the outer bounds set by those of industrial and domestic consumers. Therefore, average WTP of industrial and domestic consumers was considered as the WTP of commercial consumers.

d. **Other Consumer Categories.** The remaining categories had limited contribution to total electricity sales in Assam (around 18% of total sales) and they primarily included agriculture and public utilities. Hence, their WTP was estimated based on average of domestic and commercial consumers, as their economic utility and behaviour did not align with industrial consumers.

e. Summarising the above discussion, WTPs were estimated as ₹6.14/kWh (7.14 cents/kWh) for domestic consumers, ₹10.44/kWh (12.14 cents/kWh) for industrial

²⁹ ₹ - Indian Rupees

³⁰ Tariff order for APDCL for FY2025-26

³¹ Typical diesel generation cost ranges between ₹15/kWh (17.45 cents/kWh) to ₹25/kWh (29.08 cents/kWh) depending on size, vintage and design efficiency of diesel gensets. Lower bound of this range was considered here factoring the predominant non-incremental usage by industrial and commercial consumers who generally had access to more efficient, large-sized and well-maintained diesel gensets.

³² [Electricity Pricing and the Willingness to Pay for Electricity in India: Current Understanding and the Way Forward. New Delhi: The Energy and Resources Institute, published by B. Gill, S. Saluja, and D. Palit](#)

³³ Average billing rate (ABR) approved by the state electricity commission in the tariff order was considered here to include the impact of variances amongst the consumers on the final payouts to the electricity distribution company.

consumers, ₹8.29/kWh (9.64 cents/kWh) for commercial consumers and ₹7.21/kWh (8.39 cents/kWh) for the remaining consumer categories.

8. The additional cost of the generation was factored by considering average power purchase cost of state’s distribution company, APDCL. This cost of ₹5.83/kWh (6.78 cents/kWh) included both fixed charges and variable costs. It is expected that the existing generation or generation already planned (and under execution) will be sufficient for the project benefits to be realised, and no additional project-specific generation investments will be required.

9. **Resource Cost Savings.** Other benefits included the resource cost savings from reduced transmission losses, from 3.28% to 3.07%, which will result to energy savings of around 2 GWh from 2029. These benefits considered avoided power purchase costs to maintain the same level of energy sales. They were valued at the average variable costs ₹5.60/kWh (6.51 cents/kWh) of power plants of APGCL as determined in the latest tariff order³⁴.

10. **Environmental Benefits.** Avoided power purchase on account of lower transmission losses, was considered to reduce GHG emissions. These were valued using current Indian grid emission factor of 608 tCO₂/GWh³⁵. As the grid emission factor is expected to improve with higher proportion of RE addition in future generation capacity. Therefore, the factor was assumed to reduce by 10% in every 5 years starting from 2031.

11. To compute the monetary value of these environmental benefits, year-wise shadow carbon prices (in USD per tCO_{2e}) in accordance with the Guidance Note on Cost-Benefit Analysis of Projects of AIIB, were considered³⁶. Project benefits and the valuation methodology are captured in Figure 1.

Total Economic Benefits			
Direct consumer benefits			Environmental benefits
Incremental benefits	Non-incremental benefits		Reduction in GHG emissions (CO ₂ equivalent of avoided power generation converted into monetary values)
Enhanced transmission capacity (Additional consumption valued at WTP; incremental cost considered as average power cost)	Displaced expensive energy sources (Valued at cost of alternative source of generation)	Reduced transmission losses (Resource cost savings valued at average variable cost of power generation)	

Figure 1: Economic benefits from the project and their valuation principles

12. **Economic Costs.** Financial costs including physical contingencies but excluding price contingencies and financial charges during implementation were converted into economic costs using the domestic price numeraire in India. Tradable inputs (goods and services) were

³⁴ Tariff order for APDCL for FY2025-26

³⁵ IFl Harmonized Grid Emission Factor Table

³⁶ As a conservative estimate, midpoint values of year-wise shadow price of carbon were considered.

adjusted by the shadow exchange rate factor of 1.04³⁷, while unskilled labor was adjusted by a shadow wage rate factor of 0.89 for India^{38,39}. The executing agency provided a composition of the investment costs, labor costs, and goods and services costs made 7.5% and 73.5% respectively of the total investment costs, excluding taxes. Further, it was assumed that skilled and unskilled labor was used in proportion of 50:50 and traded goods and services would form 80% of total goods and services. Further, annual operation and maintenance costs were assumed to be 2% of total investment costs, considering the nature of the project assets and in line with international standards⁴⁰.

13. **EIRR and Sensitivity and Risk Analysis.** The economic analysis confirms that the proposed project is economically viable. The analysis, presented in Table 5, yielded an overall EIRR of 23.51% against an EOCC or hurdle rate of 9%. The ENPV at the EOCC or hurdle rate of 9% is estimated at USD172.02 million confirming the robust economic viability of the project. Sensitivity analysis, presented in Table 6, demonstrates that the project's expected economic performance is robust and not particularly exposed to any specific risks.

Table 5: Economic Internal Rate of Return Calculation (USD million)

Year	Economic benefits			Economic costs		Net economic cash flow
	Incremental	Non-incremental	Environmental	Investments	Operating	
2025	-	-	-	-	-	-
2026	-	-	-	-	-	-
2027	-	-	-	35	-	(35)
2028	-	-	-	55	-	(55)
2029	-	-	-	41	0	(42)
2030	14	17	0.1	7	1	23
2031	18	23	0.2	-	3	39
2032	19	25	0.2	-	3	42
2033	20	26	0.2	-	3	43
2052	20	26	0.2	-	3	43
2053	20	26	0.2	-	3	43
2054	20	26	0.2	-	3	57
				Terminal value (added to year 2054)		14
				EIRR (real):		23.51%
				ENPV:		172.02

Source: Asian Infrastructure Investment Bank estimates.

Table 6: Sensitivity Analysis (EIRR)

	Variation	EIRR	ENPV [#]
		%	USD million
Base case		23.51%	172
Project capital costs	+ 10%	21.76%	162

³⁷ Rajasthan Secondary Towns Development Sector Project-economic analysis, Asian Development Bank, September 2020.

³⁸ Shadow exchange rate factor was estimated based on trade statistics from FY2012–FY2013 to FY2016–FY2017.

Shadow wage rate factor = ₹224/day (USD 2.61) (minimum wages in 2019 for unskilled laborers) / ₹252/day (USD 2.93) (practiced labor wage rate paid by contractors to unskilled laborers), <https://paycheck.in/salary/minimumwages/tripura>

³⁹ Rajasthan Secondary Towns Development Sector Project-Economic Analysis, Asian Development Bank, September 2020.

⁴⁰ [41614-033: MFF - Assam Power Sector Enhancement Investment Program - Tranche 2 | Asian Development Bank](#)

	Variation	EIRR	ENPV#
		%	USD million
Operation and maintenance costs	+ 10%	22.39%	170
Incremental benefits	- 10%	22.62%	160
Non-incremental benefits	- 10%	22.37%	156
Environmental benefits	- 10%	23.50%	172
All combined		19.70%	132

Source: Asian Infrastructure Investment Bank estimates.

Financial Analysis

14. **Methodology and Assumptions.** Financial analysis of the project was carried out in accordance with internationally accepted principles and methodology for financial evaluation of infrastructure projects. The project's financial viability was evaluated while analyzing the incremental costs and revenues. A discounted cash flow analysis was conducted on an after-tax basis in real terms to determine the weighted average cost of capital (WACC), the FIRR, and FNPV. A sensitivity analysis was also carried out to assess the impact of adverse movements in the underlying assumptions on the project's financial viability.

15. Project costs included both investment costs and O&M costs of the transmission system strengthening, which included taxes, duties and physical contingencies but excluded price contingencies and financing costs. All investment costs were expressed in constant prices of June-2025. Realization of the terminal value of 10% of the total investment was assumed at the end of the benefit period.

16. Project benefits are measured in terms of revenue from incremental wheeling charges. The analysis assumed that when the project investments commence operation, the wheeling charge: (i) had been adjusted to a level in line with tariff regulations of AERC; and (ii) would be adjusted on a regular basis following the same guideline. Nominal revenues were deflated to constant price values using expected domestic inflation.

17. AERC determines the aggregate revenue requirement (ARR) of AEGCL on yearly basis. ARR is approved on full recovery of prudent costs and ensures that all costs are recovered against approved investments and that investments earn a commercial rate of return. This regulated revenue recovery will always result in a project FIRR that is either equal to or slightly higher than its WACC. The ARR includes recovery of the full cost of loan capital by way of accelerated rates of depreciation and interest; return on equity of 13.5% (post-tax); O&M expenses⁴¹ based on a mix of historical and normative principles; interest on working capital; and corporate tax.

18. **WACC.** To calculate the WACC, it was assumed that the financing sources would consist of AIIB loan constituting 82% of the total capital requirement and equity contributions from the state government for the balance investment of 18%. The regulatory return on equity allowance of 13.5% was adopted as a proxy for the state government's required return on equity. The corporate tax rate as it applies to AEGCL was 34.94% and included any applicable surcharge. The overall real, post-tax WACC for the investment was calculated to be 2.71%.

⁴¹ For simplification, O&M expense at a fixed rate of 2% of approved capital expenditure, escalated in nominal terms at 6% per annum were considered. They are in line with investment analysis for similar projects in Assam.

19. **FIRR.** Incremental cash flows consequential to the investment were estimated based on the methodology and assumptions described earlier. Entire investment cost, including computed interest during construction and price and physical contingencies, was assumed to be approved by AERC while approving transmission ARR for relevant years.

20. FIRR of the project was calculated to be 3.74%, higher than the WACC of 2.71% and thereby resulting in a positive FNPV of USD14.08 million⁴². Therefore, the project was considered financially viable. The results are presented in Table 7.

Table 7: Financial Internal Rate of Return (FIRR) (USD million)

Year	Revenue		Costs		Net Cash Flow
	Tariff revenue	Capital	Operating	Tax	
2024	-	-	-	-	-
2025	-	-	-	-	-
2026	-	41	-	-	(41)
2027	-	62	-	-	(62)
2028	-	46	0	(0)	(47)
2029	13	8	2	2	1
2030	25	-	3	5	18
2031	25	-	3	5	17
2032	24	-	3	5	16
2033	23	-	3	4	15
2052	6	-	3	1	2
2053	5	-	3	1	2
2054	5	-	3	1	17
Terminal value (Included in 2054 cashflows):					16
FIRR (Post-tax real):					3.73%
FNPV:					14.08

Source: Asian Infrastructure Investment Bank staff estimates

21. **Sensitivity Analysis.** Sensitivity analysis of the FIRR and FNPV for key variables indicated that the project was financially viable and offered acceptable returns under a range of possible scenarios. Adverse scenarios with a 10% increase in capital costs, and a 10% increase in operation and maintenance costs were considered, with the increase assumed to be not allowed in the ARR of AEGCL. A 1-year implementation delay was also considered. The analysis is illustrated in Table 8.

Table 8: Sensitivity Analysis (FIRR)

Variation	FIRR (%)	FNPV (USD million)
Base case		3.73% 14.08
Capital cost increase	+10%	2.71% 0.03
O&M cost increase	+10%	3.39% 9.16
Delay	+1year	3.25% 7.75

Source: Asian Infrastructure Investment Bank staff estimates

⁴² FNPV was computed at the project post-tax and real WACC of 2.71%

Key Assumptions.

(i) General

- i. All costs and revenues were expressed in June-2025 constant prices.
- ii. Foreign exchange rate of ₹85.98/USD, prevailing on July 14, 2025, was considered.
- iii. The capital investment expenditure (financial) consists of all incremental expenditures related to the project, including consulting services and physical contingencies but excluding any price contingencies, debt service charges and any other financial charges.
- iv. The operating expenditures include all annual incremental expenditures incurred by AEGCL, related to project and was considered as 2% of the total investments, in line with standard international practices and similar investment projects in Assam⁴³.
- v. Implementation period was considered from 2026 to 2029, and a 25-year benefits period was considered spanning from 2030 to 2054.
- vi. No taxes and depreciation were considered for the economic analysis.
- vii. The residual value of the project-financed assets was considered as 10% of the capital investment expenditure after 25 years of operations.

(ii) Hurdle Rate

- i. Economic opportunity cost of capital (EOCC, the hurdle rate) of 9%⁴⁴.

(iii) Economic Costs

- i. Total financial cost of USD171.48 million was considered.
- ii. Financial costs including physical contingencies but excluding price contingencies and financial charges during implementation were converted into economic costs using the domestic price numeraire in India.
- iii. Tradable inputs (goods and services) were adjusted by the shadow exchange rate factor of 1.04⁴⁵, while unskilled labor was adjusted by a shadow wage rate factor of 0.89 for India^{46,47}.
- iv. The executing agency provided composition of the investment costs, labor costs and goods and services costs made 7.5% and 73.5%, respectively, of the total investment costs, excluding taxes.
- v. It was assumed that skilled and unskilled labor was used in proportion of 50:50 and traded goods and services would form 80% of total goods and services.
- vi. Annual operation and maintenance costs were assumed to be 2% of total investment costs, considering the nature of the project assets and in line with international standards⁴⁸.

⁴³ Assam Power Sector Enhancement Investment Program - Tranche 2 <https://www.adb.org/projects/41614-033/main#project-pds>

⁴⁴ Retained the 9% economic hurdle rate of Phase 1 project, as the risk profile is unchanged and the rate aligns with standard rates for similar development projects

⁴⁵ Rajasthan Secondary Towns Development Sector Project-economic analysis, Asian Development Bank, September 2020. <https://www.adb.org/sites/default/files/linked-documents/42267-031-ea.pdf>

⁴⁶ Shadow exchange rate factor was estimated based on trade statistics from FY2012–FY2013 to FY2016–FY2017. Shadow wage rate factor = ₹224/day (USD 2.61) (minimum wages in 2019 for unskilled laborers) / ₹252/day (USD 2.93) (practiced labor wage rate paid by contractors to unskilled laborers), <https://paycheck.in/salary/minimumwages/tripura>

⁴⁷ Rajasthan Secondary Towns Development Sector Project-Economic Analysis, Asian Development Bank, September 2020.

⁴⁸ Assam Power Sector Enhancement Investment Program - Tranche 2 <https://www.adb.org/projects/41614-033/main#project-pds>

(iv) Economic Benefits.

- i. Planned project benefits were assumed to arise from 2030, the first year after construction of each phase.
- ii. Partial benefits were considered for FY2029, as part of the investment planning, and partial O&M expenses were also considered during the years 2028 and 2029.
- iii. Non-incremental benefits were valued at the average of unit price of diesel generation of ₹15/kWh (17.45 cents/kWh) and power procured from bilateral traders and power exchange by Assam Power Distribution Company Limited (APDCL) for its consumers of ₹7.19/kWh (8.36 cents/kWh) ^{49,50}.
- iv. Incremental benefits, as the result of increased transmission capacity and improved system reliability were valued at the consumers' WTP.

⁴⁹ [Tariff order for APDCL for FY2025-26](#)

⁵⁰ Typical diesel generation cost ranges between ₹15/kWh (17.45 cents/kWh) to ₹25/kWh (29.08 cents/kWh) depending on size, vintage and design efficiency of diesel gensets. Lower bound of this range was considered here factoring the predominant non-incremental usage by industrial and commercial consumers who generally had access to more efficient, large-sized and well-maintained diesel gensets.

Annex 3: Paris Agreement Alignment and Climate Finance

This annex provides details on the assessment of the alignment of the Project with the mitigation (BB1) and adaptation (BB2) goals of the Paris Climate Agreement (PA), as well as the estimates of climate finance that the proposed project could report.

A. Assessment of Paris Agreement Alignment

A1.BB1: Climate Mitigation Goals (BB1)

1. The Assam Intra-State Transmission System Enhancement Phase 2 Project can be classified as Universally Aligned with the mitigation goals of the Paris Agreement, in accordance with the Joint MDB Methodological Principles (2023) and AIIB's own Paris Agreement Alignment Methodology. Specifically, the project falls under the category of "Electricity transmission and distribution, including energy access, energy storage, and demand-side management", which is listed as a universally aligned activity. The project involves the construction of six new substations and associated high-voltage transmission lines (approximately 128 km), supporting the reliability and capacity of Assam's power grid while facilitating the integration of RE into the state's energy mix. The investments are expected to result in measurable reductions in technical losses and associated GHG emissions, consistent with India's NDC goals and Assam's Integrated Clean Energy Policy 2025.

2. India's Updated NDC (2022) which commits to reducing emissions intensity of its GDP by 45% by 2023 from 2005 levels, 50% cumulative electric power installed capacity from non-fossil fuel base energy resource by 2030. In line with these targets, the project contributes to loss reduction across the intra-state transmission networks, and enhanced capacity for RE absorption.

BB1 Conclusion: All project components, focused on electricity transmission, substations, and grid strengthening, are listed under the Joint MDB methodologies universally aligned activities for climate mitigation. The project is consistent with India's Updated NDC (2022), which targets 50% cumulative electric power capacity from non-fossil sources by 2030, as well as Assam's Integrated Clean Energy Policy (2025), which prioritizes expanding grid infrastructure and RE integration. Therefore, the project is considered aligned with the Paris Agreement's climate mitigation goals (BB1).

A2. BB2: Climate Adaptation Goals (BB2)

A2-1 Climate vulnerability and risks

3. The concurrent pressures of rapidly increasing energy demand and escalating climate risks in India create a critical imperative for integrating climate resilience into every stage of infrastructure development. This is not merely an environmental concern but a fundamental economic and social security issue, as disruptions to the power sector have pervasive effects across the entire economy⁵¹. The significance of climate resilience in India's rapidly expanding power transmission sector cannot be overstated. Climate change impacts on transmission and

⁵¹ Ahmed, S., & Suphachalasai, S. (2014). Costs of Climate Change Adaptation in South Asia.

distribution networks can result in increased technical losses, reduced transfer capacity, and severe physical damage⁵². Assam, located in Northeast India, is a region of significant economic potential and ecological diversity, but it is acutely vulnerable to the impacts of climate change. The state is frequently affected by a combination of natural hazards, including floods, earthquakes, and landslides⁵³. The Brahmaputra River and its extensive network of tributaries are central to Assam's geography and underpin the livelihoods of millions, yet they also represent a major source of recurrent flood risk⁵⁴. The state has experienced notable temperature variations and altered rainfall patterns in recent decades⁵⁵.

4. Assam's unique geoclimatic setting, dominated by the Brahmaputra River system and its location in a seismically active zone, creates a complex interplay of hazards. This inherent multi-hazard environment means that climate change acts as a risk multiplier, exacerbating existing vulnerabilities and requiring integrated, rather than siloed, resilience strategies for infrastructure.

5. For the proposed project, changes in key weather parameters under a warmer climate are expected to have significant impacts on the performance and service delivery of the core components: power transmission lines and substations. These impacts, already observed in Assam, are summarized in Table 9 below.

Table 9: Potential Impacts of Climate-related Hazards on Power Transmission Lines and Substations

Climate-related hazard	Potential Impacts
High temperature and heatwaves	High temperatures, coupled with high humidity, pose immediate operational risks to power transmission systems, such as equipment overheating and increased line sag, and contribute to the long-term degradation of power transmission assets. In addition, heat wave conditions can force system operators to operate transmission line at part load to ensure thermal operating limits are not violated.
Intense rainfall and flooding	Increasingly intense rainfall and associated flooding, compounded with aging flood infrastructure, can undermine the performance and service delivery of power transmission investments through embankment breaches or uncoordinated dam releases. Floods can cause severe damage to substation equipment.
Strong winds and cyclones	Wind-related hazards from residual cyclonic activity or localized severe thunderstorms pose a significant threat to power transmission infrastructure and cause damage to substation superstructures.

6. To characterize these impacts, AEGCL carried out a climate risk and vulnerability assessment. The assessment is based on 40-year IMD climate records, Central Water Commission flood archives and National Disaster Management Authority disaster atlas. In

⁵² International Energy Agency. (n.d.). Power Systems in Transition: Climate Resilience.

⁵³ WRI India. (n.d.). Climate-proofing Assam: A Data-driven Approach.

⁵⁴ Internal Displacement Monitoring Centre. (2025, May 13). India - Assam floods highlight the need to reduce displacement risk.

⁵⁵ Das, S., & Das, S. (2024). Decadal Change in Climate and Vegetation in Northeast India: A Study Using Satellite Data. Sustainability, 15(14), 11413.

addition to this asset level exposure mapping, data from the following sources are also used: 30-meter Shuttle Radar Topography Mission- DEM, LiDAR strips (2-meter resolution) and GSI landslide inventory; and Sensitivity scoring aligned with Energy Networks Association and Central Electricity Authority, vulnerability typologies for T&D assets were conducted. Given that the assessment focuses on past and present data, projected changes in key climate-related hazards as outlined in Table 9 above are derived from the datasets of the most up to date climate model projections archive under a range of greenhouse gas emissions and socio-economic development pathways. Trends of projected changes in key climate variables (i.e., temperature and rainfall indices) are consistent with the patterns observed in Assam.

A2-2 Adaptation and Climate Resilience Measures

7. Adaptation and resilience measures have been identified to address the vulnerabilities of the core project components to potential climate change impacts associated with the key hazards as discussed above. The proposed adaptation measures, both structural and non-structural, have been validated through standard procedures adopted by AEGCL. Such procedures include field-level assessments and expert technical reviews. The project's technical design team has included a set of targeted climate adaptation measures, and they are summarized in Table 10 below.

Table 10: Adaptation Measures Integrated into Project Design

Structural Measures		
Project Component	Hazard	Measure(s)
Transmission Lines	High temperature/heat waves	Use of higher size conductor, shield wire and improved cooling system
	Storms/Cyclones	Enhanced tower design and tower footing protection
Substations	High temperature/heat waves	Use of higher size conductor, shield wire and improved cooling system
	Flooding	Improved drainage system
Non-structural Measures		
<ul style="list-style-type: none"> • Scheduling O&M during non-peak heat hours and remote monitoring/SCADA systems • Technical capacity building/strengthening: AIIB project team will deliver a focused training session for AEGCL officials on CRVA methodology, hazard measure mapping and adaptation costing, and good practices shared from similar transmission infrastructure projects, ensuring the client can replicate and refine the analysis through implementation. The project should ensure to cover operations and maintenance and asset management practices needed to make the adaptation measures effective in the field, including inspection protocols. The client will need to embed these practices through standard operating procedures, checklists, and training. Notwithstanding these steps, gaps remain in the current CRVA, and therefore careful attention during the implementation is required. 		

A2-3 Consistency with broad national and sectoral adaptation policies and priorities

8. India’s NDC (2022) highlights the development of climate-resilient infrastructure and electricity systems, particularly for critical services in disaster-prone zones. The project directly advances these goals by hardening power transmission assets against climate shocks. The Assam SAPCC 2024 prioritizes adaptation in the power sector through “flood and seismic proof siting,” “early warning-based maintenance scheduling,” and “enhancing robustness of power infrastructure” in vulnerable districts, all of which are incorporated into this project.

BB2 Conclusion: The project has undergone a detailed climate risk screening and integrates targeted adaptation measures to address material hazards such as flooding, extreme heat and high wind/cyclone risks. These measures are consistent with India’s NDC (2022) and the Assam SAPCC (2024), ensuring resilience of energy infrastructure. As such, the project is considered aligned with the Paris Agreement’s adaptation goals (BB2).

B. Climate Finance

B1. Climate Mitigation Finance

9. The project qualifies for climate mitigation finance under the Joint MDB Common Principles for Climate Mitigation Finance Tracking, specifically Category 2.10: “Greenfield high-efficiency transmission or distribution of electricity”, as the project involves the construction of new high-voltage substations and transmission lines that enhance grid efficiency and support integration of RE. The development of approximately 128 km of new high-voltage transmission lines and the construction of six new substations across Assam (both GIS and AIS technologies) will strengthen the grid’s capacity, reduce transmission congestion, and improve the reliability and efficiency of electricity delivery.

10. As shown in Table 11 below, climate mitigation finance has been estimated as USD125.73 million, representing 89% of the total AIIB finance for the project.

Table 11: Climate Mitigation Finance Calculations

Project Component	Description	Estimated Mitigation Costs (\$ million)	Mitigation Finance Justification
A: Construction of Substations and Transmission Lines	Civil works, supply, and construction of substations and transmission lines	125.15	Fully eligible under Category 2.10 – supports improved grid efficiency and RE integration
B: PMC Contract and Capacity Building	Training on energy management, grid efficiency	0.58	Aligned with Category 12.6 – policy support and TA for mitigation
Total Climate Mitigation Finance		125.73	
% of AIIB Financing (mUSD 140.61)		89.41%	

Note: The climate mitigation part, the USD125.73 million climate finance, is exclusively financed by AIIB (no pro-rata considered for this, as compared to below for climate adaptation finance).

B2. Climate Adaptation Finance

The estimate of climate adaptation finance is based on the incremental cost approach (Type 1, Activities that are adapted) as outlined in the Joint MDB Methodology for Tracking Adaptation Finance. The total climate adaptation finance allocation for the project is estimated at USD5.21 million, which represents 3.70% of the total project cost.

11. Table 12 below summarizes the investment items that are assessed as adaptation activities and the associated costs which are reported as adaptation finance. Non-structural adaptation measures are not costed so not included in the adaptation finance estimates.

Table 12: Climate Adaptation Finance Calculations

Activity	Target Climate Risk	Estimated Adaptation Costs (USD million)	Adaptation Finance Justification
Enhanced tower design and tower footing protection	Storms, Cyclones	1.84	To harden the line against storms and cyclones, reinforced tower members and bracing for higher wind loads will be added, for protection to prevent scour and foundation failure, improving reliability and reducing outages. Priced as an allowance of USD14,375 per route km; applied to 128 km of overhead line, the incremental cost is about USD1.84 million (about INR158.2 million)
Improved drainage system	Floods, Heavy rainfall	2.68	To reduce flood risk, substation will be raised by platforms, regrade yards, and add one-in-ten-year storm drainage with larger lined drains, RCC culverts, and regularly spaced manholes so stormwater moves away, foundations are protected from erosion and ponding, and operations continue during and after heavy rain while limiting water-induced corrosion and electrical faults. Priced as an allowance of USD446,667 per substation and applied to six

Activity	Target Climate Risk	Estimated Adaptation Costs (USD million)	Adaptation Finance Justification
			substations, the incremental cost is about USD2.68 million (about INR230.4 million).
Use of higher size conductor, shield wire and improved cooling system	Temperature Increase Lightning	1.83	To improve heat tolerance, reduce sag and outage risk, and keep the grid stable during heat and lightning, upgraded conductors will be placed for to high-temperature low-sag (cost difference per route km: INR2,118,000; applied to 20.354 km; about USD501,000), upgrade the shield wire to optical ground wire for better lightning performance (cost difference per route km: INR157,000; applied to 20.354 km; about USD37,000), and add forced-cooling and HVAC upgrades at substations (USD215,240 per substation; 6 substations; about USD1,291,000). Together, these measures add about USD1.83 million (about INR157.26 million).
Total Adaptation Finance		6.35	
Pro rata @82% AIB contribution		5.21	
% of AIB Financing (USD million 140.61)		3.70%	

12. As shown in Table 13 below, the total climate finance from the project is estimated to be USD130.94 million, representing 93.11% of AIB's investment in the project.

Table 13: Total Climate Finance Calculations

Category	USD (million)	% of Total AIB Finance
Climate Mitigation Finance	125.73	89.41%
Climate Adaptation Finance	5.21	3.70%
Total Climate Finance	130.94	93.11%

C. GHG Assessment.

The project Team has conducted a Relative Emissions GHG Assessment, estimating the emissions before and after project implementation. The difference (or 'delta') between these scenarios constitutes the project's relative emissions.

13. **Baseline Emissions.** Would be equivalent to the losses of the grid network before the project, times the grid emission factor of India (0.608 tCO₂/MWh as per the IFI Harmonized Grid Emission Factor Table). The yearly current load of the 6 substations on the scope is 12,276.76 GWh, although it will be increased to 23,337.70 GWh in the future, thus under the do-minimum scenario, the estimated loss would be 3.28%, and the estimated electricity loss would be 765.47 GWh. The baseline emissions under the do-minimum scenario would be equivalent to 465,405 tCO₂e/year.

14. **Project Emissions.** Using the same logic, the project emissions would be equivalent to the losses of the grid network after the project, times the grid emission factor of India (0.608 tCO₂/MWh as per the IFI Harmonized Grid Emission Factor Table). The yearly load of the 6 substations after project is expected to be 23,337.70 GWh, being the estimated loss of 3.07%. The estimated electricity loss would be 716.47 GWh, being the project emissions equivalent to 435,613 tCO₂e/year.

15. **Relative Emissions.** The relative emissions of the project would be the difference between the Baseline Scenario and the Project Scenario (465,405 tCO₂e/year minus 435,613 tCO₂e/year), equivalent to -29,792 tCO₂/year.

16. **Gross Emissions.** As we consider the Other Consequential Emissions of the project immaterial, the Gross emissions of the project would be equivalent to the Project emissions (435,613 tCO₂e/year).

17. **CO₂ Emissions Reduction.** The CO₂ emissions reduction is calculated based on the improvement in transmission efficiency after project implementation. Specifically, the project reduces the transmission loss from 3.28% to 3.07%, resulting in a 0.21% reduction in losses across the total electricity transmitted annually (23,337.70 GWh). By applying the IFI Harmonized Grid Emission Factor for India (608 tCO₂/GWh), the annual avoided emissions are estimated using the formula: CO₂ reduction which equal to Total Load multiply by Loss Reduction Rate multiply by Emission Factor. The CO₂ reduction of approximately 29,792 tCO₂ per year, represents the emissions avoided due to improved grid efficiency.

Annex 4: Country Credit Fact Sheet

Recent Economic Development

1. India is a lower-middle-income country, with a GDP per capita at USD2,700 and a population of around 1.4 billion in 2024⁵⁶. India's economy grew at an average annual rate of 7.4% between FY2014-15 and FY2018-19 but started slowing down in the years before the pandemic following disruptions due to demonetization, rollout of goods and services tax, rural distress and stress in the financial sector^{57,58}. India's GDP contracted by 5.8% in FY2020-21 (year ending March 2021) on account of the Pandemic, but recovered strongly, growing by an average of 8.3% between FY2021-22 and FY2023-24, aided by a pickup in industrial activity, consumption, capital formation and exports. However, a slowdown in the manufacturing and services sectors and softening of construction activity generated some headwinds to growth momentum in FY2024-25, with growth slowing down to 6.5%.

2. Retail inflation steadily declined from an average of 6.7% in FY2022-2023, well above the 4±2% inflation targeting band to 4.7% in FY2024-25. It further declined to 3% in the first two months of FY2025-26. The decline was aided by softening of global prices, and tighter monetary policy, as the Reserve Bank of India raised the key policy rate by a cumulative 250 basis points between May 2022 and February 2023. RBI began its monetary easing cycle in February 2025 by cutting the rate by 25 basis points to 6.25% as the retail inflation dipped below 4%⁵⁹. The RBI continued with its monetary easing cycle at its latest policy meeting in June 2025, lowering the policy rate by 50 basis points to 5.5%. This marked the third consecutive rate cut since February 2025. The move is supported by expectations of moderating inflation, including food prices, while the RBI remains attentive to the adverse effects of prolonged high interest rates on consumption and investment growth.

3. The fiscal deficit has been on a downward trend from the pandemic induced high level of 12.9% of GDP during FY2020-21. It declined to 7.9% of GDP in FY2023-24, and further to 7.4% of GDP in FY2024-25 on the back of robust growth in non-tax revenue and slowdown in recurrent expenditure. The central government fiscal deficit declined from 6.6% of GDP in FY2022-23 to 4.8% of GDP in FY2024-25 on account of higher taxes, robust dividend payout by the central bank, and lower than anticipated capital expenditure. Public debt, which is predominantly denominated in local currency, is expected to remain at 81.3% of GDP in FY2024-25.

4. The current account deficit moderated from a high of 2% of GDP in FY2022-23 to 0.8% of GDP in FY2024-25 aided by moderating global prices, which helped contain the merchandise trade deficit and improvement in services exports. Remittances remained strong with India receiving USD129.1 billion in 2024. A drop in foreign direct investment was offset by a surge in foreign portfolio inflows. External debt stood at USD717.9 billion (19% of GDP) in December 2024⁶⁰. India's reserve holdings stood at USD699.7 billion in end May 2025. Reserves remain adequate according to conventional measures.

⁵⁶ The income group classification is based on World Bank criteria. Data from WEO, April 2025.

⁵⁷ Data are based on fiscal years. Fiscal year 2021-22 (FY2021-22) begins on 1 April 2021 and ends on 31 March 2022.

⁵⁸ On Nov. 8, 2016, India's government announced withdrawal of the legal tender of INR500 and INR1,000 notes, which accounted for 86% of the value of currency in circulation, and introduction of new INR500 and INR2,000 notes.

⁵⁹ Ministry of Statistics and Programme Implementation (MOSPI)

⁶⁰ Ministry of Finance, Government of India

5. In January 2024, Fitch affirmed India’s outlook as stable, while retaining the BBB- rating. While S&P also retained the BBB- rating, it revised the outlook to positive in May 2024 on account of robust growth and quality of government spending. In June 2020, Moody’s downgraded India’s rating to Baa3 with a negative outlook but revised the outlook to stable in October 2021 and retained the same rating and outlook in April 2024.

Economic Indicators

Table 14: Economic Indicators

Economic Indicators	FY2022-23	FY2023-24	FY2024-25*	FY2025-26*	FY2026-27*	FY2027-28*
Real GDP growth	7.6	9.2	6.5	6.2	6.3	6.5
CPI Inflation (average, % change)	6.7	5.4	4.7	4.2	4.1	4.0
Current account balance (% of GDP)	-2.0	-0.7	-0.8	-0.9	-1.4	-1.6
General government overall balance (% of GDP)	-9.0	-7.9	-7.4	-6.9	-7.2	-7.1
General government gross debt (% of GDP)	82.2	81.2	81.3	80.4	79.6	78.8
Public gross financing needs (% of GDP)	15.8	14.5	13.8	13.5	14.2	13.2
External debt (% of GDP)	18.6	18.7	18.9	18.6	18.3	18.1
Gross international reserves (USD billions) 1/	578.4	645.6	665.4	699.7	-	-
Exchange rate (INR/USD, EOP) 1/	82.2	83.4	85.6	85.5	-	-

1/Reserves and exchange rates are sourced from RBI and reflect end-May data for FY2025-26.

Source: IMF World Economic Outlook 2025 April, Reserve Bank of India, and IMF Country Report 25/54.

Economic Outlook and Risks

6. The economy is expected to grow at 6.2% in FY2025-26 according to the IMF, supported by robust growth in private consumption on the back of sustained macroeconomic and financial stability. Overall growth will be aided by improved agricultural performance, increased government spending, and strong prospects for the industrial and services sectors. Consumption is expected to receive a boost from moderating inflation, and cuts in personal income tax.

7. Following the start of monetary easing in February 2025, the inflation rate remained moderate at 2.8% in May 2025. The RBI and the IMF expect overall inflation to stabilize around 4% in FY2025-26, supported by easing commodity prices, the lagged effects of past monetary tightening, and a softening of growth momentum. Monetary policy is expected to become more accommodative.

8. The general government fiscal deficit in FY2025-26 is expected to moderate to 6.9% as tax revenues increase on the back of improved economic activity. Central government deficit is projected to moderate to 4.4% of GDP in FY2025-26. While the revenue performance could be stronger than assumed, risks to fiscal consolidation may emerge from higher demand for food subsidies and higher than anticipated spending in rural areas to alleviate rural stress.

9. Public debt is expected to remain stable at around 80.4% of GDP in FY2025-26. In an environment moderating nominal growth and higher interest rates, fiscal consolidation will be key to reducing public debt. Despite being high, India’s public debt remains sustainable given

favorable debt characteristics, including long and medium maturity, contracted at fixed rates, being denominated in domestic currency, and primarily held by residents. India's external debt is expected to remain stable.

10. The current account deficit is projected at 0.9% of GDP in FY2025-26, increasing to 1.4% of GDP in FY2026-27, which is considered manageable. While the softening of commodity prices will contain the import bill, exports, especially software exports, could be lower as growth in the advanced economy continues to remain weak. Any imposition of additional tariffs would also adversely impact exports.