



**ASIAN INFRASTRUCTURE  
INVESTMENT BANK**

PD000086 – NPL  
Dec 12, 2019

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**Project Document  
of the Asian Infrastructure Investment Bank  
Sovereign-Backed Financing  
Nepal  
Distribution System Upgrade and Expansion Project**

**Currency Equivalents**

(November 5, 2019)

Currency Unit – NPR  
 NPR1.00 = USD0.0088  
 USD1.00 = NPR113.54

**Borrower's Fiscal year**

July 16 – July 15

**Abbreviations**

ABC	aerial bundled cable
AIIB	Asian Infrastructure Investment Bank
EIRR	economic internal rate of return
E&S	environmental and social
ESMF	Environmental and Social Management Framework
ESP	Environmental and Social Policy
ESS	Environment and Social Standard
FIRR	financial internal rate of return
FPIC	free, prior and informed consent
kVA	kilo-volt ampere
kWh	kilowatt-hour
GDP	gross domestic products
GRM	grievance redress mechanism
IFI	international financial institution
IMF	International Monetary Fund
IOCT	International Open Competitive Tender
IPP	Indigenous Peoples Plan
IPPF	Indigenous Peoples Planning Framework
LV	low voltage
M&E	monitoring and evaluation
MDB	multilateral development bank
MoEWRI	Ministry of Energy, Water Resources, and Irrigation
MVA	mega-volt ampere
NCT	National Competitive Tender
NEA	Nepal Electricity Authority
PDS	project delivery strategy
PIR	Procurement Instructions for Recipients
PIM	project implementation manual
PIU	project implementing unit
PPM	Project-affected People's Mechanism
PPMO	Public Procurement Monitoring Office
RAP	Resettlement Action Plan
RPF	Resettlement Planning Framework
SF	Special Fund
SS	substation
T&D	transmission and distribution

## CONTENTS

<b>1. SUMMARY SHEET</b> .....	<b>1</b>
<b>2. PROJECT DESCRIPTION</b> .....	<b>3</b>
A. Rationale.....	3
C. Description and Components.....	7
D. Cost and Financing Plan.....	8
E. Implementation Arrangements .....	9
<b>3. PROJECT ASSESSMENT</b> .....	<b>11</b>
A. Technical .....	11
B. Economic and Financial.....	12
C. Fiduciary and Governance.....	13
D. Environmental and Social .....	14
E. Risks and Mitigation Measures .....	18
 Annex 1: Results Monitoring Framework .....	 20
Annex 2: Sovereign Credit Fact Sheet.....	23
Annex 3: Detailed Project Description.....	25
Annex 4: Economic and Financial Analysis .....	30

## 1. Summary Sheet

### Nepal

#### Distribution System Upgrade and Expansion Project (DSUEP)

Project No.	000086
Borrower	Nepal
Project Implementation Entity	Nepal Electricity Authority (NEA)
Sector Subsector	Energy Power Distribution
Project Objective	The objective of the project is to increase access to and improve the quality and efficiency of electricity supply in selected areas of western Nepal.
Project Description	<p>The project comprises 21 subprojects in separate geographic locations in western Nepal, each consisting of the following three components.</p> <ul style="list-style-type: none"> <li>• Component 1: Construction of 33kV supply lines and 33/11kV substations (including upgrade of existing facilities where needed)</li> <li>• Component 2: Construction of 11kV lines, distribution transformers and LV supply lines</li> <li>• Component 3: Capacity Building, Project Implementation Support and Technical Assistance</li> </ul>
Implementation Period	Start Date: January 2020 End Date: December 2024
Expected Loan Closing Date	June 2025
Cost and Financing Plan	<p>Estimated Project Cost: USD 157.1 million</p> <p>Financing Plan:</p> <ul style="list-style-type: none"> <li>• Government of Nepal: USD 32.0 million</li> <li>• NEA: USD 11.8 million</li> <li>• AIIB Special Fund (grant) : USD 1.0 million</li> <li>• AIIB Loan: USD 112.3 million</li> </ul>
Size and Terms of AIIB Loan	USD112.3 million, with the Bank's Variable Spread Sovereign-backed Loan of a 25-year tenor including a grace period of five years
Cofinancing (Size and Terms)	None
Environmental and Social Category	B
Risk (Low/Medium/High)	High
Conditions for Effectiveness	<ul style="list-style-type: none"> <li>• Cross-effectiveness of the European Investment Bank (EIB)'s loan agreement for the parallel project</li> <li>• Effectiveness of the Subsidiary Loan Agreement between the Borrower and NEA</li> <li>• Adoption by NEA of a Project Implementation Manual (PIM), satisfactory to AIIB, covering inter alia, project</li> </ul>

	<p>management, environmental and social, procurement, monitoring and reporting, financial management and administration of loan proceeds.</p> <ul style="list-style-type: none"> <li>• Sufficient staffing of the project implementation unit (PIU) according to the PIM.</li> </ul>
Key Covenants/Conditions for Disbursement	<ul style="list-style-type: none"> <li>• The Borrower shall ensure that the implementation of all project activities complies with AIIB's Environmental and Social Policy including related Standards and Exclusion List, Policy on Prohibited Practices, and Procurement Policy and its associated Interim Operational Directives on Procurement Instructions for Recipients. NEA will carry out the Project in accordance with the PIM.</li> </ul>
Policy Assurance	The Vice President, Policy and Strategy, confirms an overall assurance that the Bank is in compliance with the policies applicable to the project.

President	Jin Liqun
Vice President, CIO	D.J. Pandian
Director General	Yee Ean Pang
Manager	Rajat Misra
Team Leader	Jeesun Han, Investment Operations Specialist - Energy
Team Members	<p>Amy Fang Lim Chua, Environmental Specialist  Chrisantha Ratnayake, Senior Power Engineer Consultant  Courtney Lowrance, Principal Environment Specialist  Dron Pun, Environment Consultant  Haiyan Wang, Senior Finance Officer  Irish Fe Aguilar, Social Development Specialist  Julius Thaler, Senior Counsel  Jurminla Jurminla, Procurement Specialist  Kunyuan Hu, Project Assistant  Michaela Bergman, Principal Social Development Specialist  Ning Wu, Financial Management Consultant  Pratyush Mishra, Investment Operations Specialist  Donggun Kim, Energy Project Consultant  Baihui Sun, Senior Assistant</p>

## 2. Project Description

### A. Rationale

1. **Country priority.** Nepal is one of the least developed and poorest countries in the world. Nepal's gross national income (GNI) per capita is USD960 in 2018, ranked 203<sup>rd</sup> out of 228 countries.<sup>1</sup> A quarter of its population (29 million) lives below the poverty line.<sup>2</sup> Sharing borders with India and China, landlocked Nepal relies heavily on its neighbors for the supply of goods and services. Nepal is also one of the countries that are most vulnerable to natural disasters and climate change impacts, including water-induced disasters such as landslides and flood.<sup>3</sup> Recent natural disasters, including the devastating 2015 earthquake, have caused severe damages to the national infrastructure.

2. Nepal's economy is rebounding, but challenges remain in sustaining the cyclical recovery. Nepal's economic growth slowed in 2015 and 2016<sup>4</sup> largely due to the earthquake damage and trade disruptions. Yet, the real gross domestic product (GDP) growth rebounded strongly to 7.9 percent in FY2016/17 and 6.3 percent in FY2017/18, and is estimated to grow at 6.5 percent in FY2018/19.<sup>5</sup> Macroeconomic performance has been steady, with low public debt and moderate inflation.<sup>6</sup> Public debt has been decreasing, from 34 percent (FY2011/12) to 30.4 percent (FY2017/18) of GDP. However, after 4 years of surpluses, fiscal performance has turned to a deficit of 3.2 percent of GDP (FY2016/17) and 6.5 percent of GDP (FY2017/18), due to rising current and capital spending. Softening remittances, which have contributed to more than 25 percent of GDP, result in a current account deficit in the last 3 years. Trade deficit is growing due to strong imports and exports growing slower than GDP. Inflows of foreign direct investment remain small, falling far behind neighboring countries.

3. While there has been progress, Nepal has a complex political situation for over a decade. With frequent changes in government, restructuring the state from a unitary system to a federal one remains a complex, on-going task. Income, poverty levels, human development index, and infrastructure provision vary widely based on the urban–rural divide, geography, ethnic groups and occupational castes.

4. Access to an affordable and reliable supply of electricity is critical for economic development as well as the reduction of poverty and inequality, according to the United Nations' Sustainable Development Goals (SDGs). This SDG 7 is further reinforced by the Sustainable Energy for All (SE4ALL) initiative, aiming to help achieve universal access to sustainable energy by “increasing electricity access, expanding renewable energy, and improving energy efficiency.” The Government of Nepal has set a target to provide affordable electricity for all by 2023, according to the 15<sup>th</sup> Periodic Plan. In addition to increasing generation and transmission capacity, Nepal needs to provide new service connections to the unserved population and new industry users, which requires upgradation and construction of substations and distribution facilities. In the meantime, access to electricity is not only about having electricity connections, but also includes

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<sup>1</sup> World Bank. 2019. GNI per Capita, Atlas Method.

<sup>2</sup> World Bank. 2019. Country Partnership Strategy for Nepal FY2019-2023. Washington, D.C.

<sup>3</sup> ADB. 2017. Nepal Energy Sector Assessment, Strategy, and Roadmap. Manila.

<sup>4</sup> At 2.7% (2015) and 0.6% (2016) in real GDP growth at market prices, IMF (March 2017). See Annex 2 for more details on Nepal's macroeconomic data.

<sup>5</sup> IMF. 2019. Country Report. Washington, D.C.

<sup>6</sup> IMF. 2018, 2019. Nepal: Recent Macro-Economic Developments. Washington, D.C.

the reliability and quality of the electricity supply.<sup>7</sup> Thus it is also important to reduce system losses and improve the quality of service for both existing and new users by providing electricity at the required technical standards (e.g., adequate voltage). The proposed project aims to address these challenges and thus is considered by the government as a priority investment project, included in the first list of the government's investment projects for AIIB's support.

5. **Sectoral and institutional context.** Power shortage in Nepal has been a major constraint to growth. The electricity supply–demand gap in the country persists. The demand has been rising rapidly along with economic growth and increasing urbanization. While supply has been increasing, it remains short of the demand. The supply shortage is due to: (i) insufficient generation capacity; (ii) seasonal fluctuation of hydrogeneration, which accounts for 95 percent of the total installed generation capacity in the country; and (iii) outdated transmission and distribution (T&D) systems.<sup>8</sup> In recent years, the government has tried to increase the generation capacity up by 50 percent in 4 years from 787MW (2014/15) to 1182MW (2018/19). During the same period, the peak demand for electricity grew from 1291MW to 1320MW, beyond the combination of available local supply and imports from India. The supply–demand gap is exacerbated by the diverging supply and demand peaks, with electricity demand peaking during the dry seasons/winter seasons, when hydrogeneration is at the lowest.<sup>9</sup>

6. Compared to the large investments in new generation capacity, transmission and distribution (T&D) networks remain underinvested. The upgrading and expansion of T&D networks have not kept pace with the growth of the electricity supply and consumer demand. As a result, Nepal experiences system losses of over 15 percent<sup>10</sup> and excessive voltage drops, due to the overloading and extended feeder lengths of the existing networks. Distribution losses contribute to about three quarters of the total system losses. Sizeable investments are needed to relieve the T&D bottlenecks in Nepal to ensure an efficient and reliable delivery of electricity to consumers.

7. In terms of access to electricity, there is a large regional disparity. About 78 percent of the population is known to have access to grid electricity.<sup>11</sup> While the eastern and central regions are better served with access rates over 85%, western regions fare worse: Provinces 5, 6, and 7 having electrification ratios of 81.0%, 27.0%, and 58.9%, respectively. The rural and hilly areas of the western Nepal are the least connected, requiring substantial investments in distribution networks to increase access to electricity and improve the quality of electricity service.

8. The Nepal Electricity Authority (NEA) is the central operator and developer of Nepal's power system under the auspices of the Ministry of Energy, Water Resources, and Irrigation (MoEWRI). MoEWRI is the line ministry with primary jurisdiction and authority for the energy sector including the power sector. Overseen by MoEWRI, NEA is a government-owned, vertically-

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<sup>7</sup> The Multi-tier Framework (MTF), developed under the Sustainable Energy for All (SE4ALL) initiative, defines energy access as “the ability to avail energy that is adequate, available when needed, reliable, of good quality, convenient, affordable, legal, healthy and safe for all required energy services.” According to the World Bank's Nepal Energy Access Survey (2017), the issues of the reliability of the electricity supply affect 70% of the households surveyed.

<sup>8</sup> NEA. 2019. A Year in Review, FY 2018–2019.

<sup>9</sup> ADB. 2017. Nepal Energy Sector Assessment, Strategy, and Roadmap. Manila.

<sup>10</sup> Total T&D loss has been reduced from 25.78% (FY15/16) to 22.90% (FY16/17) after NEA carried out a dedicated loss reduction program. According to NEA, the current figure of FY18/19 is estimated at 15.32%, further reduced from 20.45% (FY17/18).

<sup>11</sup> NEA webpage, accessed on September 5<sup>th</sup>, 2019.

integrated electric utility, which generated about 34 percent of the total electricity available<sup>12</sup> in Nepal (FY2018/19) and owns the transmission grid and distribution networks, except off-grids. In distribution, NEA owns and operates grid-connected networks in Nepal, and plans, expands, operates and maintains and rehabilitates the networks. NEA is also the electricity system operator and the single off-taker buyer from independent power producers (IPPs) that provided about 29 percent of the total electricity available in Nepal (FY2018/19). Nepal's electricity imports have increased steadily from 18 percent of total electricity supplies (FY2011/12) to 37 percent (FY2018/19).

9. **Strategic fit for AIIB.** The Project is well-aligned with the Bank's Energy Sector Strategy: Sustainable Energy for Asia,<sup>13</sup> as the Strategy focuses on: (i) promoting, directly or indirectly, access to modern energy by those who currently have little or no access; (ii) realizing energy efficiency potential; and (iii) improving the reliability of electricity supply. The Project also fits in one of Bank's key strategic investment priorities,<sup>14</sup> i.e., sustainable infrastructure, as the Project will support energy efficiency improvements in the distribution system that would in turn help reduce greenhouse gas emissions.

10. **Value addition by AIIB.** This is the first project in which AIIB's technical assistance under the Project Preparation Special Fund (SF) has supported comprehensive project preparation from the very early stage. By extending a SF grant for the Project, the Bank is facilitating the Project's preparation and implementation with good industry standards, including appropriate technology to be introduced, cost-effectiveness and sustainability of investments, and high standards on governance, fiduciary control, and environmental and social management. This will enhance the quality of the Project which in turn will generate substantial benefits to the affected communities and the country. In addition, the Bank's financing of the project will help develop the capacity of the implementing agency, not only in system planning, but also in project preparation, implementation monitoring, and operation and maintenance of the distribution infrastructure.

11. **Value addition to AIIB.** This is AIIB's first sovereign-backed financing to Nepal. This Project will set a precedent to establish the Bank's reputation as an important development partner. Through the Project, the Bank will also further develop its expertise and skills in the power sector, as well as its capacity for supporting clients in financial management, procurement, and addressing social and environmental risks and impacts.

## B. Project Objective and Expected Results

12. **The Electrification Program in Western Nepal.** The electrification program covers 35 subprojects<sup>15</sup> scattered in 20 districts. AIIB's SF has financed the preparation work for the entire program. The Project supported by AIIB will finance equipment, works, transportation and services for six subprojects in Province 5 and all 15 subprojects in Province 6 (Figure 1). In addition, EIB will finance nine subprojects in Province 5 and all five subprojects in Province 7. The AIIB and EIB Projects are distinctly divided geographically. NEA will finance project management and supporting activities through staff and existing infrastructure, and implement

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<sup>12</sup> NEA 2019

<sup>13</sup> AIIB Energy Sector Strategy ([https://www.aiib.org/en/policies-strategies/strategies/sustainable-energy-asia/content/index\\_download/energy-sector-strategy.pdf](https://www.aiib.org/en/policies-strategies/strategies/sustainable-energy-asia/content/index_download/energy-sector-strategy.pdf))

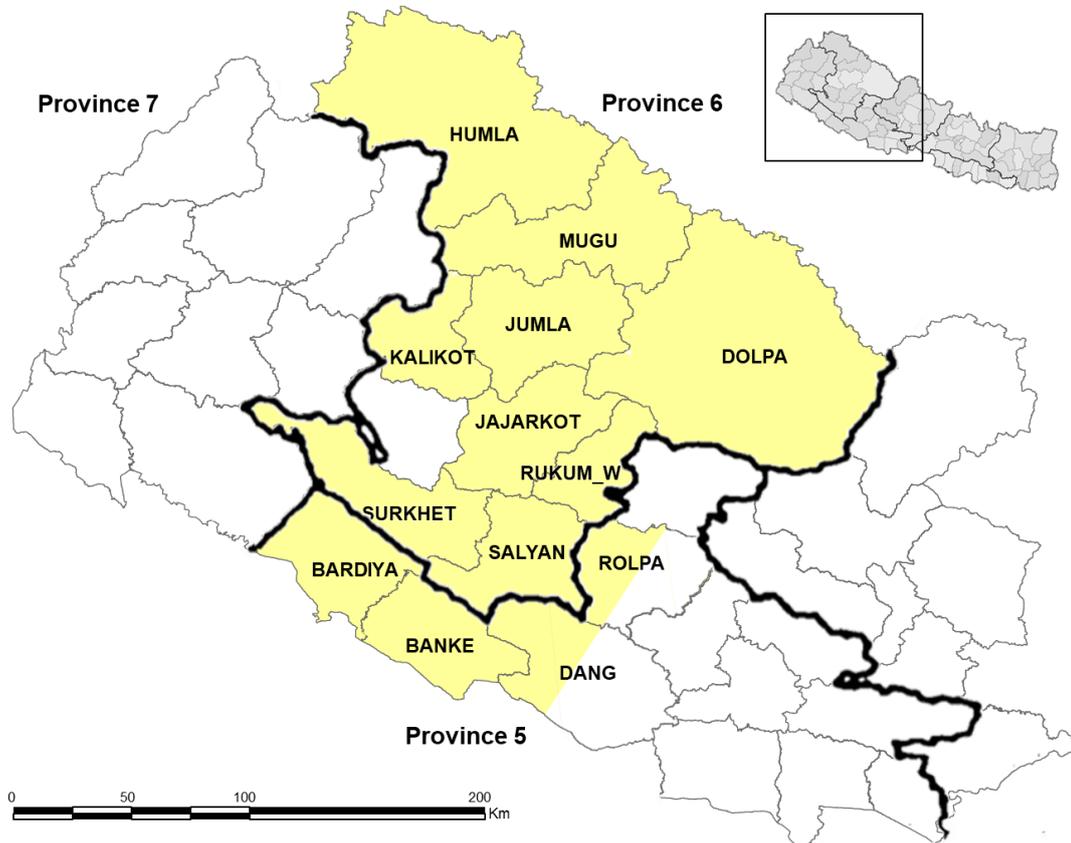
<sup>14</sup> Three priorities for the Bank's investments are: (i) sustainable infrastructure, (ii) cross-country connectivity, and (iii) private capital mobilization.

<sup>15</sup> A subproject mainly comprises a new primary substation with associated facilities.

the entire program. The Government of Nepal will finance land acquisition, access roads and relevant taxes.

13. **Project Preparation under the Special Fund.** The Government had requested in May 2018 AIIB’s SF financing of USD1 million to assist the Government to prepare the electrification program in western Nepal. The SF was approved, and the program preparatory activities have been implemented by NEA. The SF has financed consultancy services for key preparatory studies for the entire program, ranging from the feasibility study, detail engineering design, environmental and social studies to incremental operational support to the project implementation unit (PIU). In addition, the SF has also financed a GIS-based planning software and voltage measuring instruments for NEA to analyze the system performance, monitor the construction progress of the electrification program, and evaluate the resulting loading of the lines in future years. These facilities will contribute to a technically sound system development and support NEA’s planning capabilities.

**Figure 1. Map of the AIIB Project Areas**



Source: NEA PIU; visualized by AIIB Project Team

14. **Project Objective.** The objective of the proposed AIIB Project is to increase electricity access to and improve the quality and efficiency of electricity supply in selected areas of western Nepal.

15. **Expected Results.** The key results indicators for the Project will include: (i) the numbers of new residential connections (households) and beneficiaries (including females); (ii) the number of new non-residential connections (commercial and industrial); (iii) the numbers of existing residential connections (households) and beneficiaries (including females) with improved quality of service; and (iv) energy saved from loss reduction (in GWh). A detailed results framework for the AIIB Project is in Annex 1.

16. **Expected beneficiaries.** The primary beneficiaries of the Project are: (i) new consumers, both residential and non-residential, who will have access to grid-electricity, and (ii) existing consumers who are already connected to the grid and will be provided with additional loads and a better quality of electricity supply.

### C. Description and Components

17. The AIIB Project comprises of three components listed below. Detail project description is in Annex 3.

18. Component 1: Construction of 33kV supply lines and 33/11kV substations (including upgrade of existing facilities where needed).

This component comprises activities facilitating the enhancement of the network below transmission (sub-transmission)<sup>16</sup>. It consists of the construction of new 33/11kV primary substations and the extension of 33kV lines to the 33kV network to supply these new substations. In some instances, where needed, the existing 33kV lines would be augmented by the increase of conductor size or number of circuits.

19. Component 2: Construction of 11kV lines, distribution transformers, low-voltage (LV) supply lines including consumer connections.

This component comprises activities related to the new power distribution facilities required to bring the power supply to the ultimate consumers. It consists of new 11kV feeders, installation of distribution transformers, development of the LV network and service connections to consumers.

20. Component 3: Capacity Building, Project Implementation Support, and Technical Assistance.

This component focuses on improving the capacity of NEA's distribution planning and analyzes the network performance of the proposed project components. This component will also finance an independent project supervision and monitoring support that the PIU needs for project implementation. AIIB will finance technical assistance, utilizing the geographical information systems (GIS) planning software already acquired using the SF.

21. The AIIB Project will construct the following facilities:

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<sup>16</sup> The sub-transmission system in Nepal is essentially at 33kV terminating at 33/11kV substations. It connects the transmission system (at 132kV and higher voltages) to the main distribution system operated at 11kV and lower voltages.

- (i) 33/11kV substations: 21 substations with a combined capacity of 150 MVA,
- (ii) 33kV supply lines: about 468 kilometers (km),
- (iii) 11kV distribution lines: about 1,978 km,
- (iv) LV supply lines and consumer connections: about 1,045 three-phase and 2,728 single-phase distribution transformers, and supporting LV supply lines to reach about 814 three-phase and 69,162 single-phase connections.

#### D. Cost and Financing Plan

22. The total cost for the AIIB Project is USD157.1 million, to be funded by a sovereign-backed loan from AIIB and counterpart funds to be provided by the Government and NEA. Table 2 outlines the project costs.

**Table 2. Cost Estimates and Financing Plan for the AIIB Project (USD million)**

Item	Total Cost	AIIB Special Fund		AIIB Loan		GoN		NEA		
		Amount	%	Amount	%	Amount	%	Amount	%	
<b>A</b>	<b>Preparatory Studies</b>	1.0	1.0	100	0.0	0	0.0	0	0.0	0
<b>B</b>	<b>Base Cost</b>									
1	Capital costs (equipment, construction, transport, etc.)	93.3	0.0	0	93.3	100	0.0	0	0.0	0
1-1	Component 1	34.2	0.0	0	34.2	100	0.0	0	0.0	0
1-2	Component 2	59.1	0.0	0	59.1	100	0.0	0	0.0	0
2	Local expenditures (project supervision costs, administration, etc.)	5.0	0.0	0	0.0	0	0.0	0	5.0	100
3	E&S Implementation (land acquisition, compensation, etc.)	8.0	0.0	0	0.0	0	6.0	75	2.0	25
4	Taxes and Duties	26.0	0.0	0	0.0	0	26.0	100	0.0	0
5	Technical Support, Project Implementation Support & Capacity Building (Component 3)	3.3	0.0	0	3.0	91	0.0	0	0.3	9
<b>C</b>	<b>Contingencies</b>	13.5	0.0	0	9.0	67	0.0	0	4.5	33
<b>D</b>	<b>Financing charges during construction*</b>	7.0	0.0	0	7.0	100	0.0	0	0.0	0
	<b>Total:</b>	157.1	1.0	1	112.3	71	32.0	20	11.8	8

\* AIIB's fees subject to sovereign-backed financing policies and interest during construction (IDC) when amortized

Source: AIIB Project Team and NEA PIU

## E. Implementation Arrangements

23. **Implementation period.** The project implementation will be spread over 5 years, from January 2020 to December 2024.

24. **Implementation management.** NEA will be the project implementing entity/agency. It is managed by a managing director, who is appointed by a board of directors chaired by the energy secretary of MoEWRI. Upon the approval of the SF, a PIU was established under the deputy managing director for Distribution and Consumer Services within NEA. The PIU, headed by a project manager, will continue to be responsible for project preparation, as well as for implementation, procurement, financial management, compliance with environmental and social (E&S) requirements, and liaison with the Bank. The PIU will consist of staff from various units including: (i) Project Administration and Financial Management, (ii) Engineering, (iii) Project Contract Management and Reporting, and (iv) E&S Monitoring. The PIU will be supported by the district offices in the project areas. At present a limited capacity PIU is in operation attending to the project preparatory work.

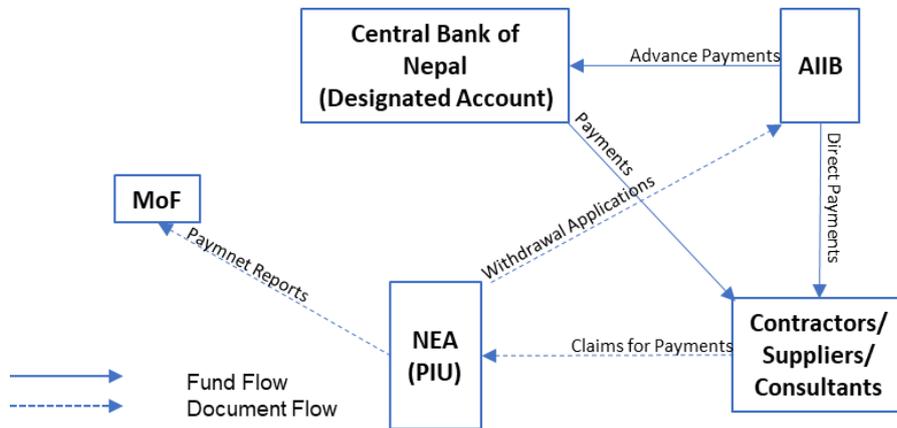
25. **Procurement.** Procurement would mostly include construction of 33/11kV substations, 33 kV and 11kV lines, and LV network facilities. Procurement of goods, works, and services financed by the loan proceeds will be conducted in accordance with the provision of the Bank's Procurement Policy and Section II of Interim Operational Directives on Procurement Instructions for Recipients (PIR). The procurement of goods, works, and services will follow International Open Competitive Tender (IOCT) and National Competitive Tender (NCT) as set out in paragraphs 10.1 and 10.4 of the PIR. Procurement of any contract estimated to cost more than USD5 million for works and USD1 million for goods will be conducted following IOCT and will be subject to Bank's prior review as indicated in procurement plan. The thresholds are consistent with those of the other International Financing Institutions (IFIs). All eligible expenditures under the Project, incurred in compliance with the Bank's procurement policy and PIR paragraph 8.2 and in respect of which payments were made not more than 12 months before the date of the loan agreement, may be financed retroactively.

26. **Financial management.** The financial management system of NEA is applicable to the Project. A project annual budget will be prepared in May every year together with the annual budget of NEA, based on the procurement plan and activity schedule. The approved project annual budget will be submitted to the Bank as one of tools to monitor the progress of the Project. The contracts under the Project will be signed by the project manager. The Nepal Accounting Standards will apply, including the accrual method, to project financial statements. The quarterly project financial statements will be submitted to the Bank within 45 days after the end of each quarter. NEA's Internal Audit Department will audit the Project semi-annually and submit the audit reports to the audit committee of NEA. The Office of the Auditor General, Nepal, will audit the project account, in accordance with the Nepal Auditing Standards. The audited project financial statements together with the auditors' reports will be submitted to the Bank within 6 months after the end of the fiscal year.

27. **Disbursement.** The loan proceeds will be disbursed in accordance with AIB's loan disbursement letter. Multiple disbursement methods will be applied to accommodate the needs of the project cash flow, such as direct payment and advance. The Designated Account for the advance will be opened by the PIU at the Central Bank of Nepal. The ceiling for the advance

amount will be based on the forecast of the cash flow needs for the next two quarters. Before the submission of the first withdrawal application, the Government should submit to AIIB sufficient evidence of the authority of the person(s) who will sign the withdrawal applications on behalf of the government, together with the authenticated specimen signatures of each authorized person. The fund flow is presented in Figure 2.

**Figure 2. Fund Flow Diagram**



Source: AIIB Project Team

28. **Governance and anti-corruption.** AIIB is committed to preventing fraud and corruption in the project it finances. It places the highest priority on ensuring that projects are implemented in strict compliance with AIIB's Policy on Prohibited Practices (2016). Detailed requirements and reference to AIIB's Policy on Prohibited Practices have been specified in the Loan Agreement and the project tender documents. AIIB will monitor the work related to tender preparation and evaluation under Bank financing.

29. **Monitoring and evaluation (M&E).** The PIU will also monitor the implementation progress and prepare the M&E reports, which will include: (i) consolidated quarterly reports, (ii) quarterly interim financial reports, (iii) annual reports on project implementation progress, and (iv) annual independent financial audits of the Project. A project supervision and monitoring consultant will prepare the quarterly progress reports, which will cover all essential aspects of project implementation, including contract awards, disbursements, physical progress as per the defined key performance indicators, compliance with E&S requirements, key implementation issues and solutions, and updated implementation and procurement plans for next 12 months. A Project Implementation Manual (PIM) is being developed. Based on assessments of the Project, the PIM will cover tasks from project management, E&S aspects, procurement, monitoring and reporting to disbursement administration. The PIM will also indicate the required skilled resources and the allocation of such resources across the different geographical locations.

30. **AIIB's implementation support.** The project implementation will be supported by regular implementation support missions, at least twice a year, undertaken by the Bank project team. In addition to the regular implementation support missions, it is anticipated that the Project may require focused support in the early stage of implementation. For that, the Bank team will mobilize staff and consultants as needed to provide timely advice. A comprehensive midterm review will be conducted at an appropriate time during the project implementation. The midterm review

mission will assess the implementation performance of all aspects of the project and will discuss, agree, and take any midterm course corrections deemed necessary.

31. To cope with this wide geographic spread and the time required to visit project sites, the Bank's core project team will work with local consultants based in Nepal. In addition to the regular implementation support missions by the Bank team, the local consultants will undertake frequent site visits and review progress, when and as needed. The consultants will be supervised by the Bank team and then report their findings back to the Bank team during/after each mission.

### 3. Project Assessment

#### A. Technical

32. **Project design.** The technical studies have provided a comprehensive technical design to ensure a reliable and efficient supply of electricity to both existing and new consumers in the project areas. More details are in Annex 3.

33. The Project addresses two basic requirements of the power distribution networks in the western provinces of Nepal as follows:

(i) Quality of the existing networks.

Excessively long and overloaded 33kV and 11kV lines, particularly in the Terai regions, result in very low voltage to the end-consumers<sup>17</sup>, who would experience a poor service quality and electrical equipment being damaged.<sup>18</sup> The 8 of new 33/11kV substations will address the need of improving the existing power system to operate within the appropriate voltage limits.

New feeders from the new 33/11kV substations will connect with the existing network. The new supply lines will not only add additional loads but also reduce losses by optimizing supply lines of the expanded network. The additional loads with improved quality will bring substantial benefits to both existing and new consumers. The benefits will be greater for industrial consumers, who had to suppress demand due to the lack of available loads. With the new development, substantial economic activity is expected to materialize.

(ii) Electricity access rates for the poorly served areas in western Nepal.

The other aspect of the Project is to provide supply to unelectrified areas which are at substantial distances from the existing networks. The 13 of new 33/11kV substations under the Project will enhance access to reliable power supply by consumers in these remote areas. It will be conducive to substantial economic development and to establish new commercial and industrial ventures.

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<sup>17</sup> Substantial voltage drops were observed in many subproject areas, often approaching half of the statutory required voltage.

<sup>18</sup> According to the World Bank's Nepal Energy Access Survey (2019), 17% of the households surveyed report serious voltage problems that damage appliances. To offset the voltage drops, households tend to invest in stabilizers.

34. **Operational sustainability.** NEA will implement the Project. NEA has been carrying out similar projects for a number of years. A project supervision and monitoring consultant will be procured by NEA to ensure the works to meet acceptable technical standards and E&S requirements. On completion of each of the Project's subprojects, the new systems will be handed over to the respective NEA district offices. NEA will arrange for additional staff required to maintain the facilities.<sup>19</sup> The new facilities provided are similar to the already existing equipment in NEA and no complex development is proposed in this project.

## **B. Economic and Financial**

35. **Economic Analysis.** A cost-benefit analysis was carried out to assess the economic viability of the Project on a with- and without-project basis. Without the Project, it is assumed that unserved demand of the existing and new consumers will be partially met by self-generated power (industrial) and kerosene (residential) at higher cost than grid supplied electricity. With the Project, additional power at cheaper cost will be made available to serve existing and new consumers in the western regions of Nepal. Details are in Annex 4.

36. The project investments will increase the network capacity by 150 MVA to serve the expected incremental load flow. An estimated additional 110 GWh/annum will be served for end-users by 2025, growing to 393 GWh/annum in 2044. The economic benefits are estimated using Willingness to Pay (WTP) for the additional power supply made possible by project investment. The WTP is valued at weighted average WTP for industrial, commercial and residential consumers. The Project's economic costs include capital investments in substations and 33 kV supply lines to be supported by the Project and the associated investments in the downstream distribution system needed to serve end-users. Recurrent costs include operation and maintenance (O&M) costs of the facilities constructed as well as the cost of power supply.

37. Based on available data and assumptions adopted, in the base case scenario, the economic internal rate of return (EIRR) for the proposed project is 13.78 percent. The economic viability of the project investment is robust enough to withstand large variations in four scenarios of (i) 20 percent construction cost overruns; (ii) two years delay in commercial operation date (COD); (iii) 20 percent increase in cost of supply; and (iv) worst case scenario which is a combination of all the above (Annex 4).

38. It may be noted that NEA, with minimal incremental investments, can extend the network developed under the Project to reach a much larger number of potential consumers. It is expected that the EIRR of these additional extensions will be much higher than that of the existing project as the capital investment required would be materially lower.

39. **Financial Analysis.** The Bank's sovereign-backed loan will be borrowed and repaid by the government. NEA will repay its subsidiary loan to the Government. NEA will be required to operate and maintain the assets created under the Project. Project costs include both investment costs and O&M costs. Project benefit is measured in terms of revenue from additional consumption. The current tariffs and expected consumptions in the project areas, most of which are of low-density, rural areas, will not reach a full cost-recovery at the T&D loss level of 10%.

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<sup>19</sup> NEA is maintaining similar facilities in all parts of the country, where current arrangements are at generally acceptable levels, although the maintenance practices need to be improved and modernized.

40. Despite making losses in the past, NEA has shown some substantial improvement in its financial performance since 2017. Sales revenues have grown significantly over the past few of years on the back in increased consumption (increase of 2,662 GWh between 2016 and 2019) and an increase in average sale price per unit of electricity. Tariffs were increased by 14% in 2016, and currently reach full cost-recovery levels.<sup>20</sup> EBIDTA margins have also improved significantly between 2016 and 2019, driven by higher revenues from both larger sales and average price increases.<sup>21</sup> With continued loss reduction activities<sup>22</sup> and increased domestic supply of hydro-generated electricity upon commissioning of the independent power producers, NEA is making efforts for sustainable operational and financial performance.

### C. Fiduciary and Governance

41. In Transparency International's 2018 Corruption Perceptions Index, Nepal is ranked 124th out of 180 countries. Both the World Bank (WB) and the Asian Development Bank (ADB) country assessments and institutional studies provide comprehensive information on fiduciary gaps and risks in Nepal. Fiduciary and governance risks are identified as the most significant risks in the World Bank's Nepal 2019–2023 Country Partnership Strategy, naming political instability, weak governance, increased corruption and fiduciary risks, and low capacity for program implementation. ADB's Nepal country partnership strategy, 2013–2017 also identified risks relating to country governance and corruption, ranking Nepal's Fiduciary Risk as "Substantial."

42. A procurement capacity assessment (experience, capacity, availability of procurement staff, government procurement regulations) was carried out during appraisal mission. NEA has established the PIU and additional staff are being recruited. The current staff handling procurement has experience in handling multilateral development bank (MDB)-financed projects and their service is expected to continue in the PIU. All government funded procurements are conducted in accordance with Public Procurement Act, 2063 (2007) using e-procurement platform monitored by the Public Procurement Monitoring Office.

43. A Project Delivery Strategy (PDS), in accordance with PIR requirements, has been prepared by NEA in consultation with the Bank. The PDS outlines procurement arrangements for the Project, particularly: the tendering and contracting strategies; capacity assessment; procurement risk and proposed mitigation measures; prior review thresholds etc. One of the potential procurement risks to highlight is that decision-making process in NEA is slow and lengthy, which may potentially result in delayed project implementation. The Bank has reviewed the PDS including proposed procurement plan and found it acceptable. Modifications to the PDS will be subject to the Bank's concurrence. Based on the outcome of the overall assessment of the procurement process, the procurement risk for the Project is rated as "high."

44. Based on the draft PDS, NEA has proposed a procurement approach that entails the use of IOCT and NCT based on cost estimate, risk and complexity considerations. NEA will ADB's Standard Procurement Document (SPD) modified to meet the Bank's procurement requirements as NEA is more familiar with ADB's SPD. While all government procurement is normally

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<sup>20</sup> There are no explicit subsidies from the government; cross-subsidy exists between and within consumer categories.

<sup>21</sup> The average price increases to NPR 10.48/kWh while the average rate of purchase was constant around NPR 7.5/kWh or below.

<sup>22</sup> Net system losses have reduced from 25.78% (2015/16) to 20.45% in (2017/18).

conducted using e-procurement platform, the project procurement will be conducted manually as no other MDBs have used the e-procurement platform to date. Procurements estimated to cost more than USD5 million equivalent per contract for works; and USD1 million equivalent per contract for goods will be conducted following IOCT and will be subject to prior review by the Bank. Simple civil works and off-the-shelf goods estimated to cost less than USD25,000 equivalent per contract may be procured following a request for quotation as agreed in the procurement plan. Likewise, quality- and cost-based selection method is the default procurement method for selecting consulting firms. Other methods may be used as agreed in the procurement plan.

45. **Financial management.** The financial management system of NEA has been assessed since the PIU was set up. NEA has a systematic process for preparing, reviewing, approving and analyzing the annual budget, and reasonable control on awarding, executing, paying and completing contract awards. The accounting standards applied by NEA are in line with good industry practices. NEA has an Internal Audit Department that reports to the managing director of NEA. The Auditor General's Department of Nepal will audit NEA's accounts. The financial management system of NEA and the Bank's financial management requirements will apply to the Project. The PIU will prepare a financial management manual, which will include the financial management requirements of both NEA and the Government.

46. **Disbursement.** Direct payment and advance disbursement methods will be applied to accommodate the needs of the project cash flow. With the implementation of Bank's SF, NEA has developed experience in the Bank's disbursement management including the opening and managing of the designated account for advances and preparing disbursement documents.

47. **Governance and anti-corruption.** AIIB's Policy on Prohibited Practices (2016) has been provided to NEA and will be included in the legal agreements. Implementation will be monitored regularly by the Bank. AIIB reserves the right to investigate—directly and indirectly through its representatives—alleged corrupt, fraudulent, collusive or coercive practices relating to the Project and to take necessary measures to address any issues in a timely manner, as appropriate.

48. **Institutional capacity.** NEA has experience in distribution projects, including contract management. However, other MDBs working in the country consider NEA's procurement and implementation capacity limited. The project supervision and monitoring consultant is expected to help the PIU in all procurement and contract management activities.

#### **D. Environmental and Social**

49. **Environmental and social policy (including standards) and categorization.** The Bank's Environmental and Social Policy (ESP), including the Environmental and Social Standards (ESSs) and Environmental and Social Exclusion List are applicable to the Project. The Project has been placed in **Category B**, considering the scale and nature of the proposed project activities.

50. **Environmental aspects.** An environmental and social management framework (ESMF) has been developed to cover the entire Electrification Program in Western Nepal, including the

Project.<sup>23</sup> The ESMF (i) provides an overview of the Project and its components; (ii) explains the generally anticipated environment and social risks and impacts, mitigation measures and monitoring activities for each subproject under the Project (i.e., alignment of proposed distribution lines to each substation); (iii) specifies the requirements that will be followed in relation to E&S screening, categorization, and assessment, including monitoring, meaningful consultation with subproject-affected people and relevant stakeholders, and information disclosure requirements; and (iv) specifies the E&S criteria that determine the required E&S instruments to be prepared for each subproject.

51. Anticipated environmental impacts will occur mainly in the construction stage, including dust, noise and disruption to local traffic and local business and residents. Additionally, some subprojects are located in hilly and/or mountainous regions with potential forest impacts, erosion and landslide risks. All subprojects will be subject to further assessment as detailed in the ESMF, and a site-specific environmental and social monitoring plan (ESMP) will be prepared to ensure implementation of properly designed mitigation measures. The PIU will implement the ESMF which will be supervised by the E&S specialists of the Bank.

52. Additionally, the ESMF includes criteria for screening and excluding subprojects with category “A” impacts from the Project. This includes subprojects with measurable adverse impacts on critical habitat or environmentally sensitive areas such as national parks, wildlife reserves, conservation areas, World Heritage sites, and known religious and archeological sites.

53. **Climate change risks and opportunities.** Substations and distribution lines in some areas are exposed to landslide risks, induced both by earthquakes and intense precipitation. The location of substations may also be sensitive to flooding that can result in erosion, scouring of foundation base, and submergence of equipment. Appropriate adaptation measures, such as aerial bundled cables (ABC), pole protection, and extra resistivity in some areas, will be employed to increase the Project's adaptive capacity to climate variabilities and geologic hazards.

54. The Project will provide new access to previously-unelectrified areas where households use kerosene lamps and candles for lighting and burn wood for cooking. Electricity access will reduce emissions from these primary fuels. This project will also upgrade the overloaded areas by adding 11kV lines from another supply, which will not only improve the supply quality but also reduce losses, which are about 12 percent at the distribution level. Industrial users will be able to replace diesel generators with improved quality of grid-supplied electricity. The use of climate-resilient materials such as ABC lines will help the grid system to be more climate-resilient against wildfire.

55. **Social aspects.** Electrifying households bring substantial social benefits by providing access to modern conveniences, such as refrigeration, television, and mobile phones. Women's work at home will be less laborious, and children can study at night with lighting. The Project aims

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<sup>23</sup> The overall program includes two distinct projects, this one and a separate one to be financed by EIB (EIB Project). The Bank's ESP will apply to the Project and EIB's E&S policies and procedures will apply to the EIB Project. However, given that one ESMF covers both projects, in order to ensure harmonization and facilitate the borrower's implementation of both projects, if one of the lender's E&S policy requirements are more comprehensive or stricter than the other's, the latter specific requirements will apply to this Project. Consequently, should ESS3 (Indigenous Peoples) be triggered in connection with any given subproject, the Bank will require Free Prior and Informed Consent in consultations with Indigenous Peoples.

to enhance the distribution capacity and improve the reliability and quality of electricity supply in the subproject areas. Some subprojects will require land acquisition for the construction of proposed substations and for securing the right-of-way for distribution lines. Anticipated social impacts include economic displacement of both titled and non-titled land owners resulting from the land acquisition, as well as potential impacts to the livelihoods of Indigenous Peoples. In at least one subproject, impacts to community forests have also been identified. Both a Resettlement Planning Framework (RPF) and an Indigenous Peoples Planning Framework (IPPF) have been prepared as part of the ESMF to guide the preparation of site-specific Resettlement Action Plans (RAPs) and Indigenous Peoples plans (IPPs).

56. **Gender aspects.** Electrifying households are proven to support women in health, education, safety, and economic empowerment.<sup>24</sup> According to the World Bank energy access household survey in Nepal (2017), more than 80 percent of the households surveyed rely on biomass as their primary cooking fuel; in addition, 92.5 percent of the biomass users cook indoors without an exhaust system.<sup>25</sup> Indoor electricity would prevent the burning of highly polluting fuels and decrease the chances of respiratory diseases that women at home are most likely to suffer. Electrification can increase women's literacy and educational levels, for example, evidence from Brazil shows that girls in rural areas with access to electricity are 59 percent more likely to complete primary education than those without.<sup>26</sup> Crime rates and violence toward women decrease after electrification of public spaces and streets. Electricity access also extends the working day of women for income-generating activities. As part of the ESMF, measures have been identified to ensure a gender-inclusive approach to project implementation. This includes gender-inclusive consultation and the creation of equal employment opportunities, where possible. Contractors will be required to prepare and abide by a code of conduct to manage potential risks of gender-based violence.

57. **Occupational health and safety, labor and employment conditions.** While labor requirements are likely to be significant at peak construction, permanent employment during operations will be limited. Construction activities will require both skilled and unskilled labor during project implementation, and priority will be given to the local population during labor selection. Construction risks such as earthworks, excavations, work at height, heat exertion, and electrical hazards during operation have been included in the ESMF and will be assessed in site-specific ESMPs.

58. **Stakeholder engagement, consultation and information disclosure.** The ESMF outlines a set of broad public consultation activities and information dissemination to affected people, including public meetings in subproject areas, focus group discussions, and information awareness campaigns. This will be undertaken early and throughout project preparation and implementation. Additionally, the PIU will set up and manage project information centers, which will be responsible for disseminating information to district subproject stakeholders. Information will be made available in English and Nepali.

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<sup>24</sup> African Development Bank. 2016. Empowering Women in Africa through Access to Sustainable Energy. Abidjan.

<sup>25</sup> World Bank. 2019. Nepal - Multi-Tier Framework for Measuring Energy Access Household Survey (MTF) 2017.

<sup>26</sup> Deloitte. 2014. Applying a gender lens to amplify the impact of energy access.

59. During the preparation of site-specific instruments, particularly RAPs and IPPs, focused consultation will be undertaken directly with affected families, affected institutions, community representatives, rural municipality and/or related ward office representatives. Given the nature of the distribution project, physical resettlement is unlikely, but economic displacement is expected due to land acquisition. For subprojects with substantial impacts on Indigenous Peoples, a process of Free, Prior and Informed consent (FPIC)<sup>27</sup> will be undertaken. The FPIC process will be facilitated by an Indigenous Peoples expert and will involve several rounds of consultation, community discussions, and working group input into site-specific IPPs.

60. The English language report of the ESMF, which includes the RPF and the IPPF, and the executive summary in local language(s) has been disclosed online on both AIIB and NEA websites,<sup>28</sup> and will be made available in hard copy throughout the project area. The ESMPs, RAPs, and IPPs will also be made available in English and local language(s) on both AIIB and NEA websites.

61. **Project grievance redress mechanism.** NEA will establish a project-level grievance redress mechanism (GRM) in accordance with the requirements of AIIB's ESP for the Project. The GRM will include a procedure to receive and facilitate resolution of project-affected peoples' concerns, complaints and grievances about any irregularities in application of the ESMF or site-specific instruments. The GRM would not preempt legal access to the courts or the project-affected people's mechanism (PPM, see below) for resolution of grievances. The GRM will operate at three levels: (i) PIU field officers will receive and respond to grievances from project-affected people, and seek to resolve minor grievances; (ii) if the grievance cannot be resolved at the field level, it will be referred to a PIU grievance committee; and (iii) if the matter cannot be resolved at the PIU grievance committee level, the matter will be referred to a multistakeholder grievance redress committee. The GRM process is outlined in more detail in the ESMF.

62. **AIIB's Project-affected People's Mechanism (PPM).** The PPM has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through project-level GRM or AIIB management's processes.<sup>29</sup>

63. **Monitoring and supervision arrangements.** NEA will hire an independent project supervision and monitoring consultant, to monitor the construction progress and E&S risks and impacts of the Project and to produce quarterly reports. The AIIB project team will also monitor overall progress. Sufficient implementation review missions will be arranged to keep a close check on project progress and any corrective actions required will be arranged with the PIU and NEA.

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<sup>27</sup> Although the ESP requires Free, Prior and Informed Consultation (FPICon) rather than FPIC, in order to ensure harmonization across the entire Electrification Program in Western Nepal, the standard that NEA will apply is the FPIC standard required by EIB.

<sup>28</sup> Please visit:

<https://www.aiib.org/en/projects/proposed/2018/power-distribution-system-upgrade-expansion.html> (AIIB)

<https://www.nea.org.np/publications> (NEA)

<sup>29</sup> For information on the PPM, including how to make submissions, please visit <https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html>

## E. Risks and Mitigation Measures

64. The Bank team proposes an overall “high” risk rating for the Project. Risks and constraints in achieving the project objective include: (i) lengthy land acquisition process reported in other IFI-financed projects and subsequent project delays; (ii) limited number of NEA staff to carry out adequate project implementation, procurement and environmental and social safeguards in a timely manner; and (iii) limited practice of NEA on financial management and audit procedures set by IFIs.

65. The identified risks will be mitigated by: (i) robust public consultation and land acquisition process meeting the Bank’s ESP requirements during project preparation and early project implementation; (ii) agreement with the NEA management on the adequate PIU structure with sufficient and dedicated staff; and (iii) the Bank’s technical support.

**Table 3. Summary of Risks and Mitigating Measures**

Category	Risks	Rating	Mitigation Measures
Environmental and Social	Prolonged process of land acquisition	High	Some of IFI-financed power projects suffered significant implementation delays due to the extended time it took to reach agreement with private land owners. To avoid the delays in land acquisition, the feasibility study has identified substation locations with alternatives in case of difficult negotiation. Public consultation process has started under project preparation. In addition, the Project adopts a longer implementation period (5 years), incorporating common delays experienced in the country. Project implementation will be supported by E&S staff from AIIB.
Financial Management	Limited experience with financial management procedures of international financial institutions	High	The Project will support: (i) project organization structure, verification mechanism, reporting and accountability mechanisms, financial reports preparation, and project supervision; (ii) types of project expenditures; (iii) arrangements to ensure proper planning and budget allocation; (iv) funds flow mechanism; (v) disbursement; and (vi) audit arrangements.
	Misuse of loan proceeds	High	Proper accounts and records will be maintained and audited in a timely manner to adequately identify the use of loan proceeds. Independent experts will be recruited to verify the implementation results.
Procurement	Geographically-challenging project area	High	The standard tendering process requires a number of internal clearances within NEA. Given some geographically-challenging project areas, adequate consideration will be given to the size of procurement packages to ensure that they are sizable enough to proceed efficiently and attract wider competition of qualified tenderers.

Category	Risks	Rating	Mitigation Measures
Technical Design	Suitability of the project design for the project purpose	Medium	Construction and upgrading of 33/11kV substations and the associated lines are considered relatively simple. NEA has sufficient experience in constructing and operating distribution assets for decades, including for the projects financed by the WB and ADB. The SF has financed technical consultant to prepare a feasibility study to ensure adequate technical design at the least long-term economic cost for both served and unserved areas for electricity service quality improvement and new connections.
Implementation	Limited capacity of NEA, in terms of the number of personnel	Medium	The Project will require a project implementation manual (PIM) indicating detailed tasks, required resources, allocation across geographical areas. The PIM will be finalized as a condition of effectiveness. The Bank will support: training of NEA staff in relevant knowledge and methodologies (technical, procurement, environmental and social safeguards); training in processes and procedures; training in monitoring and evaluation of the works progress; training in operations and maintenance, and development and updating of technical documentation, etc.

Source: AIIB Project Team

## Annex 1: Results Monitoring Framework

Project Objective	To increase access to and improve the quality and efficiency of electricity supply in selected areas of western Nepal											
Indicator Name	Unit of measure	Base-line 2019	Cumulative Target Values						Target by project close	End Target <sup>4</sup>	Frequency	Responsibility
			2020	2021	2022	2023	2024 <sup>1</sup>	2027 <sup>1</sup>	2024	2030		
<b>Project Objective Indicators:</b>												
New households connected to electricity <sup>1</sup> ; people <sup>2</sup> provided with new electricity service (of whom are female) <sup>3</sup>	Number	0	0	0	0	6,533; 28,744 (14,660)	32,664; 143,721 (73,298)	65,328; 287,442 (146,595)	32,664; 143,721 (73,298)	81,660; 359,302 (183,244)	Annually	NEA
New commercial & industrial connections provided <sup>5</sup>	Number	0	0	0	0	427	2,137	4,273	2,137	5,342	Annually	NEA
Existing households with improved service quality <sup>6</sup> ; people <sup>2</sup> provided with improved service quality (of whom are female) <sup>3</sup>	Number	0	0	0	0	4,400; 19,360 (9,874)	44,000; 193,600 (98,736)	44,000; 193,600 (98,736)	44,000; 193,600 (98,736)	44,000; 193,600 (98,736)	Annually	NEA
Energy saved from loss reduction <sup>7</sup>	GWh/annum	0	0	0	0	1.5	15.3	15.3	15.3	15.3	Annually	NEA

Project Objective	To increase access to and improve the quality and efficiency of electricity supply in selected areas of western Nepal											
Indicator Name	Unit of measure	Base-line 2019	Cumulative Target Values						Target by project close	End Target <sup>4</sup>	Frequency	Responsibility
			2020	2021	2022	2023	2024 <sup>1</sup>	2027 <sup>1</sup>	2024	2030		
Additional capacity provided to the distribution system	MVA	0	0	0	0	10	150	150	150	150	Annually	NEA
<b>Intermediate Results Indicators:</b>												
33/11kV substations constructed	Number	0	0	0	0	2	21	21	21	21	Semi-annually	NEA
33kV lines constructed	km	0	0	0	0	35	468	468	468	468	Semi-annually	NEA
11kV lines constructed	km	0	0	0	0	200	1,945	1,945	1,945	1,945	Semi-annually	NEA
Distribution transformers installed	Number	0	0	0	0	310	3,779	3,779	3,779	3,779	Semi-annually	NEA
Service connections made <sup>8</sup>	Number	0	0	0	0	6,960	34,800	69,601	34,800	87,001	Semi-annually	NEA
Existing 11 kV lines supplied from new networks	Number	0	0	0	0	1	2	12	2	12	Semi-annually	NEA

## Notes:

1. The new connections will materialize only when consumers wire their households and apply for new connections after each subproject is completed. This process is expected to take 3 to 6 years after project completion for full utilization is achieved. Hence at project closure all substations, 33 and 11 kV lines will be completed, but only 50% of service connections provided for are expected to be completed. Full targets are expected to be achieved 3 years after the project closure (i.e. 2030).

2. The number of people per household is assumed at 4.4. (United Nations. 2017. Household Size and Composition Around the World)

3. Female to total population is assumed at the national average of 51%. (United Nations. 2017. Household Size and Composition Around the World)
4. The end target is estimated at 6 years after project completion (i.e.2030) and a 25% increase of estimated number of new connections is expected. The project investments are sufficient to meet the end target plus further additional loads for at least 5 years or more.
5. The same assumptions for the utilization rates are applied the same here as those for the utilizations rates for residential connections (See Point 1). These connections include both three-phase and single-phase connections.
6. People benefitting from improved quality of supply will include only the currently-supplied consumers whose supply systems are improved by project investments. The figures are computed as: (the kVA transferred to the new system) \* (2) \* (1kVA per household) \* (4.4 people / household). The doubling factor counts both the anticipated loss reduction and the voltage improvement due to the shortening of effective lengths of the feeding lines, i.e. improvements to consumers who remain on the old network but will now have improved voltage due to shortened lines.
7. Energy saved from loss reduction is calculated by (previous technical loss level (%) – new loss level (%)) \* (the kVA transferred to the new system) \* (2) \* (8760 hours/year) \* (load factor) \* (power factor). The Previous technical loss level of 10%, new technical loss level of 3%, the load factor of 0.6, and the power factor of 0.95 are used for the target.
8. New service connections made include all new connections, both single-phase and three-phase connections.

## Annex 2: Sovereign Credit Fact Sheet

### Recent Economic Development

1. Nepal is a low-income country with GDP per capita at USD 849 and a population of 29 million.<sup>30</sup> The country's growth fell sharply during 2015-2016 due to the devastating earthquake and the disruption in cross-border trade. Nepal's economic growth has rebounded to 7.9 percent in 2017 and stabilized at 6.3 percent in 2018, supported by ongoing reconstruction activity following the 2015 earthquakes and the increased growth in manufacturing and tourism-related sectors.

2. The headline inflation averaged at 4.2 percent in 2018, held down by subdued food-price inflation. The current account dived to a deficit at 8.2 percent of GDP, driven by faster import increase than that of the exports in 2018. The deficit is partly financed by the buoyant remittance inflows. Since the government expenditure increased by 32.4%, propelled by Nepal's transition to fiscal federalism<sup>31</sup> and ongoing reconstruction spending, the fiscal deficit increased to 6.5 percent of GDP in 2018.

### Economic Indicators

#### Selected Macroeconomic Indicators - Nepal (2015-2020)

Economic Indicators	2015	2016	2017	2018	2019*	2020*
Real GDP growth	3.3	0.6	7.9	6.3	6.5	6.3
CPI Inflation (% change, average)	7.2	9.9	4.5	4.2	4.9	6.5
Current account balance (% of GDP)	5.0	6.3	-0.4	-8.2	-9.6	-12.5
General government overall balance (net lending/borrowing, % of GDP)	0.7	1.4	-3.1	-6.5	-5.0	-5.0
Nominal gross public debt (% of GDP)	25.2**	27.9	26.4	30.4	33.1	34.1
Public gross financing needs (% of GDP)	5.1**	3.6**	6.1**	7.2	6.6	6.7
External debt (% of GDP)	15.9**	17.3	15.7	17.4	20.2	21.8
Gross external financing need (% of GDP)	-4.2**	-5.7**	0.4**	8.2	9.1	12.0
Foreign Direct Investment (% of GDP)	0.2**	0.3**	0.3**	0.6	1.1	1.1
Gross official reserves (months of imports)	10.4**	9.6	8.3	7.2	5.7	4.4
Broad money (M2, % change)	19.9**	19.5	15.5	19.4	14.4	10.8
Exchange rate (NPR/USD, EOP) ***	106.0	108.7	102.1	112.3	115.2	--

Note: \* denotes projected figures.

\*\* Data from IMF Country Report No. 17/74

\*\*\* FX rate data from Thomson Reuters. 2019 data as of Sep 5<sup>th</sup>, 2019

Source: IMF Country Report No. 19/60. Italic data are from IMF WEO Apr. 2019.

<sup>30</sup> The income group classification for fiscal year 2019 is based on World Bank criteria, details seen: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>; Population data use World Bank 2017 data.

<sup>31</sup> The Constitution 2015 has established Nepal a Federal Democratic Republic state, which has provided the model of fiscal federalism to formalize the fiscal decentralization policies.

## Economic Outlook and Risks

3. Growth is expected to accelerate to 6.5 percent in 2019, well above its historical average, driven by ongoing reconstruction, investment in hydropower projects, a rebound in agricultural production, and supportive tourism-related activity. Inflation is projected to increase and will reach 6.5 percent in 2020, mainly due to non-food inflation pressures. The current account deficit is projected to grow larger, from 9.6 percent of GDP in 2019 to 12.5 percent of GDP in 2020, due to the strong import of capital and consumer goods coupled with weak export competitiveness and a substantial excess of government spending over revenues. Gross external financing needs have therefore increased significantly in the near-term. This remains a risk factor to be monitored going forward. In the medium-term, the current account deficit projections will decline to 4.5 percent of GDP by 2024.

4. On debt sustainability outlook, the IMF suggested that the risk of both external and overall debt distress remain low. The ratio of public debt to GDP is projected at 33 percent in 2019. In the long term, the ratio of public debt to GDP will stay stable: 35 percent for 2029 and 42 percent for 2039. The increase in the ratio of public debt to GDP from 2019 to 2039 mainly owes to continuing fiscal and current account deficits, as the country implements fiscal federalism and aims to put the economy on a higher growth path.

5. Nepal's external debt is projected at 20 percent of GDP in 2019 and will gradually increase to 26 percent by 2029, while under the revised IMF/World Bank Debt Sustainability Analysis Framework for Low-Income Countries, all external debt indicators continue to stay well below indicative sustainability thresholds<sup>32</sup>. Though both public and external debt dynamics remain resilient under standard stress tests, the possible recurrence of natural disasters is a key risk factor to the country's debt sustainability.<sup>33</sup>

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<sup>32</sup> The thresholds for external debt to GDP are 30%, 40%, and 55% for low-income countries with weak, medium, and strong debt carrying capacity, respectively.

<sup>33</sup> International Monetary Fund (IMF), 2019. 2018 article IV consultation—press release, staff report; and statement by the executive director for Nepal, No. 19/60, February 2019.

### Annex 3: Detailed Project Description

#### Background

1. The Nepal Electricity Authority (NEA) bears responsibility for the power sector in Nepal and handles the functions of generation, transmission and distribution of electric power. In the generation function, the total installed capacity in Nepal is 1,182 MW. It is supported by a number of private power producers contributing 560.8 MW of hydro power capacity out of a total installed hydro capacity of 1,129MW, according to NEA (FY2018/19). Other sources of power generation are very limited with 53.4 MW thermal and 1.7 MW of Solar power. In transmission, NEA is the sole provider with a network of 220 and 132 kV lines supplying most parts of the country. Apart from a few off-grid supplies, NEA carries out the power distribution function in the country mainly utilizing a network of 33 kV and 11 kV medium-voltage lines. 33 kV acts as the main sub-transmission system supplying power to 33/11 kV primary sub stations. Thereafter, 11 kV provides the main backbone of the distribution system.

2. Provinces 5, 6 and 7 fare worse in terms of access. While the overall electrification ratio in Nepal is currently at 77.8% there is a wide disparity of electricity access across regions. The eastern and central regions of the country are better served with access rates over 85%. In contrast, the Western and North Western regions of Nepal fare worse in this respect, with provinces 5, 6 (Karnali) and 7 (Sudurpashim) having electrification ratios of 81.0%, 27.0% and 58.9% respectively. The Government of Nepal has accepted that access to an affordable and reliable supply of electricity is critical for economic development and poverty reduction and is therefore anxious to improve electrification access throughout the country. In furtherance of this goal NEA is planning to improve electricity access to Provinces 5, 6 and 7 and the current project is designed to assist NEA in this regard.

3. Improved planning procedures will be used in the project design. In the past NEA has been extending both sub-transmission and distribution lines without much consideration to the required technical standards resulting in a very poor voltage at network peripherals. Often the voltage prevalent at peak periods are reported to drop to nearly half the required levels. The excessive line lengths and high loading also result in excessive losses. The overall system losses were as high as 25.78% in 2015/16 and a major effort was made to reduce this to 20.45% (2017/18) and 15.32% (estimate for 2018/19). However, this figure is still excessive in comparison to single digit losses experienced by many well performing utilities. This situation presents a major challenge to further network expansion; considerable redevelopment and strengthening of the existing network is required at many locations. In view of this situation, considerable inputs are made to assist NEA to improve its distribution planning standards in keeping with modern trends. Accordingly, AIIB's Project Preparation Special Fund (SF) has financed a state-of-the-art distribution network planning software to enable NEA to address all system improvements in accordance with the relevant standards. Particular attention has paid to compute the voltage drop and loss levels of the planned networks of each subproject to ensure technical soundness of the planned development.

4. The electrification program in western Nepal is designed for the upgrade and expansion of the power distribution systems with new 35 subprojects in 20 districts in Provinces 5, 6 and 7. The AIIB Project will finance 21 subprojects in 13 districts. The AIIB Project will be implemented

and managed by NEA. Where deficiencies of the existing system have been identified, proposals have been made to enhance the existing systems to ensure that the voltage supplied to consumers and system losses are within the statutory limits. In general, the target areas may be classified as: the Terai region, and the rural unserved areas at considerable distance away from major towns. The former is already identified to be supplied partially with poorly performing networks with a low voltage profile during peak hours. In these areas, improved networks to stipulated levels will materialize suppressed demand and potential for new commercial and industrial loads. Thus, there are considerable economic benefits achievable by improving the networks. The latter shows underdeveloped areas, lacking electrification due to long distances from main supply centers. Providing electricity supply to these areas through new substation networks will bring in considerable benefits with access to modern living conditions to these populations living in remote areas.

### **Subproject design**

5. All subprojects are designed to meet the technical standards stipulated under the Electricity Act of Nepal. In particular, the voltage at line-ends will be within the permissible 5% drop at the target year. In addition, technical losses will also be limited to a peak value of 5%. To facilitate project works and storage of materials, some standardization of conductors, support types and distribution transformers have been carried out. The load expected has been determined based on existing loads of similar electrified areas in Nepal and extrapolated to the target year based on growth rates achieved in the recent past. Each of the planned sub-transmission lines and distribution feeders have been subjected to a voltage drop and loss analysis to determine compliance with the standards.

### **Sub-transmission design**

6. The sub-transmission system in Nepal has been standardized at 33 kV. Supply sources to the subprojects are selected by one of three possible options given below:

- a. From a nearby 132/33 kV grid substation
- b. From an existing 33/11 kV substation using a 'line in line out' (LILO) arrangement with a 33 kV circuit breaker
- c. From direct tapping of an existing 33 kV line close by

The most optimum arrangement from the above options is selected for each of the proposed new substations.

7. In all cases the voltage drop at the line loading in the target year is computed from the source grid-substation. When the tapping is made from existing lines, the voltage drop caused to existing systems is also be computed and summed up as appropriate to determine final line end voltage.

8. The sub transmission lines will feed 33/11 kV substations which has been standardized by NEA to the sizes of 3 MVA, 8 MVA and 24 MVA. The first two substations will consist of one transformer each at 3 and 8 MVA respectively. The 24 MVA substation will consist of three 8 MVA transformers and where necessary will have 2 x 8 MVA at the initial stage.

9. The following conductor sizes and support types have been standardized for 33 kV lines in keeping with the conditions experienced in Nepal:

Table 2A-1. Proposed standardization of 33 kV line conductor sizes

<b>Substation capacity supplied by line</b>	<b>Conductor size</b>	<b>Line configuration</b>
3 or 8 MVA substation	100 sqmm ACSR (Dog)	Single circuit, triangular orientation Double circuit, horizontal orientation
24 MVA substation	200 sqmm ACSR (Panther) or 420 sqmm ACSR (Zebra)	Single circuit, triangular orientation Double circuit, horizontal orientation

Note: When the voltage drop is over 5% higher conductor size or double circuit configuration will be selected.

### **Distribution network development**

10. The medium-voltage (MV) distribution network will be based on 11 kV as the main feeder arrangement. As in the case of 33 kV lines, the voltage drop at target loading year will be computed, and then conductor size will be selected to maintain a voltage drop less than 5%. In selecting the distribution transformers (DTs) maximizing the HT/LV ratio will be considered by increasing the number of DTs while reducing their individual capacities. In particular, extending LV lines over areas with no settlements (e.g. paddy fields) will be avoided, and the use of single-phase DTs will be considered for the dispersed supply areas. Large capacity (100 kVA and 50 kVA) transformers will be considered for market areas and high-density supply conditions.

11. Standardized conductor sizes for the 11 kV feeders and distributors will be 100 mmsq ACSR (Dog), 50 sqmm ACSR (Rabbit) and 30 sqmm ACSR (Weasel), and voltage drop will be contained within 5%.

12. When single-phase DTs are used for low-density areas, the service connections will be made directly from the transformer, where feasible, using 10 mmsq insulated wires. For longer LV lengths, ABC conductors of 35 mmsq, 70 mmsq and 95 mmsq will be considered depending on the load carried and voltage drop expected.

### **Subprojects supporting existing electrified areas**

13. A number of subprojects selected will assist in strengthening the existing systems which are either overloaded or exhibiting a poor voltage. These areas have a considerable amount of suppressed demand. It is anticipated that with the improvement of the supply conditions, there will be substantial new loads added to the system. Such conditions prevail extensively in the Terai regions, where there is a great opportunity for industrial development. In addition to alleviating the suppressed loads, the network development undertaken will shorten the coverage of existing lines and reduce their loads. This will result in considerable loss reduction to the existing system. A list of these sub projects together with the anticipated loads, voltage drop calculations and investments required are provided in Table A3-1 below.

### **Subprojects providing new electricity access to unserved areas**

14. The remaining subprojects will provide access to unelectrified areas. These projects will enable improvement of the quality of life to these rural households and enable economic development of the project areas. A list of such subprojects together with the anticipated loads, voltage drop calculations and investments required are provided in Table A3-2 below.

### AIB Project

**Table A3-1: Details of Sub Projects supporting existing electrified areas**

SS No.	District	Substation (SS) Location	SS Capacity (MVA)	33 kV line length (km)	33 kV line type	33 kV volt drop	11 kV trunk line length	11 kV spur line length	No. of connections		Transfer load kVA	Suppressed load kVA	New loads kVA	Total kVA
									3 phase	1 phase				
9	Dang	Hapur	8	23.5	Panther S/C	3.60%	15	20	66	3452	1,000	700	2,036	3,736
10	Banke	Khajura	24	20.5	Panther D/C	5.00%	7	46	68	2785	7,000	1,200	1,900	10,100
13	Bardiya	Macchagadh	24	27	Zebra S/C	4.10%	14	61	65	2802	7,000	2,500	2,097	11,597
17	Rolpa	Ghartigaon	8	3	Dog S/C	6.70%	39	98	32	2181	2,000	1,000	775	3,775
21	Jajharkot	Sermaila	8	40	Dog S/C	4.00%	36	92	60	4370	1,000	1,000	1,551	3,551
22	Salyan	Piple Lekhgaun	8	20	Dog S/C	5.30%	25	56	0	2915	1,000	1,000	1,020	3,020
23	Salyan	Thamare	8	22	Dog D/C	5.00%	34	121	57	2589	1,500	1,000	926	3,426
24	Jumla	Mangri	8	20	Dog S/C	5.30%	43	78	0	1267	1,500	500	443	2,443

**Table A3-2: Details of Sub Projects exclusively supplying new unelectrified areas**

SS No.	District	Substation Location	SS Capacity (MVA)	33 kV line length (km)	33 kV line type	33 kV volt drop	11 kV trunk line km	11 kV spur line km	No. of connections		suppressed load kVA	New loads kVA	Total kVA
									3 phase	1 phase			
6	Dang	Makayundanda	8	14	Panther D/C	3.90%	19	10	75	4197	1,200	2,476	3,676
8	Dang	Jamnibas	8	18	Dog S/C	4.80%	10	13	70	1955	2,200	1,480	3,680
11	Surkhet	Budhe Bapar	3	22	Dog S/C	2.20%	12	53	78	2737		1,400	1,400
12	Surkhet	Baddichaur	3	0.2	Dog S/C	4.50%	9	63	69	2452		1,312	1,312
18	Kalikot	Raskot	3	30	Dog S/C	3.00%	31	72	11	4734		1,661	1,661
19	Kalikot	Nagma	3	2	Dog S/C	5.60%	26	73	0	4244		1,485	1,485
20	Jajharkot	Badhban	3	22	Dog S/C	4.20%	43	129	104	4179		1,499	1,499
25	Jumla	Badki	3	57	Dog S/C	5.60%	35	122	0	4678		1,637	1,637

SS No.	District	Substation Location	SS Capacity (MVA)	33 kV line length (km)	33 kV line type	33 kV volt drop	11 kV trunk line km	11 kV spur line km	No. of connections		suppressed load kVA	New loads kVA	Total kVA
									3 phase	1 phase			
26	Mugu	Khatyad	3	30	Dog S/C	4.00%	34	76	0	3707		1,297	1,297
34	Rukum West	Vampuchaur	8	20	Dog S/C		35	54	14	2456		1,000	1,000
35	Dolpa	Dunai	3	14	Dog S/C		16	45	17	3711		1,200	1,200
36	Dolpa	Tribeni	3	16	Dog S/C		16	43	21	3133		1,200	1,200
37	Humla	Simikot	3	41	Dog S/C		66	55	28	4222		1,300	1,300

## **Annex 4: Economic and Financial Analysis**

### **Methodology and Key Assumptions**

1. A cost-benefit analysis was carried out to assess the economic viability of the Project on a with- and without-project basis. Without the Project, it is assumed that unserved demand of the existing and new consumers will be partially met by self-generated power and kerosene at higher cost than grid supplied electricity. With the Project, additional power at cheaper cost will be made available to serve existing and new consumers in western Nepal.
2. It is assumed that the Project will operate 25 years after completion. Electricity demand is assumed to grow at 6 percent per annum.<sup>1</sup> Costs and benefits are estimated in constant 2019 prices. The exchange rate used is NPR/USD 110. Economic costs and benefits are derived from the financial cost estimates excluding taxes and financing charges.

### **Economic Benefits**

3. The Project investments are expected to increase the network capacity to serve incremental load flow of 150 MVA. An estimated additional 110 GWh will be available to serve end users annually in 2025, growing to 393 GWh in 2044.
4. The economic benefits are estimated using Willingness to Pay (WTP) for the additional power supply made possible by project investment. The WTP is valued at the current prevailing tariffs for the respective consumer segments and works out to USD 0.10/kWh, the weighted average WTP for the main consumption groups in western Nepal i.e. industrial, commercial and residential consumers. Industrial and commercial consumers, accounting for about 66 percent of the total consumption, have an estimated WTP of USD 0.12/kWh, based on the cost of supply. For residential consumers which accounted for the balance 34 percent of the total consumption, the WTP is assumed at the average retail tariff for consumption at USD 0.07/kWh.
5. Expected energy saved from distribution system loss reduction, about 15.3GWh per year upon completion of the Project, is also considered.

### **Economic Costs**

6. Capital costs. The capital costs include investments in the sub-transmission system and distribution facilities which will be financed by the Project. The incremental generation will be from IPPs and NEA hydrogeneration that are already under construction,<sup>2</sup> therefore no capital costs for generation is considered. In addition, to be able to serve the end-users, additional investment will be needed for upgrading low-voltage networks in the distribution system. The total capital costs including investment in distribution network is about USD 93.3 million.
7. Cost of generation is assumed at NPR 6.5/kWh in line with historical costs which have ranged between NPR 6.0-6.9/kWh in the past few years. The annual O&M costs are assumed at

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<sup>1</sup> IMF expects demand in Nepal to grow in the medium-term at an average of 5 percent per annum. Energy intensity of GDP normally increases, as a low-income country like Nepal grows with fast-growing energy demand from households and manufacturing. Hence, a slightly higher rate of growth in electricity consumption is assumed.

<sup>2</sup> According to NEA Annual Report 2017/18, 1,017MW is under construction, and an additional 2,920MW is under planning.

1 percent of the capital cost. These estimates have taken into consideration higher O&M needs in the outer years to maintain the high voltage transmission system.

### Summary of Results

8. Based on available data and assumptions adopted the economic internal rate of return (EIRR) for the proposed Project is 13.78%.

9. **Sensitivity Analysis.** Given the uncertainties associated with various market and project-specific parameters, sensitivity study was carried out to assess the robustness of the economic viability of the Project investment. The economic viability of the Project investment is robust enough to withstand large variations in four scenarios: (i) 20 percent construction cost overruns; (ii) two years delay in commercial operation date (COD); (iii) 20 percent increase in cost of supply; and (iv) worst case scenario which is a combination of all the above. The EIRR positive even in the worst-case scenario. The results of the analysis are summarized below.

Table A4-1. Sensitivity Analysis

	<b>Sensitivity Scenario</b>	<b>EIRR</b>
1	Base Case	13.78%
2	20% increase in construction cost	11.71%
3	COD delay by 2 years	11.41%
4	Cost of power supply increase by 20%	12.15%
5	All of the above combined (2+3+4)	8.30%

### Financial Performance of NEA

NEA's financial performance has improved significantly in the last three years as seen in Table A4-2.

Table A4-2. NEA Financial Performance in last three years

<b>Year</b>	<b>2018/19**</b>	<b>2017/18</b>	<b>2016/17</b>
Net Sales Revenue*	600.16	503.76	425.84
Growth %	19.14%	18.30%	47.04%
EBIDTA*	149.83	94.00	80.11
EBDITA Margin	24.97%	18.66%	18.81%
Net payable Interest*	41.41	29.32	32.27
Profit after tax*	65.56	26.36	13.67
EBIDTA/Interest	3.62	3.21	2.48
Total Current Assets*	587.40	582.75	441.38
Total Non-Current Assets*	2,411.14	2,006.85	1,787.78
Total Current Liabilities*	695.93	771.48	705.35
Total Non-Current Liabilities*	1,282.55	1,100.68	1,013.51
Net worth*	1,020.06	717.44	510.30
Total Borrowings*	1,276.24	1,094.38	1,007.20
Cash and Bank*	283.42	313.90	225.90
Net Debt to EBITDA	6.63	8.30	9.75
Net Debt to Net Worth	0.97	1.09	1.53
Current Ratio	0.84	0.76	0.63
Exchange Rate	0.0091	0.0091	0.0097

\* in million USD

\*\* provisional figures