ADB

# Completion Report

Project Number: 40553-013
Loan Number: 2587
Grant Numbers: 0182 and 0183
August 2018

# Nepal: Energy Access and Efficiency Improvement Project



Asian Development Bank

## CURRENCY EQUIVALENTS

Currency unit – Nepalese rupee/s (NRe/NRs)

| | | At Appraisal (01 August 2009) | At Project Completion (14 April 2018) |
|---|---|---|---|
| NRe1.00 | = | $0.0125 | $0.0096 |
| $1.00 | = | NRs80.00 | NRs104.09 |

## ABBREVIATIONS

| | | |
|---|---|---|
| ADB | – | Asian Development Bank |
| ADF | – | Asian Development Fund |
| AFS | – | audited financial statements |
| APFS | – | audited project financial statements |
| CCF | – | Climate Change Fund |
| CEF | – | Clean Energy Fund |
| CFL | – | compact fluorescent lamp |
| COL | – | concessional OCR loans |
| $CO_2$ | – | carbon dioxide |
| FY | – | fiscal year |
| EIRR | – | economic internal rate of return |
| EMP | – | environmental management plan |
| ETFC | – | Electricity Tariff Fixation Commission |
| FIRR | – | financial internal rate of return |
| IEE | – | initial environmental examination |
| NEA | – | Nepal Electricity Authority |
| NFRS | – | Nepal financial reporting standards |
| PMU | – | project management unit |
| PPP | – | public–private partnership |
| TA | – | technical assistance |
| WACC | – | weighted average cost of capital |

## WEIGHTS AND MEASURES

| | | |
|---|---|---|
| GWh | – | gigawatt-hour (1,000 megawatt-hours) |
| km | – | kilometer |
| kV | – | kilovolt |
| kW | – | kilowatt |
| kWh | – | kilowatt-hour |
| MVA | – | megavolt-ampere (1,000,000 volt-amperes) |
| MVAr | – | megavolt-ampere reactive |
| MW | – | megawatt (1,000 kilowatts) |
| MWh | – | megawatt-hour |
| Wp | – | watt peak |

**NOTES**

(i) The fiscal year (FY) of the Government and its agencies ends on 15 July. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2009 ends on 15 July 2009.
(ii) In this report, "$" refers to United States dollars.

| | |
|---|---|
| **Vice-President** | Wencai Zhang, Vice President, Operation 1 |
| **Director General** | Hun Kim, Director General, South Asia Department (SARD) |
| **Director** | Mukhtor Khamudkhanov, Nepal Resident Mission, SARD |
| | |
| **Team leader** | Pushkar Manandhar, Project Officer (Energy), SARD |
| **Team member** | Arjun Neupane, Associate Finance Control Officer, SARD |
| | Deepak Bahadur Singh, Senior Environment Officer, SARD |
| | Laxmi P. Subedi, Senior Social Development Officer (Safeguards), SARD |
| | Rabindra Shah, Associate Project Analyst, SARD |
| | Rajani Tuladhar, Project Analyst, SARD |
| | Roman Bhattarai, Senior Operations Assistant, SARD |

**CONTENTS**

## BASIC DATA

### A. Loan Identification

| | | |
|---|---|---|
| 1. | Country | Nepal |
| 2. | Loan number and financing source | 2587-NEP (COL) |
| | Grant number and financing source | 0182-Climate Change Fund (CCF) |
| | Grant number and financing source | 0183-Clean Energy Fund (CEF) |
| 3. | Project title | Energy Access and Efficiency Improvement Project |
| 4. | Borrower | Government of Nepal |
| 5. | Executing agency | Nepal Electricity Authority |
| 6. | Amount of loan | SDR41,127,000 |
| | Amount of grant 0182 | $0.3 million |
| | Amount of grant 0183 | $4.2 million |
| 7. | Project completion report number | 1702 |
| 8. | Financing modality | Project Loan |

### B. Loan Data

| | | |
|---|---|---|
| 1. | Appraisal | |
| | – Date started | 15 July 2009 |
| | – Date completed | 22 July 2009 |
| 2. | Loan & grant negotiations | |
| | – Date started | 14 September 2009 |
| | – Date completed | 17 September 2009 |
| 3. | Date of Board approval | 27 November 2009 |
| 4. | Date of loan & grant agreement | 11 March 2010 |
| 5. | Date of loan & grant effectiveness | |
| | – In loan & grant agreement | 9 June 2010 |
| | – Actual | 4 June 2010 |
| | – Number of extensions | None |
| 6. | Project completion date | |
| | – Appraisal | 30 September 2014 |
| | – Actual | 10 April 2018 |
| 7. | Loan & grant closing date | |
| | Loan 2587 | |
| | – In loan agreement | 30 March 2015 |
| | – Actual | 10 April 2018 |
| | – Number of extensions | 3 |
| | Grant 0182 | |

| | |
|---|---|
| – In grant agreement | 30 March 2013 |
| – Actual | 30 September 2014 |
| – Number of extensions | 1 |
| Grant 0183 | |
| – In grant agreement | 30 March 2013 |
| – Actual | 30 September 2015 |
| – Number of extensions | 2 |

8. Financial closing date

| | |
|---|---|
| Loan 2587 | |
| – Actual | 10 April 2018 |
| Grant 0182 | |
| – Actual | 09 November 2016 |
| Grant 0183 | |
| – Actual | 09 November 2016 |

9. Terms of loan

| | |
|---|---|
| – Interest rate | 1.0% per annum during grace period, 1.5% per annum thereafter |
| – Maturity | 32 years |
| – Grace period | 8 years |

10. Terms of relending

| | |
|---|---|
| – Interest rate | 5.0 per annum |
| – Maturity | 32 years |
| – Grace period | 0 |
| – Second-step borrower | Nepal Electricity Authority |

11. Disbursements

a. Dates

| Initial Disbursement | Final Disbursement | Time Interval |
|---|---|---|
| • 8 November 2010 (Loan 2587)<br>• 6 March 2012 (Grant 0182)<br>• 2 April 2012 (Grant 0183) | • 16 October 2017 (Loan 2587)<br>• 10 November 2015 (Grant 0182)<br>• 25 July 2016 (Grant 0183) | • 83 months (Loan 2587)<br>• 44 months (Grant 0182)<br>• 52 months (Grant 0183) |
| **Effective Date** | **Actual Closing Date** | **Time Interval** |
| • 4 June 2010 (Loan 2587)<br>• 4 June 2010 (Grant 0182)<br>• 4 June 2010 (Grant 0183) | • 31 March 2017 (Loan 2587)<br>• 30 September 2014 (Grant 0182)<br>• 30 September 2015 (Grant 0183) | • 82 months (Loan 2587)<br>• 52 months (Grant 0182)<br>• 64 months (Grant 0183) |

b. Loan Amount (SDR)

| Category | Original Allocation (1) | Increased During Implementation (2) | Canceled During Implementation (3) | Last Revised Allocation (4=1+2-3) | Amount Disbursed (5) | Undisbursed Balance (6=4-5) |
|---|---|---|---|---|---|---|
| **1. Turnkey contract for components 1, 2, and 3** | 26,726,000.00 | 4,856,844.00 | 1,530,418.00 | 30,052,426.00 | 27,439,940.00 | 2,612,486.00 |
| **2. Supply contract for components 2 and 4** | 9,681,000.00 | | 5,265,251.00 | 4,415,749.00 | 4,220,302.00 | 195,447.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **3. Consulting services** | 361,000.00 | | 141,750.00 | 219,250.00 | 103,104.00 | 116,146.00 |
| **4. Service charge during construction** | 1,404,000.00 | | | 1,404,000.00 | 860,492.00 | 543,508.00 |
| **5.Unallocated** | 2,955,000.00 | | 2,953,846.00 | 1,154.00 | | 1,154.00 |
| **Total** | **41,127,000.00** | **4,856,844.00** | **9,891,265.00** | **36,092,579.00,** | **32,623,838.00** | **3,468,741.00** |

Grant 0182 Amount ($ million)

| Category | Original Allocation (1) | Increased During Implementation (2) | Canceled During Implementation (3) | Last Revised Allocation (4=1+2-3) | Amount Disbursed (5) | Undisbursed Balance (6=4-5) |
|---|---|---|---|---|---|---|
| **1. Consulting services for component 5** | 0.27 | 0.00 | 0.00 | 0.27 | 0.02 | 0.25 |
| **2.Unallocated** | 0.03 | 0.00 | 0.00 | 0.03 | 0.00 | 0.03 |
| **Total** | **0.3** | **0.00** | **0.00** | **0.30** | **0.02** | **0.28** |

Grant 0183 Amount ($ million)

| Category | Original Allocation (1) | Increased During Implementation (2) | Canceled During Implementation (3) | Last Revised Allocation (4=1+2-3) | Amount Disbursed (5) | Undisbursed Balance (6=4-5) |
|---|---|---|---|---|---|---|
| **1. Equipment and Material for component 5 and 6** | 3.74 | 0.37 | 0.00 | 4.11 | 3.67 | 0.45 |
| **2. Consulting Services for component 6** | 0.11 | 0.00 | 0.07 | 0.03 | 0.03 | 0.00 |
| **3. Training and Workshops** | 0.09 | 0.00 | 0.04 | 0.05 | 0.01 | 0.05 |
| **4.Unallocated** | 0.26 | 0.00 | 0.26 | 0.00 | 0.00 | 0.00 |
| **Total** | **4.20** | **0.37** | **0.37** | **4.20** | **3.70** | **0.50** |

## C. Project Data

1. Project cost ($ million)

| Cost | Appraisal Estimate | Actual |
|---|---|---|
| Foreign exchange cost | 68.1 | 46.9 |
| Local currency cost | 25.5 | 25.6 |
| **Total** | **93.6** | **72.5** |

2. Financing plan ($ million)

| Cost | Appraisal Estimate | Actual |
|---|---|---|
| **Implementation cost** | | |
| Borrower financed | 24.19 | 20.12 |
| ADB loan | 62.76 | 47.42 |
| ADB administered grant 0182 | 0.30 | 0.02 |
| ADB administered grant 0183 | 4.20 | 3.69 |
| **Total implementation cost** | **91.45** | **71.26** |
| **Interest during construction costs** | | |
| Borrower financed | 0.00 | 0.00 |
| ADB loan | 2.23 | 1.24 |

| Cost | Appraisal Estimate | Actual |
|---|---|---|
| ADB administered grants | 0.00 | 0.00 |
| **Total interest during construction cost** | **2.22** | **1.24** |

ADB = Asian Development Bank.

## 3. Cost breakdown by project component ($ million)

| Component | Appraised | Actual |
|---|---|---|
| Facilitating Access to Clean Energy | 46.65 | 43.15 |
| Energy Access Quality Enhancement | 14.29 | 9.44 |
| Clean Energy Plant Improvement | 3.39 | 3.54 |
| Supply-Side Energy Efficiency Improvement | 12.35 | 10.70 |
| Energy Efficiency in Lighting | 1.70 | 1.03 |
| Renewable Energy for Street Lighting | 2.30 | 3.17 |
| Capacity Building | 0.76 | 0.23 |
| Taxes and Duties | 2.00 | |
| Contingencies | 7.97 | 0.00 |
| Interest During Construction | 2.22 | 1.24 |
| **Total** | **93.63** | **72.50** |

## 4. Project schedule

| Item | Appraisal Estimate | Actual |
|---|---|---|
| **Date of Contract with consultants** | | |
| System designing and implementation support for loss reduction project | Aug-2010 | Feb-2011 |
| Individual Consultant (International) for Distribution PPP project | Sept-2010 | Jul-2011 |
| Individual Consultant (National-Legal) for Distribution PPP project | Sept-2010 | Jul- 2011 |
| Individual Consultant (National) for Distribution PPP project | Sept-2010 | Jul- 2011 |
| Waste Management Policy Advisor | Dec-2009 | Jun--2011 |
| Individual Consultant (National) for Renewable Energy Street Lighting Projects | Feb-2010 | May-2011 |
| **Turn-key contracts** | | |
| **Component 1** | | |
| A1. Procurement of Dumre–Damauli 132 kV transmission line and Middle Marshyangdi–Marshyangdi 132 kV second circuit stringing | | |
| Date of award | Mar-2010 | Oct-2010 |
| Completion of work | Sep-2011 | Work Ongoing |
| A2. New Marshyangdi 132 kV substation and associated line bay extension in surrounding region | | |
| Date of award | Mar-2010 | Jun-2014 |
| Completion of work | Sep-2011 | Mar-2017 |
| A3. Procurement of Chapali 132 kV substation, Lainchaur–Chabel 66 kV underground cable link, and associated works | | |
| Date of award | Mar-2010 | Jan-2012 |
| Completion of work | Sep-2011 | Sept-2015 |
| A4. Supply and construction of 132 kV Butwal–Kohalpur second circuit transmission line | | |
| Date of award | Mar-2010 | Mar-2011 |
| Completion of work | Aug-2011 | Aug-2014 |
| A5. Supply and construction of 132 kV substations | | |
| Date of award | Oct-2010 | Dec-2010 |
| Completion of work | Mar-2012 | Oct-2014 |
| A6. Design, supply, and installation of Matatirtha substation expansion | | |
| Date of award | Mar-2010 | Oct- 2010 |
| Completion of work | Sep-2011 | Jun-2014 |

| Item | Appraisal Estimate | Actual |
|---|---|---|
| A7. Design, supply, testing, and commissioning of capacitor banks in grid substations. | | |
| Date of award | Feb-2010 | Oct-2010 |
| Completion of work | Sep-2011 | May-2013 |
| A8. Grid substation reinforcement project (extended scope of A5) | | |
| Date of award | N/A | Dec-2013 |
| Completion of work | N/A | July-2016 |
| **Component 2** | | |
| B1. Supply, delivery, and construction of 33/11 kV substations | | |
| Date of award | Feb-2010 | Aug-2010 |
| Completion of work | Aug-2011 | Dec 2014 |
| B2. Supply, delivery, and construction of 33/11 kV substations and switching stations | | |
| Date of award | Feb-2010 | Aug-2010 |
| Completion of work | Aug-2011 | Work-Ongoing |
| B5. Supply, delivery, and construction of 33 and 11 kV lines | | |
| Date of award | Feb-2010 | Dec-2010 |
| Completion of work | Aug-2011 | Mar-2017 |
| **Component 3** | | |
| C1. Procurement of Marshyangdi power station weir control modernization and modification | | |
| Date of award | Mar-2010 | Sep-2011 |
| Completion of work | Jan-2011 | Oct- 2013 |
| C2. Procurement of excitation system at Marshyangdi power station | | |
| Date of award | Mar-2010 | July-2014 |
| Completion of work | Jan-2011 | Jun-2016 |
| C3. Procurement of design, fabrication, supply, and installation of trash rack cleaning machine at Gandak power station | | |
| Date of award | Mar-2010 | Apr-2013 |
| Completion of work | Dec-2011 | Dec-2016 |
| **Component 4** | | |
| D3. Supply and delivery of various line materials and construction of lines | | |
| Date of award | Sep-2010 | Jun-2013 |
| Completion of work | Sep-2011 | Jan-2017 |
| **Component 5** | | |
| E. Supply and delivery of CFLs | | |
| Date of award | Dec-2009 | Nov-2012 |
| Completion of supply | Oct-2010 | Mar-2014 |
| **Component 6** | | |
| F1. Supply and installation of solar streetlights | | |
| Date of award | Jun-2010 | Dec-2013 |
| Completion of work | Sep-2011 | Apr-2015 |
| F2. Supply and installation of solar and solar-wind hybrid streetlights | | |
| Date of award | Jun-2010 | Jan-2013 |
| Completion of work | Sep-2011 | Apr-2014 |
| F3. Supply and installation of solar rooftop | | |
| Date of award | Jun-2010 | Feb-2013 |
| Completion of work | Sep-2011 | Sep-2014 |
| **Equipment and Supplies** | | |
| Dates | | |
| First Procurement | Nov-2010 | Dec-2010 |
| Last Procurement | May-2011 | May-2013 |

| Item | Appraisal Estimate | Actual |
|---|---|---|
| Completion of equipment Installation | Jan 2013 | Mar-2017 |
| Start of Operation | | |
| Completion of tests and commissioning | Feb-2013 | Mar-2017 |
| Beginning of start-up[a] | Feb-2012 | May-2013 |

Note [a]: For first completed contract.
CFL = compact fluorescent lamp, kV = kilovolt, NA = not applicable, PPP = public–private partnership.
Sources: Appraised data from the Report and Recommendation of the President and actual data from Nepal Electricity Authority.

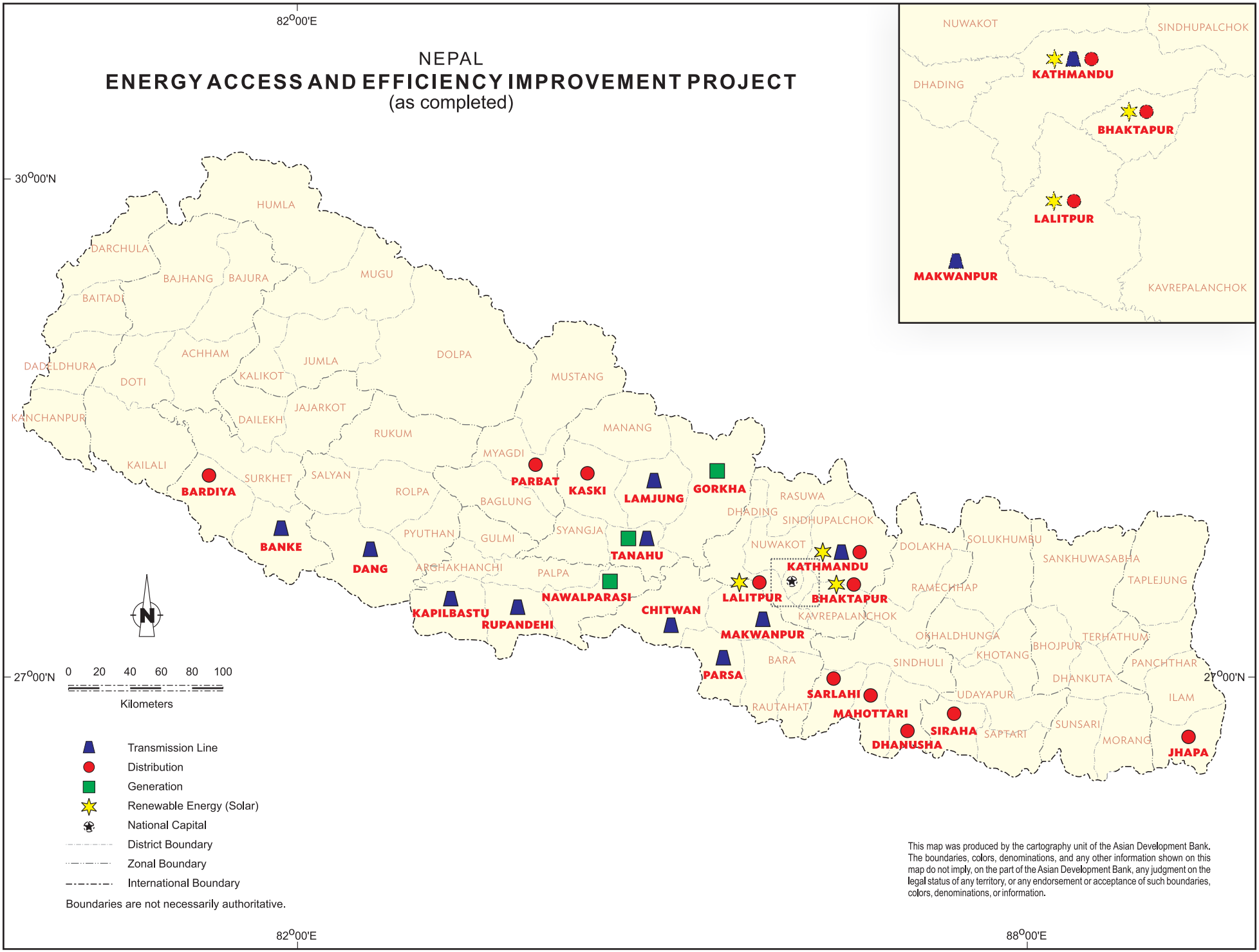
5. Project performance report ratings

| Implementation Period | Ratings | |
|---|---|---|
| | Development Objectives | Implementation Progress |
| From 30 November 2009 to 31 December 2009 | Satisfactory | Satisfactory |
| From 1 January 2010 to 31 December 2010 | Satisfactory | Satisfactory |
| | Single Project Rating | |
| From 1 April 2011 to 30 June 2011 | Potential Problem | |
| From 1 July to 31 December 2011 | Actual Problem | |
| From 1 January 2012 to 30 June 2012 | Actual Problem | |
| From 1 July 2012 to 30 September 2012 | On Track | |
| From 1 October 2012 to 31 December 2012 | Potential Problem | |
| From 1 January 2013 to 31 March 2013 | Actual Problem | |
| From 1 April 2013 to 31 December 2013 | On Track | |
| From 1 January 2014 to 31 December 2014 | On Track | |
| From 1 January 2015 to 30 September 2015 | Potential Problem | |
| From 1 October 2015-31 December 2015 | On Track | |
| From 1 January 2016 to 31 December 2016 | On Track | |
| From 1 January 2017 to 31 December 2017 | On Track | |
| From 1 January 2018 to 30 April 2018 | On Track | |

## D. Data on Asian Development Bank Missions

| Name of Mission | Date | No. of Persons | No. of Person-Days | Specialization of Members |
|---|---|---|---|---|
| Inception Mission | 05 June–12 June 2010 | | NA | NA |
| Project Review Mission | 15 November–19 November 2010 | 3 | 12 | f/a, c, b |
| Project Review Mission | 7 November–14 November 2011 | 3 | 18 | f/a, b, g |
| Special Project Administration Mission | 29 August–30 August 2012 | 2 | 4 | f/j, h |
| Mid Term Review Mission | 1 March–7 March 2013 | 3 | 21 | f/j, h, k |
| Project Review Mission | 10 December–25 December 2013 | 4 | 28 | f/d, e, h, i |
| Project Review Mission | 13 August–15 September 2014 | 5 | 35 | f/d, e, i, j, h |
| **Project Review Mission** | 09 July–31 August 2015 | 4 | 28 | f/d, h, i, j |
| Project Review Mission | 3 May–3 June 2016 | 4 | 28 | f/d, h, i, j, |
| **Project Completion** | 27 February–23 March 2018 | 4 | 40 | f/d, h, i, k |

a = finance specialist, b = project/program implementation officer, c = energy economist, d = project officer (energy), e = senior environment officer (consultant), f = mission leader, g = project officer (energy division), h = associate project analyst, i = senior social development officer (safeguards), j = project administration unit head (Nepal resident mission), k = project analyst.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ENERGY ACCESS AND EFFICIENCY IMPROVEMENT PROJECT
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Boundaries are not necessarily authoritative.
NUWAKOT
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# I. PROJECT DESCRIPTION

1. At the time of project appraisal in 2008, only 33% of households in Nepal were served with grid electricity, and the country could not generate adequate power to meet the demand. Nepal's hydropower generation potential is estimated at 43,000 megawatt (MW).[1] The total installed generation capacity of Nepal was 615 MW in 2008. Developing new generating capacity requires time and large investments, which the government continued to pursue through the Nepal Electricity Authority (NEA) and the private sector. Until additional generation capacity is developed, improving the reliability of existing generation and transmission facilities and pursuing energy efficiency and demand management—both on the supply side and the demand side—will be essential. The Energy Access and Efficiency Improvement Project was proposed almost after 10-year gap in Asian Development Bank (ADB) investments in Nepal's energy sector, with the objectives of (i) making existing assets on the supply side more efficient and reliable, and (ii) reducing demand for lighting during peak hours, while providing distribution network capacity to serve households with electricity connections. The project was relevant at the time amid growing capacity shortages and load shedding in Nepal.

2. The project aimed to contribute to government's objectives of (i) increasing the grid electrification rate from 33% in 2008 to 45% by 2015, and (ii) adding 50 MW of generation capacity annually for use within Nepal. The outcome targets envisaged at appraisal were: (i) 20,000 new domestic consumers connected in project areas by 2014; (ii) power transfer capability between generating regions and load centers increased by 75 MW by 2014; (iii) generation capacity increased by 4 gigawatt-hours (GWh) per year from two existing hydropower plants; (iv) distribution losses in pilot project areas reduced from 25% to 22% by 2013, with an energy saving of 25 GWh per year; (v) per capita lighting load decreased by 30% by the end of 2011, with an energy saving of about 23 GWh per year; (vi) street lighting load in selected urban centers eliminated or reduced by end-2011, with an energy saving of 1 GWh per year; and (vii) accounts receivable (for using NEA's electricity service by its consumers) reduced from 4.3 to 3.0 months by end-2010. In addition, it was estimated that items (i) through (vi) above would reduce carbon dioxide ($CO_2$) emissions by about 15,000 tons per year.

3. The project was structured into seven components (paras. 12–24). Two small-scale projects preparatory technical assistance (TA) projects were provided by ADB to prepare the project and facilitate project appraisal.

# II. DESIGN AND IMPLEMENTATION

4. The project was designed to provide additional generation, transmission and distribution capacity, and additional energy at a lower cost and construction lead time, compared with establishing new assets. Project preparatory studies included an energy sector assessment, technical and safeguards due diligence, a financial and economic evaluation, and a financial management assessment of the NEA. The project also explored how to reduce peak-time demand for and consumption of lighting.

5. The project duration was extended three times, and the project was finally closed on 10 April 2018, against an original project completion date of 30 September 2014. The project scope included packages for transmission lines, distribution lines, and associated substations. All physical assets were completed and commissioned except one transmission line and one switching substation. The failure to complete one transmission line package was mainly because

[1] Government of Nepal, Ministry of Water Resources. 2001. *The Hydropower Development Policy*. Kathmandu.

of contractor nonperformance. Poor project readiness in terms of design, land acquisition, and forest clearance also contributed to the delay, especially in the early implementation phase. A minor scope change took place during project implementation to increase the capacity of three grid substations (para. 18). All consulting support tasks have been completed. The planned intervention to support the NEA in moving into public–private partnership (PPP) arrangements for three distribution areas was partly implemented, although initial support to identify and prioritize distribution centers was implemented successfully.

## A. Project Design and Formulation

6. The project design was consistent with the government's Eleventh Three-Year Interim Plan, 2008–2010, which focused on reducing load shedding in the short term and exporting electricity to neighboring countries in the long term.[2] The targets set for the energy sector in the long term, to be achieved by 2027, include: (i) adding generation capacity to reach 4,000 MW; (ii) expanding electricity services to ensure coverage of 75% of the population through the national grid, and 25% through decentralized and alternative energy sources; (iii) increasing per capita annual electricity consumption to 400 kilowatt-hours (kWh);[3] and (iv) exporting significant amounts of electricity to contribute to national earnings. At project completion, the government's 14th Three-Year Plan, 2016–2019 contained similar objectives, with a target to make electricity accessible and available to all, while improving efficiency on both the supply side and the demand side.[4]

7. The project was consistent with ADB's country partnership strategy (CPS) for Nepal, 2010−2012, and its outcome targets were in alignment with energy-related CPS outcomes.[5] The project design focused on key milestones for the energy sector as outlined in ADB's CPS results framework, which included: (i) upgrading and building new transmission lines; (ii) extending distribution lines; (iii) improving energy access; (iv) constructing new hydropower plants; (v) developing cross-border transmission lines; (vi) reducing transmission and distribution network losses; (vii) enforcing anti-theft laws; (viii) expanding off-grid street-lighting; (ix) achieving positive cumulative cash flow for the NEA by 2015; (x) establishing an independent energy sector regulator; and (xi) ensuring that the NEA is fully ring-fenced with separate cost centers for its business activities.

8. At the time of inception, the project was well aligned with ADB's CPS and its strategies and milestones for Nepal's energy sector. The project components (para. 12-24) were adequately mapped and aligned to achieve outcomes and key milestones outlined in the CPS for Nepal, 2010–2012. Components 1 and 2 contributed to ADB's CPS result framework (i) through (iv) and (vi) above. Component 3 was aligned with milestone (v) by enhancing the capacity of existing hydropower plants. Component 4 was aligned with milestone (vii), while components 5 and 6 focused on milestone (ix). Component 7 (capacity development) was designed to build a basis for achieving milestones (x) and (xi); it was designed to bridge gaps in policy, focusing on developing capacity in (i) PPP, (ii) energy sector regulations, (iii) policy formulation and planning,

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[2] Government of Nepal, National Planning Commission. 2007. *Eleventh Three-Year Interim Plan, 2007/08–2009/10.* Kathmandu.

[3] Per capita electricity consumption in Nepal in 2006 was 76 kWh.

[4] Government of Nepal, National Planning Commission. 2016. *Fourteenth Three-Year Interim Plan, 2016/17–2018/19,* Kathmandu.

[5] ADB. 2009. *Country Partnership Strategy: Nepal, 2010−2012.* Manila. The Country Partnership Strategy outcomes related to the energy sector include: (i) increased energy access for households, (ii) rapid hydropower development and expansion of transmission and distribution, and (iii) increased regional cooperation through cross-border power trade and related investment.

and (iv) project management and implementation. Political uncertainties in Nepal during the project period delayed the implementation of reforms, including formation of independent regulator. Although the sector targets were not fully achieved, ADB support in the four key areas listed above (para. 6) gave the government the flexibility to advance energy sector reforms.

9. The Ministry of Finance, Ministry of Energy, and NEA participated in the project formulation and helped identify needs and project outputs. Components 1 through 4 are direct responsibilities of NEA as an integrated utility, and NEA ensured a high degree of ownership. The NEA also implemented components 5 and 6, which were demand-side initiatives to improve efficiency in lighting and introduce renewable energy for street lighting, because a modern utility should ensure that demand-side initiatives are included in plans to serve customers. The NEA's ownership in these new areas of intervention was important in that respect. Component 7 contributed to building NEA's capacity to support energy sector reforms and project management.

10. The strategic direction of the government's Action Plan on National Energy Crisis Prevention and Electricity Development Decade[6] and ADB's CPS, 2013–2017[7] remain similar to the direction of the government's 2008–2010 interim plan and ADB's CPS for Nepal, 2010–2012. Power sector infrastructure development and improved financial performance have yet to be achieved in Nepal and remain highly relevant. Given Nepal's slow pace of developing infrastructure to produce, transmit, and distribute electricity, and its efforts to achieve technical quality, commercial and financial viability in the electricity industry, the project outputs remained just as relevant at project completion as they were during the design phase.

## B. Project Outputs

11. This section compares planned project outputs at appraisal with actual achievements for each component.

12. **Component 1: Facilitating access to clean energy.** This component comprised six subcomponents, including additional grid substations capacity development.

13. **Subcomponent (a): Middle Marshyangdi–Marshyangdi transmission line (second circuit stringing), Dumre–Damauli transmission line, and related substation works.** The scope of work included (i) stringing a 40-kilometer (km) long second circuit of the existing transmission line from Middle Marshyangdi to Marshyangdi, (ii) constructing 20 km of new 132 kilovolt (kV) double circuit transmission line from Dumre to Damauli, and (iii) constructing a new 132 kV substation at Markichowk and bay extensions at the existing Middle Marshyangdi and Damauli substations. The new 132 kV transmission line from Dumre to Damauli could not be completed because of poor contractor performance, right-of-way issues, and delayed approval of forest tree cutting. The NEA terminated the contract and is currently constructing the remaining portion of the line. The second circuit stringing work from Middle Marsyangdi to Marsyangdi and the foundation of the new transmission towers for Dumre to Damalui has been completed. The NEA is expected to complete remaining works by December 2018.[8] Construction of the new substation at Markichowk and bay extension works at the Middle Marshyangdi and Damauli substations, including the addition of 30 megavolt-amperes (MVA) of substation capacity, were

[6] Government of Nepal, Ministry of Energy, Water Resources and Irrigation, 2016. *Action Plan on National Energy Crisis Prevention and Electricity Development Decade,* Kathmandu

[7] ADB, 2013, *Country Partnership Strategy: Nepal 2013–2017,* Manila

[8] At contract termination (4 November 2016), the foundations for 30 of the 68 towers in the Dumre–Damauli transmission line section had been completed, and 25 km out of 40 km of second circuit stringing for the Middle Marshyangdi–Marshyangdi transmission line section had been completed.

completed in March 2017.

14. **Subcomponent (b): Butwal–Kohalpur 132-kilovolt transmission line and construction of associated substations.** The scope of this subcomponent included (i) stringing of the second circuit of the existing 132 kV transmission line from the Butwal substation to the Kohalpur substation, and (ii) constructing new 132/33 kV, 30 MVA and 33/11 kV, 5 MVA substations at Kusum, along with bay extensions at the Butwal, Lamahi, Chanauta, and Kohalpur substations. The second circuit stringing was completed and commissioned in August 2014, adding 213 circuit km of transmission line and doubling power transfer capacity between these two cities, supporting more power flow toward load centers. Construction of the new substation at Kusum and bay extensions at the four substations, adding 35 MVA of transformer capacity, was completed and commissioned in October 2014.

15. **Subcomponent (c): Chapali 132-kilovolt substation and associated facilities.** The scope of this subcomponent included the construction of a new 132/11 kV, 30 MVA grid substation at Chapali, the extension of the 66 kV Lainchaur substation, and connecting Lainchaur substation with the Chabel substation through a new 66 kV underground cable. The subcomponent was completed and commissioned on 28 September 2015.

16. **Subcomponent (d): Expansion of the Matatirtha 132-kilovolt substation.** The scope of work included the construction of 132/11 kV, 22.5 MVA and 132/33 kV, 30 MVA substations. The subproject was completed and put into operation in June 2014. The 132/11 kV substation has reduced the average length of the 11 kV feeders that supply electricity to the western part of Kathmandu, thereby improving the voltage profile, improving reliability, and reducing distribution losses.

17. **Subcomponent (e): Installation of capacitor banks.** The scope of work included installation of 220 megavolt-ampere reactive (MVAr) capacitor banks across eight substations. However, the project installed 252.5 MVAr capacitor banks across 11 substations due to system requirements.[9] The work was completed in May 2013. The subproject has significantly improved the voltage profile of the 11 kV distribution feeders originating from these substations and has helped to ease the congestion problem in the transmission system. The installation of 40 MVAr capacitor banks at the Butwal substation at 33 kV enabled additional power to be imported from India.

18. **Subcomponent (f): Reinforcement of grid substations.** This was added on during implementation. The transformer capacity at the Birgunj, Parwanipur, and Hetauda substations was increased under this subcomponent by adding 208 MVA and enabling the project to achieve more substation capacity than projected at inception. The work was completed in July 2016. The reinforcement of these substations has enhanced the distribution capacity in Hetauda–Birgunj, Nepal's major industrial corridor, thereby, enhancing the relevance of the project.

19. **Component 2: Energy access quality enhancement.** This component consisted of constructing (a) eight new 33/11 kV, 6/8 MVA substations at Kusma, Barahathwa, Mainapokhar, Dhanushadham, Paraul, Baniyani, Mirchaiya, and Baskot, and (b) three new 11 kV switching substations at Swayambhu, Mulpani, and Mirmi. These areas were earlier served by long 11 kV feeders originating from substations in distant locations, which resulted in frequent outages and

[9] Capacitor bank is a set of capacitor units arranged in series or parallel to compensate reactive energy (*power factor correction*) due to consumers and the inductive effect of *long* overhead lines *& underground cables* and p*rovide* voltage regulation.

a poor voltage profile, and constrained new customer connections. The new substations have helped reduce distribution losses, have improved the quality and reliability of the distribution network in these areas, and have extended electricity access to rural households. All substations have been completed, commissioned, and put into operation except the Mirmi switching substation. Final civil works and installation of equipment at the Mirmi switching substation were not completed within the project period because of the contractor's poor performance. The remaining work at the Mirmi substation is being undertaken through a separate ADB loan under the Electricity Transmission Expansion and Supply Improvement Project.[10]

20. **Component 3: Clean energy plant improvement.** This covered two subcomponents (i) modernization of weir control and replacement of an excitation system[11] at the Marshyangdi hydropower plant (69 MW), and (ii) installation of a trash rack cleaning system at the Gandak hydropower plant (15 MW). The work was completed in June 2016. Subcomponent (i) has helped reduce forced outages, enabling the Marshyangdi plant to produce more electricity. This power plant on average accounts for 21% of electricity generated for domestic use annually in Nepal. Similarly, subcomponent (ii) has increased annual generation at the Gandak plant. This power plant was producing about 15 GWh of electricity per year; in fiscal year (FY) 2017, after the installation of the trash rack cleaning system, the plant generated 21 GWh.[12]

21. **Component 4: Supply-side energy efficiency improvement.** The scope of this component was to reduce technical and commercial losses by upgrading and/or rebuilding selected distribution feeders and low-voltage networks in the Kathmandu Valley and the Birgunj–Simara corridor. A consultant's study identified 27 feeders with unacceptably high system losses (average loss: 35%) and established the detailed scope of the component. The implementation of this component was completed by January 2017. Lines built under the component have contributed to reduce technical losses from the pre-project average of 35% to 8% and have improved the quality of supply in these two areas.

22. **Component 5: Energy efficiency in lighting.** The planned target was 1 million compact fluorescent lamps (CFLs) distributed to households to improve energy efficiency in lighting. Approximately 750,000 CFLs were procured (at a cost of $1.09 per CFL) and distributed by March 2014; this resulted in an estimated reduction of 25 MW of power demand during peak times and saved an estimated 46 GWh of energy per year. The outputs did not reach the planned 1 million CFLs distributed because, as the NEA noted, customers themselves were willing to purchase CFLs at market prices (average cost: $2 per CFL) once the initial distribution of 750,000 CFLs had been completed. Thus, it was not deemed useful to continue distributing free CFLs, as this could potentially have distorted the market.

23. **Component 6. Renewable energy for street lighting.** The planned scope was to install 1,000 solar or wind–solar street lights in the Kathmandu Valley. Actual achievements substantially exceeded the target, with installation of 1511 stand-alone solar streetlights, each rated at 40 watt-peak (Wp) or 60 Wp. All streetlights have battery storage. These interventions resulted in an estimated displacement of about 1 GWh of electrical energy per year, which otherwise would have been drawn from the grid. The scope of this component was increased during implementation with the installation of 150 kWp grid tied solar photovoltaic systems[13] and a 10

[10] Asian Development Bank. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Loan, Grant, Technical Assistance Grant, Administration of Grant to Nepal for the Electricity Transmission Expansion and Supply Improvement Project.* Manila.

[11] An excitation system produces the magnetic flux required in a generator to produce electricity.

[12] Information collected during a personal interview with the project manager, Nepal Electricity Authority.

[13] 100 kWp was installed at the NEA training center in Kharipati, while 50 kWp was installed at Bir Hospital.

kWp backup system at Bir Hospital. These two grid-tied solar energy systems supply an average of 225 MWh per year. All installations under this component were completed, commissioned, and became operational by April 2015.

24. **Component 7: Capacity building**. The scope of this component included consultant studies to: (i) identify and support the operation of three distribution centers under a PPP modality, and (ii) prepare a loss-reduction plan for component 4. The first study on the potential PPP modality conducted a performance analysis of the NEA's distribution centers and, based on the findings of the analysis, recommended three distribution centers for PPP initiatives. The bid documents, including the terms and conditions for the PPP, evaluation criteria, a monitoring plan, and an implementation schedule and plan, were developed. However, the absence of clear policies, delays in establishing a legal and regulatory framework, and unfavorable site conditions contributed to a government agency not taking sufficient ownership to implement this component. The second study under this component identified areas in Kathmandu and the Birgunj corridor for improving 11 kV feeders and low voltage networks to reduce technical losses, improve the voltage profile, and improve the quality of the electricity supply.

## C. Project Costs and Financing

25. The total project cost, comprising base costs, taxes, contingencies, and interest during construction, was estimated at $93.6 million during appraisal, while the actual cost was $72.5 million at project completion (APPENDIX 2). Actual outputs were less than planned for some components, while for other outputs exceeded projected targets. Compared with the projected base costs, components 1, 2, 4, 5, and 7 reported cost underruns, but components 3 and 6 reported cost overruns. Major cost overrun was for component 6 ($850,000, or 37.0% of the estimated cost) which was attributed to an increase in the scope of work (para. 23) and was justified considering that it led to a 30% increase in output compared with the appraisal target for component 6. Cost overrun in component 3 was small ($150,000, or 4.4% of the estimated cost) and can be attributed to commercial conditions.

26. At appraisal, ADB was to finance 74.2% of the total project cost, whereas at project completion ADB financed 72.2% of the total cost of the project. The main cause for the change in the percentage allocation is that $6.44 million spent on equipment maintenance during the project implementation period was borne by the government and the NEA. ADB administered grant 0183 under this project (the Clean Energy Fund grant, under the Clean Energy Financing Partnership Facility),[14] which financed (i) consulting support for components 6, and 7, and (ii) implementation of components 5 and 6. Grant 0182 (the Climate Change Fund grant) financed consulting support for component 5.

## D. Disbursements

27. ADB loan disbursement totaled $48.7 million, or 67% of the projected amount of $72.5 million.[15] The project administration manual did not forecast a specific disbursement schedule. Figure 4.1 outlines the forecast disbursement schedule (APPENDIX 4), derived using ADB internal database. The actual cumulative loan disbursements were lower than the forecast for each year of the project (2010 to 2017). The discrepancy can be attributed to: (i) actual costs being lower than the planned costs, and (ii) substantial delays in completing almost all

[14] Financing partners: the governments of Australia, Norway, Spain, Sweden, and the United Kingdom.
[15] ADB's total disbursement was $52.37 million or 72.2% of the project amount of $72.5 million, including also disbursement from grant 0182 ($0.024 million) and grant 0183 ($3.69 million).

components, mainly resulting from poor contractor performance and poor project management by the NEA, especially during early stages of implementation. Several contracts were extended to allow more time to complete them. For other contracts, the NEA initiated actions to deal with nonperformance. For example, the NEA imposed liquidated damages for three contracts, and cancelled two nonperforming contracts and undertaking remaining works by itself. Poor contractor performance requiring such actions, along with the NEA's late submission of withdrawal applications to ADB, resulted in ADB disbursements being reduced by $3.03 million. Meanwhile, for the CEF and CCF grants, $3.71 million was disbursed out of $4.50 million budgeted.

## E. Project Schedule

28. The loan became effective on 4 June 2010. The procurement, construction, and installation activities were expected to be completed by 30 September 2014. The original closing date for the loan was 30 March 2015. ADB extended the loan closing date three times, and it finally closed on 30 March 2017, 24 months behind the original schedule. The original closing date for both grants was 31 March 2013. All the activities under the grants were expected to be completed by 30 September 2012. Grant 0182 was extended once and closed on 30 September 2014, while grant 0183 was extended twice and finally closed on 30 September 2015.

29. A mix of internal and external factors led to the implementation delays. Key internal factors were: (i) frequent management changes within the NEA. (ii) inadequate capacity for contract administration by the NEA; (iii) the limited procurement authority delegated to NEA management;[16] and (iv) inadequate authority of the project management unit (PMU) on project implementation (para.30). Key external factors were (i) delays in right-of-way acquisition for transmission lines; (ii) delays in obtaining approval for tree clearance; (iii) delays in securing approval for road cutting for underground cables; and (iv) poor performance of contractors and (v) the earthquake of 25 April 2015; (vi) the Tarai strike causing trade and transit disruptions that resulted in shortages of construction materials, labor, and fuel.[17]

## F. Implementation Arrangements

30. The NEA was the executing agency as well as the implementing agency for all project components. A PMU headed by a project director was established for monitoring and reporting on day-to-day project implementation in coordination with other NEA departments. During implementation, ADB noted limited roles and authority of the PMU to instruct the subproject teams on project-related issues resulting in delays. This was primarily because subproject managers reported to the heads of the different business units—e.g., generation, transmission, and distribution units—rather than to the PMU. This arrangement resulted in poor implementation, which was further weakened by capacity weaknesses within the PMU. ADB raised these issues during its review missions and quarterly portfolio review meetings and urged the NEA to resolve them. The NEA addressed this weakness by establishing a dedicated project management directorate in 2013 to implement subsequent ADB-funded projects. The requirement of regular monitoring of project progress and contractor performance were not up to expected levels for the project, especially during the early phases of implementation.

[16] The NEA required board approval for procurement of packages with cost estimates exceeding $4 million. This delayed the procurement of several packages under this project. However, this process was reformed, and the NEA's Managing Director is now authorized to decide on procurement matters irrespective of the cost of the package.

[17] NEA's limited implementation capacity for contract administration and supervision also led to disputes with contractors.

## G. Consultant Recruitment and Procurement

31. Three international individual consultants and three national consultants were recruited individually following ADB's Guidelines on the Use of Consultants (2007 as amended from time to time) to provide support to the NEA in implementing components 4, 5, 6, and 7. It was envisaged that supervision work on these components would be carried out by the NEA. However, during implementation, the NEA and ADB realized that implementation of these subprojects would be more effective, had there been a provision of an experienced project supervision consultant.

32. Procurement modalities included international competitive bidding, as per the project procurement plan and ADB procurement guidelines (2010 as amended from time to time). The NEA prepared detailed design and bidding documents for all packages except for component 6. A national consultant supported the NEA in preparing the preliminary design and bidding documents for the component 6.

## H. Safeguards

33. **Environmental safeguards.** Initial environmental examinations, with an environmental management plan (EMP), were carried out for all project components in compliance with ADB's Environment Policy 2002.[18] The project was classified as environment category B (with potentially less significant environmental impacts). The Butwal–Kohalpur 132 kV transmission subproject partially passes through Banke National Park, which was established on 12 July 2010—after the project was approved. This subproject complied with the regulatory provisions of the Government of Nepal, in close coordination with Banke National Park. Limited adverse environmental impacts were observed because of the nature of the subproject (the substation was within a confined area along an existing 132 kV line), the substation's proximity to the national highway, and its location in an area of intensive human activity. Hence, the original environmental classification of category B was retained for the project.

34. The project staff conducted subproject-level EMP compliance monitoring and reporting, including additional scope of work under component 1 (para 18). The NEA's Environment and Social Study Department was recruited to carry out EMP compliance monitoring for the Dumre–Damauli 132 kV transmission line subproject. Safety compliance for the project was satisfactory. No major or fatal accidents were recorded, and all workers were insured. No major environment-related grievances were noted during project implementation, and those recorded were duly resolved following the project grievance redress mechanism. The project could not submit regular (semiannual) environmental safeguard monitoring reports because the PMU did not have a dedicated environment expert. Although the project compliance with the EMP was recorded to be satisfactory, areas for improvement were noted, such as proper solid waste and spoil management and work camps with basic facilities. Therefore, overall compliance with the project's environmental safeguards is rated *less than satisfactory*. A brief on the environmental safeguard performance of the project is in APPENDIX 12.

35. **Social safeguards.** An updated resettlement plan recorded 128 households affected by permanent land acquisition. That was slightly higher than the 122 households recorded in the original resettlement plan. Similarly, 317 households were affected due to right-of-way along the transmission line. During implementation, some towers along the Dumre–Damauli transmission line were realigned to address the concerns of affected persons and to minimize land-acquisition requirements. This reduced land acquisition from 26 hectares to 20.8 hectares. However, the

[18] ADB, 2002, Environment Policy of the Asian Development Bank, Manila

number of affected households increased from 314 to 445 during implementation because of land fragmentation, land transactions, and migration. Meanwhile, the number of affected structures decreased from 20 (at appraisal) to 18, of which 7 were relocated while 11 are yet to be relocated and the compensation payment process for remaining 11 structures is ongoing. All households affected by permanent land acquisition have been compensated in full, while the compensation process has been initiated for 317 households affected by restricted use of land under the right-of-way for the Dumre–Damauli transmission line (the line-stringing work for this subproject has yet to commence). The additional scope of work on the Birgunj, Parwanipur, and Hetauda substations (para. 18) was carried out without any additional safeguard impacts. The NEA's monitoring report indicates that the living standards of affected households, including vulnerable households and indigenous people, improved or remained the same compared with pre-project conditions. Therefore, the objective of the project resettlement plan was largely achieved. No other safeguards issues affecting indigenous people were noted during implementation.

36. Exposure visits, and skills development and other training activities (on, e.g., awareness and livelihood restoration, forest conservation, wildlife conservation, agriculture intensification, and social awareness) were undertaken for 329 people, of whom 140, or 43%, were female. Training sessions lasted 1 to 2 weeks. About 150 local persons were hired for 10 days to 2 months as unskilled and semi-skilled workers for the construction work. The project used public media to inform locals on the project schedule and precautionary & safety measures to be taken during the construction period, which was reported to be effective also on establishing links between the project and project affected families. Although the NEA submitted semiannual reports during later phases of the project, it did not submit an external monitoring report.

37. At the institutional level, the project was instrumental in reestablishing the NEA's relationship with ADB and renewing the NEA's understanding of ADB guidelines and requirements. ADB is also supporting NEA with additional resources to improve safeguards compliance in future projects. The grievance redress mechanism established under the project was generally satisfactory.

## I. Monitoring and Reporting

38. Out of 43 covenants, 33 were fully complied with, 8 were partially complied with, and 2 were not complied with (APPENDIX 6). The covenants that were not complied with were: (i) maintaining a debt-service-coverage ratio of 1.2 and a rate of return on historic net fixed assets of 6%, and (ii) reducing system losses to 22% by 2013 (which seriously impacted the NEA's financial health). Meeting these covenants require broader and continuous engagement in terms of investment backed up by regulations and strong political will. No covenants were modified, suspended, or waived during implementation.

39. The project followed ADB's standard templates for reporting on environmental, social, and contract-administration. The NEA generally complied with all reporting requirements besides those pertaining to safeguards. The timeliness and quality of reports suffered because of limited capacity and resources within the PMU.

40. The finance directorate, headed by a deputy managing director, supervised financial reporting of the NEA. A chartered accountant appointed by the Office of the Auditor General conducted annual audits of NEA's projects. Based on the results of the appointed chartered accountant's audit, OAG issues the final audit report. The NEA generally complied with submission of all annual audited project financial statements (APFS) and audited entity financial

statements (AFS) from project effective date to closing.[19] Systemic issues that prevails across both APFS and AFS included: (i) financial statements not being prepared as per Nepal Financial Reporting Standards (NFRS); (ii) physical verification of assets not being conducted on a regular basis; (iii) interest on the allocated loan amount rather than on the utilized loan amount; (iv) inter-unit accounts not being reconciled; (v) proper segregation of overheads between the project and corporate office not being conducted; and (vi) 'netting off' of the miscellaneous income against the project expenditures. However, ongoing efforts to implement NFRS, asset verification and valuation and roll out the Enterprise Resource Program will support the NEA to (i) comply with NFRS financial and accounting guidelines, (ii) assess the fair value of NEA's assets, and iii) improve financial reporting standards thereby helping NEA in addressing the repeated qualification of the audit opinion.[20]

## III. EVALUATION OF PERFORMANCE

### A. Relevance

41. The project is rated *relevant*. The project design was consistent with ADB's country partnership strategy (CPS) for Nepal, 2010−2012 and with the government's eleventh three year Interim Plan 2008–2010 on energy sector development strategy.[21] The project continued to be relevant throughout its appraisal, implementation, and completion stages. The strategies of ADB's CPS for Nepal, 2013–2017 and the intention of the government's action plan for National Energy Crisis Prevention and Electricity Development Decade, 2016 is strongly aligned with CPS for Nepal, 2010–2012 and the Interim Plan, 2008–2010, as the power sector infrastructure development and improvement of financial performance goals is ongoing in Nepal. The project design focused on critical investments needed to improve the reliability of electricity generation, increase the availability of transmission facilities to transfer generated power to load centers, and strengthen the distribution system to improve reliability and capacity. Investments identified and implemented under the project were urgently required because of underinvestment in the energy sector in the years leading up to project appraisal; hence, the appropriateness of the lending modality (investment loan).

42. The project does not overlap with other development partner initiatives. The project was largely implemented as planned, without major changes to the design or scope, despite a few shortcomings in project formulation and in conducting due diligence on the transmission line components. The design and monitoring framework had strong logical linkages and most target indicators were realistic, appropriate and measurable.[22] Project outputs pertained to physical assets built, and as such were measurable. Savings of budgeted loan amounts were reallocated to add a subcomponent (para. 18) under component 1 and to increase the scope of component 6 (para. 23), thus, responding to urgent needs of the NEA and ground realities consistent with the project outputs.

[19] Refer to Appendix 6, status of compliance to loan covenant, section 2.09 (a) and (b) for detailed information.

[20] Enterprise resource planning refers to the systems and software packages used by organizations to manage day-to-day business activities, such as accounting, procurement, project management, production etc.

[21] Footnote 2.

[22] However, this report notes the inconsistencies between the targeted length in transmission line provided in the RRP (400km), PCR-Appendix 1 (273km), PCR Appendix 8 based on PAM (260km) due to inaccurate recording of transmission line length between Butwal and Kolhapur during appraisal. The actual length between Butwal and Kohalpur is 273 km as noted in Appendix 1.

## B. Effectiveness

43. The project is rated *effective*. Project outcomes and outputs were mostly achieved (APPENDIX 1). In terms of outcomes, the project exceeded what was targeted in seven out of eight indicators. As for the PPP initiative in distribution, only the preparatory work was completed (para. 24). The NEA's revenue collection efficiency improved to only 3.9 months by July 2010, against the target outcome indicator of 3.0 months of accounts receivable by end-2010. This was due to weak collection methods and the NEA's failure to promptly disconnect nonpaying customers. However, by 2017, upon project closure, efficiency collection further improved to 3.75 months.

44. Among the project outputs, achievements for components 2, 4 and 6 exceeded the targets, component 3 achieved the targets and component 1 substantially met the targets.[23] Weighing the indicators against the actual cost of implementing each component, the degree of achievement of outputs of the project was assessed to be 95% (Table A7.1). Outputs which were partially achieved included (i) the CFL target under component 5 as the CFL distribution catalyzed consumers to buy from the market (para. 22); and (ii) the implementation of a distribution PPP under component 7 given the lack of institutional framework for PPP (para. 24). While compliance to environmental safeguard measures have been less than satisfactory, implementation of social safeguards have been satisfactory (paras. 33–37). Notwithstanding the challenges in implementing safeguards measures, the project's resettlement plan and EMP were instrumental in building the NEA's capacity to carry out impact assessments and implement mitigation measures using new practices. This process also facilitated bridging the gap between the government's and ADB's safeguards policies.

## C. Efficiency

45. The project is rated *efficient*. During project appraisal, the economic internal rate of return (EIRR) of the project was estimated at 19.1%. Upon reevaluation at project completion, the EIRR marginally increased to 19.3%. Thus, the project can be considered to have maintained the expected efficiency despite some changes to anticipated costs and benefits. Project implementation was substantially delayed, resulting in some of the immediate benefits which were available at appraisal stage not been captured in full. On the other hand, expected project outputs of most project components were achieved at a cost lower than estimated at appraisal. The combined effect of lower costs and delayed outputs resulted in an EIRR, slightly higher than originally estimated, indicating efficient utilization of the investment.

46. In terms of process efficiency, lesson learned discussed during the project formulation includes capacity constraints in the energy sector, difficulties in acquiring land for rights-of-way for transmission lines, slow recruitment of consultants, and delayed procurement. Although ADB were aware of these constraints in advance, these problems nonetheless affected the project, resulting in a 2 years delay. Major causes for delays included contract management issues, delayed forest clearance, and delayed clearance of rights-of-way for transmission lines. Similarly, safeguards planning, implementation, and monitoring of the project were not up to the desired level as these activities were also external and may not be entirely assigned to the inefficiency in project management.

[23] From the subcomponent A (para 13) and subcomponent B (para 14) of component 1, planned transmission line length shall be 273 circuit km, against 400 km inadvertently stated in the RRP and 248 km stated in the project administration manual (footnote 23). 253 km of transmission line was achieved, and 20 km of transmission line between Dumre–Damauli was not completed by the time of the project completion (para. 13). See Appendix 8 for more information.

## D. Sustainability

47. The project is rated *likely sustainable*. The reevaluated project financial internal rate of return (FIRR) is 18.1% against the real weighted average cost of capital (WACC) of 0.9%. At appraisal, the FIRR was estimated to be 11.1% against a WACC of 1.3%. Real WACC was reassessed for the actual debt-to-equity ratio, adjusted for prevailing inflation rates, and it was found that the reevaluated FIRR exceeds the WACC benchmark, displaying the project's robust investment characteristics. The increase in the FIRR stemmed from the lower costs and higher outputs discussed earlier (paras.17,18 and 23), complemented by recent increases in electricity prices in Nepal. Increased project revenues (by increased sales of electricity) and reduced generation costs, are likely to be retained since such savings are not expected to be reversed (as assets built by the project were within standard quality).

48. The project outcomes and outputs will continue to serve Nepal's growing electricity demand.[24] The rehabilitated hydropower plants and other hydropower plants will continue to benefit from the increased transmission capacity installed under the project. Component 5 (CFL distribution) have a limited life span and would require replacements typically once every 2 years. Since CFLs have gained popularity and are being purchased by customers in the open market, it appears that the project has had a catalytic effect in establishing an open market for CFLs.

49. NEA has long-standing experiences and required human resources in operating and managing the power system up to 132 kV. Thus, it can be expected that NEA will manage operation and maintenance of assets built under the project. The NEA can be expected to provide financial resources to operate and maintain these assets using its regular maintenance budget as the assets built under the project are critical to smooth operation NEA's overall system. As presented in APPENDIX 11, despite NEA's challenges in its financial performance, the tariff increase, and enhanced revenue collection efficiency are positive indications of NEA's improving capacity to set-aside resources for operation and maintenance. A timely revision, though, of electricity tariffs remains imperative in ensuring its financial sustainability to develop similar projects using its own resources. Recent enactment of Nepal Electricity Regulatory Commission Act is thus important milestone for development of Nepal's energy sector. Timely operationalization of the Nepal Electricity Regulatory Commission will also provide firm basis in commencement of scientific tariff determination process which will be critical for NEA to achieve cost recovery tariffs. These factors provided positive future outlook on NEA's financial sustainability. Improved safeguard systems have been institutionalized and is expected to enhance implementation of safeguards measures for future projects.

## E. Development Impact

50. The project demonstrated that good maintenance and timely replacement of auxiliary equipment in hydropower plants yield additional energy, which is important for an energy-deficit power system. The project facilitated electricity connections for more than 21,000 households. The project also pioneered the use of a grid-connected solar system and stand-alone solar photovoltaic-based street lights in Nepal. Subprojects such as the construction of the Chapali substation and the rebuilding and upgrading of 11 kV feeders have been instrumental in eliminating load shedding in the Kathmandu Valley. The project supported reducing electricity demand through the use of more efficient lighting—a trend that has blossomed in Nepal as more and more electricity customers purchase efficient lighting devices at market prices. The project

[24] Nepal aims to achieve a per capita electricity consumption of 400 kWh per year by 2027.

intervention helped reduce greenhouse gas emissions in Nepal by about 68,000 tons of CO2 per year. Meanwhile, there were no negative development impacts reported. Accordingly, the development impact is rated *satisfactory.*[25]

## F. Performance of the Borrower and the Executing Agency

51. The performance of the borrower (the government) and the NEA as both executing and implementing agency are rated *less than satisfactory*. The performance of NEA with respect to meeting the conditions for loan effectiveness, implementing project activities, and ensuring the continuity and sustainability of the project, was acceptable, but with significant room for improvement. Timely implementation of a project of this magnitude requires high levels of support and ownership that were not forthcoming at the initial stages of the project. The NEA rectified these shortcomings in 2013, but only after several components had been significantly delayed. Shortcomings in engaging with stakeholders resulted in disputes over right-of-way, which led to significant portions of the Dumre–Damauli 132 kV transmission line not being completed. A lack of dedicated safeguards experts in the PMU resulted in irregular submission of semiannual safeguard reports. In addition, the NEA failed to comply with two covenants: (i) reducing national transmission and distribution losses from 25.2% of electricity generation to (a) 24.5 % by 15 July 2011, (b) 23.5% by 15 July 2012, and (c) 22% by 15 July 2013; and (ii) meeting the debt-service-coverage ratio of 1.2. Despite these shortcomings, the NEA registered an operational surplus in FY2017, successfully eliminated load shedding in the Kathmandu Valley, and reduced the duration of load shedding in other areas by optimizing the use of available assets, reducing commercial losses, and introducing smart demand-side management and supply diversification (including increased electricity imports from India). Counterpart funds were also made available on time by the government and the NEA submitted all APFS to ADB on time except for FY 2012/2013 and FY 2016/2017.

## G. Performance of the Asian Development Bank

52. The performance of ADB is rated *satisfactory*. ADB responded to the needs of the borrower and demonstrated reasonable flexibility in project implementation, for example, utilizing savings to extend the scope of subprojects. ADB's Nepal Resident Mission and South Asia Energy Division at headquarter collaborated well and provided continuous guidance to the NEA through review missions, consultations, and progress review meetings. The NEA reported that the weekly progress review meetings conducted by ADB from 2013 onward were useful; however, ADB should have taken more measures to ensure that the PMU was staffed by qualified personnel and that right-of-way and forest-clearance permissions were sorted out, especially for the transmission-line packages. This would have minimized the risk of project delays.

## H. Overall Assessment

53. Overall, the project is rated *successful* based on relevance, effectiveness, efficiency and sustainability assessed, as described in the preceding sections.

[25] The project contributed to the following targets in ADB's results framework: (i) new households connected to electricity—21,000; and (ii) greenhouse gas emission reduction—68,000 tonne/yr.

**Overall Ratings**

| Criteria | Rating |
|---|---|
| Relevance | Relevant |
| Effectiveness | Effective |
| Efficiency | Efficient |
| Sustainability | Likely sustainable |
| **Overall Assessment** | **Successful** |
| Development impact | Satisfactory |
| Borrower and executing agency | Less than Satisfactory |
| Performance of ADB | Satisfactory |

Source: Asian Development Bank.

## IV. ISSUES, LESSONS, AND RECOMMENDATIONS

### A. Issues and Lessons

54. **Improving the PMU structure**. This project was the first major ADB loan managed by the NEA after almost 10 years of nonengagement. As a result, NEA staff assigned to the PMU were inexperienced in areas such as safeguards. The foregoing indicates that the quality, experience, and clear lines of authority for approval that goes beyond the traditional limits of approval in NEA, are required to be awarded to the PMU for the successful management of future projects.

55. **Facilitating forest clearance and land acquisition procedures**. The project witnessed major delays in completion of transmission line components because of delays in clearing forests and acquiring land. While human and/or social elements can complicate such procedures, the NEA could have followed up and managed these issues in a timely manner and this could have reduced the implementation delays.

56. **Time for contracts to be effective**. ADB's standard bidding documents stipulate that individual contracts should become effective within 60 days of the contract signing date. However, the project witnessed major start-up delays in various components because of excessively delays in contract effectiveness.[26] A review of 16 contract packages showed that the average period between contract signing and declaration of the contract to be effective was 230 days. The shortest time taken was 118 days and the longest was 392 days. Avenues to reduce the period between contract signing and contract effectiveness should be explored (e.g., adjust conditions for contract effectiveness in the bidding documents to capture ground realities).

57. **Enabling environment for Public–Private Partnership.** The implementation of a PPP in distribution as a pilot exercise (para. 24) did not materialize, partly because the NEA demonstrated limited desire and ownership toward the initiative. The absence of a legal framework for PPPs compounded the problem. A conducive legal and professional environment should be established to enable implementation of effective PPPs.

### B. Recommendations

58. **Sector Reforms.** Current momentum gained by government to reform the energy sector should be sustained; however, reforms need to be pursued in a phased manner. Redefining the role of the NEA will be critical, and it is worth exploring the possibility of transforming the NEA into a transmission company in charge of the national transmission grid, while delegating generation and distribution to separate companies.

[26] Delays in finalizing proforma invoices and establishing letters of credit by the contractors were the main factors contributing to the delays in contract packages.

59. **Project Readiness.** Energy projects in Nepal suffer from poor project readiness (lack of a detailed feasibility study and design, land acquisition and right-of-way issues, forest clearance delays, etc.). The NEA is recommended to (i) pursue a project design facility; and (ii) mobilize the government's or its own resources to prepare future projects, with better readiness in place, before development-partner approval.[27]

60. **Transmission line projects**. Advance detailed land acquisition plans, IEEs, and forest clearance plans should be drawn up by NEA and be approved by concerned authorities before future contracts are awarded for transmission line projects. Consultation with affected persons is essential at all stages to minimize conflicts during implementation.

61. **Safeguards compliance.** Primary responsibility to implement safeguard compliance shall be provided to subprojects level, as such, the NEA shall provide adequate resources to subprojects. PMU shall consolidate information from subprojects level and provide overall guidance to subprojects in meeting safeguard compliance for the project. It is also recommended that NEA creates an independent safeguards compliance unit at a corporate level with its own corporate policy for safeguard impact assessment, planning, implementation and monitoring to ensure compliance with government and development partners safeguard requirement are properly addressed at projects level.

62. **Covenants.** Covenants related to energy sector reforms that were not complied with or partially complied with—specifically covenants dealing with tariffs, loss reduction, and the NEA's debt-service-coverage ratio (which was set at 1.2 for this project)—must be addressed by NEA to ensure that it remains on a stable and sustainable financial footing. These reforms are being pursued through subsequent ADB loans.[28] It is recommended that ADB includes similar covenants in future energy projects for Nepal.

63. **Nepal Electricity Regulatory Commission.** Operationalization and capacity building of the Nepal Electricity Regulatory Commission (NERC) should be pursued on a priority basis by the government. NERC should also commence a scientific tariff determination process with adequate consideration of principles of technical and economic regulation.

64. **Capacity Building.** The NEA should continue to build the capacity of its staff in contract management, safeguards, and dispute resolution. Enhancing technical skills such as transmission line surveying, high-voltage-tower design (especially above 132 kV) and use of advanced technologies for efficient system operation are also important.

65. **Further action or follow-up**. The Dumre–Damauli 132 kV transmission line remained incomplete when this project completion report was prepared. ADB requires to seek progress reports from NEA to monitor its completion ensuring compliance with its safeguards requirement.

66. **Timing of the project performance evaluation report**. It is recommended that a project performance evaluation report be prepared in 2020. This will provide the NEA with sufficient time to complete the remaining transmission lines and will also allow time for more information to become available on the operational performance of the project components.

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[27] The project design facility is intended to provide quick-disbursing resources for project formulation, including detailed engineering design and broader project and program preparatory work (such as feasibility studies and due diligence, safeguards, and pre-implementation work).

[28] Loan 2808 (footnote 10) and Loan 3542-NEP Power Transmission and Distribution Efficiency Enhancement Project.

## DESIGN AND MONITORING FRAMEWORK

| Design Summary | Performance Indicators and Targets | Achievements |
|---|---|---|
| **Impact**<br>Increased access to electricity across the country. | Grid electrification rate increased from 33% in 2008 to 45% by 2015.<br><br>Installed generation capacity for domestic use annually increased by 50 MW. | **Exceeded.** Grid electrification reached 60% by July 2015.<br><br>**Exceeded.** Installed generation capacity increased from 631 MW in July 2009 to July 729 MW in 2015. |
| **Outcome**<br>Reliable and energy efficient power supply with increased access and operational efficiency in the project areas. | Increased power transfer capability between generation regions and load centers by 75 MW by 2014.<br><br>Additional domestic consumer connections of 20,000 in project areas by 2014.<br><br>4 GWh average increase in annual generation from Marshyangdi and Gandak hydropower plants.<br><br>Reduced system losses in the pilot areas for distribution loss reduction and private sector participation from present 25% to 22% by 2013 with an energy saving of 25 GWh per year.<br><br>Per capita lighting load to reduce by 30% by the end of 2011 against the without-project scenario and save approximately 23 GWh of energy per year.<br><br>Eliminate street lighting load in selected urban centers by end of 2011 and save approximately 1 GWh of energy per year.<br><br>Improve revenue collection efficiency and consumer service indicators. Accounts receivables to reduce from 4.3 months to 3.0 months by end of 2010.<br><br>Reduce CO2 emissions by a minimum of 15,000 tons annually against the business as usual case by 2012. | **Exceeded.** Power transfer capacity between generation regions and load centers increased by 80 MW.<br><br>**Exceeded.** Estimated 21,046 new consumer connections in the project areas by December 2016.<br><br>**Exceeded.** 5.1 GWh increase in generation from Gandak and Marshyangdi hydropower plants.<br><br>**Exceeded.** System losses remained at 25.0% in 2013, but at project completion, loss levels in project areas reduced to 8.7%, saving 25 GWh/year.<br><br>**Exceeded.** Saved approximately 46 GWh of energy annually.<br><br>**Exceeded.** Eliminated street lighting load in pilot areas in Kathmandu valley and saved approximately 1.1 GWh of energy per year.<br><br>**Not achieved.** accounts receivable reduced from 4.3 months to 3.94 months by July 2010, and 3.75 by 2017.<br><br>**Exceeded.** reduced CO2 emissions by 68,000 tons per year by 2016. |
| **Outputs**<br>**1. Component 1**<br>Construction of Middle | 132 kV transmission line length increased by 248 km[1] and grid | **Substantially achieved.** 132 kV transmission line length increased by 253 circuit km (93% of actual corrected length |

[1] Actual exact length between Butwal and Kohalpur is 273 km.

| Design Summary | Performance Indicators and Targets | Achievements |
|---|---|---|
| Marshyangdi–Marshyangdi 132 kV line, Butwal–Kohalpur 132 kV line second circuit, and Chapali grid substation; expansion of Matatirtha grid substation; and installation of capacitor banks. | substation capacity increased by 172 MVA. | of 273 km) and grid substation capacity increased by 351 MVA. |
| **2. Component 2**<br>Construction of eight primary distribution substations and three distribution switching stations. | Distribution substation capacity increased by 48 MVA. | **Exceeded.** Distribution substation capacity increased by 64 MVA. |
| **3. Component 3**<br>Rehabilitation of Marshyangdi and Gandak hydropower stations. | Excitation system of Marshyangdi plant and weir control system of Gandak plant replaced. | **Achieved.** Excitation system of Marshyangdi plant and weir control system of Gandak plant replaced. |
| **4. Component 4**<br>Rebuilding of 11 kV feeders, relevant low voltage networks, and associated facilities in pilot areas. | Sixteen 11 kV feeders and downstream networks in Kathmandu valley and Birgunj. | **Exceeded.** Twenty-seven (27) 11 kV feeders and downstream networks replaced in Kathmandu valley and Birgunj. |
| **5. Component 5**<br>Countrywide expansion of the CFL program. | 1 million CFLs introduced by 2012. | **Partially achieved.** 750,000 CFLs introduced by 2012. |
| **6. Component 6**<br>Establishment of solar/solar-wind street lighting systems. | Construction and commissioning of 1,000 solar and solar-wind street lighting systems in Bhaktapur, Kathmandu and Lalitpur. | **Exceeded.** 1,511 solar street lights installed in Kathmandu valley.<br><br>Two grid tied solar photovoltaic systems (150 kWp) and 10 kWp solar battery back-up system installed. |
| **7. Component 7**<br>Introduction of PPP in distribution.<br><br>Implementation support for component 4. | PPP introduced in three distribution centers by 2014 | **Partially achieved.** Prepared the study report with recommendations, bidding documents and evaluation criteria.<br><br>**Achieved.** Implementation support for component 4 completed. |

## PROJECT COST AT APPRAISAL AND ACTUAL
($ million)

| Item | Appraisal Estimate | | | Actual | | |
|---|---|---|---|---|---|---|
| | Foreign Exchange | Local Currency | Total Cost | Foreign Exchange | Local Currency | Total Cost |
| **A. Facilitating Access to Clean Energy** | | | | | | |
| 1. Middle Marshyangdi-Dumre-Marshyangdi 132 kV transmission line and substation | 11.08 | 1.64 | 12.72 | 6.39 | 7.94 | 14.33 |
| 2. Construction of Chapali 132 kV substation and 66kV cable link for Lainchaur-Chabel | 6.61 | 1.17 | 7.78 | 5.71 | 2.12 | 7.83 |
| 3. Butwal - Kohalpur 132 kV transmission line (2nd circuit stringing) | 12.06 | 1.72 | 13.78 | 8.81 | 3.83 | 12.63 |
| 4. Matatirtha 132 kV substation | 2.96 | 0.33 | 3.29 | 1.72 | 0.66 | 2.38 |
| 5. Capacitor banks | 1.86 | 0.30 | 2.16 | 1.92 | 0.65 | 2.57 |
| 6. Grid substation capacity reinforcement project | 0.00 | 0.00 | 0.00 | 2.25 | 1.15 | 3.40 |
| 7. Items not funded by ADB | 0.00 | 6.92 | 6.92 | 0.00 | 0.00 | 0.00 |
| **Subtotal (A)** | **34.57** | **12.08** | **46.65** | **26.80** | **16.35** | **43.15** |
| **B. Energy Access Quality Enhancement** | | | | | | |
| 1. Distribution system augmentation project | 9.94 | 4.35 | 14.29 | 4.41 | 5.03 | 9.44 |
| **Subtotal (B)** | **9.94** | **4.35** | **14.29** | **4.41** | **5.03** | **9.44** |
| **C. Clean Energy Plant Improvement** | | | | | | |
| 1. Marshyangdi excitation rehabilitation project | 3.15 | 0.05 | 3.20 | 1.57 | 0.52 | 2.09 |
| 2. Gandak hydro power station trash rack rehabilitation project | 0.16 | 0.00 | 0.17 | 0.81 | 0.64 | 1.45 |
| 3. Items not funded by ADB | 0.00 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 |
| **Subtotal (C)** | **3.31** | **0.07** | **3.39** | **2.38** | **1.16** | **3.54** |
| **D. Supply-Side Energy Efficiency Improvement** | | | | | | |
| 1. Kathmandu valley, Birgunj-Samara corridor DSR and loss reduction project | 9.61 | 2.74 | 12.35 | 8.31 | 2.39 | 10.70 |
| **Subtotal (D)** | **9.61** | **2.74** | **12.35** | **8.31** | **2.39** | **10.70** |
| **E. Energy Efficiency in Lighting** | | | | | | |
| 1. Supply of CFLs and Equipment for DSM unit | 1.50 | 0.04 | 1.54 | 0.82 | 0.21 | 1.03 |
| 2. Public awareness campaign in support of part E (1) and workshops and training | 0.00 | 0.16 | 0.16 | 0.00 | 0.00 | 0.00 |
| **Subtotal (E)** | **1.50** | **0.20** | **1.70** | **0.82** | **0.21** | **1.03** |
| **F. Renewable Energy for Street Lighting** | | | | | | |
| 1. Supply and installation of solar street lighting | 2.30 | 0.00 | 2.30 | 2.67 | 0.49 | 3.17 |

| Item | Appraisal Estimate | | | Actual | | |
|---|---|---|---|---|---|---|
| | Foreign Exchange | Local Currency | Total Cost | Foreign Exchange | Local Currency | Total Cost |
| **Subtotal (F)** | **2.30** | **0.00** | **2.30** | **2.67** | **0.49** | **3.17** |
| **G. Capacity Building** | | | (consulting support only) | | | |
| **H. Consulting Services** | | | | | | |
| 1. System designing and implementation support for component D (component G) | 0.22 | 0.07 | 0.29 | 0.08 | 0.00 | 0.08 |
| 2. Design and implementation support and capacity building for component E (1) | 0.06 | 0.07 | 0.13 | 0.02 | 0.00 | 0.02 |
| 3. Design, implementation support and capacity building for component F | 0.00 | 0.07 | 0.07 | 0.04 | 0.00 | 0.04 |
| 4. Support and capacity building for distribution PPP (component G) | 0.23 | 0.04 | 0.27 | 0.09 | 0.00 | 0.09 |
| **Subtotal (H)** | **0.51** | **0.25** | **0.76** | **0.23** | **0.00** | **0.23** |
| **Taxes and Duties** | **0.00** | **2.00** | **2.00** | **0.00** | **0.00** | **0.00** |
| **Total Base Cost** | **61.74** | **21.69** | **83.44** | **45.62** | **25.64** | **71.26** |
| **Contingencies** | | | | | | |
| Physical | **3.62** | **1.35** | **4.97** | **0.00** | **0.00** | **0.00** |
| Price | **0.53** | **2.47** | **3.00** | **0.00** | **0.00** | **0.00** |
| **Financing Charges During Implementation** | **2.22** | **0.00** | **2.22** | **1.24** | **0.00** | **1.24** |
| **Total Project Cost** | **68.11** | **25.51** | **93.63** | **46.86** | **25.64** | **72.50** |

Sources: Asian Development Bank and Project Audited Financial Statement for FY2017

## PROJECT COST BY FINANCIER

### Table A3.1: Project Cost at Appraisal by Financier

| | ADB | | | | | | | | NEA/GON | | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ADF Loan | | CCF Grant 0182 | | CEF Grant 0183 | | Sub Total | | | | |
| | Amount ($ million) | % of Cost Category | Amount ($ million) | % of Cost Category | Amount ($ million) | % of Cost Category | Amount ($ million) | % of Cost Category | Amount ($ million) | % of Cost Category | Amount ($ million) |
| **A. Investment Costs** | | | | | | | | | | | |
| 1. Civil works and erection | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 13.09 | 100.0% | 13.09 |
| 2. Equipment supply | 57.48 | 92.9% | 0.00 | 0.0% | 3.81 | 6.2% | 61.29 | 99.1% | 0.56 | 0.9% | 61.85 |
| 3. Env. and social mitigation | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 1.25 | 100.0% | 1.25 |
| 4. Land | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 4.30 | 100.0% | 4.30 |
| 5. Consultants | | | | | | | | | | | |
| a. Project design | 0.34 | 49.9% | 0.27 | 39.6% | 0.07 | 10.4% | 0.68 | 100.0% | 0.00 | 0.0% | 0.68 |
| b. Capacity development | 0.23 | 79.3% | 0.00 | 0.0% | 0.06 | 20.7% | 0.29 | 100.0% | 0.00 | 0.0% | 0.29 |
| **Subtotal (A)** | **58.05** | **71.3%** | **0.27** | **0.3%** | **3.94** | **4.8%** | **62.26** | **76.4%** | **19.20** | **23.6%** | **81.46** |
| **B. Recurrent Costs** | | | | | | | | | | | |
| Project Management | 0.00 | **0.0%** | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 1.99 | 100.0% | 1.99 |
| **Subtotal (B)** | **0.00** | **0.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **1.99** | 100.0% | **1.99** |
| **Total Base Cost (A+B)** | **58.05** | **69.6%** | **0.27** | **0.3%** | **3.94** | **4.7%** | **62.26** | **74.6%** | **21.19** | **25.4%** | **83.45** |
| **C. Contingencies** | **4.71** | **58.9%** | **0.03** | **0.4%** | **0.26** | **3.3%** | **5.00** | **62.5%** | **3.00** | **37.5%** | **8.00** |
| **D. Interest during construction** | **2.22** | **100.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **2.22** | **100.0%** | **0.00** | **0.0%** | **2.22** |
| **Total Project Cost (A+B+C+D)** | 64.98 | 69.37% | 0.30 | 0.32% | 4.20 | 4.48% | 69.48 | 74.18% | 24.19 | 25.8% | 93.67 |
| **% Total Project Cost** | | | | **74.2%** | | | | | | **25.8%** | |

Sources: Asian Development Bank and Project Audited Financial Statement for FY2017

## Table A3.2: Project Cost at Completion by Financier

| | ADB | | | | | | | | NEA/GON | | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ADF Loan | | CCF Grant 0182 | | CEF Grant 0183 | | Sub Total | | | | |
| | Amount ($ million) | % of Cost Category | Amount ($ million) | % of Cost Category | Amount ($ million) | % of Cost Category | Amount ($ million) | % of Cost Category | Amount ($ million) | % of Cost Category | Amount ($ million) |
| **A. Investment Costs** | | | | | | | | | | | |
| 1. Civil works and erection | 10.24 | 81.2% | 0.00 | 0.0% | 0.00 | 0.0% | 10.24 | 81.2% | 2.37 | 18.8% | 12.61 |
| 2. Equipment supply | 37.03 | 77.5% | 0.00 | 0.0% | 3.65 | 7.6% | 40.68 | 85.1% | 7.10 | 14.9% | 47.78 |
| 3. Env. and social mitigation | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.09 | 100.0% | 0.09 |
| 4. Land | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 3.23 | 100.0% | 3.23 |
| 5. Consultants | | | | | | | | | | | 0.00 |
| a. Project design | 0.16 | 73.1% | 0.02 | 9.0% | 0.04 | 17.9% | 0.22 | 100.0% | 0.00 | 0.0% | 0.22 |
| b. Capacity development | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 |
| **Subtotal (A)** | **47.42** | **74.2%** | **0.02** | **0.0%** | **3.69** | **5.8%** | **51.14** | **80.0%** | **12.79** | **20.0%** | **63.93** |
| **B. Recurrent Costs** | | | | | | | | | | | |
| 1. Salaries | 0.00 | **0.0%** | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 0.89 | 100.0% | 0.89 |
| 2. Equipment O&M | 0.00 | **0.0%** | 0.00 | 0.0% | 0.00 | 0.0% | 0.00 | 0.0% | 6.44 | 100.0% | 6.44 |
| **Subtotal (B)** | **0.00** | **0.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **7.33** | 100.0% | **7.33** |
| **Total Base Cost (A+B)** | **47.42** | **66.6%** | **0.02** | **0.0%** | **3.69** | **5.2%** | **51.14** | **71.8%** | **20.12** | **28.2%** | **71.26** |
| **C. Contingencies** | **0.00** | **0.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **0.00** |
| **D. Interest during construction** | **1.24** | **100.0%** | **0.00** | **0.0%** | **0.00** | **0.0%** | **1.24** | **100.0%** | **0.00** | **0.0%** | **1.24** |
| **Total Project Cost (A+B+C+D)** | **48.66** | **67.1%** | **0.02** | **0.0%** | **3.69** | **5.1%** | **52.38** | **72.2%** | **20.12** | **27.8%** | **72.50** |
| **% Total Project Cost** | | | | | **72.2%** | | | | | **27.8%** | |

Source{s}: Asian Development Bank and Project Audited Financial Statement for FY2017

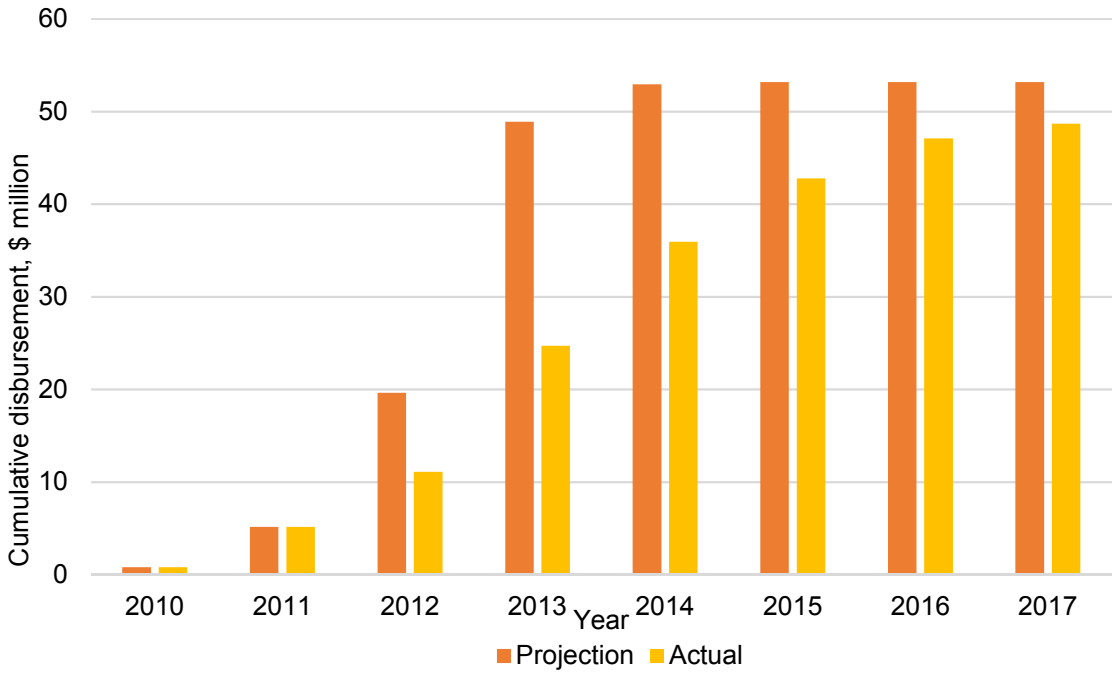
## DISBURSEMENT OF ADB LOAN AND GRANT PROCEEDS

**Table 4.1: Annual and Cumulative Disbursement of ADB Loan Proceeds**
($ million)

| | Annual Disbursement | | Cumulative Disbursement | |
|---|---|---|---|---|
| Year | Amount ($ million) | % of Total | Amount ($ million) | % of Total |
| 2010 | 0.79 | 1.6% | 0.79 | 1.6% |
| 2011 | 4.37 | 9.0% | 5.16 | 10.6% |
| 2012 | 14.46 | 12.2% | 11.09 | 22.8% |
| 2013 | 29.27 | 28.0% | 24.72 | 50.8% |
| 2014 | 4.04 | 23.1% | 35.95 | 73.9% |
| 2015 | 0.25 | 14.0% | 42.76 | 87.9% |
| 2016 | 0 | 8.9% | 47.08 | 96.7% |
| 2017 | 0 | 3.3% | 48.67 | 100.0% |
| **Total** | **48.67** | **100%** | **48.67** | **100%** |

ADB = Asian Development Bank.
Source: Asian Development Bank.

**Figure 4.1: Projection and Cumulative Disbursement of ADB Loan Proceeds**
($ million)



## CONTRACT AWARD OF ADB LOAN AND GRANT PROCEEDS

### Table 5.1: Annual and Cumulative Contract Awards of ADB Loan Proceeds

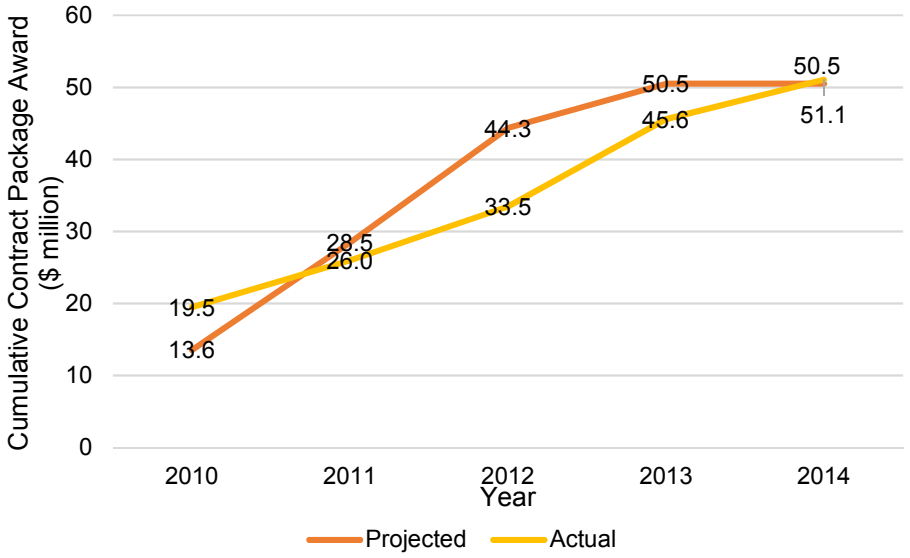
($ million)

| | Annual Contract Awards | | Cumulative Contract Awards | |
|---|---|---|---|---|
| **Year** | **Amount** ($ million) | **% of Total** | **Amount** ($ million) | **% of Total** |
| 2010 | 19.49 | 38.16% | 19.49 | 38.16% |
| 2011 | 6.49 | 12.71% | 25.98 | 50.86% |
| 2012 | 7.50 | 14.68% | 33.48 | 65.54% |
| 2013 | 12.12 | 23.73% | 45.6 | 89.27% |
| 2014 | 5.48 | 10.73% | 51.08 | 100.00% |
| **Total** | **51.08** | **100.00%** | **51.08** | **100.00%** |

ADB = Asian Development Bank.
Source: Asian Development Bank.

### Figure 5.1: Projection and Cumulative Contract Awards of ADB Loan Proceeds

($ million)



## STATUS OF COMPLIANCE WITH LOAN COVENANTS

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| **Particular Covenant- Project Agreement** | | |
| (a) NEA shall carry out the Project with due diligence and efficiency, and in conformity with sound administrative, financial, engineering, environmental, social safeguards and energy practices. | Section 2.01 of Article II | Partially Complied with |
| (b) In the carrying out of the Project and operation of the Project facilities, NEA shall perform all obligations set forth in the Loan Agreement to the extent that they are applicable to NEA. | Section 2.01 of Article II | Complied with |
| NEA shall make available, promptly as needed, the funds, facilities, services, equipment, land and other resources which are required, in addition to the proceeds of the Loan, for the carrying out of the Project. | Section 2.02 of Article II | Complied with |
| (a)In the carrying out of the Project, NEA shall employ competent and qualified consultants and contractors, acceptable to ADB, to an extent and upon terms and conditions satisfactory to ADB. | Section 2.03 of Article II | Complied with |
| (b)Except as ADB may otherwise agree, all Goods, Works and consulting services to be financed out of the proceeds of the Loan shall be procured in accordance with the provisions of Schedule 4 to the Loan Agreement. ADB may refuse to finance a contract where Goods, Works or consulting services have not been procured under procedures substantially in accordance with those agreed between the Borrower and ADB or where the terms and conditions of the contract are not satisfactory to ADB. | Section 2.03 of Article II | Complied with |
| NEA shall carry out the Project in accordance with plans, design standards, specifications, work schedules and construction methods acceptable to ADB. NEA shall furnish, or cause to be furnished, to ADB, promptly after their preparation, such plans, design standards, specifications and work schedules, and any material modifications subsequently made therein, in such detail as ADB shall reasonably request. | Section 2.04 of Article II | Complied with |
| (a)NEA shall take out and maintain with responsible insurers, or make other arrangements satisfactory to ADB, for insurance of the Project facilities to such extent and against such risks and in such amounts as shall be consistent with sound practice. | Section 2.05 of Article II | Complied with |
| (b) Without limiting the generality of the foregoing, NEA undertakes to insure, or cause to be insured, the Goods, Works and consulting | Section 2.05 of Article II | Complied with |

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| services to be imported for the Project and to be financed out of the proceeds of the Loan against hazards incident to the acquisition, transportation and delivery thereof to the place of use or installation, and for such insurance any indemnity shall be payable in a currency freely usable to replace or repair such Goods, Works and consulting services. | | |
| NEA shall maintain, or cause to be maintained, records and accounts adequate to identify the Goods, Works and consulting services and other items of expenditure financed out of the proceeds of the Loan, to disclose the use thereof in the Project, to record the progress of the Project (including the cost thereof) and to reflect, in accordance with consistently maintained sound accounting principles, its operations and financial condition. | Section 2.06 of Article II | Complied with |
| (a) ADB and NEA shall cooperate fully to ensure that the purposes of the Loan will be accomplished. (b) NEA shall promptly inform ADB of any condition which interferes with, or threatens to interfere with, the progress of the Project, the performance of its obligations under this Project Agreement or the Subsidiary Loan Agreement, or the accomplishment of the purposes of the Loan. (c) ADB and NEA shall from time to time, at the request of either party, exchange views through their representatives with regard to any matters relating to the Project, NEA and the Loan. | Section 2.07 of Article II | Complied with |
| (a) NEA shall furnish to ADB all such reports and information as ADB shall reasonably request concerning: (i) the Loan and the expenditure of the proceeds thereof; (ii) the Goods, Works and consulting services and other items of expenditure financed out of such proceeds; (iii) the Project; (iv) the administration, operations and financial condition of NEA; and (v) any other matters relating to the purposes of the Loan. | Section 2.08 of Article II | Complied with |
| (b) Without limiting the generality of the foregoing, NEA shall furnish to ADB quarterly reports on the execution of the Project and on the operation and management of the Project facilities. Such reports shall be submitted in such form and in such detail and within such a period as ADB shall reasonably request, and shall indicate, among other things, progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and proposed program of activities and expected progress during the following quarter. | Section 2.08 of Article II | Partially complied with. NEA could not submit quarterly progress reports to ADB in regular manner. |
| (c) Promptly after physical completion of the Project, but in any event not later than 3 months | Section 2.08 of Article II | Partially complied with. NEA also could not submit report within 3 |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| thereafter or such later date as ADB may agree for this purpose, NEA shall prepare and furnish to ADB a report, in such form and in such detail as ADB shall reasonably request, on the execution and initial operation of the Project, including its cost, the performance by NEA of its obligations under this Project Agreement and the accomplishment of the purposes of the Loan. | | months on the execution and initial operation of the Project, including its cost, the performance. |
| (a) NEA shall: (i) maintain separate accounts for the Project, each Subproject, and for its overall operations; (ii) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB; and (iii) furnish to ADB, promptly after their preparation but in any event not later than 6 months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditors' opinion on the use of the Loan proceeds and compliance with the financial covenants of the Loan Agreement as well as on the use of the procedures for the imprest account and the statement of expenditures), all in the English language. NEA shall furnish to ADB such further information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request. | Section 2.09 of Article II | Partially Complied with<br><br>All APFS from effective date to closing (FY2010/2011 to FY 2016/2017) were received. All audit opinion issued were qualified.<br><br>Except for FY2012/2013 and FY2016/2017, APFSs were submitted within due date of 31 Jan 2018. The final APFSs were submitted for FY2016/2017. AFPS submission details are:<br><br>(i) FY2009/2010: Not required.<br>(ii) FY2010/2011: 13 Jan 2012 (on time, qualified)<br>(iii) FY2011/2012: 15 Jan 2013 (on time, qualified)<br>(iv) FY2012/2013: 4 Jun 2014 (124 days delay, qualified)<br>(v) FY2013/2014: 15 Jan 2015 (on time, qualified)<br>(vi) FY2014/2015: 31 Jan 2016 (on time, qualified)<br>(vii) FY2015/2016: 12 Jan 2017 (on time, qualified)<br>(viii) FY2016/2017 APFS: 7 Feb 2018 (7 days delay, qualified)<br><br>Specific opinion on use of funds was issued by the Auditor in APFS.<br><br>Compliance of NEA with financial covenants of Schedule para 11-17 were issued in APFS.<br><br>All AFS from effective date to closing (FY2010/2011 to FY 2016/2017) were received. All audit opinion issued were qualified.<br><br>(i) FY2009/2010: Received date-20 Jun 2011<br>(ii) FY2010/2011: Received date-20 Apr 2012<br>(iii) FY2011/2012: Received date-5 Apr 2013<br>(iv) FY2012/2013: Received date-15 Aug 2014 |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| | | (v) FY2013/2014: Received date-16 Nov 2015<br>(vi) FY2014/2015: Received date-4 Oct 2016<br>(vii) FY2015/2016: Received date-16 Nov 2017<br>(viii) FY2016/2017: Received date-12 Apr 2018 |
| (b) In addition to annual audited financial statements referred to in paragraph (a) of this Section, NEA shall furnish to ADB:<br>(i) within 45 days after the end of the first 6 months of each fiscal year, unaudited semiannual financial statements on its operations for such 6 month period; (ii) within 2 months after the end of each fiscal year, unaudited annual financial statements on its operations for such fiscal year; and (iii) within 3 months after the end of each fiscal year, financial projections of its operations (including income statements, balance sheets and cash flow statements) for the ensuing 2 years. | Section 2.09 of Article II | Partially complied with. |
| (c) NEA shall enable ADB, upon ADB's request, to discuss NEA's financial statements and its financial affairs from time to time with the auditors, appointed by NEA pursuant to Section 2.09(a) hereabove, and shall authorize and require any representative of such auditors to participate in any such discussions requested by ADB, provided that any such discussion shall be conducted only in the presence of an authorized officer of NEA unless NEA shall otherwise agree. | Section 2.09 of Article II | Complied with. |
| NEA shall enable ADB's representatives to inspect the Project, the Goods, Works and consulting services financed out of the proceeds of the Loan, all other plants, sites, properties and equipment of NEA, and any relevant records and documents. | Section 2.10 of Article II | Complied with. |
| (a) NEA shall, promptly as required, take all action within its powers to maintain its legal existence, to carry on its operations, and to acquire, maintain and renew all rights, properties, powers, privileges and franchises which are necessary in the carrying out of the Project or in the conduct of its business. | Section 2.11 of Article II | Complied with. |
| (b) NEA shall at all times conduct its business in accordance with sound administrative, financial, environmental and social safeguards and energy practices, and under the supervision of competent and experienced management and personnel. | Section 2.11 of Article II | Partially complied with. NEA's environmental and social safeguard performance has been relatively weak |
| (c) NEA shall at all times operate and maintain its plants, equipment and other property, and from time to time, promptly as needed, make all necessary repairs and renewals thereof, all in | Section 2.11 of Article II | Partially complied with. Operation and maintenance of its plants, equipment and other property has been poor and not following good |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| accordance with sound administrative, financial, engineering, environmental, social safeguards, energy and maintenance and operational practices. | | practices. |
| Except as ADB may otherwise agree, NEA shall not sell, lease or otherwise dispose of any of its assets which shall be required for the efficient carrying on of its operations or the disposal of which may prejudice its ability to perform satisfactorily any of its obligations under this Project Agreement. | Section 2.12 of Article II | Complied with. |
| Except as ADB may otherwise agree, NEA shall apply the proceeds of the Loan to the financing of expenditures on the Project in accordance with the provisions of the Loan Agreement and this Project Agreement, and shall ensure that all Goods, Works and consulting services financed out of such proceeds are used exclusively in the carrying out of the Project. | Section 2.13 of Article II | Complied with. |
| Except as ADB may otherwise agree, NEA shall duly perform all its obligations under the Subsidiary Loan Agreement, and shall not take, or concur in, any action which would have the effect of assigning, amending, abrogating or waiving any rights or obligations of the parties under the Subsidiary Loan Agreement. | Section 2.14 of Article II | Complied with. |
| NEA shall promptly notify ADB of any proposal to amend, suspend or repeal any provision of the NEA Act and shall afford ADB an adequate opportunity to comment on such proposal prior to taking any action thereon. | Section 2.14 of Article II | Complied with. |
| **Particular Covenants** | | |
| In the carrying out of the Project and operation of the Project facilities, the Borrower shall perform, or cause to be performed, all obligations set forth in Schedule 5 to this Loan Agreement. | Paragraph 1 of Article IV | Complied with. |
| The Borrower shall enable ADB's representatives to inspect the Project, the Goods and Works financed out of the proceeds of the Loan, all other plants, sites, properties and equipment of the Borrower, and any relevant records and documents. | Paragraph 2 of Article IV | Complied with. |
| The Borrower shall take all action which shall be necessary on its part to enable NEA to perform its obligations under the Project Agreement, including the establishment and maintenance of tariffs as stipulated in paragraphs 8 and 9 of Schedule 5 to this Loan Agreement, and shall not take or permit any action which would interfere with the performance of such obligations. | Paragraph 3 of Article IV | Complied with. |
| The Borrower shall exercise its rights under the | Paragraph 5 of Article | Complied with. |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| Subsidiary Loan Agreement in such a manner as to protect the interests of the Borrower and ADB and to accomplish the purposes of the Loan. | IV | |
| No rights or obligations under the Subsidiary Loan Agreement shall be assigned, amended, or waived without the prior concurrence of ADB. | Paragraph 6 of Article IV | Complied with. |
| **Project Execution and Implementation Arrangement** | | |
| NEA shall be the Project Executing Agency and shall be responsible for the overall execution and supervision of the Project. The Borrower shall cause NEA to follow the implementation arrangements set forth in this Schedule. | Paragraph 1 of Schedule 5 | Complied with |
| NEA shall establish a project management unit ("PMU"), which will be responsible for implementation of the Project, the Street Lighting Subproject, and the CFL Subproject, and such PMU shall oversee Project operations, including in particular disbursement, accounting, logistics management, reporting, monitoring, supervision, organization of research activities, and coordinating with relevant government departments, and development partners. | Paragraph 2 of Schedule 5 | Complied with |
| The Borrower shall also ensure that: (a) the PMU is managed and operated by a full-time Project director, acceptable to ADB, reporting to the managing director of NEA; and (b) the Project director is supported by competent full-time senior officers of NEA and other personnel acceptable to ADB | Paragraph 3 of Schedule 5 | Complied with - Head of PMU is serving also as head of Project Management Directorate (PMD) and providing full time support in managing ADB supported energy projects in NEA. |
| NEA shall appoint a separate project manager for each Subproject, to be appointed from the relevant NEA Business Group, to ensure that all day to day operations for such Subproject, including procurement and accounting, are conducted by persons within the relevant NEA Business Group with the relevant technical skills and experience. | Paragraph 4 of Schedule 5 | Partially Complied with - Some project managers are managing more than one sub projects under the loan. |
| **Financing** | | |
| The Borrower shall ensure that: (a) all local and foreign currency counterpart financing necessary for the Project shall be provided in time to enable completion of the Project activities; (b) additional counterpart financing shall be provided, if necessary, for any shortfall of funds or cost overruns; and (c) counterpart financing for compensation and entitlements under any Resettlement Plan are fully provided directly to affected people prior to their displacement from housing and land. | Paragraph 5 of Schedule 5 | Complied with |
| The Borrower and NEA shall be responsible for the operation and maintenance of the Project and shall provide sufficient counterpart funding for such operation and maintenance. | Paragraph 6 of Schedule 5 | Complied with |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| **Sector Reform** | | |
| The Borrower shall ensure that NEA will remain an autonomous legal entity legally distinct from the Borrower for the duration of the Project. The Borrower shall not interfere with NEA's management and operations for the duration of the Project but shall ensure that NEA delegates operational authority to each NEA Business Group and that each NEA Business Group is operated and maintained as a functionally distinct business group. | Paragraph 7 of Schedule 5 | Complied with |
| The Borrower shall ensure that NEA prepares tariff petitions and submits them, in a prompt and timely manner, and in accordance with any rules and procedures established by the Electricity Regulator in order for the Electricity Regulator to consider such tariff petitions at least once every year. | Paragraph 8 of Schedule 5 | Complied with – NEA prepared and submitted tariff petition to Electricity Tariff Fixation Commission (ETFC) in a regular manner, at-least in subsequent years of ETFC's approval of the first tariff petition submitted by NEA. ETFC approved tariffs in 2012 and 2016 against NEA's petition submitted in 2010, 2013 respectively. |
| The Borrower shall ensure that: (a) economic regulation of NEA and technical regulation are coordinated; and (b) the Electricity Regulator adequately considers economic and technical regulation in determining tariff petitions. Within 6 months of the Effective Date, the Borrower shall ensure, by issuing a regulation that the Electricity Regulator considers: (i) NEA's debt service; (ii) a rate of return to be agreed upon between the Electricity Regulator and NEA; and (iii) a lifeline tariff to protect poor customers in determining appropriate rates of tariff. | Paragraph 9 of Schedule 5 | Partially Complied with - ETFC did not adequately coordinate economic and technical regulation in determining tariff petitions. |
| NEA shall develop an implementation plan, acceptable to ADB, for including public private partnerships in electricity distribution by 31 December 2010 in at least 3 geographical areas or municipalities, based upon the recommendations resulting from Component 5 of the Loan Project and a process of stakeholder consultation. | Paragraph 10 of Schedule 5 | Complied with. An implementation plan (including preparation of the RFP for introducing PPP in selected distribution centers) was prepared by 2015 |
| By 30 December 2010, the Borrower shall have finalized the NEA Financial Restructuring Plan in a form and manner satisfactory to ADB. By 31 July 2011, the Borrower shall have commenced implementing the NEA Financial Restructuring Plan. | Paragraph 11 of Schedule 5 | Partially Complied with - Only some provisions of NEA financial restructuring plan are approved and implemented by the government. |
| NEA shall have a financial accounting system in place by 31 December 2011 that ensures that each NEA Business Group prepares separate accounts. | Paragraph 12 of Schedule 5 | Complied with |
| By 15 July 2013, the Borrower shall cause NEA to meet a debt service coverage ratio of 1.2 | Paragraph 13 of Schedule 5 | Not Complied with- Debt service coverage ratio of 1.0 times debt |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| times debt service and a rate of return on historic net fixed assets of 6%. | | service and a rate of return on historic net fixed assets of 1.66%.was achieved on FY2017 |
| If the Borrower takes any decision that has a direct and adverse financial impact upon NEA, the Borrower shall directly compensate NEA by a line item in the Borrower's budget allocation to NEA in an amount that entirely offsets the amount of the negative impact. | Paragraph 14 of Schedule 5 | Complied with - Government is compensating NEA for its actions that directly impact financial health of NEA. Examples include excess cost of power import from India paid by the government. Further, the government had also write off total accumulated loss of NEA twice since 2012. |
| By 31 December 2010, the Borrower shall cause: (a) all government institutions to pay their electricity bills for street lighting to NEA within 90 days of receiving the bill; and (b) NEA to maintain its accounts receivables at a level that ensures that on average NEA's accounts receivables are paid in 90 days. | Paragraph 15 of Schedule 5 | Complied with- a) NEA is receiving the amount of electricity bills for Street light from GoN but not in 90 days from issuing bills b) ACP is recorded as 81.26 days for 2016/17. |
| The Borrower shall exempt NEA from all taxes and duties on Project related procurement except for the 1% customs levy on imported equipment and the 13% value added tax on construction. | Paragraph 16 of Schedule 5 | Complied with - Project experienced procedural complexities and delays in securing such exemptions. |
| NEA shall establish a demand side management unit at NEA, develop a disposal strategy for used CFLs for the Borrower, and assist the Borrower develop the NEA Financial Restructuring Plan. | Paragraph 17 of Schedule 5 | Complied with - Planning and Technical service department of Distribution Consumer Directorate (DCS) oversees all DSM activities. An international consultant has developed disposal strategy for CFLs. NEA assisted Ministry of Finance (borrower) and Ministry of Energy in preparation of the NEA financing restructuring plan. |
| NEA shall take measures to reduce the overall national transmission and distribution losses from the present levels of 25.2% of electricity generation to: (a) 24.5 % by 15 July 2011; (b) 23.5% by 15 July 2012; and (c) 22% by 15 July 2013. | Paragraph 18 of Schedule 5 | Not Complied with - Overall national system losses including transmission and distribution losses and non-technical losses remain at 25.11% in 2013. |
| NEA shall develop and present to ADB by 1 December 2010, a plan for reducing technical and non-technical losses of electricity in Loss Reduction Pilot Areas, acceptable to ADB. Such plans should be replicable across all NEA's distribution networks. NEA shall start implementing such plans by 30 June 2011. | Paragraph 19 of Schedule 5 | Complied with - The Loss Reduction program implemented in the pilot areas. NEA is also undertaking losses reduction measures in the distribution areas mobilizing its own resources and resources from other development partners in other parts of country. |
| **Environmental and Social Issues** | | |
| NEA shall acquire or make available the land and rights to land free from any encumbrances, and cleared the utilities, trees, and any other obstruction from such land, required for commencement of construction activities in | Paragraph 20 of Schedule 5 | Complied with |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| accordance with the schedule agreed under the related civil works contract, subject to compliance with the relevant provision of the Resettlement Plan and in accordance with all applicable laws, regulations and policies of the Borrower and ADB including ADB's Resettlement Policy (1998). | | |
| NEA shall ensure that all land and rights-of-way required by the Subprojects are made available in a timely manner and that the provisions of the Resettlement Plan, including compensation and entitlements for affected households and persons, are implemented in conformity with all applicable laws and regulations of the Borrower, and ADB's policy on Involuntary Resettlement (1995). NEA shall ensure that persons affected by each Subproject are given cash compensation, at the replacement cost of acquired land and other property, in a timely manner, in accordance with the Resettlement Plan, such that their living standards are not adversely affected by the Project. NEA shall provide adequate budgetary support to cover the costs of land acquisition and resettlement. NEA shall submit progress reports on land acquisition and resettlement under the quarterly progress reports for each Subproject. In addition, NEA shall engage external monitors and shall submit the external monitoring report to ADB on a semiannual basis for review. | Paragraph 21 of Schedule 5 | Partially Complied with – External monitoring reports were not submitted to ADB on a semiannual basis for review |
| NEA shall ensure that prior to any land acquisition or resettlement under any Subproject, the Resettlement Plan including its update based upon a census of affected people, is disclosed with all necessary information made available to persons affected by such Subproject and is uploaded onto ADB's web site. NEA shall ensure that essential communal property that may be affected under land acquisition and resettlement is timely replaced in accordance with the Resettlement Plan. The Borrower shall ensure that compensation is awarded if construction activities block pathways and temporarily deprive some people of their livelihood. NEA shall ensure that all compensation programs are completed as set forth in the Resettlement Plan prior to the commencement of Works. | Paragraph 22 of Schedule 5 | Partially Complied with |
| NEA shall ensure that construction contracts contain binding requirements for construction contractors to fully reinstate pathways, other local infrastructure, and agricultural land, to at least their pre-project condition after the construction of a Subproject has been completed. NEA shall ensure adequate recording of the condition of roads, agricultural land, and other infrastructure prior to the commencement of the transportation of Goods | Paragraph 23 of Schedule 5 | Complied with |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| or construction of Works. | | |
| The Borrower, through NEA, shall ensure that all national environmental laws and regulations, and ADB's Environment Policy (2002) apply to the Project and that contractors' contracts include relevant provisions thereof. Within 3 months of the Effective Date, NEA shall have obtained the final clearance of the EIA from the Ministry of Environment of the Borrower. | Paragraph 24 of Schedule 5 | Complied with. However NEA could not submit request for clearance with concerned government agencies within 3 months of the effective date. |
| The Borrower and NEA shall ensure: (a) compliance with each IEE outcome and mitigation measure identified in the Environmental Management Plan during design, implementation, and operation of the Project; and (b) the IEE is updated and submitted to ADB for approval if there are any changes to Project design that would cause significant environmental impacts not included in the scope of any of the IEE. The Borrower shall ensure that NEA includes the relevant provisions of the Environmental Management Plan in bidding documents and awarded contracts and shall submit progress reports on the implementation of the Environmental Management Plan to ADB twice a year. | Paragraph 25 of Schedule 5 | Complied with. No major changes in project scope and no additional major environmental impact were noted during implementation that would triggered updating of IEE. |
| The Borrower shall in particular ensure that: (a) the Subprojects are not located within national parks, wild and planted forests, or wildlife sanctuaries unless NEA obtains prior environmental approvals from relevant Government agencies and submits them to ADB for review and approval; and (b) monuments of cultural or historical importance are avoided. | Paragraph 26 of Schedule 5 | Complied with - Necessary approvals were obtained when project sites are located within a National Park. One of subproject location was designated as national park after the project was approved. |
| The Borrower and NEA shall cause the contractors to disseminate information on the risks of socially and sexually transmitted diseases, including HIV/AIDS and malaria, to their employees during Project implementation. | Paragraph 27 of Schedule 5 | Complied with |
| Within 6 months of the Effective Date, the Borrower and NEA shall develop and agree upon an HIV/AIDS and Human Trafficking Prevention and Sensitization Program, satisfactory to ADB. NEA shall cause the contractors to implement the HIV/AIDS and Human Trafficking Prevention and Sensitization Program among the contractor's employees for the duration of that contractor's contract. The Borrower, through the PMU, shall monitor the HIV/AIDS and Human Trafficking Prevention and Sensitization Program. | Paragraph 28 of Schedule 5 | Complied with |
| NEA shall ensure that all contracts under the Project follow all applicable labor laws of the Borrower and that such contracts include provisions to the effect that contractors: (a) do | Paragraph 29 of Schedule 5 | Complied with |

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| not use children as labor; (b) follow legally mandated provisions of labor, health, safety, sanitation, welfare and working conditions; and (c) take steps to ensure priority employment for female headed households. The contracts shall also include clauses for termination in case of any breach of these provisions by contractors. | | |
| The Borrower shall ensure that the gender development measures provided in the agreed Summary Poverty Reduction and Social Strategy are undertaken in order to promote the participation of women in Project activities. | Paragraph 30 of Schedule 5 | Complied with |
| The Borrower shall: (a) conduct gender sensitization training on gender and resettlement for its and NEA's relevant staff, and the district-level resettlement committees; and (b) ensure that women leaders and youth from affected households of all major ethnic groups in the Project area are included in the HIV/AIDS and Human Trafficking Prevention and Sensitization Program. | Paragraph 31 of Schedule 5 | Complied with |
| **Capacity and Governance** | | |
| The Borrower shall comply with and shall cause NEA to carry out the Project in accordance with ADB's Anticorruption Policy (1998, as amended to date) and that relevant provisions of ADB's Anticorruption Policy are included in all bidding documents for the Project. The Borrower acknowledges ADB's right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive or coercive practices relating to the Project and shall ensure NEA cooperates fully with any such investigation and extends all necessary assistance as may be necessary for successful completion of the investigation. The Borrower shall ensure that all contracts financed by ADB in connection with the Project, specify the right of ADB to review and examine the records and accounts of the suppliers and contractors as they relate to the Project. | Paragraph 32 of Schedule 5 | Complied with |
| Within 6 months of the Effective Date, NEA shall: (a) establish accounting and financial control systems to ensure the (i) regular monitoring of expenditures and all financial transactions, and (ii) the safe custody of all assets financed under the Project, including all Project facilities; and (b) expand the use of its financial management system to ensure efficient, effective and accountable financial management, in each case in a form and manner satisfactory to ADB. | Paragraph 33 of Schedule 5 | Complied with |
| Within 6 months of the Effective Date, NEA shall prepare a grievance redress mechanism, acceptable to ADB, to receive and resolve complaints and grievances relating to all matters | Paragraph 34 of Schedule 5 | Complied with |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| relating to the Project, including resettlement and environment (the "Grievance Redress Mechanism"). The Borrower shall: (a) make public the existence of this Grievance Redress Mechanism through public awareness campaigns in the provinces; (b) review and address grievances of stakeholders in relation to the Project, any of the service providers, or any person responsible for carrying out any aspect of the Project; and (c) proactively and constructively respond to such grievances. | | |
| Within 6 months of the Effective Date, NEA shall create a Project website as a part of its existing web-site to disclose information about various matters on the Project, including procurement. With regard to procurement, the website shall include information on the list of participating bidders, the name of the winning bidder, basic details on the bidding procedures adopted, the amount of contract awarded, and the list of goods and services procured. | Paragraph 35 of Schedule 5 | Complied with -The content of website however needs improvement. |
| The Borrower shall ensure information regarding the Project is publicly available through the publication of leaflets and their availability in the provinces and districts within which the Project operates. | Paragraph 36 of Schedule 5 | Partially Complied with - Only in a few subprojects, such information was made available. |
| **Planning, Monitoring and Review** | | |
| The Borrower shall ensure that the PMU reviews invoices from firms and individual consultants engaged in implementing the Project. Where NEA is responsible for making payments, NEA shall make payments within 15 working days of their receipt or inform the contractors of any shortfalls in its ability to make payment of the invoices. | Paragraph 37 of Schedule 5 | Partially Complied with - Delay in some cases noted due to lack of civil engineers for timely verification of civil work carried out by contractors. |
| The Borrower shall allow and facilitate the Borrower's representatives and ADB's representatives to conduct spot and random checks on: (a) the flow of funds and their use for the Project in accordance with this Loan Agreement; (b) work-in-progress; and (c) Project implementation. | Paragraph 38 of Schedule 5 | Complied with |
| During Project implementation, the Borrower shall cause NEA, through the PMU, to develop a Project Performance Monitoring and Evaluation System ("PPMES") including baseline performance monitoring and systematic Project performance monitoring, and benefits monitoring and evaluation acceptable to ADB and other donors. NEA shall carry out surveys: (a) at the start of Project implementation to establish baseline data; (b) at Project mid-term; (c) at the time of Project completion; and (d) not later than 6 months after Project completion, to evaluate the Project benefits. The Borrower and NEA | Paragraph 39 of Schedule 5 | Partially Complied with - NEA informed about availability of project baseline data, mid-term survey not carried out. |

| Covenant | Reference in Loan Agreement | Status of Compliance |
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| shall ensure that data to be compiled and analyzed for the purpose of performance monitoring and evaluation is in a format acceptable to ADB. NEA shall propose key indicators that shall be acceptable to ADB. | | |
| By 31 July of each year of Project implementation, NEA shall provide ADB with an annual budget and operating plan for the following fiscal year. | Paragraph 40 of Schedule 5 | Complied with |
| The Borrower and ADB shall together carry out semiannual reviews of the Project during the Project implementation period. The semiannual reviews shall include an examination of budgetary allocations for the Project, operation and maintenance costs, staffing, implementation arrangements | Paragraph 41 of Schedule 5 | Complied with |
| and achievements under the Project. The review shall include assessing progress for each Component, identifying difficulties and constraints, and determining ways to overcome them. | | |
| The Borrower and ADB shall jointly carry out a midterm review of the Project during the third year of Project implementation or at any other time as may be agreed upon by the Borrower and ADB. The results of the midterm review shall be discussed by the Borrower and ADB. If required, appropriate corrective measures shall be formulated to ensure successful Project implementation and achievement of the Project objectives by the Loan Closing Date. | Paragraph 42 of Schedule 5 | Complied with |
| The Borrower and NEA shall submit a Project completion report to ADB within 3 months of completion of the Project, which shall include a description of the results of any land acquisition and resettlement. | Paragraph 43 of Schedule 5 | Complied with. Submission of PCR by NEA was however delayed. |

Following three project covenants are recommended to be retained in future ADB energy sector projects.

| Covenant | Reference in Loan Agreement | Suggested Change |
|---|---|---|
| The Borrower shall ensure that NEA prepares tariff petitions and submits them, in a prompt and timely manner, and in accordance with any rules and procedures established by the Electricity Regulator in order for the Electricity Regulator to consider such tariff petitions at least once every year. | Para 8 of Schedule 5 | These two covenants may be combined and structured as follow:<br><br>By [reference year, month], the borrower shall ensure regulations and commence operations of a system of regular tariff filings by NEA and tariff determinations by Nepal Electricity Regulatory Commission (NERC), where |
| The Borrower shall ensure that: (a) economic regulation of NEA and technical regulation are coordinated; and (b) the Electricity Regulator | Para 9 of Schedule 5 | |

| Covenant | Reference in Loan Agreement | Suggested Change |
|---|---|---|
| adequately considers economic and technical regulation in determining tariff petitions. Within 6 months of the Effective Date, the Borrower shall ensure, by issuing a regulation that the Electricity Regulator considers: (i) NEA's debt service; (ii) a rate of return to be agreed upon between the Electricity Regulator and NEA; and (iii) a lifeline tariff to protect poor customers in determining appropriate rates of tariff. | | technical and economic performance benchmarks and targets will be included in the methodology and determinations. |
| NEA shall take measures to reduce the overall national transmission and distribution losses from the present levels of 25.2% of electricity generation to: (a) 24.5 % by 15 July 2011; (b) 23.5% by 15 July 2012; and (c) 22% by 15 July 2013. | Para 18 of Schedule 5 | NEA, shall develop (i) a scientific assessment of disaggregated technical and commercial losses (as of a reference year), and (ii) a time-bound plan and investment requirements to achieve a transmission and distribution loss level comparable with international best practices. |

## WEIGHTING FACTORS TO DETERMINE EFFECTIVENESS

### Table A7: Weighting Factors

| Component | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Completion | 93% | 100% | 100% | 100% | 75% | 100% | 25% |
| Completion cost ($ million) | 42.8 | 9.4 | 3.5 | 10.7 | 1 | 3.2 | 0.4 |
| Weighted average | | | | | | | 95.01% |

Source: SLRM PCR Team

## LENGTH OF TRANSMISSION LINE BUILT UNDER THE PROJECT

### Table A8: Length of transmission line length details

| Packages | Transmission Line Length (km) | |
|---|---|---|
| | During Appraisal (Corrected) | At completion |
| Package A1-Turnkey contract for 132 kV transmission system for Middle Marshyangdi–Dumre– Damauli–Marshyangdi | 60 | 40 |
| Package A4- Turnkey contract for 132 kV transmission system for Butwal–Kohalpur | 200 | 213 |
| **Total** | **260** | **253** |

Source:

## COMPONENT WISE COST VARIATION

### Table A9: Cost Variation Details

| Item | | Appraisal | Actual | Variance | |
|---|---|---|---|---|---|
| | | | | Amount | % |
| 1. | Facilitating access to Clean Energy | 46.65 | 43.15 | 3.50 | 7.50 |
| 2. | Energy Access Quality Enhancement | 14.29 | 9.44 | 4.85 | 33.94 |
| 3. | Clean Energy Plant Improvement | 3.39 | 3.54 | -0.15 | -4.42 |
| 4. | Supply-Side Energy Efficiency Improvement | 12.35 | 10.70 | 1.65 | 13.36 |
| 5. | Energy Efficiency in Lighting | 1.70 | 1.03 | 0.67 | 39.41 |
| 6. | Renewable Energy for Street Lighting | 2.30 | 3.17 | -0.87 | -37.83 |
| 7. | Capacity Building | 0.76 | 0.23 | 0.53 | 69.74 |
| H. | Others (taxes, contingencies, etc.) | 12.19 | 1.24 | 10.95 | 89.83 |
| | **Total Project Cost** | **93.63** | **72.50** | **21.13** | **22.57** |

Source:

## FINANCIAL AND ECONOMIC REEVALUATION

1. Financial and economic performance of the project was reevaluated at project completion. This appendix discusses the major assumptions used in these analyses and presents the forecast financial and economic performance of the project based on the revised parameters.

2. Analyses are performed for a period of 27 years inclusive of the 8-year project implementation period (2010-2017) and an operating period of 20 years (2018-2037). Most project assets would have a longer useful life; thus, a residual value is credited to the project at the end of the evaluation period.

3. Appraisal stage operational forecasts including additional sales and loss reductions are retained in the reevaluation. However, changes already realized; such as capital cost variations, final debt: equity ratio, current macro-economic parameters have been considered in reassessing project costs and benefits.

### A. Financial Reevaluation

4. The financial reevaluation of the project was carried out in accordance with the *Financial Management and Analysis of Projects* of the Asian Development Bank (ADB)[1]. Financial benefits derived from the project by the Implementing agency (IA); Nepal Electricity Authority (NEA) are compared against the additional costs incurred by NEA due to the project.

5. The key financial benefit of the project is the increase in revenue from electricity sales. In some areas served by the project assets, electricity supply was in curtailment due to capacity limitations. Potential new customers were not being provided with new electricity supply connections while existing customers had regular supply interruptions either due to lack of network capacity to serve peak demand or due to unreliability of the network. With the implementation of this project, these capacity limitations and supply unreliability issues were resolved, facilitating new connections[2], and increased and continuous electricity consumption by existing customers resulting in additional electricity sales by NEA. The Butwal-Mahendranagar sub project alone facilitate substantial amount of additional electricity sales by way of expanding electricity import capacity from India. Table A10.1 provides a summary of estimated incremental sales volumes resulting from this project.

**Table A10.1: Estimated Additional Sales due to Project over 2018-2037**

| | 2018 | 2021 | 2024 | 2027 | 2030 | 2033 | 2037 | Total |
|---|---|---|---|---|---|---|---|---|
| **A.Transmission** | | | | | | | | |
| a. Marshyangdi - Dumre - Middle Marshyangdi | 0.7 | 0.8 | 1.0 | 1.3 | 1.5 | 1.5 | 1.5 | **23.1** |
| b. Chapali 132kV SS and Lainchaur-Chabel | 2.2 | 7.7 | 15.6 | 21.5 | 25.7 | 25.7 | 25.7 | **345.4** |
| c. Butwal - Mahendranagar 2nd circuit 132kV | 210.4 | 247.5 | 247.8 | 247.8 | 247.8 | 247.8 | 247.8 | **4,623** |
| d. Matatirtha 132kV substation | 13.3 | 50.4 | 50.7 | 50.7 | 50.7 | 50.7 | 50.7 | **878.3** |
| e. Capacitor banks | 38.8 | 39.6 | 39.8 | 39.8 | 39.8 | 39.8 | 39.8 | **753.9** |
| f. Grid substation capacity improvement | 0.3 | 10.9 | 33.5 | 33.5 | 33.5 | 33.5 | 33.5 | **499.0** |

[1] ADB. 2005. *Financial Management and Analysis of Projects.* Manila.

[2] By end of 2016, 21,046 new connections have been provided within the project area, contributing to the increase in grid electrification of the country from 33% in 2008 to 60% in 2015.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **B. Distribution** | 28.3 | 38.8 | 39.1 | 39.1 | 39.1 | 39.1 | 39.1 | **724.2** |
| **C. Clean energy plant improvement** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| **D. Loss reduction** | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | **135.4** |
| **Total Project** | **301.2** | **402.8** | **434.6** | **440.7** | **445.2** | **445.2** | **445.2** | **7,982.3** |

6. Apart from incremental electricity sales, the distribution loss reduction activities and hydro power plant improvement activities undertaken by the project had also resulted in financial benefits to NEA. As identified in the project design and monitoring framework, loss levels in the project areas have been reduced by 8.7% whilst 5.1 GWh/year increase in generation from Gandak and Marshyangdi hydro power plants were also observed.

7. Financial costs of the project include capital investments on project assets, operation and maintenance (O&M) costs of the new project assets and also the incremental generation cost corresponding to the additional sales volume.

8. The reevaluation was carried out in real terms using actual and forecast cashflows attributable to the project. All costs and revenues are expressed in constant April 2018 prices.

9. The investment components of the project were financed through the ADB loan supplemented with equity raised by NEA from government sources. Loan funds received by the Government of Nepal (GoN) was on lent to NEA at a nominal interest rate of 5.0% per annum (p.a.). The equity funds received by NEA from GoN carry a cost of 8.5% p.a. Both rates were adjusted for tax benefits and inflation and the real cost of funds on ADB loan is estimated at -0.5% p.a. while the equity real rate is estimated at 4.3% p.a. WACC in real terms is calculated to be 0.9% as given in Table A10.2.

**Table A10.2: Weighted Average Cost of Capital**

| | ADB Loan | Equity | Total |
|---|---|---|---|
| Amount (US$ million) | 48.7 | 20.1 | 68.8 |
| Weighting | 70.7% | 29.3% | 100.0% |
| Nominal Cost | 5.0% | 8.5% | |
| Tax Rate | 30.0% | 0.0% | |
| Tax Adjusted Nominal Cost | 3.5% | 8.5% | |
| Inflation Rate | 4.0% | 4.0% | |
| Real Cost | -0.5% | 4.3% | |
| WACC | -0.3% | 1.3% | **0.9%** |

Source: Nepal Electricity Authority.

### 1. Project Expenditure

10. **Capital Costs**: All investment components of the project have been completed, allowing the actual costs to be used in the reevaluation. As given in Table A10.3, yearly capital cost

expenditure on sub projects are assumed to be in similar proportions across all sub projects. The proportions have been derived based on annual ADB loan disbursements.

**Table A10.3: Project Annual Capital Expenditure**

Values are in $ Million

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **A.Transmission** | | | | | | | | | |
| a. Marshyangdi - Dumre - Middle Marshyangdi | 0.23 | 1.29 | 1.75 | 4.01 | 3.31 | 2.01 | 1.27 | 0.47 | **14.33** |
| b. Chapali 132kV SS and Lainchaur-Chabel | 0.13 | 0.70 | 0.95 | 2.19 | 1.81 | 1.10 | 0.69 | 0.26 | **7.83** |
| c. Butwal - Mahendranagar 2nd circuit 132kV | 0.21 | 1.13 | 1.54 | 3.54 | 2.91 | 1.77 | 1.12 | 0.41 | **12.63** |
| d. Matatirtha 132kV substation | 0.04 | 0.21 | 0.29 | 0.67 | 0.55 | 0.33 | 0.21 | 0.08 | **2.38** |
| e. Capacitor banks | 0.04 | 0.23 | 0.31 | 0.72 | 0.59 | 0.36 | 0.23 | 0.08 | **2.57** |
| f. Grid substation capacity improvement | 0.06 | 0.31 | 0.41 | 0.95 | 0.78 | 0.48 | 0.30 | 0.11 | **3.4** |
| **B. Distribution** | 0.15 | 0.85 | 1.15 | 2.64 | 2.18 | 1.32 | 0.84 | 0.31 | **9.44** |
| **C. Clean energy plant improvement** | 0.06 | 0.32 | 0.43 | 0.99 | 0.82 | 0.50 | 0.31 | 0.12 | **3.54** |
| **D. Loss reduction** | 0.17 | 0.96 | 1.30 | 3.00 | 2.47 | 1.50 | 0.95 | 0.35 | **10.7** |
| **Total Project** | **1.08** | **6.00** | **8.14** | **18.71** | **15.42** | **9.35** | **5.93** | **2.18** | **66.82** |

Source: ADB staff estimate.

11. **Supply Costs:** In addition to project capital expenditure, NEA incurs additional costs when electricity sales are increased due to the project. Despite the delays in implementing, expected outputs of key project elements have been achieved, allowing the originally estimated quantities of additional electricity sales attributed to the project to be used in the reevaluation. Additional sales during winter and summer as well as their peak and off-peak periods have been estimated separately. Since generation cost during each of these periods differ from one another, forecast marginal cost of electricity generation during each of these periods have been separately estimated and used to value the incremental cost of supply. System side infrastructure development plan, which can influence future generation costs, have continued largely unabated since project appraisal, enabling the same supply cost forecasts to be used in the reevaluation. For the Butwal-Mahendranagar sub project, amount of additional electricity that can be imported from Indian has been estimated, which is valued at the estimated marginal cost (energy tariff) of Indian electricity imports[3].

12. **Operation and Maintenance Costs**: Annual operation and maintenance (O&M) costs pertaining to each project component was calculated as a percentage of the asset value. Different O&M cost percentages were assumed for transmission assets (1.5%), distribution assets (2%), and rehabilitated generation assets (0%[4]).

### 2. Project Income

13. **Additional Electricity Sales:** The increased supply of electricity facilitated by the project results in additional revenue to NEA through increased electricity sales. The additional electricity

[3] Average power purchase rate from India in 2017 was 7.36 NRs/kWh (NEA Annual Report 2017). Allocating 1.12 NRs/kWh for capacity costs, the marginal cost of Indian electricity imports was estimated at 5.24 NRs/kWh.

[4] Since the generation assets are only replacing existing ones, no additional O&M costs are expected on these assets.

sold to its customers by NEA was valued at the national average selling price of electricity of 9.85 NRs/kWh[5]. As the analysis was done on constant currency basis, the prevailing electricity tariff and generation costs were assumed to remain constant throughout the evaluation period.

**Generation Cost Reductions:** In some of the sub projects, financial benefits were derived in the form of generation cost reductions. When the network losses are reduced, the saved electricity can be either sold without any additional costs or else, the generation of that amount of electricity can be avoided, resulting in lower overall generation cost. For loss reduction project component, combination of both these options have been assumed. The higher electricity generation made possible in the hydro power plants by the project also results in lower overall generation cost by avoiding expensive thermal generation. However, considering the long term generation plan of NEA to consist of a substantial hydro capacity, a weighted average avoided cost of generation (which includes both thermal and hydro generation in the pool) of 1.03 NRs/kWh was used[6].

### 3. Financial Internal Rate of Return

14. Based on the above income/expenditure reflected as project cashflows; the financial internal rate of return (FIRR) was calculated to be 18.1%. In comparison with a WACC of 0.9%, the expected FIRR suggests a highly sustainable project even exceeding the FIRR estimate of 11.1% made during project appraisal. Increase in FIRR can be partly attributed to the recent increase in electricity tariff, but more significant is the effect of lower capital expenditure spent on the project compared against the appraised amounts to achieve almost the same project outputs. The FIRR calculation is summarized and presented in Table A10.4.

**Table A10.4: Financial Internal Rate of Return Reevaluated at Project Completion**

Values are in NRs Million

| Year | Revenue from Sales | Generation Cost Savings | Total Inflows | Capital Cost | O&M Costs | Supply Costs | Total Outflows | Net Cashflow |
|---|---|---|---|---|---|---|---|---|
| 2010 | - | - | - | 113 | - | - | 113 | -113 |
| 2011 | - | - | - | 626 | - | - | 626 | -626 |
| 2012 | - | - | - | 849 | - | - | 849 | -849 |
| 2013 | - | - | - | 1,951 | - | - | 1,951 | -1,951 |
| 2014 | - | - | - | 1,608 | - | - | 1,608 | -1,608 |
| 2015 | - | - | - | 975 | - | - | 975 | -975 |
| 2016 | - | - | - | 619 | - | - | 619 | -619 |
| 2017 | - | - | - | 228 | - | - | 228 | -228 |
| 2018 | 2,967 | 50 | 3,016 | - | 109 | 1,123 | 1,232 | 1,784 |
| 2019 | 3,059 | 50 | 3,108 | - | 109 | 1,133 | 1,243 | 1,865 |
| 2020 | 3,653 | 50 | 3,703 | - | 109 | 1,335 | 1,445 | 2,258 |
| 2021 | 3,968 | 50 | 4,017 | - | 109 | 1,417 | 1,527 | 2,490 |
| 2022 | 4,097 | 50 | 4,147 | - | 109 | 1,432 | 1,541 | 2,605 |
| 2023 | 4,191 | 50 | 4,240 | - | 109 | 1,444 | 1,553 | 2,687 |
| 2024 | 4,281 | 50 | 4,330 | - | 109 | 1,455 | 1,564 | 2,766 |
| 2025 | 4,304 | 50 | 4,354 | - | 109 | 1,457 | 1,567 | 2,787 |
| 2026 | 4,322 | 50 | 4,372 | - | 109 | 1,459 | 1,569 | 2,803 |
| 2027 | 4,341 | 50 | 4,391 | - | 109 | 1,461 | 1,571 | 2,820 |
| 2028 | 4,362 | 50 | 4,411 | - | 109 | 1,464 | 1,573 | 2,838 |
| 2029 | 4,384 | 50 | 4,434 | - | 109 | 1,466 | 1,576 | 2,858 |
| 2030 | 4,385 | 50 | 4,435 | - | 109 | 1,466 | 1,575 | 2,859 |
| 2031 | 4,385 | 50 | 4,435 | - | 109 | 1,466 | 1,575 | 2,859 |
| 2032 | 4,385 | 50 | 4,435 | - | 109 | 1,466 | 1,575 | 2,859 |
| 2033 | 4,385 | 50 | 4,435 | - | 109 | 1,466 | 1,575 | 2,859 |
| 2034 | 4,385 | 50 | 4,435 | - | 109 | 1,466 | 1,575 | 2,859 |

[5] Annual Report 2017 of Nepal Electricity Authority

[6] This is in contrast to the very high (8.93 NRs/kWh) avoided costs anticipated for the winter season in the short term during project appraisal. Such high benefits were not realized by the project due to delays in project implementation.

| Year | Revenue from Sales | Generation Cost Savings | Total Inflows | Capital Cost | O&M Costs | Supply Costs | Total Outflows | Net Cashflow |
|---|---|---|---|---|---|---|---|---|
| 2035 | 4,385 | 50 | 4,435 | - | 109 | 1,466 | 1,575 | 2,859 |
| 2035 | 4,385 | 50 | 4,435 | - | 109 | 1,466 | 1,575 | 2,859 |
| 2037 | 4,385 | 50 | 4,435 | - | 109 | 1,466 | 1,575 | 2,859 |
| RV | - | - | - | -2,555 | - | 109 | -2,555 | 2,555 |
| | | | | | | | FIRR | **18.1%** |

RV = residual value; FIRR = economic internal rate of return; O&M = operation and maintenance
Source: ADB staff estimates

## B. Economic Revaluation

15. The economic analysis of the project was carried out on the basis of the economic benefits of additional power NEA could supply to its customers due to this project. The economic costs of implementing and operating the project over the evaluation period were compared against the economic benefits derived by facilitating additional consumption of grid electricity to calculate the EIRR of the project.

**Economic costs.** The economic analysis was carried out using the world price numeraire. Standard conversion factor (SCF) of 0.84 was used to convert the financial costs to economic costs. All three cost components; capital, O&M and additional supply costs considered in the financial analyses were taken as economic costs of the project. As detailed in Table A10.5, Nepal's import export transaction volumes and taxes and subsidies imposed on these transactions over the project implementation period was used to derive the shadow exchange rate factor (SERF) applicable for the project and the SCF for the project period was taken as the reciprocal of the deduced SERF[7].

**Table A10.5: Derivation of Shadow Exchange Rate Factor**

| Item | 2010 | 2012 | 2013 | 2014 | 2015 | 2016 | Total |
|---|---|---|---|---|---|---|---|
| **Imports (NPR m)** | | | | | | | |
| Total Import | 374,335 | 461,668 | 556,740 | 714,357 | 774,684 | 773,599 | 4,051,559 |
| Import Tax | 75,067 | 92,707 | 120,450 | 147,287 | 166,006 | 180,213 | 863,151 |
| *% Import Tariff* | *20.05%* | *20.08%* | *21.63%* | *20.62%* | *21.43%* | *23.30%* | *21.30%* |
| Import Subsidy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *% Import Subsidy* | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *0.00%* |
| **Import+Taxes-Subsidies** | **449,402** | **554,375** | **677,191** | **861,644** | **940,690** | **953,812** | **4,914,710** |
| **Exports (NPR m)** | | | | | | | |
| Total Export | 60,824 | 74,261 | 76,917 | 91,991 | 85,319 | 70,117 | 523,768 |
| Export Tax | 908.9 | 810.76 | 419.51 | 1065.26 | 310.67 | 155.9 | 4,029 |
| *% Export Tariff* | *1.5%* | *1.1%* | *0.5%* | *1.2%* | *0.4%* | *0.2%* | *0.8%* |
| Export Subsidy | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *% Export Subsidy* | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *0.00%* |
| **Export+Subsidies- Taxes** | **59,915** | **73,450** | **76,498** | **90,926** | **85,008** | **69,961** | **519,740** |
| **Total trade** | **435,159** | **535,929** | **633,657** | **806,348** | **860,003** | **843,716** | **4,575,327** |
| **SCF** | | | | | | | **0.84** |
| **SERF** | | | | | | | **1.19** |

Source: Nepal Rastra Bank

[7] SERF = (Imports + Import Taxes - Import Subsidies + Exports + Export Subsidies - Export Taxes) / (Total Trade)

16. **Economic benefits.** Both incremental and non-incremental benefits are expected from the project. By avoiding system constraints and unreliability related outages, more grid electricity can be supplied to end users; firstly, displacing alternative energy sources used by those consumers in lieu of grid electricity and then, due to the convenience and lower cost of grid electricity, these consumers are expected to consume additional electricity up to national average consumption levels of those consumer categories. In addition to existing consumers, facilitation of new connections will also provide additional economic benefits.

17. **Non-incremental benefits:** In the reevaluation of project economic efficiency, it was assumed that 30% of the additional electricity sales is used to offset alternative energy sources consumed by existing and deprived electricity consumers due to temporary or continuous absence of grid electricity. The economic saving of avoiding alternative energy sources is conservatively approximated to the incremental generation (capacity + energy) cost of the grid (without transmission and distribution related costs) as that will be lowest alternative energy cost possible for any consumer.

18. **Incremental benefits:** The incremental electricity consumption was valued at willingness to pay (WTP) for electricity by the consumers. During project appraisal, the consumer willingness to pay for electricity has been estimated. Average WTP of different consumer categories, namely; domestic, agricultural, commercial and industrial were separately estimated using the electricity demand functions of each of these consumer groups. An overall WTP value has been arrived at by taking the weighted average of individual WTP values based on the share of electricity consumption by each consumer category as forecast for each year of the evaluation period. A summary of yearly variation of alternative resource cost and WTP value is given in Table A10.6.

**Table A10.6: Yearly Project Economic Benefit Valuation**

| | 2018 | 2021 | 2024 | 2027 | 2030 | 2033 | 2036 |
|---|---|---|---|---|---|---|---|
| Alternative Resource Cost (NRs/kWh) | 5.99 | 6.46 | 6.63 | 6.63 | 6.63 | 6.63 | 6.63 |
| Av. Willingness to Pay (NRs/kWh) | 9.59 | 10.41 | 10.38 | 10.35 | 10.33 | 10.33 | 10.33 |

19. **Economic Internal Rate of Return (EIRR):** Similar to financial analysis, the economic analysis was carried out by comparing the economic benefits derived from the project against the economic costs incurred by Nepal in implementing and operating the project elements. As per the economic analysis, at project completion, the EIRR is re-calculated as 19.3%. This reevaluated economic performance forecast is better than the 9.0% benchmark considered for ADB financed projects in the region. Thus, the project can be considered an efficient investment in the Nepalese power sector. The economic reevaluation further confirms the positive outlook projected at the appraisal stage with an EIRR estimate of 19.1%. The economic analysis is summarized and presented in Table A10.7.

## Table A10.7: Economic Internal Rate of Return Reevaluated at Project Completion

Values are NRs Million

| Year | Benefits | | Costs | | | Net Benefits |
|---|---|---|---|---|---|---|
| | Incremental Output | Non-Incremental Output | Capital | O&M | Supply | |
| 2010 | - | - | 98 | - | - | -98 |
| 2011 | - | - | 541 | - | - | -541 |
| 2012 | - | - | 734 | - | - | -734 |
| 2013 | - | - | 1,687 | - | - | -1,687 |
| 2014 | - | - | 1,390 | - | - | -1,390 |
| 2015 | - | - | 843 | - | - | -843 |
| 2016 | - | - | 535 | - | - | -535 |
| 2017 | - | - | 197 | - | - | -197 |
| 2018 | 2,026 | 546 | - | 95 | 950 | 1,527 |
| 2019 | 2,182 | 631 | - | 95 | 960 | 1,757 |
| 2020 | 2,712 | 686 | - | 95 | 1,130 | 2,174 |
| 2021 | 2,942 | 786 | - | 95 | 1,200 | 2,432 |
| 2022 | 3,034 | 833 | - | 95 | 1,212 | 2,559 |
| 2023 | 3,100 | 852 | - | 95 | 1,222 | 2,634 |
| 2024 | 3,163 | 870 | - | 95 | 1,231 | 2,706 |
| 2025 | 3,177 | 874 | - | 95 | 1,233 | 2,723 |
| 2026 | 3,188 | 878 | - | 95 | 1,235 | 2,736 |
| 2027 | 3,199 | 882 | - | 95 | 1,237 | 2,749 |
| 2028 | 3,212 | 886 | - | 95 | 1,239 | 2,764 |
| 2029 | 3,226 | 891 | - | 95 | 1,241 | 2,781 |
| 2030 | 3,225 | 891 | - | 95 | 1,241 | 2,780 |
| 2031 | 3,225 | 891 | - | 95 | 1,241 | 2,780 |
| 2032 | 3,225 | 891 | - | 95 | 1,241 | 2,780 |
| 2033 | 3,225 | 891 | - | 95 | 1,241 | 2,780 |
| 2034 | 3,225 | 891 | - | 95 | 1,241 | 2,780 |
| 2035 | 3,225 | 891 | - | 95 | 1,241 | 2,780 |
| 2035 | 3,225 | 891 | - | 95 | 1,241 | 2,780 |
| 2037 | 3,225 | 891 | - | 95 | 1,241 | 2,780 |
| RV | | | -2,208 | | | |
| | | | | | EIRR | **19.3%** |

RV = residual value; EIRR = economic internal rate of return; O&M = operation and maintenance
Source: ADB staff estimates

## FINANCIAL PERFORMANCE OF NEPAL ELECTRICITY AUTHORITY

20. In FY2017, NEA was granted a 19% tariff increase, substantially improving its financial performance compared with previous years. The previous tariff increase was in FY2012, which was insufficient to allow NEA to meet interest costs on long-term debt and to cover depreciation costs. Consequently, NEA's accumulated losses had increased to around NRs34 billion by the end of FY2016, despite its long-term loans having been converted to equity (that is, "reset" to zero) in FY2012. The government's 2012 Financial Restructuring Plan for NEA was largely focused on cleaning NEA's balance sheet but fell short of ensuring the company's ongoing financial performance[1]. Thus, subsequent annual tariff increases were not permitted until 2017, eroding the financial situation year after year. However, with the tariff increase in 2017, NEA achieved accounting breakeven and managed to reduce its accumulated losses to NRs30 billion.

21. External audit reports have indicated that NEA is significantly understating interest on long-term debt (interest is calculated on outstanding loan balances after deductions for notional principal repayments, even though principal payments are not made)[2]. Net accounting losses reported by NEA during 2014-2016 period are therefore understated.

22. Audit qualifications made during that period suggests that NEA's balance sheet is not presenting a cogent picture of the company's financial position:

(i) there has been no physical verification of fixed assets or capital work in progress (NRs86 billion and NRs58 billion respectively at the end of FY2015);
(ii) no impairment test appears to have been carried out on fixed assets or capital work in progress;
(iii) no evidence of aging analysis of receivables was made available (NRs10 billion at the end of FY2015)
(iv) no documentation was made available to support the carrying balance of long-term loans (NRs98 billion at the end of FY2015); and
(v) the status of sundry creditors (NRs46 billion at the end of FY2015) was not verifiable.

23. To forecast the true financial outlook of NEA, a significant balance sheet restructuring is required—a write-off of long-term debt and interest arrears, conversion of some long-term debt to equity, and a write-down (impairment) of the carrying value of fixed assets to reflect their condition (particularly in the case of some hydropower assets) and their revenue-earning potential.

24. The change in financial performance induced by the tariff increase in 2017 is evident by the improvement of all financial performance indicators presented in Table A10.1. Both the profit and loss statement (Table A11.2) and the balance sheet (Table A11.3) suggest a recovery from the deteriorating financial situation of NEA. However, to safeguard the financial sustainability of NEA in the longer term, timely tariff increases to reflect increasing cost of sales and financing supported by the restructure of long term debts is necessary.

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[1] In January 2012, the government approved parts of the Financial Restructuring Plan prepared by NEA and a government-appointed taskforce. The following recommendations have been adopted:
(i) increase NEA's authorized share capital from NRs30 billion to NRs75 billion;
(ii) write-off accumulated loss up to FY2011 amounting to NRs12 billion;
(iii) capitalize interest accrued on loans up to FY2011, amounting to NRs9.6 billion;
(iv) grants received by the government to be provided to NEA as equity; and
(v) reduce the interest rate on any new local currency on-lending to NEA from 8% to 5%.

[2] For the first time in many years, a loan repayment of NRs468 million was made in FY2015.

**Table A11.1: Nepal Electricity Authority Summarized Financial Performance 2014-2017**

| Item | FY[a] | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| **Commercial** | | | | | |
| Electricity sales | *(GWh)* | 3,496 | 3,743 | 3,719 | 4,777 |
| Average revenue per unit sold | *(NRs/kWh)* | 8.1 | 8.1 | 8.6 | 9.7 |
| Average cost per unit sold [b] | *(NRs /kWh)* | 9.4 | 9.2 | 10.3 | 10.0 |
| **Financial** | | | | | |
| Revenue | *(NRs m)* | 30,363 | 33,285 | 35,074 | 50,230 |
| Operating expenses | *(NRs m)* | 24,911 | 27,408 | 31,315 | 40,614 |
| Operating profit | *(NRs m)* | 5,451 | 5,877 | 3,759 | 9,616 |
| Overheads | *(NRs m)* | 4,781 | 3,389 | 3,269 | 3,557 |
| Depreciation | *(NRs m)* | 3,297 | 3,471 | 3,554 | 3,652 |
| Finance costs incl FX | *(NRs m)* | 4,182 | 4,147 | 5,826 | 3,386 |
| Net profit before tax | *(NRs m)* | (6,809) | (5,130) | (8,890) | (979) |
| Current assets | *(NRs m)* | 21,641 | 27,502 | 33,729 | 38,543 |
| Current liabilities | *(NRs m)* | 55,597 | 65,052 | 72,684 | 73,875 |
| Fixed assets | *(NRs m)* | 143,521 | 162,042 | 176,960 | 199,494 |
| Long-term liabilities | *(NRs m)* | 82,692 | 98,253 | 111,304 | 117,484 |
| Capital and reserves | *(NRs m)* | 26,874 | 26,239 | 26,702 | 46,678 |
| Return on average net fixed assets [c] | | 1% | 4% | 1% | 7% |
| Debt-service coverage ratio [d] | | 0.06 | 0.42 | 0.00 | 0.05 |
| Debt:equity ratio [e] | | 75:25 | 79:21 | 84:20 | 71:29 |
| Receivable days | | 117 | 120 | 116 | 105 |

FX = foreign exchange GWh = gigawatt-hour, kWh = kilowatt-hour, Prov = provisional/estimated
[a] "FY" denotes the fiscal year ending on 15 July of the calendar year indicated.
[b] Includes operating expenses, overheads and depreciation. Finance costs are excluded.
[c] Calculated as earnings before interest, tax and depreciation divided by closing net fixed assets.
[d] Calculated as earnings before interest, tax and depreciation divided by interest and principal payments due.
[e] Long-term debt divided by equity net of accumulated profits/losses.
Source: Asian Development Bank staff estimates.

## Table A11.2: Income Statement of Nepal Electricity Authority 2014-2017 (in NRs million)

| | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|
| **Revenues** | | | | |
| Electricity sales | 28,206 | 30,169 | 31,824 | 46,145 |
| Other operating revenue | 2,157 | 3,116 | 3,249 | 4,085 |
| **Total Operating Revenues** | **30,363** | **33,285** | **35,074** | **50,230** |
| | | | | |
| **Operating Expenses** | | | | |
| Generation | 1,887 | 1,384 | 1,333 | 1,824 |
| Power purchases | 17,042 | 19,210 | 22,332 | 28,457 |
| Transmission | 519 | 580 | 1,095 | 1,907 |
| Distribution | 4,575 | 5,342 | 5,671 | 7,458 |
| Electrification | 0 | 0 | 0 | 0 |
| Royalties | 889 | 893 | 883 | 968 |
| **Total Operating Expenses** | **24,911** | **27,408** | **31,315** | **40,614** |
| | | | | |
| **Gross profit** | **5,451** | **5,877** | **3,759** | **9,616** |
| | | | | |
| **Overhead Expenses** | | | | |
| Administrative expenses | 1,239 | 1,339 | 1,219 | 1,307 |
| Other provisions and write-offs | 3,542 | 2,050 | 2,050 | 2,250 |
| **Total Overhead Expenses** | **4,781** | **3,389** | **3,269** | **3,557** |
| | | | | |
| **EBITDA** | **670** | **2,488** | **490** | **6,059** |
| *EBITDA %* | 0 | 0 | 0 | 0 |
| | | | | |
| Depreciation and amortization | 3,297 | 3,471 | 3,554 | 3,652 |
| | | | | |
| **EBIT** | **(2,627)** | **(983)** | **(3,064)** | **2,407** |
| | | | | |
| Interest on long term borrowings | 4,235 | 4,670 | 5,080 | 3,879 |
| (Gain)/loss on foreign exchange | (53) | (523) | 745 | (493) |
| | | | | |
| **Net Profit/ (Loss) Before Tax** | **(6,808)** | **(5,130)** | **(8,889)** | **(979)** |
| | | | | |
| Corporate tax | 0 | 0 | 0 | 0 |
| Provision for tax | 0 | 0 | 0 | 0 |
| Deferred tax expenses recognised | 0 | 0 | 0 | 0 |
| Prior years (income)/expense reclassification | (192) | (383) | 32 | 5,200 |
| Insurance fund contributions | 0 | 0 | 0 | 0 |
| | | | | |
| **Profit/(Loss) for the year** | **(7,000)** | **(5,513)** | **(8,889)** | **(979)** |
| **Profit Available for Appropriation** | (6,808) | (5,130) | (8,890) | (979) |
| **Retained Earnings** | (13,238) | (20,239) | (25,751) | (34,609) |
| **Accumulated Loss Adjustment** | 0 | 0 | 0 | 0 |
| **Transfer to Balance Sheet** | (20,239) | (25,751) | (34,609) | (30,388) |

Source: Nepal Electricity Authority.

## Table A11.3: Balance Sheet of Nepal Electricity Authority (in NRs million)

| | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|
| **ASSETS** | | | | |
| **Current Assets** | | | | |
| Cash and fixed bank deposits | 6,122 | 10,622 | 15,362 | 10,622 |
| Trade and other receivables | 9,016 | 9,927 | 11,187 | 14,434 |
| Prepayments, advances, loans and deposits | 3,645 | 3,783 | 3,804 | 4,231 |
| Inventories | 2,859 | 3,170 | 3,377 | 3,923 |
| **Total Current Assets** | **21,641** | **27,502** | **33,729** | **38,543** |
| **Non-Current Assets** | | | | |
| Net fixed assets | 84,239 | 86,439 | 88,521 | 90,204 |
| Capital work-in-progress | 46,994 | 58,052 | 66,684 | 83,940 |
| Other assets and investments | 12,288 | 17,551 | 21,755 | 25,350 |
| **Total Non-Current Assets** | **143,521** | **162,042** | **176,960** | **199,494** |
| **Total Assets** | **165,162** | **189,544** | **210,689** | **238,037** |
| **LIABILITIES** | | | | |
| **Current Liabilities** | | | | |
| Bank OD / short term loans | 700 | 0 | 0 | 0 |
| Sundry creditors and other payables | 37,637 | 45,743 | 51,325 | 50,266 |
| Provisions | 17,259 | 19,309 | 21,360 | 23,610 |
| **Total Current Liabilities** | **55,597** | **65,052** | **72,684** | **73,875** |
| **Long Term Borrowings** | **82,692** | **98,253** | **111,304** | **117,484** |
| **Capital and Reserves** | | | | |
| Share capital | 44,511 | 49,275 | 58,528 | 74,284 |
| General reserves | 1,909 | 2,022 | 2,089 | 2,089 |
| Retained earnings | (20,239) | (25,751) | (34,609) | (30,388) |
| Deferred Tax | 693 | 693 | 693 | 693 |
| **Total Capital and reserves** | **26,874** | **26,239** | **26,702** | **46,678** |
| **Total Liabilities and Equity** | **165,162** | **189,544** | **210,689** | **238,037** |

Source: Nepal Electricity Authority.

# ENVIRONMENTAL SAFEGUARDS

## A. Introduction

1. The Energy Access and Efficiency Improvement Project (the project) with seven components consisting of 24 subprojects was classified as a category B. The Initial Environmental Examination of the project was disclosed in the ADB website on September 2009. A separate IEE report was prepared for the Dumre Damauli 132kV Transmission Line (TL) with specific mitigation measures to avoid adverse environmental impacts owing to passing through dense forest area. Other subprojects had site-specific low to moderate adverse impacts and required mitigation measures were addressed through the ADB approved consolidated IEE Report. The IEE was prepared in compliance with ADB Environment Policy 2002.

2. The Butwal-Kohalpur 132kV transmission subproject partially passes through the Banke National Park, which was established in 12th July 2010[1] after the project was approved and the subproject entered into implementation. The subproject was completed complying with the regulatory provisions of the Government of Nepal. Limited adverse impacts were observed by the subproject due to the nature of the project (substation within a confined area along existing 132 kV transmission line), proximity to the national highway and located in intensive human activity area. Therefore, an original environmental classification of category B was retained. Good coordination was however maintained with the park authority during construction and operation.

## B. Public Consultation

3. Consultation regarding the sub-project activities, potential environmental impacts and mitigation measures was made during design as well as implementation. Along with consultation at project level during implementation, separate consultation was carried out while preparing separate IEE for Dumre Damauli 132kV Transmission Line project. No major environment related issues were raised during consultation process except for Dumre Damauli 132kV Transmission Line project where people demanded for compensatory plantation, training on electrical safety and hazard, herbal and vegetable planting which were fulfilled during implementation.

## C. Environmental Safeguards Management

4. As an executing as well as implementation agency, NEA was responsible for coordinating and implementing the environmental management plan (EMP) for the project. The umbrella IEE for the project, prepared in September 2009 provided overall framework and guidance on implementation of EMP. In addition, owing to the alignment passing through dense forest area requiring clearing of large number of trees, a separate IEE was prepared for Dumre Damauli 132kV Transmission Line sub-project. NEA's Environment and Social Study Department (ESSD) with dedicated staffs was mobilized at the field to undertake close monitoring of EMP compliance. A separate field office was also opened at site (Damauli) to facilitate closer monitoring of EMP implementation and handling the public grievances. The office kept close coordination with the local administration for resolving local grievances. ESSD also coordinate with other district government offices like district forest office to clear trees and implement compensatory plantations. For other subprojects including additional scope of work for reinforcement of existing

[1] http://bankenationalpark.gov.np/index.php

grid substations at Birgunj, Parwanipur, and Hetauda, environmental footprints being smaller, the sub-project offices themselves monitored implementation of EMP and worked well during implementation.

**D. Environmental Monitoring and Reporting**

5. Contractors and ESSD conducted regular environmental monitoring at work sites. The EMP compliance by the contractors was found generally satisfactory. No major environmental impacts were recorded due to the project implementation. Environmental compliance monitoring and documentation was carried out in coordination with respective project managers or field staff of NEA. Brief on the compliance monitoring is presented below;

6. **Physical environment:** The project distributed 750,000 Compact Fluorescent Lamp (CFL) to NEA's consumer at selected locations. For safe disposal of CFL lamp, international individual consultant under the project helped NEA in drafting CFL waste management policy, however it was not implemented. ADB during its review mission in 2014 also advised and agreed with NEA to procure CFL's mercury extracting machines from the saving under the Grant 0183 but it was not materialized as NEA did not submit the bidding documents and the grant was closed in 2015. Local municipalities has some practices to collect and manage such waste in landfill, however safe disposal of CFL promoted under this project remained concern. In other hand, areas experiencing frequent power cuts including Kathmandu Valley have resulted into increased use of lead acid batteries for electricity backup whose safe disposal in itself would have been a problem. In Kathmandu Valley, the requirement of battery backup systems has been almost eliminated since 2017 which can be partly attributed to the project's intervention. No other major environmental safeguards related issues were identified and reported till date.

7. **Biological environment:** Clearance of trees along Dumre Damauli 132kV TL was a major impact of the subproject requiring clearing of 3,393 trees. About 33,000 saplings were planted as compensatory measure in three areas including Ghumaune Dharapani, Chisapani and Basudev Pahara Community Forest in the Ghasikuwa Rural Municipality. The saplings were arranged to be guarded for five years. A forest fire burnt 7,000 of these saplings which will be replanted in coordination with the Department of Forest. A few mature sal trees (*Shorea robusta)* were cleared at Kusum Substation in Banke. Compensatory plantation were done for 133 trees cleared in Butwal Kohalpur TL, and 598 private trees along the Dumre Damauli TL. Clearance of trees and construction of TL did not cause any significant impact on any wildlife habitat.

8. **Socio-economic and cultural environment:** All the sub-projects generally complied with the EMP requirements. Complying to the community request, 4.2km section of Dumre Damauli TL passing through major settlements was rerouted to reduce social impacts.

9. At institutional level, it was realized during implementation that the presence of separate and independent unit within NEA to oversee safeguard compliance of all projects would have been effective way to ensure safeguard compliance. ESSD could be right unit within NEA to take this role however its engagement in implementing the safeguard measures needs to be limited only in monitoring safeguard compliance to avoid possible conflict of interest. Given NEA is gearing with implementation of large numbers of projects funded by government and various development partners, establishment of independent safeguard compliance unit within NEA will be critical in coming days.

## E. Monitoring performance

10. The subprojects' earlier compliance to IEE was moderate with poor performance on activities such as spoil management, occupation health, bioengineering, drainage management etc. ADB safeguard mission field in 2013 identified several issues and provided several recommendations after which improvements were noticed in EMP compliance. ESSD of NEA conducted safeguard monitoring of project in the Dumre Damauli TL. For other sub-projects having relatively minor environmental impacts were monitored by the EA's project field staff. The regular safeguard monitoring was hindered time to time due to absence of environmental expert in the project management unit (PMU). A dedicated environmental safeguards team could only ensure higher safeguard compliance assurance efficiency in the project.

## F. Reporting:

11. The submission of semiannual monitoring report was not regular, although the project submitted reports on December 2015 and September 2016 for the months between July-December 2015 and January-June 2016, respectively. Both the reports were uploaded in ADB website. Major reason for non-submission is due to lack of dedicated environment safeguard team at the PMU.

## G. Grievance Redress Mechanism

12. Grievance Redress Mechanism(GRM) established to handle land acquisition and resettlement also served to handle grievances related to environment related issues. No major environmental related grievances were noted during project implementation. Minor issues were handled from the subproject level.

## H. Information Disclosure, Consultation, and Participation

13. The Project complied with information disclosure, public consultation and participation for each subproject from early stage of the project through ESSD for Dumre-Damauli TL, and field staff were actively involved in the rest of the subprojects. The project supported in capacity building and environmental conservation awareness building of the local affected people in the areas of forestry conservation awareness trainings (25 persons), non-timber forest product training (25 persons), wildlife awareness trainings (25 persons) and Social training on health and sanitation (150 persons).

## I. Environmental Benefits

14. The project objectives of improving grid connectivity, control of electricity leakage, use of renewable energy and adaption of energy efficiency measures result into environmental benefits by facilitating access to clean energy into national grid, reducing the use of fossil fuel and battery back-up systems for electricity supply for household consumers. The total combined impact of project intervention yield an estimated reduction of $CO_2$ emission by 68,000 tonnes per year. 33,000 saplings planted as compensatory measures against the trees cleared for project activities will have increased environment benefits in the future.

## J. Conclusion

15. The PMU and sub-project staff demonstrated a fair level of adhering to environmental safeguard requirements with no major concerning issue reported during project implementation. Considering absence of dedicated staff at the PMU resulting into lower attention of environment safeguard implementation, non-submission regular semiannual safeguard report, the environmental safeguard performance of project is rate *partially satisfactory*.

16. Engagement of dedicated safeguard staff at PMU and project level with serious environmental footprint could be considered as lessons learned for the future projects. Further to ensure better compliance of safeguards compliance, NEA shall establish separate and independent safeguard compliance unit that will oversee, guide and advice safeguard compliance requirement of all project implement by NEA.

# SOCIAL SAFEGUARDS

## A. Introduction

1. The project components include; (i) Transmission System Augmentation; (ii) Distribution System Enhancement; (iii) Distribution Loss Reduction, (iv) Generation Plant Improvement, (v) Energy Efficient Lighting, (vi) Solar Power based Street Lighting, and Public Private Partnerships (PPP) in distribution. Among them only the subprojects, (i) Middle Marshyangdi- Dumre-Damauli – Marshyangdi 132 kV T/L and Related Sub-station Works, and (ii) Construction of Chapali substation, and distribution and switching center construction (in Parbat, Kaski, Janakpur, Mahottari, Bardiya, Jhapa, Sarlahi,Siraha) required land acquisition. Additional scope was introduced to respond to needs identified during implementation. The transformer capacity at existing substations at Birgunj Parwanipur and Hetauda was increased under this subcomponent 1 without any additional safeguard impacts.

2. Land identification and acquisition for substations and transmission towers construction were not finalized during the feasibility phase. Therefore, likely acquisition and impact was estimated using data collected based on field survey. Some sections of alignment route of Dumre-Damauli 132 kV transmission line was changed during implementation to avoid/minimize impact on settlements as well as forest. Consequently, there are some differences on the acquisition and impact related data during the appraisal and implementation phase.

3. The project was categorized as “B” category for IR and recategorized to category ’A’ considering the number of affected household though the significant impact was recorded less. Full resettlement plan was prepared and recorded in the RRP as well. Draft final RP was uploaded in ADB website and updated during implementation after the detail design.

## B. Scope of Land Acquisition and Resettlement

4. As estimated in the original RP, a total of 25.06 ha of land is required to implement all project components affecting 1654 persons of 314 households. However, during the implementation phase the actual area of affected land has been reduced to be only 20.79 ha. The change in land area, number of affected households, and affected persons is mainly, due to use of Government land for some subprojects like; substation/switching stations construction at Swayambhu, Matatirtha, Mirmi, Mahottari, Kanchanpur, change in transmission line alignment to minimize land acquisition. However, the number of affected person has been increased due to fragmentation of land, land transaction and migration of the people to the area. A comparative information on land acquisition impacts estimated at appraisal and completion is summarized in Table A13.1.

**Table A13.1: Area of Permanently, Restricted and Temporary Acquired Land**

| S.N. | Acquisition Type | Area of Acquisition Based on Updated RP-2016 | | Area of Acquisition Feasibility Phase RP-2009 | |
|---|---|---|---|---|---|
| | | HHs | ha | HHs | ha |
| 1.1 | Permanent Acquisition of Land for Dumre-Damauli-Marshyangei | 33 | 4.44 | 33 | 1.9 |
| 1.2 | Land Restricted to Use Except for Agriculture for 132 kV RoW (Dumre-Damauli) | 317 | 13.77 | 192 | 21.39 |
| 1.3 | Land acquired for Substations | 95 | 2.58 | 89 | 2.76 |
| | **Total** | 445 | **20.79** | **314** | **26.05** |
| **Total Number of Affected Structures** | | | | | |
| 1.4 | Affected Structures (residential, temp shed) | 18 | | 20 | |

## C. Land Acquisition and Resettlement Cost

5. Land acquisition and resettlement cost for the project during the appraisal phase was based on the calculation made by the project preparatory TA consultant in 2009 and NRs 345,538,950.75 was estimated for permanent acquisition and right-of-way. Later, after finalizing the scope of impacts, NEA with the support of CDO, after verification and investigation of affected assets and their current market value, finalized the compensation rate was NRs. 313,596,536.79 for permanent acquisition.

**Table A13.2: Summary of Land Acquisition and Compensation Cost**

| S.N | Description | | Total Project Affected HHs | Average Compensation Amount (NRs) |
|---|---|---|---|---|
| 1 | Permanent Acquisition | Appraisal Phase | 122 | 330,512,955.56 |
| | | Implementation Phase | 128 | 313,596,536.79 |
| 2 | Restriction for RoW | Appraisal Phase | 192 | 15,025,995.19 |
| | | Implementation Phase | 317 | Yet to be decided |

## D. Livelihood and Income Restoration

6. Different types of skill trainings and livelihood enhancement activities to the family members of project affected households were imparted in different locations. This training was conducted in collaboration with environmental safeguards team.

**Table A13.3: Vulnerability Category Details**

| S.N. | Vulnerability Category | Vulnerable HHs | % |
|---|---|---|---|
| 1 | Single Women Headed Households | 16 | 4.86 |
| 2 | Households having full impact on residential structures | 12 | 3.65 |
| 3 | Households having economic displacement impact | 235 | 71.43 |
| 4 | Dalit (minor caste) Households | 18 | 5.47 |
| 5 | Indigenous People's Households | 44 | 13.37 |
| 6 | Below Poverty Level Households | 4 | 1.22 |
| | **Total** | **329** | **100** |

## E. Information Disclosure, Consultation, and Participation

7. The disclosure related major activities like land acquisition and resettlement, compensation, etc were made through official notification from public media (national newspapers) and other disclosures were made through progress reports, official letters, formal, and informal invitations, and group and individual meetings. However, submission of semiannual safeguards report has been found irregular due to administrative constraints in the implementing agency. The monitoring reports are submitted in regular basis at later part of project implementation after continuous follow up from ADB and staff consultant support for capacity development and monitoring.

## F. Grievance Redress Mechanism

8. Grievance Redress Mechanism (GRM) was established under the leadership of local administration head (CDO) in major subproject like Dumre-Damauli 132 kV transmission line project. Additionally, the project has established grievances handling desk in leadership of respective project managers. Most of grievances were received by this desk and resolved by the project itself. The desk escalated the grievances requiring decision of CDO to the GRM. No outstanding grievances were recorded at completion.

## G. Monitoring and Evaluation

9. To ensure safeguards compliance in Dumre-Damauli 132 kV transmission line project, Environmental Social Studies Department (ESSD) of NEA was hired. ESSD provided overall facilitation on land acquisition and compensation distribution activities, follow up monitoring of land acquisition and compensation distribution activities including other associated tasks like; disclosure, coordination with the likely affected persons and disclosure, contractors, and the project, facilitation on updating ownership documents of affected/restricted land and receiving compensation. For other remaining subprojects, respective project management team mobilized its own staff for monitoring and reporting at subproject level.

10. The NEA could not comply the provision of mobilizing external monitoring consultant for RP implementation monitoring due to slow progress on land acquisition and compensation distribution activities.

## H. Outstanding activities

11. Payment of compensation for the land used for 132 kV RoW of Dumre Damauli section is remained as major outstanding activity. The project has completed all the necessary process and communicated with CDO with formal official letters with the references of rate used to acquire and compensate for other components. NEA informed that the compensation distribution work will be completed by December 2018.

## I. Performance of NEA

12. NEA's PMU handled the ADB project after a long spell where no new loans were formulated, causing experienced NEA staff assigned to the PMU to be minimal. This was further compounded by absence of dedicated safeguards staff at project management unit (PMU) leading to lower attention from NEA for safeguard implementation. However, despite of these shortcoming, all subproject were completed except Dumre–Damauli 132 kV transmission line where substantial work could not be completed within project duration. With many areas of improvement, the safeguard performance of NEA for the project is assessed to be less than satisfactory. The safeguard staffs in the NEA need to be enhanced in terms of numbers, proficiency and quality in a way enabling them also to handle the matters related to ADB Safeguard Policy Statement (2009) in the context of increasing the investment on energy sector.

## J. Conclusion

13. Households affected due to substation/switching stations related works in different districts and the project affected households having impacts on land in Dumre-Damauli section have already been compensated at replacement cost. Additional scope of work was carried out without any additional safeguards impacts. The monitoring report submitted by NEA indicates that living standard of the affected households including vulnerable households improved or same as pre-project condition. Therefore, the objective of project RP was largely achieved. Indigenous people affected due to land acquisition was addressed by the involuntary resettlement impact mitigation measures. Other indigenous people safeguard issues were not noted during implementation.