

Document of
The World Bank

Report No: ICR2955

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IDA-35030 IDA-46730)

ON AN

IDA CREDIT

IN THE AMOUNT OF SDR 31 MILLION
(US\$42 MILLION EQUIVALENT)

AND AN ADDITIONAL CREDIT

IN THE AMOUNT OF SDR 7.6 MILLION
(US\$12 MILLION EQUIVALENT)

TO

MONGOLIA

FOR AN

ENERGY PROJECT

March 28, 2014

Sustainable Development Department
China and Mongolia Country Management Unit
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective September 30, 2013)

Currency Unit = US Dollar

US\$1.00 = 1646.48 Mongolian Tugrig

US\$ 1.00 = SDR 1.53

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

| | |
|----------|---|
| ADB | Asian Development Bank |
| AF | Additional Financing |
| Aimag | Equivalent to province |
| BCA | Benefit-cost analysis |
| CAS | Country Assistance Strategy |
| CHP | Combined Heat and Power |
| CRETC | Central Regional Electricity Transmission Company |
| DCA | Development Credit Agreement |
| EA | Energy Authority |
| EIRR | Economic Internal Rate of Return |
| EMP | Environmental Management Plan |
| ENVP | Economic Net Present Value |
| EOCK | Economic Opportunity Cost of Capital |
| ERA | Energy Regulatory Agency |
| ERC | Energy Regulatory Commission |
| ESMAP | Energy Sector Management Assistance Program (of the Bank) |
| FIRR | Financial Internal Rate of Return |
| FNPV | Financial Net Present Value |
| GOM | Government of Mongolia |
| Ger area | Poor neighborhood with traditional housing |
| GHG | Greenhouse Gas |
| ISN | Interim Strategy Note |
| ISR | Implementation Status and Results Report |
| JSC | Joint Stock Company |
| KfW | Kreditanstalt für Wiederaufbau |
| M&E | Monitoring and Evaluation |
| MMRE | Ministry of Mineral Resources and Energy |
| MOFE | Ministry of Finance and Economy |
| MOI | Ministry of Infrastructure |
| MTR | Mid-Term Review |
| NPTC | National Power Transmission Company |
| PAD | Project Appraisal Document |

| | |
|-------|--|
| PDO | Project Development Objective |
| PIU | Project Implementing Unit |
| SAIDI | Service Average Interruption Duration Index |
| SAIFI | Service Average Interruption Frequency Index |
| SLA | Subsidiary Loan Agreement |
| Soum | Subdivisions of Aimag, equivalent to counties or districts |
| TA | Technical Assistance |
| TTL | Task Team Leader |
| UBEDN | Ulaanbaatar Electricity Distribution Company |
| UBEDO | Ulaanbaatar Electricity Distribution Office |
| USAID | United States Agency for International Development |
| WTA | Willingness-to-accept |
| WTP | Willingness-to-pay |

| |
|--|
| <p>Vice President: Mr. Axel van Trotsenburg, EAP Country Director: Mr. Klaus Rohland, EACCF Sector Manager: Mr. Charles Feinstein, EASWE Project Team Leader: Mr. Peter Johansen, EASWE ICR Team Leader: Mr. Peter Johansen, EASWE</p> |
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MONGOLIA
Energy Project

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| A. Basic Information | | | |
|---|------------|-------------------|-----------------------|
| Country: | Mongolia | Project Name: | Energy Sector Project |
| Project ID: | P040907 | L/C/TF Number(s): | IDA-35030,IDA-46730 |
| ICR Date: | 03/28/2014 | ICR Type: | Core ICR |
| Lending Instrument: | SIL | Borrower: | MONGOLIAN GOVERNMENT |
| Original Total Commitment: | XDR 23.40M | Disbursed Amount: | XDR 30.67M |
| Revised Amount: | XDR 30.67M | | |
| Environmental Category: B | | | |
| Implementing Agencies: Ministry of Energy | | | |
| Cofinanciers and Other External Partners: | | | |

| B. Key Dates | | | | |
|---------------------|------------|-------------------|---------------|--|
| Process | Date | Process | Original Date | Revised / Actual Date(s) |
| Concept Review: | 03/16/1998 | Effectiveness: | 07/30/2002 | 07/30/2002 |
| Appraisal: | 11/02/1998 | Restructuring(s): | | 12/31/2006 12/31/2008 12/31/2009 |
| Approval: | 05/03/2001 | Mid-term Review: | 04/16/2012 | 04/16/2012 |
| | | Closing: | 12/31/2006 | 09/30/2013 |

| C. Ratings Summary | |
|--------------------------------------|-------------------------|
| C.1 Performance Rating by ICR | |
| Outcomes: | Moderately Satisfactory |
| Risk to Development Outcome: | Moderate |
| Bank Performance: | Moderately Satisfactory |
| Borrower Performance: | Moderately Satisfactory |

| C.2 Detailed Ratings of Bank and Borrower Performance (by ICR) | | | |
|---|-------------------------|--------------------------------------|-------------------------|
| Bank | Ratings | Borrower | Ratings |
| Quality at Entry: | Moderately Satisfactory | Government: | Moderately Satisfactory |
| Quality of Supervision: | Moderately Satisfactory | Implementing Agency/Agencies: | Satisfactory |
| Overall Bank Performance: | Moderately Satisfactory | Overall Borrower Performance: | Moderately Satisfactory |

| C.3 Quality at Entry and Implementation Performance Indicators | | | |
|---|-------------------|---------------------------------|-------------------------|
| Implementation Performance | Indicators | QAG Assessments (if any) | Rating |
| Potential Problem Project at any time (Yes/No): | No | Quality at Entry (QEA): | Moderately Satisfactory |
| Problem Project at any time (Yes/No): | No | Quality of Supervision (QSA): | None |
| DO rating before Closing/Inactive status: | Satisfactory | | |

| D. Sector and Theme Codes | | |
|--|-----------------|---------------|
| | Original | Actual |
| Sector Code (as % of total Bank financing) | | |
| Central government administration | 3 | 1 |
| Energy efficiency in Heat and Power | 49 | 50 |
| Transmission and Distribution of Electricity | 48 | 49 |
| Theme Code (as % of total Bank financing) | | |
| City-wide Infrastructure and Service Delivery | 33 | 38 |
| Infrastructure services for private sector development | 23 | 28 |
| Other Private Sector Development | 22 | 27 |
| Regulation and competition policy | 22 | 7 |

| E. Bank Staff | | |
|----------------------|----------------------|---------------------|
| Positions | At ICR | At Approval |
| Vice President: | Axel van Trotsenburg | Jemal-ud-din Kassum |
| Country Director: | Klaus Rohland | Ian C. Porter |
| Sector Manager: | Mark R. Lundell | Yoshihiko Sumi |
| Project Team Leader: | Peter Johansen | Arturo S. Rivera |
| ICR Team Leader: | Peter Johansen | |
| ICR Primary Author: | Yun Wu | |

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)

The objective of the project is to reduce system losses and improve revenue collection in electricity distribution companies in Mongolia. A central emphasis of the project is to improve the reliability and financial sustainability of electricity distribution companies, so that consumers are provided reliable, high-quality distribution services by commercially-operated distribution utilities.

Revised Project Development Objectives (as approved by original approving authority)

(a) PDO Indicator(s)

| Indicator | Baseline Value | Original Target Values (from approval documents) | Formally Revised Target Values | Actual Value Achieved at Completion or Target Years |
|------------------------------------|---|---|---------------------------------------|--|
| Indicator 1 : | System loss for UBEDN (%) | | | |
| Value quantitative or Qualitative) | 30.64 | 10.00 | 18.00 | 14.60 |
| Date achieved | 12/31/2004 | 12/31/2009 | 04/16/2010 | 09/13/2013 |
| Comments (incl. % achievement) | The target was revised as it was deemed too ambitious. At completion, the formally revised target was overachieved by 26.9%. | | | |
| Indicator 2 : | Receivable collection days for UBEDN (days) | | | |
| Value quantitative or Qualitative) | 100.4 | 44 | | 35.4 |
| Date achieved | 12/31/2004 | 12/31/2009 | | 09/30/2013 |
| Comments (incl. % achievement) | At completion, the original target was overachieved by 15.2% with the closing date extensions. | | | |
| Indicator 3 : | Weighted system loss for selected Aimags (%) | | | |
| Value quantitative or Qualitative) | 31.6 | 15.2 | | 13.3 |
| Date achieved | 12/31/2004 | 12/31/2009 | | 09/30/2013 |
| Comments (incl. % achievement) | Original target and actual values are weighted at the actual yearly additional customer sales. At completion, the original target value was overachieved by 11.6% on average. | | | |
| Indicator 4 : | Weighted receivable collection days for selected Aimags (days) | | | |
| Value quantitative or Qualitative) | 77.4 | 24.8 | | 18.4 |
| Date achieved | 12/31/2004 | 12/31/2009 | | 09/30/2013 |
| Comments (incl. % achievement) | Original target and actual values are weighted at the actual yearly additional customer sales. At completion, the original target value was overachieved by 12.2% on average. | | | |
| Indicator 5 : | Additional households or businesses provided with access to electricity under the project (#) | | | |
| Value quantitative or Qualitative) | 0 | 124,000 | | 147,717 |

| | | | | |
|-----------------------------------|---|------------|--|------------|
| Date achieved | 12/31/2004 | 09/30/2013 | | 07/30/2013 |
| Comments (incl. % achievement) | The number was updated till July 30, 2013 meaning that the target was achieved before the project completion. | | | |

(b) Intermediate Outcome Indicator(s)

| Indicator | Baseline Value | Original Target Values (from approval documents) | Formally Revised Target Values | Actual Value Achieved at Completion or Target Years |
|--|--|--|--------------------------------|---|
| Indicator 1 : | Total net injected generation (MWh) | | | |
| Value (quantitative or Qualitative) | 1,000,000 | 1,850,000 | | 2,118,000 |
| Date achieved | 09/02/2002 | 09/30/2013 | | 09/30/2013 |
| Comments (incl. % achievement) | At project completion, the net injected generation doubled that of baseline. | | | |
| Indicator 2 : | Additional Customer Sales per Annum (Gwh) | | | |
| Value (quantitative or Qualitative) | 0 | 64 | | 114 |
| Date achieved | 09/02/2002 | 09/30/2013 | | 09/30/2013 |
| Comments (incl. % achievement) | At project completion, the indicator value nearly doubled that of baseline. | | | |
| Indicator 3 : | SAIDI for UBEDN (minutes) | | | |
| Value (quantitative or Qualitative) | 4204.7 | 600 | | 397.5 |
| Date achieved | 12/31/2004 | 12/31/2009 | | 09/30/2013 |
| Comments (incl. % achievement) | At completion, the original target was overachieved. | | | |
| Indicator 4 : | SAIFI for UBEDN (Nos/year) | | | |
| Value (quantitative or Qualitative) | 28.4 | 10 | | 7.16 |
| Date achieved | 12/31/2004 | 12/31/2013 | | 09/30/2013 |
| Comments (incl. % achievement) | At completion, the original target was overachieved. | | | |
| Indicator 5 : | Number of staff trained | | | |
| Value (quantitative or Qualitative) | 0 | not set | | not specified in document |
| Date achieved | 12/31/2001 | 09/30/2013 | | 09/30/2013 |

| | | | | |
|--|--|-------------------------|--|---------------|
| Comments (incl. % achievement) | no target or baseline was set. It was not monitored either. | | | |
| Indicator 6 : | Distribution and transmission load flow programs operational | | | |
| Value (quantitative or Qualitative) | no such program | operational | | operational |
| Date achieved | 12/31/2009 | 09/30/2013 | | 09/30/2013 |
| Comments (incl. % achievement) | At project completion,software for planning of transmission and distribution network was installed and operated by well trained staff. | | | |
| Indicator 7 : | Development proposals prepared systematically | | | |
| Value (quantitative or Qualitative) | no proposals | prepared systematically | | not specified |
| Date achieved | 12/31/2009 | 09/30/2013 | | 09/30/2013 |
| Comments (incl. % achievement) | It was not specified in document or monitored whether the development proposals were prepared systematically. | | | |

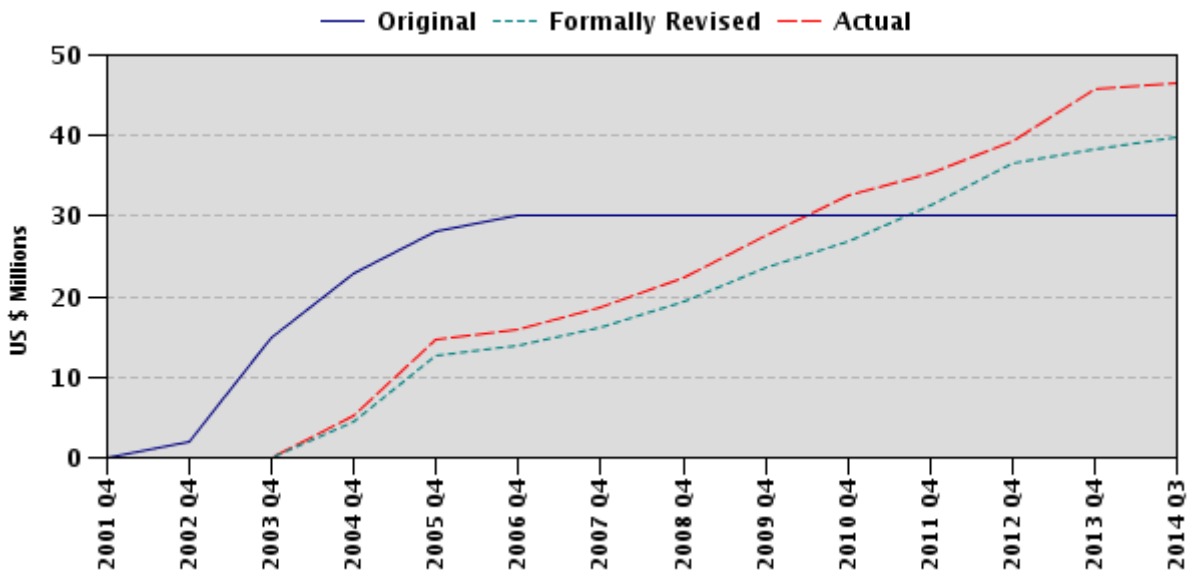
G. Ratings of Project Performance in ISRs

| No. | Date ISR Archived | DO | IP | Actual Disbursements (USD millions) |
|-----|-------------------|--------------|-------------------------|-------------------------------------|
| 1 | 06/28/2001 | Satisfactory | Satisfactory | 0.00 |
| 2 | 12/27/2001 | Satisfactory | Satisfactory | 0.00 |
| 3 | 06/27/2002 | Satisfactory | Satisfactory | 0.00 |
| 4 | 12/27/2002 | Satisfactory | Satisfactory | 0.00 |
| 5 | 06/25/2003 | Satisfactory | Satisfactory | 0.00 |
| 6 | 12/25/2003 | Satisfactory | Satisfactory | 0.66 |
| 7 | 06/29/2004 | Satisfactory | Satisfactory | 5.22 |
| 8 | 12/28/2004 | Satisfactory | Satisfactory | 13.24 |
| 9 | 06/22/2005 | Satisfactory | Satisfactory | 14.52 |
| 10 | 06/21/2006 | Satisfactory | Satisfactory | 15.95 |
| 11 | 06/26/2007 | Satisfactory | Satisfactory | 18.77 |
| 12 | 06/29/2008 | Satisfactory | Satisfactory | 22.52 |
| 13 | 06/25/2009 | Satisfactory | Moderately Satisfactory | 27.28 |
| 14 | 05/23/2010 | Satisfactory | Satisfactory | 31.73 |
| 15 | 06/15/2011 | Satisfactory | Satisfactory | 35.47 |
| 16 | 04/06/2012 | Satisfactory | Satisfactory | 38.64 |
| 17 | 03/31/2013 | Satisfactory | Satisfactory | 45.63 |
| 18 | 09/18/2013 | Satisfactory | Satisfactory | 46.16 |

H. Restructuring (if any)

| Restructuring Date(s) | Board Approved PDO Change | ISR Ratings at Restructuring | | Amount Disbursed at Restructuring in USD millions | Reason for Restructuring & Key Changes Made |
|-----------------------|---------------------------|------------------------------|----|---|---|
| | | DO | IP | | |
| 12/31/2006 | | S | S | 17.04 | The first extension postponed closing by two years from December 31, 2006 to December 31, 2008 due to delayed project commencement and inclusion of the new activities |
| 12/31/2008 | | S | S | 25.73 | To enable certain delayed construction activities to be completed. These were largely due to longer than anticipated finalization of the new commercial operation system as a result of poor consultant performance and postponements in the procurement process resulting from differences in views between the relevant government agencies |
| 12/31/2009 | | S | MS | 30.17 | To enable certain delayed construction activities to be completed. These were largely due to longer than anticipated finalization of the new commercial operation system as a result of poor consultant performance and postponements in the procurement process resulting from differences in views between the relevant government agencies |

I. Disbursement Profile



1. Project Context, Development Objectives and Design

1.1 Context at Appraisal

Mongolia's district heat and electric power system is a critical part of the country's basic infrastructure. It provides the heating needs for much of the urban population in one of the coldest climates in the world, and electricity supply for mining activities, and other industrial, public, commercial and household consumers. At the time of appraisal, the central system was based upon five coal-fired combined heat-and-power (CHP) plants of Russian design for base load operation and was interconnected by a 220 kV line with Russia's Siberian grid. The central system serviced Ulaanbaatar, Darkhan, Baganuur, Erdenet and six surrounding aimags (provinces), accounting for about 90 percent of total electricity use and the bulk of the country's district heating. Small towns (aimag centers) outside of the central system were either serviced by small coal-fired CHP plants and district heating systems (such as in Choibalsan in eastern Mongolia), or various combinations of coal-fired heat-only boilers and diesel-fueled power generation sets. The central system and aimag power systems were managed by the Energy Authority¹, an umbrella institution comprised of a number of subsidiary energy enterprises or departments.

The country's coal-power-heat supply system was in poor condition, and was unable to meet the basic supply requirements of industrial and commercial enterprises or the urban population. Power supply was marred by voltage and frequency fluctuations, unscheduled outages, load shedding and power rationing. In the Ulaanbaatar distribution system, electricity losses totaled about 33 percent, compared to 8-15 percent in other Asian cities. Losses in the electricity distribution systems in the aimag centers were typically even higher, reaching 50 percent in some cases. It was imperative that these problems be addressed to improve the financial condition of the electric power industry and to provide the stable and reliable revenue in-flow necessary to enable sector restructuring. At the same time, in the period 1990-98, electricity demand had grown at about 8.3 percent, and demand was expected to increase modestly over the medium-term.

Government Objectives for the Power Supply System. Mongolia's main development objective for the power supply system was to improve the reliability, quality and cost-effectiveness of electricity supply. For the central system, key issues included the need to:

- continue the rehabilitation of coal production, electricity and heat distribution facilities to ensure a stable supply of energy to meet basic demand;

¹ Energy Authority: Established by Resolution No. 300 dated December 5, 1996, issued by the Minister of Infrastructure pursuant to Parliamentary Resolution No. 40 of December 1996, on Administrative Structure of Government, responsible for implementing the energy policy of the Ministry of Infrastructure throughout Mongolia. It was dissolved in 2001. See footnote 3.

- improve the efficiency and cost-effectiveness of the system, and reduce high system losses through involvement of modern technology and adoption of commercially-based utility management practices;
- improve the financial viability of the sector through improved revenue collection (including improved metering, billing, and theft control), more efficient financial management, and tariff adjustments; and
- improve operational efficiency and provide peak-load capacity to complement the existing base-load capacity.

For the aimag² center systems in particular, the most pressing needs were for investment, training and technical assistance (TA) to: (a) avoid further dangerous supply disruptions and improve system reliability to ensure energy for basic human needs and to allow development of income-generating activities; (b) reduce the high costs of supply through efficiency improvements; and (c) improve financial viability by introducing measures to reduce losses, improve efficiency and improve financial management.

Institutional and Sector Reforms. At the time of project appraisal, the Government of Mongolia (GOM) had made some progress in laying the foundations for market-based sector operations by: (a) abandoning the previous centrally planned sector structure and achieving institutional separation of government policy making, public ownership, and enterprise management and operations; (b) developing joint public/private shareholding companies; and (c) initiating efforts to increase private sector participation in new project development. Moreover, the Energy Law, approved by Parliament on February 1, 2001, separated policy, regulatory and operational roles while creating the first incentives for private sector participation.

Rationale for Bank Involvement. The Project was designed to address selected issues mentioned above through an integrated program of TA and physical investments. It was aligned with GOM's sector strategy and directly supported one of the four primary Country Assistance Strategy (CAS, IDA\R98-38, discussed on June 2, 1998) objectives: to develop and upgrade infrastructure to support private sector growth and market development and improve the living conditions of the poor by improving access to services and increasing efficiency gains, particularly in energy and water supply. The Bank's continued support was considered key for completing the transformation and reform of the power sector in Mongolia, where the need for international assistance was evident.

1.2 Original Project Development Objectives (PDO) and Key Indicators

In the Project Appraisal Document (PAD), the objective of the project was *“to reduce system losses and improve revenue collection in the electricity distribution companies in Mongolia”*. However, in both the Development Credit Agreement (DCA) and Project Paper for Additional Financing (AF), the objective of the project was stated as: (1) to reduce electricity system losses and improve service reliability in electricity distribution in Ulaanbaatar and selected aimag

² An “aimag” is a province of the Borrower. “Aimag utilities” refers, collectively, to entities responsible for providing electricity and heat services at the aimag level.

centers; (2) to improve revenue collections in the electricity distribution system; and (3) to build up institutional capacity to move toward a more commercial and market-based energy sector. For the purposes of this evaluation, the PDO specified in the DCA will be used.

The **key performance indicators** included measurable indicators of improvement in distribution system's loss reduction, and improved financial performance:

- Selected indices of electricity supply, quality, and reliability (e.g. number of forced outages in certain service areas, and among consumer categories.);
- Decline in disruptions to production and supply of basic needs (heat, water) due to inadequate electricity supply; and
- Selected indices of the improved costs effectiveness of electricity supply. However the Project Design Summary did not provide concrete indices of improved costs effectiveness.

1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification

The PDO and the four key indicators were not revised. However, the Project Paper for the AF used the DCA formulation of the PDO and introduced “Increased reliability of and access to electricity supply” as an additional outcome/impact indicators and three sets of additional output indicators:

- 1(a) Additional consumer capacity served from new developments; 1(b) reduced system losses; and 1(c) outstanding collections (days);
- 2(a) and (b) Distribution and transmission load flow programs operational; and 2 (c) Development proposals prepared systematically; and
- 3 Number of staff trained in specialized areas.

In addition, the KPIs for UBEDN and aimags were finalized in 2005 and the original target of system losses in UBEDN was revised to 18% at the time of the additional financing, as the original target was deemed too ambitious after detailed loss calculations were carried out.

1.4 Main Beneficiaries

The main beneficiaries were power consumers (households and businesses) in the project areas that were provided with more reliable and high quality distribution services, and project targeted distribution companies that benefited from reductions in system losses and improved financial performance. In particular, the project improved the living conditions for the poor population located in project aimags (UBEDN, Phase I aimags Bayankhongor, Gobi-Altai, Umnugobi, Dornod, Huvsgui, and Suhbaatar, and Phase II aimags Hobd, Ubs, and Bayan-Olgii), where economic activity was depressed and unemployment and poverty rates were high.

Over the course of project implementation, the implementation arrangements changed several times (see Section 1.7 below). The following institutions received project TA: Energy Regulatory Agency (ERA, now Energy Regulatory Commission ERC), all project distribution companies (UBEDN, and Phase I and Phase II aimags), and the PIU. With the AF, an additional

institution, the Central Region Electricity Transmission Company (CRETC, also called National Power Transmission Company NPTC), benefited from training in investment planning.

1.5 Original Components

Component 1: Ulaanbaatar Electricity Distribution (US\$23 million in total, Bank financing US\$18.7 million or 81.3% of total). The purpose of this component was to reduce losses and improve revenue collection, improve the efficiency and reliability of the electricity distribution system in the capital city, and to commercialize the operations of the Ulaanbaatar Electricity Distribution Office³ (UBEDO). Component 1 financed the following: (a) purchase and installation of new meters for customers already supplied electricity without meters, and replacement of existing customer meters with new UBEDO meters; (b) reconductoring bare conductors in the low-voltage system with insulated wire; (c) new installation and replacement of distribution transformers; (d) mid-voltage step-up (6 kV to 10 kV) in the Domod I substation area; (e) purchase of hardware, software, technical assistance and training to commercialize and implement a re-engineering of UBEDO customer business procedures, especially meter reading, billing, money collection and customer account management; (f) implementation of a public campaign on new customer service initiatives and against power theft; (g) purchase of spare parts, safety equipment and measurement tools; (h) training and technical assistance (TA) on project management, power distribution company management, financial management, technical skills and energy economics, and (i) about \$1.2 million of unallocated investments to be financed by IDA and used by UBEDO as needs arose during implementation to meet the PDO subject to IDA approval of sub-project feasibility reports.

Component 2: Aimag Energy (US\$13.2 million in total, Bank financing US\$10.5 million or 80% of total). The purpose of Component 2 was to reduce system and financial losses in the aimag electricity operations, along with improving the reliability of electricity services to meet the basic needs of the aimag centers' population. Component 2 financed the following: electricity system rehabilitation and loss reduction in 12-14 aimag centers, and energy system rehabilitation in Choibalsan, Domod aimag, to complement the recently completed power plant rehabilitation project of Kreditanstalt fur Wiederaufbau (German bilateral assistance, KfW). The support for the aimag center electricity rehabilitation and loss reduction program included equipment and material for the highest priority areas of network rehabilitation, installation of new electricity meters in apartments and commercial buildings, and training in network design, proper installation of equipment, power system loss reduction and basic financial management.

Component 3: Technical Assistance for Regulatory Support and Financial Audits (US\$0.8 million in total, Bank financing US\$0.8 million). The purpose of this component was twofold: (a) to provide support to develop the Energy Regulatory Authority. Focus was to be put into building the institutional capacity at the regulatory agency to properly discharge its mandate to

³ UBEDO: Ulaanbaatar Electricity Distribution Office, the affiliate of the Energy Authority responsible for the distribution of electricity throughout the city of Ulaanbaatar. After EA was dissolved in 2001, Ulaanbaatar Electricity Distribution Network Company (UBEDN), established and operating under Mongolia's law, pursuant to its charter dated September 12, 2001 and the Government Resolution No. 203, dated July 9, 2001, became responsible for the distribution of electricity throughout the city of Ulaanbaatar.

implement and enforce the newly enacted Energy Law, particularly development of any necessary subsidiary legislation, tariff level and rate structure analysis, financial analysis for utilities regulation, and transition to market based electricity systems including needed analytical tools; and (b) to conduct annual audits under acceptable international accounting standards of the Energy Authority's financial statements, and the Energy Project's Financial Statements by an independent external auditor in accordance with International Standards of Auditing over the life of the project.

1.6 Revised Components

Under the AF approved on March 25, 2010, three components were added:

Component 4: UBEDN Investments (US\$11.2 million in total, Bank financing US\$10.7 million or 96% of total). Component 4 focused on carrying out critical investments in UBEDN's distribution network. Many of UBEDN's substations contained aged and obsolete switchgear that was unreliable and posed fire hazards. Out of 35 kV equipment, 22 obsolete oil-filled circuit breakers were to be replaced by modern SF6 circuit breakers, and of the 6kV and 10KkV equipment, 177 obsolete oil-filled circuit breakers were to be replaced with vacuum circuit breakers. The project was also to provide additional substation capacity and flexible switching substations to enhance the distribution network, supply the expected new loads and improve system reliability. Some urgent maintenance equipment would be procured such as a 35kV mobile cable testing equipment and a cable pulling machine to facilitate cable-laying.

Component 5: Development of Distribution Network Planning (US\$1.0 million in total, fully Bank financed). Component 5 focused on developing the planning and design capabilities of UBEDN and the CRETC in order to prepare more efficient and structured investment plans for the distribution and transmission networks in Ulaanbaatar and the Central region. UBEDN and CRETC would carry out planning studies using new state-of-the art software financed by the project. In addition external consultants would carry out (a) a condition assessment of the central regions 6kV, 10kV and 35kV distribution substations and the extensive cable and overhead line network to determine all rehabilitation and replacement needs; (b) estimation of load growth in various parts of the city and development of a reliable load forecast for each subarea of the city; (c) development of a cost of supply including long-run marginal cost; and (d) preparation of appropriate design standards to replace former Soviet Union standards that were still in use.

Component 6: Capacity Building for UBEDN and Project Management (\$0.3 million in total, fully Bank-financed). Component 6 was designed to sustain and enhance the financial and operational improvements achieved to-date and the institutionalization of efficient system planning work for distribution and transmission development. It would (a) improve the capability of UBEDN to use the new software tools being introduced under Component 5; and (b) include training programs to improve the project management capabilities and accounting practices of the Ministry of Mineral Resources and Energy (MMRE) to further develop the loss reduction exercises carried out under the original part of the project.

The total cost of the new components was US\$12.5 million. With these new activities the project cost increased from US\$49.5 million estimated at appraisal to US\$62 million upon approval of the AF.

1.7 Other significant changes

Implementation arrangements. Due to changes in GOM’s structure, the line ministry and management of the PIU changed five times during implementation. When the DCA was signed in August 2001, the Energy Authority (EA) was the implementing agency with oversight of the PIU. Eventually the PIU was housed under the Fuel and Energy Authority (2002-2003), later changed to the Ministry of Fuel and Energy (2004-2008), which became MMRE between 2008 and 2012, and the Ministry of Energy from 2012 to 2013.

UBEDO, affiliate of the Energy Authority, was responsible for the distribution of electricity throughout the city of Ulaanbaatar before 2001. After EA was dissolved in 2001, Ulaanbaatar Electricity Distribution Network Company (UBEDN), established and operating under Mongolia’s law, became responsible for the distribution of electricity throughout the city of Ulaanbaatar.

New Activities Introduced in November 2006. Project savings of US\$18.3 million arose through a combination of efficient procurement and favorable exchange rate fluctuations. These savings were reallocated to new activities such as: (a) inclusion of UBEDN ger areas which had developed during early implementation; (b) system improvements in Ulaanbaator to address overloading issues; and (c) inclusion of three western aimags with high losses and financial sustainability problems. All activities were based on government priorities, fell within the Project’s original description, but necessitated two closing date extensions.

Extensions of Closing Date: The closing date of the original Credit was extended four times:

| Extension No. | From | To | Length | Justification |
|----------------------|-------------|------------|---------------|---|
| 1 | 12/31/2006 | 12/31/2008 | 2 years | Extra time needed due to early implementation delays and inclusion of new activities in 2006. |
| 2 | 12/31/2008 | 12/31/2009 | 1 years | Completion of new activities |
| 3 | 12/31/2009 | 09/30/2010 | 9 months | Completion of new activities |
| 4 | 09/30/2010 | 09/30/2013 | 3 years | Completion of AF activities |

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Soundness of Background Analysis: The World Bank completed the Mongolia Energy Sector Review in late 1994/early 1995, identifying the set of policy and investment priorities needed to increase reliability and security of energy supply. Another study⁴ carried out in 1997 by the Bank's Energy Sector Management Assistance Program (ESMAP), proposed specific measures to improve efficiency in electricity distribution and identified areas and utilities with the highest priority for rehabilitation. The experience of the Mongolia Coal Project (Cr. 2854, closed FY01) was taken into consideration, where very good progress was achieved but a lack of timely price adjustments and insufficient collection of revenues had caused major financial stress for the company. International experts on heat and power utilities provided strong support for Mongolia in the substance of technical project preparation.

Assessment of Project Design. The project design reflected lessons learned, including the advantage of focusing on one primary beneficiary and one sector – energy – as opposed to both energy and heating. The project also focused on the early development of the PIU with training and TA support. The PDO was realistic and important for Mongolia's power sector and the three components were all highly relevant to achieving the PDO. The outcome indicators focused on quantifiable results for which the project could reasonably be held accountable. That said, the PDO in the PAD was inconsistent with that in DCA or Project Paper of AF (per Section 1.2). In addition, the indicators did not capture the more qualitative outcome of strengthened institutional capacity to move toward a more commercial and market-based energy sector (See also Sections 2.3 and 5.1 (a)).

The project approach considered the Bank's comparative advantage, other donors' engagement, past experiences, and the Borrower's commitment. The task team made a justifiable decision to focus on addressing reliable energy supply issues in a sustainable and decentralized way, considering the much larger financial presence of other donors' involvement on alternative topics, urgent needs in the energy sector to reduce losses and improve bill collections, and Bank's position on sector reform. The first group of aimags was carefully selected with the PIU based on their level of losses -- typically above 25 percent -- level of commitment by managers at the aimag level to implement recommended measures, replicability of measures selected, and their financial returns (> 15 percent) and sustainability. At design, the project aimed to assist 12-14 aimag centers which was too ambitious given limited project resources. The project design also endeavored to link poverty reduction and social impact through provision of energy supply to isolated rural areas and included a strategy to establish a lifeline tariff system for low-income consumers although the modalities for implementation were not clearly spelled out in the PAD.

Adequacy of Government Commitment. The Government's commitment to the Project improved during preparation. At appraisal completion, GOM disagreed with the Bank on

⁴ ESMAP-Energy Efficiency in the Electricity and District Heating Sectors, draft report, 1997

required price adjustments, including upfront increases, which resulted in project processing delays until the new government took actions to meet the requirements in January 2001. From then on, it demonstrated its support to the Project through committing to co-finance the Project and to reforms via a 15% increase in the electricity tariff level in 2000, the passage of the Energy Law by Parliament in April 2001, and ongoing USAID efforts⁵ to corporatize the sector.

Stakeholder Involvement and Participatory Processes. Stakeholders were involved using a participatory process, which included a number of field interviews and investigations with industrial, commercial and residential electricity consumers concerning usage patterns, perceptions of service quality, and payment mechanisms and issues. Consultations with other international donors (KfW, ADB and USAID) involved in related activities were also carried out throughout project preparation, to set priorities and avoid duplication of effort in the sector.

Adequacy of Risk Assessment. The overall risk assessment in the PAD was “substantial” which was correct. Specific critical risks were identified, such as those involving slower than anticipated gains due to weak management and low gains in capacity building, and procurement delays due to lack of experience and were rated substantial. Project design included mitigation measures such as completion of training courses on procurement, disbursements and other implementation procedures during project preparation and supervision, early initiation of procurement processing for selected packages, closer supervision, capacity building and donor coordination. The risk of implementation delays was correctly identified and rated, but the difficulty of mitigating it was underestimated as detailed in Section 2.2.

GOM’s commitment to market-based reforms and the necessary pricing and electricity metering reforms were rated moderate due to then recent passage of the Energy Law. In retrospect, GOM’s willingness to reform was over-assessed as few actions were taken toward building a market-based sector.

Quality at Entry. In general, the project’s background analysis was sound and consistent with the sector strategy and GOM’s strategy for the sector. The PDOs were realistic and important, the components were well designed to achieve them, and the overall risk was rated correctly. Nevertheless, the PDO was not consistently stated in PAD and DCA. As judged by today’s standards, the performance indicators should have included intermediate outcome indicators, baselines, annual targets and end-of project targets. The project could have had stronger institutional arrangements, and could have provided more focused and realistic TA for regulatory support. The economic and financial analyses in the PAD could have been more thorough with more realistic assumptions and better articulated methodologies. In addition, the “lifeline” tariff program to support the poor was not well developed in the PAD. Furthermore, the project was appraised in November 1998, but was not approved by the Board until May 2001. As pointed out by the Bank’s Quality Assurance Group (QAG) in the Quality at Entry Review of October 2001, the Bank did not insist that the project implementation plan (PIP) be formally updated as it should have been. Procurement should have been packaged differently to avoid start-up delays as

⁵ Mongolia-Power and Heat Sector Reform Project-Regional Technical Support for East Asia-July 2001, USAID.

discussed in Section 2.2 below. Therefore the overall quality at entry rating is moderately satisfactory.

2.2 Implementation

The DCA was signed in August 2001 but did not become effective until July 30, 2002. The delay in declaring effectiveness was mainly related to meeting the additional condition of authorizing and ratifying the Subsidiary Loan Agreement (SLA) between the Ministry of Finance and the seven distribution utilities. Due to the reorganization of the EA in 2001, the original DCA and PA were amended in July 2002, after which the Ministry of Finance and Economy (MOFE) entered into SLAs with UBEDN and the aimags. These institutional changes and consequent delays contributed to the need for the first extension of the Credit closing date by two years.

Implementation Delays. The Project experienced substantial delays for other reasons. As of February 2003, contract award had not taken place on any of the six most critical bid packages. The reasons for the delays related to::

- Readiness: There was a lack of readily available counterpart financing to cover local costs, including installation, works, customs arrangements, insurance, storage, etc. Also, the PIU had low capacity for dealing with procurement procedures, contributing to protracted bid evaluations and awards.
- Procurement/Disbursement: Goods and construction activities were procured under separate contracts, making coordination between suppliers and contractors more challenging. Moreover, the local funding withdrawal procedures were lengthy and had little flexibility for revisions.
- Institutional Support: The institutional support from the Ministry of Infrastructure (MOI) and MOFE to the PIU was insufficient, leading to a lack of proper training, missing remuneration and inconsistent supervision of their activities and outputs. Also, responsibilities among government agencies were not allocated clearly to properly monitor project implementation.

Actions to Accelerate Implementation. Subsequently, both sides agreed to take actions to accelerate project implementation: a limit of 10 working days was established for both GOM and the World Bank to respond to communications. The internal evaluation procedures were sorted out between MOFE and MOI, and, in parallel, World Bank assistance – in coordination with MOFE – was provided to: (a) streamline the local procurement law; (b) improve confidentiality of internal processes; and (c) support PIU capacity building in procurement. To strengthen the institutional arrangements, GOM also agreed to assign counterpart funding for the incremental costs of project supervision directly to UBEDN and the aimags.

Mid-Term Review. A Mid-Term Review (MTR) was carried out in early 2005 to examine in depth the recurrent issues that had hampered implementation. It also focused on remedial measures to accelerate implementation, improve operational efficiency, and strengthen UBEDN's financial position and operating performance. While suggesting steps to ensure that the technical loss reductions were being implemented without further delay, the MTR also focused on actions to formulate and implement the UBEDN commercialization program and

reduce non-technical losses in UBEDN and aimags, which were fundamental to the success of the Project.

Financial Restructuring in UBEDN: In the Project's early years, the financial situation in UBEDN continued to deteriorate and acceleration of Project implementation became urgent. A financial recovery plan for UBEDN was agreed on in 2004 to improve its financial status and avoid non-compliance with financial covenants and later Financial Plans were developed for UBEDN and the aimags, based on solid work done under the project funded TAs.

As a result of these efforts, project implementation picked up considerably in the beginning of 2005 and started to demonstrate solid progress in loss reduction and in UBEDN's financial health. After recording losses in 2006 and 2007, UBEDN achieved a small profit in 2008 with an operating margin of 1.2 percent. Thereafter, it began to show growth in profits, as detailed in Section 3.3 and Annex 3. The improved financial performance was a result of reduced losses and improved collections.

New activities. As told in Section 1.7, several new activities were added with a DCA amendment dated November 21, 2006. The additional activities were determined based on the priorities of various institutions and the extent to which they could contribute directly to the PDOs. Three Western aimags (Bayan-Ulgii, Khovd, Uvs) were selected for assistance under the project based on their high system losses (32%-53%), financial stress, and poor state of the networks in their ger areas. The new activities, together with early implementation delays, required an extension of the closing date from December 2006 to December 2008. The second extension (for one year up to December 31, 2009) and the third extension for nine months in December 31, 2009 were to enable certain delayed construction activities to be completed. These were largely due to longer than anticipated finalization of the new commercial operation system as a result of poor consultant performance and postponements in the procurement process resulting from differences in views between the relevant government agencies.

Rationale for AF. By 2008, it was evident that Mongolia's continued mining development and its rapid urbanization were greatly stressing the country's energy generation capacity, which in turn, caused serious reliability issues. (In fact, in 2008, a fire caused by overloading and safety breakdowns destroyed a substation.) At the same time, the condition of transmission and distribution networks had deteriorated markedly due to a lack of regular maintenance and delayed investments. There was an urgent need to help avert disruptions in the supply of electricity to Ulaanbaatar, which caused acute problems during the eight-month long heating season where reliable power supplies were imperative to the proper functioning of the district heating pumps, which, if not maintained, would deprive the population of vital heating services. As the Energy Project had already generated benefits in loss reduction and increased reliability, GOM requested in January 2009 to use it as a ready vehicle to continue improvements in reducing system losses and increasing reliability with an AF credit of US\$12 million. The AF financed three additional components (per Section 1.6) to scale up activities to enhance impact and development effectiveness. The key investment component, carrying out critical investments to augment UBEDN's distribution network, was somewhat loosely linked to the original PDO, but the AF was nonetheless justified given the urgency of making critical

improvements. Thus the AF was appraised on November 16, 2009, approved by the Board on March 25, 2010, and became effective on September 16, 2010.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

Design. The M&E framework design focused on progress towards meeting the PDO as measured by the outcome and intermediate results indicators, but no assessment of project impact through beneficiary survey data and analysis was provided for. The indicators of loss percentage, receivable collection days, and were correctly selected as they are strongly linked with the PDOs. Shortcomings of the design of M&E framework were (a) the indicators on system reliability (Service Average Interruption Frequency Index (SAIFI) and Service Average Interruption Duration Index (SAIDI⁶)) were not included at appraisal but were developed later during implementation; (b) the M&E system could have included some output indicators to monitor progress of the capacity building component and it should have included indicators to monitor progress on system reliability for aimags; and (c) the PAD did not provide baseline or final target for the KPIs and output indicators, which were later on developed as project proceeded. This was in accordance with QAG's suggestion on improving the identification of performance indicators consistent with project objectives.

The target for loss reduction was revised at the time of AF as the original was deemed too ambitious (data sheet). In the AF, the indicator of additional customer sales per annum was added but it did not have a clear link to the PDO.

Implementation: The PIU regularly collected data to reflect implementation progress and outstanding issues, and make adjustments as needed. The M&E framework was monitored and updated in a systematic manner and was made available in progress reports and supervision documents. However, during implementation, the indicators of technical losses and power supply reliability (SAIFI and SAIDI) were not monitored for the aimags, due to the weak capacity of aimag utilities. The results framework was updated for the AF to monitor the increased capacity and connections, which were not directly linked with PDOs.

Utilization: The M&E framework was useful in monitoring implementation progress, signaling issues and prompting the client and the Bank to make adjustments to enhance the project's ability to realize its objectives. The PDO and intermediate outcome indicators were regularly monitored and evaluated against the baseline and target values, after they were set in 2005. Financial indicators for UBEDN were used to track progress and make adjustments to comply with covenants.

2.4 Safeguard and Fiduciary Compliance

Compliance with Safeguards. This project triggered *only* the environmental assessment safeguard policy (OP 4.01) as it did not exhibit potential for any negative environmental impacts and did not involve any involuntary resettlement, land acquisition, or indigenous people issues. It

⁶ SAIFI: Service Average Interruption Frequency Index; SAIDI: Service Average Interruption Duration Index. Lower frequency and duration of annual interruptions indicate higher reliability of electricity supply.

was therefore correctly categorized as a “B” project. An Environmental Analysis Report and Environmental Management Plan (EMP) were prepared in both Mongolian and English, and disclosed to the public locally and at the Bank’s InfoShop on September 5, 1999. The EMP contained a number of precautions as told in the PAD. For the AF, no additional safeguards were triggered and the project remained a Category B. An EMP was prepared and disclosed locally and at the Bank’s InfoShop in 2009. Compliance with the environmental safeguards policy was satisfactory. Compliance with the EMP was monitored by the PIU to international standards and compliance was reported in progress reports. Appropriate measures were taken on complex issues such as the removal of asbestos from the heating pipes of Choibalsan with support from international experts. According to the July 2013 Compliance report, no issues were encountered.

Procurement: Procurement was organized and carried out by the PIU with oversight from its line ministry and the Project Steering Committee under it. Procurement of goods was carried out on the basis of international competitive bidding, shopping and direct contracting. The Bank’s oversight included prior and post reviews of procurement and contracting procedures to ascertain that the Procurement Guidelines were followed and all activities complied with the modalities outlined in the legal documents. The process experienced significant delays in the first three years (See Section 2.2) and a MU rating was given in FY09. The procurement issues were eventually satisfactorily resolved and all systems have been operating since then.

Financial Management: The PIU maintained the project accounting records and prepared interim financial reports on a quarterly basis in compliance with requirements under the legal documents. Annual audit reports with unqualified opinions were submitted to the Bank on time as recorded from FY05. Both financial management reviews and audits identified shortcomings, mostly in the areas of internal controls, filing and documentation, and operating account reconciliation. The findings were followed up and the problems were resolved satisfactorily.

2.5 Post-completion Operation/Next Phase

No significant post-completion operational issues are anticipated. For UBEDN and project aimags, new substations, rehabilitated lines, and meters in tamperproof boxes were installed (Photo in Annex 10) and in some cases, moved from privately owned apartment to utility-owned boxes to reduce power theft. The equipment was inspected and certified to meet quality standards to minimize potential breakdowns in the future. Also, UBEDN completed its commercialization program, established customer centers in branches, and has business plans and financial models in place. Planning software has been installed and is being operated appropriately by well trained staff (Photo in Annex 10). Operations and maintenance are being carried out by well trained staff.

UBEDN will continue to use the key indicators summarized in Annex 3, Table 6, to measure its system losses, financial performance, and will continue to monitor SAIDI, SAIFI to track system reliability. At aimag level, the ability to monitor system reliability needs to be improved.

In addition, some recommendations related to energy sector reform have been adopted, but further changes in the regulatory and sectoral structure are still needed to move towards a

market-based sector, such as price indexation, single buyer market, etc. As a follow-up, the ERA has informally requested the Bank’s technical assistance in continuing and strengthening the sector reform and institutional building.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

Rating: Substantial

The Project remained relevant to the current country and sector context throughout its entire implementation period. In fact, the Project’s objectives in securing sufficient and reliable energy supply became even more relevant, with the country’s recent rapid increase in electricity demand due to mining development, urbanization, and population growth. The Project supported GOM’s national strategy in moving towards a market-based energy sector. It was relevant to the Interim Strategy Note (ISN) for Mongolia covering 2009-2010 (Report no. 48311-MN) which supported high priority operations and focused on protecting the poor, managing critical infrastructure and capacity building. It remained also consistent with current Country Partnership Strategy for FY2013-2017, wherein one of the three pillars was to address vulnerabilities through improved access to services and better service delivery, safety net provision, and improved disaster risk management.

The Project adopted a combination of physical components, commercialization program measures, and capacity building for utility staff that proved to be effective toward meeting its objectives. However, the achievement on the regulatory front requires continued support. The implementation delays experienced in the beginning were resolved and the experience contributed to some of the lessons learned.

3.2 Achievement of Project Development Objectives

Rating: Moderately Satisfactory

This report employs the PDO as stated in the DCA and the AF Project Paper, which was directly linked to the project activities and outputs, and was measurable and attributable to the project interventions. The PDO was comprised of three sub-objectives, weighted as follows:

Table 1. Sub-objectives of PDO and their relative weight

| PDO | Share of IDA financing | Assigned weight |
|--|-------------------------------|------------------------|
| (a) Reduce electricity systems losses and improve service reliability in UB and selected aimags | 66 | 50 |
| (b) Improve revenue collections in electricity distribution system | 27 | 40 |
| (c) Build institutional capacity to move toward a more commercial and market-based energy sector | 7 | 10 |

The Project aimed at addressing the urgent issues of high system losses, low reliability, and slow receivables collection through a series of investments and TA under Project Components 1, 2 and 4, in order to achieve the first two sub-objectives. The other sub-objective targeted at creating an enabling environment for longer term sector reform by building up institutional capacity through Project Components 3, 5, and 6.

The three sub-objectives and thereby the project components were correlated with each other. The achievement of loss reduction and reliability improvement (Sub-objective 1) directly contributes to the improvement in financial status and revenue collection (Sub-objective 2), and the strengthened capacity (Sub-objective 3) at the energy regulator and distribution and transmission companies contributes to the sustained achievement of the other two sub-objectives.

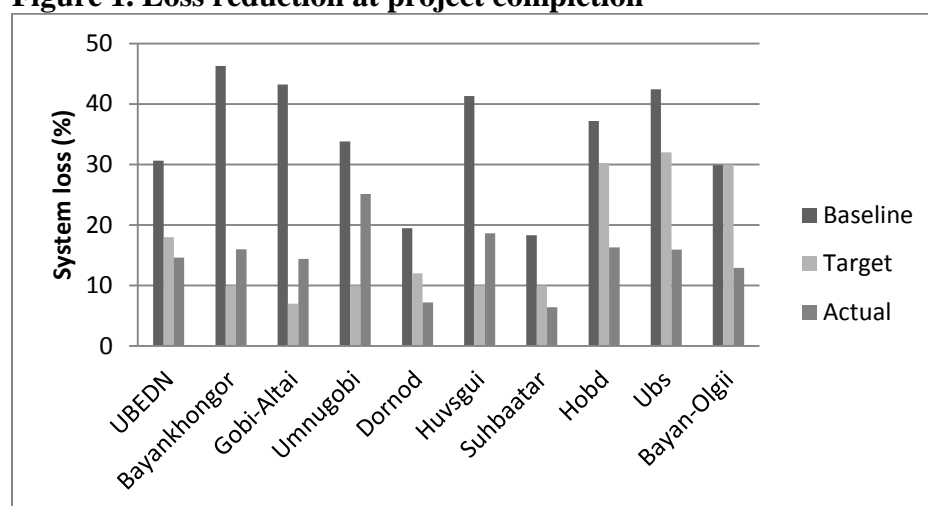
PDO (1): “to reduce electricity system losses and improve service reliability in electricity distribution in Ulaanbaatar and selected aimag centers.”

Rating: Moderately Satisfactory

Reducing system losses. Achievement of this outcome is measured through PDO indicator #1 (system loss reduction in UBEDN) and indicator #3 (system loss reduction for selected aimags). At appraisal, electricity losses stood at 31% in UBEDN’s distribution system and reached almost 50% in some aimag systems. The Project involved the upgrading of 758 substations, establishing of 119 new substations, renovation of 1587 km of low-voltage lines, and installation of 119,075 meter and 23,762 meter boxes, all of which contributed to the reduction of losses and improvement in reliability. See Annex 2 for details on project investments.

At project completion, six out of ten companies (UBEDN, Dornod, Suhbaatar, Hovd, Uvs, Bayan-Olgii) had surpassed their loss reduction targets. For the remaining four (Bayankhongor, Gobi-Altai, Umnugobi, and Huvsgul), their losses were reduced to below 25% of their original loss levels of 34%-46%, as seen in Figure 1. Per Section 3.6 below, a beneficiary survey carried out in late 2013 shows that the main reason why these aimag utilities failed to meet their loss reduction targets was “added connections to distant soums”, in other words, the system losses could increase with the extension of distribution lines to remote areas, which could negatively influence the achievement of the loss reduction objective. Overall, the number of consumers in the regions served by distribution companies that reached the project loss reduction targets accounted for about 92% of the total consumers when the Project closed. Therefore achievement of this part of the PDO is rated Satisfactory.

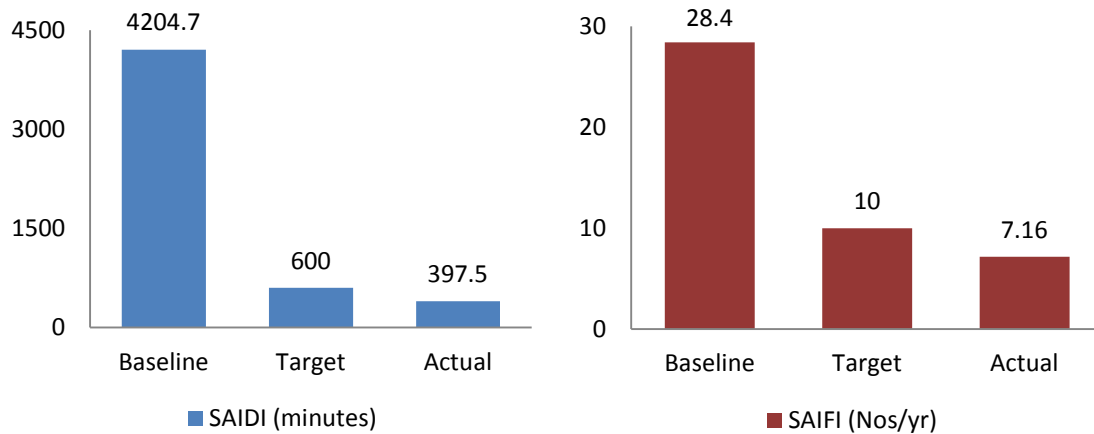
Figure 1. Loss reduction at project completion



| % | Baseline | Target | Actual | #connections in 2013 |
|--------------|----------|--------|--------|----------------------|
| UBEDN | 30.64 | 18 | 14.6 | 235,000 |
| Bayankhongor | 46.3 | 10 | 16 | 9984 |
| Gobi-Altai | 43.20 | 7 | 14.4 | 5688 |
| Umnugobi | 33.8 | 10 | 25.12 | 6956 |
| Dornod | 19.47 | 12 | 7.18 | 15680 |
| Huvsgui | 41.3 | 10 | 18.6 | 1299 |
| Suhbaatar | 18.33 | 10 | 6.4 | 4530 |
| Hobd | 37.2 | 30.2 | 16.3 | 7322 |
| Ubs | 42.40 | 32 | 15.92 | 7161 |
| Bayan-Olgii | 29.90 | 30 | 12.9 | 4201 |

Improving reliability at UBEDN. Achievement of this outcome is measured through intermediate indicators 3 (SAIDI for UBEDN) and 4 (SAIFI for UBEDN). The reliability of electricity services provided by UBEDN was successfully improved, as evaluated by these two indicators. SAIDI at UBEDN dropped significantly from a baseline of 4,204.7 minutes annually to an actual of 397.5 minutes annually, surpassing the target of 600 minutes annually. SAIFI dropped from a baseline of 28.4 times per year to an actual of only 7.16 times per year, surpassing the target of 10 times per year as seen in Figure 2 below. Taken together lower duration and frequency of annual interruptions indicate higher reliability of electricity supply and achievement of reliability improvement targets at UBEDN. The rating for this part of the objective is Highly Satisfactory.

Figure 2. Reliability improvement in UBEDN



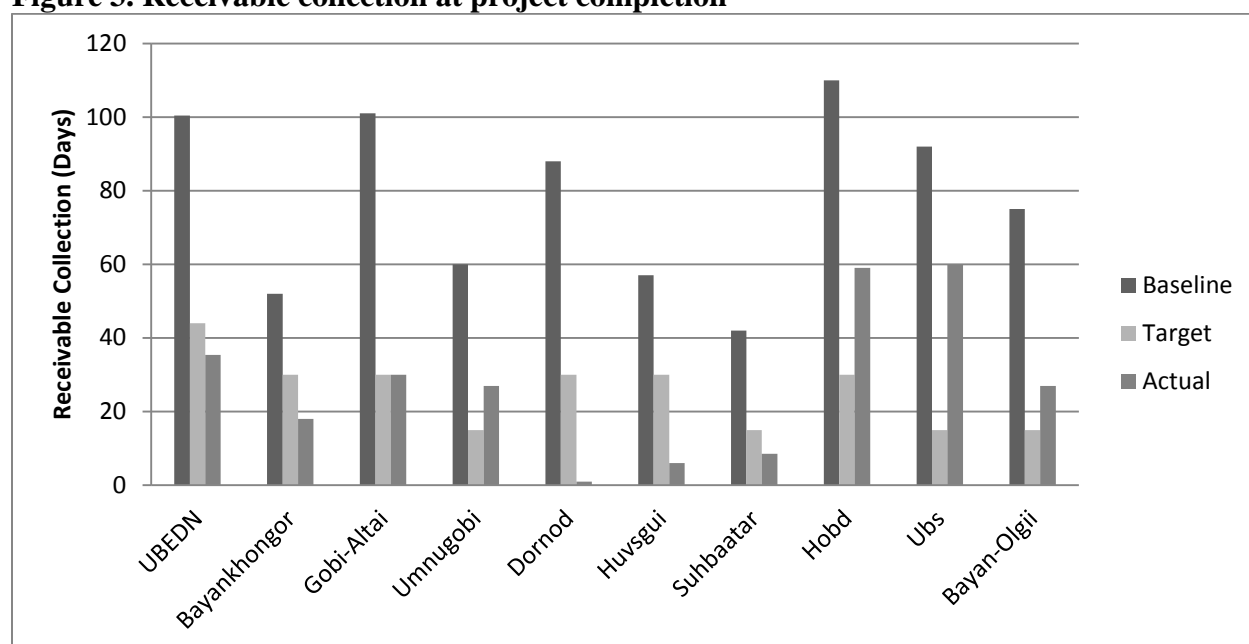
Improving reliability at project aimags. There were no outcome or intermediate indicators established to measure this aspect of the PDO. However, anecdotal evidence from the beneficiary survey suggests a general positive sentiment towards reliability improvements (See Section 3.6 and Annex 5). In light of the fact that no data is available, the rating is reduced to Moderately Unsatisfactory.

PDO (2): “to improve revenue collection in the electricity distribution system.”

Rating: Satisfactory

Achievement of this outcome is measured through PDO indicator #2 (receivable collection improvement for UBEDN) and indicator #4 (receivable collection improvement for selected aimags). Through the project, 119,075 meters and 23,762 boxes of meters were installed, commercialization programs were implemented and software was deployed, leading to the significant improvement in revenue collection in the electricity distribution system. At project completion, the billing collection days at UBEDN had been reduced from 100 in 2004 to 35, exceeding the target of 45 days (PDO indicator #2). As can be seen in Figure 3, five out of nine aimags (Bayankhongor, Gobi-Altai, Dornod, Huvsgui, and Suhbaatar) achieved the target in PDO indicator #4, while the other four (Umnugobi, Hobd, Ubs and Bayan-Olgii) experienced a significant reduction in collection days without meeting their targets. *Significantly, about 98% of the consumers who benefited from the Project were served by the distribution companies which surpassed their targets for receivable collection days.*

Figure 3. Receivable collection at project completion



| Days | Baseline | Target | Actual | #connections in 2013 |
|--------------|----------|--------|--------|----------------------|
| UBEDN | 100.4 | 44 | 35.4 | 235,000 |
| Bayankhongor | 52 | 30 | 18 | 9984 |
| Gobi-Altai | 101 | 30 | 30 | 5688 |
| Umnugobi | 60 | 15 | 27 | 6956 |
| Dornod | 88 | 30 | 1 | 15680 |
| Huvsgui | 57 | 30 | 6 | 1299 |
| Suhbaatar | 42 | 15 | 8.5 | 4530 |
| Hobd | 110 | 30 | 59 | 7322 |
| Ubs | 92 | 15 | 60 | 7161 |
| Bayan-Olgii | 75 | 15 | 27 | 4201 |

PDO (3): *“to build up institutional capacity to move toward a more commercial and market-based energy sector.”*

Rating: Moderately Satisfactory

There were no outcome or intermediate indicators established to measure this aspect of the PDO; however, a qualitative analysis of the outcome is presented below. The component supporting this objective was divided into two parts: (a) support to develop the Energy Regulatory Authority, and (b) to conduct annual audits under acceptable international accounting standards of the EA’s financial statements, and the Energy Project’s financial statements.

For part (a) above, the project’s results were moderately satisfactory. The project provided TA and training especially on the development of power market rules and tariff structures. While the studies were completed in good quality, only a small portion of the recommendations were adopted, such as the implementation of the merit order dispatch approach, a way of ranking available source of power generation in ascending order of their short-run marginal cost of

production. Some key recommendations on tariff reform (including the lifeline tariff system that was included at design) and transition to market based energy sector were not implemented, largely due to a lack of political will. As observed from Annex 1, only 25% of the originally allocated budget for the ERA component (\$80,000) was actually spent. This would correlate with the lack of progress in assisting GOM to implement the recommendations.

For part (b), the results were satisfactory. Before the project, neither the PIU nor the distribution companies in Mongolia had experience with preparing financial statements for independent audits. Through the TA activities during project implementation, annual audits were conducted on time under acceptable international accounting standards of UBEDN's and the Project's financial statements, with support from an international auditor.

Core Sector Indicators. At closing the following information related to energy sector core indicators was available:

Table 2. Indicators at project baseline and project completion

| Indicator | Project baseline | End of Project achievement |
|--|--------------------------------------|----------------------------|
| Distribution lines constructed or rehabilitated under the project (km) | 0 | 1587 |
| SAIFI ((Nos/year) | 28.4 | 7.16 |
| People provided with access to electricity under the project by number of connections | 0 | 147,717 |
| People/businesses served by improved electricity services in the project area (# of connections) | 0 | 297,821 |
| Electricity losses in the project area (%) | See Figure 1 above on loss reduction | |

Given the weighting system mentioned at the beginning of this section, the overall achievement of outcomes is determined in the table below. The project is solidly moderately satisfactory with an overall weighted score of "4.4" on a "6" point scale, where "6" is highly satisfactory and "1" is highly unsatisfactory. The fact that the number of beneficiaries increased to nearly 298,000 is further evidence of the project's success.

Table 3. Score and rating of PDO achievement

| PDO | Weight | Rating (based on 6 pt scale) | Overall score |
|--|--------|------------------------------|---------------|
| (a) Reduce electricity systems losses and improve service reliability in UB and selected aimags | 50% | MS (=4) | 2 |
| (b) Improve revenue collections in electricity distribution system | 40% | S (=5) | 2 |
| (c) Build institutional capacity to move toward a more commercial and market-based energy sector | 10% | MS (=4) | 0.4 |
| Composite score | | | 4.4 = MS |

3.3 Efficiency

Rating: Substantial

At completion, the Project is estimated to have generated an economic internal rate of return (EIRR) of 34.0%. At an economic opportunity cost of capital (EOCK) of 11%, it is estimated to have generated an economic net present value (ENPV) of US\$127.0 million at completion, compared with an estimated US\$67.7 million at appraisal. The higher ENPV is primarily due to the enhanced impact of loss reductions achieved by UBEDN over a decade of accelerated demand expansion. In the decade of 2004-13, UBEDN's sales grew at an average annual rate of 10.9 percent, and its revenue at 19.4 percent. The investments under the original Loan are estimated to have yielded an EIRR of 32.8% and an ENPV of US\$102.1 million at completion, compared with an estimated 30.3% and US\$10.9 million at appraisal. The investments under the AF are estimated to have generated an EIRR of 61.7% and an ENPV of US\$24.9 million at completion, compared with an estimated 158.9% and US\$56.8 million at appraisal. The lower EIRR and ENPV of the investments under the AF at completion are due to the exclusion of the global environmental benefit of loss reduction. When the benefit is included, the economic returns of these investments are on par with appraisal estimates.

Table 4: Summary of the Outcomes of the Economic Analysis

| Project | Cost (US\$ million) ^[1] | | EIRR (%) | | ENPV (US\$ million) ^[2] | |
|----------------------|------------------------------------|-------------|-------------|--------------|------------------------------------|--------------|
| | Appraisal | Completion | Appraisal | Completion | Appraisal | Completion |
| Original Scope | 36.2 | 39.8 | 30.3% | 32.8% | 10.9 | 102.1 |
| - UBEDN | 23.0 | 27.0 | > 20% | 36.8% | n.a. | 93.8 |
| - aimags | 13.2 | 12.9 | 20-35% | 20.1% | n.a. | 8.3 |
| Additional Financing | 11.2 | 9.4 | 158.9% | 61.7% | 56.8 ^[3] | 24.9 |
| Total | 47.4 | 49.2 | n.a. | 34.0% | 67.7 | 127.0 |

^[1] Undiscounted

^[2] In 2004 US dollars

^[3] The appraisal of this component was carried out in 2010. Then, the ENPV was estimated in terms of 2010 US dollar at US\$117.9 million. The difference between the two figures, i.e., US\$56.8 million and US\$117.9 million, is due to discounting. In 2010 US dollar terms, the ENPV of the component was estimated at US\$ 51.8 million.

At completion, the Project is estimated to have generated a financial internal rate of return (FIRR) of 27.4%. At a financial real discount rate of 8%, it is estimated to have generated a financial net present value (FNPV) of US\$107.2 million at completion, compared with an estimated US\$24.2 million at appraisal. Again, the higher estimated FNPV at completion is primarily due to the enhanced impact of loss reductions achieved by UBEDN over a decade of accelerated demand expansion. The investments under the original Loan are estimated to have yielded an FIRR of 27.6% and an FNPV of US\$102.7 million at completion, compared with an estimated 21.2% and US\$5.3 million at appraisal. The investments under the AF are estimated

to have yielded an FIRR of 20.2% and an FNPV of US\$4.5 million at completion, compared with an estimated 19.1% and US\$3.0 million at appraisal.

Table 5: Summary of the Outcome of the Financial Analysis

| Project | Cost (US\$ million) ^[1] | | FIRR (%) | | FNPV (US\$ million) ^[2] | |
|----------------------|------------------------------------|-------------|-----------|--------------|------------------------------------|--------------|
| | Appraisal | Completion | Appraisal | Completion | Appraisal | Completion |
| Original Scope | 36.2 | 39.8 | 21.2% | 27.6% | 5.3 | 102.7 |
| - UBEDN | 23.0 | 27.0 | > 20% | 30.3% | n.a. | 87.8 |
| - aimags | 13.2 | 12.9 | 20-35% | 20.1% | n.a. | 14.8 |
| Additional Financing | 11.2 | 9.4 | 19.1% | 20.2% | 3.0 ^[3] | 4.5 |
| Total | 47.4 | 49.2 | | 27.4% | 24.2 | 107.2 |

^[1] Undiscounted

^[2] In 2004 US dollars

^[3] The appraisal of this component was carried out in 2010. Then, the ENPV was estimated in terms of 2010 US dollar at US\$5.15 million. The difference between the two figures, i.e., US\$3.0 million and US\$5.15 million, is due to discounting. In 2010 US dollar terms, the FNPV of the component was estimated at US\$ 7.7 million.

Furthermore, the Project played an instrumental role in the financial recovery of UBEDN by: (i) reducing the company's cost of supply through loss reduction; and (ii) providing much needed liquidity through increased revenue collection and reduction in accounts receivables. **As a result, UBEDN reached full cost recovery for the first time in 2008.** The company's liquidity situation had also undergone marked improvements with growing cash reserves, increasing the current ratio increased from 0.47 in 2005 to 1.33 in 2012, reduced need for short-term borrowing, and expanded capacity for servicing long-term debts used for financing future investments. Over the past decade, UBEDN's balance sheet has undergone a fundamental structural shift from having two-thirds of the assets backed by short-term liabilities and negative equity to a healthier composition with 45% in equity, 42% in long-term liabilities, and 13% in short-term liabilities. See Annex 3 for more detail.

3.4 Justification of Overall Outcome Rating

Rating: Moderately Satisfactory

The Project remained substantially relevant throughout its lifetime. It was relevant to (a) GOM's strategy and the Bank's CAS in place at appraisal, (b) the ISN in place for approval of the AF, and (c) the latest CPS. Also, the Project was substantially based on reasonable economic and financial performances especially benefiting from a surge in the demand for power during the extension period. The Project performed well with reducing losses and increasing reliability for UBEDN, and with improving revenue collection. However, the Project performed less well on making reliability improvements at aimag level and on moving toward commercial and market-based reforms in the energy sector. Therefore, the overall rating is moderately satisfactory.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

The project was not specifically targeted at the poor or women, but provided some linkages with social/poverty aspects (Section 2.1). Although the lifeline tariff system was not adopted, with reduced distribution system losses and improved supply reliability, the project provided households and small businesses access to better energy services, thereby likely improving their productivity and contributing to poverty reduction, especially in remote project aimags. In addition, a more reliable supply with fewer interruptions has the potential to ameliorate the lives of women who were traditionally responsible for cooking and washing.

Anecdotal evidence from the Beneficiary Survey (Annex 5) suggested that aimag utility customers generally become more responsible and energy efficient than in the past thanks to improved customer relations, improved metering and bill collection, and consumer campaigns.

(b) Institutional Change/Strengthening

Through the TA offered by the project, at completion, UBEDN and CRETC (NPTC) had improved their ability to plan investments in their networks. Moreover, UBEDN had completed its commercialization program, established customer centers in seven branches, and had a business plan and financial model in place, placing it in a better position to meet future challenges. The aimags were staffed with personnel trained in planning, design, maintenance and operation of distribution systems.

TA to ERA generated some key recommendations for removing regulatory barriers and strengthening regulatory capability. These recommendations are still relevant to current operations at ERA, which is moving toward shaping a market-based energy sector, such as design of electricity pricing, market rules, etc.

(c) Other Unintended Outcomes and Impacts (positive or negative)

The technical and commercial practices developed under the project have been transferred to other areas of the utilities' operations. For example, to reduce non-technical losses, several project aimags have expanded locked meter boxes to areas and customer segments not covered by the project. In some aimags, the design specifications of project substations have been replicated for the rehabilitation of substations in soums (district level administrative subdivision). In addition, a more efficient distribution network could lead to a reduction in energy losses thereby reducing greenhouse gas emissions, all other things being equal.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

Results from a beneficiary survey are presented in Annex 5: Beneficiary Survey Results.

A post-project completion beneficiary survey was carried out in November/December 2013 among eight of the nine participating aimag utilities of Western and Eastern Mongolia. The survey comprised two parts, providing insights into: (a) the impact of the infrastructure investments made and commercialization measures taken at the aimag level; and (b) beneficiary satisfaction linked with the PDOs under the aimag component.

On the impact of the infrastructure investments made and commercialization measures taken at the aimag level, the survey analysis chiefly points to a fair degree of homogeneity in the type of infrastructure investments made and commercialization measures taken by participating aimag utilities. Regarding beneficiary satisfaction linked with the PDOs under the aimag component, the analysis of the data collected shows a generally positive sentiment towards the project's helpfulness in improving the utilities' operational performances, customer service levels, customer satisfaction, and management and employees' capacity, as well as towards the effectiveness of the software and training programs provided. The greater majority of the utilities interviewed also indicated that improved operational performance ultimately translated into higher levels of operational sustainability.

However, despite the positive results obtained in terms of beneficiary satisfaction and improved operational performance, the survey shows that "added connections to distant soums" is cited as the main reason why some utilities failed to meet their loss reduction targets, as extending distribution lines to remote areas tends to increase system losses. "Lack of technical knowledge and support" is the primary reason for some utilities missed their revenue improvement targets instead.

4. Assessment of Risk to Development Outcome

Rating: Moderate

Risks to loss reduction and collection improvement are *low*. The loss reduction objective was generally achieved by project completion. Given the equipment quality, few risks are anticipated with regard to the physical sustainability of the rehabilitated lines and installed meters. Also, the staff has been trained to maintain the installed equipment. Moreover, revenue collection was improved through a series of activities such as more accurate meter reading and loss identification, customer awareness campaigns, customer service improvement, etc., which, to some extent changed customers' behavior in paying for electricity in the project region.

There have been some concerns on potential disruptions in the supply system outside of project aimags, due to rapid urbanization and booming industries. During the ICR mission, several aimags requested the Bank's support in reducing losses and improving reliability, while expanding their supply capacity. With similar projects in other aimags, the development outcome could be extended to a broader area. The Bank is in close discussion with the Ministry of Energy on next steps. Thus, the associated risks are rated as *moderate*.

Risks linked with building up institutional capacity remain *moderate*, given the less than expected actions undertaken by the ERA during project implementation. Recommendations on tariff and price indexation, market rules, etc. have not been adopted, which are important for sector reform, thereby posing risks to move towards a market based energy sector. Over the past decade, tariff growth had trailed behind inflation, resulting in lower average tariff in real terms. Going forward, further loss reduction in the Project area will become more challenging. In recognition of the risks, ERC has already requested TA support from the Bank with the aim to continue implementing recommendations and the Bank will follow up with GOM on potential

TA, either as an independent project or a project component. Therefore, the associated risks are rated *moderate*, rather than substantial.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Moderately Satisfactory

Overall, the Bank's performance in ensuring quality at entry is rated as Moderately Satisfactory, which is consistent with the QAG's rating in the Quality at Entry review of October 2001.

As summarized in Sections 1.1 and 2.1, the Bank's support for the Project was well aligned with the prevailing CAS and GOM's energy strategy. The project was prepared and designed based on a Bank technical review of studies and past experience with IDA's involvement in Mongolia and incorporated lessons learned from past and then ongoing projects. The Bank team assisted GOM in designing the Project to meet the Bank's technical, financial, economic, fiduciary, and safeguards standards. The Project was prepared in close coordination with ADB, USAID, KfW and the Japanese Government. The Bank spent \$480,930 on project preparation (excluding the preparation of the AF) and two very senior task team leaders (TTLs) collaborated in project preparation. (Note no system-generated information is available due to the project's age.)

Preparation began in November 1997, with the concept review being held in March 1998. The appraisal was authorized in November 1998 but was not considered complete until October 1999. Project processing was held up further due to a disagreement with GOM on the required price adjustments. However, the processing started up again with the post-appraisal mission in January 2001, which found that sufficient progress had been made by the new government to meet the Bank's requirements. The Bank did not reappraise the project as no substantial changes had occurred in the design or conditionality of the project.

As detailed in Section 2.1, certain shortcomings with Quality at Entry led to implementation delays and other problems including: (a) PDO in the PAD was inconsistent with the DCA; (b) performance indicators could have been improved by including reliability indicators for aimags and setting realistic targets at design; (c) the institutional set-up for the Project could have been more clearly arranged; (d) TA support to the regulator could have been more focused and realistic; (e) implementation arrangements for the lifeline tariff for the poor could have been better described; and (f) the economic and financial analyses could have been more thorough with more realistic assumptions and better articulated methodologies. However, it should also be recalled that project preparation started in 1997 when standards were different, especially for the Results Framework, where the old log-frame format was still being used.

(b) Quality of Supervision

Rating: Moderately Satisfactory

The Bank's performance during project implementation was moderately satisfactory. It conducted supervisions under extreme weather conditions in geographically dispersed regions

over long hours. The financial management and procurement functions were provided by field-based staff in Ulaanbaatar and at project sites. Field-based staff also provided continuous training and hand-holding to PIU staff on procurement, disbursements, and M&E, and consultants provided support on environmental safeguards. The Bank's technical expert spent a significant amount of time each year actually living in project aimags to provide hands-on assistance to utility staff. Overall reporting on supervision was adequate with 18 ISRs file over 12 years; however some of the implementation progress ratings were optimistic especially early in the project when rather serious delays occurred, yet all ISRs reported "satisfactory" progress but one MS in June 2009 due to contract delay.

The team responded promptly to the deteriorating financial situation of UBEDN in 2008 by developing the Financial Restructuring Plan and later developing Financial Plans for UBEDN and the aimags. When delays arose, the Bank team proactively and correctly identified problems and came up with action plans to move the project forward. Based on evidence on the ground and recommendations in continuous TAs, the commercialization program and business plans were developed and refined to reduce non-technical losses and increase revenue collection. The Project also allowed for flexibility to adjust work scope and strategies based on evolving internal and external conditions and client's demand over time, evidently from the contract repackaging under Phase II and the more focused TA in the AF. Continuous training and capacity building, intensive supervision, problem identification and prompt problem solving greatly contributed to the success of the Project. One shortcoming was that inadequate attention was paid to follow-up on the recommendations for ERA.

Preparation of the AF. As told already above, GOM requested AF for the project to address an emergency capacity generation problem. The Bank appraised the AF in November, 2009 and as a result, the three components shown in Section 1.6 were added to the project and a three-year extension of the Credit closing date to September 30, 2013 was granted. These three components were perhaps not tightly tied to the achievement of the PDO, but they were highly relevant to the situation at hand, and the AF design incorporated lessons learned from implementation. As demonstrated by the results at project completion, targets for both loss reduction and capacity generation targets for Ulaanbaatar were reached and Ulaanbaatar had the energy generation capacity to meet demand at project completion. Therefore, the ICR considers adding the three new components under the original project justifiable, especially given the longer processing time that would have been required by developing a separate project.

As far as the quality of the Project Paper is concerned, it could have been better. The Project Paper adopted the PDO from the DCA without ever mentioning a change from the PAD version. The Project Paper should have had an updated Results Framework with clear Key Performance Indicators and Intermediate Outcome Indicators, with baselines, annualized targets and end-of-project targets; instead it used the old logframe from 2001. In particular it did not include indicators of improved energy supply reliability for aimags making evaluation of that sub-PDO very difficult. It also lacked an overall revised financing plan for the entire project.

(c) Justification of Rating for Overall Bank Performance

Rating: Moderately Satisfactory

During implementation, the Bank promptly responded to emerging issues and client requests and showed flexibility in making adjustments based on evidence on the ground and recommendations in TAs. However, the shortcomings in ensuring quality at entry contributed to the initial delays in implementation, and the PDO was moderately satisfactorily achieved. Thus, considering the moderately satisfactory rating for Bank's performance in ensuring quality-at-entry and supervision, the overall Bank performance is also rated Moderately Satisfactory.

5.2 Borrower Performance

(a) Government Performance

Rating: Moderately Satisfactory

GOM was supportive of the Project during both preparation and implementation, and its commitment to the project became stronger over time. The Project was appraised in November 1998 but was not negotiated until 2001 due to delays in meeting required price adjustments. The progress made by the new government in 2001 was considered sufficient for the Bank to continue the project processing. From then on, GOM demonstrated its support through (a) the passage of the Energy Law in April 2001; (b) a 15% tariff increase in April 2001; and (c) ongoing efforts to un-bundle the sector as supported by USAID.

Not long after Board approval, however, implementation arrangement changed and counterpart financing was inadequate in the first few years, both of which contributed to significant delays. In response, the Bank team and GOM (Ministry of Finance and Ministry of Infrastructure) worked through the issues and implemented actions to move the Project forward (Section 2.2). Subsequently, GOM became more committed to the Project, and provided sufficient counterpart funding for goods and installations and PIU staff salaries. By project completion, it had built much stronger ownership of the Project, contributing to the achievement of the PDO. However, Ministry of Fuel and Energy/MMRE lacked the necessary political will to carry out the energy reform program that was still needed, particularly in the areas of tariff indexation and single buyer market.

Regarding the AF, MMRE can be credited with recognizing a quickly emerging need for capacity expansion in 2008, and requesting Bank assistance with the AF Credit. With the three-year extension necessary to implement the AF, it was also possible to further strengthen UBEDN's financial position, train staff of the NPTC on investment planning, design, and maintenance and operation of the system..

(b) Implementing Agency or Agencies Performance

Rating: Satisfactory

The PIU, seated within the Ministry of Energy at closing, provided continuous and solid support to the Project. It communicated and cooperated with management from line ministries, UBEDN, aimags, Steering Committee and the Bank team. Several shortcomings were noted early in

project implementation, e.g., lack of experience with procurement and financial management procedures. However, with proper training, the PIU's performance greatly improved over time. Financial management and procurement were generally rated satisfactory for most of the project duration. The PIU maintained good relationships with the aimags throughout project implementation and took initiatives without Bank prompting to conduct hands-on trainings. The PIU also saw that the environmental safeguards framework complied with international standards and took appropriate measures on complex issues with support from international experts.

(c) Justification of Rating for Overall Borrower Performance

Rating: Moderately Satisfactory

GOM commitment to the Project was somewhat lacking at times, with the long delays between appraisal and Board due to reticence to adjust tariffs to meet Bank imposed requirements, and more start-up delays (Sections 2.1 and 2.2); however, it became stronger during project implementation. Although the initial lack of support did not significantly affect the ultimate achievement of the first two sub-objectives of the PDO, it greatly contributed to project preparation delays and implementation delays which required multiple extensions of the closing date. In addition, the lack of concerted political will to reform persisted over the course of project implementation, which led to the partial achievement of the third sub-objective of the PDO. Therefore, the overall borrower's performance is rated Moderately Satisfactory.

6. Lessons Learned

- Early intensive and continuous training and capacity building are critical to the success of projects, particularly when the PIU has no previous experience with Bank projects and the domestic regulatory framework is weak. The project management capacity of the PIU was built up over time, which allowed the PIU to play a key role in monitoring and supervising project implementation and guiding the aimags.
- More coordinated and frequent high-level communications between the Bank and government agencies are needed, especially when the responsibility framework or approval authority is not clearly defined. Early in implementation, coordination among Bank, MOI, MOFE, PIU was not well organized, thereby contributing to misunderstandings and implementation delays.
- The design of procurement packages needs to consider country-specific regulatory frameworks and government organizations. While it seems easier to allocate responsibility to procure goods and construction activities under separate contracts, coordination between the two contracts is likely compromised. The initial decision to procure them separately turned out to be ill-advised and, after repackaging supply and install contracts under Phase II and AF, procurement delays were significantly reduced.
- Given limited budget, the TA support to the regulator needs to be designed in a focused and pragmatic matter. For a country in the infancy of sector reform, it is key to focus on selected priorities, while taking government's will to act into consideration. Meanwhile, the on-going policy dialogue with high level government officials should be maintained during the whole course of the project.
- The practice of having the technical consultant sit with the aimag utilities to provide intensive hand-holding trainings and TAs contributed to the project success. Under the tight

supervision budget, the project managed to have the consultant rotate in all project aimags to provide such support, which was highly valuable and made the project popular at aimags.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

The PIU raised the need to hold suppliers accountable for flawed equipment through instruments such as, guarantees provided by suppliers.

(b) Cofinanciers

(c) Other partners and stakeholders

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

| Components | Appraisal Estimate (USD millions) | Actual/Latest Estimate (USD millions) | Percentage of Appraisal |
|---|--------------------------------------|---|----------------------------|
| Original Loan | 37.00 | 40.16 | 108.5% |
| Ulaanbaatar Distribution | 23.00 | 27.11 | 117.9% |
| Aimag Energy | 13.20 | 12.85 | 97.3% |
| ERA | 0.80 | 0.20 | 25.0% |
| | | | |
| Additional Financing | 12.50 | 13.80 | 110.4% |
| UBEDN Investments | 11.20 | 12.51 | 111.7% |
| Distribution Network Planning | 1.00 | 0.90 | 90.0% |
| Capacity Building & Project Management | 0.30 | 0.39 | 130.0% |
| | | | |
| Total Project Costs | 49.50 | 53.96 | 109.0% |
| Total Financing Required | 49.50 | 53.96 | 109.0% |

(b) Financing

| Source of Funds | Type of Cofinancing | Appraisal Estimate (USD millions) | Actual/Latest Estimate (USD millions) | Percentage of Appraisal |
|--|------------------------|--|--|----------------------------|
| Original Loan | | 37.00 | 40.16 | |
| Borrower | Counterpart Funds | 7.00 | 5.26 | 75.1% |
| International Development Association (IDA) | Credit | 30.00 | 34.9 | 116.3% |
| | | | | |
| Additional Financing | | 12.50 | 13.80 | |
| Borrower | Counterpart Funds | 0.50 | 2.10 | 420% |
| International Development Association (IDA) | Credit | 12.00 | 11.70 | 97.5% |
| | | | | |
| Total | | 49.50 | 53.96 | |

Annex 2. Outputs by Component

| Project Outputs | Outputs Status | | |
|--|------------------|-------------------|------------------------|
| | Actual by number | Planned by number | Actual as % of Planned |
| Ulaanbaatar Electricity Distribution Company | | | |
| Phase I: Implementation of a program to reduce technical losses and improve reliability of electricity services | | | |
| i) Reconfiguration of existing low-voltage lines to balance loads on existing transformers & Installation of additional low-voltage lines (km) | | | |
| - Bayangol branch | 50.6 | 53.9 | 93.90% |
| - Bayanzurh branch | 154.3 | 143.4 | 107.60% |
| - Chingeltei branch | 130.1 | 150.0 | 86.70% |
| - Khan-uul branch | 72.1 | 88.8 | 81.20% |
| - Nalaikh branch | 60.3 | 54.0 | 111.60% |
| - Songinokhairkhan branch | 285.5 | 269.1 | 106.10% |
| - Suhbaatar branch | 118.0 | 116.1 | 101.60% |
| - Zuunmod branch | 41.8 | 36.4 | 114.80% |
| TOTAL: | 912.7 | 911.7 | |
| ii) Installation of additional substations (number) | | | |
| - Bayangol branch | 6.00 | 6.00 | 100.00% |
| - Bayanzurh branch | 10.00 | 11.00 | 90.90% |
| - Chingeltei branch | 5.00 | 8.00 | 62.50% |
| - Khan-uul branch | 5.00 | 13.00 | 38.50% |
| - Nalaikh branch | 3.00 | 3.00 | 100.00% |
| - Songinokhairkhan branch | 16.00 | 16.00 | 100.00% |
| - Suhbaatar branch | 15.00 | 15.00 | 100.00% |
| - Zuunmod branch | 3.00 | 3.00 | 100.00% |
| TOTAL: | 63.00 | 75.00 | |
| iii) Installation of meters for residential customers in ger areas (pcs) | | | |
| - Bayangol branch | 6,389.00 | 6,685.00 | 95.60% |
| - Bayanzurh branch | 16,938.00 | 17,645.00 | 95.90% |
| - Chingeltei branch | 12,792.00 | 12,582.00 | 101.70% |
| - Khan-uul branch | 5,707.00 | 7,173.00 | 79.60% |
| - Nalaikh branch | 3,065.00 | 3,104.00 | 98.70% |
| - Songinokhairkhan branch | 21,825.00 | 21,720.00 | 100.50% |
| - Suhbaatar branch | 11,607.00 | 12,408.00 | 93.50% |
| - Zuunmod branch | 1,811.00 | 1,614.00 | 112.20% |

| | | | |
|---|-----------|-----------|---------|
| TOTAL: | 80,134.00 | 82,931.00 | |
| iv) Installation of meter boxes for residential customers in ger areas (pcs) | | | |
| - Bayangol branch | 1,104.00 | 1,257.00 | 87.80% |
| - Bayanzurh branch | 2,823.00 | 3,493.00 | 80.80% |
| - Chingeltei branch | 2,127.00 | 2,067.00 | 102.90% |
| - Khan-uul branch | 1,206.00 | 1,513.00 | 79.70% |
| - Nalaikh branch | 629.00 | 660.00 | 95.30% |
| - Songinokhairkhan branch | 4,266.00 | 4,344.00 | 98.20% |
| - Suhbaatar branch | 2,060.00 | 2,228.00 | 92.40% |
| - Zuunmod branch | 351.00 | 351.00 | 100.00% |
| TOTAL: | 14,566.00 | 15,913.00 | |
| Phase II: Implementation of a program to reduce technical losses and improve reliability of electricity services | | | |
| i) Eastern region | | | |
| - Install poles 6kV network (number) | 11.00 | 13.00 | 84.60% |
| - Install 6kV network (km) | 1.96 | 2.60 | 75.40% |
| - Install substation's poles and transformers (lot) | 4.00 | 4.00 | 100.00% |
| - Commissioning of the DTS complex and 6kV network (lot) | 4.00 | 4.00 | 100.00% |
| - Install poles 0.4kV network (number) | 2,330.00 | 2,330.00 | 100.00% |
| - Earthing (number) | 534.00 | 534.00 | 100.00% |
| - Supply and install ABC network (km) | 103.90 | 103.40 | 100.50% |
| - Install customer service cable (km) | 332.00 | 332.00 | 100.00% |
| - Supply and install meter boxes with 6 and 3 meters (pieces) | 1,365.00 | 1,563.00 | 87.30% |
| - Supply and install 1 phase meters (pieces) | 5,829.00 | 6,650.00 | 87.60% |
| - Dismantling of existing LV networks and hand over all materials to UBEDN warehouse (km) | 71.00 | 71.00 | 100.00% |
| - Commissioning of the LV network complex (km) | 103.90 | 103.40 | 100.50% |
| ii) Rehabilitation of the Dornod 1 substation & Installation a New substation | | | |
| <u>Dornod 1 Substation Plant and Equipment</u> | | | |
| - Supply and Install ground mounted Open bushing Substation Transformer 400kVA 10/.04kV (number) | 2.00 | 2.00 | 100.00% |
| - Supply and Install 35kV/100V voltage transformer Y/yd (number) | 2.00 | 2.00 | 100.00% |
| - Demounted old 35kV equipment (lot) | 2.00 | 2.00 | 100.00% |
| - Install power transformer 35/10kV, 16000kVA (pcs) | 2.00 | 2.00 | 100.00% |

| | | | |
|---|-------|-------|---------|
| - 35kV Switchyard equipment (lot) | 2.00 | 2.00 | 100.00% |
| - 10kV Indoor panels related works (lot) | 20.00 | 20.00 | 100.00% |
| - 35kV Control measuring and protection panels (lot) | 2.00 | 2.00 | 100.00% |
| - Substation building (lot) | 1.00 | 1.00 | 100.00% |
| - Miscellaneous items (lot) | 1.00 | 1.00 | 100.00% |
| <u>4ZAM Substation</u> | | | |
| - Supply and Install ground mounted Open bushing Substation Transformer 100kVA 6/0.4kV (number) | 0.00 | 2.00 | 0.00% |
| - 35kV Indoor panels (lot) | 0.00 | 2.00 | 0.00% |
| - 6kV Indoor panels (lot) | 0.00 | 20.00 | 0.00% |
| - 35kV Lines, double circuit cable (km) | 2.00 | 2.51 | 79.70% |
| - Install power transformer 35/6kV, 16000kVA (pcs) | 2.00 | 2.00 | 100.00% |
| - Substation building (lot) | 0.5 | 1.00 | 50.00% |
| - Miscellaneous items (lot) | 0.00 | 1.00 | 0.00% |
| Implementation of a program of institutional strengthening | | | |
| i) Reengineering of UBEDN's business procedures | N/A | N/A | 100.00% |
| - Advance payments | N/A | N/A | 100.00% |
| - Quarterly reports | N/A | N/A | 100.00% |
| - Interim Report: Review of UBEDN existing CIS, Bus | N/A | N/A | 100.00% |
| - Re-engineering Report and mid-term CIS master plan | N/A | N/A | 100.00% |
| - Implementation Plan-Redesign of bus and CIS MP | N/A | N/A | 100.00% |
| - Development of CIS, system testing, user & parallel test | N/A | N/A | 100.00% |
| - Final Report | N/A | N/A | 100.00% |
| ii) Strengthening of the technical, financial and management capacity of UBEDN | | | |
| <u>Audit 1 KPMG</u> | | | |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2002 | N/A | N/A | 100.00% |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2003 | N/A | N/A | 100.00% |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2004 | N/A | N/A | 100.00% |
| <u>Audit 2 KPMG</u> | | | |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2005 | N/A | N/A | 100.00% |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2006 | N/A | N/A | 100.00% |

| | | | |
|---|---------|---------|--------------------|
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2007 | N/A | N/A | 100.00% |
| <u>Audit 3 Integlt Co;Ltd</u> | | | |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2008 | N/A | N/A | 100.00% |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2009 | N/A | N/A | 100.00% |
| <u>Audit 3 Dalai van Co;Ltd</u> | | | |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2010 | N/A | N/A | 100.00% |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2011 | N/A | N/A | 100.00% |
| - Auditing of the Project and UBEDN's financial statements for the year ending 31 December 2012 | N/A | N/A | 100.00% |
| <u>Commercialization project UBEDN</u> | | | |
| - Ulaanbaatar Electricity Distribution Company's operations, research and analysis, "Report Comment" | N/A | N/A | 100.00% |
| - "Commercialization projects plan" submission | N/A | N/A | 100.00% |
| - Determine the customer-oriented business, operational changes | N/A | N/A | 100.00% |
| - Ulaanbaatar Electricity Distribution Company's approval for organizational change model | N/A | N/A | 100.00% |
| - Information technology system upgrade | N/A | N/A | 100.00% |
| - Ulaanbaatar Electricity companies change the structure of industry groups, and a new order of execution | 10 1 | 10 1 | 100.00% 100.00% |
| - Ulaanbaatar city to create a customer service center | | | |
| - Final report | | | |
| <u>Consulting service for improvement of electricity distribution management</u> | | | |
| - Inception Report and Initial Analysis - End of 1st Mission | N/A | N/A | 100.00% |
| - Initial Recommendations and 1st Quarterly Report | N/A | N/A | 100.00% |
| - Final Analysis and Recommendations | N/A | N/A | 100.00% |
| - Recommendations on business procedures and 4th Monthly Report – End of 2nd Mission | N/A | N/A | 100.00% |
| - Standards and samples of documents | N/A | N/A | 100.00% |
| - Implementation Schedule and Plan 5th Monthly Report – End of 4th Mission | N/A | N/A | 100.00% |
| - Final Report – End of 5th Mission | N/A | N/A | 100.00% |
| <u>LAN</u> | | | |

| | | | |
|--|----------|----------|---------|
| - Advance payment | N/A | N/A | 100.00% |
| - Supply IT equipment | N/A | N/A | 100.00% |
| - Installation LAN for Bayangol, Songinokhairkhan CSCs | N/A | N/A | 100.00% |
| - Installation LAN for Khan-Uul, Suhbaatar, Chingeltei, Bayanzurh, Nalaikh and Zuunmod CSCs | N/A | N/A | 100.00% |
| - Final payment | N/A | N/A | 100.00% |
| WAN | | | |
| - Phase I: Install local network to CSCs | N/A | N/A | 100.00% |
| - Convert and transfer existing Customer Relationship Management System (CRMS) using in Bayangol and Songinokhairkhan branches to a new system to be developed | N/A | N/A | 100.00% |
| - Convert the other CSCs' information database into new system | N/A | N/A | 100.00% |
| - Phase II: Establish a center of WAN | N/A | N/A | 100.00% |
| - Connect at least two CSCs and one Commercial Bank has the cooperation with UBEDN to WAN | N/A | N/A | 100.00% |
| - Start to develop the software for WAN | N/A | N/A | 100.00% |
| - Phase III: Connect the remaining CSCs and the Commercial Banks to WAN | N/A | N/A | 100.00% |
| - Complete to develop the software for WAN in connection with existing CRMS | N/A | N/A | 100.00% |
| aimag Center Electric Power Systems | | | |
| Rehabilitation and improvement of the electricity and heat distribution lines of Dornod utility | | | |
| i) Rehabilitation and improvement of the heat distribution lines of Dornod utility | | | |
| <u>Overhead</u> | | | |
| - Insulated by segmental insulation R400 mm overhead (km) | 4.10 | 4.10 | 100.00% |
| - Insulated by segmental insulation R500 mm overhead (km) | 2.32 | 2.32 | 100.00% |
| - Insulated by segmental insulation R300 mm overhead (km) | 1.48 | 1.48 | 100.00% |
| <u>Underground</u> | | | |
| - Install pipes R400mm underground (km) | 0.33 | 0.33 | 100.00% |
| - Install pipes with 2xR250mm without panels (km) | 1.20 | 1.20 | 100.00% |
| - Install pipes R400mm with panels (km) | 0.93 | 0.93 | 100.00% |
| - Cover pipes R400mm with insulation segment (m2) | 1,280.00 | 1,280.00 | 100.00% |
| - Install 2xR400mm pipes upper ground as P type (km) | 1.37 | 1.37 | 100.00% |
| - Commissioning | 1.00 | 1.00 | 100.00% |

| | | | |
|---|----------|----------|---------|
| ii) Rehabilitation and improvement of the electricity distribution lines of Dornod Utility | | | |
| - Reconfiguration of existing low-voltage lines to balance loads on existing transformers & Installation of additional low-voltage lines (km) | 59.28 | 48.9 | 121.20% |
| - Installation of additional substations (number) | 9.00 | 9.00 | 100.00% |
| - Installation of meters for residential customers in ger area (pieces) | 3,750.00 | 3,350.00 | 111.90% |
| - Installation of meter boxes for residential customers in ger areas (pieces) | 1,021.00 | 850.00 | 120.10% |
| Rehabilitation and improvement of the electricity distribution lines of six aimag utilities | | | |
| i) Reconfiguration of existing low-voltage lines to balance loads on existing transformers & Installation of additional low-voltage lines | | | |
| - Bayankhongor Utility | 70.91 | 66.70 | 106.30% |
| - Gobi-Altai Utility | 48.00 | 54.90 | 87.40% |
| - Huvsgul Utility | 91.00 | 93.20 | 97.60% |
| - Suhbaatar Utility | 31.77 | 33.06 | 96.10% |
| - Umnugobi Utility | 73.20 | 73.20 | 100.00% |
| - Dornod Utility | 59.30 | 59.30 | 100.00% |
| ii) Installation of additional substations | | | |
| - Bayankhongor Utility | 10.00 | 10.00 | 100.00% |
| - Gobi-Altai Utility | 9.00 | 9.00 | 100.00% |
| - Huvsgul Utility | 5.00 | 6.00 | 83.30% |
| - Suhbaatar Utility | 4.00 | 4.00 | 100.00% |
| - Umnugobi Utility | 9.00 | 9.00 | 100.00% |
| - Dornod Utility | 27.00 | 27.00 | 100.00% |
| iii) Installation of meters for residential customers in ger areas | | | |
| - Bayankhongor Utility | 4,014.00 | 3,350.00 | 119.80% |
| - Gobi-Altai Utility | 3,210.00 | 3,105.00 | 103.40% |
| - Huvsgul Utility | 4,066.00 | 5,406.00 | 75.20% |
| - Suhbaatar Utility | 2,550.00 | 2,556.00 | 100.00% |
| - Umnugobi Utility | 3,100.00 | 3,100.00 | 100.00% |
| - Dornod Utility | 3,750.00 | 3,750.00 | 100.00% |
| iv) Installation of meter boxes for residential customers in ger areas | | | |
| - Bayankhongor Utility | 1,041.00 | 932.00 | 111.70% |
| - Gobi-Altai Utility | 720.00 | 697.00 | 103.30% |
| - Huvsgul Utility | 571.00 | 760.00 | 75.10% |
| - Suhbaatar Utility | 532.00 | 584.00 | 91.10% |

| | | | |
|--|----------|----------|---------|
| - Umnugobi Utility | 1,126.00 | 1,126.00 | 100.00% |
| - Dornod Utility | 1,021.00 | 1,021.00 | 100.00% |
| Rehabilitation and improvement of the electricity distribution lines of three western aimag utilities | | | |
| i) Supply and Install New Outdoor Transformers to new locations platform 6/0.4kV (by number of substation) | | | |
| - Bayanulgii Utility | 6.00 | 6.00 | 100.00% |
| - Khovd Utility | 4.00 | 4.00 | 100.00% |
| - Uvs Utility | 36.00 | 11.00 | 327.30% |
| ii) Remove, Rehabilitate, Move and Install existing Transformers to new locations platform 6/0.4kV (by number of substation) | | | |
| - Bayanulgii Utility | 2.00 | 2.00 | 100.00% |
| - Khovd Utility | 6.00 | 7.00 | 85.70% |
| - Uvs Utility | 10.00 | 10.00 | 100.00% |
| iii) Rehabilitate existing Transformers (by number of substation) | | | |
| - Bayanulgii Utility | 16.00 | 16.00 | 100.00% |
| - Khovd Utility | 5.00 | 21.00 | 23.80% |
| - Uvs Utility | 15.00 | 15.00 | 100.00% |
| iv) 6kV Plant Equipment and Works for DTS (by number of substation) | | | |
| - Bayanulgii Utility | 24.00 | 24.00 | 100.00% |
| - Khovd Utility | 15.00 | 32.00 | 46.90% |
| - Uvs Utility | 61.00 | 36.00 | 169.40% |
| v) 0.4kV Equipment for DTS (by number of substation) | | | |
| - Bayanulgii Utility | 24.00 | 24.00 | 100.00% |
| - Khovd Utility | 15.00 | 32.00 | 47.00% |
| - Uvs Utility | 61.00 | 36.00 | 169.00% |
| vi) 6kV Network: Supply and Install 3 phase conductors with 35mm ² ACSR (km) | | | |
| - Bayanulgii Utility | 3.10 | 3.10 | 100.00% |
| - Khovd Utility | 3.00 | 3.00 | 100.00% |
| - Uvs Utility | 7.00 | 7.00 | 100.00% |
| vii) 0.4kV Network: Supply and Install ABC circuit with 16mm ² - 50mm ² (km) | | | |
| - Bayanulgii Utility | 85.50 | 90.40 | 94.60% |
| - Khovd Utility | 42.00 | 47.40 | 88.60% |
| - Uvs Utility | 69.60 | 72.00 | 97.00% |

| | | | |
|--|----------|----------|---------|
| viii) Supply and Install meter boxes (number) | | | |
| - Bayanulgii Utility | 1,210.00 | 1,240.00 | 97.60% |
| - Khovd Utility | 1,181.00 | 1,190.00 | 99.20% |
| - Uvs Utility | 1,450.00 | 1,450.00 | 100.00% |
| ix) Supply and Install 1 phase kWh meters (number) | | | |
| - Bayanulgii Utility | 5,750.00 | 5,900.00 | 97.40% |
| - Khovd Utility | 5,976.00 | 6,000.00 | 99.60% |
| - Uvs Utility | 6,525.00 | 6,525.00 | 100.00% |
| x) Supply 3 phase meters (number) | | | |
| - Bayanulgii Utility | 100.00 | 100.00 | 100.00% |
| - Khovd Utility | 180.00 | 180.00 | 100.00% |
| - Uvs Utility | 250.00 | 250.00 | 100.00% |
| xi) Supply meter testing equipment to W3 | | | |
| - Bayanulgii Utility | 1.00 | 1.00 | 100.00% |
| - Uvs Utility | 1.00 | 1.00 | 100.00% |
| Improve management the aimags Utilites | | | |
| - Internal consultant with the international consultant under the scope of work of the computer and software for processing | N/A | N/A | 100.00% |
| - Organizational structure the Ulaanbaatar Electricity Joint Stock Company (JSC) was implemented in commercial project management expertise and international recommendations were developed for each class. | N/A | N/A | 100.00% |
| - National consultants in accordance with the international consultant to implement the regional electricity distribution networks, hardware asset management methodology developed for preparation to introduce the methodology | N/A | N/A | 100.00% |
| - Nine aimags to create a customer service center | 1.00 | 1.00 | 100.00% |
| - Final reports | | | |
| Technical assistance and training for nine aimag Utilities | | | |
| - Phase I report | N/A | N/A | 100.00% |
| - Phase II report | N/A | N/A | 100.00% |
| - Phase III report | N/A | N/A | 100.00% |
| - Final report | 1.00 | 1.00 | 100.00% |
| Technical Assistance for Regulatory Support and | | | |

| Financial Audits | | | |
|---|-----|-----|---------|
| Development of the Energy Regulatory Authority, through the provision of technical assistance and training (package 1-5) | | | |
| Energy market policy - 1 training | N/A | N/A | 100.00% |
| Energy market policy - 2 training | N/A | N/A | 100.00% |

Annex 3. Economic and Financial Analysis

This section comprises the economic and financial analyses of the project and the financial assessment of UBEDN. At appraisal, several benefit-cost analyses (BCAs) were carried out to assess the economic and financial viability of the investments in Ulaanbataar and six aimag centers. Later on, BCAs were carried out again for the investments under the additional financing. At completion, the economic and financial returns of all components previously assessed were reassessed based on their actual scope and performance.

A. Project Economic and Financial Analysis

a. Analytical assumptions

To ensure comparability with the appraisal-stage estimates, the economic and financial analyses at the project completion adopted the same methodology, and in some cases, the same unit valuations, such as those for the willingness-to-pay (WTP) for new connections and power outage. This would allow the analyses to focus on the more substantive differences between the project actual performance at its completion and the planned performance envisaged at appraisal.

However, due to the long project implementation period expanding over a decade, the values of some macro and project-specific parameters have experienced considerable fluctuations. Notably, the considerable depreciation of the local currency had posed two opposite impacts on the Project's economic and financial return by (i) increasing the local purchasing power of the IDR-based IDA credit, thus allowing an extension of the original project scope; and (ii) reducing the dollar-based valuation of the Project's future benefit streams.

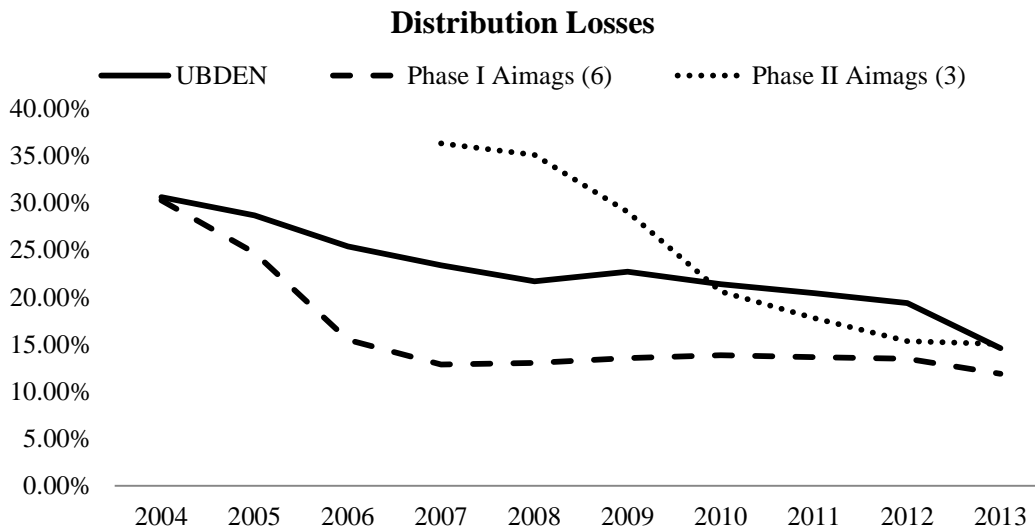
b. Benefits and costs

At the appraisal, three main economic benefits were identified: (i) power loss reduction and associated improved revenue collection; (ii) improved system reliability; and (iii) reduced electricity purchases by UBEDN and associated reduced coal consumption by power generators. Of all these identified benefits, only the loss reduction benefit was quantified at the initial appraisal. The technical analysis of the investments proposed for additional financing identified three main categories of potential benefits: (i) reduction in network losses; (ii) reduced outages; and (iii) ability to connect additional customers to the network. All three benefits were assessed for the additional investments.

The same benefit streams were assessed at the project completion based on the actual performance of the project.

- *Loss reduction.* Substantial reduction in distribution losses was achieved through the Project in the networks of UBEDN and nine project aimags (see figure below). Arguably, the Project's actual impact on loss reduction could have been greater if not countered by the utilities' expansion to more distant soums during the same period, which led to increases in technical losses in recent years.

At the project completion, the economic value of loss reduction was valued at the WTP of power supply, which was conservatively assumed as the lower of (i) the actual tariff of power supply, and (ii) the implicit tariff of power supply derived from the retail tariff. The same conservative assumption was also adopted at the initial appraisal. Global environmental benefits in terms of greenhouse gas (GHG) emissions reduction were excluded in the benefit valuation, although they were included at the appraisal of the additional financing.⁷



- Avoided outages.* To be consistent with the appraisal-stage assumptions, this benefit was only measured for the Project investments under the additional financing, thus being only applicable for the period from 2011 onward even though more substantial reduction in SAIDI, from 4,205 minutes to 2,234 minutes per year, was achieved in UBEDN's network in the period of 2004-2010. The WTP for power outages assumed at the appraisal was overly conservative at conservative values of US\$0.07 per kWh for the WTA of power outages, compared with US\$0.50 per kWh, a commonly cited figure based on diesel-based back-up units operating at low load factors. To allow for comparability with the estimates at the appraisal, the ICR analysis has adopted the same conservative assumption. The financial value of avoided power outages was assumed at and US\$0.01 per kWh for the financial values were assumed at both the appraisal and the project completion.
- Increased access to electricity supply.* Again, this benefit was only measured for the Project investments under additional financing even though both UBEDN and the project aimags experienced a continuous increase in access throughout the decade of project implementation. The benefit of being able to connect additional customers to the

⁷ An additional value of US\$0.035 per kWh in global environmental benefit was included in the loss reduction benefit assessment at the appraisal of the additional financing.

network was measured as the aggregate willingness of new customers to pay for electricity supply, assumed at \$US0.159 per kWh, the same assumption in the appraisal of the additional financing.

c. Results of the economic analysis

At completion, the Project is estimated to generate an economic internal rate of return (EIRR) of 34.0%. At an economic opportunity cost of capital (C) of 11%, it is estimated to generate an economic net present value (ENPV) of US\$127.0 million at completion, compared with an estimated US\$67.7 million at appraisal. The higher ENPV is primarily due to the enhanced impact of loss reduction achieved by UBEDN over a decade of accelerated demand expansion. In the decade of 2004-13, UBEDN's sales had grown at average annual rate of 10.9 percent, and its revenue at 19.4 percent. The investments under the original Loan are estimated to yield an EIRR of 32.8% and an ENPV of US\$102.1 million at completion, compared with an estimated 30.3% and US\$10.9 million at appraisal. The investments under the additional financing are estimated to generate an EIRR of 61.7% and an ENPV of US\$24.9 million at completion, compared with an estimated 158.9% and US\$56.8 million at appraisal. The lower EIRR and ENPV of the investments under the additional financing at completion are due to the exclusion of the global environmental benefit of loss reduction. When the benefit is included, the economic returns of these investments are on par with the estimates at appraisal.

Table 4: Summary of the Outcomes of the Economic Analysis

| Project | Cost (US\$ million) ^[1] | | EIRR (%) | | ENPV (US\$ million) ^[2] | |
|----------------------|------------------------------------|-------------|-----------|--------------|------------------------------------|--------------|
| | Appraisal | Completion | Appraisal | Completion | Appraisal | Completion |
| Original Scope | 36.2 | 39.8 | 30.3% | 32.8% | 10.9 | 102.1 |
| - UBEDN | 23.0 | 27.0 | > 20% | 36.8% | n.a. | 93.8 |
| - aimags | 13.2 | 12.9 | 20-35% | 20.1% | n.a. | 8.3 |
| Additional Financing | 11.2 | 9.4 | 158.9% | 61.7% | 56.8 ^[3] | 24.9 |
| Total | 47.4 | 49.2 | | 34.0% | 67.7 | 127.0 |

^[1] Undiscounted

^[2] In 2004 US dollars

^[3] The appraisal of this component was carried out in 2010. Then, the ENPV was estimated in terms of 2010 US dollar at US\$117.9 million. The difference between the two figures, i.e., US\$56.8 million and US\$117.9 million, is due to discounting. In 2010 US dollar terms, the ENPV of the component was estimated at US\$ 51.8 million.

Moreover, at a discount rate of 8%, the Project will result in a lifetime net present reduction of 4.46 GWh in distribution losses, equivalent of the avoidance of 4.46 million ton of CO₂ emissions. The implicit cost of CO₂ abatement is estimated at an impressive US\$8.58 per tCO₂.

c. Results of the financial analysis

At completion, the Project is estimated to generate a financial internal rate of return (FIRR) of 27.4%. At a financial real discount rate of 8%, it is estimated to generate a financial net present value (FNPV) of US\$107.2 million at completion, compared with an estimated US\$24.2 million at appraisal. Again, the higher estimated FNPV at completion is primarily due to the enhanced impact of loss reduction achieved by UBEDN over a decade of accelerated demand expansion. The investments under the original Loan are estimated to yield an FIRR of 27.6% and an FNPV of US\$102.7 million at completion, compared with an estimated 21.2% and US\$5.3 million at appraisal. The investments un the additional financing are estimated to yield an FIRR of 20.2% and an FNPV of US\$4.5 million at completion, compared with an estimated 19.1% and US\$3.0 million at appraisal.

Table 5: Summary of the Outcome of the Financial Analysis

| Project | Cost (US\$ million) ^[1] | | FIRR (%) | | FNPV (US\$ million) ^[2] | |
|----------------------|------------------------------------|-------------|-----------|--------------|------------------------------------|--------------|
| | Appraisal | Completion | Appraisal | Completion | Appraisal | Completion |
| Original Scope | 36.2 | 39.8 | 21.2% | 27.6% | 5.3 | 102.7 |
| - UBEDN | 23.0 | 27.0 | > 20% | 30.3% | n.a. | 87.8 |
| - aimags | 13.2 | 12.9 | 20-35% | 20.1% | n.a. | 14.8 |
| Additional Financing | 11.2 | 9.4 | 19.1% | 20.2% | 3.0 ^[3] | 4.5 |
| Total | 47.4 | 49.2 | | 27.4% | 24.2 | 107.2 |

^[1] Undiscounted

^[2] In 2004 US dollars

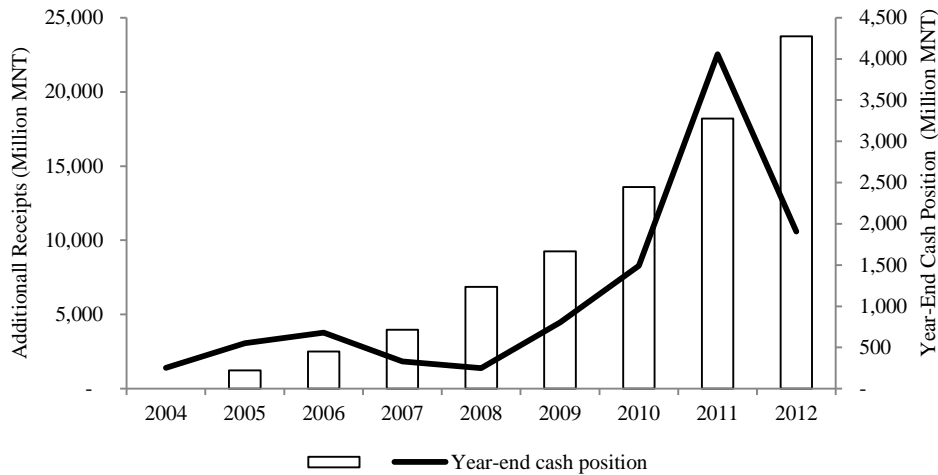
^[3] The appraisal of this component was carried out in 2010. Then, the ENPV was estimated in terms of 2010 US dollar at US\$5.15 million. The difference between the two figures, i.e., US\$3.0 million and US\$5.15 million, is due to discounting. In 2010 US dollar terms, the FNPV of the component was estimated at US\$ 7.7 million.

B. Financial Analysis of UBEDN

The Project played an instrumental role in the financial recovery of UBEDN by (i) reducing its cost of supply through loss reduction; and (ii) providing the company with much needed liquidity through increased revenue collection and reduction in accounts receivables.

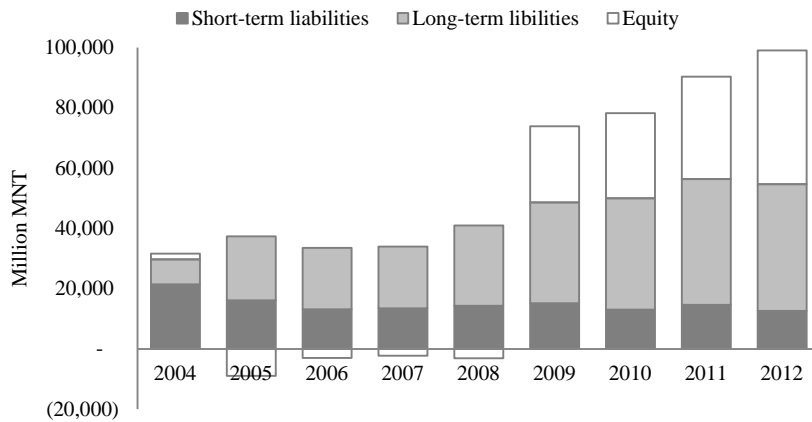
As a result, UBEDN reached full cost recovery for the first time in 2008. The company's liquidity situation had also undergone marked improvements with growing cash reserves, increasing current ratio increased from 0.47 in 2005 to 1.33 in 2012, and reduced need for short-term borrowing, and expanded capacity for servicing long-term debts used for financing future investments.

Impact of Lower Accounts Receivables on UBEDN's Liquidity Position



Over the past decade, UBEDN's balance sheet had undergone a fundamental structural shift from having 2/3 of the assets backed by short-term liabilities and negative equity to a healthier composition with 45% in equity, 42% in long-term liabilities, and 13% in short-term liabilities.

UBEDN Liability and Equity Composition



Notably, tariff increase had not played a major role in UBEDN's path toward cost recovery. In the period of 2007-12, retail tariff in UB grew at an average annual rate of 11.6%, trailing behind the average inflation of 13.3% in the same period, resulting in lower average tariff in real terms. Going forward, as loss reduction becomes more challenging, the pace of tariff increase will need to pick up to keep the company at full cost recovery.

Table 6. Summary of UBEDN's Financial Performance (2004-12)

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---------------|---------------|---------------|----------------|---------------|----------------|---------------|---------------|---------------|
| Balance Sheet | | | | | | | | | |
| Assets | | | | | | | | | |
| Current | 18,843 | 7,531 | 7,802 | 7,754 | 11,379 | 11,462 | 12,532 | 16,585 | 16,708 |
| Noncurrent | 12,780 | 20,875 | 22,707 | 23,859 | 26,439 | 62,382 | 65,684 | 73,774 | 82,383 |
| Total Assets | 31,623 | 28,406 | 30,509 | 31,614 | 37,818 | 73,845 | 78,215 | 90,359 | 99,091 |
| Liabilities | | | | | | | | | |
| Short-term | 21,399 | 16,105 | 13,077 | 13,492 | 14,291 | 15,185 | 12,978 | 14,610 | 12,593 |
| Long-term | 8,250 | 21,230 | 20,434 | 20,419 | 26,697 | 33,364 | 37,016 | 41,795 | 42,028 |
| Total Liabilities | 29,649 | 37,334 | 33,511 | 33,910 | 40,988 | 48,549 | 49,994 | 56,405 | 54,621 |
| Equities | 1,974 | (8,928) | (3,002) | (2,297) | (3,169) | 25,296 | 28,221 | 33,954 | 44,470 |
| Liabilities and Equities | 31,623 | 28,407 | 30,509 | 31,614 | 37,818 | 73,845 | 78,215 | 90,359 | 99,091 |
| Income Statement | | | | | | | | | |
| Electricity revenue | 34,566 | 41,198 | 43,969 | 49,202 | 67,369 | 76,596 | 98,602 | 119,079 | 142,839 |
| Power purchase | (33,698) | (31,767) | (35,166) | (38,759) | 51,484) | (60,595) | (82,955) | (87,406) | (103,897) |
| Electricity (revenue - purchase) | 868 | 9,431 | 8,803 | 10,443 | 15,885 | 16,001 | 15,647 | 31,673 | 38,942 |
| Other costs | | | | (11,966) | (16,388) | (18,194) | (10,874) | (30,475) | (38,176) |
| Net income | | | | (1,523) | (503) | (2,193) | 4,773 | 1,198 | 766 |
| Cash Flows | | | | | | | | | |
| From operations | | | | 1,319 | (734) | 2,387 | 31,976 | 101,316 | 117,253 |
| From investments | | | | (3,819) | (4,337) | (7,250) | - | 15 | - |
| From financing | | | | 2,150 | 4,993 | 5,416 | (31,286) | (98,766) | (119,406) |

| | | | | | | | | | |
|---------------------------------|------------|------------|------------|--------------|-------------|------------|--------------|--------------|----------------|
| Net cash flow | 88 | 299 | 126 | (350) | (79) | 553 | 690 | 2,566 | (2,153) |
| Cash – beginning of year | 166 | 254 | 553 | 679 | 329 | 250 | 803 | 1,493 | 4,059 |
| Cash – end of year | 254 | 553 | 679 | 329 | 250 | 803 | 1,493 | 4,059 | 1,906 |
| Ratios | | | | | | | | | |
| <i>Collections (%)</i> | | 97.4 | 98.5 | 103.3 | 97.8 | 101.4 | 100.3 | 100.1 | 100.0 |
| <i>Accounts receivables</i> | | | | | | | | | |
| <i>(days)</i> | 98 | 91 | 39 | 33 | 68 | 54 | 42 | 34 | 30 |
| <i>Cost recovery</i> | | | | 0.97 | 0.99 | 0.97 | 1.05 | 1.01 | 1.01 |
| <i>Current ratio</i> | 0.88 | 0.47 | 0.60 | 0.57 | 0.80 | 0.75 | 0.97 | 1.14 | 1.33 |

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

| Names | Title | Unit | Responsibility/ Specialty |
|------------------------|---|-------|------------------------------|
| Lending | | | |
| Roberto P. Taylor | Task Team Leader | EASEG | |
| Arutro S. Rivera | Task Team Leader | EASEG | |
| Julius Wilberg | Financial Specialist | ECSEG | |
| Charles Husband | Sr. Mining Specialist | EMT | |
| Mikio Matsumura | Power Engineer (UB Distribution Component) | EASEG | |
| Heinz Pape | Energy Specialist (AIMAG Energy Component) | EASEG | |
| Hong Chen | Procurement/Operations Specialist | AFTH3 | |
| Sandra Durham | Financial Management Specialist | | |
| Nancy Chen | Financial Management Specialist | EASFP | |
| Carlos Escudero | Senior Counsel | LEGES | |
| Hoi0chan Nguyen | Senior Counsel | LEGES | |
| Rosa Muleta | Sr. Disbursement Officer | LOAAS | |
| Supervision/ICR | | | |
| Arturo S. Rivera | Task Team Leader | EASEG | |
| Tumentsogt Tsvegmid | Task Team Leader | EACMF | |
| Migara Jayawardena | Task Team Leader | EASTE | |
| Peter Johansen | Task Team Leader | EASWE | |
| Erdene Ochir Badarch | Operations Officer | EACMF | |
| Charles A. Husband | Consultant | ECSEG | |
| Xiaoping Li | Senior Procurement Specialist | AFTPW | |
| Haixia Li | Sr Financial Management Specialist | EASFM | |
| Lhagvasuren Ochir | Operations Officer | EACMF | |
| James A. Reichert | Senior Infrastructure Speciali | EASNS | |
| Jinan Shi | Senior Procurement Specialist | EASR1 | |
| Yun Wu | Consultant | EASWE | |
| Roberto La Rocca | Consultant | EASWE | |

(b) Staff Time and Cost

| Stage of Project Cycle | Staff Time and Cost (Bank Budget Only) | |
|------------------------|--|--|
| | No. of staff weeks | USD Thousands (including travel and consultant costs) |
| Lending | | |
| FY97 | n.a | 45.29 |
| FY98 | 0 | 209.58 |
| FY99 | 0 | 73.03 |
| FY00 | 13 | 70.45 |
| FY01 | 16 | 82.58 |
| | | |
| Total: | 29 | 480.93 |
| Supervision/ICR | | |
| FY97 | n.a ⁸ | n.a |
| FY98 | n.a | n.a |
| FY99 | n.a | n.a |
| FY00 | n.a | n.a |
| FY01 | 0.45 | 3.78 |
| FY02 | 27 | 108.29 |
| FY03 | 17 | 94.04 |
| FY04 | 26 | 151.12 |
| FY05 | 29 | 77.31 |
| FY06 | 27 | 65.38 |
| FY07 | 14 | 69.95 |
| FY08 | 19 | 76.14 |
| FY09 | 35.15 | 102.32 |
| FY10 | 51.58 | 90.52 |
| FY11 | 39.55 | 62.86 |
| FY12 | 6 | 42.24 |
| FY13 | 9 | 50.25 |
| FY14 | 9 | 35.06 |
| | | |
| Total: | 309.28 | 1029.26 |

⁸ Data not available before FY01

Annex 5. Beneficiary Survey Results

A post-Project completion beneficiary survey was carried out among eight of the nine participating aimag utilities of Western and Eastern Mongolia. The survey comprised two parts. Part A provided insights into the impact of the infrastructure investments made and commercialization measures taken at the aimag level; Part B provided insights into beneficiary satisfaction linked with the PDOs under the aimag component. To further shed light on the survey results, anecdotal evidence was collected through in-depth interviews with a selected number of key aimag utility stakeholders.

Part A:

The survey analysis points to a fair degree of homogeneity in the type of infrastructure investments made and commercialization measures taken by the aimag utilities engaged with the Project. The results show that such investments have generally translated into improved sustainability of the utilities' operational models. According to Mr. Chinbat, Executive Director of the local distribution utility in the Dornod aimag, *“the improved operational performance of the utility stems from the infrastructure and commercialization investments made under the Project, which are complementary in nature”*. In a brief overview of Pre-project conditions, Mr. G.Otgonbaatar, Deputy Financial Director, recounted how the local distribution utility was troubled with: (i) high losses, (ii) a high average number of days to collect receivables; and (iii) the inability to keep track of due payments, which created uncertainties about the sustainability of the distribution utility commercialization model. Mr. Dorjragchaa elaborated as follows:

“As a result of the joint efforts between the Government of Mongolia, Choibalsan’s local utility and the World Bank, a number of measures were taken to address the issues of physical assets”, emphasized Mr. Chinbat. On the Project’s infrastructure investments, he then added: “Twenty-nine out of the 42 aimag substations were rehabilitated, thereby reducing power losses from over 19% in 2004 to below 9% in 2013. We now have a more reliable system with a very low number of yearly power faults (120 in 2003 and two in 2007) and voltage drops. In the district ger areas, obsolete Russian mechanical meters were upgraded to more modern and precise models and confined into breakin-free boxes. Equally, in the urban areas of Choibalsan, meters were moved from privately-owned apartments to utility-owned boxes, which reduced power theft and facilitated the monthly visits of official inspectors. Our customers have generally become more responsible and energy efficient than in the past”.

“The real revelation, however, was seeing great strides in improving our customer relationship management”, continued Mr. Munkhtulga, Head of the Sales Department. “We were able to decrease the average number of days to collect receivables below 7 in 2013. This naturally followed the set-up of a customer service center which greatly helps with addressing complaints and dealing with new contracts. We also made some organizational changes, splitting the billing and revenue collection units into two separate entities for payments

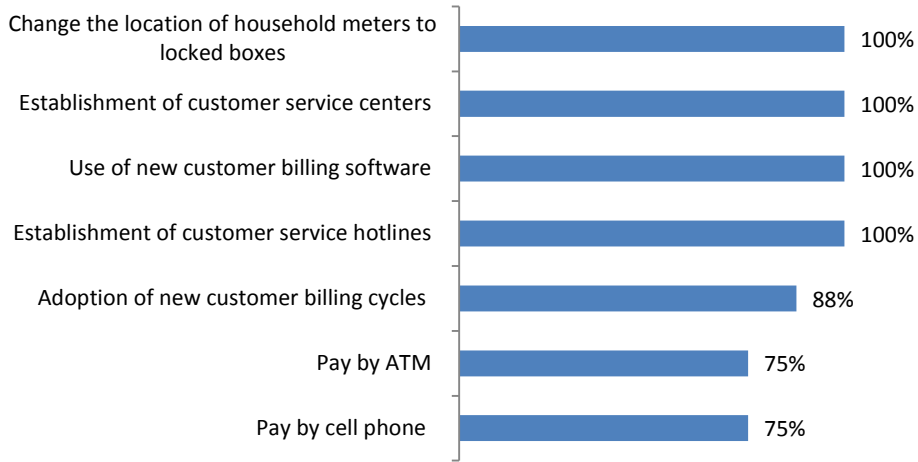
tracking and organizational improvement purposes. Finally, we upgraded the utility's software infrastructure, which supports the work of the newly created customer service center by improving the sales and finance functions".

Part B:

The survey shows a high level of satisfaction among the utilities having participated in the Project. On a scale from one to five (from worst to best), utility contentment averages at 3.75 in terms of loss reduction achievements and 3.88 for the reduction in the average number of days to collect account receivables. This is backed by a generally positive sentiment towards the project's helpfulness in improving the utilities' operating performances, customer service levels, customer satisfaction, and management and employees' capacity, as well as towards the effectiveness of the software and training programs provided (all above an average of 4 out of 5). The majority of the aimag utilities found the newly gained levels of operational performance to be a key element for strengthening the sustainability of their business. In fact, 75% of the utilities interviewed attest to having sufficient funds to finance investments to further reduce distribution losses, or at least, keep up with current trends.

However, despite the positive results obtained in terms of beneficiary satisfaction and improved operational performance, the survey indicates that the Infrastructure component could have been handled better with a higher degree of emphasis on upgrading meters and on installing meter boxes. This, however, does not seem to be the cause for some aimag utilities to have missed the PDOs targets. The survey shows that "added connection to distant soums" is cited as the main reason why some utilities failed to meet their loss reduction targets. According to Mr. Gansukh, Director of the local distribution utility in the Suhkbaatar aimag: *"Consistently with a country-wide trend, many herders are moving from the countryside to more developed areas and more soums are coming on-line in the local distribution networks"*. This automatically results in higher demand for electricity, which in turn calls for higher investments in physical infrastructures. According to the utilities surveyed, the revenue improvement target was not always met primarily due to a lack of technical knowledge and support. A graphic illustration of selected survey results is presented below.

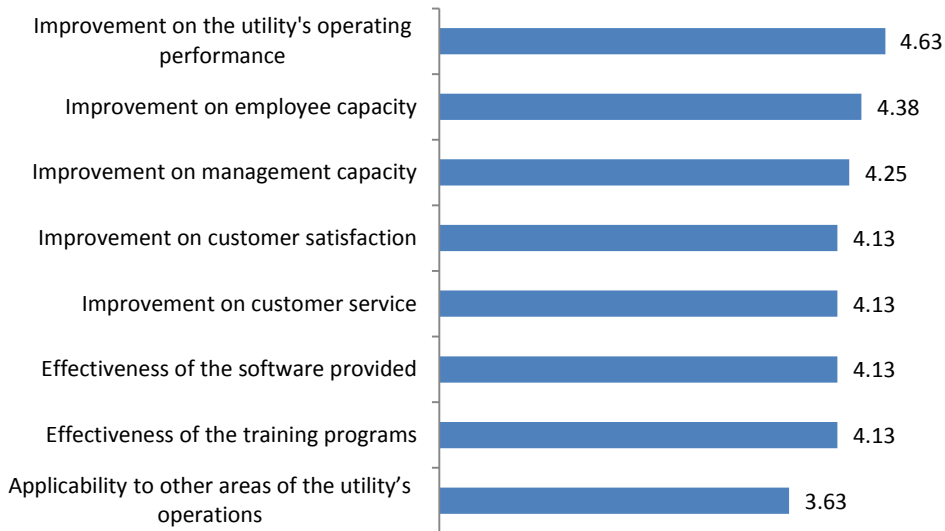
Commercialization Measures Taken



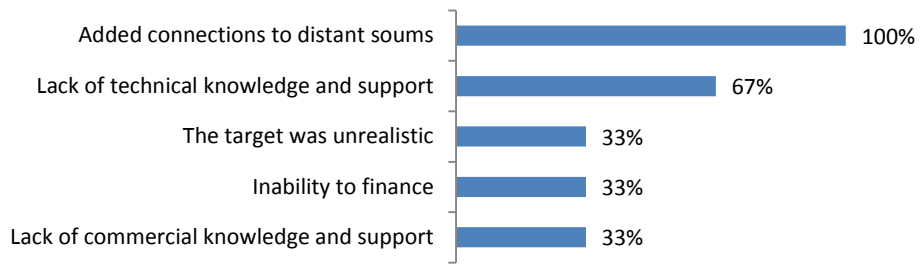
General Satisfaction (on a scale of 1-5)



Project Effectiveness (on a scale of 1-5)



Why the loss reduction target was not met
(multiple choice)



Annex 6. Stakeholder Workshop Report and Results
(if any)

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

Department of Project Financing and Debt Management, Ministry of Finance, Government of Mongolia Implementation Completion Report Energy Sector Project

The following report summarizes the views of representatives of the Ministry of Finance, UBEDN, and Ministry of Energy on behalf of the Government of Mongolia on the implementation and completion of the Energy Sector Project (Project), financed by the International Development Association (IDA), with funding from the Government of Mongolia.

I. Introduction

The “Ulaanbaatar Electricity Distribution Network” JSC (“UBEDN” JSC) and Aimag Energy Plants (AEP) have been operating long time with high technical and non-technical losses, and could not meet power supply requirement to customers, finally having negatively impacts to the economic benefits of the UBEDN and AEPs. Therefore in order to reduce non-technical losses of UBEDN and AEPs and to reorganize them into commercial principles, the WB International Development Agency (IDA) have initiated and implemented the Energy Project since 2001.

The objective of the project was to reduce system losses and improve revenue collection in electricity distribution companies in Mongolia. As stated in the Development Credit Agreement, the project development objective was: (1) to reduce electricity system losses and improve service reliability in electricity distribution in Ulaanbaatar and selected Aimag centers; (2) to improve revenue collections in the electricity distribution system; and (3) to build up institutional capacity to move toward a more commercial and market-based energy sector.

As one of parts of World Bank “Energy Project”, in the scope of distribution network loss reduction project there were rehabilitated electricity distribution network of “ger” areas in 8 districts of Ulaanbaatar city and 9 aimag centers and constructed new sub-stations. The project of “The distribution network loss reduction” was commenced in 2001 and financed by World Bank long-term loan (35 million US\$), with technical rehabilitation project implemented in 2 phases. The capacity building component of the project included consultancy services to UBEDN, selected aimags, and Energy Regulatory Agency.

II. Project Preparation and Design

The World Bank team had adequate experience and knowledge for the preparation of the project. The task team collaborated closely with the Government and the UBEDN in the design and preparation of the project.

III. Project Implementation

A. Implementation delays

There are some factors impacting on project slowdown. The selection of construction companies to perform construction and installation works in a few districts in 2005 was delayed and due to loss of lot of time for Contract signing off as well as construction works non-starting in warm season, the construction works were not completed in scheduled due time. Due to insufficient supply of steel concrete poles and wooden logs under domestic financing as well as household's inlet dropping cable under overseas financing, the delay on work performance and scheduling of Contractors was happened.

Upon organizing work meetings between PIU, UBEDN and Contractors companies and based on assumption that goods and materials required for construction works will be delivered in August 2006 and according to agreed work schedule and quantity, the PIU made decision to not ceasing construction and installation works and has assigned Contractors to follow. However, due to the low quality of poles and installation, the PSC meeting decided to dismantle the low quality steel concrete poles and resolve compensation.

Another major factor impacted on project implementation was that project design drawings, which performed in 2002-2003, are not updated considering increasing number of "ger" households and land permits for new sub-station site and protection stripes are not validated by district land authorities and therefore working drawings keep changing because of disputes between customers, operator and contractor. This is not because of particular drawing mistake, but because of increased migration, unauthorized settling down and owning of land, careless action of district authorities on land granting as well as households arbitrary extension of fences.

In order to solve any disputes related with project working drawings, the technical staff from PIU and UBEDN have updated working drawings and included some of missing household and even though working drawings are subject for frequent change because of land disputes by customers.

Delay on supply of required construction materials in 2006-2007, delay on selection of Contractor to supply steel concrete poles etc., lead up to slowdown of construction works. Because of construction work slowdown of one contractor in 2008, the several official notifications were sent to them to speed up work progress and finally even Contract termination proposal submitted to the Head of Energy Policy department of the MMRE in 2009, but despite these efforts repeatedly issued tasks and implementation of decision by PSC meeting of MMRE were not sufficient.

As II phase of Project, due to delay project financing as well as delay on payment for supplied equipment and goods etc., caused construction work of a rehabilitation Contractor's delay against planned schedule. Besides that non-fulfillment of Contract obligation to supply 1-phase electronic meters, required for construction works within 2008 made impossible the completion of sub-stations. Regarding of this issue, the

working meetings between Client, Operator and Contractor company had been organized and despite of certain task and recommendations to speed up construction works, the Project is not fully completed in 2008, as per schedule. As per Resolution No. 135 by State Secretary of MMRE on intensification of construction works of “Distribution Network Loss Reduction Project”, upon decision of PSC to take audit on performance on supplied goods and materials and installation works; the working team has appointed to make Contract conclusion and worked at the Contractor to check above mentioned items.

B. Additional Financing

Due to lack of the investment for reforming techniques and technology and expanding in conformity with demandable capacity increasing within the area of construction, production and services with more electric load concentration, the critical situation of overloading of line equipment has been occurred and the reliability of power supply has been worse as the reserve of inter-loading transfer is limited during the damage and cutoff. Therefore, the additional financing project had the main purpose of renovation electric equipment and technology to expand a capacity and ensure a reliability of power supply in conformity with demandable capacity increasing within the area of construction, production and services with more electric load concentration.

IV. Project Achievements

The Project was successful in fulfilling its objective of reducing system losses and improving revenue collection in electricity distribution companies in Mongolia. As a result of these works the voltage drop has decreased at customers end points, high quality power is provided to the customers, loading are balanced and loss reduction positively impact to the power electricity distribution and sales activities and gained significant technical and economical outcomes.

A. Technical benefits

Before Project implementation, the 0.4kV OHL of “ger” area of Ulaanbaatar city and aimag centers have general problems such as OHL has bare conductors and too long length, significant voltage drop, lighting glowing, customers own electricity meters and so high non-technical loss or power stealing as well as there were many failures and breakdown when weather is poor because of rain and snow, strong wind etc. Also substations are overloaded, load between phases are not equal, low operation level, many non-standard wooden poles and most of them decayed, the household’s insertion or dropper wires are not adequate and there are used various kinds of electrical wires, due to meter is located inside of households there is possible wrong usage including ceasing, meter reading takes too long time, many payment related breaches because of human factors as well as outdated equipment and technology, inefficient organizational structures, careless attitudes in work place, customers senseless and uncultured actions /e.g power stealing/ etc. lead up to implement this Project.

As of 2004, the UBEDN has been operated with 69,36% of sales and 30,64% losses upon purchased power. Upon implementation of distribution network loss reduction project,

the losses have been decreased by 2-3% annually. Comparing to 2004, the losses were decreased by 9,25% as end of 2009.

As of 2004, the Aimags under the 1st phase of Project were operating with 81,7-53,7% of sales and 18,3-46,3% of losses upon purchased power. Under implementation of distribution network loss reduction Project, the annual losses have been decreasing by 2,6-17,6%. Comparing to 2004, the losses were decreased by 5,1-31,2% as end of 2010.

As of 2004, the Aimags under the 2nd phase of Project were operating with 70,1-57,6% of sales and 29,9-42,4% of losses upon purchased power. Under implementation of distribution network loss reduction Project, the annual losses have been decreasing by 1-10,6%. Comparing to 2004, the losses were decreased by 10,1-22% as end of 2010.

Table A7.1 Loss Reduction Over Time



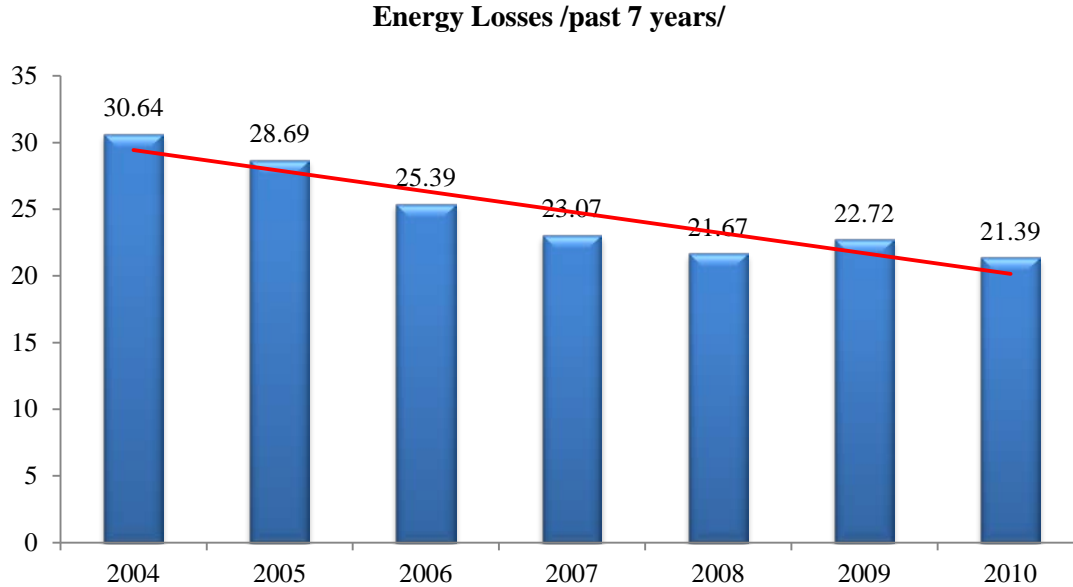
As a result of project's economical outcome before project was implemented year of 2004 for the base to compute, loss reduction 691.4 million kV hours indicating electricity was saved in 2010. By each year's current sold price was multiplied and economical outcome was shown USD 24.26 million which is equals to 31066.4 million MNT.

B. Energy Loss reduction at UBEDN

Please see following graphs, which illustrate how main sales indicators have been increased upon implementation of Commercialization project at UBEDN. Actual electricity loss reached to 21,39 as of 31st Dec, 2010, and planned losses reduced by 0,21

point or 3,3 million kWh and we achieved actual loss reduction by 9,25 points as to compare last 7 years.

Figure A7.1 Energy Loss Over Time

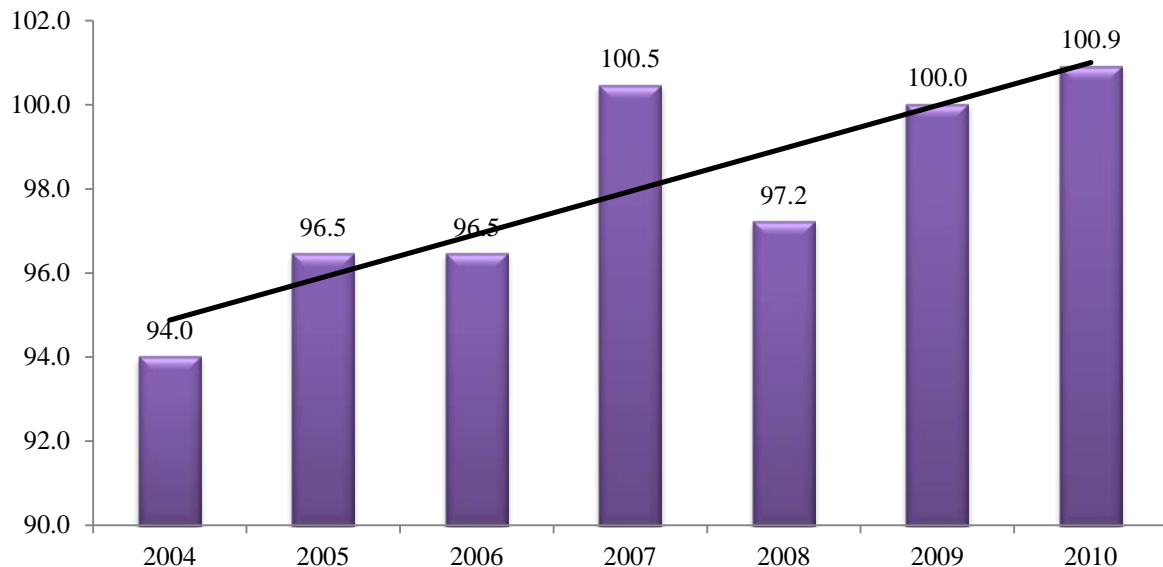


In the current year, the income collecting plan of the company over fulfilled by 100,9% or 767,1million MNT was the indication of record level of actual performance percentage.

Table A7.2 Performance of Income Collection Over Time

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|------------------------|---------|---------|---------|---------|---------|---------|---------|
| Income collecting plan | 32565.3 | 36768.1 | 40440.4 | 42634.8 | 56632.8 | 66654.4 | 82954.4 |
| Income collected | 30618.1 | 35469.1 | 39013.2 | 42836.6 | 55061.6 | 66670.4 | 83721.5 |
| Over/Less | -1947.2 | -1299.0 | -1427.2 | 201.8 | -1571.2 | 16.0 | 767.1 |

Performance of collected income /past 7 years/



Upon implementing of the Project, the company's debt repayment works have been intensified and according to auditing recommendations for company's financial performance, which done by KPMG-International auditing company, debts occurred before 2003 are separated from the branches and bad debts worth 5,231.5 million MNT has been transferred to company's registration as well as upon receiving and validation of 2227 customers request and complains, the 67.1 million MNT worth debts are separated from customers account.

C. Improved reliability

There were significant economic and technical reform investment in the distribution business activities since UDEDN and AEPs have received and operating various machineries, equipment and testing tools etc, supplied under rehabilitation works done within distribution network loss reduction Project. Upon rehabilitation of "ger" area OHL, the calls and complaints regarding power quality and distribution have decreased and voltage drop and operational failures and downtimes reduced due to sub-station's outlets load balancing.

Upon fixing up failures in short time, the network reliability operation is increased and customers will be able to get power quickly and thus resulting to reduce dead expenses. Throughout the company, the System Average Interruption Duration Index (SAIDI) has decreased by 5.2% in 2009 comparing to previous 2008. The System Average Interruption Frequency Index (SAIFI) has decreased by 0,3% and the Customer Average Interruption Duration Index (CAIDI) has decreased by 7,7 minutes compare to previous year. The interruption call ups of UBEDN in 2008 were 10586 and it reduced up to 8058 in 2009. Therefore it is obvious that outcomes of works, performed in the framework of the Project are actualized and have a positive impact on distribution business.

Table A7.3 UBEDN Electricity Supply Interruption Index

| | Interruption Index | 2006 | 2007 | 2008 | 2009 | 2013 |
|---|--------------------|------|------|------|------|-------|
| 1 | SAIDI | 1487 | 2157 | 2699 | 2558 | 397.5 |
| 2 | SAIFI | 14 | 14 | 17 | 17 | 7.16 |
| 3 | CAIDI | 106 | 150 | 157 | 149 | |

D. Institutional strengthening

Within the Project main scope of objectives, several training abroad were planned in order to transfer UBEDN into commercial activities, upgrading AEPs performance management, capacity building of organizational structures and staff capabilities, reducing power electricity technical and adverse (non-technical) losses as well as to improve power system efficiency.

During these trainings, the employees have been introduced and familiarized with equipment and technologies as well as organizational structures and management adopted in particular country and company and based on that have developed their own ideas and initiatives to improve existing situation and this had positive impacts on company's performances.

Under this project for improving financial management of aimags energy utilities, the finance and sales integrated software was installed. Moreover, in developing investment plan, aimags have put into an order the investment works according to their priority and allocated them for next 4 years. In calculating financing sources of investment in the financial planning section of their business plans, at first they determined internal financing potential based on cash flow planning. Hereupon, they have estimated the necessary financing required for investment to be financed out of external sources. The distribution companies are required to seek sources for financing for the works put in the investment plan which were planned to be financed out of the state and local budget.

V. Overall assessment of World Bank and Government Performance

The overall performance of the World Bank in preparing and implementing the project is rated as **satisfactory**. While initial progress made on the project was slow, the World Bank responded timely and came up with action plans to follow during supervision, and ensured that the central objective of the project was effectively attained.

The overall performance of the Government of Mongolia in preparing and implementing the project is rated as **satisfactory**. The Government placed priority on achieving the objectives of the project and demonstrated ownership as project proceeded, despite weak coordination in the early stages of project implementation. The PIU was able to effectively negotiate between the project stakeholders in implementing the project, and keep monitoring project work progress, its quality and performance and timely solving critical issues and successfully managed construction work acceptance and handover by State Committee. Also it provided Project progress reports to the PSC as well as keep

communicating and coordinating with relevant specialists from the World Bank. Moreover, annual and quarterly financial statements and financial management reports were prepared and submitted to district tax authority, and IFR or internal financial reports were prepared according to the form provided by the World Bank and submitted to the World Bank, Ministry of Mineral and Energy and Ministry of Finance. The financial statements of the projects were audited by external auditor and measures in accordance with the recommendations in audit report.

VI. Lessons and Experiences

A. Procurement and coordination

Initially, due to insufficient supply of materials under domestic financing as well as household's inlet dropping cable under overseas financing, the delay on work performance and scheduling of Contractors happened. After close coordination among government agencies, World Bank, and repackaging of procurement packages, the delay was reduced.

B. Contract management

Complexity of contracts and insufficient contract management contributed to the implementation delay. As project proceeded, the PIU and PSC improved their ability in dealing with complicated contracts and resolving disputes, through training, technical support, and learning by doing. Moreover, the monitoring engineers from Technical Project Unit and AEPs Project Support Units were responsible to keep working relationships and communications between customers, operators and contractors including solution of any disputes and complaints and take operative countermeasures and/or escalating the to the proper decision making management level.

C. Public campaigns and marketing PR activities

The information dissemination works have been done to provide customers correct and operative information on the Project. The supply service department also provided information about project importance and construction and installation works as well as benefits for "ger" area residents as well as provided required necessary information on timely manner. Upon receiving customers complaints and suggestions and taking proper solution, the public advertisement in relation with construction works have been done in parallel including introducing project related activities to the general public, further actions, making presentation on new equipment and technologies etc.

VII. Follow-up Activities

There exist possible follow-up activities that could be supported by the World Bank and are currently being pursued.

First, there is a need for the World Bank to expand the support to other aimags. For example, two regional distribution companies outside Ulaanbaatar expressed strong

interests in replicating some key components of the Energy Sector Project in their service areas. Both aimags presented a compelling case for investments in loss reduction and capacity expansion.

Second, there is a possibility for continuing technical assistance to the ERA (now Energy Regulatory Commission). In specific, the priority areas are (1) methodology on tariff and price indexation; (2) methodology for setting fuel price used for energy generation and its calculation; (3) electricity market model and rules; (4) strengthening of ERC independence and autonomy; and (5) capacity building of ERC staff.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

n.a.

Annex 9. List of Supporting Documents

Project Appraisal Document

Project Agreement

DCA and SLAs

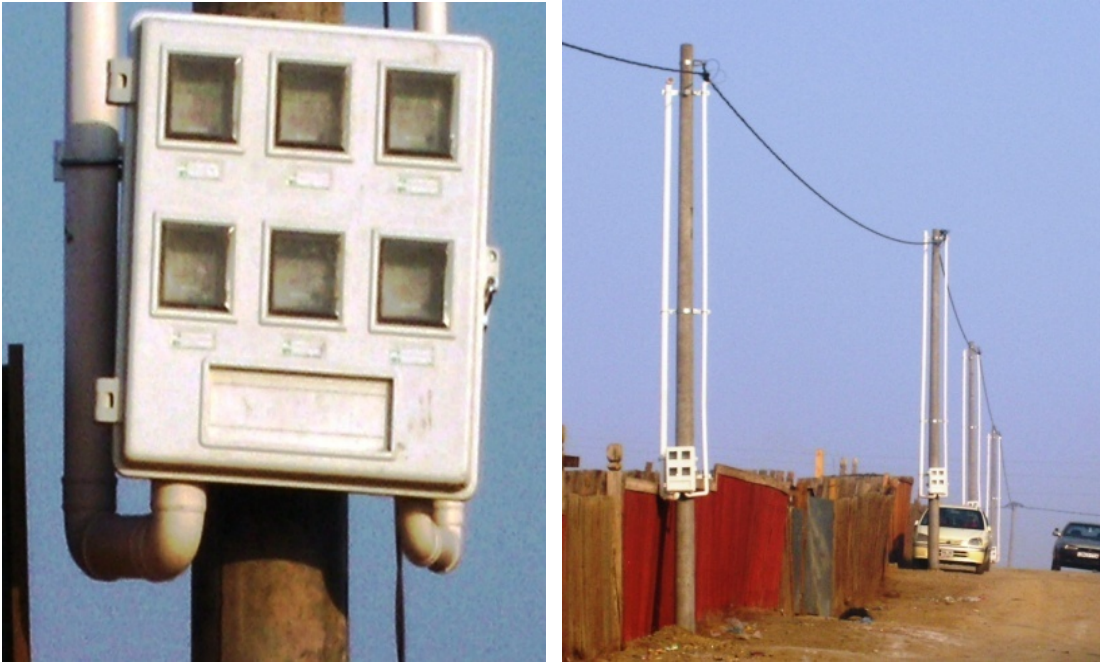
WB Implementation Status Reports

Aide Memoires and Management Letters

Progress Reports submitted by the Borrower

QAG comments

Annex 10. Photos of Project Investments and Training Activities



Under project rehabilitated Overhead Line with concrete pole and plastic meter boxes in ger areas Eastern Distribution Center of UBEDN



Rehabilitated transformers substation with wooden and concrete poles in ger areas















TP900 remote type Hand Held Meter Reading Devices is used to read meters with DDSF22/RF/ type radio modem



Special task team organized training about determining system losses and analyzing sales activities to engineers, technical staffs and sales workers of “Khuvsgul”, “Bayan-Ulgii”, and “Umnugovi” Energy Utilities on 2010.



MONGOLIA ENERGY SECTOR PROJECT

-  UBEDN ELECTRICITY DISTRIBUTION COMPONENT
- AIMAG ENERGY COMPONENTS:
-  PHASE I
-  PHASE II
-  PAVED ROADS
-  GRAVEL ROADS
-  EARTH ROADS
-  RAILROADS
-  NATIONAL CAPITAL
-  AIMAG (PROVINCE) CAPITALS
-  MAIN CITIES
-  AIMAG (PROVINCE) BOUNDARIES
-  INTERNATIONAL BOUNDARIES



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