



1. Project Data

Project ID P152343	Project Name Mongolia: Second Energy Sector Project	
Country Mongolia	Practice Area(Lead) Energy & Extractives	
L/C/TF Number(s) IDA-61020,WBTF-A4506	Closing Date (Original) 30-Sep-2022	Total Project Cost (USD) 53,303,557.51
Bank Approval Date 15-Jun-2017	Closing Date (Actual) 31-Aug-2024	
	IBRD/IDA (USD)	Grants (USD)
Original Commitment	42,000,000.00	12,400,000.00
Revised Commitment	41,625,823.00	12,313,093.34
Actual	41,035,560.01	12,313,093.34

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2. Project Objectives and Components

a. Objectives

The Original Project Development Objective (PDO) was “to improve reliability and sustainability of electricity services in Mongolia.” (Financing Agreement, page 6). The PDO was phrased identically in the Project Appraisal Document (PAD) (PAD, page 4).

The Project’s PDO was not revised during implementation.



For the purposes of this Implementation Completion and Results Report (ICR) review, the PDO will be parsed into two objectives:

PDO1: To improve reliability of electricity services in Mongolia.

PDO2: To improve sustainability of electricity services in Mongolia.

b. Were the project objectives/key associated outcome targets revised during implementation?

No

c. Will a split evaluation be undertaken?

No

d. Components

1. Original components

Component 1: Rehabilitation of Distribution Networks (cost at appraisal: US\$28.5 million; actual amount at closure: US\$28.2 million) covered nine subprojects appraised during Project preparation (Group I), with a potential to finance additional ones (Group II) if funds remain. It comprised three subcomponents:

Subcomponent 1.1 (BSEDN) aimed to rehabilitate the Baganuur-Southeastern Region Electricity Distribution Network (BSEDN) distribution grid, including upgrades to primary and distribution substations, distribution lines, and single-phase meters, as well as installation of digital metering - Advanced Metering Infrastructure (AMI) and Advanced Metering Reading (AMR). These activities were intended to enhance both the reliability and sustainability of electricity service by reducing system losses (both technical and non-technical), improving supply quality, and narrowing the gap between available supply and demand.

Subcomponent 1.2 (EBEDN) aimed to implement the same activities as Subcomponent 1.1 in the Erdenet-Bulgan Electricity Distribution Network (EBEDN).

Subcomponent 1.3 aimed to support the National Power Transmission Grid (NPTG, the country's single transmission company) by: (i) procuring transmission switchgear for the lines and substations rehabilitated under Subcomponents 1.1 and 1.2; and (ii) installing planning and management software.

Component 2: Solar Power (cost at appraisal: US\$24.9 million; actual amount at closure: US\$23.1 million) aimed to demonstrate solar PV generation in remote rural areas by financing a 10-megawatt-peak (MWp) grid-connected solar photovoltaic (PV) plant in the Western Energy System (WES) (including design, construction, commissioning, and operations & maintenance (O&M)), an additional 3-7 MWp of solar PV capacity in the Central Energy System (CES), and, If funds remain available, further solar sub-projects outside of CES; all subprojects would require feasibility studies and safeguards documentation.

Component 3: Capacity Building (cost at appraisal: US\$2.0 million; actual amount at closure: US\$2.0 million) aimed to support capacity building for the Ministry of Energy (MOE) and Project Implementing Units (PIUs) under BSEDN, EBEDN, and WES; finance studies and training; and fund Project management.



Revised Components:

The components were not revised.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: The appraisal estimate was US\$55.40 million and revised to US\$54.4 million during Restructuring 1 in August 2022. The actual disbursement at closure was US\$53.35 million, while the amount of US\$1.05 million was undisbursed (Operations Portal; ICR, page 4, paragraph 11).

Project Financing: The Project was financed through an IDA grant of US\$42.0 million, with US\$41.04 million disbursed at closure; and a Strategic Climate Fund grant of US\$12.4 million, with US\$12.31 million disbursed at closure.

Borrower/Recipient (WAPP's) contribution: Borrower contribution of US\$1.0 million was planned at appraisal, but it was cancelled at Restructuring 1.

Project Dates: The Project was approved on June 15, 2017, and became effective on December 15, 2017. The mid-term review (MTR) was completed on April 27, 2021. The Project was restructured twice: (i) on August 31, 2022; and (ii) on March 11, 2024. The original closing date of September 30, 2022 was extended twice for a total of 25 months (two years and one month), and the Project closed on August 31, 2024.

Restructurings:

Restructuring 1 (August 31, 2022):

- Expanded Component 1 to include network rehabilitation in WES and reallocated \$2.8 million for these activities from savings in Component 2.
- Updated the Results Framework (RF) accordingly, by adding two output-level Intermediate Results Indicators (IRI) indicator: (i) length of rehabilitated/constructed distribution lines in WES; and (ii) grievance cases resolved. No indicator targets were reduced.
- Initiated preparation of OP 4.10 Indigenous Peoples (IPs) safeguards, triggered by the Project's expansion in WES and potential impact on the Kazak ethnic group.
- Extended the closing date by 18 months, from September 30, 2022, to March 31, 2024, due to: (i) additional works in WES; and (ii) COVID-19–related delays.

Restructuring 2 (May 29, 2024):

- Extended the closing date by five months, from April 1, 2024 to August 31, 2024, to complete activities added during Restructuring 1.

Split evaluation. A split evaluation was not applied, as there was no reduction in the Project's scope, ambition, and targeted outcomes.



3. Relevance of Objectives

Rationale

Country and Sector Context. At Project appraisal, Mongolia's GDP growth had sharply declined - from 7.9 percent in 2014 to 1.0 percent in 2016 - mainly due to falling commodity prices and a slowdown in China, in an economy heavily dependent on mineral exports, largely to China. Annual household consumption fell by 8.8 percent in 2016, and the unemployment rate increased to 8.6 percent. Adequate electricity services were critical to support economic development and diversification. However, Mongolia's electricity sector faced serious challenges. Rapid industrialization and urbanization drove a surge in electricity demand, creating a demand-supply gap – reflected in a negative reserve margin of 10 percent – covered largely by imports, which accounted for 20 percent of consumption in 2015. Although national electricity access exceeded 90 percent, service quality was unreliable and unsustainable due to outdated infrastructure with high system losses and low quality of supply, a coal-heavy generation mix, and growing dependence on imports. WES was particularly energy-insecure, importing 81 percent of its electricity, mostly from Russia. More than half of distribution lines were over 35 years old, and another third were 15-30 years old, with many operating at capacity. System losses exceeded 25 percent in many networks, and service interruptions were frequent, lasting 20 hours on average in some regions. Coal accounted for 96 percent of total domestic generation in 2016, driving high GHG emissions and severe local pollution. The government needed support to meet rising demand for electricity, reduce reliance on coal, and improve energy security. Priority solutions included upgrading and expanding distribution networks and scaling up renewable energy (RE), particularly solar PV due to its declining costs. The Project was designed to upgrade aging assets, expand distribution capacity, and develop solar energy in selected areas. (PAD, pages 2-3; ICR, pages 1-2)

Relevance to Government Strategies at closure. The Project remained aligned with Mongolia's strategic priorities. It supported Vision 2050, specifically Objective 4.2, which calls for expanding and upgrading generation, transmission, and distribution systems, introducing new energy sources, and achieving electricity self-sufficiency; and Objective 6.4, which emphasizes climate change mitigation through a low-emission, productive, and inclusive green economy (ICR, page 7). The Project also aligned with the government's energy policy target of achieving 30 percent renewable installed capacity by 2030, and with the Just Energy Transition Framework launched in November 2025 to ensure a socially just, economically resilient, and environmentally sustainable energy transition. In addition, it was consistent with the State Policy on Energy (2015–2030), which prioritizes reliable energy supply, operational security, energy-saving measures, and the adoption of innovative advanced technologies. (ICR, page 1)

Relevance to the WBG's Assistance Strategies at closure. The Project remained aligned with the WBG's Country Partnership Framework (CPF) for FY2021-25, which was in effect at the time of Project closure. It supported CPF's *Focus Area 2: Boosting Competitiveness*, specifically *Objective 2.4: Improving Connectivity through Sustainable Infrastructure*, which highlighted the challenges of meeting growing electricity demand and the need for new generation capacity, network upgrades, reduced reliance on coal, and the development and grid integration of RE - particularly solar. Under *Cross-Cutting Themes*, the CPF emphasized climate mitigation, including such priorities as increasing share of RE energy sources and improving efficiency of energy production. (CPF FY 2021-25, pages 27-28, 34-36)

Previous sector experience. The Project built on earlier energy sector initiatives, notably the *First Energy Sector Project* (ESP1, P512300), implemented from 2001 to 2013, which focused on rehabilitating and modernizing parts of the distribution network and strengthening institutional capacity. Learning from ESP1, the Project focused on upgrading the BSEDN, EBEDN, and WES distribution networks, which were not



covered under ESP1. It also drew on lessons from the *Renewable Energy for Rural Access Project* (REAP, P099321) and the Bank's international experience in solar power development, particularly in Nepal and India, as well as the Climate Investment Fund's (CIF's) *Scaling-Up Renewable Energy Program* (SREP). (ICR, page 2)

The PDO was aligned with the country's development needs and government priorities, as well as with the WBG's assistance strategies. The Project built on the WBG's prior engagement in supporting electricity sector in Mongolia. Accordingly, the rating for Relevance of Objectives is High.

Rating

High

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

To improve reliability of electricity services in Mongolia.

Rationale

A Theory of Change (ToC) was not included in the PAD but was developed for the ICR. It outlined the Project's activities/inputs, outputs/intermediate outcomes, PDO outcomes, and long-term impacts, with clear logical links from one level of the results chain to the next. To achieve Objective 1, the Project supported the rehabilitation of distribution networks. Expected outputs/intermediate outcomes included: (i) rehabilitated or newly constructed distribution lines; (ii) installed single phase meters; (iii) reduced distribution losses; (iv) installed switchgear; (v) installed planning and management software; and (vi) resolved grievances. The corresponding PDO 1 outcome was improved reliability of electricity services. The ToC also identified critical assumptions: (i) no constraints in the transmission network or equipment failures; (ii) continued electricity demand growth; (iii) no reduction in hydropower dispatch in WES; and (iv) force majeure conditions (e.g., COVID-19) not preventing trainees from applying skills gained.

Overall, the ToC is logical and clear, with a comprehensive representation of the Project's inputs and results and well-defined causal links. However, the logic could have been further strengthened by separating distribution loss reduction from the list of direct outputs, as it is an outcome resulting from the listed outputs - upgraded power lines, substations, meters, and switchgear – and, together with reduced service interruptions (already treated as an outcome), serves as a measure of improved service reliability. Also, some assumptions could have been articulated more clearly.

The RF for Objective 1 included two outcome level indicators – a PDO indicator of average interruption duration (for BSEDN and EBEDN separately) and an IRI on distribution loss reduction (BSEDN and EBEDN) – and five output level IRIs: (i) length of upgraded distribution lines (BSEDN, EBEDN, and WES), (ii) number of single-phase meters installed (BSEDN and EBEDN), (iii) installed software; (iv) person-days of training, and (v) resolved grievances. The RF was well aligned with the clearly defined PDO and the ToC, and was



technical, comprehensive, and concise, with indicators that were straightforward to monitor. The output indicators appropriately underpinned both Objective 1 and Objective 2 outcome indicators, consistent with Project design. As correctly noted in the ICR, some outcome indicators were categorized as IRIs (ICR, page 16). Specifically, under Objective 1, the distribution loss indicator was classified as an IRI, while the average interruptions indicator was listed as a PDO indicator. Although the ICR identifies such classification as a shortcoming, this Review notes a different view, as it is the accepted practice to include only selected outcome indicators at the PDO level.

Note: The ICR's RF introduced new indicators – on 0.4 kV network distribution losses. However, this undermines the purpose of the RF, which, as per OPCS guidelines, is to document observed achievements at closure and compare them with previously set - at appraisal or during restructurings - baselines and targets. RF indicators cannot be defined after project closure when actual results are already known. While these indicators will be used in the efficacy discussion as information outside the RF, they add limited value in the absence of previously defined targets.

Objective 1 RF indicators:

I. Output indicators specific to Objective 1:

None.

II. Cross-cutting output indicators (supporting both Objectives):

1. "Length of distribution lines rehabilitated and/or constructed (Kilometers (km))":

1.1. BSEDN: baseline: zero, target: 290 km. The achievement was 470 km; the target was exceeded.

1.2. EBEDN: baseline: zero, target: 623 km. The achievement was 734 km; the target was exceeded.

1.3. WES: baseline: zero, target: 100 km. The achievement was 100 km; the target was met.

2. "Number of single-phase meters installed":

2.1. BSEDN: baseline: zero, target: 24,215. The achievement was 33,352 meters; the target was exceeded.

2.2. EBEDN: baseline: zero, target: 38,086. The achievement was 44,224 meters; the target was exceeded.

3. "Installation of the planning and management software (Yes/No)". The target was met.

4. "Training person-days" (baseline: zero, target: 100). The achievement was 635; the target was exceeded. The gender specific target (Person-days of training for female staff) was also exceeded.

5. "Grievances cases resolved in a timely manner (Yes/No)". The target was met.

III. Outcome indicators specific to Objective 1:

1. "Average interruption duration per year in the Project area (Minutes)" (PDO indicators):



1.1. BSEDN: baseline: 809, target: 647. The achievement at closure was 572 minutes. The target was exceeded.

1.2. EBEDN: baseline: 1,200, target: 960. The achievement at closure was 749 minutes. The target was exceeded.

IV. Cross-cutting outcome indicators (supporting both Objectives):

1. "Distribution loss in the Project area (%)":

1.1. BSEDN: baseline: 25.7 percent, target: 15 percent. The achievement was 17.5 percent; the target was 76.6 percent (substantially) achieved.

1.2. EBEDN: baseline: 21.8 percent, target: 13.4 percent. The achievement was 13.9 percent; the target was 94.0 percent (almost fully) achieved.

Overall, the Project substantially achieved Objective 1. It upgraded and constructing distribution networks and substations, installed single-phase meters and switchgear, and deployed digital customer metering. As a result, both distribution system losses - a key outcome level indicator of network reliability and of reduced electricity theft - and average interruption duration - a core outcome level indicator of supply quality - substantially decreased.

All RF targets were exceeded, met, or almost fully achieved, except the outcome-level IRI on distribution losses in the entire BSEDN system, which was achieved at 76.6 percent. The ICR explains that this indicator did not fully capture Project results because the interventions focused on the 0.4 kV segment (ICR, page 9). However, this indicator was appropriately included at appraisal, when upgrades across 0.4 kV, 6 kV, and 10 kV networks (with emphasis on 0.4 kV) were planned, with no specific lines identified due to the framework design approach (source: PAD, communication with the Project team). The indicator remained in place through closure, indicating it was still considered relevant. While the ICR reports reduction in distribution losses in the 0.4 kV network (BDEN: from 24.6 percent to 19.0 percent; EBEDN: from 9.1 to 7.0 percent) as supplementary indicators to the RF's indicators of losses across the entire networks, their contribution to the efficacy analysis is limited without previously established targets.

Rating. The efficacy rating for Objective 1 is Substantial. The Project made a substantial contribution to improving network and electricity service reliability in the targeted regions. All outcome and output level RF targets were exceeded, met, or almost fully achieved, except the outcome-level distribution loss indicator for BSEDN, which was substantially achieved.

Rating
Substantial

OBJECTIVE 2

Objective

To improve sustainability of electricity services in Mongolia.



Rationale

A Theory of Change (ToC) was not included in the PAD but was developed for the ICR. It outlined the Project's activities/inputs, outputs/intermediate outcomes, PDO outcomes, and long-term impacts, with clear logical links from one level of the results chain to the next. To achieve Objective 2, the Project supported the rehabilitation of distribution networks and solar power plant construction. Expected outputs/intermediate outcomes included: (i) constructed and commissioned solar PV power plant; (ii) rehabilitated or constructed distribution lines; (iii) installed single phase meters; and (iv) reduced distribution losses; (v) installed switchgears; (vi) installed planning and management software; and (vii) resolved grievances. The corresponding PDO 2 outcome was improved sustainability of electricity services. The ToC also identified critical assumptions: (i) no constraints in the transmission network and no equipment failures; (ii) continued electricity demand growth; (iii) no reduction in hydropower dispatch in WES; and (iv) force majeure conditions (e.g., COVID-19) not preventing trainees from applying skills gained.

Overall, the ToC is logical and clear, with a comprehensive representation of the Project's inputs and results and well-defined causal links. However, the logic could have been further strengthened by separating the outcome of distribution loss reduction from the list of direct outputs (see details under Objective 1). Also, some ToC assumptions could have been presented more clearly.

The RF for Objective 2 included six outcome level indicators: (i) a PDO indicator on commissioned and functioning solar PV capacity, (ii) an IRI on generated solar energy, (iii) an IRI on the number of people provided with electricity due to the solar plant, (iv) IRIs on additional electricity supplied in BSEDN and EBEDN, (v) IRIs on distribution loss reduction (BSEDN and EBEDN), and (vi) an IRI on GHG emission reduction. It also included five output level IRIs: (i) length of upgraded distribution lines (BSEDN, EBEDN, and WES), (ii) number of single-phase meters installed (BSEDN and EBEDN), (iii) installed software; (iv) person-days of training, and (v) resolved grievances.

The RF was well aligned with the clearly defined PDO and the ToC and provided good coverage of expected results. It was technically grounded, comprehensive, and concise, with indicators that were straightforward to monitor. Most output indicators appropriately underpinned both Objective 1 and Objective 2 outcome indicators, consistent with the Project design. As correctly noted in the ICR, some outcome indicators were categorized as IRIs – for Objective 2, these were: generated solar energy, people provided with access due to the solar plant, additional power supply in the regions, and GHG emission reduction. Although the ICR identifies such classification as a shortcoming, this Review notes a different view, as it is standard practice to include only selected outcome indicators at the PDO level.

The ICR also criticizes the use of constructed and commissioned solar plant capacity as an outcome indicator, arguing that it is an output. This Review agrees that electricity generation is a typical outcome indicator for power plants. For conventional plants, generation can be reliably estimated at appraisal from capacity to be financed, and therefore using generation as a PDO indicator may be reasonable. For solar plants, however, generation depends heavily on sunlight, which can differ year-to-year - outside the control of the team. It is therefore more appropriate not to use generation as a PDO indicator and instead rely on commissioned and fully functional capacity, as in this Project's RF.

Note: The ICR's RF includes an IRI - "10 MWp grid connected solar PV plant is commissioned in WES" - that was not part of the RF though Project closure. This indicator simply rephrases an RF's PDO indicator. Accordingly, this Review does not use it and refers to the wording in the actual Project RF.



Objective 2 RF indicators:

I. Output/intermediate outcome indicators specific to Objective 2:

None.

II. Cross-cutting output/intermediate outcome indicators (supporting both Objectives):

Please see the list under Objective 1.

III. Outcome indicators specific to Objective 2:

A. Solar plant construction outcomes:

1. “Generated solar energy under the Project (Gigawatt-hour (GWh))” (baseline: zero, target: 42 GWh). The achievement at closure was 58.7 GWh; the target was exceeded. The ICR noted that the utility-scale solar PV plant constructed and commissioned under the Project was already operational in 2022 when it surpassed its annual target of 14 GWh. In 2023 and 2024, it was in full operation and generated more than 21 GWh per year.

2. “Generation Capacity of Renewable Energy (other than hydropower) constructed (MW)” (baseline: zero, target: 10 MW). The achievement at closure was 10 MW; the target was reached.

3. “People provided with access to electricity under the project by household connection (Number)” (baseline: zero, target: 161,280 people). The achievement at closure was 189,957 people; the target was exceeded. The sub-indicator targets for female and youth beneficiaries were also exceeded. This indicator measured the number of customers who received new or improved connections as a result of the solar plant’s construction.

B. Overall outcomes:

1. “Additional electricity supplied in Project area-BSEDN (Megawatt hour (MWh)/year)”:

1.1. BSEDN: baseline: zero, target: 57,760 MWh/year. The achievement at closure (for 2024) was 28,512 MWh/year; the target was 49.4 percent (partially) achieved. The ICR reported that the 2024 shortfall occurred because 45 percent of the Project-upgraded substations had not been yet operational for the full year. At IEG’s request, the team provided 2025 data: the achievement was 63,455 MWh, surpassing the target.

1.2. EBEDN: baseline: zero, target: 47,769 MWh/year. The achievement at closure was 51,756 MWh/year; the target was exceeded.

2. “Estimated GHG emission reduction (Tones/year)” (baseline: zero, target: 65,355 tons/year). The achievement at closure was 38,794 tons/year; the target was 59.4 percent (partially) achieved.

IV. Cross-cutting outcome indicators (supporting both Objectives):

Please see the list under Objective 1.

Overall, the Project substantially achieved Objective 2. It helped address insufficient electricity supply, reliance on coal, and energy security constraints – thereby enhancing the sustainability of electricity services.



Key activities were: constructing a grid-connected solar plant, upgrading and constructing distribution networks, installing single phase meters and switchgear, and deploying digital customer metering. As a result, domestic electricity generation increased, while technical losses, electricity theft, import demand, and GHG emissions declined. The latter reflected both the clean energy produced by the solar plant - substituting for largely fossil-based imports—and the reduced system losses, which lowered demand for (mostly fossil-fueled) generation relative to the without-project baseline.

Most RF targets were exceeded, met, or nearly met, except for three outcomes:

- Distribution loss reduction in the BSEDN, which was only 76.6 percent (substantially) achieved (see discussion under Objective 1, concluding that the target was not fully met).
- GHG emission reduction, which was only 59.4 percent (partially) achieved. This indicator was derived from: (i) solar generation replacing coal-based supply, and (ii) network upgrades lowering technical losses. The ICR noted that the solar plant-related emission reduction target was exceeded, leaving the shortfall attributable to technical loss reduction. However, this shortfall was not large enough to explain the partially met overall emission reduction target. At IEG's request, the team clarified that the target had been significantly overestimated at appraisal and was not aligned with the underlying expected results. The estimate had been imprecisely derived - calculated for the entire network, proportionate to the anticipated level of network upgrades. The shortfall could reflect a reduced share of large consumers (typically with lower losses) and/or further deterioration in non-upgraded network, among other possible reasons.

Rating. The efficacy rating for Objective 2 is Substantial with minor shortcomings due to two outcomes that were only partially achieved. The Project made a strong contribution to improving electricity service sustainability in the targeted regions. All RF targets were exceeded, met, or nearly achieved, except the following outcomes: (i) distribution loss reduction in BSEDN, which was substantially met, and (ii) GHG emission reduction, which fell short due to the incomplete loss reduction and an overestimated appraisal target not aligned with the underlying expected results.

Rating
Substantial

OVERALL EFFICACY

Rationale

Efficacy is rated Substantial. The Project made a substantial contribution to improving electricity service reliability and sustainability in the targeted regions. All outcome and output level RF targets were exceeded, met, or almost fully achieved, except the following outcomes: distribution loss reduction in BSEDN, which was substantially achieved, and GHG emission reduction, for which the target was not precisely estimated.



Overall Efficacy Rating

Substantial

5. Efficiency

a. Economic Analysis (PAD, pages 11, 54-50; ICR, pages 12-14, 31-51):

A cost-benefit analysis (CBA) was conducted at both appraisal and closure using comparable methodologies, with a 6-percent discount rate and a 25-year Project life. Components 1 and 2 were assessed separately. Carbon price was US\$32 per ton of CO₂ in 2017 and US\$69.5 per ton of CO₂ in 2043, based on the Bank's *Guidance Note on Social Value of Carbon* (2014). At closure, this price was retained, while an updated carbon price of US\$83/ton – average EU Emission Trading System (ETS) permit prices from 2022-2024 - was also applied. Both the net present value (NPV) and an economic internal rate of return (EIRR) were calculated at appraisal, while only the NPV was calculated at closure.

I. At appraisal.

Distribution network upgrades (Component 1):

- Economic benefits included: (i) avoided power outages (valued at the cost of self-generated diesel power); (ii) reduced technical losses (valued at half the cost of diesel-based generation); and (iii) avoided GHG emissions.
- Results of economic analysis were: NPV of US\$13.3 million, and EIRR of 10.4 percent, comprising: (i) BSEDN network: NPV of US\$8.1 million and EIRR of 12.0 percent; and (ii) EBEDN network: NPV of US\$5.2 million and EIRR of 9.2 percent.

Solar PV plant (Component 2):

- Economic benefits included: (i) savings from import replacement; (ii) additional power supply; (iii) avoided transmission losses; and (iv) avoided GHG emissions compared to imports (using the same valuation approach as Component 1)
- Results of economic analysis: NPV of US\$1.7 million, and EIRR of 6.9 percent.

II. At closure.

Distribution network upgrades (Component 1):

- Economic benefits included: (i) avoided power outages (valued at the cost of self-generated diesel power); (ii) reduced technical losses (valued at the bulk electricity purchase price); (iii) reduced commercial losses (valued as the average between the users' maximum willingness to pay and the pre-Project marginal cost of zero for unpaid consumption); (iv) additional electricity supplied due to upgraded networks (valued at the retail–bulk price differential); and (v) avoided GHG emissions (valued as at appraisal).
- Results of economic analysis: NPV of US\$15.9 million, comprising: (i) BSDEN: NPV of -US\$ 2.2 million (lower than the appraisal estimate due to the focus on the smaller 0.4 kV segments); and (ii) EBEDN:



NPV of US\$18.1 million. With the updated carbon price, Component 1 NPV rose to US\$17.1 million, comprising -US\$1.6 million in BSEDN and US\$18.7 million in EBEDN.

Solar PV plant (Component 2):

- Economic benefits comprised: (i) import replacement savings; (ii) additional power supply; (iii) avoided transmission losses; and (iv) avoided GHG emissions, compared to imported generation sources (valued as under Component 1)
- Results of economic analysis: NPV of -US\$0.8 million, increasing to US\$1.6 million when the updated carbon price was applied.

Overall, for Component 1, NPVs were positive at both appraisal and closure, and higher at closure than at appraisal (the ICR stated the opposite by error in para 49), indicating higher value added than expected. The above-expectations EBEDN NPV offset the lower-than-appraisal BSEDN NPV. For Component 2, the NPV was positive at appraisal and positive at closure with the updated carbon price. EIRRs - calculated only at appraisal - exceeded the opportunity cost of capital (the discount rate) for both components, suggesting expected economic viability.

b. Administrative Efficiency:

The ICR noted that the Project was well-structured and simple in design, drawing on lessons from the *First Energy Sector Project* (ESP1, P152343), the *Renewable Energy for Rural Access Project* (REAP, P099321), and Bank's broader solar development experience, such as in Nepal and India. Lessons included intensive technical training and TA, and hiring technical staff for PIUs and international technical consultants. The PDO was clear and the RF design adequate, with good coverage of outcomes and outputs. Key risks – potential delays from post-election administration changes, macroeconomic pressures, weak financial position of utilities, and the introduction of innovative technologies – were adequately mitigated through government engagement and advice on policy, sector reform, and technical issues. Implementation arrangements were robust, with a Project Steering Committee (PSC) providing oversight, a Project Management Office (PMO) in the Ministry of Energy - staffed partly by former ESP1 personnel, - and a Project Implementation Unit (PIU) in each beneficiary entity - BSEDN, EBEDN, and WES. The Project stayed within budget, with savings (due to solar panel cost drop) funding new subprojects. Bank team worked efficiently with the PMO to address issues such as delays in Group II investments and a VAT dispute on solar plant imports. (PAD, pages 7-10; ICR, pages 15-16, 18-19)

However, the Project was extended by 25 months - 18 months to implement subprojects added during Restructuring 1 (June 2022) and seven months due to inefficiencies. External factors included COVID-19, which caused equipment delivery delays and suspended training, and government changes after the 2016 and 2020 parliamentary elections and the 2017 presidential elections. These contributed to a three-month delay in effectiveness and a slow establishment of the PMO and PIUs (bridged by a "Study Team"). Internal factors included: (i) appraisal of only Group I subprojects by Project effectiveness (with Group II left unprepared by design); and (ii) procurement issues. The ICR noted that partial appraisal could have been mitigated by including technical assistance (TA) to prepare Group II subprojects after effectiveness, with their implementation funded by additional financing. Procurement was hindered by contracting unreadiness, causing multiple contract extensions; a four-month vacancy of the procurement specialist position in 2020; and slow bid evaluations and disbursements due to bidding documents requiring revisions to meet Bank standards. (RP1, page 5; ICR, pages 15-16)



On balance - considering the higher Component 1 NPV at closure than at appraisal; the positive Component 2 NPV when using the updated carbon price and its demonstration nature (with costs declining at scale); strong project preparation; and hands-on implementation addressing challenges caused mainly by external factors - the efficiency rating is assessed as Substantial with moderate shortcomings due to the negative to low NPVs and marginal EIRRs (at appraisal), slow contracting and implementation delays.

Efficiency Rating

Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal		0	0 <input type="checkbox"/> Not Applicable
ICR Estimate		0	0 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

Relevance of objectives is rated as High, while both efficacy and efficiency are Substantial with minor to moderate shortcomings. As such, overall outcome is rated as Satisfactory .

a. Outcome Rating

Satisfactory

7. Risk to Development Outcome

Government ownership and commitment. The Project was affected by changes in government administration. Future elections and subsequent turnover in sector leadership could jeopardize continued support for maintaining the Project-financed assets (including the network and solar plant) and for scaling up the pilot solar plant. However, the Project delivered intensive technical training to help retain institutional knowledge and financed the solar plant's O&M for the first two years, allowing WES to gain experience before assuming full operational responsibility (PAD, p. 6). The WBG country team has been engaged in good governance, transparency and oversight initiatives at the national level, helping to mitigate these risks (PAD, page 9). Falling solar equipment prices also make the pilot's scale-up more viable, reducing the risk that solar energy development will stall.



Macroeconomic. The economy is highly reliant on mineral exports, with a significant share traded to China. Given commodity price volatility and reduced demand from China, the country remains vulnerable to unstable economic growth and external shocks, which can weaken fiscal health and limit funding for O&M of the built or upgraded assets, as well as for continued investments in solar energy. However, the government recognizes the need for economic diversification, starting with a strategic development plan, and the WBG is advising on appropriate economic policies to help restore economic stability and establish efficient, fiscally sustainable investment planning (PAD, page 10). These efforts help to mitigate this risk.

Financial position of utilities. As a result of unsustainable sector policies, including below-cost-recovery tariffs and chronic sector debt, the financial performance of distribution companies is weak, limiting their ability to finance O&M and investment needs required to sustain Project outcomes. The WBG has been advising on sector reforms, helping mitigate this risk to the extent possible.

Technical. As noted in the PAD, the increased complexity of the networks' operation, particularly related to the integration of the solar plant, combined with the lack of basic tools and limited capacity within WES, creates technical risks for the continued optimal functioning of the Project-funded assets. However, Mongolia has prior experience with solar plants, and international lessons and best practices were incorporated into the Project. In addition, the Project's intensive training and knowledge-sharing activities have helped to mitigated this risk. (PAD, page 10)

8. Assessment of Bank Performance

a. Quality-at-Entry

The Project design was simple and well structured, drawing on lessons from the predecessor operation (ESP1, P152343) and from similar Bank's RE investments globally and in the region. Risks were correctly identified, with the major ones—post-election changes in administration, macroeconomic pressures, and weak utility finances—largely outside the Bank's control. These were adequately mitigated through continuous counterpart engagement and policy and strategy advice. Implementation arrangements were strong and established in advance (see details in section 5), and M&E was adequately designed.

However, there were some shortcomings. The ICR noted that partial appraisal of subprojects during preparation (by design, Group I was appraised but Group II was left unprepared) caused inefficiencies. Additionally, contract unreadiness necessitated multiple contract extensions, and unfamiliarity with Bank requirements to bidding documents led to lengthy revisions. (PAD, pages 7-10; ICR, pages 15-16, 18-19)

Quality-at-Entry Rating

Satisfactory

b. Quality of supervision

The ICR noted that the Bank team provided consistent implementation support, with regular in-person or virtual missions and 11 Implementation Status and Results Reports (ISRs) filed. A Mid-Term Review (MTR)



was conducted virtually in April 27-May 7, 2021, due to COVID-19 pandemic. Implementation benefited from efficient institutional arrangements; continuous Bank collaboration with the PMO, PIUs, and government counterparts; and strong Bank support across the areas of procurement, financial management, social protection, and technology. Procurement challenges were actively addressed through intensive training, seminars, and advisory support. The Bank team also actively helped resolve delays in Group II investments and a VAT dispute on solar plant imports. The Project further benefited from the Bank team's strong technical expertise and specialized consultants.

However, some shortcomings are noted, mainly procurement bottlenecks that led to multiple contract extensions, a four-month vacancy of the PMO procurement specialist position, and slow bid evaluation. However, procurement performance improved significantly - from Moderately Unsatisfactory in June 2021 to Satisfactory in June 2023. (PAD, pages 7-10; ICR, pages 15-16, 18-19)

Overall, the Bank performance is rated as Satisfactory. Both design and implementation were strong, although each had some shortcomings.

Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

The RF at design was aligned with the clearly defined PDO and featured time-bound, specific, objective, and Project-attributable indicators that were mostly quantitative and had baselines and targets. It was technically sound and concise, with easy-to-monitor indicators that covered activities and expected results adequately. Output indicators logically underpinned outcome indicators for both objectives. Some outcome indicators were categorized as IRIs – such as distribution loss reduction under Objective 1; and generated solar energy, people gaining electricity access from the solar plant, additional power supply in the regions, and GHG emission reduction under Objective 2. This categorization was appropriate and consistent with standard Bank practice to use selected outcome indicators at the PDO level.

The RF also used the capacity of constructed and commissioned solar plant as the PDO indicator for Objective 2. While electricity generation is often an outcome indicator for conventional power plants, it is less suitable for solar plants where generation depends heavily on sunlight, which varies year-to-year and is outside of Project's control. The team's decision to use generation as an IRI and installed capacity as the PDO indicator was therefore appropriate. Overall, the RF design reflects good practice.

The ICR noted that the outcome-level IRI on distribution losses in the entire BSEDN and EBEDN systems did not fully capture results because the interventions ultimately focused on the 0.4 kV segment (ICR, page 9). However, at appraisal, upgrades were planned across the 0.4 kV, 6 kV, and 10 kV segments. Given the framework design, adjustments to this plan were made during implementation. Nonetheless, this indicator



could have been revised during the restructurings. The ICR also correctly observed that the GHG emission reduction target was overstated at appraisal and was not subsequently revised.

b. M&E Implementation

M&E implementation was carried out as planned, with regular reporting through 11 ISRs, nine Aide Memoires, and an MTR. These documents provided in-depth analysis and conclusions and informed management decisions, guiding implementation and adjustments in this framework-approach Project as needed. No changes were made to the RF during implementation. According to the ICR, “the physical outputs of the Project were consistently monitored, and actions were taken to resolve issues as they arose”.

The ICR noted some delays in timely monitoring of RF indicators but confirmed that all results were submitted and recorded before Project closure. (ICR, page 17)

c. M&E Utilization

M&E data were extensively used in Aide Memoires, ISRs, and the MTR. The Bank team applied the information with technical competence to track progress toward the PDO, flag emerging issues, adjust implementation plans, inform decision-making, support dialogue with key stakeholders, and guide Project restructurings (source: MTR, ISRs, Restructuring papers, Borrower comments in the ICR (page 52)).

The quality of M&E is rated Substantial. The RF design constituted good practice, and M&E implementation and utilization were adequate, despite some shortcomings.

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

Environmental and Social (E&S) Safeguards. At appraisal, the Project was classified as Environmental Category B (Partial Assessment), triggering four safeguards policies: (i) OP/BP 4.01 Environmental and Social Assessment; (ii) OP/BP 4.04 Natural Habitats; (iii) OP/BP 4.11 Physical Cultural Resources; and (iv) OP/BP 4.12 Involuntary Resettlement. An Environmental and Social Management Framework (ESMF) and a Resettlement Policy Framework (RPF) were prepared and disclosed during preparation. During implementation, OP 4.10 Indigenous Peoples was triggered due to the Project’s expansion in WES during Restructuring 1 and potential impact on the Kazak ethnic group; an Indigenous Peoples Plan Framework (IPPF) was subsequently prepared. A Grievance Redress Mechanism was also established. The ICR reported satisfactory ESMF implementation throughout the Project. Waste from the solar plant site was properly transported and disposed of. To address a pre-identified asbestos risk, the Project developed an Environmental Code of Practice (ECOP) to guide safe disposal in coordination with the government. All



grievances were resolved in a timely manner. Safeguards ratings for all OPs were Satisfactory in the last six ISRs (for OP4.10, in the last two ISRs, after the policy was triggered). (PAD, page 14; ICR, page 18)

b. Fiduciary Compliance

Financial management (FM). The ICR noted that FM performance was adequate and provided accurate, timely information on the use of the Bank’s credit and grant proceeds. FM arrangements and practices remained satisfactory throughout implementation, with no weaknesses identified in the internal control system. The PMO addressed issues promptly and effectively. All audit reports were submitted on time and did not note significant FM concerns. After loan closure, however, an expense of US\$45,114 for PMO operations was deemed ineligible. By the time this Review was completed, US\$13,388 had been repaid to the Bank, while the remaining US\$31,726 was still being processed by the Ministry of Finance. FM ratings were Satisfactory in the last six ISRs. (ICR, pages 17-18)

Procurement. The ICR noted that the Project faced several procurement challenges, although all were eventually resolved. Early difficulties stemmed from delays in establishing the PMO, prompting the Ministry of Energy to form a “Study Team” to provide interim support and manage the initial procurement packages. Challenges persisted, including in relation to the preparation of the Group II packages that had not been appraised at approval and handling nonresponsive bids. Procurement was further affected by contracting unreadiness, leading to multiple contract extensions, and by a four-month vacancy in the procurement specialist position in 2020 following the administration changes after the 2020 parliamentary elections. Bid evaluations and disbursements were slow due to inadequate bidding documents that required revisions to meet Bank standards. All these issues were actively addressed through intensive training, seminars, and advisory support. Procurement ratings declined from Moderately Satisfactory to Moderately Unsatisfactory in June 2021, but subsequently improved to Moderately Satisfactory in February 2022 and to Satisfactory in June 2023, closing with a Satisfactory rating. (ICR, pages 15-16)

c. Unintended impacts (Positive or Negative)

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d. Other

The ICR noted no unintended outcomes or impacts resulting from the Project.

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Satisfactory	Satisfactory	



Bank Performance	Satisfactory	Satisfactory
Quality of M&E	Substantial	Substantial
Quality of ICR	---	Substantial

12. Lessons

The following lessons were mostly derived from the ICR (ICR, pages 19-20):

1. Clear and simple project design, combined with robust implementation arrangements, strongly supports PDO achievement. The Project design was simple, with two components and a clear, detailed list of activities linked to the PDO. Implementation arrangements were robust: a Project Steering Committee (PSC) provided strategic oversight; a Project Management Office (PMO) in the Ministry of Energy – partly staffed by former ESP1 personnel – led coordination; and each beneficiary entity (BSEDN, EBEDN, and WES) hosted a Project Implementation Unit (PIU). These elements were critical for the Project’s effective implementation and outcome achievement.

2. Flexible project design supports adaptive implementation, but it is effective only when capacity constraints are properly considered; without this, efficiency declines. In the Project under review, network rehabilitation subprojects were only partially appraised during preparation: Group I was ready for implementation, while Group II was to be appraised later depending on remaining funds. This design provided flexibility to adapt to evolving conditions but caused delays, adding workload for implementing entities that struggled to scope, appraise, and procure subprojects on time. These challenges could have been mitigated by including TA to prepare Group II subprojects after effectiveness, with implementation funded through additional financing.

3. Procurement readiness and strong contract management are critical for timely project implementation. Limited Project procurement readiness contributed to delays, resulting in multiple contract extensions. Bidding documents often required revisions to meet Bank standards, slowing progress. Although these challenges were successfully addressed through intensive training, seminars, and advisory support, they could have been avoided through advance procurement planning for future phases, ensuring timely contract awards; early market engagement; and realistic scheduling.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR provides detailed and technically well-grounded information on many aspects of Project implementation, including restructurings, relevance of objectives, efficacy, key factors affecting preparation and implementation, E&S safeguards, and fiduciary performance. It is internally consistent, and the lessons learned



are based on the ICR discussion and useful for similar projects. The main shortcomings are: (i) efficacy analysis: the assessment is unclear, as the unmet RF indicator on distribution losses is replaced by a non-RF indicator (losses in the 0.4 kV segment), leading to a High Objective 1 rating; and Objective 2 is not rated; (ii) efficiency analysis: EIRR estimates are missing, administrative efficiency is too brief, and the discussion of NPV calculations would have benefitted from a clearer, more structured presentation, with a summary table.

On balance, as the ICR provides overall sufficient and technically sound information, the rating is Substantial, despite the noted shortcomings.

a. Quality of ICR Rating
Substantial