



Report Number: ICRR0024170

## 1. Project Data

**Project ID**  
P131263

**Project Name**  
RERED II

**Country**  
Bangladesh

**Practice Area(Lead)**  
Energy & Extractives

**L/C/TF Number(s)**  
IDA-51580,IDA-55140,IDA-62020,TF-15034,TF-15077,TF-B4774,TF-A3639

**Closing Date (Original)**  
31-Dec-2018

**Total Project Cost (USD)**  
289,034,236.96

**Bank Approval Date**  
20-Sep-2012

**Closing Date (Actual)**  
18-Dec-2023

	<b>IBRD/IDA (USD)</b>	<b>Grants (USD)</b>
Original Commitment	155,000,000.00	37,070,000.00
Revised Commitment	155,000,000.00	37,070,000.00
Actual	274,466,455.35	31,873,842.07

**Prepared by**  
Ihsan Kaler Hurcan

**Reviewed by**  
Avjeet Singh

**ICR Review Coordinator**  
Avjeet Singh

**Group**  
IEGSD (Unit 4)

**Project ID**  
P119547

**Project Name**  
GPOBA W3: Bangladesh Renewable Mini-grid ( P119547 )

**L/C/TF Number(s)**

**Closing Date (Original)**

**Total Project Cost (USD)**  
15049581.31

**Bank Approval Date**

**Closing Date (Actual)**



13-May-2010

	IBRD/IDA (USD)	Grants (USD)
Original Commitment	0.00	1,100,000.00
Revised Commitment	0.00	1,099,581.31
Actual	0.00	1,099,581.31

**Project ID**

P119549

**Project Name**

BD: GPOBA W3: Bangladesh Solar Home Syst ( P119549 )

**L/C/TF Number(s)**

**Closing Date (Original)**

**Total Project Cost (USD)**

15049581.31

**Bank Approval Date**

26-Mar-2010

**Closing Date (Actual)**

	IBRD/IDA (USD)	Grants (USD)
Original Commitment	0.00	13,950,000.00
Revised Commitment	0.00	13,950,000.00
Actual	0.00	13,950,000.00

## 2. Project Objectives and Components

### a. Objectives

According to the International Development Association (IDA) Financing Agreement (p.6) dated October 23, 2012, and the Project Appraisal Document (p.6), the project objective was “to increase access to clean energy in rural areas through renewable energy and to promote more efficient energy consumption.”

At the time of first additional financing and project restructuring in June 2014, the project objective was revised to read as only “to increase access to clean energy in rural areas through renewable energy.” The project objective “to promote more efficient energy consumption” was dropped because of the deletion of the



third component titled Compact Fluorescent Lamp (see Revised Components in section 2.d. Components below).

This review will undertake a split assessment of the project outcome because of the revision in the project objective. The project objectives are parsed as the following for the split assessment:

Before the June 2014 project restructuring:

Objective 1: To increase access to clean energy in rural areas through renewable energy.

Objective 2: To promote more efficient energy consumption.

After the June 2014 project restructuring, when the second objective was deleted:

Objective 1: To increase access to clean energy in rural areas through renewable energy.

Because of the expanded project scope through two additional financings, the project's efficacy in achieving Objective 1 before and after the June 2014 will be assessed based on the revised targets. The targets were mostly revised up in line with the expanded project scope, but a few of them were revised down because of technical reasons and the government's expansion of the grid to unserved areas restricting the construction of mini-grids and biogas power plants for captive use. Such changes in the indicators' targets do not require a split assessment of Objective 1, which will be same before and after the project restructuring. Therefore, this review will only take the deletion of Objective 2 into account when undertaking a split assessment of the project's outcome.

#### **Note on Two Global Partnership for Output-Based Aid (GPOBA) Projects**

The GPOBA Rural Electrification and Renewable Energy (Mini Grid) Project (P119547) and the GPOBA Rural Electrification and Renewable Energy (Solar Home Systems) Project (P119549) were approved in May 2010 with the objectives of expanding access to electricity to the poor population in the rural areas of Bangladesh through mini grids and solar homes systems, respectively. These projects were linked to the Rural Electrification and Renewable Energy Development 1 (RERED I) Project (P071794) to provide a matching grant support to the construction of mini grids and installation of solar home systems. Following the closure of RERED I in December 2012, the two active GPOBA projects were linked to the Renewable Electrification and Renewable Energy Development 2 (RERED II) Project (P131263), which was approved in September 2012, to continue supporting the mini grids and solar home systems through matching grants.

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

Yes

#### **Did the Board approve the revised objectives/key associated outcome targets?**

Yes

#### **Date of Board Approval**

12-Jun-2014



### c. Will a split evaluation be undertaken?

Yes

### d. Components

According to the IDA Financing Agreement (pp.6-8), the Rural Electrification and Renewable Energy Development Project II (RERED II) had four components:

**A. Access to Electricity.** (*Appraisal cost: US\$309.2 million; revised cost at the first additional financing: US\$374.0 million; revised cost at the second additional financing: US\$433.6 million; actual cost: US\$340.19 million*)

This component was to finance the acquisition and installation of solar home systems, mini-grids and captive power plants (based on biogas), and solar irrigation pumps by extending sub-loans through partner organizations (i.e., micro-finance institutions, non-governmental organizations, and private enterprises) for the provision of electricity to households, businesses, and farmers in rural areas.

**B. Household Energy.** (*Appraisal cost: US\$46.3 million; revised cost at first additional financing: US\$46.1 million; revised cost at second additional financing: US\$94.7 million; actual cost: US\$85.41 million*)

This component was to finance the provision of clean cooking solutions to rural households through sub-grants to partner organizations for the supply of improved cookstoves and domestic biogas digesters, the implementation of awareness-raising and social mobilization activities regarding clean cooking solutions, the research and development activities to enhance product quality, performance, safety, and durability, and the development of performance standards, labels, and testing facilities.

**C. Compact Fluorescent Lamp.** (*Appraisal cost: US\$19.0 million; actual cost: US\$0.00 million*)

This component was to finance the acquisition and distribution of 7.25 million compact fluorescent lamps (CFLs) to reduce the peak energy demand through the replacement of highly inefficient incandescent light bulbs. This component was canceled at the time of the first additional financing in June 2014.

**D. Technical Assistance to Power Cell.** (*Appraisal cost: US\$6.5 million; revised cost at first additional financing: US\$10.0 million; actual cost: US\$13.50 million*)

This component was to provide technical assistance to Power Cell—a technical arm of the Power Division of the Ministry of Power, Energy and Mineral Resources established in 1996—in the implementation of power sector reforms and implementation of capacity building activities. These were to include support for the establishment and operation of Sustainable Renewable Energy Development Authority (SREDA), support to Bangladesh Energy Regulatory Commission to improve its capacity to regulate the power sector and develop tariff methodologies, implementation of a power sector reform roadmap, development of national guidelines for safe disposal of CFLs, transaction advisory support for private sector participation in the power and gas sectors, preparation of feasibility studies, environmental and social impact assessments, and project preparation support for power sector projects, preparation of feasibility studies for liquefied natural gas import, and preparation of bidding documents to employ consultants. This component was also to finance trainings, road shows, workshops, seminars, study tours, and awareness campaigns. This component was a continuation of the activities implemented under the Power Sector Development Technical Assistance Project, which closed in 2012.



## Revised Components

At the time of the first additional financing and project restructuring in June 2014, the second component Compact Fluorescent Lamp was cancelled because the demonstration of CFLs under the predecessor RERED I had a significant impact in increasing awareness about CFLs and the number of CFL manufacturers had already increased from 2 companies to 19 companies. The M&E findings also showed that there had already been an uptake in the CFL market without the need to further support its development through IDA concessional credit. Therefore, it was decided to cancel this component and reallocate the US\$17 million of funds to other components.

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

**Project Cost:** At project approval in September 2012, the project cost was estimated at US\$386.0 million including US\$5.0 million for contingencies. The revised project cost at the first additional financing in June 2014 was US\$435.1 million including US\$5.0 million for contingencies. The project cost increased to US\$543.4 including US\$5.1 million for contingencies at the second additional financing in March 2018. The project closed in December 2023 with an actual cost of US\$439.1 million.

**Financing:** At appraisal, the IDA credit amount was estimated at US\$155.0 million. After the approval of the first additional financing of US\$78.4 million in June 2014, the total estimated IDA financing amount increased to US\$233.4 million. A second additional financing of US\$55 million was approved in April 2018 increasing the total IDA funding amount to US\$288.4 million. At the sixth project restructuring in December 2023, US\$29.6 million of IDA credit was canceled. By project closing, the project had disbursed US\$242.59 million.

The total GPOBA matching grant amount under two GPOBA projects, which were transferred from RERED I to RERED II in 2012, was estimated at US\$16.1 million under three separate trust fund agreements. The GPOBA matching grant was fully disbursed at project closing.

At appraisal, the US Agency for International Development (USAID) Trust Fund financing was estimated at US\$7.6 million, and the Bangladesh Climate Change Resilience Fund financing (BCCRF) at US\$24.5 million. These funds were fully disbursed at project closing.

Germany Kreditanstalt für Wiederaufbau (KfW) financing was estimated at US\$12.9 million, local beneficiaries' funding at US\$53.4 million, and non-government organizations funding at US\$90.2 million. The actual disbursed amounts of these funds were unknown at the time of project evaluation.

In February 2018, the Board of the Green Climate Fund (GCF) approved US\$20 million grant for the financing of improved cookstoves component. By project closing, the Fund had disbursed US\$15.5 million.

**Borrower's contribution:** At appraisal, the borrower's contribution through the Infrastructure Development Company Limited (IDCOL) was estimated at US\$38.8 million. The actual contribution of IDCOL was unknown at the time of project evaluation.

**Project Restructurings:** The project was restructured six times including an additional financing.



- **First Project Restructuring and First Additional Financing (May 23, 2014 – Level 1):** An additional financing of US\$78.4 million as credit was approved to expand the scope of the solar home system program by 480,000 units in addition to the original target of 550,000. The third component Compact Fluorescent Lamp was cancelled, and its funds were reallocated to the solar home system program and sector technical assistance. This resulted in the revision of the project objective (see section 2.a Objectives above). Solar photovoltaic (PV) micro grids were included in the eligible technologies to be considered for financing under the project. Because of the slower uptake, the target for mini grids was revised down from 42 to 30 and irrigation pumps from 1,500 to 1,250. The target of biogas digesters for cooking was revised up from 20,000 to 33,000. The additional financing triggered the Indigenous People (OP/BP 4.10) safeguard policy because the expanded scope of the project activities were expected to reach the areas where tribal people lived.
- **Second Project Restructuring (June 16, 2016 – Level 2):** The closing date of the USAID Trust Fund funding was extended by two months from June 30, 2016 to August 31, 2016 as an interim measure to allow time for the revision of the Trust Fund Administration Agreement with the USAID, which was expected to take a longer time, so that the closing date of the trust fund could be extended to December 31, 2018 to match the IDA Financing Agreement closing date.
- **Third Project Restructuring (August 25, 2016 – Level 2):** The closing that of the USAID Trust Fund funding was extended by 28 months from August 31, 2016 to December 31, 2018 to match the closing date of the IDA Financing Agreement. The GPOBA grant agreement was revised to allow advances as a disbursement method for output-based sub-grant categories. The target for the biogas digesters for cooking was revised down from 33,000 to 16,000 to accommodate the higher subsidy requirements for the pre-fabricated digesters.
- **Fourth Project Restructuring and Second Additional Financing (April 10, 2018 – Level 1):** An additional financing amounting of US\$55.0 million as credit was approved to support the installation of irrigation pumps and solar mini grids, and the distribution of an additional 4 million improved cookstoves in rural areas. The project had applied for an additional grant of US\$20 million from Green Climate Fund (GCF) for the improved cookstoves component, and GCF Board approved it in February 2018. The project closing date was extended by three years from December 31, 2018 to December 31, 2021 to allow time for the completion of activities added to the project scope.
- **Fifth Project Restructuring (May 21, 2021 – Level 2):** The project closing date was extended by approximately two years from December 31, 2021 to December 18, 2023 to allow time for the utilization of the GCF grant and the implementation of project activities that were delayed because of the onset of COVID-19 in March 2020. The target for the solar irrigation pumps was revised down from 2,170 to 1,987 because of a new government rule that required 800 meters between two boreholes, which resulted in the installation of fewer solar irrigation pumps. The target for the number of connections made through mini grid systems and captive power plants was revised down from 28,100 to 26,881 because of the government's decision to electrify isolated off-grid pockets through grid connections.
- **Sixth Project Restructuring (December 12, 2023 – Level 2):** Upon the request of the Government of Bangladesh, a total of approximately US\$29.66 million of undisbursed IDA credit was canceled, of which approximately US\$25.21 million was from the second additional financing of US\$55 million because of the delays in the implementation of the improved cookstove activities during the COVID-19 pandemic.

**Dates:** The project was approved on September 20, 2012 and became effective on February 20, 2013. A Mid-Term Review was conducted in August and September 2015. The original project closing date was



December 31, 2018, but it was extended by approximately five years (please see the project restructurings above for the reasons of project closing date extensions). The project closed on December 18, 2023.

### 3. Relevance of Objectives

#### Rationale

The project was substantially aligned with the World Bank strategy as defined in the Bangladesh Country partnership Framework (CPF) for FY 2023-2027. The project sought to address the rural population's lack of access to efficient and clean energy sources including access to electricity and clean cooking. The project was to achieve this objective by financing the installation of solar home systems and the construction of solar mini grids and biogas plants for captive power use for access to electricity and improved cook stoves for cooking while replacing inefficient incandescent bulbs with CFL lights and increasing awareness about these efficient and clean energy solutions. The project objective did not fully correspond to the higher level objectives of the current CPF, mostly because the World Bank strategy evolved from focusing on increasing access to clean energy sources as Bangladesh is posed to achieve the clean energy outcomes in the medium-term. For example, electrification rate in the country increased from 32 percent in 2000 to 99.4 percent in 2022 according to the World Bank data. Therefore, the project objective partially corresponded to the CPF's third higher level objective of "Enhanced climate and environment resilience" and supported the achievement of "Objective 8: Enhanced sustainability and productivity in the use of natural capital for green growth and energy transition" (CPF, pp.46-48). The project's intervention in scaling up renewable energy sources for lighting (through solar home systems, solar mini grids, and biogas power plants) and improving energy efficiency through the distribution of cookstoves and CFLs would have been expected to contribute to the achievement of the CPF's Objective 8.

The project was a repeater project of RERED I, which was successfully implemented between 2002 and 2012. While the project objective was output-oriented, it was appropriately pitched for the development status and capacity in the country as defined in the World Bank strategy. The project objective was aligned with the context in the country. It supported the high-level development priorities defined in the country's Eighth Five-Year Plan for FY2020-25 such as exploitation of solar energy and improvement of energy efficiency and conservation through demand-side management.

Overall, the relevance of the objectives is rated Substantial.

#### Rating

Substantial

### 4. Achievement of Objectives (Efficacy)





## OBJECTIVE 1

### Objective

To increase access to clean energy in rural areas through renewable energy.

### Rationale

#### Theory of Change for Objective 1

The project activities were expected to result in the project outputs of new solar home systems and solar irrigation pumps installed and new solar mini grids and biogas and biomass gasification captive power plants constructed through financial intermediation of project funds by partner organizations. The project was also to finance technical assistance activities. The outputs expected from technical assistance activities were clean cooking awareness activities completed, performance standards and labeling system established, and testing facilities formed for improved cookstoves, and partner organizations supported to create demand for cookstoves. These outputs would have been expected to lead to the outcomes of increased access to electricity and the usage of more efficient and clean energy appliances for cooking because of increased awareness and demand creation. The long-term impacts of the project would have been improved socioeconomic conditions in rural areas including health and education, reduced greenhouse gas emissions, and increased inclusion. The project's theory of change was structured on the key assumptions of households willing to pay improved energy services and partner organizations having sufficient local presence and credibility to facilitate the delivery of project's results in the rural areas. It was also assumed that the grid would not have expanded in the project areas fast.

Overall, as a repeater project following the successful implementation of RERED I, the causal chains in the theory of change of the project were direct and valid, and the achievement of the project's objective could be attributed to the project's intervention. However, as formulated, the project objective was output-oriented, and the project's objective and theory of change did not adequately capture the outcomes expected from the project's support to the development of a solar services market in Bangladesh because of the use of the project funds through partner organizations and the technical activities.

### Outputs

- **Number of solar home systems installed:** The project supported the installation of slightly more than 1.2 million solar home systems by providing financing through partner organizations to households. The original and revised targets were 550,000 and 1.2 million solar home systems. The installation of solar home systems was stopped in 2017 because of the expansion of grid electricity into the project areas.
- **Number of connections made through mini-grid systems and captive plants:** This indicator measured the number of connections from solar mini grids and captive plants based on biomass gasification, biogas and other technologies. The project financed 9,082 such connections. The original target was 6,750 connections. It was revised up to 26,881 connections. The lower achievement was because of the extension of the grid in project areas and reduced need for electricity supply from mini grids or captive power, and the higher capital costs of mini grids.
- **Number of solar irrigation pumps installed:** The project installed 1,303 solar irrigation pumps. The original and revised targets were 1,500 and 1,987 solar irrigation pumps, respectively. The achievement was lower than the targets because of a change in the intervention's design that resulted in the installation of fewer solar pumps with higher capacity to irrigate a larger amount of agricultural area.





- **Number of higher efficiency cook stoves disseminated:** The project financed the distribution of approximately 4.06 million higher efficiency cook stoves against the original and revised targets of 1 million and 5 million cook stoves.
- **Number of biogas plants installed:** The project financed the distribution of 10,907 biogas plants of different capacity for cooking. The original target was 20,000 biogas plants. The target was revised down to 8,300 biogas plants to accommodate the higher subsidy requirements for the pre-fabricated digesters used in biogas production at the household level.
- **Generation capacity of renewable energy (other than hydropower) constructed:** This indicator measured the megawatt (MW) capacity created because of the installation of solar home systems and the construction of mini grids and captive power plants. The project supported the installation of 85 MW renewable energy (mainly solar) generation capacity against the original and revised targets of 61 MW and 88 MW, respectively. This amount corresponds to approximately one fifth of the installed solar PV capacity of 459 MW in Bangladesh (ICR, footnote 22 on p.28).
- **Enabling policy for renewable energy development:** The project provided financing for the establishment of SREDA. The agency did not exist before the project. At project closing, SREDA was established and operational as planned.

The project delivered the following outputs that were not captured by the results framework:

- Under the technical assistance component, the project provided consultancy services or technical inputs for the production of 54 knowledge products ranging from a technical audit study for old power plants in Bangladesh to the updating of the safeguard documents. Annex 6.1 of the ICR provides an exhaustive list of the studies prepared under the project.
- The project also supported the establishment of an improved cookstoves testing facility at the Department of Chemical Engineering of Bangladesh University of Engineering and Technology.
- The ICR (p.25) states that the project implemented awareness campaigns for financing of cookstoves under the project.

## Outcomes

- **Number of households, farmers, and businesses having access to clean energy services:** As a result of the installation of solar home systems, mini grids, captive power plants, and solar irrigation pumps, and the distribution of biogas plant and efficient cook stoves for cooking, a total of approximately 5.3 million households gained access to clean energy services. The original target was approximately 1.6 million. The revised target was approximately 6.1 million households.
- **People provided with access to electricity under the project by household connections:** The project resulted in 5.4 million people gaining access to electricity through solar home systems. The original target was 4.3 million people. The revised target was 5.5 million people.
- **People who gained access to more energy-efficient cooking and/or heating facilities:** The project's intervention resulted in 4.1 million gaining access to energy-efficient cooking. The original target was 4.3 million people, which was later revised up to 5.5 million. The achievement was lower than the revised target because of the distribution of fewer efficient cookstoves than the estimated amount. This also resulted in a lower achievement for the first indicator in this section.
- **Direct project beneficiaries:** A total of approximately 9.6 million people benefited from the project results. The original target was 10.4 million people. It was revised down to 9.8 million people because



of the cancellation of third component (see Objective 2 below) and the construction of fewer solar mini grids than the target.

The ICR provides additional explanations on how project activities led to project outputs and expected outcomes. Direct grant subsidies to customers and financial incentives to partner organizations were effective in creating demand for clean energy solutions because of reduced initial investment and financing costs. The increased demand for solar home systems and other clean energy solutions offered under the project led to the processing of two additional financings. The survey conducted at the time of project evaluation shows that the awareness campaigns conducted, and product quality improvements achieved under the project contributed to the increase in demand for modern cooking energy solutions. The technical assistance activities and the operationalization of SREDA created an enabling environment for the development of clean energy services in rural areas of the country. The project was successful in addressing the barriers to market creation in clean energy services in rural areas that manifested itself in connecting a substantial number of people to clean energy services including electricity supply through solar home systems, solar irrigation pumps, biogas power plants, and improved cook stoves. However, as noted in the outputs section, the fast expansion of the grid in project areas and the high capital costs adversely affected the implementation of solar mini grids resulting in fewer people gaining access to electricity than the target. Similarly, because of the reasons explained under the outputs section above, fewer solar irrigation pumps and cookstoves were distributed contributing to the decrease in the number of project beneficiaries.

Overall, despite a slow implementation start and some technical and economic issues related to dissemination of clean energy solutions, the project was substantially successful in achieving the project results and increasing the number of people with access to clean energy solutions. The project efficacy in achieving the project objective to access to clean energy in rural areas through renewable energy is rated Substantial.

### **Rating**

Substantial

## **OBJECTIVE 1 REVISION 1**

### **Revised Objective**

To increase access to clean energy in rural areas through renewable energy.

### **Revised Rationale**

For the project's efficacy in achieving the project objective to increase access to clean energy in rural areas through renewable energy, please see the assessment of Objective 1 in the previous section. The efficacy of the project in achieving the project objective in the period following the revision of the project objectives is rated Substantial.

### **Revised Rating**

Substantial



## OBJECTIVE 2

### Objective

To promote more efficient energy consumption.

### Rationale

#### Theory of Change

The project was to finance the distribution of 7.25 million CFLs to replace inefficient incandescent bulbs. The project output of CFLs installed would have been expected to result in efficient energy consumption because CFLs use less electricity than incandescent light bulbs. The project was designed to achieve the second objective through the replacement of inefficient incandescent bulbs with CFLs. Therefore, when the CFL activity was cancelled at the June 2014 restructuring, the second objective was also canceled. However, the use of improved cookstoves and domestic biogas digesters that were to be distributed under the project would have been expected to contribute to the promotion of more efficient energy consumption, because these appliances replace the use of wood fuel and promotes the use of biomass for biogas production increasing efficient use of energy sources and decreasing greenhouse gas emissions.

Overall, the causal chain between the project activities of increased use of CFLs, improved cookstoves, and domestic biogas digesters and the achievement of project outcome of efficient energy consumption was valid and direct, and the achievement of the second objective could be attributed to the project's intervention.

### Outputs

- **Number of energy efficient lamps distributed:** The project did not distribute any CFLs because the M&E findings showed that the uptake of CFLs was already in effect without any concessional financing. The funds allocated to this activity were reallocated to the solar home systems component. The target was 7.25 CFLs to be distributed under the project.
- **Number of higher efficiency cook stoves disseminated:** The project financed the distribution of approximately 4.06 million higher efficiency cook stoves against the original and revised targets of 1 million and 5 million cook stoves.
- **Number of biogas plants installed:** The project financed the installation of 10,907 biogas plants of different capacity for cooking. The original target was 20,000 biogas plants. The target was revised down to 8,300 biogas plants to accommodate the higher subsidy requirements for the pre-fabricated digesters used in biogas production at the household level.

### Outcomes

- **More efficient energy consumption through introduction of energy-efficient lighting:** Because the project did not distribute any CFLs, the achievement under this indicator was zero. The target was energy saved annually equal to 160 MW installed generation capacity.
- **People who gained access to more energy-efficient cooking and/or heating facilities:** The project's intervention resulted in 4.1 million gaining access to energy-efficient cooking. The original target was 4.3 million people, which was later revised up to 5.5 million. The achievement was lower than the revised target because of the distribution of fewer efficient cookstoves than the estimated amount. This also resulted in a lower achievement for the first indicator in this section.



Because of the change in the project' scope after the cancellation of the CFL component, there was no energy efficiency achievement in lighting. However, the project was successful in distributing biogas plants and higher efficiency cookstoves albeit some high capital cost problems that adversely affected the number of cookstoves distributed. The project provided energy efficient cooking solutions to 4.1 million people against the revised target of 5.5 million. Overall, although the project did not achieve any outcomes in increasing energy efficiency in lighting, it was substantially successful in promoting energy efficient consumption through the dissemination of higher efficiency cookstoves and biogas plants. The project's efficacy in achieving the second project objective to promote more efficient energy consumption is rated Modest.

**Rating**

Modest

**OBJECTIVE 2 REVISION 1**

**Revised Objective**

To promote more efficient energy consumption.

**Revised Rationale**

The second objective was deleted at the first additional financing in June 2014. Therefore, the project's efficacy in achieving the second objective is not rated for the period after the first additional financing.

**Revised Rating**

Not Rated/Not Applicable

**OVERALL EFFICACY**

**Rationale**

The project was substantially successful in the installation of solar home systems, higher efficiency cookstoves, solar irrigation pumps, and domestic biogas plants by providing financing through partner organizations while addressing the barriers to the development of clean energy services in rural areas of Bangladesh. The achievements were mostly substantial except in solar mini-grids because of high capital cost and fast expansion of the grid electricity. The efficacy of the project in achieving the first objective to increase access to clean energy in rural areas through renewable energy is rated Substantial. The project did not finance the installation of CFLs to replace inefficient incandescent bulbs because the CFLs uptake was already in effect without the use of concessional financing. Therefore, this activity was cancelled. Although the project did not finance any lighting activity that would have promoted efficient energy consumption, the successful distribution of higher efficiency cookstoves and biogas plants resulted in the use of energy efficient appliances in rural areas of Bangladesh. Therefore, the project's efficacy in achieving the second objective to promote efficient energy consumption is rated Modest. Overall, the project's efficacy in achieving the project



objectives before the project restructuring in June 2014 is rated Modest because of no energy efficiency gains in lighting.

**Overall Efficacy Rating**  
Modest

**Primary Reason**  
Low achievement

**OVERALL EFFICACY REVISION 1**

**Overall Efficacy Revision 1 Rationale**

At the project restructuring in June 2014, the second objective was cancelled. As explained in the previous Overall Efficacy section, the project efficacy in achieving the project’s first objective to increase access to clean energy in rural areas through renewable energy is rated Substantial. Therefore, the project’s overall efficacy after the project restructuring in June 2014 is rated Substantial.

**Overall Efficacy Revision 1 Rating**

Substantial

**5. Efficiency**

**Economic Analysis**

At appraisal, an economic analysis was conducted for each technology used in increasing access to clean energy and promoting efficient energy consumption.

- The benefits from the use of solar home systems were identified as displacement of kerosene and disposable or rechargeable batteries for lighting resulting in monetary savings. The costs were taken as the subsidized cost of the installation of the solar home systems, the replacement cost of batteries used with solar home systems, and other operation and maintenance (O&M) costs. The calculations resulted in an economic rate or return (ERR) of 43 percent and a net present value (NPV) of 16.5 billion Bangladeshi Taka (BDT) at a discount rate of 10 percent.
- The benefits expected from the replacement of incandescent bulbs with CFLs were avoided electricity consumption, reduction of peak load, reduction of greenhouse gas emissions, reduction in electricity expenses and the frequent replacement cost of incandescent bulbs. The only cost included in the analysis was the cost of CFLs. The calculations resulted in an ERR of 211 percent and an NPV of 3.5 billion BDT at a discount rate of 10 percent.
- The benefits of improved cookstove use were improved energy efficiency, reduced greenhouse gas emissions, and health cost savings for households. The costs were taken as the cost of the improved cookstoves and their maintenance costs. The calculations resulted in an ERR of 36.4 per cent and an NPV of 419 million BDT.
- The benefits expected from the biogas plants with biogas stoves were fuel savings, domestic labor savings, reduction in greenhouse gas emissions, and health cost savings for households. The costs were



taken as the cost of the initial investment and maintenance costs. The calculations resulted in an ERR of 27.3 percent and an NPV of 356 million BDT.

- For solar mini-grid, solar irrigation pumps and gasifier power for captive use, an economic analysis was not conducted because it was concluded at appraisal that the levels of service from solar and other renewable energy solutions were identical to the level of service from diesel-based energy; hence, the benefits were identical (PAD, p.19). Instead, a cost effectiveness analysis was conducted for these applications. The calculations showed that solar mini-grids were approximately 21 percent less costly than diesel alternative, solar irrigation pumps were approximately 29 percent less costly, and gasifier power for captive use was approximately 68 percent less costly. The assumptions used in the economic analyses were realistic and appropriate to assess the economic viability of project interventions through different technologies (PAD, footnote 15, p.18).

At project closing, the same methodology with actual project benefits and costs was used to conduct a post-project economic analysis for each technological intervention. The calculations resulted in an ERR of 49 percent and an NPV of 43 million BDT for solar home systems, an ERR of higher than 1,000 percent and an NPV of 24.4 billion BDT for improved cookstoves (significantly higher than the appraisal estimates because of underestimation of rural biomass expenses at appraisal and different lifespans used at appraisal and project evaluation—seven years and 15 years, respectively), and an ERR of 27 percent and an NPV of 1.01 billion BDT for biogas plants with biogas stoves. These calculations show the economic viability of these interventions. However, cost effectiveness analyses conducted for solar mini-grids and gasifiers for captive power use resulted in significantly lower cost effectiveness for these technologies compared to the diesel alternative. Because of considerably higher initial capital costs than those estimated at appraisal, the solar mini grids were approximately five times more costly than the diesel alternative (at appraisal solar mini grids were estimated to be 21 percent less costly than diesel alternatives) and the gasifiers for captive power use were almost as costly as the diesel alternative (they were estimated to be 68 percent less costly than the diesel alternative at appraisal). On the other hand, solar irrigation pumps were calculated to be 63 percent less costly than the diesel alternative at project evaluation because of the use of fewer large capacity solar irrigation pumps covering the same agricultural areas. At appraisal it was estimated that the solar irrigation pumps would have been 29 percent less costly than the diesel alternative.

Although the cost effectiveness of solar mini-grids and gasifiers for captive power use was significantly lower than the appraisal estimates, the project financed the construction of only 12 solar mini grids and three gasifiers for captive power use. All other technologies implemented in increasing access to clean energy and promoting efficiency energy consumption have high ERRs or cost effectiveness. Overall, the project's efficiency in achieving the project objectives through the use of different technologies was substantial.

### **Operational and Administrative Efficiency**

Because of the processing of two additional financings, the project closing date was extended by a total of approximately five years. These additional financings were approved to increase the project's scope and development impact. Through to project closing, the project's actual disbursement amounts were higher than the amounts estimated at appraisal. Based on the M&E findings, the project was restructured early in project implementation to cancel the CFL component because the uptake of CFLs through market mechanisms was already happening, and there was no need to use concessional funds for this activity. This was a positive strategy shift to increase the development of the project through other renewable energy technologies although this could have been avoided if CFL market assessment had been conducted adequately at appraisal. The





project did not face any major financial management or procurement issues. The implementation of safeguards policies were compliant with the provisions of the relevant World Bank policies.

Overall, the project’s efficiency in achieving the project objective is rated Substantial.

### 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	✓	43.00	0 <input checked="" type="checkbox"/> Not Applicable
ICR Estimate	✓	49.00	0 <input checked="" type="checkbox"/> Not Applicable

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

## 6. Outcome

While the project objectives do not directly support the achievement of the objectives in the World Bank strategy because the strategy now focuses on energy transition and other higher objectives rather than rural electrification (the country has almost achieved universal access to electricity), sustainability of electricity services and scaling up of clean energy services for irrigation and clean cooking are still highly relevant to the country context. Therefore, the relevance of objectives is rated Substantial. The project’s efficacy in achieving the project objectives before the June 2014 restructuring is rated Modest because of no achievement in energy efficiency in lighting, but the project efficacy in achieving the project objective after the restructuring is rated Substantial. The project’s efficiency in achieving the project objectives is also rated Substantial. Since the project objective was revised because of the deletion of the second objective at the June 2014 restructuring, a split assessment of the project’s performance was undertaken using the ration of disbursed amounts before and after the project restructuring to the total amount disbursed. The calculation resulted in a Moderately Satisfactory rating for the project’s outcome.

**Table 1**

	Before June 2014	After June 2014
<b>Relevance of Objectives</b>	<b>Substantial</b>	
<b>Efficacy</b>	Modest	Substantial
<b>Efficiency</b>	<b>Substantial</b>	
<b>Outcome Rating</b>	<b>Moderately Unsatisfactory</b>	<b>Satisfactory</b>
<b>Outcome Rating Value (a)</b>	3	5
<b>Amount Disbursed (US\$ million) (b)</b>	73.63	200.84



<b>Total Disbursed Amount (US\$ million) (c)</b>	274.47	
<b>Disbursement (%) (d) = (b/c)</b>	26.83%	73.17%
<b>Weight Value (a)x(d)</b>	0.8049	3.6585
<b>Total weights</b>	<b>4.4633 (rounds down to 4)</b>	
<b>Overall Outcome Rating</b>	<b>Moderately Satisfactory</b>	

- a. **Outcome Rating**  
Moderately Satisfactory

## 7. Risk to Development Outcome

**Financial:** The default of the customers in paying back microloans they used for the purchase of solar home systems poses a substantial risk for the sustainability of the market mechanisms established under the project. The project design did not include a strong collateralization or security mechanism to back the repayments of microloans in case of a default. When customers' willingness to pay back microloans decreased, the partner organizations' collection rate dropped down to 7 percent adversely affecting their financial viability. The project implemented local collection campaigns, and the IDCOL issued partial waivers of microloan obligations on some customers (ICR, p.40). These measures contributed to an increase in the collection rate of microloans, but the customers' default risk still stands as a substantial risk for the financial viability of the partner organizations and sustainability of solar home system services.

**Technical:** The maintenance of solar power solutions introduced under the project and the replacement of the used batteries stand as a moderate risk to the sustainability of development outcomes. Although Bangladesh has a sizable solar energy market, technical support for the repair and maintenance of solar technologies are not at the desired level. The delays in dispatching maintenance technicians are common in the country. The quality of such services has been improving but there is still room for improvement.

**Informal market:** The project activities are adversely affected by the emergence of an informal market for the sale of solar products. The insufficient enforcement of the rules and regulations resulted in similar services and goods provided at a lower quality and cost. Such services could adversely affect the development and sustainability of solar products market the project supported. A continuous sectoral dialogue with the government could help address these market distortions and solidify a well-functioning solar products and services market.

## 8. Assessment of Bank Performance

### a. Quality-at-Entry

At appraisal, achieving universal access to electricity and promotion of clean energy for irrigation and cooking were of high strategic importance for the Government of Bangladesh. As a repeater project, the approach of the project was relevant for the achievement of the project objectives. The implementation arrangements were adequately defined. IDCOL was responsible for the implementation of the first and second components, and Rural Electrification Board and Power Cell for the third and fourth components, respectively. The technical aspects of the project were mostly adequate. However, the uptake in the FCL



market was not adequately identified, which led to the cancellation of the third component only two years after the approval of the project. The economic analysis was detailed and based on reasonable assumptions. Because of the limited and reversible impact of the project activities, the triggering of the Environmental Assessment safeguard policy only was sufficient. The M&E arrangements were sufficient to capture the project outputs and intermediate outcomes that would have been expected to lead to the achievement of the project objectives. However, the formulation of the project objective and the results framework did not capture the project's impact on the development of a sustainable solar services market although the project's design clearly indicates that this was one of the expected outcomes of the project's intervention. The ICR (p.37) provides a highly evaluative assessment of this shortcoming in the project objectives' formulation and results framework. The financial management and procurement arrangements were in place and adequate for the implementation of the project. The risks and measures to mitigate them were adequately identified.

Overall, the World Bank's identification, facilitation of the preparation, and appraisal of the project was adequate to achieve the results identified in the project's objectives, but there were moderate shortcomings in the formulation of the project's objective and the results framework that did not sufficiently capture all outcomes expected from the project's intervention and in identifying the market dynamics related to the implementation of CFL component. Therefore, the quality at entry is rated Moderately Satisfactory.

### **Quality-at-Entry Rating**

Moderately Satisfactory

#### **b. Quality of supervision**

The World Bank project team held supervision missions twice a year and additional technical missions. The project team's focus on the development impact of the project in a changing policy environment and market dynamics was adequate. The cancellation of the CFL component and reallocation of the funds to other activities early in the project implementation was appropriate in addressing a project preparation shortcoming and use of concessional funds for other renewable energy solutions. Because of continuous policy dialogue with the authorities, the project team was able to take proactive action to discontinue with the installation of solar home systems as grid electricity was expanding in the project areas. The project team's supervision of financial management and procurement was adequate. The project did not experience any major issues in these aspects. However, there were some shortcomings in the quality of performance reporting in the project documents. As the ICR (p.37) reports the detailed reporting focused on the installation of solar home systems and solar irrigation pumps, while the documentation of mini grids and biogas plants for captive power was insufficient. The project restructurings were not adequately recorded in the Operations Portal (ICR, pp 21 and 38). The project did not have any major issues related to safeguard policy implementation but the detailed reporting of grievances in project documents started only in 2021. This review identified that six project restructurings including two additional financings, but the shortcomings in the M&E design in capturing all outcomes expected from the project's intervention were not addressed (see section 9. M&E Implementation).

Overall, the quality of supervision is rated Moderately Satisfactory.



### **Quality of Supervision Rating**

Moderately Satisfactory

### **Overall Bank Performance Rating**

Moderately Satisfactory

## **9. M&E Design, Implementation, & Utilization**

### **a. M&E Design**

How the key activities and outputs would have resulted in the expected project outcomes was adequately documented in the project appraisal document, but the results framework did not adequately capture all the outcomes expected from the project's intervention such as the development of a commercially viable solar services market and improved enabling environment for renewable energy development. The indicators were broadly adequate to capture the achievement of project results in increasing access to clean energy services and promoting efficient energy consumption, but quality and sustainability of such services were not captured by the results framework. This was partly because of the output-oriented formulation of the project objective. Most of the indicators were relevant, measurable, achievable, and time bound in relation to the achievement of the output-oriented project objectives. However, because of insufficient CFL market analysis, the indicator measuring the number of CFLs installed replacing incandescent bulbs was not achievable. The M&E design and arrangements were well embedded institutionally including the government agencies responsible for the implementation of the project, partner organization, and third party monitoring agent.

### **b. M&E Implementation**

The indicators in the results framework were adequately measured and reported by the project implementation units. Under each component, representative sample subprojects were randomly inspected to gather M&E data through decentralized M&E units (ICR, p.34). A management information system software was used to encode all the data for the activities IDCOL conducted, except data related to solar irrigation pumps and solar mini grids, which required manual encoding because of the nature of the subprojects. The ICR (P.34) reports that "No data errors or significant quality monitoring issues were reported during project implementation, a conclusion corroborated by the Mid-Term Review of the project and the ICR survey." The data were found to be adequately reliable, good quality because of sound methodology, independence of analysts, and quality control. In addition to the measurement of the indicators in the results framework, the project conducted several impact evaluations to assess the impact of the project's intervention on socioeconomic welfare of the beneficiaries in accordance with the multi-tier framework criteria for access developed by the Energy Sector Management Assistance Program. However, although the project was restructured numerous times and two new indicators were introduced to measure the number of people provided with access to electricity and more energy-efficient cooking and heating facilities, the shortcomings in the M&E design in capturing the project outcomes related to solar services market development were not addressed. The measurement of the indicators were reported in the Implementation Status and Results Reports, but the reporting of the implementation



of mini-grids and biogas plants for captive power use was not as detailed as the reporting of the implementation of the solar home systems and solar irrigation pumps (ICR, p.37).

### c. M&E Utilization

The M&E findings were regularly reported to stakeholders in quarterly reports. Based on the M&E findings and data, the project team restructured the project early in its implementation to cancel the CFL component and reallocated the funds for scaling up other project activities and processed two additional financings to scale the project activities and increase its development plan. Based on M&E data, “a performance-based mechanism was introduced to encourage the deployment of energy solutions that were effectively used and well-functioning” under the first and second components (ICR, p.35). The ICR used the M&E data gathered through the measurement of the indicators and the implementation of impact evaluations to adequately provide evidence of achievement of project outcomes, rather than only providing evidence of application of inputs or achievement of outputs.

Overall, while there were moderate shortcomings in the M&E system’s design and implementation related to the measurement of all outcomes expected from the project’s intervention, the data collected through the M&E system and impact evaluation surveys were sufficient to assess the achievement of the project objectives as formulated and test the links in the results chain. Therefore, the M&E quality is rated Substantial.

### M&E Quality Rating

Substantial

## 10. Other Issues

### a. Safeguards

The project was classified as Category B under Environmental Assessment (OP/BP 4.01) and triggered the Indigenous Peoples (OP/BP 4.10) safeguard policy at the second additional financing.

**Environmental Assessment (OP/BP 4.01):** The project was classified as Category B because of the risk of lead contamination from improper disposal or recycling of lead-acid batteries used in SHS and the risk of mercury contamination from improper disposal of CFL lights. An Environmental and Social Management Framework (ESMF) was prepared by updating the one used for RERED I. The ESMF was disclosed on IDCOL website in Bangla and English on July 18, 2012, and in the World Bank’s InfoShop on July 20, 2012. Under the predecessor RERED I project, IDCOL had already taken measures to strengthen battery recycling through refinancing for battery replacement and incentives for partner organizations and manufacturers for the collection of used batteries (PAD, p.25). Majority of the battery suppliers had already acquired the relevant ISO certificate. Annual environment audits undertaken by independent third parties confirmed the proper recycling of used batteries. National guidelines were to be developed for the proper disposal of CFLs, but this activity was cancelled after the cancellation of CFL component of the project. The bid documents included required environmental management provisions. An Environment and Social



Safeguards Management Unit was established at IDCOL with full-time staff. The project was compliant with the requirements of Environmental Assessment safeguard policy.

**Indigenous Peoples (OP/BP 4.10):** The project triggered this safeguard policy at the time of second additional financing because of the expected expansion of the project activities into the areas where tribal communities lived. A Tribal People's Development Framework (TPDF) was developed and added to the updated (ESMF). The project activities were expected to have no negative impacts on tribal people, and none materialized. The project was in compliance with the requirements of this safeguard policy.

## **b. Fiduciary Compliance**

### **Financial Management**

The interim financial reports were submitted according to schedule. Financial management benefited from IDCOL's advanced automated accounting system. Power Cell's financial management was Excel-based but this was deemed sufficient by the World Bank. In addition to the regular project audits by the Foreign Aided Project Audit Directorate of the government. Internal audits were sufficient. The opinions in the independent project audit reports were unqualified. The ICR (p.37) reports that "Financial management was rated in the Satisfactory range throughout almost the project's duration, reflecting sound financial management practices by both implementing agencies." At the time of project closing, all project funds were accounted for. The ICR does not report any corruption or misuse of funds related to the project.

### **Procurement**

The procurement followed the World Bank procurement guidelines and policies. Because of the project design, the majority of the funds flowed from IDCOL to partner organizations as financial intermediaries; therefore, IDCOL was not involved in major procurement processes. The risk of Power Cell's insufficient procurement capacity because of a shortage of staff trained in procurement matters was adequately mitigated by project's support through trainings and hiring of a procurement consultant. Third parties regularly audited the partner organizations' procurement practices. The only procurement-related issue reported in the ICR (p.36) was the shortcoming in IDCOL and Power Cell's maintaining updated procurement plans and information on the World Bank Systematic Tracking Exchanges in Procurement portal. Overall, the procurement rating of the project remained Satisfactory through to project closing.

## **c. Unintended impacts (Positive or Negative)**

None.

## **d. Other**

None.





## 11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Satisfactory	Moderately Satisfactory	The difference is because of the incorrect calculation of disbursement weights in the ICR where the disbursed amount was taken as US\$48.69 million as of end of first quarter of 2014. However, the disbursed amount at the time of project restructuring in June 2014 was US\$73.63 according to the information in the data sheet of the Project Paper Report No: RES88000-BD dated May 23, 2014 (p. v).
Bank Performance	Moderately Satisfactory	Moderately Satisfactory	
Quality of M&E	Modest	Substantial	While there were moderate shortcomings in the M&E design and implementation, the M&E system and the data collected through the impact evaluations were sufficient to text the links in the results chain and assess the achievement of the project objective.
Quality of ICR	---	Substantial	

## 12. Lessons

This review has drawn three lessons based on the information in the ICR.

**Adequately conducted market analysis at the appraisal stage can help increase the project’s effectiveness and avoid the revision of project objectives.** The project was designed to implement 7.25 million CFLs to promote efficient energy consumption, which was the second objective of the project. However, early in project implementation, the M&E findings showed that there was an uptake of CFLs in the market without any subsidy using the concessional funds. This led to project restructuring and a deletion of the second project objective without any CFL activity having been implemented. A detailed market analysis conducted at appraisal could have identified the uptake in the market and the CFL component could have been excluded from the project scope.

**Shortcomings in the formulation of project objectives and the theory of change can critically affect the adequate assessment of the project’s achievements.** The project objectives were to



increase access to clean energy and promote efficient energy consumption, but the project activities were also expected to lead to development of a solar services market. These activities did not directly support the achievement of the output-oriented project objectives within the project's theory of change, nor were the market development related outcomes captured by the project's formulation. This also resulted in adoption of inadequate measures to ensure the sustainability of the achievements in market development by preventing market distortion and financial viability of the sector.

**Continuous policy dialogue with the authorities can be critical in changing a project's implementation direction and preventing the use of concessional funds for redundant activities.** The project was to install solar home systems and construct solar mini-grids and gas plants for captive power use in areas where grid was not expected to expand in the medium term. However, the Government of Bangladesh accelerated the expansion of the electricity grid into project areas. The expansion of the grid was supported by the World Bank under a continuous policy dialogue. This resulted in the early cessation of installation of solar home systems and construction of min-grids, the implementation of which had already been slow because of higher than estimated initial capital costs.

### 13. Assessment Recommended?

No

### 14. Comments on Quality of ICR

The ICR is candid and tightly written. It provides a complete critique of the project. The report is highly evaluative in its assessment of the project's performance, the achievement of the project objectives, the Bank performance, and the M&E quality. While the ICR points out the shortcomings in the M&E design and implementation, it appropriately references and adequately presents the evidence to support the achievement of the project objectives. The interrogation of evidence is sufficient using additional data from surveys in triangulating the findings. The narrative is highly results-oriented highlighting how activities and outputs led to the outcomes and what the project's shortcomings were. The internal consistency of the report is high, which is manifested throughout the report by logical linking and integration of report's sections. The figures presented in the report are highly useful in understanding how various clean energy solutions were implemented under the project. The lessons are based on evidence and analysis and respond to the specific experiences and findings of the project.

However, the report had minor shortcomings in following the Bank guidance in undertaking a split assessment of the project's outcome. First, the ICR does not report the implementation of the Indigenous Peoples safeguard policy, which was triggered at the time of second additional financing. Second, the disbursement weights were inaccurately calculated. As the project team later explained in an email on November 18, 2024, the ICR took the actual disbursement at end of the first quarter of calendar year 2014 in the calculation of the disbursement rate before the project restructuring in June 2014. However, the calculation should have taken the actual disbursement reported in the project restructuring paper. The difference between these two disbursement amounts was approximately US\$30 million. A higher disbursement rate before the June 2014 project restructuring results in a Moderately Satisfactory outcome rating. Third, the ICR assesses the project's efficacy



in achieving the project objectives before the project restructuring in June 2014 based on the actual achievements at the time of the restructuring. However, according to the Bank guidance (p.40), “It is important to note that, when objectives are revised, the project is rated against both sets of objectives separately, for the entire duration of the project (not just the period for which each of the objectives was in effect). Achievement of each individual objective (efficacy), both original and revised, is assessed across the project’s entire lifetime.” Therefore, when assessing the project’s efficacy prior to the project restructuring in June 2014, the project’s achievements at project closing should have been taken into consideration, rather than the achievements at the time of project restructuring.

Overall, despite the mistakes in the implementation of the split rating methodology and a minor shortcoming in reporting the implementation of safeguard policies, the report was detailed, highly evaluative, results-oriented, and a complete critique of the project in every aspect. Therefore, the quality of the ICR is rated Substantial.

**a. Quality of ICR Rating**  
Substantial