

Document of
The World Bank
International Development Association

Report No: ICR2518

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IDA-37120 IDA-47950 TF-56092)

**ON A
CREDIT**

**IN THE AMOUNT OF SDR104.9 MILLION
(US\$132.7 MILLION EQUIVALENT)**

AN

**ADDITIONAL CREDIT
IN THE AMOUNT OF SDR119.2 MILLION
(US\$180 MILLION EQUIVALENT)**

**AND A
GLOBAL ENVIRONMENTAL FACILITY GRANT
IN THE AMOUNT OF US\$4.93 MILLION**

**TO THE
FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA**

FOR AN

ENERGY ACCESS PROJECT

May 30, 2014

Energy Practice 1
Sustainable Development Department
Country Department AFCE3
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective June 30, 2013)

Currency Unit = Ethiopian Birr

ETB18.7325 = US\$1

US\$1.5039 = SDR 1

GOVERNMENT FISCAL YEAR

JULY 8-JULY 7

ABBREVIATIONS AND ACRONYMS

| | |
|--------|---|
| AF | Additional Financing |
| APL | Adaptable Program Loan |
| CAS | Country Assistance Strategy |
| CFL | Compact Fluorescent Lamps |
| CPS | Country Partnership Strategy |
| EAREP | Electricity Access for Rural Expansion Project |
| EEA | Ethiopian Energy Authority |
| EAP | Energy Access Project |
| EEPCo | Ethiopian Electric Power Corporation |
| EIRR | Economic Internal Rate of Return |
| EMF | Environmental and Social Management Framework |
| EMP | Environmental Management Plan |
| EMU | Environmental Monitoring Unit |
| ENPV | Economic Net Present Value |
| ENREP | Electricity Network Reinforcement and Expansion Project |
| EREDPC | Ethiopian Rural Energy Development and Promotion Center |
| ERP | Enterprise Resource Package |
| ESIA | Environmental and Social Impact Assessment |
| ESMF | Environmental and Social Management Framework |
| ETB | Ethiopian Birr |
| FIRR | Financial Internal Rate of Return |
| FWFCA | Former Women Fuel Wood Carriers Association |
| FY | Fiscal Year |
| GDP | Gross Domestic Product |
| GEO | Global Environmental Objective |
| GHG | Greenhouse Gases |
| GNI | Gross National Income |
| GoE | Government of Ethiopia |
| GTP | Growth and Transformation Plan |
| IBRD | International Bank for Reconstruction and Development |
| ICR | Implementation Completion and Results Report |
| IDA | International Development Association |
| I-PRSP | Interim Poverty Reduction Strategy Paper |

| | |
|-------|---|
| ISR | Implementation Status Report |
| kWh | Kilowatt Hour |
| LDC | Load Dispatch Center |
| LRMC | Long-Run Marginal Cost |
| MFI | Microfinance Institution |
| MIS | Management Information System |
| MoE | Ministry of Mines and Energy |
| MoWE | Ministry of Water and Energy |
| MW | Megawatt |
| M&E | Monitoring and Evaluation |
| MTR | Mid-Term Review |
| MV | Megavolt |
| NDF | Nordic Development Fund |
| O&M | Operation and Maintenance |
| OMA | Operation and Maintenance Agreement |
| PAD | Project Appraisal Document |
| PAP | Project Affected People |
| PCU | Project Coordinating Unit |
| PDO | Project Development Objective |
| PMU | Project Management Unit |
| PRSP | Poverty Reduction Strategy Paper |
| PV | Photovoltaic |
| QEA | Quality at Entry Assessment |
| QSA | Quality of Supervision Assessment |
| RAP | Resettlement Action Plan |
| REB | Rural Electrification Board |
| REF | Rural Electrification Fund |
| RES | Rural Electrification Secretariat |
| RPF | Resettlement Policy Framework |
| RPTES | Regional Program in the Traditional Energy Sector |
| SCADA | Supervisory Control and Data Acquisition |
| UEAP | Universal Electrification Expansion Plan |
| USD | United States Dollar |
| WTP | Willingness to Pay |

| | |
|---------------------|------------------------|
| Vice President | Makhtar Diop |
| Country Director | Guang Zhe Chen |
| Sector Manager | Lucio Monari |
| Project Team Leader | Issa Diaw/Raihan Elahi |
| ICR Team Leader | Issa Diaw |
| ICR Primary Author | J. Matthew Mitchell |

**FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
ENERGY ACCESS PROJECT**

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DATA SHEET

| A. Basic Information | | | |
|---|-----------------------------------|-------------------|---|
| Country: | Ethiopia | Project Name: | ENERGY ACCESS PROJECT |
| Project ID: | P049395,P077380 | L/C/TF Number(s): | IDA-37120,IDA-3712A,IDA-47950,TF-56092 |
| ICR Date: | 05/28/2014 | ICR Type: | Core ICR |
| Lending Instrument: | SIL | Borrower: | FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA |
| Original Total Commitment: | XDR 104.90M, XDR119.20M USD 4.93M | Disbursed Amount: | XDR85.5M, XDR19.95M USD 4.45M |
| | | | |
| Environmental Category: B | | Focal Area: C | |
| Implementing Agencies: | | | |
| Ethiopian Rural Energy Development and Promotion Center | | | |
| Ministry of Agriculture | | | |
| Ethiopian Electric Power Corporation (EEPCO) | | | |
| Ethiopia Electric Power Corporation | | | |
| Co-financiers and Other External Partners: | | | |
| • European Investment Bank | | | |
| • OPEC Fund for International Development | | | |
| • Government of Japan | | | |

| B. Key Dates | | | | |
|---------------------------------|------------|-------------------|--------------------------|--|
| ENERGY ACCESS PROJECT - P049395 | | | | |
| Process | Date | Process | Original Date | Revised / Actual Date(s) |
| Concept Review: | 03/21/2002 | Effectiveness: | 04/09/2003 | 04/09/2003 |
| Appraisal: | 05/13/2002 | Restructuring(s): | | 01/26/2007 06/29/2009 06/10/2010 05/17/2013 |
| Approval: | 09/19/2002 | Mid-term Review: | 12/31/2004 04/20/2012 | 02/16/2005 04/20/2012 |
| | | Closing: | 12/31/2007 | 06/30/2013 |

| ENERGY ACCESS PROJECT - P077380 | | | | |
|--|-------------|-------------------|----------------------|---------------------------------|
| Process | Date | Process | Original Date | Revised / Actual Date(s) |
| Concept Review: | 03/21/2002 | Effectiveness: | | 04/28/2006 |
| Appraisal: | 05/13/2002 | Restructuring(s): | | 19/09/2010 06/29/2011 |
| Approval: | 07/28/2005 | Mid-term Review: | 10/20/2010 | |
| | | Closing: | 12/31/2009 | 06/30/2012 |

C. Ratings Summary

C.1 Performance Rating by ICR

| | |
|-----------------------------|---------------------------|
| Outcomes | Moderately Unsatisfactory |
| GEO Outcomes | Moderately Unsatisfactory |
| Risk to Development Outcome | Substantial |
| Risk to GEO Outcome | Moderate |
| Bank Performance | Moderately Unsatisfactory |
| Borrower Performance | Moderately Unsatisfactory |

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)

| Bank | Ratings | Borrower | Ratings |
|--------------------------|---------------------------|-------------------------------|---------------------------|
| Quality at Entry | Moderately Unsatisfactory | Government: | Moderately Unsatisfactory |
| Quality of Supervision: | Moderately Unsatisfactory | Implementing Agency/Agencies: | Moderately Unsatisfactory |
| Overall Bank Performance | Moderately Unsatisfactory | Overall Borrower Performance | Moderately Unsatisfactory |

C.3 Quality at Entry and Implementation Performance Indicators

| ENERGY ACCESS PROJECT - P049395 | | | |
|---|-------------------------|---------------------------------|----------------|
| Implementation Performance | Indicators | QAG Assessments (if any) | Rating: |
| Potential Problem Project at any time (Yes/No): | Yes | Quality at Entry (QEA) | None |
| Problem Project at any time (Yes/No): | Yes | Quality of Supervision (QSA) | None |
| DO rating before Closing/Inactive status | Moderately Satisfactory | | |

| ENERGY ACCESS PROJECT - P077380 | | | |
|---|-------------------|---------------------------------|----------------|
| Implementation Performance | Indicators | QAG Assessments (if any) | Rating: |
| Potential Problem Project at any time (Yes/No): | No | Quality at Entry (QEA) | None |
| Problem Project at any time (Yes/No): | No | Quality of Supervision (QSA) | None |
| GEO rating before Closing/Inactive Status | Satisfactory | | |

D. Sector and Theme Codes

| ENERGY ACCESS PROJECT - P049395 | | |
|---|-----------------|---------------|
| | Original | Actual |
| Sector Code (as % of total Bank financing) | | |
| Forestry | 5 | 5 |
| General public administration sector | 8 | 8 |
| Other Renewable Energy | 5 | 5 |
| Other industry | 2 | 2 |
| Transmission and Distribution of Electricity | 80 | 80 |

| | | |
|--|----|----|
| Theme Code (as % of total Bank financing) | | |
| Climate change | 24 | 24 |
| Infrastructure services for private sector development | 13 | 13 |
| Pollution management and environmental health | 13 | 13 |
| Rural services and infrastructure | 25 | 25 |
| Urban services and housing for the poor | 25 | 25 |

| ENERGY ACCESS PROJECT - P077380 | | |
|---|-----------------|---------------|
| | Original | Actual |
| Sector Code (as % of total Bank financing) | | |
| Central government administration | 25 | 25 |
| Energy efficiency in Heat and Power | 30 | 30 |
| Other Renewable Energy | 5 | 5 |
| Sub-national government administration | 10 | 10 |
| Transmission and Distribution of Electricity | 30 | 30 |

| | | |
|--|----|----|
| Theme Code (as % of total Bank financing) | | |
| Climate change | 40 | 40 |
| Infrastructure services for private sector development | 20 | 20 |
| Rural services and infrastructure | 40 | 40 |

| E. Bank Staff | | |
|--|---------------------|------------------------|
| ENERGY ACCESS PROJECT - P049395 | | |
| Positions | At ICR | At Approval |
| Vice President: | Makhtar Diop | Callisto E. Madavo |
| Country Director: | Guang Zhe Chen | Ishac Diwan |
| Sector Manager: | Lucio Monari | M. Ananda Covindassamy |
| Project Team Leader: | Issa Diaw | Joel J. Maweni |
| ICR Team Leader: | Issa Diaw | |
| ICR Primary Author: | J. Matthew Mitchell | |

| ENERGY ACCESS PROJECT - P077380 | | |
|--|---------------------|--------------------|
| Positions | At ICR | At Approval |
| Vice President: | Makhtar Diop | Gobind T. Nankani |
| Country Director: | Guang Zhe Chen | Ishac Diwan |
| Sector Manager: | Lucio Monari | Yusupha B. Crookes |
| Project Team Leader: | Issa Diaw | Reynold Duncan |
| ICR Team Leader: | Issa Diaw | |
| ICR Primary Author: | J. Matthew Mitchell | |

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)¹

The project's development objectives are to: (i) establish a sustainable program for expanding the population's access to electricity and improving the quality and adequacy of electricity supply, thus supporting broad-based economic development and helping to alleviate poverty; (ii) reduce environmental degradation and improve energy end-use efficiency; (iii) reduce the barriers to the wide spread adoption of renewable energy technologies, in particular solar photovoltaic (PV) and micro-hydro power generation in rural areas, thereby contributing to the reduction in greenhouse gas (GHG) emissions via displacement of kerosene and diesel that would otherwise be used for lighting and electricity generation; and (iv) provide technical support for institutional and capacity building of key sector agencies, including for regulatory, fiscal and institutional reforms in the mining sector.

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

None.

Global Environment Objectives (from Project Appraisal Document)

The proposed global environment objective is to initiate the process of eliminating the barriers that impede the development of renewable energy, in particular solar photovoltaic

¹ The PDO as set out in the PAD is substantially consistent with that of the Financing Agreement (FA) with the exception that the FA PDO is more concise, omitting the higher level objectives on broad based economic development and poverty alleviation in (i) and the details related to (ii).

(PV) systems, and develop micro hydro capacity. The global objective would contribute to the reduction of GHG as some of the use of diesel for power generation would be displaced by the renewable energy².

Revised Global Environment Objectives (as approved by original approving authority)

None.

(a) PDO Indicator(s)

| Indicator | Baseline Value | Original Target Values (from approval documents) | Formally Revised Target Values | Actual Value Achieved at Completion or Target Years |
|-------------------------------------|---|--|--------------------------------|---|
| Indicator 1 : | Number of people with direct access to electricity in urban and rural areas due to the project. | | | |
| Value (quantitative or Qualitative) | 0 | 850,000 | | 615,540 |
| Date achieved | 06/04/2002 | 06/30/2009 | | 06/30/2011 |
| Comments (incl. % achievement) | 72 percent of target. After the Project's restructuring in 2010 and an additional financing credit a second target of 700,000 people was established, to be achieved for the period 2011 to 2013. However, this target was drastically reduced to 100,000 persons in 2013 during the restructuring that included a significant cancellation of IDA resources. | | | |
| Indicator 2 : | Number of people with indirect access served by health centers and schools with improved services due to electrification. | | | |
| Value (quantitative or Qualitative) | 0 | 250,000 | | 1,100,000 |
| Date achieved | 06/04/2002 | 06/30/2009 | | 06/30/2012 |
| Comments (incl. % achievement) | 440 percent of target. This indicator is associated with the GEO indicator for renewable energy development. The number of persons is based on 200 health centers, each with an estimated 5,000 people and 100 schools each with an estimated 1,000 people. | | | |
| Indicator 3 : | Power system losses by the end of the project. | | | |
| Value | 20% | 17% | 9.6% | 20% |

² The Grant Agreement defined the PDO as follows: The objectives of the Project are to: (i) establish a sustainable program for the expansion of access to electricity and for improvement of the quality and adequacy of the electricity supply in the Recipient's territory; (ii) reduce environmental degradation, and improve the supply and efficient use of energy; (iii) reduce the barriers to the wide spread use of renewable energy technologies; and (iv) provide technical support to the Recipient for the institutional and capacity building of key energy sector agencies, and for regulatory, fiscal and institutional reforms in the mining sector to attract private investment.

| | | | | |
|-------------------------------------|--|------------------|------------|------------|
| (quantitative or Qualitative) | | | | |
| Date achieved | 02/28/2005 | 06/30/2009 | 06/02/2010 | 06/30/2013 |
| Comments (incl. % achievement) | 20 percent of target. The PAD mentioned the loss-reduction indicator but did not provide a baseline or target in the list of key indicators. However, EAP's Minutes of negotiation cited a baseline of 18 percent and a target of 15 percent. During project implementation, the ISRs monitored the total power system losses. | | | |
| Indicator 4 : | Number of efficient injera baking wood fuel and stoves produced and sold by the private sector. | | | |
| Value (quantitative or Qualitative) | 0 | 320,000 | 1,000,000 | 2,600,000 |
| Date achieved | 06/04/2002 | 06/30/2009 | 06/02/2010 | 06/30/2011 |
| Comments (incl. % achievement) | | | | |
| Indicator 5 : | Number of hectares of forests brought under participatory management. | | | |
| Value (quantitative or Qualitative) | 0 | 302,000 | | 0 |
| Date achieved | 06/04/2002 | 06/30/2009 | | 06/30/2011 |
| Comments (incl. % achievement) | | | | |
| Indicator 6 : | Number of hectares of farm/agro-forestry schemes established. | | | |
| Value (quantitative or Qualitative) | 0 | 384,000 | | |
| Date achieved | 06/04/2002 | 06/30/2009 | | |
| Comments (incl. % achievement) | | | | |
| Indicator 7 : | EEPCo maintenance of an agreed operating margin. | | | |
| Value (quantitative or Qualitative) | 0 | US\$0.01 per kWh | | N/A |
| Date achieved | 06/04/2002 | 02/28/2005 | | 06/30/2012 |
| Comments (incl. % achievement) | This indicator fluctuated between US\$0.04 per kWh and US\$1.5 per kWh during EAP's implementation. At project closing, information on the | | | |

| | | | | |
|--|--|--|--|------------|
| achievement) | operating margin was unavailable. | | | |
| Indicator 8 : | Establishment of a regulatory and institutional structure for rural electrification. | | | |
| Value (quantitative or Qualitative) | No | | | Yes |
| Date achieved | 06/04/2002 | | | 06/30/2012 |
| Comments (incl. % achievement) | The Ethiopian Rural Energy Development and Promotion Center (EREDPC). The Rural Energy Secretariat (RES), the Rural Electrification Board (REB) and the Rural Electrification Fund (REF) have been established as permanent institutions with funding to study, evaluate and arrange funding for rural electrification projects. | | | |

(b) GEO Indicator(s)

| Indicator | Baseline Value | Original Target Values (from approval documents) | Formally Revised Target Values | Actual Value Achieved at Completion or Target Years |
|--|--|--|--|---|
| Indicator 1 : | Number of private developers and rural development organizations involved with active investments (in renewable energy systems) by the end of the project. | | | |
| Value (quantitative or Qualitative) | No mini-hydro schemes. | | 5 mini-grids with a capacity of 1.2 MW | 0 |
| Date achieved | 01/29/2006 | | 06/02/2010 | 06/30/2011 |
| Comments (incl. % achievement) | 0. This indicator was tracked in the M&E framework for the original project ending in June 2011 and carried over to the M&E framework for additional financing credit for the Energy Access Project with the added indicator of target capacity installed. | | | |
| Indicator 2 : | Total number of electrified health centers and schools with access to electricity by the end of the project. | | | |
| Value (quantitative or Qualitative) | 0 | 320 | | 300. |
| Date achieved | 10/14/2005 | 06/30/2009 | | 06/30/2011 |
| Comments (incl. % achievement) | 94 percent. This indicator did not appear in the PAD but was tracked by the ISRs beginning in 2005. Solar PV systems were installed in 200 health posts and 100 schools. | | | |

(c) Intermediate Outcome Indicator(s)

| Indicator | Baseline Value | Original Target Values (from approval documents) | Formally Revised Target Values | Actual Value Achieved at Completion or Target Years |
|-------------------------------------|--|---|---------------------------------------|--|
| Indicator 1 : | Acceleration in access to electricity (number of connections) | | | |
| Value (quantitative or Qualitative) | 0 | 150,000 | | 120,000 |
| Date achieved | 06/04/2002 | 06/30/2009 | | 06/30/2011 |
| Comments (incl. % achievement) | Achievement (%): 80 (for connections under the project) and 87 (for number of towns with new connections). | | | |
| Indicator 2 : | Acceleration in access to electricity (geographical coverage) | | | |
| Value (quantitative or Qualitative) | 0 | 85 | | 67 |
| Date achieved | 06/04/2002 | 06/30/2009 | | 06/30/2012 |
| Comments (incl. % achievement) | 79 Percent. | | | |

G. Ratings of Project Performance in ISRs

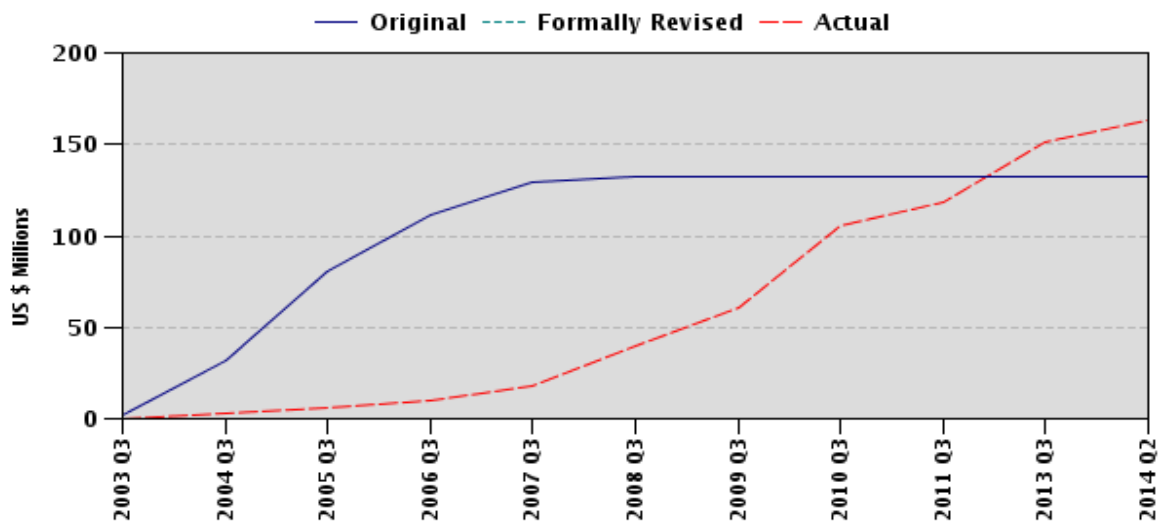
| - | | | | | | |
|-----|-------------------|----|-----|----|-------------------------------------|-----------|
| No. | Date ISR Archived | DO | GEO | IP | Actual Disbursements (USD millions) | |
| | | | | | Project 1 | Project 2 |
| 1 | 04/11/2003 | S | | S | 0.00 | 0.00 |
| 2 | 11/26/2003 | S | | S | 2.04 | 0.00 |
| 3 | 05/10/2004 | S | | S | 2.63 | 0.00 |
| 4 | 12/15/2004 | U | | S | 6.13 | 0.00 |
| 5 | 05/12/2005 | U | | S | 7.06 | 0.00 |
| 6 | 12/21/2005 | U | S | S | 8.51 | 0.00 |
| 7 | 05/21/2006 | MS | MS | S | 10.59 | 0.00 |
| 8 | 12/22/2006 | MS | MS | MS | 17.00 | 0.00 |
| 9 | 06/07/2007 | MS | MS | MS | 18.52 | 0.25 |
| 10 | 12/21/2007 | MS | MS | MS | 35.95 | 0.30 |
| 11 | 06/04/2008 | MS | MS | MS | 46.32 | 0.32 |
| 12 | 12/24/2008 | MS | MS | MS | 60.52 | 0.46 |
| 13 | 06/30/2009 | MS | MS | MS | 62.17 | 0.46 |
| 14 | 12/01/2009 | MS | MS | MS | 99.44 | 0.83 |
| 15 | 06/28/2010 | S | S | S | 109.04 | 1.75 |
| 16 | 03/27/2011 | MS | MS | MS | 118.31 | 2.70 |
| 17 | 12/18/2011 | MS | S | MS | 134.59 | 3.60 |
| 18 | 06/30/2012 | MS | S | MS | 136.05 | 4.45 |
| 19 | 05/17/2013 | MS | S | MU | 151.85 | 4.45 |

H. Restructuring (if any)

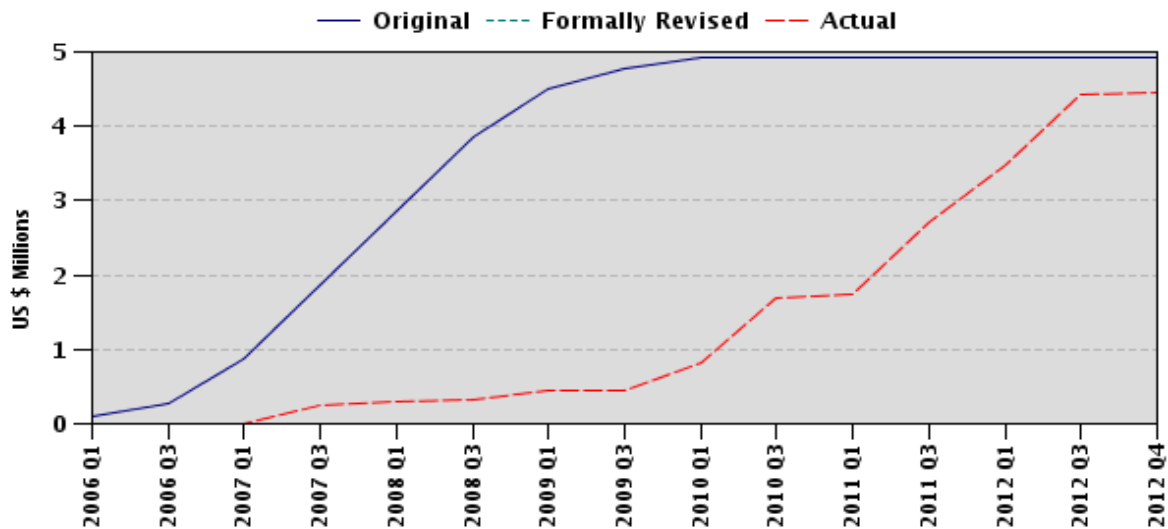
| Restructuring Date(s) | Board Approved | | ISR Ratings at Restructuring | | | Amount Disbursed at Restructuring in USD millions | | Reason for Restructuring & Key Changes Made |
|-----------------------|----------------|------------|------------------------------|-----|----|---|-----------|---|
| | PDO Change | GEO Change | DO | GEO | IP | Project1 | Project 2 | |
| 06/15/2010 | | | S | | S | 108.94 | | |
| 05/13/2013 | | | MS | | MS | 151.85 | | Cancellation of activities and reallocation of funds. |

I. Disbursement Profile

P049395



P077380



1. Project Context, Development and Global Environment Objectives and Design

1.1. Context at Appraisal

1. **Economy/ Energy Sector Interface.** The Energy Access Project (EAP), appraised in 2002, was part of a multi-sector strategy to reduce poverty and improve environmental quality in Ethiopia. EAP supported the Interim Poverty Reduction Strategy Paper (I-PRSP) of 2001. The I-PRSP called for expanded, improved infrastructure to support higher levels of economic growth, in order to raise Ethiopia's low level of per capita income (US\$100). The main source of energy for 90 percent of the population (67 million in 2002) was biomass—wood and dried leaves from trees—for subsistence, mainly for cooking food. Continued dependence on biomass without access to modern fuels was a barrier to the transformation of large segments of Ethiopia's population away from a life of subsistence. An estimated 13 percent of the population had access to electricity but only 6 percent had electricity connections, with connections in rural areas much lower, at 2 percent of the population.

2. **The Power Subsector.** EAP supported the strategy of the Government of Ethiopia (GoE) to increase the electricity access of the population from 13 percent to 20 percent between 2002 and 2012. To reduce imbalances between rural and urban areas, the rural electrification strategy called for the development of an independent Rural Electrification Board (REB) and the Rural Electrification Secretariat (RES) to identify viable projects. The strategy also provided for the creation of the Rural Electrification Fund (REF) to assist in the financing of capital expenditures by households and businesses for connection to the national power grid or the development of off-grid electricity systems. In 2002, the national power utility, EEPCo, had 600,000 customers, of which 85 percent were residential consumers using mainly electricity for basic lighting. Electricity connections were highly concentrated in Addis Ababa and the Central Region of Ethiopia, which accounted for about 70 percent of total electricity sales.³ Decentralization of electrification and greater commercialization were key factors for improving operational performance of the utility, the Ethiopian Electric Power Corporation (EEPCo).⁴

3. **The Biomass Subsector.** The low level of electricity access was one side of Ethiopia's energy poverty; the other was diminishing biomass resources, the main sources of energy. The demand for wood products was increasing at about the same rate as the growth of population (three percent annually), outpacing annual forest yields. Only 10 percent of Ethiopia's total land area of 1.1 million square kilometers (km²) was arable

³ EEPCo's total generating capacity was 473 MW and projected to rise to 981 MW by 2012. Electricity losses were high- at 19.3 percent- and system outages were commonplace. Power demand was growing fast but EEPCo's tariffs were insufficient to generate the needed capital for investment. System load growth was an estimated seven percent annually, based on an electricity tariff of US cents 5.6 per kWh, amounting to only 62 percent of the long-run marginal cost of supply (LRMC).

⁴ The decentralization of EEPCo's operations to eight regional offices was in progress at the time of project appraisal. A management information system (MIS), including an accounting module, was in the implementation stage. The MIS, under implementation with support from the Nordic Development Fund (NDF), was designed to support the operation of regional offices as separate profit/cost centers. EEPCo was also planning to contract its management to an experienced utility for several years. With EEPCo and other development partners focusing on these short-term measures, EAP was to finance a long-term power sector strategy.

while Ethiopia's forest cover was only about four percent of land area. Vanishing forest resources were a major environmental threat to Ethiopia, a landlocked country, periodically afflicted with water shortages, soil erosion, and the threat of desertification. Inadequate supplies of fuelwood and inefficient use in cooking stoves, with high levels of smoke and wood resource waste, were also adversely affecting the health and well-being of women, who had the primary responsibility for gathering fuelwood and cooking.

4. **Key Issues and Strategic Choices.** EAP sought to simultaneously address the following issues, which had resulted in low energy access: inadequate investment in system maintenance and expansion; a large, scattered, rural population for which grid-based access was not an economically viable option; limited development of off-grid solutions for electricity supply; human capacity constraints to implementing electrification programs, and widespread use of biomass energy leading to deforestation and biomass deficits. The key strategic choice in project design was to address energy poverty in the electricity and biomass energy sectors simultaneously in single project. The Bank and the Borrower recognized that biomass would remain important, as a cooking fuel, in the energy balance, even with expanded access to electricity. Both grid-based and off-grid electricity connections also supported the Global Environmental Objective (GEO) of reducing fossil fuels for lighting, by replacing kerosene lamps with electricity for lighting.

5. **Rationale for Bank Involvement.** EAP aimed at supporting higher-level objectives for sustainable economic growth, better distribution of economic opportunity, and private sector development associated with the Country Assistance Strategy (CAS) ⁵ in place at the time of project appraisal. By giving priority attention to rural energy development, EAP supported greater regional balance in access to infrastructure for economic growth and improved quality of life. The Project also supported private sector development, for solar PV and mini-grid expansion. Finally, the Bank brought country and technical experience to this operation through: (i) two previous energy projects in Ethiopia, and (ii) a Regional Program in the Traditional Energy Sector (RPTES), assisting 15 African countries in developing sustainable management practices for biomass fuels.

1.2. Original Project Development Objectives (PDO) and Key Indicators (as approved)

6. The Project's Development Objectives (PDOs) were to: (i) establish a sustainable program for expanding the population's access to electricity and improving the quality and adequacy of electricity supply, thus supporting broad-based economic development and helping to alleviate poverty; (ii) reduce environmental degradation and improve energy end-use efficiency; (iii) reduce the barriers to the widespread adoption of renewable energy technologies, in particular, solar photovoltaic (PV) and micro-hydro power generation in rural areas, thereby contributing to the reduction in greenhouse gas (GHG) emissions via displacement of kerosene and diesel that would otherwise be used for lighting and electricity generation; and (iv) provide technical support for institutional and capacity building of key sector agencies, including for regulatory, fiscal and institutional reforms in the mining sector.

7. The Project Appraisal Document (PAD) listed key performance indicators for the

⁵ The latest CAS, at the time of project appraisal, was dated September 9, 1997.

power and biomass sectors by project closing. The five key indicators in the *power sector* were: (i) an additional 850,000 persons with direct access to electricity (plus an additional 250,000 persons with indirect access to electricity through the improved services of electrified health and educational institutions); (ii) a significantly faster rate of small business development in newly electrified areas than in similar locations not yet electrified; (iii) a permanent regulatory and institutional structure for private-sector led rural electrification; (iv) an adequate distribution network to meet requests from new customers (backlog reduced by 75 percent); and (v) reduction of the incidence of low voltages and voltage fluctuations beyond acceptable ranges. In the *biomass sector*, the three key indicators were: (i) the production and distribution of 320,000 improved, injera-baking stoves; (ii) an additional 302,000 hectares (ha.) of forests under participatory management; and (iii) 384,000 ha. of new agroforestry schemes.

1.3. Original Global Environment Objectives (GEO) and Key Indicators (as approved)

8. The Global Environment Objective (GEO) was to initiate the process of eliminating the barriers that were impeding the development of renewable energy, in particular solar photovoltaic (PV) systems and micro hydro capacity. The GEO was to contribute to the reduction of greenhouse gases (GHG) as some of the use of diesel for power generation would be displaced by the renewable energy. The key indicators for the GEO were the following: (i) solar PV systems installed in 320 institutions, health centers and schools, (ii) 4,000 homes with solar PV systems and (iii) 5 mini-hydro schemes developed.

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

9. The PDO was not revised during project implementation.

1.5. Revised GEO (as approved by original approving authority) and Key Indicators, and reasons/justification

10. The GEO was not revised during project implementation.

1.6. Main Beneficiaries

11. The direct beneficiaries were people living in towns and villages gaining access to their electricity in their homes and small businesses. The indirect beneficiaries were people without direct household connections but served by health centers or schools improved by electricity access.

1.7. Original Components (as approved)

12. **Component 1: Institutional and Capacity Building.** This component consisted of preparation of the following outputs: (i) a long-term power sector strategy; (ii) an indicative Rural Electrification Master Plan and specific studies to build a pipeline of rural electrification projects for private-sector investment; (iii) an integrated, rural energy strategy paper, covering both the biomass sector and modern forms of energy; (iv) capacity-

building for private-sector enterprises interested in investing in small-scale renewable energy resources; (v) capacity-building for the key energy sector agencies – EEPCo, the Ethiopian Electricity Agency (EEA), the regulatory body, and the Rural Electrification Secretariat (RES); and (vi) regulatory reforms for the mining sector.

13. **Component 2: Urban Distribution and Load Dispatch.** This component included the following subcomponents: (i) expansion and rehabilitation of the urban electricity distribution system, covering the country's four largest load centers: Addis Ababa, Bahir Dar, Dire Dawa, and Nazareth; and (ii) establishment of a Load Dispatch Center (LDC), which was to include a Supervisory Control and Data Acquisition (SCADA) system.

14. **Component 3: Rural Electrification.** This component consisted of technical and financial support for: (i) grid-based rural electrification to be managed by EEPCo, and (ii) private-sector development of isolated rural electricity systems, including the development of local capability to formulate renewable energy strategies and plans.

15. **Component 4: Biomass Management.** This component consisted of: (i) the development of a national strategic plan and policy framework for the biomass energy sector; (ii) the planning, establishment and monitoring of participatory sustainable natural forest management systems covering 302,000 ha; (iii) the establishment of farm/agroforestry schemes, covering 384,000 ha; and (iv) support for energy end-use efficiency improvement in the household sector, through the promotion of 320,000 injera-baking stoves in peri-urban and rural areas.

16. **Project Component 5: Environmental Mitigation.** This component was to finance the cost of implementing the Environmental Management Plan (EMP) prepared under the Environmental and Social Impact Assessment (ESIA). It included the following activities: (i) capacity-building for an environmental and social management unit to be established by EEPCo; (ii) implementation of a compensation plan for crops lost during the construction of power lines; and (iii) technical audits to ensure and support safe disposal of old transformers containing polychlorinated biphenyls.

Project Costs and Financing

17. The total cost of the Project, as designed at appraisal (Original Project) was US\$199.12 million equivalent. Table 1A shows the original allocation of Bank financing of EAP, by component. The power sector components – improvements to the power system and increased access to electricity-- accounted for 80 percent of the total. Improved biomass management accounted for 14 percent and support for institutional development and capacity building along with environmental mitigation, the remaining six percent. As shown in Table 1B, Bank financing accounted for about 67 percent of the total with the Borrower (Government of Ethiopia) financing 23 percent and other financiers, the remaining 10 percent.

Table 1A: Allocation of Bank Financing by Project Component

| Component | Cost (million) | Share of Total (percent) | Bank Financing (US\$ million) | Share of Bank Financing (Percent) |
|--------------------------------------|----------------|--------------------------|-------------------------------|-----------------------------------|
| Institutional and Capacity Building | 10.80 | 5.40 | 7.46 | 5.60 |
| Urban Distribution and Load Dispatch | 88.71 | 44.60 | 60.14 | 45.30 |
| Rural Electrification | 56.30 | 28.30 | 46.25 | 34.90 |
| Biomass Management | 42.30 | 21.20 | 18.64 | 14.00 |
| Environmental Mitigation | 1.01 | 0.50 | 0.21 | 0.20 |
| Total Project Costs | 199.12 | 100.0 | 132.70 | 100.00 |

Table 1B: Planned Financing of Project Costs at Appraisal

| Financier | Project Costs | % Share of Total |
|---|---------------|------------------|
| Borrower | 46.07 | 23 |
| IDA | 132.70 | 67 |
| European Investment Bank | 15.42 | 8 |
| Global Environment Associated IBRD Fund | 4.93 | 2 |
| Total | 199.12 | 100 |

1.8. Revised Components

18. In 2010 an Additional Financing (AF) credit in the amount of \$180 million was approved and the Original Project restructured to drop the supply side activities of the biomass component, scale up ongoing activities, and add new activities within existing components. Over 75% of the Additional Financing was allocated to Component 2 to finance increasing the capacity and reliability of urban networks by carrying out power system rehabilitation within and beyond Addis Ababa. The government identified this as a priority investment activity to achieve its goal of expanding electricity access. Although more than half of the Original Project proceeds were allocated to this activity, it remained a priority for scaling up under the AF credit, given the large, ongoing financing needs of this investment activity. The rehabilitation work and upgrading under the Project were intended to almost double the power distribution capacity in Addis Ababa and seven additional cities. Table 2 summarizes the components of the restructured project.

Table 2: Summary of Revised Project Components

| Component | Description of activities |
|---|--|
| Urban Distribution Network and Load Dispatch Center | Continued upgrading of the Addis Ababa network ⁶ , renovation of networks in seven other cities and upgrading of 19 substations. |
| Rural Electrification (a) Grid Based | Connecting 50 new villages for supply of electricity to an additional 70,000 households and businesses ⁷ ; supporting connections of new customers in previously electrified villages; the installing of 1.1 million compact fluorescent lamps (CFLs) in the houses of new electricity consumers, and the installing energy-efficient lamps for the streetlights. |
| (b) Off-Grid | Financing of the drilling and testing of appraisal wells for geothermal development, in partnership with the Government of Japan. |

1.9. Other significant changes

19. In 2006, the government established the Universal Electricity Access Program (UEAP), as the framework under which EAP's component for expanding grid based rural electrification would be implemented. Due to delays in project implementation, two closing date extension were approved in January 2007 and in June 2009. In 2010, an Additional Financing and a restructuring were processed simultaneously with the effect of: eliminating the supply side activities under the biomass management component; significantly scaling up support for power system rehabilitation, increasing grid-based connections, supporting geothermal development and improving energy efficiency; reallocating expenses in line with activities under the restructured project and revising the performance indicators to be consistent with changes made since the MTR in 2005.

2. Key Factors Affecting Implementation and Outcomes

a. Project Preparation, Design and Quality at Entry

20. The Project's design incorporated experience with other electrification⁸ and biomass development projects,⁹ taking account of some lessons learned¹⁰. The Project's rationale was sound in its tailoring of electrification access to location, allowing the private sector to take the lead in providing electricity access to remote areas, and rehabilitating

⁶ Bahir Dar, Mekele, Jima, Awassa, Dessie, Nazareth, and Dire Dawa.

⁷ Shops, artisans, flour mills, etc.

⁸ Eritrea, Ghana, India, Laos, Indonesia, Mozambique, Sri Lanka, Uganda, and Vietnam. Also, a feasibility study found the rehabilitation and expansion of the urban distribution market in Addis Ababa to be the least-cost means of reducing electricity losses as well as meeting un-served energy. Furthermore, prior to appraisal, EEPCo funded a study tour of engineers and management staff to Ghana to learn about shield-wire distribution technology, a low-cost power option proposed for use in the Project. Finally, the GoE revised the EEPCo tariff to ETB 5/kWh (US\$0.06/kWh equivalent) in 2006 as recommended by the cost-of-supply study, an important step towards maintaining EEPCo's financial viability.

⁹ The Cooking Efficiency Improvement and New Fuels Marketing Project and the Commercialization of Innovative Woodstoves Project. The design of the supply-side component in the biomass sector benefited from the analysis of: (i) successful participatory forest schemes tested in Burkina, Ethiopia, Mali, Mozambique and Senegal; and (ii) successful experience with farm/agroforestry schemes in Ethiopia, Mozambique and Senegal.

¹⁰ Lessons in these areas concerned the importance of involving the beneficiary communities in the design of remote power systems and ensuring cost-recovery.

power distribution systems to support increased access. Also, the government showed a strong commitment to the project's objectives.¹¹ The Project preparation and design had a number of shortcomings, which were to have an important impact on project outcomes: *First*, despite the importance of the biomass sector in the energy balance, the strategic choice of including the biomass sector with the power sector in a single project did not take into account government ownership of the biomass program as a whole and its institutional capacity in the coordination of activities to be implemented by different sub-sectors; *Second*, the team failed to heed lessons from past projects on the importance of simplifying the project design, while the scale of access expansion i.e. 120,000 new, rural customers, was unrealistic;¹² *Third*, the design of the rehabilitation of the urban distribution system and the completion of the institutional architecture were left to project implementation, ultimately contributing to substantial implementation delays; and *Fourth*, the PAD rated the overall project risk as *moderate* when it should have been rated *substantial*, given the project's complexity and existing institutional capacity constraints.¹³

2.1. Implementation

21. **Overview.** EAP took about 10 years to complete from effectiveness in 2003 until the closing date of June 30, 2013, more than double the original four years envisaged. The main factors that caused the delay were the lack of readiness, at appraisal, of the design for the rehabilitation of the urban power distribution systems and unforeseen changes in city planning in Addis Ababa, which delayed the completion of physical works. The supply side of biomass component was cancelled due to the lack of interest from the GoE. Throughout project implementation, the Implementation Status Report (ISR) ratings ranged from *satisfactory* to *moderately satisfactory*, with a *moderately unsatisfactory* rating at the end due the lack of timely implementation of activities planned under the additional financing. Finalizing the design of the rehabilitation of the power distribution systems and the weak institutional capacity of EEPCo caused implementation delays. The end result was that by the closing date of the project, minimal progress was made on the implementation of power system rehabilitation financed by the AF, thus all of the AF proceeds allocated to that component were cancelled. Annex 2B provides a detailed review of project implementation. Of the total amount of US\$340 million allocated to the Project from the Original Credit in 2002 and AF Credit in 2010, the Bank disbursed only about US\$160 million, or 47 percent. Table 3 shows the changes in project financing.

¹¹ The Government's Letter of Development Policy supported the foundational elements for improvements to the power system, expansion of electricity access, enhanced sustainability of biomass resources, and the promotion of private-sector involvement in the energy sector. The Chairman of the Board of EEPCo and the Minister of State for Infrastructure had taken a key interest in promoting electricity access.

¹² EAP covered the national power grid, off-grid systems, afforestation, improved cook stove production as well as regulatory aspects of the mining sector.

¹³ The analysis in the PAD considered four categories of risks as *moderate*: adoption of low-cost designs for grid extension, the effectiveness of power sector strategies, failure to mainstream the components for biomass management, and limited government capacity for project preparation and implementation. The adoption of low-cost designs was to be mitigated by EEPCo's strong interest in such designs during appraisal. For the mainstreaming of biomass management, the PAD assumed that the success of the initial small program being supported by the project would allow for mainstreaming in follow-up projects. However, this underestimated the difficulties involved with actual adoption of the initial program. The PAD considered that the institutional set up at the time of appraisal, strengthened by consultancy services, to be sufficient to mitigate the capacity risks in implementing rural electrification investments.

Table 3: Changes in Funding Allocations by Project Component: 2002-2013 (in million US\$)

| Component | Original Allocation In 2002 | Reallocation in 2010 | Additional Financing in 2010 | Budget Adjustment in 2013 | Cancelled Amount |
|--------------------------------------|-----------------------------|----------------------|------------------------------|---------------------------|------------------|
| Urban Distribution and Load Dispatch | 60.10 | 80.00 | 137.00 | 0.00 | 137.00 |
| Rural Electrification | | | | | |
| -Grid-based expansion | 39.80 | 66.00 | 30.00 | 16.74 | 13.26 |
| -Off-grid expansion | 6.40 | 5.00 | 10.00 | 12.95 | -2.95 |
| Biomass Development | 18.60 | 4.70 | 0.00 | 0.00 | 0.00 |
| Institutional Capacity Building | 7.50 | 4.00 | 3.00 | 4.54 | -1.54 |
| Environmental Mitigation | 0.20 | 0.30 | 0.00 | 0.00 | 0.00 |
| Total | 132.70 | 160.00 | 180.00 | 34.23 | 145.77 |

22. **Mid-Term Review (MTR).** The Project's MTR, conducted in October 2005, found implementation progress *moderately satisfactory*. Disbursements were extremely low at 5.4 percent of the Original Project amount (US\$132.7 million equivalent). Nevertheless, the MTR was optimistic that the pace of disbursement would pick up, noting a contract recently awarded for grid-based electrification. The MTR also gave considerable attention to financial and institutional factors constraining implementation of the off-grid component. Finally, the MTR modified some of the project's performance indicators.¹⁴

23. **Establishment of the Universal Electricity Access Program (UEAP).** During the implementation of EAP, the Government established the UEAP as the overall framework for extending the power grid to rural towns and villages, serving up to 20,000 people. UEAP's initial target was the electrification of about 50 percent of rural towns over five years with the remaining rural towns electrified after 10 years. Most remote towns were to be electrified through off-grid systems. From 2006, the UEAP coordinated all rural electrification programs in Ethiopia. The beneficiaries include residential customers, commercial/industrial customers, such as flourmills, irrigation centers, water pumping, and telecommunications.

24. **Extensions of the Closing Date and Restructuring.** The Bank extended the closing date from June 30, 2007 to June 30, 2009, based on signs of progress in the implementation of most components after a slow start and low disbursements. A second extension took place from June 30, 2009 to June 30, 2011, due to additional time required to complete the Urban Power Distribution Component. The Additional Financing Credit was also a restructuring operation that addressed a financing gap in the Original Project urban network rehabilitation component, extended the project scope of rehabilitation work to additional towns outside of Addis Ababa, and provided funding to assess the country's geothermal potential in support of a large scale renewable energy development. The GEF grant supporting off-grid electrification with renewable energy closed on June 30, 2012,

¹⁴ Following the MTR, the ISRs show the addition of a target of 17 percent for power system losses, from a baseline of 20 percent, and a target operating margin of US cents 1.0 per kWh for EEPCo.

three years later than the original closing date of June 30, 2009. The final closing date for the Project as a whole, including components funded by the AF, was June 30, 2013.

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

25. There were serious shortcomings and inconsistencies in the M&E framework of EAP, which had to be sorted through during the ICR in order to have an M&E framework that could be used for performance evaluation (Table 4). *First*, there was a disconnect between the key indicators in the main text of the PAD and the annex with the design summary¹⁵. *Second*, some key indicators in the PAD were not included in the Implementation Status Reports (ISRs), i.e., faster business growth in electrified areas and reduction in the backlog of requests for connections. *Third*, there was no methodology given for comparing business growth in electrified and non-electrified areas, the key indicator of the energy/economy interface. *Fourth*, the tracking of indicators in ISRs was inconsistent.¹⁶ *Fifth*, there was a lack of logical distinction between outputs and outcomes, as discussed in paragraph 31. *Sixth*, there was no tracking of cumulative results in the ISRs of the Project's last three years. Annex 2A provides a detailed account of the changes in the M&E framework during project implementation.

26. Taking the above factors into account for the purpose of evaluating achievement of the PDOs, the ICR used outcome indicators highlighted in the main text as well as the institutional capacity indicator from the design summary of the original PAD, supplemented by measurable indicators established during the MTR. The ICR has based this selection on two factors. First, the EAP did not change objectives during the decade of its implementation. Second, with the cancellation of most of the Additional Financing credit, the new indicators selected and noted in the ISRs for the last three years of the project became essentially invalid.

27. Table 4 summarizes the performance indicators used for the ICR's evaluation of EAP's performance. In cases where performance indicators were listed as both outcome indicators and intermediate outcome indicators, the ICR evaluation has chosen the key outcome indicators highlighted in the main text of the PAD. For example, the ICR has classified the number of towns connected (and the related number of connections), along with the number of solar PV and mini/micro hydro installations as intermediate-outcome indicator but the number of people gaining access to electricity through these connections as outcome/impact indicators.

¹⁵ For example, in the main text of the PAD, reductions in voltage fluctuations and a decrease in the backlog of connections were performance indicators of improved service quality. However, in the design summary, the outcome indicators for improved service quality were significant reductions in unserved energy and losses.

¹⁶ For example, regarding network losses, sometimes ISRs tracked a percentage decline and other times a specific loss target (i.e. 17 percent). The final loss target of 9 percent was unrealistic and the loss reduction indicator was dropped altogether toward the end of the Project.

Table 4: Key Indicators used for the ICR Evaluation

| Outcome Indicators | |
|--|--|
| Expanded electricity access | 850,000 people with direct electricity access in urban and rural areas and 250,000 people with indirect electricity access served by electrified health centers and schools. |
| Improved quality of electricity service | Power system losses at 17 percent at the end of the Project, from a baseline of 20 percent. |
| Improved biomass management | <i>On the demand side:</i> distribution of 1.2 million improved wood-fueled injera cooking stoves. (Target increased after the 2010 restructuring from 1 million in 2009 and 320,000 at appraisal. <i>On the supply side:</i> 384,000 hectares of forests under participatory management and 302,000 hectares of agroforestry, on the supply side. |
| Capacity building and institutional development | Operating margin of EEPCo at least US\$0.01 per kWh. Establishment of a regulatory and institutional structure for rural electrification. |
| Intermediate Outcome Indicators | |
| Grid-based electrification | 85 towns electrified, resulting in 150,000 connections by project closing. |
| Off-grid electrification | 320 health clinics and schools electrified and five micro-hydro installations established. |

28. As indicated above, the ISRs selectively monitored the key indicators in the PAD, focusing on quantitative indicators and reporting on progress twice per year. However, the Bank could have given more attention to the results chain, particularly the relationship between intermediate and final outcome indicators. For example, in its list of key indicators, the PAD provided an outcome/impact indicator for “faster rate of growth for income-enhancing and economic diversification businesses in project areas.” This was the only outcome indicator of the impact of electricity on the economy. Instead of setting up an appropriate M&E framework for evaluating it, the ISRs dropped the indicator. Most of the quantified ‘outcome’ indicators --such as the facilities constructed and the number of persons with access to electricity--were really outputs, or intermediate outcomes in a results chain that, with hindsight, should have focused more on the electricity/economy interface.

2.3. Safeguards and Fiduciary Compliance

29. **Safeguards.** EAP, as originally designed, triggered two safeguard policies: Environmental Assessment (OP/BP/GP 4.01); and Involuntary Resettlement (OP/BP 4.12). EEPCo developed and publicly disclosed a Resettlement Policy Framework (RPF) in accordance with World Bank requirements. The restructuring of the Project also triggered the safeguards for International Waterways (OP/BP7.50). The possibility of financing micro hydro power plants was envisaged under the original scope of the Project but ultimately no such plants were financed. The AF for EAP also triggered Physical Cultural Resources (OP/BP 4.11) because of the possibility of a cultural find during geothermal exploration. Furthermore, the AF triggered OP/BP 4.01 because of possible contamination from old transformers removed from the system during upgrade of the urban electricity distribution network and substations. Finally, EAP and the AF triggered OP/B4.12, due to the high volume of bird flocks in project areas. EEPCo developed and publicly disclosed an

Environmental and Social Management Framework (ESMF) for screening of individual projects as well as a Resettlement Policy Framework (RPF), in accordance with the World Bank requirements. The Project supervision documents do not reflect problems with safeguards compliance, other than some delays in compensation for persons affected by the Project. There was also no need to monitor compliance with OP/BP7.50 and OP/BP 4.11 because both micro hydro schemes and drilling activities were not implemented during the project period

30. **Procurement.** Although EEPCo was a major procurement entity in Ethiopia, the legal framework and institutional arrangements for procurement were problematic for the company throughout project implementation. Specific problems encountered, included high staff turnover and a highly centralized decision-making process, requiring EEPCo's Board to approve most procurement packages. This cumbersome process delayed the submission of bid evaluation reports that required review by several tender committees. The resolution of procurement complaints caused further delays. The EEPCo also expressed dissatisfaction on occasion with the time required for clearances given by the Bank, as there were often multiple iterations prior to issuing the "no objection". As part of the overall portfolio discussion, IDA and EEPCo agreed on the recruitment of an internationally experienced Procurement Advisor under the second Electricity Access and Rural Expansion Project (EAREP2). This Advisor has helped to provide on-the-job training to EEPCo project staff and enhance the quality of procurement documents submitted to IDA.

31. **Financial Management.** Overall, EAP complied with requirements for project reporting and auditing. However, at the corporate level, there were delays in reporting and audits were due to the introduction of a computerized accounting and billing system in 2006, which created interface issues with the accounting software. The Bank expressed concern about the lack of a data back-up mechanism and inefficient processes for manual updating of customer billing records. The Bank also expressed concern about the lack of internal financial controls in EREDPC, recommending improvements. EEPCo's audit was consistently submitted after the due date, with the same qualifications, year after year, without rectification. The Bank suggested that EEPCo conduct a "Just-in-Time" assessment to improve its business processes. In early 2012, the JIT assessment of EEPCo's financial management and governance procedures prompted a dialogue between the Bank's task team and EEPCo management, which led to an agreement on a time-bound action plan. EEPCo has also agreed to install an enterprise resource package (ERP) that would integrate data within EEPCo's accounting, billing, procurement, human resources, stores management, and operations management systems and facilitate better information flow, oversight and management of its operations. The ERP package is currently at the procurement stage, with financing provided under Electricity Network Reinforcement and Expansion Project (ENREP).

2.4. Post-completion Operation/Next Phase

32. Following the implementation of the EAP, the Bank adopted a programmatic development approach to rural electrification and access expansion in Ethiopia. In 2006, the Bank supported the first Electricity Access for Rural Expansion Project (P097172), which closed on December 31, 2012. The second Electricity Access and Rural Expansion Project (P101556) was approved in 2007 and will close on December 31, 2014. The most recent

project to support access expansion in Ethiopia was the Electricity Network Reinforcement and Expansion Project (P119893), approved in 2012. During the supervision of these ongoing projects, the Bank's project team is following up on household electricity connections implemented by EEPCo, with goods procured under EAP's additional financing credit. These follow-on projects have been continuing the promotion of off-grid electricity access expansion by the private sector and the strengthening of the power distribution network in Addis Ababa and other towns, as well as assisting with geothermal exploration. However, the future commitment of funds for investment in expanding energy access will depend on: (i) measurable improvement in EEPCo's institutional capacity, especially outside of Addis Ababa, (ii) progress in attracting private capital, and (iii) progress in improving the quality and reliability of electricity supply.¹⁷

3. Assessment of Outcomes

3.1. Relevance of Objectives, Design and Implementation

Rating: High

33. The Project's objectives for electricity expansion and strengthening continue to be highly relevant to Ethiopia's Growth and Transformation Plan (GTP) and the Bank's Country Partnership Strategy (CPS) for Ethiopia. The per capita gross national income (GNI) in Ethiopia is currently about US\$391, substantially lower than the average of US\$1,176 for Sub-Saharan Africa. The GTP, which covers the period 2009/2010 to 2014/2015, is designed to help Ethiopia become a middle-income economy by 2020/2023. A key element of the GTP is the provision of quality infrastructure. Pillar one of the Bank's CPS fosters competitiveness and employment, for which increased and improved delivery of infrastructure are key elements. The GTP calls for expanded coverage of electricity services from about 41 percent of Ethiopia's towns and villages at present to 75 percent by 2015, doubling the number of customers to about four million by that time.¹⁸ The rapid rise in electricity demand has saturated the generation and transmission capacity of EEPCo's network, requiring continued upgrading and expansion to meet GTP objectives.¹⁹ As indicated in Section 2.5, IDA-funded projects are still contributing to addressing the challenges of efficient system performance. Thus, the relevance of EAP's objectives remains high.

¹⁷ Under EAREP II, 5 micro-hydro schemes are to be developed by private operators or cooperatives. Besides funding improvements to the transmission network, ENREP will further strengthen the Addis Ababa network as part of a package to improve the distribution networks of 8 towns. Regarding geothermal development, ongoing drilling activities are using the equipment and consumables bought under the Additional Financing Credit, with financing from the Government of Japan. These drilling activities have paved the way for an IDA-financed Geothermal Development Project.

¹⁸ The number of electricity consumers connected to the EEPCo system grew from 600,000 in 2002 when EAP was appraised, to more than 2 million in 2011. With the increase in access in recent years, demand for electricity has soared. Average annual growth in demand was above 15 percent during 2005-2010, jumped to 25 percent in FY2010, and 32 percent in FY2011.

¹⁹ Numerous segments of the network are over 30-40 years old and many power lines are experiencing a 35 percent voltage drop in transmission. The transmission lines, distribution lines, and the sub-stations are in urgent need of repair and expansion even to meet the current load.

3.2. Achievement of Project Development Objectives and Global Environment Objectives

Rating: Moderately Unsatisfactory

34. The tables that appear below each of the four objectives compare planned targets and actual achievements in meeting the objective. While the ICR will rely on the achievement of the indicators mentioned in Table 4 above in its evaluation, for the sake of completeness, in this section all relevant indicators referenced in either the PAD or the design summary and their status have been included in the respective table beneath each objective.

35. **Objective 1:** Establish a sustainable program for expanding the population's access to electricity and improving the quality and adequacy of electricity supply, thus supporting broad-based economic development and helping to alleviate poverty.

Table 5: Target and Actual Achievements for Objective 1²⁰

| Indicator | Target | Revised Target | Actual Achievement |
|---|-------------------|------------------|----------------------|
| <i>Outcome Indicators</i> | | | |
| people with direct electricity access in urban and rural areas | 850,000 | unchanged | 615,540 |
| people with indirect electricity access served by electrified health centers and schools. | 250,000 | unchanged | 1,100,000 |
| Decrease in power system losses by the end of the Project (%) | 3 | 10.4 | NA ²¹ |
| <i>Total losses on energy sent out by the end of the Project (%)</i> | <i>17</i> | <i>9.6</i> | <i>20</i> |
| <i>Reduction in low voltage and voltage fluctuations</i> | <i>No target</i> | | <i>Not monitored</i> |
| <i>Reduction in the backlog of requests for electricity service</i> | <i>75 percent</i> | <i>unchanged</i> | <i>Not monitored</i> |
| <i>Faster rate of growth for income-enhancing and economic diversification businesses in project areas.</i> | <i>No target</i> | | <i>Not monitored</i> |
| <i>Intermediate Outcome Indicators</i> | | | |
| Number of urban and rural connections to the grid | 150,000 | unchanged | 120,000 |
| No of towns connected | 85 | unchanged | 67 |

36. Table 5 compares planned targets and actual achievements in meeting the objective. The Project achieved 72 percent of its target number of persons gaining access to electricity in both urban and rural areas. The estimated 615,540 people gaining access include those

²⁰ The indicators in italics will not form part of ICR evaluation but were included in the main text of the PAD or the design summary and have been included for completeness.

²¹ The indicator was based on broad based rehabilitation work in the distribution system planned in the original Project for Addis Ababa and four other major towns. However, project funds could only support rehabilitation work in Addis Ababa in the MV system. EEP Co has calculated the reduction in losses in the Addis Ababa distribution system, due to the Project's rehabilitation work, at 0.52 percent, significantly less than 3%.

who obtained off-grid access to electricity as well as those who connected to the power grid.²² The Project expanded access in 67 towns instead of the planned 85 towns, or 79 percent of the target. In addition, EAP provided indirect access to an estimated 1,100,000 people, more than four times the target.²³ In sum, two indicators were partially achieved and 1 exceeded its targets.

37. EAP did not track reductions in the backlog of requests for electricity service or voltage fluctuations. Power system losses declined from a baseline of 20 percent to around 17 percent briefly during the project but by the project closing they had returned to around 20 percent. As indicated earlier, the M&E framework of EAP did not have a system for evaluating the extent of business diversification resulting from electrification.

Objective 2: Reduce environmental degradation and improve end use efficiency.

Table 6: Target and Actual Achievements for Objective 2

| Indicator | Target | Revised Target | Achievement |
|--|-------------|----------------|----------------|
| <i>Demand side:</i> number of efficient injera-baking, wood-fueled stoves produced and sold by the private sector. | 320,000 | 1,000,000 | 2,600,000 |
| <i>Supply side:</i> Natural forest brought under participatory management | 302,000 ha. | unchanged | 0 ha. 0 ha. |
| Farm/agro-forestry schemes established. | 384,000 ha. | | |

38. EAP only partially achieved this objective, as Table 6 indicates. On the demand side, the production and sale of 2.6 million stoves amounted to more than double the revised target set during project implementation and eight times the target at project appraisal. However, on the supply side, EAP did not achieve either of its targets. In 2006, the Government informed the Bank that it had dropped the supply-side subcomponent. However, the forestry-management subcomponent was not formally cancelled until the Project's restructuring in 2010. Given that both demand and supply-side measures were necessary to meet the objective, the ICR considers this objective only 50 percent achieved.

39. **Objective 3 (GEO):** Reduce the barriers to the widespread adoption of renewable energy technologies, in particular solar photovoltaic (PV) and micro-hydro power generation in rural areas, thereby contributing to the reduction in greenhouse gas (GHG) emissions through the displacement of kerosene and diesel fuels that would otherwise be used for lighting and electricity generation, respectively.

²² The total is based on 120,000 connections, the intermediate outcome indicator, assuming five persons per household, for a total of 600,000. In addition, 10,500 people gained access through diesel-powered mini-grids and 5,040 persons through solar PV-based systems

²³ This estimate is based on the electrification of 200 health centers, each serving an estimated 5,000 people and 100 schools, each serving an estimated 1,000 students.

Table 7: Target and Actual Achievements of Objective 3

| Indicator | Target | Achievement |
|---|--------|---|
| Number of solar PV systems installed in schools and health posts. | 320 | 200 health posts and 100 schools. |
| No. of mini-hydro grids installed | 5 | 0 installed but environmental and social impact assessments (ESIAs) were prepared and designs were completed. |

40. The GEO-financed components were considered pilot operations to test the market and modalities for renewable energy promotion. As Table 7 indicates, the Project substantially achieved the GEO physical indicator, reaching 94 percent of the target solar-PV installations for health centers and schools. It is estimated that 160.7 tons of CO₂ will be avoided per year with the use of PV systems. None of the mini-hydro grids was installed. However, the EAP did result in the completion of Environmental and Social Impact Assessments (ESIAs) as well as design studies for the mini-hydro plants such that five projects are now ready for implementation. Consequently, the ICR confirms that the EAP met the GEO with moderate shortcomings and consequently the achievement of the GEO outcomes should be rated *moderately satisfactory*.

41. **Objective 4:** Provide technical support for institutional and capacity building of key sector agencies, including regulatory, fiscal and institutional reforms in the mining sector.

Table 8: Targets and Achievements for Objective 4

| Indicator | Target | Achievement |
|--|---|---|
| Establishment of a regulatory and institutional structure for rural electrification. | Structure established and mainstreamed. | The Ethiopian Rural Energy Development and Promotion Center (EREDPC), the Rural Energy Secretariat (RES), the Rural Electrification Board (REB) and the Rural Electrification Fund (REF) have been established with funding to study, evaluate, and arrange funding for rural electrification projects. |
| Level of EEPCo's operating margin. | At least US cents 1.0 per kWh. | This indicator fluctuated between US cents 0.4 per kWh and US cents 1.5 per kWh during EAP's implementation. At project closing, information on the operating margin was unavailable. |

42. Table 8 summarizes the targets and achievements in institutional development and capacity building. By project closing, EAP had resulted in the establishment of the institutional and financial architecture for rural electrification. The EREDPC has a mandate to conduct studies on national energy resources, collect data, and promote renewable energy in rural areas. The RES appraises rural projects and provides advisory services, capacity building and training to Ethiopia's regional energy bureaus and cooperatives. The REF enables private and cooperative engagement in rural electrification activities through loan-based finance and technical support. This fund subsidizes 85 percent of the cost of rural electrification projects, with renewable energy sources entitled to a higher subsidy of 95 percent. Regarding sustainability, the Bank has concern that the absorption of EREDPC within Ministry of Water and Energy (MoWE) -- as opposed to remaining an autonomous, public sector institution--may limit the institution's effectiveness in promoting renewable energy in rural areas and in further expanding rural electricity access.

43. During EAP's implementation, EEPCo, the agency responsible for managing the major project components, had an operating margin fluctuated during implementation between US cents 0.4 per kWh and US cents 1.5 per kWh, with data on this margin unavailable at project closing. Moreover, EEPCo's current financial position is weak so its ability to continue supporting rural electrification expansion is uncertain. Given these considerations, and despite progress made in establishing an institutional framework for expanding rural electricity access, the longer-term impact of this framework is not assured. Thus, the ICR considers the institutional objective only partially achieved, with uncertainty regarding sustainability.

Summary Achievement of Objectives

44. Table 9 summarizes the achievements for all four objectives in the table below. Overall, the ICR considers that EAP only partially achieved each of the four objectives, three with significant shortcomings and one with moderate shortcomings, raising concern about long-term sustainability. Taking into account the shortcomings and weighing the importance of the objectives, the ICR finds, on balance, significant shortcomings in the achievement of objectives.

Table 9: Summary Achievement of Targets for Project Objectives

| Objective | End-of-Project Achievement |
|--|---|
| Objective 1: Establishment of a sustainable program for electricity access and improved quality of service | Partially achieved with significant shortcomings in quality and sustainability of electricity supply. |
| Objective 2: Reduction of environmental degradation and improved efficiency. | Partially achieved with significant shortcomings to ensure environmental sustainability. |
| Objective 3: Reduce the barriers to renewable energy development. | Partially achieved with moderate shortcomings. |
| Objective 4: Technical support for institutional development and capacity building. | Partially achieved with the institutional framework in place but significant shortcomings in technical and financing. |

3.3. Efficiency

45. The PAD prepared an economic cost-benefit analysis for three project components: (i) urban distribution system rehabilitation and expansion, (ii) the construction of a load dispatch center, and (iii) grid extension to towns and villages. The Economic Internal Rate of Return (EIRR) at appraisal, for all three of these components combined was 18 percent. The EIRRs by component were as follows: urban distribution system rehabilitation (13 percent), load dispatch center (20 percent), and grid-based rural electrification (14 percent). All components had positive economic net present values (ENPVs). For the ICR, information was available to re-estimate only the EIRR and ENPVs for the grid-based electrification component. Based on the roughly the same period as the PAD, from project start to 2037, the ICR has re-estimated the EIRR at 21 percent with an ENPV of US\$67.7 million at 10 percent and US\$40.5 million at 12 percent, using relatively conservative estimate of willingness to pay for electricity.²⁴ Annex 3 provides details of the analysis.

²⁴ The economic cost-benefit analysis in the PAD used the average tariff of US\$0.06 per kWh in 2002 as a proxy for WTP. The ICR has used US\$0.17 per kWh for the base case WTP, a figure cited in recent Bank

The higher EIRR of 21 percent, calculated for the ICR, compared to the EIRR of 14 percent in the PAD, results primarily from the valuation of the benefits at the WTP of US\$17 per kWh, whereas the PAD valued the benefits at the average tariff of US\$06 per kWh, used as a proxy for WTP.

3.4. Justification of Overall Outcome and Global Environment Outcome Rating

Rating: Moderately Unsatisfactory

46. On the positive side, EAP: (i) increased rural electricity connections significantly; (ii) established an institutional framework for continuing rural electrification in the future; and (iii) made notable progress toward eliminating barriers to renewable energy development (GEO). On the negative side, the Project : (i) had significant shortcomings in achieving specific outcome indicators; (ii) did not generate the data to fully assess the efficiency; (iii) failed to implement the entire supply side of the biomass component; and (iv) cancelled most of the Additional Financing Credit due to low disbursements. The distribution of improved fuelwood stoves was a considerable success with a large-scale impact. However, as indicated earlier, this program represented only half of the biomass management component, which, in its entirety, accounted for only about 14 percent of the original project costs. Furthermore, despite the EAP's long implementation period, there was no upgrading of the M&E framework to evaluate the economic impact of electrification on small business development, an indicator in the PAD, or the environmental impact of improved stoves and the substitution of renewable energy for diesel-based generation in off-grid electrification. Also, the ICR considers the risk to development outcome substantial. Therefore despite the continued high relevance of objectives, weighing both the positive and negative results and considering the limited extent to which efficiency can be evaluated, the ICR has rated the overall outcome *moderately unsatisfactory*.

3.5. Overarching Themes, Other Outcomes and Impacts

47. Under EAP, the Bank managed Trust Funds (from the Government of Japan), amounting to US\$ 1.86 million for financial and social assistance to the Former Women Fuel Wood Carriers Association (FWFCA), which consists of about 30,000 women who earn a living collecting woody biomass and transporting it over long distances. The woody biomass typically collected consists of branches, leaves, twigs, and barks weighing approximately 35kg to 80kg that the women carry distances ranging from 10km to 30km. They sell the woody biomass at city centers for Birr 15 to 25 (equivalent US\$1 to US\$1.5). These earnings are not sufficient to support the families of these women, which have an average of seven children each. A successful pilot project in Addis Ababa has helped the women in the FWCA to improve their marketing systems, diversify their income, and improve access to health and educational facilities. Subsequently the project was expanded to cover women in the cities of Addis Ababa, Bahir Dar, Dessie, Mekelle, Awassa, Nazret,

reports, which is toward the low end of the range reported for African (US\$0.15 to US\$0.25 per kWh). In recent years a much higher WTP estimate of US\$0.30 per kWh has been reported by the Bank for Ethiopia. However, given the weakness of the data available for the analysis, the ICR has opted for the more conservative estimate. Using the lowest WTP, the EIRR at 17 percent is still higher than the appraisal estimate (14 percent).

Harar, and Dire Dawa. This project closed in August 2011. No detailed evaluation of the expanded project was available for the preparation of the ICR.

Institutional Change/Strengthening

48. The Bank repeatedly has requested that EEPCo address its severe capacity constraints, improve its database and strengthen network-planning capabilities. Deficiencies in procurement performance, leading to project delays, were pervasive throughout project implementation. The Bank and the Borrower have taken steps to expedite the procurement processes, which have been improving. Also, the lack of coordination between grid and off-grid electrification activities has proven a critical barrier to the implementation of off-grid electrification because REES needs a response from EEPCo to implement approved mini-hydro projects. The Bank has recommended that the Ministry of Energy take the lead in improving coordination between EEPCo and REES. To enhance private-sector led rural electrification, the Bank has recommended that REES and EEA explore a new business model for rural electrification that allows private rural entities to purchase bulk power from EEPCo and become de facto distribution companies.²⁵ EREDPC needed to strengthen its organizational capacity, especially for procurement.²⁶ The Bank also has found that the quality of the technical, environmental and social assessment needs significant improvement.

4. Assessment of Risk to Development and Global Environmental Outcomes

Rating: Substantial

49. The Government has demonstrated a strong commitment to achieving universal access to electricity and the main institutions for expanding electricity access are in place. However, there remain serious constraints, increasingly evident over the past decade, regarding: (i) the limited institutional capacity in the energy sector; (ii) the financial sustainability of EEPCo, which has a vital role in expanding grid connections; (iii) a government strategy that is heavily dependent on state owned energy institutions with limited involvement of private operators; (iv) the lack of agreement on a viable strategy for sustainable expansion of access to electricity in rural areas; and (v) the lack of tangible progress over the past decade in improving the quality of electricity supply. Considering these constraints, the ICR has rated the risk to the main development outcome, i.e. to establish a sustainable program for expanding electricity access, as *substantial*.

50. There are no major issues related to the operation and maintenance of the solar PV

²⁵ This model would allow cooperatives, private operators or other organizations to purchase bulk power, at wholesale prices, from EEPCo, at the nearest sub-station, and re-sell the power at the retail price in one or more villages. The Bank has explained to counterparts in Ethiopia that this type of arrangement has operated successfully in Bangladesh, Mali, Costa Rica and the United States.

²⁶ Project supervision noted the high turnover of key personnel under REF, which is staffed with independent consultants and therefore constantly experiencing a “brain drain” problem. During project implementation, the Bank noted that EREDPC was aware of this problem and was trying to staff the REF group with qualified professionals. Furthermore, the Bank recommended that EREDPC review its business model for the development of mini-hydro-plants to determine why it was not attracting a large number of bankable projects. These issues had not been resolved by project closing in June 2013, when EREDPC became a Directorate under the MoWE.

systems installed in the health posts and schools. A small budget for battery renewal will need to be considered 5 years after installation. Given the modest cost involved it is not anticipated as a burden for GOE in light of the fuel cost savings created by replacement of diesel sources. Therefore, the risk to Global Environmental outcome is rated moderate.

5. Assessment of Bank and Borrower Performance

5.1. Bank Performance

(a) Bank Performance in ensuring Quality at Entry

Rating: Moderately Unsatisfactory

51. The objectives of the Project were aligned with Ethiopia's priorities for the economy and the energy sector as well as with the Bank's CAS. However, there were significant shortcomings, at project entry, in design, institutional assessment, ownership of the strategy to expand electricity access, and the risk assessment. The Project was too ambitious, with: (i) multiple components and three implementing agencies; (ii) a wide scope of activities, which included grid-based and off-grid connections, power system rehabilitation, and biomass management; (iii) inadequate assessment of institutional capacity; (iv) a serious lack of readiness for implementation, which inevitably led to delays; and (v) an underestimation of the project risks. In addition, regarding monitoring and evaluation as discussed in Section 2.8 and Annex 2, the results indicators in the PAD were not consistent with the design summary in the PAD. More specifically, the Project's design left most of the preparation for the rehabilitation of the urban distribution system to project implementation, a decision that resulted in major delays while the institutional constraints and the delayed preparatory work were not adequately accounted for in the assessment of risks. Considering the aforementioned shortcomings, the ICR has rated the Bank's performance in ensuring quality of entry *moderately unsatisfactory*.

(b) Quality of Supervision

(including fiduciary and safeguards policies)

Rating: Moderately Unsatisfactory

52. The Bank supervised EAP simultaneously with other projects focusing on issues common to the entire energy portfolio. Task team leadership changed five times over the 10-year implementation period, causing some continuity problems. The strengths of supervision were: (i) flexibility in working with the Borrower, reallocating project funds in line with the Borrower's requests, (ii) the posting of a senior energy specialist in Addis Ababa to manage the Bank's large energy portfolio in Ethiopia as of 2008, and (iii) cancellation of large portion of the additional financing due to lack of activity, focusing on the preparation of a new project. The main shortcomings were missed opportunities over a 10-year implementation period to: (i) simplify the project, taking into account the capabilities of the implementing agencies; (ii) redesign the M&E framework for a clearer results chain focusing on outcomes; and (iii) establish a stronger capability of the Borrower for cross-sector monitoring and reporting. Actions in these areas could have greatly

enhanced the project performance. Towards the last couple of years, there have been some improvements in Bank management and supervision of the energy portfolio in Ethiopia but it came too late to have a major impact on the overall EAP's outcome. Considering the aforementioned strengths and shortcomings, the ICR finds the Bank's performance in supervision *moderately unsatisfactory*.

(c) Justification of Rating for Overall Bank Performance

Rating: Moderately Unsatisfactory

53. Overall, the Bank's performance had several identified weaknesses. At entry, there were significant shortcomings in scope and design while during supervision there were missed opportunities to take corrective action. Based on *moderately unsatisfactory* performances in ensuring quality at entry and in supervision, the ICR rates overall Bank performance as *moderately unsatisfactory*.

5.2. Borrower Performance

(a) Government Performance

Rating: Moderately Unsatisfactory

54. During project implementation, the Government, through the UEAP and the GTP, further strengthened its commitment to expanding electricity access by targeting the electrification of 75 percent of towns by 2015. However, there were also significant shortcomings in the Government's performance. During the power crisis in 2009/2010, when shortages of hydropower resulted in the use of costly diesel-powered plants, the Government did not allow EEPCo to pass these costs on to the consumer, resulting in a sharp deterioration in the company's financial performance. The government did not also maintain an overall, cross-sector project coordinator, which was necessary, due to the complexity of EAP, to ensure adequate monitoring of the project during implementation and consolidation of the Government's contribution to the ICR. Also, the government did not take full ownership of the biomass component, dropping the supply-side activities. Therefore, on balance, ICR has rated the Government's overall performance *moderately unsatisfactory*.

(b) Implementing Agency or Agencies Performance

Rating: Moderately Unsatisfactory

55. The ICR has rated EEPCo's performance as *moderately unsatisfactory*, primarily due to management and operational deficiencies cited in supervision reports and major delays in completing the design work. EREDPC successfully managed the component for the distribution of improved wood-based cook stoves, far exceeding the target distribution. However, because EREDPC had shortcomings in managing training and in financial controls, the ICR has rated its performance as *moderately satisfactory*. The Ministry of Agriculture was to manage the participatory forestry management and farm agro/forestry programs. Due to the cancellation of these components, the ICR is unable to evaluate the

Ministry's performance. Given ratings of *moderately unsatisfactory* and *moderately satisfactory* for the overall performance of EEPCo and EREDP, respectively, and the fact that EEPCo was responsible for the largest project components, the ICR has rated overall implementing agency performance as *moderately unsatisfactory*, consistent with Bank guidelines for mixed ratings.

(c) Justification of Rating for Overall Borrower Performance

Rating: Moderately Unsatisfactory

56. Given ratings of *moderately unsatisfactory* for both the Government and the implementing agencies, the overall rating of overall Borrower performance is *moderately unsatisfactory*.

6. Lessons Learned

57. The following are the key lessons learned from the Project:

(i) Project Scope and Ownership

58. *A multi-sector energy project without a strong, cross-sector institutional focus can result in a loss of commitment and underachievement of objectives.* EAP was committed to simultaneously expand access to modern energy and increase the availability of biomass energy, the main fuel source for 90 percent of the population. However, neither the Bank nor the Borrower maintained this commitment throughout project implementation, ultimately leading to the cancellation of EAP's subcomponent for improved management of biomass supply in addition to the use of more efficient fuelwood stoves. The Government was supposed to implement the biomass activities on its own but the project files showed no evidence that this took place, raising doubts as to the government's ownership of this component.²⁷ Had the EAP established an entity to monitor actions in both the power and biomass sectors, there may have been more attention given to this component.

59. *Notwithstanding the need to address urgent issues in multiple energy subsectors, if project scope and design are not tailored to the institutional capacity of the implementing agencies, there is a substantial risk of delays and limited achievement of project objectives.* As noted earlier, EAP was extremely ambitious in design, scope, institutional framework, objectives and time framework for project completion. There were three major investment components, each implemented by a different ministry or implementing agency, as well as an institutional and capacity building component. With hindsight, in a country with weak institutional capacity, there probably should have been three separate projects – rehabilitation of the distribution system, expansion of electricity access, and improved biomass management, each of them with a reduced scope and commensurate implementation capabilities at the time of appraisal.

²⁷ The Government informally abandoned the participatory forestry and the agroforestry subcomponents without informing the Bank, sometime in 2006; however, the Bank did not formally cancel the component until 2010.

(ii) Assessment of Capacity-Building Impact

60. *The lack of performance indicators for capacity building and the absence of a clear linkage to planning for staff-development limit the extent of impact assessment for training and technical assistance programs.* The Bank's supervision reports constantly referred to institutional deficiencies –most notably in procurement and financial management--high staff turnover and the need for capacity building. However, there was no evidence of linkage of numerous technical assistance and training activities provided by the project to staff development planning in each of the implementing agencies or any substantive follow-up on the impact of activities on institutional performance. Thus, the design of future projects should ensure a shared understanding between the Bank and implementing agencies on capacity needs and an agreed program on capacity building for which the various energy agencies take full ownership.

(iii) Project Readiness

61. *If the detailed design of a major project is not completed prior to Credit approval for an investment operation, there is a high risk of delay and/or cancellation.* EAP's preparation left the detailed design of critical rehabilitation work in the urban electricity distribution system to project implementation. This was a major task, involving considerable data collection and analysis. Before completing the design during project implementation, there were substantial disagreements between EEPCo staff and the design consultant as well as between the Bank and EEPCo on the design, which contributed to implementation delays. Moreover, experience with the subsequent AF Credit revealed that, even with a completed design at appraisal, problems may still arise due to the lack of commitment to the design and unforeseen changes due to external factors that can delay the completion of physical works.

(iv) Importance of the M&E Framework

62. *The lack of a clear results chain in an M&E framework can lead to major data gaps and missed opportunities for impact evaluation.* EAP was originally designed when the Bank was just beginning to give greater attention to performance monitoring, particularly measurable indicators. However, the Bank had a long implementation period during which it could have improved the M&E framework. In a project such as EAP, which makes a case for funding due to its potential impact of electrification on the economy, the benefits cannot be fully evaluated without an M&E framework designed to assess its impact on key economic activities. The PAD referred to monitoring the development of businesses in areas with and without access to electricity but there was no framework for such analysis at project appraisal or during project implementation. Similarly, the Project was supposed to reduce the adverse impact use on the environment through demand and supply management in the biomass sector and the replacement of hydropower for diesel power in the electrification of remote rural areas. However, the M&E framework did not provide any targets or analytical constructs for measuring environmental impacts. The framework also did not provide technical data needed for an ex-post economic and financial analysis of the Project.

63. *The lack of a system of standardized testing for improved fuelwood stoves prevents a full assessment of the program's impact on reducing emissions from the burning of wood.* The improved stoves sold under the Project claimed efficiency in the range of 47-63 percent. However, these estimates were arrived at by different organizations using various testing protocols. In order to improve project quality and better assess environmental impact, a modern laboratory for stove testing is necessary. This testing could have been incorporated in EAP's M&E framework for estimating the reduction resulting from the sale of improved wood-fueled stoves under the Project.

(v) Close Coordination with Local Planning Authorities and Flexibility in Materials Contracting

64. *The lack of detailed coordination of rehabilitation work for urban power distribution systems with city planning authorities and shortages of local construction materials can be major obstacles to timely completion of the work.* Discussions with EEPCo and reports on the delay of the rehabilitation work in the urban power distribution system indicated that the lack of coordination with city planning was a major obstacle, given considerable construction work in Addis Ababa during the Project's implementation period. The master plan for urban development in the city reportedly changed frequently during project implementation, often without warning, causing delays in the rehabilitation work. Therefore, the planning of rehabilitation work in the distribution system needed to be continuously coordinated with city-planning authorities. There were also shortages of local materials, such as cement and iron bars, during the project. In order to avoid delays due to these shortages, construction contracts should include a clause requiring the import of materials if they are not available locally.

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

(a) Borrower/implementing agencies

65. The Ministry of Finance and Economic Development (MOFED) did not have major comments²⁸ on the ICR. The implementing agencies through UEAP shared the following comments:

(a) Additional Financing 049395 of the Grid based Rural electrification

UEAP claimed connection of 306 customers to the grid and requested the revision of the financial and economic analysis section accordingly. The ICR took into account the fact that all the distribution materials procured under the additional financing were shipped from February 2013 (i.e. 4 months before closure) and not used for electrification during the project implementation period. Therefore it is hard to consider customers connections as part of the AF results. UEAP refers to the time required for IDA no objection and recommend a further revision of the Country Office current threshold for the clearance to be considered. It should be noted that the Procurement Hub Coordinator based in Addis has been given more responsibility the last years, however large complex contracts require corporate oversight. Revisions requested on some sections of the Annex 7 were taken into account.

²⁸ MOFED's comment on the datasheet was taken into account

(b) Urban Distribution Rehabilitation Project

EEP highlighted the fact that Energy Access Project comprises several components of specific projects, whereas the Rating summary tabulated in ICR seems in a combine project portfolio basis and it is difficult to see the detail rating approach for each component. Therefore, it is hard for them to share some of the rating results with regard to Urban Rehabilitation Component. The ICR is based on an overall assessment of the implementing agency which is a mix of the performance under the different components.

(c) Co-Financiers

(d) Other partners and stakeholders

N/A

Annex 1. Project Costs and Financing

(a) Project Costs by Component (in USD million equivalent)

| Components | Appraisal ²⁹ Estimate | Actual/Latest Estimate | Percentage of Appraisal |
|--------------------------------------|----------------------------------|------------------------|-------------------------|
| Institutional and Capacity Building | 8.53 | 3.9 | 45.72 |
| Urban Distribution and Load Dispatch | 80.92 | 112.92 | 139.54 |
| Rural Electrification | 48.09 | 82.32 | 171.18 |
| Biomass Management | 42.39 | 22.7 | 53.55 |
| Environmental and Social Mitigation | 1.00 | 0.3 | 30 |
| Total Base Cost | 180.93 | 222.14 | 122.78 |
| Physical Contingencies | 11.50 | NA | |
| Price Contingencies | 6.69 | NA | |
| Total Project Costs | 199.12 | 222.14 | 111.60 |

NA=Not Applicable

(b) Financing (in USD million equivalent)

| Components | Appraisal Estimate | Actual/Latest Estimate | Percentage of Appraisal |
|---|--------------------|------------------------|-------------------------|
| Borrower | 46.07 | 26.57 | 57.20 |
| EC: European Investment Bank | 15.42 | 31.72 | 120.10 |
| Global Environment Associated IBRD Fund | 4.93 | 4.45 | 90.30 |
| IDA | 132.70 | 159.40 | 120.10 |
| Total Financing | 199.12 | 222.14 | 111.60 |

²⁹ These figures are based on Annex 3 in the PAD. The figures have been adjusted for minor computational errors in the PAD for individual components, to arrive at the total amount on which financing was based, US\$ 199.12 million.

Annex 2: Outputs by Component

| Planned Output | Actual Output |
|--|--|
| <i>Component 1: Institutional Development and Capacity Building</i> | |
| Long-term power sector and rural electrification strategies prepared | A rural electrification strategy was prepared prior to the Project appraisal. Its objective was to enable increase in the population's access to electricity from an estimated 13 percent in 2002 to 20 percent in 2012. According to World Bank development indicators, the latest figure on access to electricity in Ethiopia is 23 percent (2010 data). During the implementation of EAP, the Government increased its commitment to extending electricity by establishing the Universal Electricity Access Program (UEAP). This would help in the realization of 100 percent access to electricity by 2015. EEPCo did not prepare a power system master plan as part of the project as originally envisaged; it informed the Bank of an existing plan and thus declined the Bank's assistance in this regard. |
| <i>Component 2: Urban Distribution and Load Dispatch</i> | |
| Distribution grid strengthened and extended | The project extended and strengthened the distribution system, with the focus on Addis Ababa, which accounts currently for 60% of electricity demand in EEPCo's system. Initially four other towns were to be included in the Project's network rehabilitation work but due to an increase in the cost of materials as at the time the detailed design work was completed, there was not enough funding to cover the additional networks. The additional financing for the project was supposed to rehabilitate networks of additional towns in extreme disrepair but was cancelled due to insufficient time left to complete the works, given the long delay in the design work and cancellation of most of the proceeds. However, the follow-on Electricity Network Rehabilitation and Expansion Project (ENREP) will rehabilitate the networks of eight (8) towns. The Project made a great stride in modernizing Ethiopia's management of the distribution system through the installation of an automated Load Dispatch Center (LDC). The LDC will enable reduction in outage duration and unserved energy. The Project also extended the system grid to 67 towns as described below. |
| <i>Component 3: Rural Electrification</i> | |
| About 100 villages, towns or rural communities electrified in a financially and environmentally sustainable manner | The Project helped provide 67 towns with access to electricity from the EEPCo grid, compared to an estimated 85 towns at appraisal. EAP electrified 21 remote villages from the grid with diesel generators and vastly extended access to electricity generated by renewable energy through providing about 1,000 households, 200 health centers, and 100 schools with electricity generated by solar-PV systems |
| <i>Component 4: Biomass</i> | |
| Management of biomass resources improved and demand for improved, wood-fueled cooking stoves | The Project objective was to improve biomass management from the demand side and the supply side simultaneously through the distribution of a target number of improved, wood-fueled, cooking stoves and the establishment of participatory management of forests and agroforestry developments. The project helped create the demand for improved, wood-fueled cooking stoves as planned, evidenced by the production, sale and distribution of 2.5 million cooking stoves by the private sector, far exceeding the target distribution of 320,000 cooking stoves set at appraisal. However, improvements on the supply side cannot be ascertained based on available project data. The Government cancelled the supply-side component during project implementation and did not produce the completion report requested by the Bank. As a result of this, at project closing, it was unclear to what extent the participatory management of 384,000 hectares of participatory forestry and 302,000 hectares of agroforestry took place with funding outside the Project. |

Annex 2A: Review of the Project's Monitoring and Evaluation (M&E) Framework

1. Given the age of the project, the results framework used the log frame approach with sector and project related objectives and a large number of indicators at the level of the PDOs, intermediate outcomes and outputs. The project's M&E framework had both qualitative and quantitative outcome indicators but the indicators in the main text and the design summary were not always consistent (Annex 1). The main text of the PAD listed key indicators in three categories, corresponding to the first three objectives: expanded electrification, improved quality of electricity service, and improved biomass management. However, for the Institutional and Capacity Building component, there was no corresponding indicator. The design summary had multiple indicators for each component but it would have been difficult to track all of them.

2. The main text shows eight key indicators compared to seven in the design summary, with only two outcome indicators in common: the end-of-project target for hectares of forests under participatory management and the number of hectares under agro forestry schemes. Of the design summary's seven outcome indicators, only these two are quantified. The indicator for a post-project institutional structure required the establishment of institutions responsible for sustaining the energy access program. The other four indicators cannot be measured without baselines targets and a specified methodology. In contrast, the main text shows eight indicators, of which six have measurable targets.

Table 2.1: Comparison of Performance Indicators in the Main Text and the Design Summary of the PAD

| Main Text of the PAD | Design Summary (Annex 1 of the PAD) |
|--|--|
| Expanded Electricity Access | |
| 850,000 direct access 250,000 with indirect access Faster rate of growth for income-enhancing and economic diversification businesses in project areas. | Reliable, affordable, sustainable electricity access and support for development and productive uses of electricity for tens of thousands of new users during project implementation Establishment of an institutional structure to continue electrification after the project. |
| Improved quality of electricity service | |
| Adequate distribution network to meet requests for new service: 75 percent reduction in backlog Reduction in low voltages and voltage fluctuations beyond acceptable ranges | Significant reduction in un-served energy and energy losses. None. |
| Improved Management of Biomass Energy | |
| 302,000 hectares of forests under participatory management | Same. |
| 384,000 hectares of agroforestry schemes developed | Same |
| 320,000 improved injera baking stoves | Shown as an output indicator |
| Capacity building for institutional development | |
| None | Letter of sector development issued by the Government. |

3. **During project implementation between 2005 and 2010.** The outcome indicators in the Implementation Status Reports (ISRs) were not consistent with either the main text or the design summary of the PAD. The ISRs from project effectiveness through 2004 show no M&E framework due to the slow start of EAP. However, in 2005, the ISRs list five outcome indicators. Unlike in the main text of the PAD, there are no outcome indicators for a target number of persons with access to electricity. Instead, there is a target of 850,000 cited as an output/intermediate indicator. For improved quality of service, the ISRs initially cite a three percent decrease in losses but beginning in 2009, the target is changed to an actual percentage target for system losses (17 percent). Also, unlike the PAD, the ISRs give a quantitative indicator for the institutional performance of EEPCo: an operating margin of greater than US\$0.01 per kWh.

Table 2.2: Key Performance Indicators in the ISRs during the period 2005-2009

| |
|--|
| Expanded electricity access: No outcome indicator |
| Improved quality of service: a three percent or reduction in losses, or a 17 percent loss, from a baseline of 20 percent, target by the end of the project. |
| Improved biomass management: (i) target distribution of 320,000 stoves, increased to 1 million stoves beginning with the ISR in 2010, on the demand side; and (ii) 384,000 hectares of forests under participatory management and 302,000 hectares of agroforestry, on the supply side. |
| Capacity building and institutional development: operating margin of EEPCo at least US cents 1.0 per kWh. |

4. **M&E changes following restructuring in 2010 and 2013.** From June 2010 until project closing on June 30, 2013, the outcome indicators changed two more times due to the Additional Financing Credit, and a final restructuring that result in the cancellation of 83 percent of the additional funds.

5. The restructuring of 2010 had four outcome indicators. It restored, as an outcome indicator, a target total number of people gaining access to electricity through household connections in urban and rural areas, and dropped the afforestation targets due to formal deletion of the related subcomponent of the biomass management component. It also revised the target for end-of-project losses in the power system from 17 percent to 9.6 percent. The M&E framework kept the targets for EEPCo's operating margin and for the dissemination of improved cookstoves using fuelwood, but increased the target number of stove distribution from 1.0 million to 1.2 million.

6. The Bank dropped the ambitious target for power system loss reduction, which was clearly unrealistic, and the planned operating margin for EEPCo. The two outcome indicators retained after the restructuring were the number of people gaining access to electricity, with a decreased target, from 700,000 down to 100,000³⁰.

³⁰ These targets covered the connection program supported by the Additional Financing Credit only.

Table 2.3: Comparison of Performance Indicators Linked to Project Restructuring in 2010 and 2013

| Restructuring in 2010 | Restructuring in 2013 |
|--|--|
| Expanded electricity access | |
| 700,000 people gaining access to electricity under the project through household connections in urban and rural areas. | Same indicator as in 2010 but with the target reduced to 100,000 people. |
| Improved quality of electricity service | |
| 9.6 percent losses by the end of the project | Indicator dropped. |
| Improved biomass management | |
| 1.2 million stoves distributed under the project. | Indicator and value retained. |
| Capacity building for institutional development | |
| Operating margin of EEP Co at least US cents 1.0 per kWh | Indicator dropped. |

7. **Monitoring of the GEO objective.** The M& E framework tracked the indicator for the GEO objective separately from the indicators for the overall PDOs. The GEO objective was a subset of the PDO objective to expand electricity access. It focused on removing institutional and technical barriers to increasing access with renewable energy technology. The Project's ISRs incorporated two targets from the GEO Trust Fund (TF) Agreement: the number of mini/micro hydro plants installed (5) and the number of solar home systems but with a lower target, 4,000 instead of 8,000.

8. The ISRs mention emissions avoided by replacing diesel-based mini-grids with hydropower. However, this indicator was not tracked through to Project closing and no target value was established. Also, the ISRs did not incorporate other indicators contained in the TF Agreement: number of persons trained; the improved quality of health centers and schools; and the total capacity of renewable energy systems. Instead, they included an indicator for the number of PV systems in health centers and schools (320).

Table 2.4: Comparison of the GEO Indicators in the GEF Trust Agreement and the Project ISRs

| GEF Trust Fund Agreement | Project ISRs |
|--|---|
| 4 MW of installed capacity comes from renewable energy systems, by the end of the Project. | |
| 8,000 additional households provided with electricity from renewable energy systems by the end of the Project. | 4,000 home PV systems. |
| 5 private developers and rural development organizations involved with active investments by the end of the Project. | 5 mini hydro projects. |
| Diesel generation emissions avoided by the development of mini grids using mini/micro hydropower. | Same indicator. |
| Improved use of productive facilities by beneficiaries by the end of the Project. | |
| 500 people trained by the end of the Project. | |
| Improved quality of service provided by ministries of health and education by the end of the Project: no measurable target | |
| | 320 solar PV systems for clinics and schools. |

9. **Results indicators for the ICR.** For the purpose of evaluating achievement of the PDOs, the ICR used outcome indicators highlighted in the main text, as well as the institutional capacity indicator from the design summary of the original PAD, supplemented by measurable indicators established during the MTR and prior to restructuring in 2010. The justification for this choice of indicators is based on:

- Maintenance of the same PDOs throughout a decade of implementation;
- Key measurable indicators appearing in the main text of the PAD with the exception of an indicator measuring capacity building for institutional development, despite some inconsistencies between the main text and Annex 1 of the PAD; and
- Very low level of disbursements under the Additional Financing Credit together with restructuring in 2010 when most proceeds were cancelled.

10. In cases where performance indicators were listed as both outcome indicators and intermediate outcome indicators, the ICR evaluation has chosen the designation in the main text of the PAD. The ICR has classified the number of towns connected (and the related number of connections), along with the number of solar PV and mini/micro hydro installations as *intermediate*-outcome indicators. However, the number of people gaining access to electricity through these connections is classified as outcome/impact indicators.

Table 2.5: Key Indicators used for the ICR Evaluation Outcome Indicators

| | |
|--|---|
| Expanded electricity access: | 850,000 people with direct electricity access in urban and rural areas. 250,000 people with indirect electricity access served by electrified health centers and schools. |
| Improved quality of electricity service | Power system losses at 17 percent at the end of the Project, from a baseline of 20 percent, a decline of 3 percent during the Project's implementation period. |
| Improved biomass management | Demand side: target distribution of 320,000 improved fuelwood-based cooking stoves at appraisal. (Target increased to 1 million in 2009 and 1.2 million after restructuring in 2010) Supply side: 384,000 hectares of forests under participatory management and 302,000 hectares of agroforestry, on the supply side. |
| Capacity building and institutional development | Operating margin of EEPCo at least US cents 1.0 per kWh. Establishment of a regulatory and institutional structure for rural electrification. |
| Intermediate Outcome Indicators | |
| Health clinics and schools electrified with solar PV systems: 320 | |
| Mini/micro-hydro installations established: 5 | |
| Number of towns electrified: 85 | |
| Number of additional grid connections due to the Project: 150,000 | |

11. As indicated above, the ISRs selectively monitored the key indicators in the PAD, focusing on quantitative indicators and reporting on progress twice per year. However, the Bank could have given more attention to the results chain, particularly the relationship between intermediate and final outcome indicators. For example, in its list of key indicators, the PAD provided an outcome/impact indicator for "faster rate of growth for income-enhancing and economic diversification businesses in project areas." This was the

only outcome indicator of the impact of electricity on the economy. Instead of setting up an appropriate M&E framework for evaluating it, the ISRs dropped the indicator. Most of the quantified 'outcome' indicators, such as the facilities constructed, the number of persons with access to electricity were really outputs, or intermediate outcomes in a results chain that, with hindsight, should have focused more on the electricity/economy interface.

Annex 2B: Detailed Review of Project Implementation

1. Key Factors Affecting Project Implementation

1.1. Factors within control of the Bank. The project period was 10 years. The Bank had control over monitoring the Project's performance, disbursing funds, and reallocating funds among the Project's components. During project implementation, the Bank was heavily engaged in supporting the development of Ethiopia's energy sector. The Bank was responsive to government's requests and adapted to changing circumstances, which I reflected in the extending the project's closing date three times and further restructuring the project twice. While the task team leadership changed five times over the 10 year implementation period, having a consultant engineer working in Addis from the beginning of the Project through completion helped maintain the Project's institutional memory. Bank management made an effort improve the overall performance of the Bank's energy portfolio in Ethiopia by stationing a Senior Energy Specialist in the Bank's Addis Ababa office from 2008 and also tried to expedite the procurement process by increasing the sign-off threshold of the Procurement Coordinator based in Addis Ababa.

1.2. Factors within Control of the Government. These factors were: adherence to agreed sector policy, provision of its planned share of the financing, and establishment of and provision of funding for, key institutions involved in rural electrification. For the most part, the GoE adhered to sector policy; however, it did not show full commitment to allowing EEPCo to recover its costs and several times during project implementation, financial performance was rated unsatisfactory. In particular, the Government did not allow EEPCo to pass on to the consumer, the higher costs of generation that resulted from reliance on expensive, emergency, diesel-based power during the power crisis. As a result, EEPCo's operating margin declined below target levels and even turned negative. Regarding local government, frequent changes in city planning, substantially delayed rehabilitation of Addis Ababa's power distribution system. Furthermore, the Government's policy decision, during project implementation, not to provide initial subsidies to promote private-sector development in the solar PV market, resulted in the re-design of the solar PV component, delaying implementation of rural electrification activities.

1.3. Factors within control of the implementing agencies. The Project's implementing agencies were responsible for keeping implementation on schedule and attaining the targets for the performance indicators. The Project had three implementing agencies: EEPCo, EREDPC and the Ministry of Agriculture. EEPCo's disagreement with the design of the urban rehabilitation work financed under the Original Project and the consequent change in the scope of work of the design consultant for the urban rehabilitation work resulted in substantial delays and ultimately cancellation of a large amount of funds dedicated to rehabilitation. Both positive and negative factors affected the implementation of the biomass component. A key factor in the success of the improved cookstove program financed by the Project was that the program benefitted from an "institutional champion", EREDPC that was committed to the expanded dissemination of improved fuelwood-based cooking stoves. In contrast, on the supply side, the lack of ownership, on the part of the Ministry of Agriculture, for planned afforestation programs, delayed progress and ultimately resulted in cancellation of the supply side subcomponent. The lack of expertise in procurement for the Project, due in part to high staff turnover, was a key factor in project

delays, affecting not only components in EAP but other projects in the Bank's energy portfolio as well. Finally, the lack of an overall project coordinator for the Borrower across the various subsectors that EAP supported -- electricity, biomass, solar PVs, mining and geothermal energy—resulted in some loss of sector integration. The evidence of that was that it was not possible to receive from the government an integrated completion report covering the Project as a whole. The project files also reflect inadequate coordination between EEPCo and EREDPC/RES on rural electrification in terms of assignment of responsibilities for specific rural areas.

1.4. Factors outside control of the Bank, the Government, and the implementing agencies. Bank funds for the Project increased due to favorable exchange rate between the US dollar and the SDR. However, by the time the design for rehabilitation of the urban power distribution network was completed, the cost of materials on the international market had increased, increasing the cost of the planned rehabilitation of urban power distribution systems. Also, deficits in power capacity in 2009, due to low hydropower availability, caused a moratorium on new connections over the period 2009/2010.

2. Implementation Experience with Specific Components

2.1. The physical activities financed by the Original project were mostly implemented, except the supply-side activities of the biomass component due to the GoE's decision to cancel the sub component. Most of the activities to be financed by the Additional Financing faced major challenges in financial management and procurement and were not implemented. Despite the GoE's request to extend EAP's closing date after June 30, 2013 and reasonable progress in the dialogue on those issues, the Bank and Borrower agreed to close the project ultimately, cancel resources which had not been used and recommit those resources to the geothermal project that was under preparation at that time. A review of the progress of implementation of each component follows:

2.2. Rehabilitation of the urban distribution network. Originally, the Project was intended to rehabilitate and strengthen the power distribution systems of four major cities, the capital Addis Ababa and three others—Bahir Dar, Dire Dawa, and Nazareth. However, the funds allocated from the Original Project were sufficient to support only the renovation of the Addis Ababa due to changes in design and increases in the international prices of materials. The total amount disbursed under this component was US\$ 81.2 million.

2.3. Table 1 compares the physical works planned at appraisal with the actual works completed at project closing. The actual rehabilitation work called for more medium-voltage (MV) cables, an increased number of underground cables to align power system development with urban planning. The length of low-voltage (LV) envisaged at 1,640 km was planned for the renovation of seven cities. However, due to these design changes and limited funding, the Original Project could construct 130 km of LV lines, in the Addis Ababa area only. As a result the number of 15 kV/0.4 kV distribution transformers required was also considerably lower, 110, compared to 429 envisaged.

Table 1: Planned vs. Actual Rehabilitation and Strengthening of Urban Power Distribution Systems

| Subcomponent | Planned | Actual |
|--|-----------|-----------|
| Rehabilitation of 15-kV overhead lines | 475 km | 0 km |
| Replacement of low-voltage lines | 1640 km | 130 km |
| 15-kV underground cable installation | 53 km | 223 km |
| 15-kV compact substation installation | 68 units | 141 units |
| 15-kV overhead installation | 99 km | 111 km |
| 33-kV overhead line construction | 60 km | 54 km |
| 132/33 kV transformer installation | 1 unit | 1 unit |
| 15/0.4 kV distribution substations | 429 units | 110 units |
| 0.4 kV line construction | 263 km | 0 km |
| 33/0.4 kV substations | 30 units | 55 units |
| CAD office equipment | 11 units | 11 units |
| Vehicles | 15 units | 15 units |

2.4. Grid-based electrification. Under EAP as originally designed, the grid-based rural electrification component connected 120,000 households in 67 villages, about 79 percent of the planned number of villages to be electrified. Based on an average of five persons per household, the Original Project provided electricity access to about 600,000 people through grid connections. With the Additional Financing, the Project was to electrify 50 towns connecting an additional 70,000 customers. The Project procured the equipment needed for construction works and the connection of consumers. However, most of the connections could not take place before the project's closing date. Table 2 shows planned and actual number of towns electrified by region.

Table 2: Planned and Actual Electrification Towns under EAP, by Region

| Region | No. of Towns Electrified, by Region | |
|---------------------------|-------------------------------------|--------|
| | Planned | Actual |
| Northern Area | 28 | 28 |
| Central and Southern Area | 33 | 24 |
| Eastern Area | 24 | 15 |
| Total | 85 | 67 |

2.5. Off-grid electrification. EAP electrified 21 villages with diesel generators. Each village had an average of 500 households, resulting in the provision of 10,500 persons with access to electricity. The Project prepared five mini-hydro projects but these projects were not completed prior to the project's closing date and are currently being developed. Also EAP electrified 1,108 households with solar PV system, through cooperatives, providing an estimated 5,040 persons with access to electricity. Furthermore, EAP electrified 200 rural health posts and 100 elementary schools with solar PV systems. Based on an average of 5,000 people served by the health posts and 1,000 students per elementary school, the

project gave 1,100,000 persons in rural areas indirect access to electricity, though improved quality of services.

2.6. Biomass management. On the demand side, the Project's financing and institutional support led to the production and sale of 2.6 million improved cooking stoves using fuelwood, by the closing date. In 2006, the Government informed the Bank that it had dropped the supply-side subcomponent. However, the forestry-management subcomponent was not formally cancelled until the Project's restructuring in 2010.

Capacity building and institutional development. Due to the Government's or implementing agencies' decisions to drop certain studies and capacity building activities originally agreed as part of the Project, this component was only partially completed. Progress on the implementation of this component was noted sporadically in the Bank's Aide memoires and ISRs and thus there is no comprehensive record of the status of completion of various training and studies. In sum, capacity building and institutional development was not a priority for the government or the implementing agencies during the implementation of the EAP. At project appraisal, US\$10.8 million were allocated for this component. In the 2010 restructuring, the amount allocated to this component was reduced to US\$4.0 million equivalent and US\$3.0 million equivalent was added from the AF to increase assistance to the mining sector. The status of technical assistance and studies, by implementing agency, at the close of EAP follow:

- **EEA.** The Government decided against the preparation of a long-term power development strategy, originally planned for EEA under EAP, determining that the strategy in place was adequate. The US\$500,000 originally allocated for the power system strategy study was to be reallocated to other components.
- **Mining Department.** To assist the development of the mining sector, EAP funded a study prepared by the consulting firm, Sofreco, on mineral policy and regulations, at a cost of US\$224,618.
- **EEPCo.** The Bank, in its project-supervision reports, repeatedly highlighted the company's need for capacity building activities to address a severe capacity deficit. In particular, the Bank emphasized the need for improved network planning, requiring a better database and technical studies to help optimize investments. A major achievement in capacity building was the establishment of the Environmental Management Unit (EMU), which is now a permanent part of EEPCo's Corporate Planning Office and, headed by an environmental specialist.
- **EREDPC.** While staff of this agency benefitted from training, the proposals appeared to be developed ad hoc, which meant that there was still a need for technical training directly linked to mini-hydro and solar PV development as well as productive uses of electricity.

Annex 3. Economic and Financial Analysis

Background

1. The Project Appraisal Document (PAD) for the Energy Access Project (EAP) included an economic cost/benefit analysis of investments to improve and expand EEPCo's infrastructure for increasing the access of Ethiopia's population to electricity. These investments accounted for about two thirds of total project costs. They consisted of: (i) extension of the power grid to rural areas; (ii) rehabilitation and expansion of the urban distribution system; and (iii) the establishment of the Load Dispatch Center (LDC). The PAD estimated economic internal rate-of-returns (EIRRs) and Economic Net Present Values (ENPVs) for each of the EEPCo-managed components. The PAD did not provide a detailed economic analysis for home-based, solar PV systems for independent grids planned under the Project. These components were considered pilot operations and were funded by GEF. The PAD also provided no economic analysis for the biomass components or an impact analysis of the capacity-building/technical assistance components. Also, the PAD provided no financial analysis of the investments.

2. Around the time of EAP's closing in 2013, the Bank prepared an economic analysis of the grid-based rural electrification component. This analysis was to be an input to the efficiency analysis for the Project's ICR. However, the ICR team has re-estimated the EIRR and related ENPVs (Clarify?). The ICR has not re-estimated EIRRs and ENPVs for investments in the rehabilitation of the urban distribution network or the establishment of the Load Dispatch Center (LDC). The analysis at appraisal and the information contained in EAP's ISRs did not provide sufficient detail for a re-estimation to be made.

Re-Estimation of the EIRR and ENPVs for the Grid-Based, Rural Electrification Component

A. Key Assumptions

3. **Actual and projected connections.** The ICR used the total grid-based actual rural connections associated with the Project, as reported in the ISRs, estimated at 120,000 before the closing of the original credit for the Project in 2011.³¹ The PAD and the ISRs for EAP did not disaggregate planned connections by sectors. Given that a little more than 90 percent of connections in Ethiopian rural electrification projects have generally been for households, and lacking a detailed sector breakdown for the 120,000 connections, the ICR, for simplicity in the analysis, has assumed all connections to be residential. The ICR has allocated the connections, by year, based on the percent share of annual capital expenditures assumed during the period 2005 to 2011 (Table 1), given the lack of data on annual connections associated with the Project. The connections linked to the allocation of capital expenditures for 2005 have been added to the connections for 2006, assuming a year's lag between initial expenditures and the first set of completed connections. The assumed connections linked to capital-cost assumptions for 2008 and 2009 amount to 18,000. However, due to the moratorium on connections during these years, given severe power supply constraints, the ICR has added these connections to assumed connections for

³¹ The Additional Financing was to bring about 70,000 connections; however, by the project closing, only a negligible number of connections had taken place. Therefore, the ICR has not included them in the analysis.

2010 and 2011, divided evenly between these years.

4. The AF was to finance infrastructure for about 70,000 connections additional to those financed by the original credit. However, by the Credit's closing, only a negligible number of connections had taken place. Therefore, the ICR has not included them in the estimated actual connections associated with the Project at closing, assuming that they will be covered by the projections for future growth in connections (See para. 6).

Table 1: Assumptions for Annual, EAP-Associated, Connections Completed During Project Implementation

| Year | Assumed Annual Percent of Capital Cost Expended on the Rural Electrification Component | Number of Connections Based on Assumed Annual Percentages of Capital Expenditures | Adjusted Incremental Annual Connections | Estimated Cumulative Annual Connections Associated with EAP |
|-------------|---|--|--|--|
| 2005 | 6 | 7,200 | 0 | 0 |
| 2006 | 1 | 1,200 | 8,400 | 8,400 |
| 2007 | 16 | 19,200 | 19,200 | 27,600 |
| 2008 | 14 | 16,800 | 0 | 27,600 |
| 2009 | 1 | 1,200 | 0 | 27,600 |
| 2010 | 29 | 34,800 | 43,800 | 71,400 |
| 2011 | 33 | 39,600 | 48,600 | 120,000 |
| Total | 100 | 120,000 | 120,000 | |

5. To the base of 120,000 connections assumed in place by project closing in 2013, the ICR has applied EEPCo's projected growth rate of connections, 15 percent a year, to the period 2011 through 2017, arriving at 277,567 connections by 2017. The ICR analysis has maintained this level of connections constant for the economic analysis through 2037.

6. **Electricity consumption.** The ICR has assumed residential consumption of 65 kWh per month, amounting to 780 kWh per year, per connection, from 2006 to 2013. For the period 2014 through 2023, the ICR has assumed an average annual growth rate of 2.49³² percent for residential energy consumption, reaching an annual consumption per connection of 971.5 kWh by the end of this period. The analysis has held this consumption level constant through 2037.

7. **Costs.** On the cost side of the analysis, the ICR has assumed capital costs, operation and maintenance (O&M) costs, the cost of electricity supply, and the cost of residential connections. The estimated actual total capital costs are US\$ 82.3 million. The ICR has used the annual percentage disbursement rate of the original Credit for the EAP as a whole, applied to the estimated actual capital costs of the grid-based rural electrification component between 2005 and 2011. These costs include the amount allocated to the component in the original Credit and reallocated funds from other components, amounting

³² An economic analysis prepared by the Bank toward the end of EAP reported consumption of 65.5 kWh per month in 2002 and a growth rate of 2.47 percent annually during 2007-2013, citing EEPCo as the source.

to US\$ 66 million (See percentage shares in Table 1). Also the ICR analysis has assumed: (i) US\$ 16.3 million from the AF, approved in 2010, expensed in 2013 on infrastructure for future connections, given that most of the AF was undisbursed before then; (ii) an industry standard of two percent of annual capital costs as yearly O&M costs; (iii) EEPCo's reported connection costs of US\$ 26; and (iv) supply costs of US\$.06 per kWh³³, the long-run marginal cost of supply (LRMC) currently reported for EEPCo.

8. **Benefits.** For the base-case EIRR and ENPVs, the ICR has used a Willingness To Pay (WTP) of US\$0.17 per kWh, applied in recent reports on rural electrification projects in Ethiopia. This WTP falls within the range of WTP estimates for Africa: US\$0.15 per kWh to US\$0.25 per kWh. In recent years, due to increased incomes, WTP in Ethiopia has been as high as US\$0.30 per kWh. However, the ICR analysis has used more conservative estimates due to concerns about quality of data.

B. Results of the Analysis and Comparison with the PAD Estimates for the EIRR and NPV

9. The PAD, prepared in 2002, estimated the EIRR for the grid-based electrification component at 14 percent, associated with an estimated capital cost of US\$ 43 million. The related ENPVs were US\$21 million and US\$7.7 million at discount rates of 10 percent and 12 percent, respectively. The benefits were valued at the average tariff of US\$0.06, taken as a proxy for WTP, far below the current WTP for rural electrification (US\$0.17 per kWh) for Ethiopia. Using this WTP, the ex-post analysis (Table 2) has re-estimated the EIRR at 21 percent, associated with the much higher estimated actual capital costs of US\$82.3 million. The associated ENPVs are US\$ 63 million at a discount rate of 10 percent and US\$40.5 million at a discount rate of 12 percent. Applying the lowest WTP value for Africa (US\$0.15 per kWh), reduces the EIRR to 17 percent, with the related ENPVs remaining positive but considerably lower than in the base case: US\$41.1 million and US\$23.3 million, at discount rates of 10 percent and 12 percent, respectively.

Table 2: Summary Results of the EIRR and ENPV Analysis

| Assumption | EIRR | ENPV (US\$ million) | |
|-------------------------|------|---------------------|--------------|
| | | @ 10 percent | @ 12 percent |
| Base Case ³⁴ | 21 | 63.7 | 40.5 |
| Lowest WTP for Africa | 17 | 41.1 | 23.3 |

10. Table 3 provides the details of the analysis, showing the annual costs, benefits and net benefits from 2005 to 2037.

³³ Bank reports have indicated on LRMC of \$0.056 to US\$0.06 per kWh. The ICR has assumed the slightly higher figure.

Table 3: Summary Cost Benefit Stream (USD)

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|--------------------------|----------|------------|-------------|-------------|------------|--------------|-----------|----------|
| COSTS | | | | | | | | |
| Capital costs | 3659656 | 946463 | 10469878 | 9710707 | 681453 | 18916635 | 21617208 | 0 |
| O&M Costs | | 92122.38 | 301519.94 | 495734.08 | 509363.14 | 887695.84 | 1320040 | 1320040 |
| Connection Costs | 0 | 218400 | 499200 | 0 | 0 | 1138800 | 1263600 | 468000 |
| Electricity Supply Costs | 0 | 393120 | 1291680 | 1291680 | 1291680 | 3341520 | 5616000 | 6458400 |
| Total Costs | 3659656 | 1650105.38 | 12562277.94 | 11498121.08 | 2482496.14 | 24284650.84 | 29816848 | 8246440 |
| BENEFITS | | | | | | | | |
| At WTP of \$.17/kWh | 0 | 1113840 | 3659760 | 3659760 | 3659760 | 9467640 | 15912000 | 18298800 |
| At WTP of \$.15/kWh | 0 | 982800 | 3229200 | 3229200 | 3229200 | 8353800 | 14040000 | 16146000 |
| NET BENEFITS | | | | | | | | |
| At WTP of \$17/kWh | -3659656 | -536265.38 | -8902517.94 | -7838361.08 | 1177263.86 | -14817010.84 | -13904848 | 10052360 |
| At WTP of \$15/kWh | -3659656 | -667305.38 | -9333077.94 | -8268921.08 | 746703.86 | -15930850.84 | -15776848 | 7899560 |

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|--------------------------|----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| COSTS | | | | | | | | |
| Capital Costs | 16400000 | | | | | | | |
| O&M Costs | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 |
| Connection Costs | 538200 | 618930 | 711769.5 | 818534.925 | 941315.1637 | 0 | 0 | 0 |
| Electricity Supply Costs | 7427160 | 8752202.48 | 10313639.16 | 12153643.96 | 14321914.81 | 14675650.67 | 15038139.24 | 15409581.28 |
| Total Costs | 26013400 | 11019172.48 | 12673448.66 | 14620218.88 | 16911269.97 | 16323690.67 | 16686179.24 | 17057621.28 |
| BENEFITS | | | | | | | | |
| At WTP of \$17/kWh | 21043620 | 24797907.03 | 29221977.63 | 34435324.55 | 40578758.62 | 41581010.24 | 42608061.19 | 43660480.3 |
| At WTP of \$15/kWh | 18567900 | 21880506.2 | 25784097.91 | 30384109.9 | 35804787.02 | 36689126.68 | 37595348.11 | 38523953.21 |
| NET BENEFITS | | | | | | | | |
| At WTP of \$17/kWh | -4969780 | 13778734.55 | 16548528.97 | 19815105.66 | 23667488.65 | 25257319.57 | 25921881.95 | 26602859.02 |
| At WTP of \$15/kWh | -7445500 | 10861333.72 | 13110649.24 | 15763891.01 | 18893517.05 | 20365436.01 | 20909168.87 | 21466331.92 |

| | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| COSTS | | | | | | | | |
| Capital costs | | | | | | | | |
| O&M Costs | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 |
| Connection Costs | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electricity Supply Costs | 15790197.94 | 16180215.83 | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 |
| Total Costs | 17438237.94 | 17828255.83 | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 |
| BENEFITS | | | | | | | | |
| At WTP of \$17/kWh | 44738894.17 | 45843944.85 | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 |
| At WTP of \$15/kWh | 39475494.85 | 40450539.57 | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 |
| NET BENEFITS (| | | | | | | | |
| At WTP of \$17/kWh | 27300656.22 | 28015689.02 | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 |
| At WTP of \$15/kWh | 22037256.91 | 22622283.74 | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 |

| | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 |
|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| COSTS (USD) | | | | | | | | | |
| Capital Costs | | | | | | | | | |
| O&M Costs | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 | 1648040 |
| Connection Costs | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electricity Supply Costs | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 | 16179380.43 |
| Total Costs | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 | 17827420.43 |
| BENEFITS | | | | | | | | | |
| At WTP of \$17/kWh | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 | 45841577.89 |
| At WTP of \$15/kWh | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 | 40448451.08 |
| NET BENEFITS (USD) | | | | | | | | | |
| At WTP of \$.17/kWh | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 | 28014157.46 |
| At WTP of \$.15/kWh | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 | 22621030.65 |

EIRR at WTP of \$17/kWh EIRR at WTP of \$15/kWh

0.209492396

0.173520667

NPV at 10 percent (USD): 41057544.6 NPV at 12 percent (USD): 23341315.65

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

| Names | Title | Unit |
|----------------------------|--|-------|
| Lending | | |
| Joel J. Maweni | Task Team Leader Original Project | |
| Reynold Duncan | Task Team Leader GEF | |
| Raihan Elahi | Task Team Leader Additional Financing | |
| Yuriko Sakairi | Economics/Off-grid rural electrification | |
| Boris Utria | Economics/Biomass | |
| Eshetu Yimer | Financial Management | |
| Craig Andrews | Mining | |
| Supervision / ICR | | |
| Antoine V. Lema | Senior Social Development Spec. | AFTCS |
| Arun P. Sanghvi | Consultant | EASNS |
| Bernard W. Tenenbaum | Consultant | AFTG1 |
| Chrisantha Ratnayake | Consultant | AFTG1 |
| Devinder Sood | Consultant | SEGES |
| Edeltraut Gilgan-Hunt | Consultant | AFTTR |
| Eshetu Yimer | Sr Financial Management Specialist | AFTME |
| Gulam H. Dhalla | Consultant | AFTG1 |
| Hiroshi Sumiyoshi | Senior Operations Officer | AFTG1 |
| Issa Diaw | Task Team Leader 4 | AFTG1 |
| Rolande Pryce | Sr. Operations Officer | AFTG2 |
| Janine A. Speakman | Operations Analyst | AFTG1 |
| Johannes C. Exel | Consultant | AFTG1 |
| Kurt F. Schenk | Consultant | AFTG1 |
| Lars O. Oedegaard | Consultant | AFTN1 |
| Luiz T. A. Maurer | Task Team Leader 2 | CBGSB |
| Maria Concepcion J. Cruz | Lead Social Development Specialist | AFTCS |
| Pankaj Gupta | Manager | TWIFS |
| Raihan Elahi | Task Team Leader 3 | AFTG1 |
| Richard Olowo | Senior Procurement Specialist | AFTPE |
| Suzanne B. Maia | Consultant | AFTG1 |
| Tafesse Freminatos Abraham | Consultant | AFTME |
| Tesfaye Ayele | Senior Procurement Specialist | AFTPE |
| Xiaodong Wang | Senior Energy Specialist | EASWE |
| Yasmin Tayyab | Senior Social Development Spec | AFTCS |
| Yeshi Gizaw | Program Assistant | AFCE3 |

| | | |
|------------------------------|-------------------|-------|
| Yusuf Haji Ali Abdurahman | Consultant | AFTG1 |
| Chita Oje | Program Assistant | AFTG1 |
| Lemlem Workalemahu | Program Assistant | AFCE3 |

(b) Staff Time and Cost

| Stage of project cycle | Staff time and cost (Bank budget only) | |
|------------------------|--|--|
| | No. of staff weeks | US\$ thousands (including travel and consultant costs) |
| Lending | | |
| FY 98 | 0.00 | 9.65 |
| FY 99 | 0.00 | 133.36 |
| FY 00 | 30.44 | 112.83 |
| FY 01 | 13.16 | 60.80 |
| FY 02 | 35.64 | 176.23 |
| FY 03 | 6.74 | 45.46 |
| FY 04 | | |
| Total | 85.98 | 538.33 |
| Supervision/ICR | | |
| FY 00 | 0.20 | 0.90 |
| FY 01 | 0.00 | 0.00 |
| FY 02 | 0.00 | 0.00 |
| FY 03 | 9.66 | 41.67 |
| FY 04 | 26.84 | 92.50 |
| FY 05 | 57.90 | 158.45 |
| FY 06 | 58.06 | 168.28 |
| FY 07 | 21.65 | 130.32 |
| FY 08 | 18.36 | 95.83 |
| FY 09 | 23.09 | 131.08 |
| FY 10 | 13.22 | 78.10 |
| FY 11 | 14.36 | 104.61 |
| FY 12 | 13.35 | 97.94 |
| FY 13 | 13.84 | 100.68 |
| FY 14 | 2.46 | 40.71 |
| Total | 272.99 | 1,241.07 |

Annex 5. Beneficiary Survey Results

None

Annex 6. Stakeholder Workshop Reports and Results

None

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

Summary of Borrower's ICR (as provided by the different project Offices)

I. Introduction

The Government of Ethiopia did not provide a consolidated completion report, from the Borrower's perspective, on the performance of EAP. Instead, the ICRR team received five completion reports from implementing agencies, ranging from 3-59 pages each, and totaling 127 pages. Therefore, the ICRR team has put together excerpts from these reports to serve as the Borrower's contribution within a maximum of 10 pages, as prescribed in the ICR guidelines. These excerpts, presented below, by implementing agency, appear as written in the full reports, unedited.³⁵ The full reports submitted to the Bank, noted below with regard to the excerpts, may be found in the project files

II. Contributions from EEPCo

A. Urban Distribution System Rehabilitation Component

[**Excerpts from:** *Urban Distribution Rehabilitation Project: Project Completion Report*, Wondwossen, Regassa, October 31, 2011 (59 pages).]

Conclusion

- The original target of Rehabilitation work volume and loss savings have been satisfactorily achieved in Addis Ababa in terms of medium voltage networks. In case of low voltage network rehabilitation, substantial scope changes have been made on the quantity and the loss reduction contribution would be insignificantly decreased proportion to the scope reduction.
- The Construction target of the Medium voltage express feeder which upgrades 100 percent load carrying capacity of existing medium voltage system has been achieved.
- Other benefits than loss savings are obvious but cannot be easily quantified.
- Right – of - way complaints and subsequent changes in the construction work has caused delays and increased construction costs.
- Due to several reasons the overall project completion time increased by 10.3 months, that means additional costs (additional consultancy months and Employer's staff month plus operation costs) and delayed benefits.
- The volume of the actual rehabilitation work, especially underground cable construction was considerably increased due to Addis Ababa master plan implementation during the project execution stage.

³⁵ Some sections have slight changes in font and formatting for presentational purposes. Footnotes and bracketed notes in the main text were added by the Bank's ICRR team.

- The actual expenditure in the foreign component of the project is much higher than the Appraisal Report due to design change and world market price increments.
- The nature of the project forced both internal and external intervention during design and implementation period. This would contribute the project completion time delay and associated costs.

Recommendation

- The future rehabilitation work should be done after intensive risk assessment and stakeholder's analysis study to avoid complex problems during design and construction periods.
- The nature of the project needs well documentation and accurate data now and then on existing networks due to distribution network dynamism prior to the design and implementation stage. This shall be realized by accurate information exchange between internal and external stakeholders and dedicated team in the project who manage such continues activities to minimize the risks on reworks and unnecessary costs.
- The project nature calls diligent support and assistance from all stakeholders to complete the project within the time frame and budget. This would be achieved by marketing the project to the designated public by all means of media prior to the project commencement.
- Local Authorities support in providing validated data/ information to such type of project is critical for successful completion of the project as per the original plan. Therefore, the subsequent same type of project shall deal with all concerned Authorities to validate all the required data/ information by the project in due time.
- Understanding of the nature of the project by stakeholders is very crucial to support such type of project during design and implementation stage. In this regard, liaison works with relevant Authorities in due time is very important.

B. Grid-Based Electrification

[**Excerpts from:** *The Additional Financing for Energy Access Project, Final Report-Draft*, October 2013 (38 pages)].

The overall activity of this project was designed to be implemented under the following two categories:

A. Procurement of distribution items for the electrification of 100 rural towns and connection of 70,000 customers:

This procurement is supply only and was being carried out with International Competitive Bidding Procedure (ICB)

B. Construction of distribution network for 100 rural towns/villages; which are dispersed in the different regions of the country.

The construction part was being carried out by local electromechanical contractors and UEAP's own task team.

London power associate (London); a consultant for both the urban rehabilitation component of the seven major towns and Grid based rural electrification commenced its task on September 2012 and concluded on 30th June , 2013.

Amongst the many tasks that were undertaken by the consultant the major ones include the following: (i) After Reviewing the existing EEPCo's specification for the distribution items, one standard technical specification was developed; which is to be used consistently by the different project units of EEPCo. (ii) Design the rehabilitation distribution networks for seven major towns. (iii) Has produced a study about the usefulness of implementing GIS based environment for EEPCo's Network and prepared an engineering estimate for its implementations. (iv) Produced a separate study on how to optimize the size of conductors and transformers.

From the total 9 distribution items that were intended to be procured under the Grid based rural electrification, contracts was committed with different supplier only for eight contracts totaling to US\$16.72.

Currently all the items of these contracts were delivered to the different warehouses' of EEPCo; except having short supplies and defects on few items of some of the contracts. Due to this, the project couldn't disburse an amount of US\$0.485 million from the signed contract amount up until the final date of the grace period of the credit (i.e. 31 October 2013). Notwithstanding the shipment of the entire contract was concluded well before their final delivery date.

An individual GIS consultant was hired on single source selection basis so as to provide training to EEPCo's staff on Arc-GIS soft wares and also to map the 450 towns of EAREPI on to the digital map. However, only sixty eight towns were mapped by the end of the loan closing date.

The construction of one hundred towns; which were deemed to be completed within the loan closing date was not completed. As a result the project was not successful in energizing the lines and giving the intended customer connections. The construction of both MV and LV network for the one hundred towns was being undertaken by local Electro Mechanical contractors, who were selected and awarded contracts based on a given sets of prequalification criteria. The fact that flat rate prices were not revised over a fixed interval of time in the phase of galloping inflation is presumed to have exacerbated the delay in the construction. This has resulted in not having a fair number of efficient and experienced electromechanical contractors. (See Annex 7 of the full report for towns' status detail).

Technical and non-technical Issues

The main difficulties through the implementation phase emanate from not having a procurement officer; at project level. In connection to this recruitment and retention of procurement professional has been a challenge. Due to this Engineers get distracted from their core assignment while trying to handle routine procurement issues. Secondly construction works got delayed mainly due to lack of having sufficient numbers of efficient and capable electromechanical contractors'. Added on to this of having proper support from local administration has made its own contribution to the delay.

Points for the Bank's consideration

All points that were included in the final completion report of EAREP I are listed below for IDA's consideration. With regard to the procurement that was cleared by IDA, it appears that procurement that are being cleared at country office level are going at a faster pace against those procurements and Bid evaluation report that are being cleared at RPM level. It is therefore of paramount importance to the client, if further revision of the current threshold for the clearance is considered.

III. REF's Contribution (Off-Grid Electrification)

[Excerpts from: *How REF is doing?* (undated) submitted by REF (3 pages)].

Under Solar home system (SHS) for households

- 1108 households electrified (through 8 cooperatives and 1 private sector)
- 25,000 number of users under installation progress

Under Institutional PV

- 336 number of off grid rural primary schools electrified
- 545 number of off grid rural health posts electrified
- 34 federal and regional energy offices and training institutions

Problems

- Lack of maintenance service backup in local areas
- Users Improper use
- Substandard items, especially 1108 households purchased from local markets
- Health posts use heater type refrigerators (diesel run), usually consumes high power for 24 hours a day,
- Very slow implementation rate
- Due to many reasons took long time to complete contracts (schools and health posts)

Remedy

- REF trained 200 technicians to provide services in their local areas
- Through Contracted companies 450 technicians are trained, involved in installation and will also manage after installation services whenever required,
- 132 local area energy officers are trained, to carry inspection and monitoring
- Check during inspection, provision of proper users training and documentation
- Discussed with health offices to replace such refrigerators
- REF procured equipment have testing facility in the country, to keep import of solar equipment good quality

Impact of the projects

- The community of the off grid areas have; light for their house, charge mobile, listen radio, students do their assignment night time, reduces woman's burden during pregnant and also after birth in care.
- In addition to improves day to day schools activity the teachers have charged lanterns for their home at night, spent more time to check students assignment and prepare,
- Even the refrigerators are not recommendable for solar projects; health post services become much better.
- Created job opportunity for technicians in their local area.

Monitoring and Evaluation

The monitoring of installed PV systems carried in coordination with regional offices and development bank of Ethiopia. Among the installed sites the monitoring report shows; about 80 out of 1108 installed have not functional Battery, Charge controller, inverter problems are main causes. Up on the report discussed and reached agreement to arrange additional loan to repair once. Institutional PV systems main problems are as stated in under problems above. In Primary schools lantern users not regularly charge and most found fail.

IV. Contribution of the Ministry of Mines³⁶

[Excerpts from: Ministry of Mines & Federal Democratic Republic of Ethiopia and Ethiopia Electricity Agency Energy Access Project (Part A4, A3 (b)(c), Financial Monitoring Report (IFR) for the 4th Quarter Ended June, 2011 and Project Completion Report, August 2011 (12 pages)].

The Ministry of Mines has established a Project Implementation Unity (PIU) for efficient and effective implementation of the Mineral Component under Energy Access Project. A Project Management Unit (PMU) mainly responsible for financial management of the project was established in the Ethiopian Electricity Agency. The Mineral Component under the Energy Access Project had three subcomponents: namely procurement of consultancy services, procurement of training and procurement of goods/equipment. The major outputs/deliverables and activities including financial disbursement are summarized below.

Mineral Policy, Legal and Institutional Framework Study

SOFRECO a French consulting firm has won the bid for the Mineral policy, legal and institutional Framework study and signed contract agreement with the Ministry in October 2005 and subsequently commenced the service. The major activities and outputs of the study are summarized as follows:

³⁶ The report received from the Ministry of Mines also included a summary of the training activities for the Ethiopian Electricity Agency (EEA).

- Held a policy dialogue on the draft policy document prepared by the consultant. More than 80 stakeholders participated in the two day policy dialogue forum.
- Local training for 3-days was given by the consultant for more than 40 experts from National Regional Mines and Energy Bureaus, Geological Survey of Ethiopia and Ministry of Mines and Energy. The training included:
 - a. Enforcing the proposed licensing system and developing investment promotion strategies for the mining sector.
 - b. Implementing the proposed mining taxation policy and legislation.
 - c. Environmental and health & safety management in mining.
- A Final Study Report submitted by the consultant has been approved by the World Bank and the Ministry. The final study report has included draft Mineral policy, draft Mining Regulation, draft Mine Health and Safety proclamation, and Model for Analysis Monitoring, Management and Control of Environmental Impact and proposals on the institutional setup required for proper regulation of the sector both at the regional and federal regulatory.
- A payment amounting 187, 580 Euros has been effected in favor of the consulting firm as per the contract agreement.

Geological Survey and Investment Promotion Study

The Geological Survey and Investment Promotion Study's main task was to assess the skill data acquisition, processing and presentation techniques institutional set-up, review existing documents in the Geological Survey of Ethiopia and to propose appropriate techniques to be employed, key areas of manpower development and appropriate institutional set-up based on international best practice and establish systematic application of geological information system and integrated database.

Industrial Mineral and Artisanal mining Study

This study consists of two parts, Industrial mineral and Artisanal Mining. The study for industrial minerals is to identify and appreciate the crucial issues involved in developing industrial minerals in order to encourage the development of local industries that use industrial minerals as raw material.³⁷

Cadastre Data Management System Study

The Cadastre Management System is aimed to establish a cadaster data management system for the Ministry of Mines and the eleven National Regional Mines and Energy Bureaus to make the licensing procedure more efficient and effective. The CMS was divided in two phases, Cadastre Date Management System Study- design Phase and Implementation of the Cadastre Data Management System- Implementation Phase. The

³⁷ The tasks included an audit of industrial minerals, human capacity assessment of the Geological Survey of Ethiopia, a demand/supply survey, promotional material, stakeholder workshop, and overseas study

design study was done by the British Geological Survey (BGS).³⁸

Training MoM

- Two local trainings for experts from the regions and the ministry on the flexicadastre have taken place aimed to overcome the staff turnover. The first training was for 18 experts that weren't familiar with flexicadastre while the second was for 36 experts as refreshment for those that are previously trained.
- Two short term trainings: the first on procurement, financial management, leadership, planning and management has undertaken New Delhi, India by Australian Habitat and the other on mineral sector administration that included negotiation and contract administration, resource evaluation and reserve calculation, environment and social issues, mineral policy and resource taxation and investment risk in South Africa by Center for Sustainability in Mining and Industry, Witswaterstrand University have been given for 18 staffs from the Ministry of Mines and Geological Survey in Ethiopia.
- A study tour consisting of three delegates from the Ministry of Mines was made to Tanzania and Mozambique from Aug. 22-Sept.1, 2004.
- In line with the objective of this project as part of the promotional activity staffs of the Ministry of Mines and Geological Survey of Ethiopia have participated in international mining conferences such as Investing in Africa Mining Conference Indaba, PDAC, inter-governmental Forums & Flexicadastre User's conferences.
- The total disbursement under the training category is about 386,241 USD.

Capacity-building for the Ethiopian Electricity Agency (EEA)

[Note: The Ministry's report provides a long list of training programs in power sector regulation energy conservation, market regulation, tariff-setting etc., which took place between 2004 and 2011. The training outside Ethiopia took place in the Gambia, Kenya, India, and the United States. About 50 professional staff participated. The Project also trained 11 support staff in electricity regulation and an unspecified number of support staff in procurement, management and disbursement. The Project also funded the attendance of one staff member at international conferences on regulation and renewable energy development].

V. Contribution from EREDPC (Completion Report on the Dissemination of Improved Cook Stoves)

[Excerpts from: Brief Report on Ethiopian Energy Access Project-EAP (Rural Household Energy End-Use Efficiency Improvement Project, Task C: Improved Rural Woodstoves (15

³⁸ According to the report, the implementation phase, concluded in June 2011, resulted in the establishment of a data management system employing flexicadastre software for the Ministry of Mines, regional mines and energy bureaus. Total expenditures were 32, 260.64 British pounds for the design phase and for the implementation phase, 2,175,178 Birr and 1,121,749 Euros.

pages)]

Background

The project has been implemented from September 2003. However, actual stove dissemination begun in 2006 to the expected level. Initially, it was planned to disseminate 320,000 stoves but so far in just the past five years over 2.6 million stoves were disseminated. Beyond that over 5,000 stove producers and experts received training on energy saving techniques and stove production and marketing methods. The stoves under dissemination are tested and proved to save from 30%-57% biomass fuels compared to the traditional stoves depending on their type. Stove dissemination was made initially in six of the nine regional states of Ethiopia (Oromia, Amhara, Southern Nations and Nationality People (SNNP), Tigray, Ben Shangul-Gumuz, and Gambella) by the Ethiopian Rural Development and Promotion Center – EREDPC through Regional and woreda Bureaus of Energy. However, because of the demand for the stoves in other regions, the project included all other regionals but with only on technical assistance and training.

Outputs of the Intervention

- Until June 2011, over 2.6 million stoves of six different models were disseminated over five years (2005-2011) all over the country.
- Over 5,000 individuals from the private sector are trained and are involved in the stove business.
- 120 stove production centers were established for use by rural cooperatives nearly all of them are run by women.

Lessons Learned

Quality control in decentralized production

- Provide molds to make every piece of the stove identical, thus guaranteeing standardized production.
- Closed stoves were self-built based on a template and using locally-available materials. Therefore the production process was not standardized.

Efficiency measures of stoves

- The Gonzi stove is claimed to save about 57 percent while the Mirte stove saves 47-52 % and the Tikikil, about 63 percent. Validation of these claims could not be done because tests were carried out differently; by different organizations and most likely with different testing protocols and methodologies. Therefore, it is advisable that the GoE consolidate such stove parameters by promoting a new round of updated validation tests, with a rigorous standard technical evaluation process applied to all stoves.
- Build in the success of RHEEIP to establish a modern laboratory for stove testing and development.

Business management

Provide training in management and bookkeeping to keep cost, production and sales records. This is a useful link in MRV system.

Financial support to producers

In general, producers have requested micro-credit only once, showing the minimized importance of such support;

Marketing strategy

- Dissemination and sale of stoves are done by the artisans themselves, with each group producing and selling stoves directly to individual customers, to retailers, NGOs or government programs which often buy in bulk;
- Reduction of IAP by ICS is used as a strong marketing message. In the absence of a chimney, the extent of production of IAP needs to be documented and validated by proper tests. This has implications for design and installation of ICS;
- Although the EREDPC has developed a stove with a chimney for commercial purposes, it should be better promoted, so as to gain broader acceptance;

End user Education/Training

- Proper biomass stoves use and maintenance should be taught and reinforced because without proper maintenance and operation, a well-designed stove can quickly become inefficient and polluting;
- All the six steps (from lab. Testing to monitoring and evaluation) should be applied.
- Strong and continued promotion through all possible medium is very important.
- Regular and systematic follow up, technical assistance, monitoring and is very important to avert market barriers.

Monitoring and Evaluation (M&E) +MRV

- Past achievements should be properly documented, by organizing the data base and the information, perform a household survey among ICS users, to estimate and document the quantitative and qualitative impacts of the RHEEIP, to better understand the actual patterns of use and preferences for future ICSs.
- In particular, focus should be given to re-evaluating the performance of the RHEEIP stove portfolio, in terms of energy efficiency, durability and emissions (IAP and GHG).

Scaling-up strategy

The World Bank can add value and assist in scaling up the strategy, and by sharing its experience from Lighting Africa, on how to further engage the national and international private sectors toward the goal of increasing access to better-quality devices.

የኢትዮጵያ ኤሌክትሪክ ኃይል ETHIOPIAN ELECTRIC POWER

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605/4/36
27 MAY 2014
Date

The World Bank
Addis Ababa
Ethiopia

Attention - Mr. Issa

Task team Leader

Subject: Comments on ICR (Report No: ICR00002518)

Dear Mr. Issa,

Please find attached herewith UEAP comments on the World Bank Implementation Completion and Result report (Report No: ICR00002518) for your consideration.

i. Additional Financing 049395 of the Grid based Rural electrification

As per Annex 5 of the project completion report of the client submitted to the Bank sometime back; there are totally 306 customers connected to the grid. Out of these, 7 of them are commercial & 12 of them are industrial customers.

Therefore, the financial and economical analysis section should be revised accordingly.

Under Annex 7 of the ICR report of page 49 having the following titles; technical & non technical issues, points for Bank's consideration; which must have been part of the grid based electrification are mistakenly incorporated under off grid section.

Further to this the statement under points for Bank's consideration must be corrected and replaced with the following statement.

It is therefore of paramount importance to the client, if further revision the current threshold for the clearance is considered by the World Bank.

ii. Urban Distribution Rehabilitation Project

Energy Access Project comprises several components of specific projects, whereas the Rating summary tabulated in ICR seems in a combine project portfolio basis and it is difficult to see the detail rating approach for each component. Therefore, it is hard to share some of the rating results in regard to Urban Rehabilitation Component to our understanding.

Best Regards,



GOSAYE TEKLEWOLD
Chief Officer, UEAP Bank
Financed Projects Management



Annex 8. Comments of Co-financiers and Other Partners/Stakeholders

Activities under co financiers were implemented separately:

- *EIB financing was devoted to the Dispatch Center.*
- *OPEC funds will cover distribution expansion/reinforcement works currently under procurement.*
- *Government of Japan support for the geothermal drilling activities is on going*

Annex 9. List of Supporting Documents

Project Preparation, Appraisal and Board Presentation

Country Assistance Strategy, August 1997.

Interim Poverty Reduction Strategy Paper, March 2002.

Rural Energy Strategy Paper (undated).

Project Appraisal Document for a Proposed Credit in the Amount of SDR 104.9 Million (US 132.7 Million Equivalent) to the Federal Democratic Republic of Ethiopia for an Energy Access Project, June 4, 2002.

Minutes of Negotiations

Project Implementation: Bank Reports

A. Implementation Status Reports

ISR 1 -19

B. Mission Aide Memoires (AMs)

AM (2002).

AM (June 3-17, 2003).

AM (October 31 to November 14, 2003).

AM (February 16 to March 25, 2005).

AM (October 4-14, 2005).

AM (January 30 to February 10, 2006).

AM (October 29 to November 9, 2007).

AM (July 21 to August 8, 2008).

AM (June 1-18, 2009).

AM (April 1 to May 21, 2010).

AM (October 25 to November 15, 2010 and January 3 to 25, 2011)

Other Bank Reports

Financial Management Review, August 2008.

Project Paper: Energy Access Project Restructuring, May 2013.

Project Paper: Energy Access Project Restructuring (two volumes), June 29, 2011.

Project Paper: Energy Access Project Restructuring (two volumes), December 13, 2010.

Project Implementation: Borrower/Implementing Agency Reports

Project Completion and Continued Strategic Relevance

Ethiopia Country Partnership Strategy (FY2013 - 2016).

Ethiopia Growth and Transformation Plan (FY 2010 -2015).

Regional Power System Master Plan and Grid Codes Study, SNC, Lavalin, in Association with Parsons Brinkerhoff, May 2011.

Doing Business in Ethiopia, 2012.

Related Projects

Project Appraisal Document, Electricity Access Rural Expansion Project, May 25, 2006.

Project Appraisal Document, Second Electricity Access Rural Expansion Project, June 7, 2007.

Project Appraisal Document, Regional Eastern Nile-Ethiopia-Sudan Power System Interconnection ESIA Project, November 20, 2007.

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