Document of
The World Bank

Report No: ICR0000760

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IDA-35450 IDA-3545A)

ON A

CREDIT

IN THE AMOUNT OF SDR48 MILLION
(US$62 MILLION EQUIVALENT)

TO THE

REPUBLIC OF UGANDA

FOR A

FOURTH POWER PROJECT

March 29, 2009

Africa Energy Team
Uganda Country Department
Africa Region

## CURRENCY EQUIVALENTS

(Exchange Rate Effective January 31, 2009)

Currency Unit = Uganda Shillings
USh 1967.5 = US$ 1
US$1.51 = SDR 1

## FISCAL YEAR

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AGO | Automotive Gasoline Oil |
| APL | Adaptable Program Lending |
| CAS | Country Assistance Strategy |
| CY | Calendar Year |
| DCA | Development Credit Agreement |
| EIRR | Economic Internal rate of Return |
| EIRR | Economic Internal rate of Return |
| EMP | Environmental Management Plan |
| ERA | Electricity Regulatory Authority |
| ERT | Energy for Rural Transformation |
| ESIA | Environmental and Social Impact Assessment |
| FMS | Financial Management System |
| GoU | Government of Uganda |
| GWh | Giga Watt hours |
| HFO | Heavy Fuel Oil |
| ICR | Implementation and Completion Results Report |
| IDA | International Development Agency |
| KV | Kilo Volt |
| KWh | Kilo Watt hours |
| LVDST | Lake Victoria Decision Support Tool |
| LVEMP | Lake Victoria Environnemental Management Project |
| M&E | Monitoring and Evaluation |
| MEMD | Ministry of energy and Minerals Development |
| MIGA | Multilateral Investment  Guarantee Agency |
| MOP | Memorandum of the President |
| MTR | Mid Term Review |
| MW | Mega Watt |
| NDF | Nordic Development Fund |
| NORAD | Norwegian International Development Agency |
| NPV | Net Present Value |
| PAD | Project appraisal Document |
| PDO | Project Development Objective |
| PEAP | Poverty Eradication Action Plan |

| | |
|---|---|
| PIU | Project Implementing Agency |
| PSDO | Power Sector Development operation |
| QEA | Quality at Entry |
| QSA | Quality of Supervision Assessment |
| SCADA | System Control and Data Acquisition |
| Sida | Swedish International Development Agency |
| UEB | Uganda Electricity Board |
| UEDCL | Uganda Electricity Distribution Company |
| UEGCL | Uganda Electricity Generation Company |
| UETCL | Uganda Electricity Transmission Company |

| | |
|---|---|
| Vice President: | Obiageli Ezekwesili |
| Country Director: | John McIntire |
| Sector Manager: | Subramaniam V. Iyer |
| Project Team Leader: | Paul Baringanire, Fanny Missfeldt-Ringius |
| ICR Team Leader: | Paul Baringanire |

**UGANDA**
**Fourth Power Project**

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| A. Basic Information | | | |
|---|---|---|---|
| Country: | Uganda | Project Name: | UG-Power SIL 4 (FY02) |
| Project ID: | P002984 | L/C/TF Number(s): | IDA-35450,IDA-3545A |
| ICR Date: | 03/29/2009 | ICR Type: | Core ICR |
| Lending Instrument: | SIL | Borrower: | THE REPUBLIC OF UGANDA |
| Original Total Commitment: | XDR 48.0M | Disbursed Amount: | XDR 47.9M |
| **Environmental Category: B** | | | |
| **Implementing Agencies:**<br>Ministry of Energy and Mineral Development<br>Uganda Electricity Generation Company Ltd.<br>Uganda Electricity Transmission Company Ltd.<br>Uganda Electricity Distribution Company Ltd. | | | |
| **Cofinanciers and Other External Partners:** | | | |

| B. Key Dates | | | | |
|---|---|---|---|---|
| **Process** | **Date** | **Process** | **Original Date** | **Revised / Actual Date(s)** |
| Concept Review: | 06/14/2000 | Effectiveness: | | 04/04/2002 |
| Appraisal: | 10/10/2000 | Restructuring(s): | | 01/11/2005 |
| Approval: | 07/03/2001 | Mid-term Review: | | 12/04/2003 |
| | | Closing: | 12/31/2004 | 03/31/2008 |

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

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

| C.3 Quality at Entry and Implementation Performance Indicators | | | |
|---|---|---|---|
| **Implementation Performance** | **Indicators** | **QAG Assessments (if any)** | **Rating** |
| Potential Problem Project at any time (Yes/No): | Yes | Quality at Entry (QEA): | Satisfactory |
| Problem Project at any time (Yes/No): | Yes | Quality of Supervision (QSA): | Satisfactory |
| DO rating before Closing/Inactive status: | Moderately Satisfactory | | |

## D. Sector and Theme Codes

| | Original | Actual |
|---|---|---|
| **Sector Code (as % of total Bank financing)** | | |
| Central government administration | 5 | 8 |
| Power | 95 | 92 |
| | | |
| **Theme Code (Primary/Secondary)** | | |
| Infrastructure services for private sector development | Primary | Primary |
| Regulation and competition policy | Primary | Primary |
| State enterprise/bank restructuring and privatization | Primary | Primary |

## E. Bank Staff

| Positions | At ICR | At Approval |
|---|---|---|
| Vice President: | Obiageli Katryn Ezekwesili | Callisto E. Madavo |
| Country Director: | John McIntire | James W. Adams |
| Sector Manager: | Subramaniam V. Iyer | M. Ananda Covindassamy |
| Project Team Leader: | Paul Baringanire | Paivi Koljonen |
| ICR Team Leader: | Paul Baringanire | |
| ICR Primary Author: | Johannes Geert Grijsen | |
| | Gulam H. Dhalla | |

## F. Results Framework Analysis

**Project Development Objectives (**from Project Appraisal Document**)**
(a) improve power supply to meet demand by supporting critically needed investments in the sub-sector; and (b) strengthen Borrower capacity to manage reform, privatization, and development in the power and the petroleum sub-sectors.

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

**(a) PDO Indicator(s)**

| Indicator | Baseline Value | Original Target Values (from approval documents) | Formally Revised Target Values | Actual Value Achieved at Completion or Target Years |
|---|---|---|---|---|
| **Indicator 1 :** | Reduced load shedding. | | | |
| Value quantitative or Qualitative) | 20 MW shed at peak time | Reduced peak load shedding compared to December 2004 values(120MW), provided hydrological conditions do not worsen. | | 110 MW shed at peak time, down from 120 MW during the last ISR. Hydrological conditions worsedned between 2004-2007. |
| Date achieved | 12/30/2001 | 12/30/2001 | | 03/31/2008 |
| Comments (incl. % achievement) | Hydrological conditions worsened due to the prolonged draught in the region from 2003-2007. | | | |
| **Indicator 2 :** | Annual Power Generation increased by 50Gwh for unit 14 and 45GWh for unit 15 by end of the Project | | | |
| Value quantitative or Qualitative) | O GWh (Units not commissioned) | 95GWh | | 19GWh for unit 14 and 0GWh for unit 15 by end of project. |
| Date achieved | 12/30/2001 | 12/30/2001 | | 03/31/2008 |
| Comments (incl. % achievement) | Only about 20% of the total estimated annual generation achieved due to the unfavorable basin hydrology at the time of commissioning. | | | |
| **Indicator 3 :** | Service interruptions reduced. | | | |
| Value quantitative or Qualitative) | 8.96GWh | Undelivered energy reduced by 30% between 2000 and end 2003 | | 4.36GWh |
| Date achieved | 12/31/2001 | 12/31/2001 | | 03/31/2008 |
| Comments (incl. % achievement) | Total energy lost in outages was 4.8GWh as of 12/31/2004, representing a reduction of about 48% of the 2000 value | | | |
| **Indicator 4 :** | Increased number of people connected to the electricity grid. | | | |
| Value quantitative or Qualitative) | 10,000 annual connections | Annual number of new urban connections increased to 15,000 by 2004 | | 20,000 per annum |
| Date achieved | 12/30/2001 | 12/30/2001 | | 03/31/2008 |

| | | | | |
|---|---|---|---|---|
| Comments (incl. % achievement) | Achieved. Annual connections now stand at about 130% of the target value. | | | |
| **Indicator 5 :** | Regulatory changes effected: (1) establish independ. sec. regulator & (2) dam safety framework; (3) downstream petrol. sec. law & regulations submitted to Pariament;& (4) Elec. Law revisions adopted. | | | |
| Value quantitative or Qualitative) | Power and Petroleum Sectors not regulated | Establishment of an independent sector regulator; Establishment of dam safety framework; Downstream Petroelum Sector Law and Regulations Enacted; Revision of the Electricity Act Adopted | | Electricity Regulatory Authority Established June 2000; Dam Safety Framework Completed Dec. 2006; Downstream Petroleum Sector Law enacted Oct. 2003; Regulations under review by the Petroleum Technical Committee |
| Date achieved | 12/30/2001 | 12/30/2001 | | 03/31/2008 |
| Comments (incl. % achievement) | Achieved | | | |

**(b) Intermediate Outcome Indicator(s)**

| Indicator | Baseline Value | Original Target Values (from approval documents) | Formally Revised Target Values | Actual Value Achieved at Completion or Target Years |
|---|---|---|---|---|
| **Indicator 1 :** | Two 40 MW units commissioned by end of Project | | | |
| Value (quantitative or Qualitative) | Not commissioned | Both units commissioned. | | Both units were commissioned August 2007. |
| Date achieved | 06/30/2001 | 09/30/2007 | | 03/31/2008 |
| Comments (incl. % achievement) | Achieved | | | |
| **Indicator 2 :** | Transmission substation installed at Kampala Industrial and Business Park by end-of-Project. | | | |
| Value (quantitative or Qualitative) | Not commissioned | Substation commissioned. | | 120MVA, 132/33KV substation |

| | | | | |
|---|---|---|---|---|
| | | | | commissioned |
| Date achieved | 12/30/2001 | 09/30/2007 | | 03/31/2008 |
| Comments (incl. % achievement) | Achieved | | | |
| **Indicator 3 :** | At least one new industrial plant connected to power in the Kampala Industrial and Business Park within a year of installation of substation | | | |
| Value (quantitative or Qualitative) | 0 (industrial park not yet established.) | Several industries set up. | | Several industries set up |
| Date achieved | 12/30/2001 | 06/30/2006 | | 03/31/2008 |
| Comments (incl. % achievement) | Achieved. Among the industries operating are the Century Bottling Company (Coca Cola) and a Mineral Water processing and bottling plant | | | |
| **Indicator 4 :** | Environmental and Social recommendations satisfactorily implemented. | | | |
| Value (quantitative or Qualitative) | No monitoring activities | Environmental Monitoring Plan implemented | | Water quality monitoring (two reports prepared) and Environment Audit completed. Project site restored and construction infrastructure decommissioned. |
| Date achieved | 12/30/2002 | 06/30/2007 | | 03/31/2008 |
| Comments (incl. % achievement) | Achieved | | | |
| **Indicator 5 :** | ERA's (Regulator's) Office is operational by end-2002. | | | |
| Value (quantitative or Qualitative) | No Regulator | Regulator's Office set up by end 2002 | | Electricity Regulatory Authority established June 2000 |
| Date achieved | 06/30/2001 | 12/30/2002 | | 03/31/2008 |
| Comments (incl. % achievement) | Achieved | | | |
| **Indicator 6 :** | A Water Management Plan prepared and implemented as measured by the percent deviation of water delivery compared to the approved water discharge arrangement. | | | |
| Value (quantitative or Qualitative) | No Water Management Plan in place. | A Water Management Plan prepared and implemented by end of the project | | Decision Support Tool has been Developed and a set of 10 Technical papers have been prepared. the Decision Support Tool is used by the |

| | | | | |
|---|---|---|---|---|
| | | | | Technical Water committee in planning for the monthly hydropower generation. |
| Date achieved | 12/30/2001 | 12/30/2004 | | 03/31/2008 |
| Comments (incl. % achievement) | Since February 2006, the hydropower generation has been following the agreed discharge monthly release | | | |
| **Indicator 7 :** | A plan for the development of geothermal resources defined. | | | |
| Value (quantitative or Qualitative) | No geothermal development plan | Surface geothermal investigations completed in two areas and temperature gradient measured in 5-10 wells (achieved) | | Preliminary assessment carried out (14 shallow wells drilled in two areas and prelliminary geological geochemical investigations completed in 25 areas) . |
| Date achieved | 10/01/2005 | 09/30/2007 | | 03/31/2008 |
| Comments (incl. % achievement) | Achieved | | | |
| **Indicator 8 :** | Guidelines established and implemented for petroleum industry monitoring with regard to quality, safety, and pricing by end-2005. | | | |
| Value (quantitative or Qualitative) | No guidelines | Operational guidelines for petroleum sector established | | Operational guidelines for the petroleum sector presented to the TPC for endorsement. |
| Date achieved | 12/30/2001 | 12/30/2004 | | 03/31/2008 |
| Comments (incl. % achievement) | Achieved | | | |
| **Indicator 9 :** | Percent of fuel stations monitored based on agreed sampling framework. | | | |
| Value (quantitative or Qualitative) | No monitoring of petroleum products in place | | | Petroleum laboratories installed.<br>At least 20 petrol stations are monitored monthly. |
| Date achieved | 12/30/2001 | | | 03/31/2008 |
| Comments | Achieved. | | | |

| | |
|---|---|
| (incl. % achievement) | |

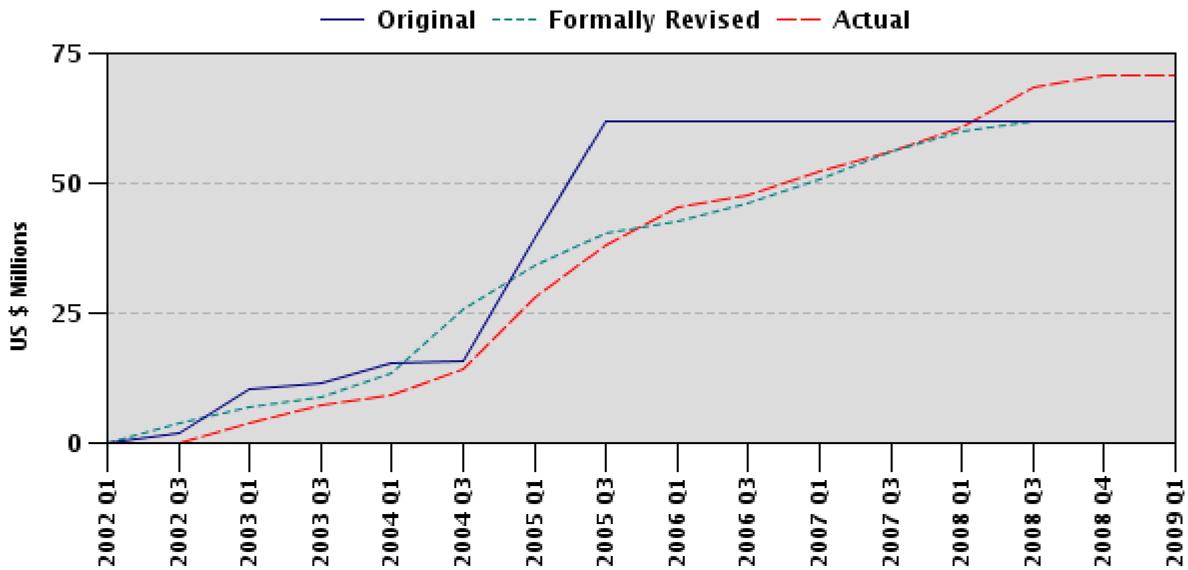
## G. Ratings of Project Performance in ISRs

| No. | Date ISR Archived | DO | IP | Actual Disbursements (USD millions) |
|---|---|---|---|---|
| 1 | 12/13/2001 | Satisfactory | Satisfactory | 0.00 |
| 2 | 05/30/2002 | Satisfactory | Satisfactory | 0.73 |
| 3 | 10/15/2002 | Satisfactory | Satisfactory | 4.27 |
| 4 | 05/27/2003 | Satisfactory | Satisfactory | 7.27 |
| 5 | 11/26/2003 | Satisfactory | Satisfactory | 10.26 |
| 6 | 05/28/2004 | Satisfactory | Satisfactory | 19.34 |
| 7 | 12/14/2004 | Satisfactory | Satisfactory | 33.92 |
| 8 | 06/13/2005 | Moderately Satisfactory | Moderately Unsatisfactory | 39.16 |
| 9 | 12/21/2005 | Moderately Satisfactory | Moderately Satisfactory | 46.49 |
| 10 | 06/30/2006 | Moderately Satisfactory | Moderately Satisfactory | 48.23 |
| 11 | 12/28/2006 | Moderately Satisfactory | Moderately Satisfactory | 53.10 |
| 12 | 06/28/2007 | Moderately Satisfactory | Moderately Satisfactory | 57.26 |
| 13 | 12/14/2007 | Moderately Satisfactory | Moderately Satisfactory | 64.57 |
| 14 | 06/27/2008 | Moderately Unsatisfactory | Moderately Unsatisfactory | 70.82 |

## H. Restructuring (if any)

| Restructuring Date(s) | Board Approved PDO Change | ISR Ratings at Restructuring | | Amount Disbursed at Restructuring in USD millions | Reason for Restructuring & Key Changes Made |
|---|---|---|---|---|---|
| | | DO | IP | | |
| 01/11/2005 | N | S | S | 35.88 | The restructuring was to make use of the cost savings to enhance the projectect outcomes. The following new components were included to the original scope:(i) support to the concessioning of the ditribution company, (ii) Dam safety and geothermal development and (iii) strenthening of the environmental Monitoring component. |

## I. Disbursement Profile



# 1. Project Context, Development Objectives and Design

## 1.1 Context at Appraisal

1. **General context.** The Fourth Power Project (Power IV) was appraised in October 2000 after 18 months of project preparation. The objectives and design of the project were based on three contextual underpinnings: *first* the Poverty Eradication Action Plan (PEAP) goals – an overarching Government of Uganda (GoU) policy for economic growth and poverty reduction - which identified improving access to and quality of power, transport and telecommunications as priorities for the country's development; *second* the World Bank Country Assistance Strategy (CAS) for Uganda (November 2000) with a focus on poverty reduction through sustained growth, and *third* the reforms which were being implemented by the GoU in the power and petroleum sub-sectors. The Power IV objective was, therefore, consistent with that of the PEAP and the CAS, and intended to support and deepen the reform programs of the GoU, while bridging the anticipated electricity supply deficit during the period 2003 - 2005.

2. **Country context.** Uganda's economy had sustained a steady Gross Domestic Product (GDP) growth rate of an average of 6.4% since 1990, with a 20% decline in poverty between 1990 and 2000. Reform programs had been successful in establishing fiscal discipline and restructuring public expenditure, trade liberalization, privatization and financial sector reform, and decentralization efforts were made to improve public service delivery. Despite notable past economic achievements, the GoU was concerned that the lack of adequate energy supply would be a serious obstacle to equitable, sustainable growth of the economy.

3. **Sector context.** Uganda was confronted by a number of challenges in the power sector, which were affecting growth, including poor sector performance, inadequate and unreliable power supply, less than cost reflective tariffs, low electricity access levels, and lack of monitoring of petroleum operations with retail margins. Power IV was thus designed in an environment where only about 5 percent of the population had access to electricity and the private sector perceived the quality and adequacy of power supply to be the most serious constraint to private investments. The expansion of Uganda's generating capacity had not kept pace with its rapid economic growth in recent years, thus creating a shortage of electricity. With continued strong economic growth and concurrent high electricity demand growth - projected at about 8 percent per year - Uganda thus needed to better utilize its domestic hydropower energy resources. Equally important was the regulation and monitoring of the petroleum sub-sector. The costs of oil imports to land-locked Uganda were high at about 27 percent of the country's export revenue and likely to rise rapidly, absorbing even more of the country's export earnings. Therefore, the provision of incentives for greater efficiency in petroleum supply was considered critical to improve the country's balance of payments as well as its energy balance.

4. The GoU power sector strategy, therefore, aimed to: (a) promote legal, regulatory and structural sector reforms, including leveraging private sector investment; (b) provide adequate, reliable and least cost power generation with the goal of meeting urban and industrial demand and

increasing access; and (c) scale up rural access to underpin broad based development. The design of Power IV built on the experiences and lessons learnt under the Third Power Project (Power III), while continuing to support the sector reform process, including the unbundling and privatization of the Uganda Electricity Board (UEB) by granting private operators concessions for its generation and distribution businesses.

5. **Rationale for Bank assistance.** The Bank had been a long-standing and deeply involved partner in the development of Uganda's energy sector, maintaining an intense dialogue covering power generation, transmission and distribution, rural access to electricity, energy efficiency, traditional fuels and the petroleum sector. The CAS (2000) also planned to improve infrastructure delivery through the least-cost development of the power system, sector reform, and privatization. The GoU, considering the World Bank as the lead donor in the Ugandan power sector, continued to seek Bank advice and support in this area, and it was therefore considered important to remain strongly engaged, especially during the critical period before the commissioning of the Bujagali plant. Whereas several donors were assisting the GoU and UEB in financing needed investments and providing technical assistance to sector reform, the GoU needed the financial and coordinating resources of the Bank to implement a broad based sector reform, such as the privatization of UEB. In addition to the proposed project, there were three other energy-related projects that helped promote the CAS objectives in the power sector, notably (i) the Bujagali Private Power Generation Project; (ii) the Energy for Rural Transformation (ERT) Adaptable Program Loan; and (iii) the Privatization and Utility Sector Reform Project. More recently (2007), the Bank has also approved the funding of the US$300 million Power Sector Development Operation.

### 1.2 Original Project Development Objectives (PDO) and Key Indicators

6. **Project Development Objective.** The PDO was (a) to improve power supply to meet demand by supporting critically needed investments in the sub-sector; and (b) to strengthen Borrower capacity to manage reform, privatization, and development in the power and the petroleum sub-sectors.

7. **Key Performance Indicators (KPIs).** The original *outcome indicators* of the project were to: (a) reduce load shedding by early 2004; (b) increase the number of new residential connections to 15,000 annually by the end of 2004; (c) reduce system losses from 30 percent in 2000 to 24 percent by the end of 2004; (d) reduce undelivered energy due to outages in the transmission system by 30 percent at the end of 2003; (e) implement transparent legal, regulatory and monitoring arrangements for the power and petroleum sub-sectors by the end of 2002; and (f) improve the GoU's fiscal sustainability.

8. The original *output indicators* were: (a) an increase of between 80 and 120 MW in the capacity of the Kiira hydro power plant by early 2004; (b) rehabilitation of critical aspects of power system transmission and generation by early 2004; (c) training of staff of Ministry of Energy and Minerals Development (MEMD) and Uganda's Electricity Regulatory Authority (ERA) by the end of 2003; (d) the establishment of petroleum sector monitoring guidelines by mid 2003; (e) procurement of equipment to test the quality of petroleum supply by the end of 2002; and (f) the establishment of the operating regime for Lake Victoria by the end of 2003.

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

9. While the PDO remained unchanged, after the project's Mid Term Review (MTR) in December 2003, the project was restructured (as per the Memorandum of the President dated December 8, 2004) as significant cost savings allowed for additional financing to be freed up for transmission and distribution. To allow for measurement of these outcomes additional indicators were included in the results framework to cater for the new components. These were formally approved by the Bank Board. To further enhance the quality of results reporting and to clarify the definition and measurement of performance indicators reflected under the project agreement(s) a new results framework was developed in November 2006, in consultation with GoU. Project outcomes were redefined as:

i. Improved (hydro-) power supply to meet energy demand in Uganda, through the commissioning of two 40 MW units at the Kiira station; measured by: (a) reduced load shedding, and (b) an annual power generation increase of 50 GWh for Kiira unit 14 and 45 GWh for unit 15. The results framework clarifies that a critical assumption, which allows for meeting of key targets is that the Lake Victoria hydrology has to permit releases in accordance with the existing water discharge arrangements.

ii. Improved electricity services, through the supply of distribution equipment and installation of a transmission substation at Kampala Industrial and Business Park; measured by (a) reduced service interruptions; (b) an increased number of people connected to the grid, and (c) new industrial plants connected to power in the Kampala Industrial and Business Park.

iii. Improved regulatory, legislative and institutional framework in place in the power and petroleum sectors, through implementing before the end of the Project: (a) the establishment of an independent sector regulator ERA by the end of 2002; (b) the establishment of a dam safety framework; (c) a Water Management Plan prepared and implemented as measured by the percent deviation of water delivery compared to the approved water discharge arrangement; (d) development of a plan for the development of geothermal energy resources; (e) the submission to Parliament of the Downstream Petroleum Sector Law and Regulations; (f) implementation of guidelines for petroleum industry monitoring with regard to quality, safety and pricing, and (g) revision of the Electricity Law.

### 1.4 Main Beneficiaries,

10. The project's direct beneficiaries are the electricity customers and in particular the productive private sector, which would benefit from increased grid supply, reduced load shedding, better quality of service, and reduced need for expensive back-up services. IDA assistance would also help to maintain the momentum of the power sector reform program through the restructuring of UEB, reducing the power sector's drain on public expenditures. Increased power supply with improved reliability would facilitate higher economic growth and allow for increased access to electricity, and thus benefit the population at large.

### 1.5 Original Components

#### *1.5.1 Component 1 – Power System Expansion and Rehabilitation (US$83.91 million –US$56.82 million Bank financing, US$14.40 million NORAD financing and US$12.70 million NDF financing)*

11. Component 1 (part A) objective: to increase annual electricity generation, reduce outages in the transmission system, reduce network losses and increase urban residential and industrial connections. The component had several investment and institutional support sub-components, namely: (i) installation of Kiira hydropower turbines 14 and 15 (2x40 MW); (ii) upgrading and extension of the existing SCADA and telecommunication system; (iii) rehabilitation of critical transmission system components to ensure operational safety, reliability and efficiency; (iv) civil works and hydro-mechanical equipment for completion of the installation of Kiira unit 13; (v) project design and supervision support.

#### *1.5.2 Component 2 – Environmental Monitoring (US$0.21 million; no Bank financing)*

12. Component 2 (part B) objective was to provide an environmental officer and environmental monitoring equipment to UEB, in order to ensure compliance with, and enforcement and monitoring of the Bank's safeguard policies and Uganda's national environmental requirements, in an effort to control any measures that might impact project quality.

#### *1.5.3 Component 3 – Power Sector Development and Reform (US$2.34 million; Bank financed)*

13. Component 3 (part C) objective: to strengthen the GoU capacity at MEMD and ERA to manage reform, privatization and development in the power sector, through providing: (i) equipment and staff training; (ii) the Lake Victoria Water Management Study; and (iii) other studies, consultancies, surveys and workshops relevant to the sector’s development and reform program.

#### *1.5.4 Component 4 – Petroleum Sector Development and Reform (US$0.94 million; US$0.90 million Bank financing)*

14. Component 4 (part D) objective: to improve the capacity of MEMD to monitor and regulate the downstream petroleum sector through providing: (i) petroleum quality monitoring equipment, training, and information; and (ii) consultancy services for setting-up a petroleum monitoring cell and for design and implementation of legal and regulatory system reforms.

### 1.6 Revised Components

15. The original project components were not revised nor were the objectives of the components changed. However, the MTR (December 2003) determined about US$21 million of the Credit amount would not be required for the completion of the project's original components, mainly due to: (a) cost savings achieved in the procurement of power generating equipment; (b) availability of the unallocated contingencies in the original Credit; and (c) the strengthening of the SDR against the US dollar. These cost savings were used to restructure the project in December 2004 and enhance the implementation of Uganda’s power sector reform and privatization program, by adding the following new sub-components to the Project:

16. Under Component 1: an expansion of the scope of the Power System Expansion and Rehabilitation component (part A) through three new sub-components, including: (i) support to the concessioning of the Distribution Company's assets to a private consortium (US$11 million); (ii) extension and strengthening of the power transmission system mainly through investments in expansion of transmission capacity at the Kampala Industrial and Business Park (Namanve sub-station), to provide reliable power supply to the manufacturing industries in Kampala (US$6.8 million); and (iii) retroactive financing of claims relating to Power III (US$2.3 million);

17. Under Component 2: financing of mitigation measures under the Environmental Monitoring component (US$0.15 million); and

18. Under Component 3: expanding the scope of the Power Sector Development and Reform component (part C) through the support of: (i) with drafting a Dam Safety Act; (ii) studies regarding tariff adjustment; and (iii) stabilization mechanisms and assessment of geothermal energy potential (US$0.73 million). Savings under the NDF-funded project components were reallocated towards the rehabilitation of four transmission substations, to further reduce losses and supply interruptions. The related amendments to the Legal Agreements (effective April 2005) also modified project implementation arrangements to reflect recent changes in the power sector structure, as well as procurement, disbursement, financial management and onlending arrangements, while extending the closing date of the project to December 31, 2006. The newly constituted Transmission and Distribution Companies were added as new Executing Agencies to the project, each requiring a Project Agreement with IDA and a subsidiary re-lending agreement with the GoU.

### 1.7 Other significant changes

19. Major Project Changes are described in paragraph 16 above. These were approved through the following actions:

- *Project Restructuring vide the Memorandum of the President, dated December 8,2004*
- *December 22,2004- Closing date extended to December 31,2006*
- *November 22, 2006 - Extension of the closing date to December 31, 2007*
- *December 14, 2007 - Extension of the closing date to March 31, 2008*

## 2. Key Factors Affecting Implementation and Outcomes

### 2.1 Project Preparation, Design and Quality at Entry

20. *Quality at Entry Assessment.* An internal Quality at Entry Assessment (QEA) panel judged the project well prepared and rated it overall as *Satisfactory*. The financial weakness of the power sector, the potential for backsliding on reform, and the possibility of delays in implementation were identified as major risks. The project's coherence with the GoU's power sector strategy and the CAS, a high quality economic and technical analysis underpinning the project design, the Borrower's commitment and political will to buy-in to sector reform along with privatization of the distribution business, and a competent project preparation team backed by country and sector management were identified as strong factors in project preparation.

21. *Satisfactory background analysis.* Lessons learned from the Power II and III operations were incorporated in the project design, and the rationale for the Bank's intervention was sound, as also demonstrated by the current support of the Bank for major operations in the power sector. GoU already had initiated a comprehensive reform and privatization program, restructured and unbundled UEB before Board presentation, and approved a major tariff increase before the project's effectiveness.

22. *Assessment of risks.* While the PAD identified several risk factors adequately, some crucial risk factors were beyond the project control, and their advent could not be mitigated by the project as follows:

(i) *Hydrology risk:* The risk of unfavorable hydrological conditions (low hydrology) was considered substantial for the viability of Kiira 15, and the project rightly re-evaluated unit 15 during 2002. The appraisal studies showed that if the flow is less than $620m^3/s$ virtually all of the flow can be passed through the 3x40MW units 11-13; at up to $820m^3/s$ the increased flow can be used by unit 14 adding as much as 50GWh/yr whereas at flows of less than about 820m3/s Kiira 15 was found to produce very little additional energy and hence minimal benefits. Therefore, the go-ahead of unit 15 was made conditional on additional analysis commissioned after effectiveness of the Power IV credit, which determined the cost effectiveness of unit 15 on the basis of the actual bidding price of the turbine and a probabilistic analysis of different hydrological scenarios. Due to the fact that the turbine costs were much lower than estimated at appraisal, the cost effectiveness of implementing unit 15 was readily proven. However, despite the thorough appraisal analysis conducted by the GoU and the Bank team, information produced through the project-financed hydropower optimization study[1], reveals that the dispatch of Unit 14 and 15 is impacted on by two additional factors at low lake levels. These are: (i) the need to maintain a certain tail water level at the Nalubaale power station for flows lower than $850m^3/s$; and (ii) the generator load following requirements given the different characteristics of the Nalubaale and Kiira turbines. Under low hydrological conditions, these two factors require that the dispatch regime of the combined Nalubaale -Kiira complex be altered from the least cost order in order to: (i) maintain system stability; and (ii) avoid cavitation at the Nalubaale power station. Taking these factors into account increases the hydrology risk, as under the current conditions, with units 14 and 15 making only small contributions toward filling the pre-Bujagali gap. However, based on a 30 year time horizon using the existing historic hydraulic record, the units 14 and 15 are economically viable (see ***Annex 3*** for a detailed analysis) with Economic Rates of Return of 54% and 37% respectively. In addition, the recently concluded Nile Basin Initiative Strategic/ Sectoral Social and Environmental Assessment for the Nile Equatorial Lakes Region[2], analyzed the potential climate change impacts in the region. Based on the outputs of the general conflation models, this study concluded on power generation**-** indicate that there is a high probability of future increases in the runoff, and thus higher power generation potential compared to historical data[3].

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[1] Study on Water Management of Lake Victoria, Technical Report 7, Lake Victoria Decision Support Tool (LVDST); WREM International Inc., November 2007

[2] Strategic/Sectoral Social and Environment Assessment of Power Development options in The Nile Equatorial lakes Region, prepared by SNC-Lavalin dated February 2007.

[3] Note that the economic analysis is done for this project and does not take into account of this potentially higher hydrology. Instead the analysis assumes a continuation of historic trends.

(ii) *Project implementation Risk.* Although early commissioning was noted as an important contributor to the project's economic benefits, the risk of delays was rated as modest. Ultimately it took six years instead of the planned three years to complete the project. As a result, Uganda lost in 2005 approximately 50 GWh of additional energy, which could have been generated by these units under the then prevailing release strategy.

(iii) *Bujagali Risk.* The risk of the first Bujagali hydropower project (approved in December 2001) failing to reach financial closure and its subsequent abandonment by the private sector in 2003was not foreseen at the time of approval of Power IV (July 2001). However, given the project commitments at that time, the project could not be restructured to include new components to meet the envisaged generation shortfall in the coming years. Instead, a new instrument, the Power Sector Development Operation (PSDO), was developed for this purpose.

(iv) *Network losses risk.* At project appraisal, combined transmission and distribution technical and non-technical losses were estimated at a very high 29% of electricity generated. Component 1 was intended to help address this issue, and at appraisal it was estimated that combined losses would be reduced at an annual rate of 1.5%. At the time of appraisal a distribution concessionaire was expected shortly, who would focus in part on loss reduction. The PAD acknowledged the risk that this loss reduction might not materialize, and rated this risk as 'moderate' in view of the imminent change in distribution operation. However, the concession process took considerably longer than expected, and it was not until March 2005 when UMEME assumed control of the distribution network. At that time the distribution losses were re-evaluated at 41%. Combined with 4.5% transmission losses, the total technical and non-technical losses amounted to 43.6% of electricity generated[4]. The post-project losses at appraisal were estimated to be 22.2% based on an appraisal estimate of initial losses of 29%. However, in view of the considerable shift in baseline values, it is inappropriate to assess performance on the absolute values. Instead the annualized loss reduction is a more appropriate measure. In early 2009, losses stand at 35% for distribution and 4% for transmission respectively. This represents a reduction of 6% in the four year period from 2005, compared to an appraisal estimated reduction of 6.8% in the initial project 3 year period. This loss reduction is equal to 0.9% per year over the seven year Power IV project period, or 1.6% over the four year UMEME operation period. It is attributable to Power IV project investments as well as UMEME investments and initiatives. The concessionare has introduced a rigorous loss detection and reduction strategy (based on the principle of rapid efficiency improvements, reduced non-technical losses and improved billing and collection rates). They also have installed new and efficient equipment, including distribution level equipment funded under the project. However, loss reduction remains a challenge due to the network wide improvements needed. It is clear that loss reduction is heavily dependent on the concessionaire. However, the project had little influence over either the timing of the concession, or the concession performance. Hence the project's loss reduction performance indicator should have been much more sharply defined.

23. *Risk Mitigation.* After the withdrawal of the Bujagali project Sponsor in September 2003, it was evident that that there would be an energy supply gap which was exacerbated by the occurrence

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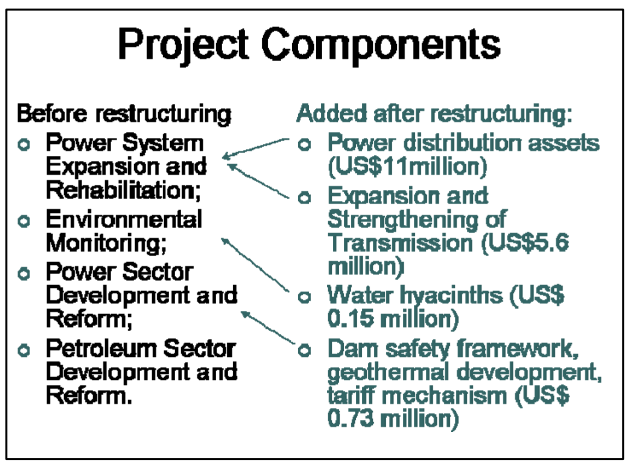
[4] The sharp increase in estimated losses is attributed to further decline in the network between 2002 and 2005, as well as UMEME's more thorough evaluation of billing data. The utility's losses were further exacerbated by a collection rate of only 85% of electricity billed. The collection rate has since improved to an average of 92%

of the low hydrology as identified in the project appraisal risk analysis. The project task team did discuss with GoU the optimal means of meeting the envisaged deficit. This ultimately resulted in the ongoing Power Sector Development Operation which includes support for additional emergency thermal generation, energy efficiency, long term sector planning and sector financial viability. In the meantime, GoU procured 50 MW thermal capacity in May 2005, followed by an additional 50 MW thermal capacity in November 2006. The project team maintained an active and continuous dialogue with the GoU regarding the over-abstraction of Lake Victoria waters from 2004 onwards.

24. *Adequacy of GoU's commitment.* The Borrower was strongly committed to the Project as evidenced by its willingness to carry out comprehensive sector reforms such as power sector restructuring, privatization, and tariff rationalization.

### 2.2 Implementation

25. *Overall Project Implementation:* The project was designed as a "fast track" primarily expected to provide the needed incremental energy before the commissioning of the next major power station then expected in 2005. The project therefore had a three year implementation period up to end 2004. During the initial years of implementation, the overall project implementation progress *was* satisfactory, mainly due to the initiation of the procurement activities before project effectiveness. The Petroleum component had a slower than expected progress during the initial years mainly due to the time taken to enact the Petroleum Supplies Act. Subsequent to the MTR, and in recognition of the considerable cost savings in the main procurements, the project was restructured and the project implementation period extended for an additional two years to allow for completion of the new components.




26. *Mid-term Review (MTR) and subsequent restructuring of the project.* The assessment of overall progress by the MTR conducted in December 2003 concluded that the project had made significant progress towards the achievement of the PDO and that the objectives continued to be both relevant and achievable in relation to the specific KPIs, although progress differed between components. The MTR recommended extension of the project completion date until December 31, 2006, and reallocation of US$21 million in cost savings for new activities supporting the PDO. The primary reallocation was under component 1 in support of the concessioning of power system distribution assets to a private operator and improvement in the reliability and service coverage of the transmission system (see Section 1.6). The support provided through Power IV to the concessioning process was part of a broader security package provided by the World Bank Group aimed at enhancing the attractiveness of the concession agreement. The package also included political risk insurance cover from MIGA for the concessionaire – Umeme- and an IDA guarantee of US$5.5 million under the Privatization and Utility Sector Reform Project.

27. *Project implementation after Restructuring.* The overall project implementation progress from 2005 was slower than expected with delays incurred due to a variety of technical problems with turbine commissioning and the procurements related to the new project components. The final

commissioning of Kiira 14 and 15 caused a delay in project implementation of about 2.5 years, while completion of the sub-components added through the project restructuring caused another 6 months delay as detailed below.

- *Commissioning of Kiira units 14/15.* The units were substantially completed during the second and third quarter of 2005 (June and August for Units 14 and 15 respectively) but defects noted during commissioning tests (e.g. vibration) delayed commercial operation of the units by about 2.5 years. The commercial operation dates for units 15 and 14 are February 22, 2007 and August 4, 2007 respectively.
- *Transmission and distribution sub-components.* The completion of the Bank-funded Namanve transmission substation at the Kampala Industrial and Business Park (added under the project restructuring) was delayed by one year primarily due to, the take-over of the supplier by Siemens, which was beyond the control of GoU and the Bank, and the subsequent delayed arrival of the transformers.
- *Petroleum component.* There was a delay in setting up of the petroleum supplies department mainly due to the change in the overall public service strategy, with the appointment of the departmental staff being put on hold until completion of the civil service reform. The public service finally approved the department structure in late 2006, after which the core staff was appointed. The new staff was then able to fast track implementation activities related to the Petroleum Technical Committee, setting up and operationalizing the petroleum supplies monitoring and testing activities.

28. *Project Management.* Quality of Supervision Assessment (QSA) reviews have judged the implementation capacity of the PIU as adequate. The project's policy components were supervised by the Ministry of Energy and Mineral Development (MEMD), while the remainder of the components were implemented by the Project Implementation Unit (PIU). Both entities have generally been diligent in following up on project implementation issues and – after a slow start - have issued the required monitoring reports on time. Overall GoU commitment was consistently maintained throughout the project period.

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

29. *M&E design.* The project design contained a number of very specific performance indicators. These indicators covered both institutional development related to the management and regulation of the sector, as well as project outcomes and outputs, such as targeted load shedding ratios, loss reductions, new electricity connections per year, etc. Some of the indicators were appropriate and suitable as indicators towards the PDO, while others were beyond the control of the project such as reducing load shedding and loss reduction, hence cannot be easily used to evaluate the project performance. While the PDO remained unchanged, a new results framework was developed in November 2006, in consultation with the GoU, to clarify the definition and measurement of performance indicators reflected under the project agreement(s).

30. *M&E implementation.* As noted from staff reports, key performance indicators were continuously tracked during the project implementation.

### 2.4 Safeguard and Fiduciary Compliance

31. The project complied with the identified safeguard policies (OP 4.01, 4.37 and 7.50) at both preparation and implementation phases. Issues were generally minor because of the local and rather small scale nature of the works involved (placing two generating units in existing bays, construction of transmission sub-stations, etc), but the wider environmental issues were also addressed. An Environmental Management Plan (EMP) was prepared for the restructured project. The final environmental supervision mission (October 2007) concluded that the project had either carried out the various environmental management activities as required under the MOP dated December 8, 2004, or had taken steps to complete them. The ICR team in April 2008 confirmed that all these activities had been completed at project completion. In its original form, the project had no direct social impacts, but was an enabling project from the standpoint of poverty reduction. However, with the restructuring in late 2005, the project added a transmission and a distribution component which had resettlement and land acquisition issues. Project impacts were minor and have been remedied. The brick makers affected by the transmission substation were adequately compensated. Compliance with environmental and social safeguards is assessed as satisfactory.

32. The project's financial management performance was assessed in January 2008. The financial management performance by UETCL (Components 1 and 2) was rated Satisfactory, based on an adequate accounting system, regular quarterly budget monitoring, adequate accounting policies and procedures, and a satisfactory internal control system. MEMD's financial management performance (Components 3 and 4) showed moderate weaknesses in the above areas, and was thus assessed as Moderately Satisfactory.

### 2.5 Post-Completion Operation/Next Phase

33. Overall, project sustainability is judged satisfactory, since the project investments are expected to attain their projected useful lifetime and the technical assistance support been incorporated into long term effort as described below.

34. MEMD has established an Energy and Mineral Development Sector Working Group (EMD-SWG), covering Energy Development, Petroleum Exploration and Minerals Development, with the objective of aligning the work within the sector closely with national priorities and strengthening the cross-sectoral links between MEMD's activities and other sectors. A Sector Investment Plan is under preparation.

35. UEGCL has signed a retainer agreement with the Project Engineer for technical support during the defects liability period for Kiira units 14 and 15, in addition to procuring adequate spares for the plant operation.

36. UETCL has mainstreamed project activities by creating a Projects Department for the management of future projects, while MEMD has created a Hydropower Unit for the management of activities related to hydropower development in Uganda.

37. A task force, comprised of officials from Umeme, ERA and MEMD, has been formed to monitor the progress made in the distribution sector with regard to the Loss Reduction Action Plan, currently implemented by the Distribution Concessionaire.

38. The operation of the petroleum laboratories jointly with the Uganda National Bureau of Standards has enabled charging of user fees (since UNBS is self accounting and allowed to charge user fees), hence raising operational revenue that could not easily be met from the Annual Central

Budget allocation. Thus it is expected that generation of self revenues will enable the monitoring activities to be self sustaining.

39. The end use energy efficiency program activities initiated under the project will continue to be implemented under other World Bank supported projects among which are the Energy for Rural Transformation Program (ERTP) and the Power Sector Development Operation**.** Under the ERTP, an Efficient Lighting program has been initiated comprising of: (i) installation of 600,000 Compact Fluorescent Lights (which has reduced the electricity system demand peak load by about 20MW); (ii) development of CFL equipment standards; and (iii) procurement of a CFL testing equipment to ensure conformity to the standards. In addition, GoU has waived import duties on all approved efficient lighting equipment to reduce the initial costs and encourage their use. The Power Sector Development Operation, co-financed by Sida, includes detailed energy audits of public institutions, and commercial enterprises; and based on the findings of the audits will also support investments in energy efficiency in selected public institutions in addition to developing capacity of local consultants with regard to energy efficiency.

40. The results of the geothermal surface exploration are being reviewed. As appropriate, proposals will be advanced for follow on actions to move the geothermal exploration to the next stage of exploratory drilling. This would pave the way for detailed feasibility studies. The results of the preliminary geochemical investigations on the rest of the Uganda geothermal areas will be used to rank the areas for detailed surface exploration and development.

41. Follow on arrangements for sustaining reforms and institutional capacity have been included in the Bank funded operations (Bujagali and PSDO projects) which are supporting short-term thermal and long-term hydropower generation facilities, and GoU's measures to stabilize the power sector and strengthening the sector's reform achievements. These operations strengthen sustainability of the Power IV outcome by ensuring that a cost-reflective tariff is paid to the generation plant, thus making it possible to operate and maintain it to best practice standards over the long term. Other development partners, such as Japan, Norway, Sweden, EU, and Germany, are also supporting GoU in the power sector, including support to Umeme in reducing non-technical energy losses and improving the billing and collection rates through the implementation of its Loss Reduction Action Plan.

42. The Interministerial Water Management Committee has been established and continues to operate. The Lake Victoria Decision Support Tool (LVDST), financed by the project, is used at MEMD and UEGCL to assist the utility operators and the Water Management Committee with short-term optimization of power generation, and to support medium and long term power planning;

## 3. Assessment of Outcomes

### 3.1 Relevance of Objectives, Design and Implementation

43. The project development objective remained fully relevant to Uganda's development priorities consistent with the PEAP and the Bank's CAS. This is also demonstrated by IDA's subsequent approval of new operations in the power sector (Bujagali hydropower and PSDO projects) which build on project achievements.

### 3.2 Achievement of Project Development Objectives

44. The achievement of the PDO with respect to improving the power supply objective is rated M*oderately Satisfactory*. The project outputs led to improved system reliability and increased installed

capacity though the expected additional energy generation has not been achieved (only about 20%). This is mainly due to reasons beyond the project's control; namely onset of low hydrology conditions and delayed project implementation. The project achieved *Satisfactory* results in terms of strengthening the Borrower's capacity to manage reform, privatization and development in the power sub-sector. The achievements by component are presented in Annex 2 and summarized below. The ICR ratings take account of the entire project implementation period, as well as additional detailed analysis based on information availed by some of the project studies (especially the hydropower optimization) and data available after the project closing date. For this reason, the ratings differ somewhat from the implementation status reports ratings which were mainly based on incremental project implementation progress.

45. ***Component 1 –*** The ***results/outcomes*** achieved by the power system expansion and rehabilitation component are mixed, but overall rated as *Moderately Satisfactory*. Positive developments were that the annual outages in the transmission system (132 kV) have been reduced to 3.69 GWh as of December 2007, representing a 59% reduction as compared to a 30% target reduction. The number of new connections to the electricity grid per annum has increased, averaging about 20,000 as compared to the forecasted 10,000. However, the component did not meet its power supply objective of increasing the generation by about 95GWh per annum on commissioning of units 14 and 15.As at project closure, the additional energy generated by the units was about 20% (19GWh) of the estimated amount at project appraisal.

46. ***Component 2*** - The environmental monitoring component achieved *satisfactory* ***results/outcomes***, due to full implementation of EMPs, compliance with the Bank's safeguard policies and Uganda's national environmental requirements, and implementation of all required mitigation measures. The project has not generated substantial negative environmental and social impacts. Minor project impacts have been remedied and adequately compensated.

47. ***Component 3 –*** The ***results/outcomes*** achieved by the power sector development and reform component are rated S*atisfactory*. The sector development component has contributed to institutional changes and practices that have become standard practice among which are; (i) the establishment of ERA as an independent and well performing power sector regulator; (ii) the unbundling of UEB into separate entities responsible for generation, transmission and distribution and the long-term concessioning of the generation and distribution facilities to the private sector; (iii) implementation of a realistic and adequate tariff structure; (iv) improved water management of Lake Victoria although releases are still above the Agreed Curve release policy; (v) establishment of a Dam Safety Framework; and (vi) progress with the development of alternative energy sources, such as mini-hydro power, increase of cogeneration and the development of a plan for the use of geothermal energy resources.

48. ***Component 4 –*** The ***results/outcomes*** achieved by the petroleum sector development and reform component are rated *Satisfactory*. The setting up of petroleum laboratories has enhanced the capacity of both the MEMD and the Uganda National Bureau of Standards to carry out inspections and enforce standards in addition to assisting the Uganda Revenue Authority to minimize the dumping of petroleum products into the Uganda market.

### 3.3 Efficiency

49. A summary of the sector financial performance and project economic analysis is presented in Annex 3.

### 3.3.1 Financial Performance

50. In order to ensure the financial viability of the power sector, the following financial targets were required: (i) Debt service coverage of 1.0 times in 2001 and 1.3 times from 2002 onwards of net operating revenues; and (ii) A current ratio of 1.0 times in 2001 and 1.2 times from 2002 onwards.

51. The key annual operational and financial performance indicators of the power sector covering the period 2000 to 2008, together with forecasts in the PAD, are set out in tables 1 and 2 in Annex 3. The financial performance of the power sector during the implementation of the project can be separated into three distinct periods:

(i) 2000 to March 2001: Prior to the unbundling of UEB.

(ii) April 2001 to February 2005: Unbundled power sector and prior the concessioning of generation and distribution businesses to the private sector.

(iii) March 2005 to date: Since the commencement of private operators in generation and distribution and the onset of the power crisis.

52. ***2000 to March 2001: Prior to the unbundling of UEB***. The GoU had set in motion various measures in preparation for the unbundling of UEB and other power sector reforms. Following the appointment of new management in April 1999, the operational and financial performance of UEB had improved considerably in 2000. UEB's cash collection increased by about 40%, administration and overheads were reduced, 1,100 staff were retrenched between 1998 and 2000, and UEB increased its debt service payments to the GoU from USh1.5 billion to USh7.4 billion in 2000. In spite of these improvements, however, UEB faced considerable challenges, such as: (i) reducing high network losses (UEB failed to collect approximately 40% of the energy sent out); (ii) full cost recovery; and (iii) meeting the significant investment needs for the rehabilitation and expansion of the network, including generation capacity additions and increasing customer access to electricity.

53. ***April 2001 to February 2005: Unbundled power sector and prior to the concessioning of generation and distribution businesses to the private sector***. The separation of generation, transmission and distribution enabled the three new entities (UEGCL, UETCL and UEDCL) to focus more clearly on their respective businesses. During this period, GoU appointed an independent electricity regulator (ERA), undertook the financial restructuring of UEB debt prior to its vesting to successor companies, and introduced cost reflective tariffs for: (i) generation; (ii) bulk supply to distribution (generation plus transmission); and (iii) end-use customers which set the stage for transparency and a financially viable power sector.

54. ***Since the commencement of private operators in generation and distribution and the onset of the power crisis*** Effective March 1, 2003, UEGCL's hydro power operations at Nalubaale/Kiira were handed over to Eskom (Uganda) Limited, and in March 2005 UEDCL's operation of the distribution network across the country were handed over to Umeme Limited. Since then, the primary roles of UEGCL and UEDCL are to provide oversight of their respective concessionaire's activities. UEGCL and UEDCL derive their revenues from lease charges to Eskom (Uganda) and Umeme respectively.

55. ***UEGCL's*** performance has been satisfactory since March 1, 2005. The company has met its debt service obligations in full; annual debt service payments since 2006 have amounted to US$8.4

million. The Bank's financial covenant of 1.0 times debt service cover has been met in 2005 to 2007 and was also expected to be met in 2008[5].

56. ***UEDCL's*** performance has been satisfactory since March 1, 2005. The company has made debt service payments of US$22.7 million from 2002 to 2007. UEDCL met the Bank's financial covenant of 1.0 times debt service cover in 2006 and 2007, and this was also expected to be met in 2008. However, the debt service cover in 2005 was only 0.3 times, largely due to staff retrenchment payments following the transfer of operations to Umeme.

57. ***UETCL*** had a negative cash flow in 2005 and thus failed to meet the cash flow covenant (as defined in the Project Agreement: i.e. meet debt service, working capital requirements and investments from own resources, from net revenues) because the bulk supply tariff was not sufficiently increased to meet UETCL's requirements. UETCL had met part of its power purchase costs from past accumulated surpluses (such payments affect current year earnings as the charge goes to the income statement & cash flows). UETCL's performance in 2005 was negatively affected by: (a) increasing reliance on thermal power and high fuel prices with inadequate increase in its bulk supply tariff, and (b) support provided by the company from its accumulated surpluses towards the cost of fuel. Since 2006, UETCL has met all of its revenue requirements following increases in bulk supply tariffs and higher GoU subsidies towards thermal power costs. Similarly, UETCL will be financially supported by GoU subsidy and IDA support for thermal power supply from Aggreko's 50MW leased plant at Mutundwe, commissioned in early September 2008.

58. ***Umeme's*** financial performance is satisfactory. The net after tax income as a percentage of revenue was 3.2% in 2007 and 4.9% in 2006, and the return (operating income after tax) on its own invested capital was 7.0% in 2007 and 14.1% in 2006. The current or liquidity ratio was healthy at 1.5 times in 2007 and 1.4 times in 2006. In 2007, Umeme's shareholders injected USh24.8 billion (US$14.3 million) in equity and loans (net of repayments). Cash inflows from operations (after changes in working capital), amounted to USh2.2 billion (US$2.0 million) in 2007 and USh40.4 billion (US$23.4 million) in 2006. Umeme's investments in the network amounted to USh34.9 billion (US$20.1 million) in 2007 and USh12.6 billion (US$6.8 million) in 2006. In addition, IDA contributed US$11.8 million towards the cost of poles, transformers and customer meters, funded under the Power IV project.

### 3.3.2 Economic Analysis

59. The economic analysis undertaken as part of the ICR used the information available in early 2009 to assess the economic viability of Units 14 and 15. These data were then inserted into the model used during the PAD analysis, as is the standard practice for ICR reviews of project performance. Table 1 below shows the economic results for units 14 and 15 under the ICR review compared with the economic results from 2001 and 2002.

[5] ICR Financial review was conducted before the close of 2008

Table 1: Economics of Kiira Units 14 and 15

| | NPV (US$ million) | | | EIRR (%) | | |
|---|---|---|---|---|---|---|
| | **Unit 14** | **Unit 15** | **Both Units** | **Unit 14** | **Unit 15** | **Both Units** |
| **WB Project Appraisal Document (2001)** | 21.1 | 10.9 | 32.1 | 22 | 18 | 20 |
| **Economic Review (2002)** | 23.7 | 8.7 | 32.5 | 39 | 36 | 38 |
| **Update ICR 2009** | 39.1 | 23.5 | 62.7 | 54 | 37 | 46 |

60. Table 1 illustrates that the changes in framework conditions have positively affected the viability of Units 14 and 15 at Kiira Hydropower Plant, despite the late commissioning of the units in 2007. The benefit of Kiira is mainly increased compared to the original estimates from 2001 and 2002 due to the further delay in the construction of Bujagali hydropower plant, which makes the availability of Units 14 and 15 more valuable than previously estimated. While in the original estimate there was only a difference of two years between commissioning of Kiira Units 14 and 15, now there are four years of difference. ***Annex 3*** presents the results in detail.

61. *Long Term Benefits*. The decision to have Kiira power station designed to accommodate 5x40MW units is detailed in the Third Power Project Reports (PAD and ICR) which was, among others, motivated by safety concerns regarding the spill way capacity and the cracking of the concrete structure at the Nalubaale power station[6]. In the long term, having Kiira as a complete power station is considered beneficial to Uganda because it: (i) provides flexibility in power generation capacity; and (ii) minimizes dam failure risks[7] for Uganda and other riparian states. In addition, the Nile Basin Initiative Strategic/ Sectoral Social and Environmental Assessment for the Nile Equatorial Lakes Region[8], indicates that there is a high probability of increases in the runoff due to climate changes. Although this is not modeled in the current analysis, this factor would further enhance the economic value of the two units.

### 3.4 Justification of Overall Outcome Rating

Rating: ***Moderately Satisfactory***

62. Project component A, representing 90% of the IDA resources and 60% of the total project costs, is rated Moderately Satisfactory and the remaining three components are rated Satisfactory. The main project component (by cost) has mixed results, with 50 percent of the component outcomes rated

[6] The cracking affects only the power station at Nalubaale and not the dam. Hence this does not represent a dam safety issue.

[7] The primary failure risk addressed by Kiira is the potential for high water that might otherwise overtop Nalubaale.

[8] Strategic/Sectoral Social and Environment Assessment of Power Development options in The Nile Equatorial lakes Region, prepared by SNC-Lavalin dated February 2007.

satisfactory whereas the other 50 percent achieved only about 20 percent of the expected results in terms of additional energy generated. Overall, about 70 percent of components achieved satisfactory outcomes. Further, the Borrower's capacity to manage reform, privatization and development in the power sector has been strengthened as evidenced from the fact that a regulatory environment conducive to attracting private investments into the sector[9] is in place; and measures have been taken to ensure sustainability for future operations of the various activities among which are the sector development, maintenance and operation of the project outputs, system loss reduction, energy efficiency and sector reforms. Following the reforms and by adopting cost reflective tariffs, the sector is positioned to be a financial contributor to the economy rather than detracting resources from the GoU budget as highlighted in Annex 3A- Financial Performance.

63. The overall project outcome is rated ***Moderately Satisfactory*** in consideration of the implementation delays and the onset of risks beyond the control of the project; namely: (i) the withdrawal of the first Bujagali project sponsor leading to the increased generation deficit beyond 2005, (ii) delay in concessioning of the distribution facilities and a commensurate delay in initiation of loss reduction investments which have delayed system losses to the project target levels; and (iii) onset of low hydrological conditions which led to achieving only about 20 percent of the project target additional energy at project close.

### 3.5 Overarching Themes, Other Outcomes and Impacts

#### (a) Institutional Change/Strengthening

64. The project achieved its objective regarding reform, capacity building and institutional development in the power and petroleum sub sectors with regard to strengthening the borrower's capacity to manage reform, privatization and development in the power and petroleum sub sectors as evidenced from the following outcomes:

i. The privatization process has progressed with the generation and distribution functions put under concession in 2003 and 2005 respectively;

ii. The Regulator's office is fully operational and has issued several licenses for new generation and distribution projects ;

iii. The Petroleum supplies department is operational and carrying out licensing activities including product quality monitoring and inspection for compliance.

#### (b) Poverty Impacts, Gender Aspects, and Social Development

65. Because of the relationship between power supply, economic development and poverty alleviation, as elaborated in the PEAP and CAS, the project intended to contribute to the reduction of poverty by removing one of the most significant obstacles to private sector development, namely with the limited and unreliable electricity supply. In addition, the project-supported sector reforms and privatization were necessary for commercial operation of the sector and to reduce the burden of the

[9] The Major sector reforms detailed in section 3.2 have facilitated private sector participation with increased private capital investments in the sector totaling to about US$1.0 billion.

sector on public finances. Though the target of increasing the power supply has not been met as at project closure, there were increases in both reliability of power supply and access over the project period. The necessary sector regulatory framework has been put in place which has enabled GoU to reduce subsidies to the sector in addition to leveraging resources with those from the private investments into the sector. It may thus be concluded that the project contributed significantly to poverty alleviation.

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

i. *Sector Development* - Due to its continuous involvement in the power sector, the Bank – through the follow up operation, the Power Sector Development Operation - has taken the lead in assisting the GoU in meeting the short term capacity generation requirements, promoting energy efficiency and developing a Sector Investment Plan aimed at optimizing the sector investment requirements with regard to increased generation and access.

ii. *Downstream Petroleum Sector* – In order to improve the efficiency of petroleum supply system and as a follow up of one of the recommendations of the study supported by the project, the GoUs of Kenya and Uganda have agreed to the extension of the oil pipeline from Kenya to Uganda whose installation is expected to commence in CY 2009.The pipeline extension is expected to reduce the cost of transporting petroleum supplies to Uganda by about 50% and to improve reliability of supply.

iii. *Cross-Sectoral Collaboration on Lake Victoria water management*. Concerns about the declining water levels of Lake Victoria, caused by over-abstraction (increased releases above the Agreed Curve for power generation) and drought in the period 2003-2005, have intensified cross-sectoral collaboration and coordination regarding the management of Lake Victoria, at the regional level through EAC, at the national level in Uganda (among institutions such as the water, energy and environment ministries and the Inter-Governmental Working Committee) and within the Bank (through the Bank's Lake Victoria Discussion Group). Similarly, the multiple negative impacts of the declining lake levels also provided an impetus for the preparation of Phase II of the Lake Victoria Environmental Management Project (LVEMP).

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

66. Two consumer satisfaction surveys were conducted in 2003 and 2004. The surveys indicated that a majority of consumers in the main cities were satisfied with the improvements in the quality and quantity of electricity supply. Subsequent annual surveys were not carried out in consideration of the onset of increased load shedding starting 2005. However, those living outside of those areas were much less satisfied. Under the ongoing Power Sector Development Operation, a Poverty and Social Impact Assessment will be carried out and will also cover the consumers' ability and willingness to pay for electricity.

## 4. Assessment of Risk to Development Outcome

67. The risk to the Development Outcome of this operation is rated as ***Low.*** With regard to the power supply objective, it is clear that the project has supported installation of generation and transmission facilities that will sustain power supply reliability over the long term. Further, measures are being taken to diversify and increase power generation to mitigate both the risks posed by the

variability of the hydrology of Lake Victoria and petroleum prices. Other risk factors related to the sector development components are also rated ***Low.*** Institutional changes are already implemented (unbundling of UEB and privatization of generation and distribution businesses through long-term concessions, enhanced performance of regulatory body). The GoU assigns a high priority to a stable and growing power sector in supporting its poverty alleviation and economic development programs, and the Bank and other development partners are presently funding several substantial new operations in the power sector, including institutional support for sector reform and development.

## 5. Assessment of Bank and Borrower Performance

### 5.1 Bank Performance

#### (a) Bank Performance in Ensuring Quality at Entry

Rating: ***Satisfactory***

68. The QEA judged the project well prepared and rated it overall as *Satisfactory*. The prioritization of the Bank funded Power IV activities was done within the context of the GoU's overall power sector strategy and reform program, with NORAD and the NDF as co-financiers in the Project. The Bank funded activities were demarcated giving due consideration to the interests of other donors in financing particular activities. This ensured coordination and harmonization of donors/Bank interventions to support a GoU owned sector program.

69. Power IV was designed on the basis of experiences and lessons learned under Power III. Design and bidding documents were available prior to project approval to enhance timely completion of the facilities. In addition, taking note of the hydrological risk and uncertainties, detailed reviews were undertaken especially with regard to Unit 15.

#### (b) Quality of Supervision

Rating: ***Satisfactory***

70. Successive Quality of Supervision Assessments rated the supervision performance of the project as satisfactory, based on a capable and hardworking Task Team, high quality supervision documentation, and effective working relations with the GoU counterparts. In particular, the Bank: (i) allowed for flexibility in terms of resources and time which supported project completion; (ii) provided additional expertise, to advise the Borrower on hydrological and other issues; (iii) responded promptly to operational issues (procurement, and financial administration); (iv) responded well to the restructuring and amendments to the DCA requested by the Borrower; and (v) ensured adequate cross-sectoral coordination regarding the concerns on the decline of Lake Victoria level.

71. The project was well supervised by a stable Bank team, consisting of multi-disciplinary members, and without significant changes in team composition throughout implementation. Supervision teams were supported by specialists for addressing specific issues which had been identified. The quality and availability of the supervision team have been high and frequent, also since part of the team was based in the country office. Issues which could affect project implementation were identified in a timely manner, documented, and brought to the attention of management. Procurement was regularly monitored, including post-reviews conducted as part of the supervision

missions' activities. Procurement rating moved from unsatisfactory to moderately satisfactory in the supervision reports. Financial Management supervision has been satisfactory and the adequacy of financial management arrangements has been reviewed regularly, although in some important areas GoU failed to implement the recommended actions on a timely basis. Safeguards policies were specifically monitored and addressed, and the team worked with the relevant agencies to help ensure environmental and social due diligence, inter alia through the implementation of an EMP. Bank Management was consistently supportive of the Task Team's effort and provided support for a major restructuring of the project and several extensions of the closing date. The quality and candor of supervision reports was good, including reporting on the outcome indicators. The MTR was of good quality and proposed an extensive reallocation and restructuring plan. The adequate supervision ensured the implementation of MTR recommendations.

72. Supervision budget requirements have at times been challenging, as: (i) the Lake Victoria crisis and the Lake Victoria Management Study required the recruiting of an additional consultant hydrologist; (ii) the unsatisfactory status of the petroleum component required active engagement of the team's petroleum specialist; and (iii) the technical problems with Kiira units 14 and 15 required active engagement of additional engineering expertise in addition to the team's experts.

**(c) Justification of Rating for Overall Bank Performance**

Rating: ***Satisfactory***

73. The overall Bank performance was Satisfactory. Assessments of the Quality at Entry as well as Quality of Supervision have been rated satisfactory. Adequate teams and resources were fielded during the preparation, appraisal and supervision. When it became clear that the Bujagali power plant could not be commissioned as expected in 2005, the Bank teams engaged GoU on the options to consider in bridging the expected generation deficit such as emergency power generation and energy efficiency measures. The continued Bank engagement and support resulted in additional financing through follow up operations. These included investments and technical assistance in energy efficiency, renewable energy, access expansion, sector reform and emergency thermal generation.

**5.2 Borrower Performance**

**(a) Government Performance**

Rating: ***Satisfactory***

74. Initially, the project faced issues regarding counterpart funding, the settlement of arrears of GoU entities in payment of electricity bills, tariff adjustments, and other issues, but these issues were resolved midway through the project except for GoU entities payment of electricity bills who were resolved at the end of the Project. Overall, GoU demonstrated a satisfactory level of ownership and commitment to the successful completion of the project, notwithstanding the challenges the project experienced during its implementation. The GoU demonstrated commitment by establishing the independent Electricity Regulation Authority (ERA) and in its commitment to the unbundling of UEB and the privatization of the power generation and distribution businesses. However, the GoU was slow to come to terms with the power shortfall implications of the first Bujagali Project Sponsor's

withdrawal. More agile planning, including an early mobilization of thermal power could have reduced the generation deficit and the negative impacts on Lake Victoria.

**(b) Implementing Agency or Agencies Performance**

Rating: ***Satisfactory***

75. Project Quality of Supervision Assessments have judged the implementation capacity of the PIU as adequate. The project's policy components were supervised by the MEMD, while the remainder of the components were implemented by the PIU. Both entities have generally been diligent in following up on project implementation issues and – after a slow start - have issued the required monitoring reports on time. Overall GoU commitment was consistently maintained throughout the project period, as evidenced by the subsequent supervision reports.

**(c) Justification of Rating for Overall Borrower Performance**

Rating: ***Satisfactory***

76. The Borrower gave support and good will to the project,. The Borrower demonstrated a firm commitment to the sector reforms by setting up a sector framework conducive for private sector involvement and sector financial viability which underpins the long term sector good performance and sustainability.

## 6. Lessons Learned

77. *Realism in project implementation planning*. The Bank should be realistic about the time it takes to complete a project of this nature, taking into account the implementation capacity of the Borrower and the potential technical and logistic problems with project implementation. This has an impact on the project outcomes especially when considering least cost options for short term interventions especially as the least-cost alternative for increasing power supply is not necessarily the least-cost option for reducing power shortages. Power shortages need to be addressed from demand, supply (generation) and distribution management angles by focusing on the installation of new generation capacity, addressing energy efficiency at the user end and reducing system losses through appropriate action plans. Though the project included all these aspects, energy efficiency and loss reduction were beyond the control of the project scope.

78. *Project Scope*. The project included both specific investments and policy issues, such as enactment of the Petroleum Law, energy sector reforms and establishment of a conducive regulatory environment to attract private operators in the generation and distribution areas. The project covered a menu of options aimed at long term sector reliability, efficiency and sustainability, though the available financing could not support all the required interventions apart from maintaining a strong dialogue with the respective stakeholders. Projects of such a nature should be more targeted, or provided sufficient resources and implementation periods to achieve the desired results.

79. *Water resources management and energy planning and development in the Lake Victoria Basin need to be integrated on the basis of a shared vision plan.* Lake Victoria riparian countries need to establish a shared vision plan for the management of Lake Victoria, which ensures the equitable utilization of this water resource, while keeping in view the interests of downstream countries. There

is also an imperative need to assess the risks and vulnerabilities associated with the Lake's hydrological variability and develop mitigation measures through integrated water and energy planning.

80. *Privatization of power generation and distribution does not necessarily provide quick remedies* in terms of ensuring efficient operations of the power sector and improved quality of supply and access, as demonstrated by the difficulties in reducing distribution losses in Uganda. However, over time a financially viable generation and distribution business will help to mitigate the perceived risks of future private investors.

81. *Development objectives should be more tightly focused on impacts realistically achievable by the project*. The project design contained a number of very specific performance indicators. Some of the indicators such as reducing load shedding and loss reduction, were beyond the control of the project hence cannot be easily used to evaluate the project performance. With hindsight, the development objective regarding the increase of power supply (or, alternatively, the reduction of power shortages) could have been more modest, considering that the justification was based on assumptions outside the control of the project; namely the project implementation period and hydrological conditions.

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

**a) Borrower/implementing agencies**

The Borrower's Implementation Completion Report notes that albeit the low hydrological conditions at project completion and delays in implementation, the project registered significant achievements in the area of capacity building in both the power and petroleum sub sectors. The Borrower rates the project performance as satisfactory.

**(b) Cofinanciers**

NORAD prepared an independent program completion report covering NORAD support to the sector for the period 1997-2005 and notes that the results of support to sector are mixed with reference to capacity building and the cost effectiveness of the procurements. Reference to the cost effectiveness of the procurements mainly arises from the restricted bidding procedures as applied by the respective agencies at the time.

NDF in summary notes that the objectives of the NDF-sub-components were achieved and the project satisfactorily reached the expected outcomes and concurs with the IDA assessment that overall results/outcomes achieved by the power system expansion and rehabilitation component, including the two NDF-sub-components, are mixed, but overall rated as moderately satisfactory.

## Annex 1. Project Costs and Financing

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

| Components | Appraisal Estimate (USD millions) | Actual/Latest Estimate (USD millions) | Percentage of Appraisal |
|---|---|---|---|
| POWER SYSTEM EXPANSION AND REHABILITATION | 83.87 | 80.5 | 96.0 |
| POWER SECTOR REFORM AND DEVELOPMENT | 2.35 | 5.62 | 240.0 |
| ENVIRONMENTAL MONITORING | 0.21 | 0.040 | 19 |
| PETROLEUM SECTOR REFORM AND DEVELOPMENT | 0.97 | 1.10 | 113.4 |
| | | | |
| **Total Baseline Cost** | 87.40 | 87.26 | 99.8 |
| Physical Contingencies | | 0.00 | 0.0 |
| Price Contingencies | | 0.00 | 0.0 |
| **Total Project Costs** | 87.40 | 87.26 | 99.8 |
| Front-end fee PPF | 1.94 | 0.522 | 27.0 |
| Front-end fee IBRD | 0.00 | 0.00 | .00 |
| **Total Financing Required** | 89.34 | 87.78 | 98.3 |
| | | | |

**(b) Financing**

| Source of Funds | Type of Cofinancing | Appraisal Estimate (USD millions) | Actual/Latest Estimate (USD millions) | Percentage of Appraisal |
|---|---|---|---|---|
| Borrowing Agency | | 6.00 | 0.60 | 10 |
| Borrower | | 3.34 | 4.10 | 122.8 |
| International Development Association (IDA) | | 62.00 | 61.16 | 99.4 |
| Nordic Development Fund (NDF) | | 11.30 | 14.70 | 130.0 |
| NORWAY: Norwegian Agency for Dev. Coop. (NORAD) | | 6.70 | 6.70 | 100 |

## Annex 2. Outputs by Component

***Component 1 – Power System Expansion and Rehabilitation:*** The main (investment) component of the project achieved the following ***outputs***:

- Commissioning of two 40 MW units (Kiira 14 and 15);
- Upgrading and extension of the existing SCADA and telecommunication system (NDF funded);
- Installation of the Namanve substation at the Kampala Industrial and Business Park, along with the NDF and NORAD funded rehabilitation and extension of 8 transmission substations;
- Feasibility study and ESIA for the rehabilitation of the Tororo-Lira 132kV transmission line;
- Provision of US$11 million in distribution equipment, including equipment for the connection of new consumers, in support of the concessioning of the Distribution Company's assets to the private company Umeme;
- Consultancy services for design and supervision of the installation of Kiira 14 and 15; and for review of the technical and economic viability of Kiira unit 15.
- Assistance to the GoU with the preparation of the revised Bujagali power plant project, including technical services in the tender design and preparation of bidding documents, and legal and financial advisory services.

The ***results/outcomes*** achieved by the power system expansion and rehabilitation component are mixed, but overall *Moderately Satisfactory*, as follows:

- The annual electricity generation increased, under the prevailing hydrological conditions, by about 19.0 GWh/yr, against an initial target of 95 GWh/yr. The intention of the project to bridge the demand/supply gap until Bujagali would come on line has not been achieved, since: (i) commissioning of the Bujagali power station was delayed by at least 6 years, (ii) technical problems delayed project completion by 3 years, and (iii) the project achieved about 20% of its target in additional energy generation. Load shedding increased to more than 400 GWh/yr (about 50 MWe) by 2007.However, given the total energy load shed as compared to the expected additional generation of 95GWh, the biggest contributor to increased load shedding is mainly due to the delayed commissioning of Bujagali/additional generation.
- The operational safety, reliability and efficiency of the Nalubaale switchyard were improved and outages in the transmission system (132 kV) have been reduced with the total energy lost in outages reduced by about 50%, from 8.96 GWh in 2000 to 3.69 GWh in 2007.
- Network distribution losses are still above the industry levels multiple efforts; losses stand at 38% against the appraisal target of 18%. The apparent increase in power losses is mainly attributed to previous underreporting by the previous public management of the utility and under investments during the period 2001 to 2005. The distribution concessionare has since reduced the losses form 41% in 2005 to the current level of about 35%. Non-collection of bills has also been reduced from 15% to 7%. At project completion, part of the distribution equipment procured under Power IV

was still in the process of being installed. Most of the distribution losses are commercial losses, including a high number of power thefts. Umeme, ERA and MEMD have formed a joint task force to fight these losses in the distribution sector and are implementing a loss reduction action plan.

- Power supply to the manufacturing industries in Kampala has been improved and several new customers/industries have requested for allocation of plots in industrial park, with several industries already operating among which are the Century Bottling Company (Coca Cola) and a Mineral Water processing and bottling plant ;
- The number of new connections has significantly increased over the life time of the project. In 2007 new connections reached a level of 21,000 against a target of 15,000.

***Component 2 – Environmental Monitoring:*** The Environmental Monitoring component delivered the following outputs:

- An environmental officer was hired by UETCL and environmental monitoring equipment was provided.
- An Environmental Audit of the Kiira extension was carried out, water quality reports were prepared and the project supported the disposal of harvested water hyacinth.
- The Kiira project site has been restored and construction infrastructure has been decommissioned.

The ***results/outcomes*** achieved by the environmental monitoring component are S*atisfactory*, as follows:

- Environmental Management Plans have been submitted in a timely manner and fully implemented;
- The Bank's safeguard policies and Uganda's national environmental requirements have been complied with.
- Mitigation measures have been implemented, including water hyacinth disposal at the power station. The project has not generated substantial negative environmental and social impacts, while minor project impacts have been remedied and/or adequately compensated.

***Component 3 – Power Sector Development and Reform:*** The Power Sector reform component delivered the following outputs:

- Computer equipment, staff training (35) and a Financial Management System(FMS were provided to ERA and MEMD in an early stage of the project;
- The Lake Victoria Water Management Study was completed and the Lake Victoria Decision Support Tool (LVDST) was implemented at MEMD and UEGCL, to assist the utility operators and the Water Management Committee with short-term optimization of power generation, and to support medium and long term power planning;
- Studies, consumer satisfaction surveys and workshops relevant to the sub-sector’s development and reform program were conducted.

- An Institutional Framework for Dam Safety and a draft Dam Safety Act were prepared and an Emergency Preparedness Committee formed chaired by the Ministry of Disaster Preparedness;
- Studies regarding tariff adjustment and Tariff Stabilization Fund management were completed, but the Tariff Stabilization Fund has not been implementation due to the energy crisis and commensurate lack of funding.
- Assessment of the country's geothermal energy potential through geothermal investigations (not yet completed at project closure).

The ***results/outcomes*** achieved by the power sector development and reform component are S*atisfactory*. Against the background of a serious power crisis, the perseverance of GOU on sector reform is commendable. The project, along with other GoU actions, Bank funded projects, and donor initiatives, contributed to the following positive developments in the power sector:

- ERA was established as an independent power sector regulator by the end of 2002, and has established a strong track record in ensuring the financial viability of the sector;
- The unbundling of UEB into separate entities responsible for generation, transmission and distribution and the concessioning of the generation and distribution facilities to the private sector was successfully completed by March 2005.
- Tariffs have consistently been increased from US$0.095/KWh in January 2001 to US$18.0/KWh in January 2008.
- The problem with GoU payment arrears has been resolved, and the operational and financial performance of the power sector has improved with most of the successor companies with a debt service of ratio of over 1.0.
- The capacity of MEMD and ERA to manage reform, privatization and development in the power sub-sector has been strengthened.
- Water management of Lake Victoria has improved through the establishment of an Intra-GoUal Committee for water management. While the over-abstraction of Lake Victoria waters persists, it has reduced considerably;
- Progress has been made with the development of alternative energy sources, such as mini-hydro power and cogeneration (including the Kakira bagasse plant) as well as the development of a plan for the use of geothermal energy resources.

***Component 4 – Petroleum Sector Development and Reform:*** The Petroleum Sector development and reform component delivered the following outputs:

- Petroleum monitoring unit structure was developed and a petroleum quality monitoring system designed;
- Petroleum quality monitoring equipment and training has been provided to the newly established Petroleum Monitoring Unit;
- A new regulatory framework for the sub-sector was prepared.

- The Petroleum Supply Department is developing the National Petroleum Information System, in addition to data collection regarding petroleum products and monitoring price movements in relation to world crude oil price movement. The system remains to be fully operationalized.

The ***results/outcomes*** achieved by the Petroleum sector development and reform component are rated *satisfactory* and are as follows:

- A Technical Petroleum Committee, established in December 2006, has strengthened the capacity of MEMD to manage monitor and regulate the downstream petroleum sub-sector;
- The Petroleum Sector Regulatory Framework and Downstream Petroleum Sector Law were enacted in October 2003. Petroleum regulations and operational guidelines for the sector have been made effective in October 2007;
- To improve the quality, specification and safety of petroleum products supply, MEMD has: (i) appointed a Technical Petroleum Committee as required under the act; (ii) completed installation of fixed and mobile laboratories and embarked on monitoring of product quality and inspection of the facilities including the environment aspects based on the agreed code of operation; (iii) commenced on the development of National Petroleum Standards in association with the Uganda National Bureau of Standards; and (iv) filled some of the critical staff positions with the recruitment of additional staff ongoing.

| Status of agreed outcomes indicators: | | | | | | |
|---|---|---|---|---|---|---|
| **Indicators** | **Measurement** | | | | | |
| | Baseline Value | | Progress To Date | | End-of-Project Target Value | |
| | Number or text | Date | Number or text | Date | Number or text | Date |
| **PDO Indicator** | | | | | | |
| 1. Reduced load shedding. | 20 MW shed at peak time | 12/30/2001 | 110 MW shed at peak time, down from 120 MW during the last ISR[10]. | 03/31/2008 | Reduced peak load shedding compared to December 2004 value of 120MW, provided hydrological conditions do not worsen[11]. | 03/31/08 |
| 2. Annual Power generation increased by 50GWh for unit 14 and 45GWh for unit 15 by end of project. | 0GWh (units not yet commissioned) | 12/30/2001 | 19.0GWh/year | 03/31/08 | 50GWh for unit 14 and 45GWh for unit 15 | 03/31/08 |
| 3. Service interruptions reduced. | 8.96 GWh | 01/01/2001 | 3.69GWh | 12/31/2007 | Undelivered energy due to outages in the transmission system reduced by 30% between 2000 to 2004[12] | 03/31/2008 |
| 4. Increased number of people connected to the electricity grid. | 10,000 annual connections | 12/30/2001 | 20,000 | 12/31/2006 | Annual Number of new urban connections increased to 15,000 by 2004 | |
| 5. Regulatory changes effected: (1) establish independent. sec. regulator & (2) dam safety framework; (3) downstream petrol. sec. law & regulations submitted to Parliament; | Power and Petroleum sectors not regulated | | The Electricity Regulatory Authority Established;<br>Dam Safety Framework Completed;<br>Downstream Petroleum | June 2000<br><br>December 2006<br>Enacted | Establishment of an independent sector regulator;<br>Establishment of a dam safety framework; | 03/31/2008 |

10 The average total generation is about 260MW against a peak demand of 370.0 MW.

11 The hydrological conditions have worsened since 2004. The average Lake level in 2004 was 11.35m compared to 2007 average of 11.180 when the units were commissioned. The 2004 forecasted Lake level at the project inception/design in September 2002 was 11.80m. T

12 Total energy lost in outages was 4.8GWh as of 12/31/2004, representing a reduction of about 48% of the 2000 value.

| | | | | | | |
|---|---|---|---|---|---|---|
| & (4) Elec. Law revisions adopted | | | Sector Law enacted Regulations prepared and under review of the Petroleum Technical Committee | 10/20/2003<br><br>03/31/2008 | Downstream Petroleum Sector Law and Regulations submitted to Parliament; Revisions of the Electricity act Adopted | |
| **Intermediate outcome indicator(s)** | | | | | | |
| 1. Two 40 MW units commissioned by end of Project | Not commissioned | 06/30/2001 | Both units were commissioned. | 08/31/2007 | Both units commissioned (achieved). | 03/31/2008 |
| 2. Transmission substation installed at Kampala Industrial and Business Park by end-of-Project. | Not commissioned | 01/01/2005 | Substation commissioned | 03/15/2008 | A 120MVA,132/33KV commissioned (achieved) | 03/31/2008 |
| 3. At least one new industrial plant connected to power in the Kampala Industrial and Business Park within a year of installation of substation. | 0 (industrial park not yet established) | 12/30/2002 | Several industries set up. | 03/31/2008 | At least 4 industries set up[13]. (achieved) | 03/31/2008 |
| 4. Environmental and Social recommendations satisfactorily implemented. | No monitoring activities | 06/30/2001 | Water quality monitoring (two reports prepared) and Environment Audit completed. Project site restored and construction infrastructure decommissioned. | 11/30/2007 | Environmental Monitoring Plan implemented | 12/01/2007 |
| 5. ERA's (Regulator's) Office is operational by end-2002. | | | New law was passed on 20 October 2003. | 10/20/2003 | Achieved. | 10/20/2003 |
| 6. A Water Management Plan prepared and implemented as measured by the percent deviation of water delivery compared to the approved water discharge arrangement. | No Water Management Plan in place | 12/30/2002 | Decision Support Tool has been Developed and a set of 10 Technical papers have been prepared. Decision Support Tool is used by Technical Water committee | 03/31/2008 | A Water Management Plan prepared and implemented. | 06/30/2007 |

[13] Among the industries operating are the Century Bottling Company (Coca Cola) and the Mineral Water processing and Bottling plant

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | in planning for the monthly hydropower generation.[14] | | | |
| 7. A plan for the development of geothermal resources defined. | No geothermal development plan | 01/01/2005 | 14 shallow wells drilled in two areas (Kibiro and Katwe) and gradient temperatures measured; Preliminary geological geochemical investigations completed in 25 areas including collection of geothermal water samples. | 03/31/08 | Surface geothermal investigations completed in two areas and temperature gradient measured in 5-10 wells. Geothermal development plan prepared based on the results of the geothermal investigations (achieved) | 11/30/07 |
| 8. Guidelines established and implemented for petroleum industry monitoring with regard to quality, safety, and pricing by end-2005. | None | | Operational guidelines for the petroleum sector presented to the TPC for endorsement. | 03/31/2008 | Operational guidelines for petroleum sector established (achieved) | 12/31/2002 |
| 9. Percent of fuel stations monitored based on agreed sampling framework. | None | | Petroleum laboratories installed.<br>Fuel stations being monitored. | 03/31/2008 | At least 20 Petrol stations inspected monthly | 12/31/2007 |

[14] Since February 2006, the hydropower generation has been following the agreed discharge monthly release.

## Annex 3. Financial and Economic Analysis

### A. Financial Analysis

### Historical Perspective

1. Power-IV project was appraised in 2000 [15] and the original scope and period of implementation was expanded over the years. The project was finally closed in March 2008. During the intervening seven years, the Uganda power sector has undergone radical transformation and it has gone through a turbulent period of power shortages. The key developments can be summarized as follows:

- April 2001 – The vertically integrated power utility, Uganda Electricity Board (UEB), was unbundled and succeeded by three independent corporate entities: Uganda Electricity Generation Company Limited (UEGCL), Uganda Electricity Transmission Company Limited (UETCL) and Uganda Electricity Transmission Company Limited (UEDCL). UEB's hydro power plant (Nalubaale/Kiira), the transmission network and the distribution network were devolved to UEGCL, UETCL and UEDCL respectively. UEB's fixed assets were professionally revalued upwards by 90% (an increase of US$144 million) and its long-term debt was restructured (involving a net write-off of US$213 million) prior to their transfer to successor companies.
- April 2000 – An independent electricity regulator, Electricity Regulatory Authority (ERA) was established.
- June 2001 – Introduction of fully cost reflective electricity tariffs. Electricity prices were increased on average by 50% (after providing rebates following debt restructuring) to give a weighted average tariff[16] of 140USh/kWh (8.1USc/kWh).
- April 2003 – UEGCL's hydro power plant was concessioned to a private operator, Eskom (Uganda) Limited for a period of twenty years.
- March 2005 - UEDCL's distribution network was concessioned to a private operator, Umeme Limited for a period of twenty (20) years.
- April 2005 – Electricity tariffs were increased by an average of 27% to give a weighted average tariff of 165USh/kWh (9.1USc/kWh).
- Early 2005 to date – Deterioration in hydro supply due to poor hydrological conditions leading to the "power crisis". Although the installed capacity of the Nalubaale/Kiira hydro plant was expanded from 260MW to 300MW in 2002 (Unit13 at Kiira, funded by Norad and Sida under Power-III, and IDA, for cost over-runs under Power-IV), and from 300MW to 380MW (Units 14 and 15 at Kiira, funded by IDA under Power-IV) in 2007, the effective capacity deteriorated significantly starting from early 2005. The effective capacity since 2001 is summarized below:

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[15] The Project Appraisal Document (PAD) was submitted in June 2001.

[16] Throughout this document, references to the average tariff are exclusive of 18% VAT (17.5% until June 30, 2005).

| | | |
|---|---|---|
| 2001 – 180MW | 2005 – 194MW | 2008 (to May) – 164MW |
| 2002 – 192MW | 2006 – 132MW | 2008 (June) – 172MW |
| 2003 – 197MW | 2007 – 144MW | 2008 (July to December,) – 148MW |
| 2004 – 214MW | | |

- June 2005 to date – The shortfall in hydro output led to the introduction to thermal generated power in Uganda as follows:

| Plant | Capacity | Fuel Type | Commissioning | Retirement |
|---|---|---|---|---|
| Aggreko I (Lugogo) | 50 | AGO | May 2005 | October 2008 |
| Aggreko II (Kiira) | 50 | AGO | Oct 2006 | June 2009 |
| Aggreko III (Mutundwe) | 50 | AGO | September 2008 | July 2011 |
| Jacobsen (Namanve) | 50 | HFO | October 2008 | End of plant life |

- Early 2005 to date - The high and increasing cost of thermal power has placed heavy financial strains on the power sector. Electricity tariffs were raised in June 2006 by an average of 37.5% and again in November 2006 by an average of 41%, resulting in the weighted average tariff of 313USh/kWh (17.2USc/kWh). In addition, the GoU has and continues to provide considerable budgetary support (detailed further below).

**Financial Performance (2000 to date)**

2. The key annual operational and financial performance indicators of the power sector covering the period 2000 to 2008, together with forecasts in the PAD, are set out in tables in Attachments 1 and 2. The financial performance of the power sector during the implementation of the Power-IV project can be separated into three distinct periods:

(iv) 2000 to March 2001: Prior to the unbundling of UEB.

(v) April 2001 to February 2005: Unbundled power sector and prior to the concessioning of generation and distribution businesses to the private sector.

(vi) March 2005 to date: Since the commencement of private operators in generation and distribution and the onset of the power crisis.

3. **2000 to March 2001: Prior to the unbundling of UEB**. The GoU had set in motion various measures in preparation for the unbundling of UEB and other power sector reforms. Following the appointment of new management in April 1999, the operational and financial performance of UEB had improved considerably in 2000. UEB's cash collection increased by about 40%, administration and overheads were reduced, 1,100 staff were retrenched between 1998 and 2000, and UEB increased its debt service payments to the GoU from USh1.5 billion to USh7.4 billion in 2000. In spite of these improvements, however, UEB faced considerable challenges, such as: (i) reducing high network losses (UEB failed to collect approximately 40% of the energy sent out), (ii) full cost recovery, and

(iii) meeting the significant investment needs for the rehabilitation and expansion of the network, including generation capacity additions and increasing customer access to electricity.

4. **April 2001 to February 2005: Unbundled power sector and prior to the concessioning of generation and distribution businesses to the private sector**. The separation of generation, transmission and distribution enabled the three new entities (UEGCL, UETCL and UEDCL) to focus more clearly on their respective businesses. The appointment of an independent electricity regulator (ERA), the financial restructuring of UEB debt prior to its vesting to successor companies, and the introduction of cost reflective tariffs for: (i) generation; (ii) bulk supply to distribution (generation plus transmission); and (iii) end-use customers set the stage for transparency and a financially viable power sector.

5. There were a number of difficulties that arose in the first few years of operations of the new companies:

- The ERA approved new electricity tariffs effective June 1, 2001 that amounted to an average increase of 69% in end-use customer tariffs. These tariffs were calculated on the basis of UEB debt prior to its restructuring. The sharp increase in tariffs led to an outcry from electricity customers and the GoU reacted by providing debt service relief starting December 2001 until June 2002 when the ERA announced lower tariffs based on the restructured debt and lower network losses. The net effective increase since the unbundling in end-use customer tariffs was around 50%. The two months' delay (April 1 to June 1) in setting new tariffs meant that the power utilities were unable to meet in full their: (a) power bills to each other in the first few months of operations; and (b) debt service obligations to the GoU. These unsettled cross-debts and debt service obligations are still outstanding and need to be written-off.
- The tariff formulae of the ERA in the first few years made allowances for depreciation of fixed assets. The depreciation element of the tariff was meant to provide funding for repayment of long-term loans, investments from own resources "counterpart funding", and eventual replacement of assets. This particular approach did not necessarily match the underlying requirements of the individual companies with respect to loan repayments and investment funding needs from own resources. In the case of UEGCL, for example, the imbalance in its financial structure of high asset base and low debt vested from UEB relative to asset values gave rise to a sizable annual depreciation charge and comparatively smaller debt service burden, thus generating large cash surpluses. In UEDCL's case, the problem was reversed in that it has high long-term debt relative to its asset base. As a consequence, the depreciation charge was inadequate to meet principal loan repayments and investment requirements which need to be funded from internal resources. The ERA later changed its tariff methodology to ensure that tariffs were set to meet the underlying revenue requirements of each utility.
- In the case of UEDCL, the ERA's allowance for bad debts in its retail tariff setting did not correspond with underlying reality. In 2003, the bad allowance in the tariff was set at 13% against actual non-collection rate of 20%, resulting in a cash flow deficit. On the other hand, UEDCL was obliged to pay in full 17% VAT on 100% of billed revenue, including uncollected billing. Consequently, UEDCL was unable to meet all of its power purchase obligations to UETCL. This anomaly was corrected by the ERA when Umeme took over distribution operations from UEDCL in March 2005.

6. The operational and financial performance of the power sector on the whole improved during the first few years of operations of the new power companies from April 2001 to February 2005. The individual company performance is summarized below:

- **UEGCL**'s financial performance was strong. Since 2002, the company met its debt service obligations in full. As at end December 2004, UEGCL had cash surplus of Shs7.7 billion (US$4.4 million) accumulated on account of depreciation collected through its tariff in earlier years. UEGCL's tariff made provisions in 2002 and 2003 for the accumulation of USh14.0 billion (US$7.2 million) in a bulk supply tariff stabilization fund, held for the benefit of the power sector, and USh4.7 billion (US$2.4 million) in an escrow account for the benefit of the concessionaire, Eskom Uganda Limited. In 2004/05, with the approval of the ERA, the funds in the tariff stabilization fund were provided to UEDCL towards investments in rural electrification. The company met its debt service ratio covenant of 1.5 times (original) until 2003 and 1.0 times (as amended) from 2004 onwards under the Power-IV project.
- **UETCL's** financial position was very strong, principally due to allowances in the bulk supply tariff (BST)[17] of earlier years for depreciation and returns on equity that were meant for capital investments. However, the company had made limited investments, giving rise to cash surpluses. In 2005, in line with the World Bank's recommendations, the ERA adopted a revised tariff methodology which aimed to meet the company's cash flow requirements, including investments to be funded from internal resources (the revised tariff methodology was also applied to UEGCL and UEDCL). UETCL's tariff made provisions in 2003 to 2005 for the accumulation of USh50.0 billion (US$27.1 million) in a bulk supply tariff stabilization fund, held for the benefit of the power sector, and USh10.0 billion (US$5.4 million) in an escrow account for the Bujagali liquidity fund. These accumulated funds, together with UETCL's accumulated cash surpluses, were later utilized towards meeting the high thermal power costs starting in late June 2005.
- **UEDCL**'s recorded average distribution losses from April 2001 to December 2004 were 33.5%, a rate similar to that of UEB from 1998 to 2000. Billing collection rate during the forty-five months to December 2004 averaged 77%, compared to UEB's collection rate of 83% in 2000. The decline in the collection rate was partly due to the high increases in electricity tariffs following the sector reforms in 2001. Customer accounts receivable of UEDCL (and UEB before that), as reported in its audited financial statements, were grossly overstated in terms of their recoverability. Bad debts were never written-off and provisions for doubtful debts were inadequate. Accounts receivable, net of provisions, as at December 31, 2003 represented around 200 days' annual billing. As a result of past under-provisions and also because of the way the Umeme's concession transaction was structured, a large write-off (impairment) of USh77 billion (US$43 million) was recorded in UEDCL's 2004 financial statements. The write-off did not involve receivables from the GoU. Under the terms of the concession agreement, Umeme was required to pay to UEDCL USh4.9 billion (representing February 2005 bill of UETCL to UEDCL for bulk supply in the last month of UEDCL operations), in settlement of debtors' book that Umeme took over from UEDCL. At the end of the twenty year concession, Umeme is obliged to

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[17] The BST is the sum of generation and transmission costs, which the distribution co (Umeme) needs to recover through its retail tariff, and which is the price at which Umeme (the private distribution company) purchases bulk power from UETCL.

hand-over its debtors' book to UEDCL at no cost to UEDCL. A large part of UEDCL's debt service obligations was applied towards: (a) tariff rebates to end-use customers (USh20.5 billion or US$10.5 million); (b) debt swap against outstanding GoU electricity bills in the books of UEDCL (USh10.1 billion or US$5.5 million); and (c) rural schemes constructed on behalf of the GoU (USh5.8 billion or US$3.3 million).

- The number of "live" customers according to UEDCL records was 266,004 as at February 28, 2005. The number of new connections (i.e. customers energized for the first time) during the fourteen months to February 28, 2005 was 15,190 (average monthly connection rate of 1,085).

7. **<u>March 2005 to date: Since the commencement of private operators in generation and distribution and the onset of the power crisis</u>**. Effective April 3, 2003, UEGCL's hydro power operations at Nalubaale/Kiira were handed over to Eskom (Uganda) Limited. On March 1st, 2005 UEDCL's operation of the distribution network across the country were handed over to Umeme Limited. Since then, the primary role of UEGCL and UEDCL is to provide oversight of their respective concessionaire's activities. UEGCL and UEDCL derive their revenues from lease charges to Eskom (Uganda) and Umeme respectively. The lease charges are approved by the ERA and comprise of operating expenses, debt service requirements, and investments that need to be funded from internal resources.

8. **UEGCL's** performance has been satisfactory since April 1, 2003. The company has met its debt service obligations in full; annual debt service payments since 2006 have amounted to US$8.4 million. The Bank's financial covenant of 1.0 times debt service cover has been met in 2005 to 2007 and was also expected to be met in 2008.

9. **UEDCL's** performance has been satisfactory since March 1, 2005. The company has made debts service payments of US$22.7 million from 2002 to 2007. Debt service arrears to December 31, 2007 amount to USh24.8 billion (US$15 million). However, there are agreed and pending swaps totalling USh26.3 billion (US$14.6 million); of these, USh8.2 billion relate to unpaid GoU electricity bills, and USh10.7 billion for rural schemes. In addition, Umeme has off-set unpaid GoU electricity bills amounting to USh17.1 billion (US$9.6 million) against UEDCL lease payments from March 1, 2005 to December 31, 2007. The offsets by UMEME are allowed by the Concession Agreements between UEDCL and UMEME. However the debt swaps between UEDCL and GoU have yet to be formally accepted by the GoU.

10. UEDCL met the Bank's financial covenant of 1.0 times debt service cover in 2006 and 2007, and it was also expected to be met in 2008. However, the debt service cover in 2005 was only 0.3 times, largely due to staff retrenchment payments following the transfer of operations to Umeme.

**UETCL,** the single buyer and wheeler of power, has felt the financial squeeze since the power crisis began in early 2005. On the one hand, it has to pay the fixed costs of Eskom, the private operator of Nalubaale/Kiira hydro plant and for thermal power costs. On the other hand, Umeme, the private operator of the distribution network, is protected in recovering its underlying costs to a large extent. GoU support has helped to close UETCL's financial gap. UETCL's liquidity has improved in 2008. The GoU has also provided additional financial relief to UETCL in the form of debt service relief. Annual debt service due to the GoU (about USh4.5 billion or US$2.6 million) is set aside to pay for UETCL's resettlement programs (RAP) in connection with the construction of transmission lines. The financial situation of UETCL is now on a firmer footing than it was since the power crisis started in early 2005 and into the first half of 2007. Improvements in hydro supply since November 2007 and

Gou budgetary support each month of USh7.7 billion (US$4.5 million) since July 2007 has eased the pressures on power sector finances. In total, the GoU provided budgetary support of USh75.7 billion (US$43.7 million) in 2007 and USh150.3 billion (US$81.8 million) in 2006. GoU support has helped to pay for 100MW of thermal capacity.

11. UETCL had a negative cash flow in 2005 and thus failed to meet the cash flow covenant (as defined in the Project Agreement: i.e. meet debt service, working capital requirements and investments from own resources, from net revenues) because the bulk supply tariff was not sufficiently raised to meet UETCL's requirements. UETCL had met part of its power purchase costs from past accumulated surpluses (such payments affect current year earnings as the charge goes to the income statement & cash flows). UETCL's performance in 2005 was negatively affected by: (a) increasing reliance on thermal power and high fuel prices with inadequate rise in its bulk supply tariff; and (b) support provided by the company from its accumulated surpluses towards the cost of fuel. Since 2006, UETCL has met all of its revenue requirements following increases in bulk supply tariffs and higher GoU subsidies towards thermal power costs. Similarly, UETCL will be financially supported by GoU subsidy and IDA support for thermal power supply from Aggreko's 50MW leased plant at Mutundwe, which was commissioned in September 2008).

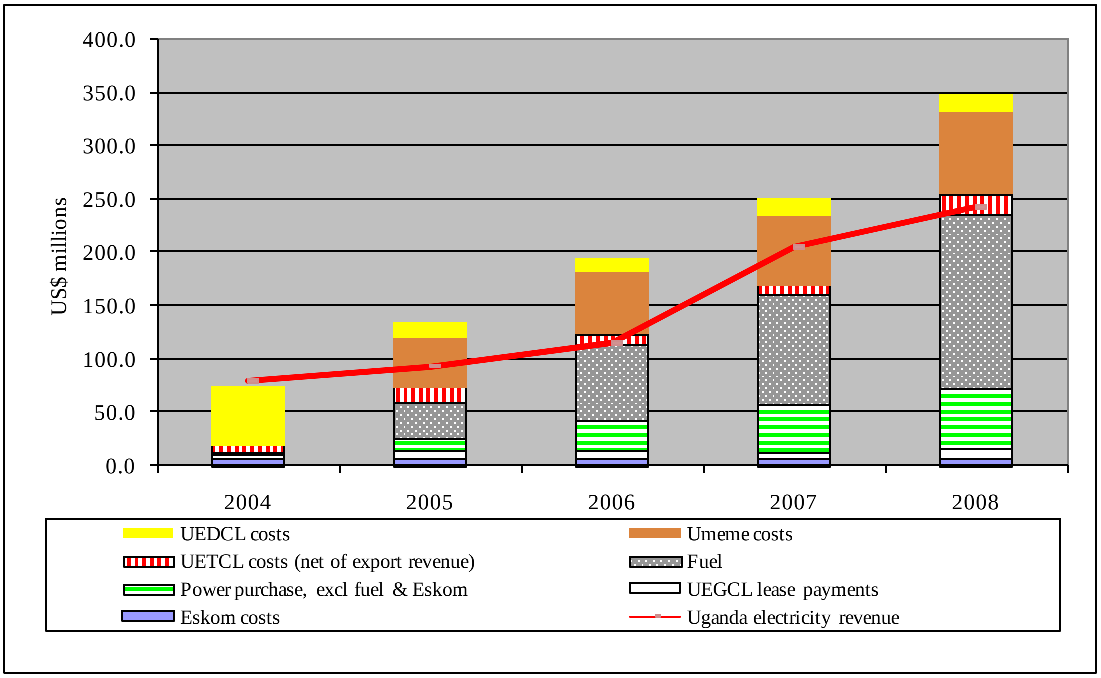
12. **Umeme's** financial performance is satisfactory. The net after tax income as a percentage of revenue was 3.2% in 2007 and 4.9% in 2006, and the return (operating income after tax) on its own invested capital was 7.0% in 2007 and 14.1% in 2006. The current or liquidity ratio was healthy at 1.5 times in 2007 and 1.4 times in 2006. In 2007, Umeme's shareholders injected USh24.8 billion (US$14.3 million) in equity and loans (net of repayments). Cash inflows from operations (after changes in working capital), amounted to USh2.2 billion (US$2.0 million) in 2007 and USh40.4 billion (US$23.4 million) in 2006. Umeme's investments in the network amounted to USh34.9 billion (US$20.1 million) in 2007 and USh12.6 billion (US$6.8 million) in 2006. In addition, IDA contributed US$11.8 million towards the cost of poles, transformers and customer meters, funded under the Power IV project.

**Retail Electricity Tariffs**

13. Retail electricity tariffs were last adjusted on November 1, 2006 (+ 41%) and on June 1, 2006 (+37.5%) before then. The cumulative average increase in the weighted average retail tariff amounted to 93%. The present weighted average retail tariff, excluding 18% VAT, is 313USh/kWh (18.4USc/kWh). Even at these high levels, the present electricity tariffs are not fully cost reflective. The fully cost reflective average retail tariff for 2007 is estimated at 382USh/kWh (22.1USc/kWh), and the forecast for the 2008 is 450USh/kWh (25.8USc/kWh). The needed high tariff levels are primarily driven by: (a) high fuel prices and fuel transport costs across land from Mombasa; and (b) high distribution losses of about 35% (see below for discussion). The shortfalls in the revenue requirements of the power sector are met by the GoU.

14. The development of Uganda weighted average electricity revenue and make-up of revenue requirements from 2004 to 2008 is illustrated in the chart overleaf.

**Uganda Av. Electricity Revenue & Make-up of Revenue Requirements 2004-2008**




**Distribution Losses**

15. The very high levels of distribution losses present a big challenge for Umeme and for the GoU. Overall distribution losses at present are estimated at 35%, of which 12% to 15% can be attributed to technical losses in the network. This means that 20% to 23% of the losses are non-technical (basically theft through illegal connections). On the basis of present retail electricity tariffs, US$3.2 million is lost annually for every 1% of distribution loss, or US$64 million annually with 20% losses. The urgency of tackling these losses has become much more pronounced now that thermal power accounts for 40-45% of total electricity output.

**Customer Billing Collections**

16. Customer billing collections have improved over the past few years, as indicated below:

2005 (since March) – 86%
2006 – 85%
2007 – 92.5%
2008 (January to November) – 93.6%

**Government Electricity Bills**

17. The GoU's electricity bills represent around 9% of Umeme's total Uganda billing, and it paid approximately 70% of its electricity bills in 2007. The collection performance has improved in the last year. The outstanding balance as at end December 2007 was USh8.7 billion, after set-offs. The largest unpaid bills related to the Ministry of Defence, Police, Prisons and Mulango Hospital. Umeme has a right under the concession to set-off overdue bills of the GoU against its lease payments due to

UEDCL. As of December 31, 2007, the company had deducted USh 17.1 billion against UEDCL's lease payment. The amounts withheld by Umeme are in turn deducted by UEDCL from its debt service obligations to GoU. This means that the Treasury ends up paying for the unpaid bills of GoU agencies. However, GoU entities started to stay current in early 2008 and continue to be current since then.

.**Power-IV Financial Covenants**

18. The following table compares the financial covenants set under Power-IV against actuals achieved by UEGCL, UETCL and Umeme.

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 Forecast |
|---|---|---|---|---|---|---|---|
| <u>Covenant</u> | | | | | | | |
| UEGCL (debt service ratio) | 1.5 | 1.5 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| UEDCL (debt service ratio) | | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| UETCL | | | Net revenues = debt service & working capital requirements, dividends and investments to be funded out of own revenues | | | | |
| <u>Actual</u> | | | | | | | |
| UEGCL (debt service ratio) | 8.1 | 2.8 | 1.1 | 1.2 | 1.0 | 1.0 | 1.0 |
| UEDCL (debt service ratio) | | | 1.9 | 0.3 | 1.0 | 1.4 | 1.0 |
| UETCL | | | Met | Not met | Met | Met | Expected to be met |

UEGCL met its financial covenant each year during project implementation; the financial covenant of debt service ratio was revised downwards to 1.0 times as from 2004 to reflect the ERA's revised tariff formula for UEGCL. UEDCL met its financial covenant in all years except in 2005, largely due to staff retrenchment payments following the transfer of operations to Umeme. UETCL was financially solvent until the power crisis, which began in early 2005. Since then it has met its financial requirements through increases in its bulk supply tariffs in 2006 and GoU subsidies (refer to paragraph 12 above).

## Table 3: Selected Power Sector Performance Indicators

| | | UGANDA FOURTH POWER PROJECT<br>SELECTED POWER SECTOR PERFORMANCE INDICATORS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Year:** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008 Forecast** |
| **Installed Capacity at December 31 (MW)** | | | | | | | | | | |
| Hydro | 180 | 260 | 260 | 300 | 300 | 300 | 300 | 300 | 380 | 380 |
| Thermal | | | | | | | 50 | 100 | 100 | 150 |
| Small scale generators | | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 16 | 16 |
| Total | 181 | 262 | 262 | 302 | 302 | 302 | 352 | 403 | 496 | 546 |
| **Hydro Plant Availability** | | | | | | | | | | |
| Nalubaale | | | 96 | | | | | | | |
| Kiira | 0 | | 96 | | | | | | | |
| Weighted average | | | 96 | 95 | | | | | | |
| Dependable capacity (MW) | 155 | 230 | 242 | 282 | 275 | 220 | 194 | 132 | 144 | 157 |
| **Units sent out (GWh)** | | | | | | | | | | |
| **Total units sent out (GWh)** | **1,355** | **1,555** | **1,595** | **1,719** | **1,769** | **1,893** | **1,888** | **1,609** | **1,894** | **2,152** |
| Hydro | 1,342 | 1,538 | 1,577 | 1,684 | 1,727 | 1,872 | 1,699 | 1,160 | 1,264 | 1,376 |
| Thermal | 1 | 1 | 1 | 1 | 1 | 1 | 141 | 370 | 539 | 623 |
| Imports | 1 | 1 | 0 | 3 | 3 | 2 | 27 | 49 | 60 | 44 |
| Small scale generators | 12 | 15 | 17 | 31 | 37 | 17 | 22 | 30 | 31 | 111 |
| **Total Units sent out (GWh)** | **1,355** | **1,555** | **1,595** | **1,719** | **1,769** | **1,893** | **1,888** | **1,609** | **1,894** | **2,152** |
| Units sent to Uganda | 1,174 | 1,291 | 1,451 | 1,443 | 1,536 | 1,688 | 1,821 | 1,554 | 1,826 | 2,082 |
| Units sent to Kenya | 159 | 242 | 125 | 249 | 204 | 169 | 30 | 10 | 23 | 22 |
| Units sent to Tanzania | 22 | 23 | 17 | 25 | 26 | 32 | 34 | 42 | 45 | 47 |
| Units sent to Rwanda | 0 | 0 | 1 | 1 | 3 | 4 | 3 | 3 | 1 | 1 |
| Total Peak demand (MW) | 257 | 260 | 252 | 274 | 283 | 334 | 354 | 365 | 380 | 399 |
| Uganda Peak demand (MW) | | 246 | | 274 | 283 | 334 | 354 | 365 | 380 | 399 |
| Kenya max supply (MW) (4) | 46 | 88 | 69 | 50 | 50 | 30 | 4 | 1 | 2 | 2 |
| Load factor (Uganda) %(1) | 63% | 68% | 72% | 72% | 71% | 65% | 61% | 50% | 57% | 62% |
| **Total Units billed (GWh)** | **876** | **1,094** | **1,021** | **1,141** | **1,253** | **1,227** | **1,140** | **1,044** | **1,204** | **1,418** |
| Uganda units billed | 702 | 843 | 884 | 876 | 1,036 | 1,031 | 1,076 | 990 | 1,138 | 1,350 |
| of which domestic | 307 | 312 | 354 | 362 | 412 | 344 | 341 | 290 | 293 | 335 |
| Kenya units billed | 153 | 230 | 118 | 239 | 190 | 162 | 29 | 10 | 22 | 22 |
| Tanzania units billed | 21 | 21 | 17 | 24 | 25 | 30 | 32 | 40 | 43 | 45 |
| Rwanda units billed | 0 | 0 | 1 | 1 | 2 | 4 | 3 | 3 | 1 | 1 |
| **Losses (GWh)** | **478** | **461** | **574** | **578** | **516** | **666** | **749** | **566** | **690** | **735** |
| Losses % of total units sent out | 35% | 30% | 36% | 34% | 29% | 35% | 40% | 35% | 36% | 34% |
| Losses % of units sent out to Uganda | 40% | 35% | 39% | 39% | 33% | 39% | 41% | 36% | 38% | 35% |
| **Interruptions** | | | | | | | | | | |
| 132 & 66kV/100km/month | | | | | | | | | | |
| Planned hours | 17.5 | 8.4 | 10.0 | 4.0 | | | | | | |
| Unplanned hours | 8.9 | 4.7 | 3.5 | 3.0 | | | | | | |
| Total | 26.4 | 13.1 | 13.5 | 7.0 | | | | | | |
| Availability (%) | 99.7% | 99.9% | 99.8% | 99.2% | | | | | | |
| **Customer Service** | | | | | | | | | | |
| Ave. no. of connections | 159,916 | 172,228 | 190,226 | 212,543 | 234,558 | 253,625 | 277,620 | 294,720 | 300,231 | 309,258 |
| of which domestic | 141,615 | 152,833 | 169,808 | 190,855 | 211,503 | 229,635 | 250,987 | 265,499 | 270,463 | 278,595 |
| Population (x1000) | 21,500 | 21,930 | 22,369 | 23,400 | 23,868 | 24,536 | 28,800 | 29,606 | 30,900 | 31,400 |
| Access (%) (8 per domestic connection) 3) | 5.3% | 5.6% | 6.1% | 6.5% | 7.1% | 7.5% | 7.0% | 7.2% | 7.0% | 7.1% |
| Ave. no. of employees (UEB, UEGCL, UETCL, UEDCL, Umeme) | 2,027 | 1,965 | 1,881 | 1,849 | 1,801 | 1,788 | 1,745 | 1,542 | 1,430 | 1,468 |
| Connections per employee (UEB, UEGCL, UEDCL, Umeme) | 79 | 88 | 101 | 115 | 130 | 142 | 159 | 191 | 210 | 211 |
| **Financial** | | | | | | | | | | |
| Exchange rate Ush/US$ (annual average) | 1,460 | 1,655 | 1,760 | 1,780 | 1,961 | 1,813 | 1,780 | 1,837 | 1,732 | 1,742 |
| | | | | | | | | | | |
| Average bulk purchase tariff paid by UETCL (USh/kWh) | | | 28.4 | 29.3 | 19.1 | 12.5 | 59.7 | 138.4 | 156.7 | 196.8 |
| -" - ( US cents/kWh) | | | 1.6 | 1.6 | 1.0 | 0.7 | 3.4 | 7.5 | 9.0 | 11.3 |
| Average bulk supply tariff to UEDCL/Umeme (USh/kWh) 5) | | | 52.7 | 49.9 | 40.8 | 31.8 | 39.6 | 53.6 | 129.0 | 127.5 |
| -"- (US cents/kWh) | | | 3.0 | 2.8 | 2.1 | 1.8 | 2.2 | 2.9 | 7.5 | 7.3 |
| Average GoU subsidy (USh/kWh) | | | 0.0 | 0.0 | 0.0 | 0.0 | 21.3 | 68.6 | 41.5 | 87.5 |
| -"- (US cents/kWh) | | | 0.0 | 0.0 | 0.0 | 0.0 | 1.20 | 3.7 | 2.4 | 5.0 |
| Average Uganda retail tariff excl VAT (USh/kWh) 2) | 93 | 95 | 132 | 160 | 150 | 141 | 156 | 215 | 313 | 313 |
| **Average Uganda retail tariff excl VAT (US cents/kWh) 2)** | **6.4** | **5.7** | **7.5** | **9.0** | **7.7** | **7.8** | **8.8** | **11.7** | **18.1** | **18.0** |
| Average Kenya tariff | 7.4 | 7.3 | 7.0 | 5.7 | 5.7 | 5.5 | 6.0 | 19.1 | 26.5 | 33.0 |
| Average Tanzania tariff | 8.5 | 7.9 | 10.7 | 8.1 | 8.1 | 7.2 | 6.6 | 6.5 | 6.5 | 6.5 |
| Average Rwanda tariff | | | | 8.3 | 8.4 | 13.9 | 9.2 | 8.3 | 8.0 | 8.3 |
| | | | | | | | | | | |
| **Billed % of units sent out (Uganda)** | | **65%** | **61%** | **61%** | **67%** | **61%** | **59%** | **64%** | **62%** | **65%** |
| | | | | | | | | | | |
| Total billed incl VAT (USh million) | 95,779 | 124,282 | 154,339 | 192,116 | 207,721 | 191,278 | 204,409 | 260,466 | 435,881 | 517,042 |
| Billed in Uganda (incl VAT) | 76,637 | 93,603 | 136,225 | 164,082 | 182,094 | 170,192 | 197,070 | 251,613 | 420,911 | 499,430 |
| of which domestic | 27,842 | 29,479 | 56,328 | 71,697 | 79,530 | 66,717 | 81,316 | 93,447 | 139,318 | 165,300 |
| Export revenue | 19,142 | 30,679 | 18,115 | 28,034 | 25,627 | 21,087 | 7,340 | 8,853 | 14,970 | 17,612 |
| Billing collected in Uganda (USh million) | | 77,648 | 93,583 | 123,627 | 133,643 | 138,284 | 169,480 | 213,871 | 389,342 | 459,476 |
| **Collected as % of billed in Uganda** | | **83.0%** | **68.7%** | **75.3%** | **73.4%** | **81.3%** | **86.0%** | **85.0%** | **92.5%** | **92.0%** |

**Table 4** Comparison of power sector performance in PAD and during implementation 2001-2008

| | PAD | Actual | PAD | Actual | PAD | Actual | PAD | Actual | PAD | Actual | PAD | Actual | Actual | Forecast |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Key Operational & Financial Indicators** | **2001** | **2001** | **2002** | **2002** | **2003** | **2003** | **2004** | **2004** | **2005** | **2005** | **2006** | **2006** | **2007** | **2008** |
| Total units sent out (GWh) | 1,591 | 1,595 | 1,679 | 1,719 | 1,831 | 1,769 | 1,926 | 1,893 | 2,127 | 1,888 | 2,989 | 1,609 | 1,894 | 2,152 |
| Units sent out to Uganda (GWh) | 1,463 | 1,451 | 1,553 | 1,443 | 1,705 | 1,536 | 1,800 | 1,688 | 1,939 | 1,821 | 2,308 | 1,554 | 1,826 | 2,082 |
| Export sales (GWh) | 121 | 136 | 121 | 265 | 121 | 217 | 121 | 196 | 180 | 64 | 653 | 53 | 65 | 67 |
| Energy billed in Uganda (GWh) | 1,005 | 884 | 1,091 | 876 | 1,226 | 1,036 | 1,324 | 1,031 | 1,444 | 1,076 | 1,672 | 990 | 1,138 | 1,350 |
| System losses (% of sent out) | 29% | 36% | 28% | 34% | 26% | 29% | 25% | 35% | 24% | 40% | 22% | 35% | 36% | 34% |
| Total Elec. Revenue (US$ mn) | 70.4 | 76.5 | 86.9 | 94.5 | 99.0 | 92.4 | 120.8 | 91.9 | 143.8 | 98.3 | 220.5 | 120.9 | 214.6 | 253.1 |
| Domestic Elec. Revenue (US$ mn) | 62.9 | 66.2 | 79.4 | 78.8 | 91.4 | 79.4 | 113.3 | 80.2 | 132.9 | 94.2 | 175.8 | 116.1 | 205.9 | 243.0 |
| Ave. domestic revenue (USc/kWh) | 6.3 | 7.5 | 7.3 | 9.0 | 7.5 | 7.7 | 8.6 | 7.8 | 9.2 | 8.8 | 10.5 | 11.7 | 18.1 | 18.0 |
| Ave. No. of customers ('000) | 189 | 190 | 204 | 213 | 219 | 235 | 234 | 254 | 249 | 278 | 264 | 295 | 300 | 309 |
| Ave. No. of employees | 1,777 | 1,881 | 1,792 | 1,849 | 1,807 | 1,801 | 1,815 | 1,788 | 1,837 | 1,745 | 1,852 | 1,542 | 1,430 | 1,468 |
| Customers per employee | 106 | 101 | 114 | 115 | 121 | 130 | 128 | 142 | 136 | 159 | 143 | 191 | 210 | 211 |
| Days receivable (UEDCL/Umeme) – domestic | 80 | 140 | 60 | 121 | 45 | 198 | 45 | 81 | 45 | 38 | 45 | 40 | 39 | 45 |
| Collection Rate (%) | 87% | 69% | 95% | 75% | 95% | 73% | 95% | 81% | 95% | 86% | 95% | 85% | 93% | 92% |
| Return on revalued fixed assets | 4.5% | 2.5% | 5.8% | 4.5% | 6.8% | 4.8% | 8.8% | 3.3% | 9.7% | -3.2% | 7.7% | 2.8% | 3.2% | 4.5% |
| Current ratio | 1.7 | 3.1 | 1.3 | 2.3 | 1.2 | 2.5 | 1.2 | 2.2 | 1.2 | 1.5 | 1.3 | 1.4 | 1.4 | 1.8 |
| Debt/equity ratio | 48% | 34% | 49% | 35% | 48% | 38% | 45% | 41% | 41% | 45% | 38% | 41% | 42% | 40% |

| | PAD | Actual | PAD | Actual | PAD | Actual | PAD | Actual | PAD | Actual | PAD | Actual | Actual | Forecast |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Key Operational & Financial Indicators** | **2001** | **2001** | **2002** | **2002** | **2003** | **2003** | **2004** | **2004** | **2005** | **2005** | **2006** | **2006** | **2007** | **2008** |
| Debt service ratio | 1.0 | 3.0 | 1.3 | 2.6 | 1.5 | 2.5 | 1.6 | 2.0 | 1.6 | 0.3 | 1.4 | 1.4 | 1.8 | 2.2 |
| Self financing ratio | 11% | -60%% | 22% | 127% | 40% | 67% | 50% | 87% | 66% | -55% | 32% | 103% | 27% | 15% |
| Exchange rate | 1,873 | 1,760 | 1,918 | 1,780 | 1,965 | 1,961 | 2,013 | 1,813 | 2,062 | 1,780 | 2,102 | 1,837 | 1,732 | 1,742 |

**Notes:**

(1) The projections in the PAD went up to 2006.

(2) Energy sent out and billed are inclusive of off-grid supply.

(3) The PAD assumed that: (a) 50 MW of Bujagali would in operation in July 2005 and an additional 100 MW in 2006; (b) 20 MW of Kakiira bagasse plant would be available in 2004; and (c) distribution concession in 2002.

## B. Economic Analysis

Economic Analysis for the Installation of Units 14 and 15 at Kiira (Sub-component A1(a))

1. *Background to the Owen Falls Extension project.* In the early 1990's the Uganda Electricity Board (UEB) decided to proceed with a large-scale extension to the Owen Falls Hydro Project located on the Victoria Nile just downstream of the Lake Victoria outlet. The project was originally built in the 1950's and had since supplied most of Uganda's electricity. The original plant had been progressively expanded to a full capacity of 10x18MW units. At maximum capacity, the flow discharged through the plant was about 1,100m$^3$/s. The Owen Falls Extension project (OFE) features a second powerhouse (named Kiira; the original powerhouse is named Nalubaale) and an adjacent spillway. The rationale for the extension was two-fold: (i) to provide for a necessary spillway for the Owen Falls to avoid topping of the dam (and its highway, which is the only transport link to Kenya in this part of Uganda) during times of high hydrology; and (ii) to provide for additional power and energy to meet the growing demand in Uganda.

2. Numerous preparatory studies were carried out on the feasibility of the extension of the existing Owen Falls Plant. In January 1991, the conclusion of the review by independent hydrological experts of the hydrological risk assessment determined that the spillway capacity of Owen Falls Dam was inadequate. Thus it was agreed that additional spillway capacity would need to be accommodated in order to protect the Owen Fall Dam against overtopping and possible failure in a major flood event (one in 1000 years). With the increased size of the canal and thus water flows, the configuration of the power house at Kiira was expanded to accommodate additional generating sets from the original concept of 3x34MW to 5x40MW to provide greater peaking capacity and flexibility for operation and maintenance. Changes in the original concept of the extension were technical in nature and motivated by safety concerns and opportunities to enhance power supply. The feasibility study in 1991 indicated also that installation of three units initially would be economic. The three units were installed progressively: units 11 and 12 were commissioned in 2001, and unit 13 in May 2002.

**Economic justification of Kiira Units 14 and 15.**

3. *Assumptions regarding the Additional Energy from Kiira Units 14& 15:* The Fourth Power Project undertook the installation of Unit 14 based on the recommendation of the 2001 feasibility study. The cost-effectiveness analysis showed the installation of Unit 14 at Kiira as least cost for meeting the demand in the interim period before the next major hydropower plant (Bujagali) came online with an EIRR of over 22%, whereas Unit 15 had an EIRR of 18% (see table 1). Given the high sensitivity of these results to water levels and assumptions on costs, the GoU of Uganda decided to proceed with the procurement of both Units 14 and 15, while retaining for as long as possible in the procurement process the option to exclude Unit 15. The intent was to re-assess the viability of the unit when more accurate evaluation parameters were available, including on bid prices and the timing of the Bujagali hydropower plant. This approach was included in the design of the Fourth Power Project and required UEB, the single power utility at the time, to provide "*satisfactory evidence of the unit's (Unit 15) economic viability*". An assessment of Unit 15 in 2002 produced an EIRR of 36%, which was sufficient to demonstrate its viability[18]. On this basis, UEB proceeded with procurement of Unit 15.

[18] The 2002 economic analysis acknowledged that low hydrology would reduce the EIRR for both units.

4. Between the 2001 and the 2002 assessments, the single most important factor that influenced the conclusion on Unit 15 was the lower than expected capital costs, as reflected in the received bid prices. The original incremental cost estimate for Unit 15 was US$20 million. The actual incremental cost for Unit 15 was US$8.9 million. The re-evaluation of Unit 15 in 2002, after receipt of bids, established that for combined flows (at 80/20% probability respectively) Unit 15 was viable with 90% probability and a mean expected EIRR of 39%. The 90% probability referred to the presumption at the time that firm flow and energy should be available with a 90% level of reliability. Put differently, there is a 1 in 10 year risk that flow and energy would be less than the firm target.

5. In 2009, certain elements have turned out to be different from what they have been assumed to be in both the 2001 and the 2002 analyses as follows:

- The start date of the Unit 14 and 15 was delayed. They became fully operation only in 2007 as compared with the earlier projection of 2003;
- The start date of Bujagali hydropower plant is now expected for 2011, as opposed to the original assumption of 2005. Costs of Bujagali hydropower plant are now estimated at US$860 million, as opposed to a Power IV appraisal estimate of US$ 500 million;
- The start date of the next hydropower plant will consequently also not be before Bujagali is scheduled to come online, and is now assumed for no earlier than 2013;
- The assumed average oil price at appraisal was US$20 per bbl of crude oil. This analysis uses the oil price in early January 2009 of US$45 per bbl. However, some sensitivity analysis has been conducted as the table below indicates.

7. To assess the economic viability of Units 14 and 15 with all data available in early 2009, these data were inserted into the economic model which was used during the PAD analysis, as is the standard practice for ICR reviews of project performance. The model uses a 30 year time horizon, and draws from the full ~100 year hydrology record. Table 1 below shows the economic results for units 14 and 15 under the ICR review compared with the economic results from 2001 and 2002.

Table 1: Economics of Kiira Units 14 and 15

| | **NPV (US$ million)** | | | **EIRR (%)** | | |
|---|---|---|---|---|---|---|
| | **Unit 14** | **Unit 15** | **Both Units** | **Unit 14** | **Unit 15** | **Both Units** |
| **WB Project Appraisal Document (2001)** | 21.1 | 10.9 | 32.1 | 22 | 18 | 20 |
| **Economic Review (2002)** | 23.7 | 8.7 | 32.5 | 39 | 36 | 38 |
| **Update ICR 2009** | 39.1 | 23.5 | 62.7 | 54 | 37 | 46 |

8. Table 1 illustrates that the changes in framework conditions have positively affected the viability of Units 14 and 15 at Kiira Hydropower Plant, despite the late commissioning of the units in 2007. The benefit of Kiira is mainly increased compared to the original estimates from 2001 and 2002 due to the further delay in the construction of Bujagali hydropower plant, which makes the availability of Units 14 and 15 even more valuable than previously estimated. While in the original estimate there was only a difference of two years between commissioning of Kiira Units 14 and 15, now there are four years of difference.

## Annex 4. Bank Lending and Implementation Support/Supervision Processes

**(a) Task Team members**

| Names | Title | Unit | Responsibility/ Specialty |
|---|---|---|---|
| **Lending** | | | |
| | | | |
| **Supervision/ICR** | | | |
| Paul Baringanire | Power Engineer | AFTEG | Task Team Leader |
| Mourad Belguedj | Adviser | COCPO | Petroleum Specialist |
| Howard Bariira Centenary | Procurement Spec. | AFTPC | Procurement |
| Denis Creamer | Consultant | AFTEG | Economist |
| Gulam H. Dhalla | Consultant | AFTEG | Financial Analyst |
| Johan Grijsen | Consultant | AFTEG | Hydrologist |
| Reynold Duncan | Lead Energy Specialist | AFTEG | Engineer |
| Edeltraut Gilgan-Hunt | Environmental Spec. | AFTEN | Environment |
| Agnes Kaye | Program Assistant | AFMUG | Assistant |
| Fanny Kathinka Missfeldt-Ringius | Sr Energy Econ. | AFTEG | Economist |
| Richard Olowo | Sr Procurement Spec. | AFTPC | Procurement |
| Janine A. Speakman | Operations Analyst | AFTEG | Operations Support |
| Anta Loum Lo | Language Program Assistant | AFTEG | Program Assistant |
| Patrick Piker Umah Tete | Sr Financial Management Spec. | AFTFM | Financial Management |

**(b) Staff Time and Cost**

| Stage of Project Cycle | Staff Time and Cost (Bank Budget Only) | |
|---|---|---|
| | No. of staff weeks | USD Thousands (including travel and consultant costs) |
| **Lending** | | |
| FY93 | | 1.40 |
| FY94 | | 5.56 |
| FY95 | | 10.91 |
| FY96 | | 14.96 |
| FY97 | | 52.98 |
| FY98 | | 137.24 |
| FY99 | | 132.60 |
| FY00 | 32 | 145.49 |
| FY01 | 36 | 3.37 |
| FY02 | 1 | 0.00 |
| FY03 | | 0.00 |

| | | |
|---|---|---|
| FY04 | | 0.00 |
| FY05 | | 0.00 |
| FY06 | | 0.00 |
| FY07 | | 0.00 |
| **Total:** | 69 | 504.51 |
| **Supervision/ICR** | | |
| FY93 | | 0.00 |
| FY94 | | 0.00 |
| FY95 | | 0.00 |
| FY96 | | 0.00 |
| FY97 | | 0.00 |
| FY98 | | 0.00 |
| FY99 | | 9.69 |
| FY00 | | 0.53 |
| FY01 | | 80.79 |
| FY02 | 20 | 130.21 |
| FY03 | 28 | 98.53 |
| FY04 | 18 | 174.19 |
| FY05 | 40 | 162.23 |
| FY06 | 45 | 100.68 |
| FY07 | 27 | 53.84 |
| FY08 | 9 | 0.00 |
| **Total:** | 187 | 810.69 |

## Annex 5. Beneficiary Survey Results

Two annual consumer satisfaction surveys were conducted in 2003 and 2004. The surveys were aimed at obtaining views of the consumers on the quality and quantity of the electricity services as a result of improvements brought about by the reforms in the electricity sector and the additional energy generation capacity (Kiira units 11, 12 and 13). The surveys indicated that a majority of consumers in the main cities were satisfied with the improvements in the quality and quantity of electricity supply. However, those living outside of those areas were much less satisfied. The survey also revealed that consumers would like to receive more accurate bills from UEDCL.

Subsequent annual surveys were not carried out in consideration of the onset of increased load shedding as from 2005. However, under the ongoing Power Sector Development operation, a Poverty and Social Impact Assessment will be carried out and it has been proposed that this study would also cover the consumers' ability and willingness to pay for electricity.

## Annex 6. Summary of Borrower's ICR and/or Comments on Draft ICR

### Summary of Borrower's ICR

### 1. Assessment of Project Objectives, Design, Implementation and Operational Experience

The main objectives of the project were (i) improve power supply to meet demand by supporting critically needed investments in the sub-sector; and (ii) strengthen Borrower capacity to manage reform, privatisation and development in the power and petroleum sub-sectors.

The Kiira Power Station (Units 14 and 15) was inflicted by hydrological conditions which were way beyond the control of the project. The entire East African region was affected by a protracted drought situation which steadily increased in magnitude from 2003 to 2006. Units 14 and 15, the main infrastructure investments of the project could not therefore be used to increase power supply in the short term. These units should, however, be looked at as major contributors to power supply in the medium to long term as the lake level improves. These units bring to five, the total installed capacity of Kiira, which is a new and robust power station which will ultimately replace the ageing Nalubaale Power Station.

Still on the power supply side, the project was able to support the packaging of the Bujagali Project, which is a medium term solution to the power needs of the country. This was a major achievement. The project also supported geothermal exploration activities which will lead to exploitation of this renewable resource in the medium to long term.

There were also investments in the power transmission and distribution infrastructure which will contribute to the reliability of power supply.

Regarding the second objective, the project registered significant achievements in the area of capacity building in both the power and petroleum sub sectors. Attainment of petroleum laboratory equipment will enhance GoU's capacity to monitor the quality of petroleum products sold on the market. Ministry, ERA and utility companies' staff acquired knowledge and skills through the training programmes which will enhance their ability to manage the two sectors.

**The design** of the project ensured that the various sub components fed into the overall objectives. As the project progressed, and when it was realised that there were considerable cost savings especially on Unit 15, reallocations were made to finance new subcomponents which were in line with the project objectives.

**During implementation**, both the World Bank project team and the Borrower project team worked in harmony to ensure accomplishment of the project.

### 2 Assessment of Project Outcomes Against the Agreed Objectives

This matter has been discussed in part in the paragraphs above. It is seldom that plans are realised 100%. The major setback for the project was the hydrological problem mentioned above for which the project had no control. Overall the project satisfactorily attained expected outcomes.

## 3 Evaluation of the Government and Bank Performance During Project Preparation and Implementation

Through the numerous supervision missions of the Bank, GoU and the Bank were able to identify and resolve matters which would impact on the attainment of the project outcomes. Both parties would agree on areas of concern and what remedial measures to take. Our view is that the performance of the Bank and GoU were satisfactory.

## Annex 7. Comments of Co-financiers and Other Partners/Stakeholders

**A. NORAD** –NORAD commissioned a study in 2006[19]to review the Norwegian support to the energy sector over the period 1997-2005. The review covers Norwegian support to 25 projects guided by 18 bilateral agreements with a total Norwegian contribution of NOK 336 million. The major share of the financial contribution has been for investments in hydro power generation and substation upgrading, refurbishment and extension. The support for the investment projects has to a large extent been provided in co-financing with World Bank credits for the Third and Fourth Power Projects (Power III and IV). In addition, approximately 10% of the financial contribution has been provided as institutional support in relation to the regulatory reform of the sector including an institutional cooperation arrangement with the Norwegian Water Resources and Energy Directorate (NVE). The scope of the review was to assess relevance, impact, effectiveness, efficiency and sustainability of the projects being supported as well as the administration of the support from an aid management perspective.

The study findings concluded that the Norwegian support has made important contributions to sector development despite the current power crisis. However, the rationale, efficiency and quality of some investments may be questioned. The investment projects have increased potential generation capacity and reduced technical losses. Questions can however be raised to the limited consideration and risk assessment of sustainable water discharge levels (including the adverse environmental impact) as well as the procurement process by limiting choice of suppliers. The institutional support has contributed to key activities in the transformation process, in particular in establishing a new legal and regulatory framework including tools for setting tariffs, but the outcome of numerous inputs and the substantial resources put into short-term visits for consultation and coordination may be questioned.

**B. Nordic Development Fund (NDF):** The NDF-credit of EUR 12,700,000, representing approximately 12% of the total project costs, has been utilized to finance two sub-components under Component 1: Power System Expansion and Rehabilitation, namely: (i) the sub-component 1b – SCADA and Telecommunications System; and (ii) the sub-component 1c - Transmission System Rehabilitation. This first sub-component has focused on upgrading of UETCL's supervisory control and data acquisition(SCADA) and telecommunications systems through the acquisition and installation of hardware and software and installation of remote and terminal units and data collecting equipment as well as extension of telecommunications systems; the second sub-component has supported the extension and refurbishment of the Lira, Lugazi, Masaka West and Mbarara North sub-stations in order to ensure operational safety, reliability and efficiency of these transmission systems. UETCL has had the primary responsibility for implementation of the NDF-components. In general, there has been a strong interest of Nordic companies in this project, but also in the energy sector in Uganda as a whole. During the project implementation of more than 5 years, two large contracts with Nordic companies have been in place. The deliveries for the SCADA and Telecommunication System were done by ABB Power Technologies AB from Sweden, while the extension and refurbishment of the four sub-stations in Lira, Lugazi, Masaka West and Mbarara North were carried out by ABB Power Systems from Finland. Thus, significant Nordic equipments and technical expertise have been applied throughout the project implementation and the activities under the two contracts were implemented with relatively minor difficulties. In overall terms, it is noted that complications in handling the procurement of the two

[19] Nordic Consulting Group (May 200), Review of the Norwegian Support to the Energy Sector (1997-2005)- Final Report

large contracts have caused delays in the project implementation, however the monitoring and management of the Nordic contractors was carried out in a very satisfactory manner by UETCL. In sum, the objectives of the NDF-sub-components were achieved and the project satisfactorily reached the expected outcomes. As assessed by IDA, the overall results/outcomes achieved by the power system expansion and rehabilitation component, including the two NDF-sub-components, are mixed, but overall rated as moderately satisfactory.

## Annex 8. List of Supporting Documents


i. Acres International Limited (May 1990), Proposed Extension to Owen falls Generating Station-Draft Feasibility Study Report

ii. Dennis Creamer (September 2002), Study of the Cost effectiveness and economic Viability of Unit 15, Final Report

iii. Kennedy and Donkin Power systems Ltd (September 1990), Owen Falls Extension, Review of the Feasibility Study by Acres International Dated May 1990

iv. Lahmeyer International (November 2007), Fourth Power project-Project Completion Report

v. Ministry of Energy and Minerals Development (April 2008), Project Completion Report for the MEMD Components

vi. Ministry of energy and Minerals Development, Progress Reports for MEMD Components 2002-2008

vii. Nordic Consulting Group (May 200), Review of the Norwegian Support to the Energy Sector (1997-2005)- Final Report

viii. Norplan (U) Ltd (December 2003), Feasibility Study for the Economic and Financial Analysis for the rehabilitation and Extension of Mbarara North, Masaka West,Lira and Lugazi Substations

ix. Norplan (u) Ltd (September 2004), Economic and financial Feasibility Study for the Namanve 132/33 KV Substation

x. Uganda Electricity Board/ Electricity Transmission Company Ltd, Quarterly Project Progress Reports, 2002-2008

xi. World Bank, Aide Memoires, 2001-2008

xii. World Bank, Implementation Completion Report, Uganda Third Power Project, Report No.24406, June 2002

xiii. World Bank, Implementation Status Reports, 2001-2008

xiv. World Bank, Memorandum of the President on the Proposed Amendments to the Legal Credit Agreements of the Uganda Fourth Power Project, December 2004

xv. World Bank, Project Appraisal Document, Uganda Fourth Power project, June, 2001