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The World Bank

Report No: ICR2462

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IDA-40850)

ON A

CREDIT

IN THE AMOUNT OF SDR 113.8 MILLION
(US\$172.0 MILLION EQUIVALENT)

TO THE

FEDERAL REPUBLIC OF NIGERIA

FOR A

NATIONAL ENERGY DEVELOPMENT PROJECT

December 25, 2012

Energy Unit – Sustainable Development Department
Western Africa 2 – Nigeria
Africa Region

CURRENCY EQUIVALENTS

(exchange rate effective November 30, 2012)

Currency unit = Nigerian naira (₦)
US\$1 = ₦157.25
US\$1 = SDR 0.649

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS

| | |
|---------|--|
| BPE | Bureau of Public Enterprises |
| BPP | Bureau of Public Procurement |
| CNL JVs | Chevron Nigeria Limited–Joint Ventures |
| CPS | Country Partnership Strategy |
| CPSU | Corporate Processing and Service unit |
| CREST | Commercial Reorientation of the Electricity Sector Toolkit |
| DBU | Distribution Business Unit |
| DCA | Development Credit Agreement |
| DISCOs | Distribution companies |
| EA | Environmental assessment |
| EIRR | Economic internal rate of return |
| ESMF | Environmental and Social Management Framework |
| EPSR | Electric Power Sector Reform |
| ERSU | Environmental, Resettlement, and Social Unit |
| FA | Financing agreement |
| FDCA | Federal Capital Development Authority |
| FGN | Federal government of Nigeria |
| FIRR | Financial internal rate of return |
| FM | Financial management |
| FMF | Federal Ministry of Finance |
| FMP | Federal Ministry of Power |
| GACN | Gas Aggregation Co. of Nigeria Ltd. |
| GEF | Global Environment Facility |
| GENCOs | Generation companies |
| GDP | Gross domestic product |
| GSAA | Gas Supply Aggregation Agreement |
| HT | High tension |
| HV | High voltage |
| HVDS | High voltage distribution systems |
| IBRD | International Bank for Reconstruction and Development |
| ICR | Implementation and Completion Results |
| ICT | Information and communications technology |
| IDA | International Development Association |
| IFC | International Finance Corporation |
| IHC | Initial holding company/NEPA |
| IPP | Independent power producer |
| ISR | Implementation Status Report |
| IT | Information technology |

| | |
|-------|--|
| KBU | Karu Business Unit |
| KVA | Kilo volt ampere |
| KW | Kilo watt |
| LNG | Liquefied natural gas |
| LT | Low tension |
| LV | Low voltage |
| LVDS | Low voltage distribution system |
| M&E | Monitoring and evaluation |
| MIGA | Multilateral Investment Guarantee Agency |
| MIS | Management information system |
| MoF | Ministry of Finance |
| MTR | Mid-term review |
| MVA | Mega volt ampere |
| MW | Mega watt |
| MYTO | Multiyear tariff order |
| NBET | Nigeria Bulk Electricity Trader PLC |
| NEDP | National Energy Development Project |
| NEEDS | National Economic Empowerment and Development Strategy |
| NEGIP | Nigeria Electricity and Gas Improvement Project |
| NEPA | National Electric Power Authority |
| NERC | Nigerian Electricity Regulatory Commission |
| NIPP | National Integrated Power Project |
| PAD | Project Appraisal Document |
| PDO | Project development objective |
| PCB | Polychlorinated biphenyl |
| PHCN | Power Holding Company of Nigeria |
| PMU | Project Management Unit |
| PPA | Power purchase agreement |
| PPM | Prepaid meter |
| PRG | Partial risk guarantee |
| PSGP | Power Sector Guarantees Project |
| PSR | Project Status Report |
| PV | Photovoltaic |
| REA | Rural Electrification Agency |
| ROW | Right of way |
| RPF | Resettlement Policy Framework |
| SCADA | Supervisory control and data acquisition |
| SDR | Special drawing rights |
| SIL | Specific investment loan |
| SPDC | Shell Petroleum Development Company |
| TA | Technical assistance |
| TDP | Transmission Development Project |
| TCN | Transmission Company of Nigeria |

| | |
|----------------------|-----------------------------|
| Vice President: | Makhtar Diop |
| Country Director: | Marie Françoise Marie-Nelly |
| Sector Director: | Jamal Saghir |
| Sector Manager: | Meike van Ginneken |
| Project Team Leader: | Erik Fernstrom |
| ICR Team Leader: | Manuel Berlengiero |

FEDERAL REPUBLIC OF NIGERIA
National Energy Development Project

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| A. Basic Information | | | |
|--|--------------------|-------------------|---|
| Country: | Nigeria | Project name: | Nigeria National Energy Development Project |
| Project ID: | P090104 | L/C/TF Number(s): | IDA-40850 |
| ICR date: | 11/14/2012 | ICR Type: | Core ICR |
| Lending instrument: | SIL | Borrower: | FGN |
| Original total commitment: | SDR 113.80 million | Disbursed amount: | XSDR 108.07 million |
| Revised amount: | SDR 113.80 million | | |
| Environmental category: B | | | |
| Implementing agencies: | | | |
| Presidency, BPE | | | |
| PHCN—Project Management Unit | | | |
| Cofinanciers and other external partners: | | | |

| B. Key Dates | | | | |
|---------------------|------------|-------------------|---------------|--------------------------|
| Process | Date | Process | Original date | Revised/actual date(s) |
| Concept review: | 03/17/2005 | Effectiveness: | 11/14/2005 | 11/14/2005 |
| Appraisal: | 04/29/2005 | Restructuring(s): | | 06/08/2010 09/01/2010 |
| Approval: | 07/01/2005 | Mid-term review: | | |
| | | Closing: | 07/31/2008 | 06/30/2012 |

| C. Ratings Summary | |
|--------------------------------------|-------------------------|
| C.1 Performance Rating by ICR | |
| Outcomes: | Moderately satisfactory |
| Risk to development outcome: | Significant |
| Bank performance: | Satisfactory |
| Borrower performance: | Satisfactory |

| C.2 Detailed Ratings of Bank and Borrower Performance (by ICR) | | | |
|---|-------------------------|--------------------------------------|--------------|
| Bank | Ratings | Borrower | Ratings |
| Quality at entry: | Moderately 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: | None |
| Problem project at any time (yes/no): | No | Quality of supervision: | None |
| Development objective rating before closing/inactive status: | Moderately Satisfactory | | |

| D. Sector and Theme Codes | | |
|--|-----------------|---------------|
| | Original | Actual |
| Sector code (as % of total Bank financing) | | |
| Central government administration | 6 | |
| General energy sector | 1 | |
| Power | 85 | |
| Renewable energy | 8 | |
| Theme code (as % of total Bank financing) | | |
| Climate change | 14 | |
| Infrastructure services for private sector development | 29 | |
| Rural services and infrastructure | 14 | |
| State-owned enterprise restructuring and privatization | 29 | |
| Urban services and housing for the poor | 14 | |

| E. Bank Staff | | |
|----------------------|-----------------------------|---------------------|
| Positions | At ICR | At Approval |
| Vice President: | Makhtar Diop | Gobind T. Nankani |
| Country Director: | Marie Francoise Marie-Nelly | Hafez M. H. Ghanem |
| Sector Manager: | Meike van Ginneken | Yusupha B. Crookes |
| Project Team Leader: | Erik Magnus Fernstrom | Subramaniam V. Iyer |
| ICR Team Leader: | Manuel Berlingiero | |
| ICR Primary Author: | Manuel Berlingiero | |
| | Yasmeen Nasser Al Tabbaa | |

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)

The Project's principal objective in the PAD was to continue support for the Government's energy sector reform effort and facilitate the sector's smooth transition to the new market and institutional structure. The expectation was to see the emergence of stronger power companies, policy and regulatory institutions, and increased private sector and community participation, in all aspects of the electricity business. The project-term outcomes included efficiency, supply and service improvements in the power sector, demonstration of possible models to scale-up electricity access and preparatory work required to launch the gas pipeline and related power generation projects. These developments were expected to provide the enabling conditions for the emergence of a competitive energy industry in Nigeria better equipped to contribute to growth and improved delivery of socio-economic services. The Project was also responsive to the GEF Operational Program No. 6, as it was designed to address barriers to the expanded use of renewable energy technologies.

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

I. To continue support for the Borrower's energy sector reform and key regulatory and policy institutions; II. To increase efficiency in the power sector and to improve the supply of electricity and service delivery; III. To demonstrate possible models to scale-up electricity access; and IV. To continue support for the Borrower's gas sector reform to improve gas supply for power generation.

Table F.1 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: | Completion of enabling framework for gas contracts | | | |
| | Before restructuring: launch of gas sector reform for development of natural gas resources | | | |
| Value (quantitative or qualitative) | Associated gas flared due to lack of infrastructure to use it | Prep work to launch gas pipeline and power providers | Strategic aggregator rules completed for gas contractual frameworks | Gas aggregator established and gas supply and aggregation agreements signed with CNL and SPDC and strategic aggregator rules established |
| Date achieved | 08/01/2005 | 07/31/2008 | 06/30/2012 | 05/27/2012 |
| Comments (including % achievement) | | | | |

| Indicator | Baseline value | Original target values (from approval documents) | Formally revised target values | Actual value achieved at completion or target years |
|-------------------------------------|---|--|--|---|
| Indicator 2: | Completion of microhydro and solar demonstration models and grid-based projects to scale up electricity access | | | |
| | Degree of private/community/state level involvement (qualitative measure) | | | |
| Value (quantitative or qualitative) | Ministry implemented rural extensions and handed them over to NEPA | (a) Pilots completed: 1 microhydro project, 4 solar electricity projects; and three grid-based projects to improve rural access extensions (b) Community state/private sector participation in management of the pilot facilities | | a) Four solar electricity pilots and four grid-based pilots completed b) Community management models piloted |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments (including % achievement) | No microhydro power project was implemented because studies showed it was not the most cost-effective option | | | |
| Indicator 3: | End-user voltage | | | |
| Value (quantitative or qualitative) | Input voltage 200 V and distribution system 29 KV | 220 (within 10% of 220) | | 220 V |
| Date achieved | 08/01/2005 | 07/31/2008 | | 05/27/2012 |
| Comments (including % achievement) | 220 (82%)–240 (100%) volts (V) in completed high voltage distribution system (HVDS) clusters of Ogba, Luth, Agege, Karu and Challenge | | | |
| Indicator 4: | Voltage at 33 kV end in identified clusters | | | |
| Value (quantitative or qualitative) | End-user voltage 180 42% system losses 3.5 million customers connected | Primary voltage at 33 kV end in identified clusters -31.9 kV (target) Before restructuring also included: system losses reduced by 8%; revenue increased by 10%; number | Primary voltage at 33 kV end in identified clusters—31.9 kV (target) | Voltage stabilized at 33 kV from 29–30 kV |

| Indicator | Baseline value | Original target values (from approval documents) | Formally revised target values | Actual value achieved at completion or target years |
|-------------------------------------|---|--|--|---|
| | | of consumers connected increased by 10% | | |
| Date achieved | 08/01/2005 | 07/31/2008 | 06/30/2012 | 07/10/2012 |
| Comments (including % achievement) | Tail end voltage improved from an average of 29 kV to 33 kV in the 32 clusters, spread across the country | | | |
| Indicator 5: | Sector-level outcome: Emergence of new institutions: NERC, REA, Market Operator and system operator, new companies from NEPA restructuring Before restructuring included: increased private participation in the electricity market | | | |
| Value (quantitative or qualitative) | Institutions do not exist Bank supported Government to ESPR Act | Delivery of these institutions | No systems operator to be established after restructuring. | NERC, Market Operator, and 18 successor companies established and operational in year 3; NEDP also played a decisive role in the progress of the government Roadmap for Reforms and implementation of revised multiyear tariff order (MYTO) |
| Date achieved | 08/01/2005 | 07/31/2008 | 06/30/2012 | 07/10/2012 |
| Comments (including % achievement) | The bids for the privatization of state-owned distribution and generation companies have been issued as well; pace of reforms has picked up since 2010 | | | |

Table F.2 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: | Commencement of implementation of renewable energy master plan | | | |
| Value (quantitative or qualitative) | Masterplan does not exist | Begin implementation of renewable energy master plan | | Renewable energy master plan available in draft to be reviewed in |

| Indicator | Baseline value | Original target values (from approval documents) | Formally revised target values | Actual value achieved at completion or target years |
|-------------------------------------|--|--|--------------------------------|--|
| | | | | December 2012; once reviewed, will be an input into the Renewable Energy Act |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments (including % achievement) | | | | |
| Indicator 2: | A renewable energy business model developed | | | |
| Value (quantitative or qualitative) | No business model exists | A business model for renewable energy developed | | Business models developed for Mfaminyen and FADAMA pilots |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments (including % achievement) | | | | |
| Indicator 3: | Number of grid-based conventional power pilots in rural areas | | | |
| Value (quantitative or qualitative) | 0 | 3 | | 4 |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments (including % achievement) | Reinforced existing distribution network (meters, LVDS, HVDS) in Enugu, Ogun, Cross River State, and Kaduna Commercial Farms serving Village communities | | | |
| Indicator 4: | Number of off-grid renewable energy pilots launched in rural areas | | | |
| Value (quantitative or qualitative) | 0 | 5 | | 4 |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments (including % achievement) | Mfaminyen = 1 FADAMA sites = 3 solar pilots | | | |
| Indicator 5: | Number of clusters developed with demonstrable improvements in service levels and tail end voltage | | | |
| Value (quantitative or qualitative) | 0 | 5 | 11 | 6 |
| Date achieved | 08/01/2005 | 07/31/2008 | 06/30/2012 | 07/10/2012 |
| Comments (including % achievement) | Abuja Karu HVDS and prepaid meters (PPMs) = 1 Abuja Kubwa PPMs = 1 Lagos Agege HVDS = 1 Lagos Obga HVDS = 1 | | | |

| Indicator | Baseline value | Original target values (from approval documents) | Formally revised target values | Actual value achieved at completion or target years |
|-------------------------------------|--|--|--------------------------------|--|
| | Lagos Luth HVDS = 1 Ibadan Challenge = 1 Remaining 6 have been procured and are to be installed under NEGIP | | | |
| Indicator 6: | Percentage of cluster-level losses | | | |
| Value (quantitative or qualitative) | 37% of energy input | 12% energy input in the identified clusters | | Less than 12% |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments (including % achievement) | Less than 12% losses in clusters Karu, Ogba, Luth, Agege and Challenge | | | |
| Indicator 7: | Installation of additional transformers at selected substations | | | |
| Value (quantitative or qualitative) | 0 | 380 MVA | Revised to 240 MVA | 810 MVA |
| Date achieved | 08/01/2005 | 07/31/2008 | 06/30/2012 | 07/10/2010 |
| Comments (including % achievement) | Transformers supplied to Alagbon, Mando, Karu cluster, Kubwa cluster, Shiroro, and other sites selected by TCN | | | |
| Indicator 8: | Technical assistance plan for evolution of PMU to CPSU | | | |
| Value (quantitative or qualitative) | PMU is essentially a process agency; need an agency that will provide central corporate and strategy support to the successor entities after NEPA is totally unbundled | Complete plan for CPSU | | Plan presented to Minister of Power along with proposal to move PMU into Electricity Management Services Agency with a mandate for project management and to provide advisory services for development agencies (World Bank, AfDB, and others) |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments (including % achievement) | | | | |
| Indicator 9: | Project performance satisfactory and on schedule; capacity assessment of environmental and social unit rated satisfactory | | | |
| Value (quantitative) | NA | Rating satisfactory | | Rating satisfactory |

| Indicator | Baseline value | Original target values (from approval documents) | Formally revised target values | Actual value achieved at completion or target years |
|-------------------------------------|--|--|--|---|
| or qualitative) | | | | |
| Date achieved | 08/01/2005 | 07/31/2008 | | 06/30/2012 |
| Comments (including % achievement) | | | | |
| Indicator 10: | Institutional development by BPE: a) Customer feedback workshops held b) New institutions established and companies launched—DROPPED c) Offers for private participation developed—DROPPED | | | |
| Value (quantitative or qualitative) | Successor companies yet to be formed and corporatized after unbundling; no clarity for mode of private sector participation; no stakeholder communication outreach conducted | | Annual customer satisfaction surveys and two communication workshops conducted | 2 |
| Date achieved | 08/01/2005 | | 06/30/2012 | 07/10/2012 |
| Comments (including % achievement) | A customer workshop was held in Karu, Abuja, on conversion from LVDS to HVDS and a stakeholder workshop was conducted with PHCN labor union to discuss concerns related to privatization in September 2011 | | | |
| Indicator 11: | BPE maintains satisfactory project implementation capacity ratings | | | |
| Value (quantitative or qualitative) | Rating moderately satisfactory | Rating satisfactory | | Rating satisfactory |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments (including % achievement) | | | | |
| Indicator 12: | Contracts for various technical assistance (TA) activities approved by BPE | | | |
| Value (quantitative or qualitative) | Not in place | All TA activities completed | | TA contracts awarded for the preparation of aggregation rules, PRGs, high-tension metering scheme, supervision of MIS for TCN, and preparation of business plan for the PMU |
| Date achieved | 08/01/2005 | 07/31/2008 | | 07/10/2012 |
| Comments | Environmental audit of successor PHCN companies did not happen and is now to | | | |

| Indicator | Baseline value | Original target values (from approval documents) | Formally revised target values | Actual value achieved at completion or target years |
|---------------------------|--------------------------|--|--------------------------------|---|
| (including % achievement) | be conducted under NEGIP | | | |

G. Ratings of Project Performance in ISRs

| No. | Date ISR archived | DO | IP | Actual disbursements (US\$ millions) |
|-----|-------------------|-------------------------|-------------------------|--------------------------------------|
| 1 | 12/21/2005 | Satisfactory | Satisfactory | 0.00 |
| 2 | 06/30/2006 | Satisfactory | Moderately satisfactory | 1.00 |
| 3 | 10/05/2006 | Satisfactory | Moderately satisfactory | 1.00 |
| 4 | 12/22/2006 | Satisfactory | Moderately satisfactory | 1.00 |
| 5 | 06/21/2007 | Satisfactory | Moderately satisfactory | 5.81 |
| 6 | 12/14/2007 | Satisfactory | Moderately satisfactory | 18.55 |
| 7 | 06/08/2008 | Satisfactory | Moderately satisfactory | 35.37 |
| 8 | 12/24/2008 | Moderately satisfactory | Moderately satisfactory | 53.16 |
| 9 | 06/24/2009 | Moderately satisfactory | Moderately satisfactory | 74.22 |
| 10 | 12/15/2009 | Moderately satisfactory | Moderately satisfactory | 99.05 |
| 11 | 06/27/2010 | Moderately satisfactory | Moderately satisfactory | 116.47 |
| 12 | 03/27/2011 | Moderately satisfactory | Moderately satisfactory | 119.28 |
| 13 | 12/01/2011 | Satisfactory | Moderately satisfactory | 139.13 |
| 14 | 06/12/2012 | Satisfactory | Moderately satisfactory | 151.43 |
| 15 | 11/05/2012 | Moderately satisfactory | Moderately satisfactory | 161.74 |

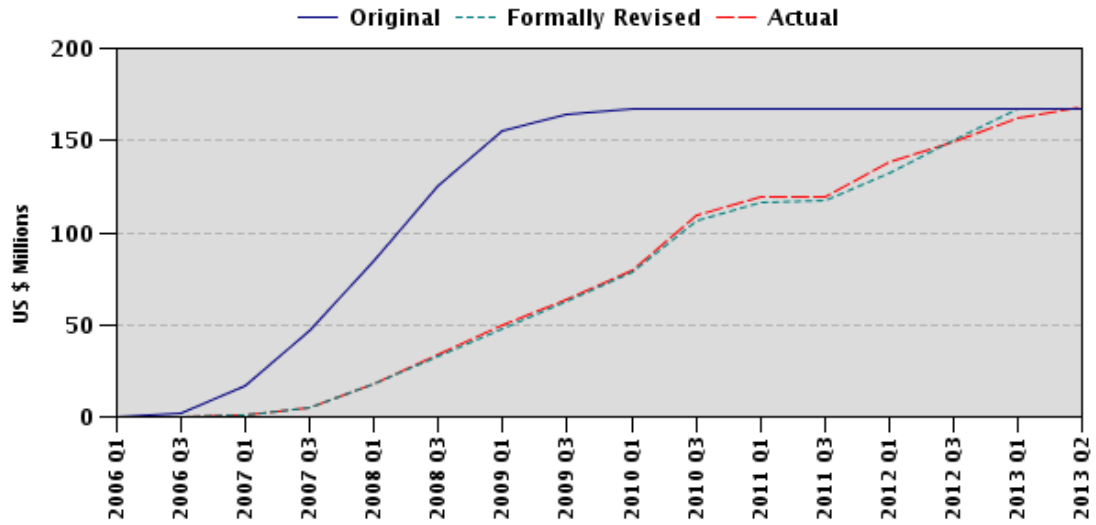
H. Restructuring (if any)

| Restructuring date(s) | Board approved PDO change | ISR ratings at restructuring | | Amount disbursed at restructuring in US\$ millions | Reason for restructuring & key changes made |
|-----------------------|---------------------------|------------------------------|----|--|--|
| | | DO | IP | | |
| 06/08/2010 | Y | MS | MS | 114.54 | To better align PDO with momentum of energy sector reform at the time and closing date extension |
| 09/01/2010 | | MS | MS | 119.02 | Reallocation of funds between components |

If PDO and/or key outcome targets were formally revised (approved by the original approving body), enter ratings below:

| | Outcome Ratings |
|--------------------------------------|-------------------------|
| Against original PDO/targets | Moderately satisfactory |
| Against formally revised PDO/targets | Moderately satisfactory |
| Overall (weighted) rating | Moderately satisfactory |

I. Disbursement Profile



1. Project Context, Development Objectives, and Design

1.1 Context at Appraisal

1. Nigeria is Africa's most populous country, with a population of 162.5 million (2012 estimate), of which a staggering 60 percent lives below the poverty line (2010 estimate). By dampening competitiveness, and thus employment opportunities, and the ability for citizens to develop and sustain small businesses and increase livelihoods, inefficiencies in and the poor performance of the power sector contribute to the obstacles that Nigerians must face every day to escape the poverty trap.

2. Despite being one of the largest economies in Africa and one of the most significant oil producers, Nigeria continues to suffer from a chronic shortage of generation, transmission, and distribution capacity. With approximately 4,300 MW of available generation supplied through the grid against an estimated demand of 10,000 MW, Nigeria has considerable unmet demand. Deficiencies cause approximately 55 percent of the country's population to live without access to electricity, and the remaining 45 percent to suffer from poor quality of service, with multiple power cuts each day (box 1).

Box 1. Issues Constraining the Sector at Appraisal (extracts from original PAD)

Utility's poor performances. The National Electric Power Authority (NEPA, which evolved into the current Power Holding Company of Nigeria [PHCN]) was responsible for four functions: generation, transmission, distribution, and rural electrification. On the generation side, plant availability was low and characterized by frequent outages. Dilapidated transmission and distribution networks caused high energy losses. Poor service forced more than 90 percent of industrial customers and significant numbers of residential consumers to install their own power generators, at a high cost to themselves and the Nigerian economy.

Low access. Barely 40 percent of Nigerians had access to electricity services, with only 20 percent of rural households able to access electricity. Given the significant cost to increase grid-based access to 75 percent of population by 2020 (over US\$10 billion in investments), different and more efficient electrification models were required, along with increased community participation.

Weak sector financials. On the business side, there was a large gap between power sold and power billed, and between power billed and revenue collected. Lack of metering, outdated information systems, and inconsistent billing practices were the principal causes of the severe revenue losses. Electricity tariffs were not cost reflective, but tariff revisions were not considered possible unless supply and service conditions measurably improved.

Absence of appropriate regulation. At the time of the National Energy Development Project (NEDP), there was no independent price or service regulation for gas or electricity supply. In theory, the Federal Ministry of Power and Steel was supposed to exercise regulatory powers, but it was not equipped to discharge this function.

3. The federal government of Nigeria (FGN) struggled for many years to find a lasting solution to these problems. In 1999, FGN began putting together a comprehensive program of sector reform and privatization to improve performance. The Transmission Development Project (TDP), approved in 2001 and closed in 2008, was designed to support the larger reform effort initiated by FGN. The National Energy Development Project (NEDP) was launched in 2005 to scale up efforts to address the urgent need for investments and improved commercial practices already started under TDP.

4. The Electric Power Sector Reform (EPSR) Act was the foundation for the development and appraisal of the NEDP. The EPSR Act (2005) provided for commercial operation of the sector and led to the restructuring of the existing power

utility, the National Electric Power Authority (NEPA), into separate generation, transmission, and distribution companies. An interim holding company (Power Holding Company of Nigeria [PHCN]) succeeded NEPA to oversee these companies, awaiting privatization before being dissolved. The EPSR Act also established an independent regulatory agency, the Nigeria Electricity Regulatory Commission (NERC), to promote fair and equitable growth of the power sector, as well as a Rural Electrification Agency (REA) to expand rural access. A Market Operator was also established to provide a clearing house mechanism for public and private generation companies to facilitate the sale of power.

5. At the time of appraisal for NEDP, the World Bank was the only large international development institution active in the sector. The Bank was able to commit the scale of funding and the prolonged period for which it was required to achieve visible impacts in a large country like Nigeria. Secondly, its staff had the experience to address the key issues affecting the sector, such as reforms, utility management, sector regulation, strategic communications, commercialization and privatization of utilities. The Bank already had a long standing relationship with NEPA and a well-established and performing Project Management Unit (PMU) with a good track record. Finally, the successor companies were in need of substantial financing from private sources, and the World Bank Group was uniquely positioned in terms of its deep technical expertise and global knowledge to assist the government in establishing the necessary conditions and environment to make this possible.

6. NEDP was presented to the International Development Association (IDA) Board of Executive Directors for approval as a flagship project along with the new Country Partnership Strategy (CPS) for Nigeria, to which it was also fully aligned. The CPS targeted long-term goals of wealth creation, employment generation, and poverty reduction.

Context at restructuring

7. Two main factors affected the sector context and eventually caused the project to be restructured: the launch of National Integrated Power Project (NIPP) before the general election in 2007, and the subsequent slowdown in reform momentum. In the preelection climate in 2007, FGN felt strongly about a quick fix for the languishing sector through the preparation and launch of NIPP. Under this program, FGN allocated almost US\$8 billion from its Excess Crude Account toward improving and increasing generation capacity, transmission, gas piping, and distribution. Since the preparation speed for NIPP left limited time for preparation of individual investment components, the FGN program absorbed many of the investments and bid packages appraised for NEDP, posing a challenge to the progress of NEDP implementation (more details in section 2.2).

8. Subsequent to the 2007 general elections, the new administration under President Umaru Musa Yar'Adua comprehensively reviewed its sector strategy. In 2008, FGN, while continuing with reforms, decided to defer privatization of the companies until improvements in power generation and efficiency could be attained. These improvements were considered necessary to attract and sustain private participation. Steps to address both generation capacity and sector efficiency were launched. The Bank's assessment concluded that these measures would take time to produce the desired results and therefore it would not be possible to achieve a competitive energy industry structure within NEDP's implementation period, even within a reasonable extension of the closing date.

9. The project was therefore restructured to consider NIPP and the shift in FGN policy, with changes to components, project development objectives and indicators, and to align these with the revisions in FGN's strategy. In 2010, however, as the administration of President Goodluck took over, the reform process gained momentum again.

1.2 Original Project Development Objectives and Key Indicators

10. This Implementation Completion and Results (ICR) Report uses the project development objectives (PDOs) as stated in the financing agreement (FA) to assess the project's achievements:

- i. to continue support for the borrower's energy sector reform to facilitate a smooth transition to the new market and institutional structure;
- ii. to increase efficiency in the power sector and to improve the supply of electricity and service delivery;
- iii. to demonstrate possible models to scale up electricity access; and
- iv. to continue support for the borrower's gas sector reform to develop natural gas resources and related electricity projects.

11. The original Project Appraisal Document (PAD) has a differently worded PDO: *The Project's principal objective is to continue supporting the Government's energy sector reform effort and facilitate the sector's smooth transition to the new market and institutional structure. The expectation is to see the emergence of stronger power companies, policy and regulatory institutions, and increased private sector and community participation, in all aspects of the electricity business. The project-term outcomes include efficiency, supply and service improvements in the power sector, demonstration of possible models to scale-up electricity access and preparatory work required to launch the gas pipeline and related power generation project. These developments are expected to provide the enabling conditions for the emergence of a competitive energy industry in Nigeria that is better equipped to contribute to growth and improved delivery of socio-economic services.*

12. Main indicators to monitor progress toward outcomes included:

- i. *Reforms and sector wide indicators:* Include the (a) emergence of new institutions in the form of NERC, successor electricity companies, the REA, and the Rural Electrification Fund; (b) development of workable private participation models in a few companies and/or clusters; (c) launch of access expansion pilots; (d) analytical inputs to establish rational and efficient domestic energy pricing structure; and (e) higher voltage level reliability indices for transmission.
- ii. *Cluster-level indicators:* Improved technical/commercial efficiency and customer service quality indicators for distribution; improved values of standard financial indicators; and number of new consumers connected.
- iii. *Qualitative measures:* Will include periodic customer satisfaction surveys, visual inspections, site visits, and feedback from civil society in formal and in informal settings.

13. The project was blended with a Global Environmental Facility (GEF) grant of US\$1 million and was also responsive to the GEF Operational Program No. 6, because it targeted barriers to the expanded use of renewable energy technologies by creating an enabling environment for grid-connected and off-grid renewable energy

sources. The envisaged outcomes were closely linked to two strategic priorities for the climate change focal area: (i) inputs to develop a power sector regulatory framework and policies for renewable energy promotion; and (ii) innovative interfaces to other development and investment efforts that require an energy supply, for example, in agriculture, water supply, rural small, and microenterprises, education, and public health.

1.3 Revised PDO and Key Indicators, and Reasons/Justification

14. During the restructuring in June 2010, the PDO was revised as follows:
- i. to continue support for the FGN’s energy sector reform and key regulatory and policy institutions;
 - ii. to increase efficiency in the power sector and to improve the supply of electricity and service delivery;
 - iii. to demonstrate possible models to scale up electricity access; and
 - iv. to continue support for the FGN gas sector reform to improve gas supply for power generation.

15. The restructuring was not carried out to address major shortcomings in project implementation, but to ensure continuity in project activities in a changing external environment. While the differences in the PDO statements might seem minor by dropping “to facilitate a smooth transition to the new market and institutional structure” and substituting “to develop natural gas resources and related electricity projects” with “to improve gas supply for power generation,” the new PDO narrowed the scope of the project and delinked it from broad reform outcomes outside the project’s influence. The corresponding indicators were aligned to the changes in the PDO:

- i. *Reforms and sector-level indicators:* No changes were carried out for the indicators regarding the creation of new institutions. Targets were, however, modified to reflect the reduced scope of the transmission-related investments. Indicators pertaining to “customers connected” and “reduction in cost of connection” were dropped because it was proposed that off-grid models be restricted to renewable energy pilots and there were no available baseline data.
- ii. *Cluster-level indicators:* Indicators have been limited to improvements in quality of supply, which will occur directly on account of project investments. Those pertaining to “number of customers connected” and “revenue enhancement” have been dropped because they also depend upon improvements in power generation and availability, which are exogenous to the project and have not materialized.
- iii. *Other changes:* Indicators pertaining to “launching the gas pipe line and related power projects” changed to “preparatory work for contractual frameworks” due to change in FGN strategy.

1.4 Main Beneficiaries

16. Direct beneficiaries included the population living in the intervention clusters and rural communities targeted by the project,¹ as well as 4.4 million electricity

¹ About 25,000 new households were connected and 117,000 consumers and small businesses received new meters under the NEDP.

consumers in Nigeria, including households, businesses/commercial enterprises, industry, and government.

1.5 Original Components

17. The project had five components:
 - i. *Component 1—Transmission System Development*: Comprising rehabilitation of dilapidated transmission substations, installation of equipment in existing substations, and studies for new 330 kV lines.
 - ii. *Component 2—Distribution Efficiency Enhancement*: This component included investments in distribution line upgrading, distribution transformers, meters, technical assistance, and capacity building.
 - iii. *Component 3—Access Expansion, Intensification, and Renewables*: Comprising construction of pilot projects for access expansion and access intensification, including development of renewable energy sources. This component was cofinanced by GEF.²
 - iv. *Component 4—Technical Assistance to the Project Management Unit*: Included activities to supervise works financed by the project, the preparation of a gas pipeline and gas-to-power project, as well as other technical and capacity-building assistance.
 - v. *Component 5—Technical Assistance for Reform and Private Participation*: Included TA for the development of risk-mitigation instruments to facilitate privatization, a communications and outreach campaign, and capacity building for sector institutions.

1.6 Revised Components

18. The restructuring modified the components are:
 - i. *Component 1—Transmission System Development*: This component was considerably scaled down following FGN's decision to include some of the activities under NIPP. In addition to a series of investments, the following activities were dropped: (a) feasibility and detailed engineering studies for extension of transmission system; (b) preparation of bidding documents for rehabilitation of the Kainji Hydro Power Station (absorbed under the IDA-funded Niger Basin Water Resources Development and Sustainable Ecosystems Management Project); and (c) preparation of a transmission system development plan for the national grid.
 - i. *Component 2—Distribution Efficiency Enhancement*: In contrast to component 1, the scope of component 2 increased due to the scale-up of the Commercial Reorientation of the Electricity Sector Toolkit (CREST) Program. A series of consultancy studies and advisory services aimed at commercialization and privatization of distribution companies (DISCOs) was dropped, however, based on FGN's decision to defer privatization of the DISCOs.

² GEF cofinancing amounted to US\$1 million and was fully blended into NEDP activities. GEF outcomes therefore have been incorporated into the overall evaluation of component 3.

- ii. *Component 3—Access Expansion, Intensification, and Renewables:* No changes were made to this component, although the cost increased by US\$4 million due to rebidding and revised cost estimates.
 - iii. *Component 4—Technical Assistance to the PMU for Electricity Sector-Related Work:* No changes were made to this component.
 - iv. *Component 5—Policy Reform and Private Participation:* Activities and costs were reduced by US\$1 million, mainly due to shift in FGN strategy.
19. The comparison of project costs before and after restructuring is in annex 2.

1.7 Other Significant Changes

20. The first restructuring in 2008 extended the closing date from July 31, 2008, to June 30, 2010, and changed the name of the implementation agency from NEPA to PHCN. A level-two restructuring in September 2010 allocated previously unallocated funds in the amount of US\$240,000 to the subcomponent Training, Study Tours, and Workshops for PHCN.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design, and Quality at Entry

21. The project followed the implementation of TDP, which initiated a dialogue on power sector reform and changes toward more commercial and private sector orientation. Lessons from TDP considered during project design included:

- i. implementing regular customer satisfaction surveys;
- ii. holding stakeholder communication meetings;
- iii. playing a catalytic role in adding value to the sector by developing models that can be replicated and scaled up; and
- iv. providing customized capacity-building activities for the implementing agencies.

22. The project's implementation agencies, the PHCN PMU and the Bureau of Public Enterprises (BPE), had good track records in project implementation and were familiar with World Bank procurement processes.

23. The project was prepared quickly, with the appraisal taking place one month after the concept note review, due to the urgency of the power sector crisis in Nigeria and the government's request for fast processing. TDP financed preparatory studies and consultancy services to improve NEDP preparation on network system planning, supervisory control and data acquisition (SCADA communication systems, and reactive power compensation. A procurement capacity assessment report, financial management assessment report, Environmental and Social Management Framework (ESMF), and a Resettlement Policy Framework (RPF) were also prepared for the project. Fast project preparation shifted procurement to the implementation phase, causing an initial lag in disbursement. In hindsight, the team's ability to respond to the FGN request for fast processing should have been weighed against readiness and quality at entry.

24. Main shortcomings include:
- i. *An overly ambitious PDO and short implementation period:* The project was initially designed as a three-year project, which, in hindsight, was unrealistic given its scope.
 - ii. *Complex design:* While the project's core design was relevant and solid, overall design was complicated by the addition of several subcomponents, such as rural off-grid electrification, a renewable energy master plan, HIV/AIDS information campaign, and TA on gas sector reform.
 - iii. *Assessment of risks:* Three out of four PDO risks were rated as substantial. These risks were: (a) the risk to continued government commitment and consensus over the transition strategy and action plan for the establishment of the new market structure and privatization; (b) the capacity of *newly former utilities* in terms of financial and human resources to capture the benefits of proposed investments; and (c) the lack of institutional coherence and multiple mandates.
25. The risk of limited capacity or interest of state government entities to develop innovative access expansion projects, especially in off-grid rural areas, was rated as moderate. It is worth mentioning that the project took a calculated risk in supporting the ambitious reform program, despite the potential delays in execution.

2.2 Implementation

26. The project closed on June 30, 2012, with 97.5 percent disbursement of the credit amount.

Factors that adversely affected implementation

27. As mentioned previously, implementation of the investment program was delayed and eventually hampered by the launch of the NIPP and its absorption of several investments supposed to be covered by NEDP. This US\$8 billion program dwarfed IDA financial contributions to the sector, but also validated NEDP's role to leverage best practices and innovations that the government can replicate through budget-funded programs.

Mid-term review

28. A mid-term review was conducted in April–May 2008 and covered the following issues: (i) extension of the closing date by 22 months based on an action plan prepared by the PMU; (ii) procurement delays addressed at the PMU level; and (iii) strengthening of the internal audit unit with additional staff.

29. Although the restructuring proposal had been under discussion with FGN since 2008, the formal request was received only on December 18, 2009. The delay in receiving the request was due to internal discussions within FGN on the reform strategy and time taken for building a consensus on the way forward, particularly in the context of the development objectives. After the departure of President Yar'Adua for medical treatment, political processes in Nigeria slowed down, also affecting the timing and strategy of NEDP restructuring.

30. Following project restructuring, implementation generally progressed according to schedule and most activities were completed by project close on June 30, 2012. A few planned activities were not carried out due to minor delays in procurement and/or implementation, such as the Idi Araba and Kubwa high voltage

distribution system (HVDS) clusters, a few transmission upgrades (for instance, the installation of mobile substations for the Alagbon substation in Lagos), and a few connections in the Ogun, Enugu, and Cross River State. Implementation of these activities was transferred to the Nigeria Electricity and Gas Improvement Project (NEGIP).³ It was also not possible to conclude the financial and environmental audits of all PHCN successor companies, as requested by BPE, to facilitate privatization within the time frame of the project (also transferred to NEGIP).

2.3 Monitoring and Evaluation Design, Implementation, and Utilization

Design

31. The indicators and targets pertaining to improvements in transmission and distribution were realistic and appropriate in light of the investments. Indicators were further refined during project restructuring by specifying that they pertained to project intervention areas only. An inconsistency over the number of target distribution clusters during restructuring, along with a broad interpretation of the definition of a cluster, also led to some confusion over assessing results under project component 2.⁴ The indicator on the percentage of cluster-level losses proved to be difficult to measure, and therefore accurate data are limited. The indicators on the rural electrification pilots were appropriate, however, there was little information collected on the degree of state/private and community involvement in these pilots. Indicators measuring institutional reform were made more specific and less ambitious following project restructuring. However, a few unspecific indicators remained. For example, there were no criteria offered to measure the performance of BPE and the PMU, and there was no clear definition of what should be the expected level of detail for the renewable energy business model.

Implementation and utilization

32. M&E data used by the borrower were taken from the following sources: (i) PHCN for operations, revenue, collapses of the transmission system, and overall system working data; (ii) PMU database that maintained data on the project components and the clusters (including the number of transformers and meters installed); (iii) BPE, which maintained data on TA activities and other government agencies and DISCOs for specific data. The same data have been used by the ICR team in assessing NEDP outcomes and were verified in interviews with project staff.

33. Program engineers at the PMU were regularly collecting data during their supervision meetings, which was then validated during site visits conducted by the M&E team at the PMU.

³ Estimated total amount to be transferred to NEGIP is about US\$3.7 million.

⁴ In paragraph 17 of the restructuring paper, the number of clusters is proposed to be increased to 9, and in paragraph 22, the number of new clusters is proposed to increase to 11. The results framework in annex 1, page 22, states the target as 11. Furthermore, the sites of the additional clusters are not mentioned in the restructuring paper. As a result of this ambiguity, the PMU has continued implementing improvements in the distribution network by adding 11 kV feeders at the six original sites, and deferred the installation of HVDS to NEGIP (see section 3.2 for further details).

2.4 Safeguard and Fiduciary Compliance

34. The PMU's Environment, Resettlement and Social Unit (ERSU), established under TDP, was responsible for NEDP's environmental and social safeguards compliance. ERSU oversaw the preparation of the ESMF and RPF for the overall project, as well as audits for the project-funded substation expansions and improvements, as needed. Over the life of the project, ERSU prepared environmental and social management plans for the transmission substation rehabilitation and reinforcement investments and supervised their implementation. In addition, the Bank's Health and Safety Guidelines applicable to this project were: Electric Power Transmission and Distribution, Occupational Health and Safety; and Management and Monitoring of Polychlorinated Biphenyls (PCBs). ERSU's satisfactory performance has been regularly confirmed by the Bank's supervision missions.

35. The one significant safeguard-related issue that arose during project implementation was a land dispute at the Karu Substation, where a church that had been constructed on land that the Federal Capital Development Authority (FDCA) had already allocated to PHCN was demolished by FDCA. The church took legal action to block the substation construction, but the court denied its request and authorized construction to proceed. The church's request for compensation is still pending in the court. The Bank did not intervene in the dispute, having determined that the actions taken by PHCN were not inconsistent with the RPF or Bank Operational Policy 4.12 and that the legal process was functioning effectively to resolve it.

36. There was substantial progress in building environmental and social impact management capacity at the Transmission Company of Nigeria (TCN) during NEDP. An environment and social unit was established at TCN headquarters, and safeguard personnel were posted in each of the eight transmission districts. ERSU itself is remaining a part of the PMU rather than becoming the nucleus of the TCN unit as planned, because of the large project management workload. All four ERSU members participated in overseas training during 2009, each in a different African country.

37. No major fiduciary issues were recorded during the lifetime of the project. On the procurement side, implementation arrangements and PMU's capacity were adequate, partly due to capacity building conducted during implementation of TDP. During implementation, however, procurement delays materialized mainly due to: (i) turnover of qualified staff in the PMU and associated time for capacity building in Bank procurement policies and procedures for replacements; (ii) time required for restructuring finalization; and (iii) administrative delays related to the opening of letters of credit. Capacity was built by organizing procurement clinics and training workshops, and procurement management performance was generally satisfactory for the duration of the project.

38. However, a few concerns over the quality of the PMU's financial management capacity (such as the Interim Financial Report's quality and timely submission of financial management [FM] reports and letters of credit issuance) and internal audit capacity (the postaudit process in particular) were highlighted. These appear to be common issues across the board for the PMU, and not only due to its implementation of NEDP. Strengthening FM capacity should be a focus of future projects implemented by the PMU.

2.5 Post completion Operation/Next Phase

39. NEDP's successful development of scalable "islands of excellence," focusing on distinct areas of technical and operational challenges in the sector's reform, has mainstreamed concepts such as CREST and prepayment metering within budget-financed and internal revenue-funded programs implemented by FGN. Apart from already completed programs within NIPP⁵ and PHCN applying CREST principles, the PMU and the World Bank energy team are currently advising NERC and the Bank of Industry on the ongoing national rollout of prepayment meters to all consumers,⁶ funded by increased revenues levied under the new tariff.

40. Since the relaunch of the reform process in 2010, progress has been encouraging. Nigeria achieved a record high in August 2012 in terms of available generation capacity of 4,477 MW and has been able to keep generation levels above 4,000 MW for most of the second half of the year. At the same time, FGN continued to implement the Roadmap for the Power Sector Reform. It moved forward with privatizing PHCN's generation and distribution companies. A request for proposal has been released for: (i) the sale of up to 70 percent of the shares in each of four gas-powered GENCOs; (ii) 25-year concessions for two hydropower GENCOs; and (iii) the sale of at least 51 percent of the shares in 11 DISCOs. The bidding process began in September 2011, and bids were submitted in July 2012. The bid evaluation process is ongoing, with the negotiations with selected bidders to begin in January 2013. A high level power task force led by the President Office continues to monitor the implementation of the overall reform.

41. Within this context, successor projects to NEDP, namely the Nigeria Electricity and Gas Improvement Project (NEGIP), approved in June 2009, and the Power Sector Guarantees Project (PSGP), currently under preparation are contributing directly to the pursuit of the power reform agenda. These projects have scaled up World Bank investment support and dialogue on sector reform to support power generation, gas sector policies, and regulatory reform. Furthermore, IDA, IFC and MIGA have prepared a joint business plan to propose a more integrated World Bank Group response to this critical power reform for the development of Nigeria.

NEGIP

42. This project's development objectives are to: (i) improve the availability and reliability of gas supply to increase power generation in existing public sector power plants and (ii) improve the power network's capacity and efficiency to transmit and distribute quality electricity to the consumers. NEGIP consists of a US\$200 million credit and a US\$400 million partial risk guarantee (PRG; US\$100 million of IDA commitment) operation.

43. The credit component of NEGIP is a continuation and scale-up of NEDP investments. A restructuring and additional financing for NEGIP was approved on July 19, 2012, with an additional US\$100 million credit (and US\$200 million of additional PRGs) targeting additional resources for TA and transmission investments.

⁵ NIPP investments in distribution system rehabilitation, budgeted to approximately US\$1 billion, are using several of the CREST principles including use of smaller transformers.

⁶ It has been estimated that over 3 million Nigerian households (or approximately 18 million people) will have benefited from the new prepayment meters when the program concludes in 2014, representing a 25-fold scale-up of the NEDP metering program.

PSGP

44. Building on the ongoing World Bank–IDA support for gas supplies to the power sector through the use of PRGs, the Nigerian Ministry of Finance (MoF) requested that the World Bank Group consider an additional support package that includes the use of IDA (or International Bank for Reconstruction and Development [IBRD]) PRGs, Multilateral Investment Guarantee Agency (MIGA) coverage, and International Finance Corporation (IFC) interventions to support the power sector reform program. The request focused on a number of independent power plants, totaling approximately 1,500 MW, being developed by the private sector. In early 2011, MoF presented the World Bank Group with a subsequent request, nominating an additional 8 independent power plants, 6 PHCN successor generation companies (GENCOs), and 11 PHCN successor DISCOs for World Bank Group risk mitigation and credit enhancement support.

3. Assessment of Outcomes

45. A split evaluation has been carried out to assess project achievements along each PDO statement before and after restructuring, given the formal nature of the restructuring. Annex 9 presents the PDO level indicators both at project’s restructuring and closing. The ratings for relevance, efficiency, and efficacy of the four PDO statements are summarized in table 1.

| PDO description | Rating | |
|--|-------------------------|-------------------------|
| | Before restructuring | After restructuring |
| Relevance | | |
| of objectives | High | High |
| of design and implementation | Modest | Substantial |
| Overall Rating | Substantial | Substantial |
| Efficacy (for each PDO statement) | | |
| i. Support the government's energy sector reform and key regulations and policy institutions | Moderately satisfactory | Satisfactory |
| ii. Increase efficiency in the power sector and improve the supply of electricity and service delivery | Moderately satisfactory | Moderately satisfactory |
| iii. Demonstrate models to scale up electricity access | Moderately satisfactory | Moderately satisfactory |
| iv. Support gas sector reform to improve gas supply | Satisfactory | Satisfactory |
| Overall Rating | Moderately satisfactory | Moderately Satisfactory |
| Efficiency | | |
| Economic and financial reevaluation of the project viability | Substantial | |

3.1 Relevance of Objectives, Design, and Implementation

46. *Relevance of objectives before and after restructuring: **high**.* The PDOs were highly relevant to development in Nigeria. Since the Obasanjo administration, power sector reform has been a critical objective of successive Nigerian governments due to its clear links to economic development, competitiveness, and job creation. NEDP supported government efforts to expand economic opportunities and promote economic growth by addressing the shortcomings in the power sector with a series of investments and TA activities, which are still very relevant today, aimed at improving

the quality and supply of electricity services, addressing chronic shortages and dilapidated transmission and distribution systems, and increasing access.

47. The project objectives are fully aligned with the "Roadmap to Power Sector Reform," as presented by President Goodluck Jonathan on August 26, 2010. In fact, the project, along with TDP and NEGIP, formed a portfolio of projects designed to promote dialogue on sector reform while investing in power sector improvements. The roadmap clearly outlines the FGN's current strategy and actions for implementing comprehensive power sector reform to expand supply, open the sector for private investment, and address some of the chronic sector issues hampering service delivery improvement and access expansion. The core reform actions, building on the EPSR Act, are centered on unbundling the national utility's distribution and generation assets and their gradual opening to private sector investment and management.

48. NEDP is fully aligned with the IDA CPS 2009–13 goal of removing key roadblocks to rural and urban development.

49. *Relevance of design and implementation before restructuring: modest.* The initial project design was ambitious for the project duration, and fast processing caused some early implementation delays. When the reform came to a standstill between 2008 and 2010, the project became less relevant until it was restructured.

50. *Relevance of design and implementation after restructuring: substantial.* During the restructuring, NEDP design and implementation were tailored to the context and flexibility was built in. Restructuring coincided with the launch of the reform in 2010, which further increased project relevance. By continuing to focus on improving transmission and distribution performance, NEDP allowed the Bank to maintain a credible dialogue that was also cemented in on-the-ground improvements achieved by the project.

51. *Overall Relevance Rating.* Based on the rationale above, project relevance of objectives, design, and implementation is rated *substantial* before and after restructuring.

3.2 Achievement of Project Development Objectives

52. Overall, the project was able to achieve its PDOs. Achievement of each of the four PDO statements is discussed in detail below.

PDO I. Support the government's energy sector reform and key regulations and policy institutions.

PDO before restructuring: Support for the government's energy sector reform to facilitate a smooth transition to the new market and institutional structure.

Achievement of the PDO is rated **moderately satisfactory** before restructuring and **satisfactory** after restructuring.

53. The PDO is rated moderately satisfactory measured against the target of a fully established "new market and institutional structure" by the closing of the project. In hindsight, it should have been made clearer that the project was necessary, but not sufficient in itself to sustain and conclude the overall reform process within the allotted time period.

54. The revised PDO after restructuring recognized the complexity and time needed for a new market to mature and focused on the actual building blocks of the reform. Major project achievements include the emergence of new strong institutions: NEDP supported, through investments and capacity building, the creation of NERC, the Market Operator, and the Rural Electrification Agency. Although the creation of the 18 successor companies cannot be credited directly to the project, the project financed institutional capacity building for their initial operations and provided substantial TA to the unbundling process.

55. The project also played a decisive role in the progress of the FGN “Roadmap for Power Sector Reform” and the establishment of appropriate pricing mechanisms to ensure the sector's financial viability. NEDP supported NERC in the revision of the multiyear tariff order (MYTO) to introduce a cost-reflective end-user tariff and 'life-line' mechanisms to protect the most vulnerable consumers.⁷ NERC implemented the new MYTO tariff starting from June 1, 2012, which provides for a phased increase of electricity retail tariffs to cost-reflective levels, contemporaneously with a similar increase in the domestic gas prices. Communication outreach on MYTO, conducted by NERC and financed by the project, paved the way for a smooth transition to the higher tariffs. Compared to the public outcry following the removal of fuel subsidies, the increase in electrical tariff, albeit substantial, was widely accepted as a necessary step toward an improved power sector.

56. The project enabled the PMU to evolve into a corporate planning and service provider for a number of donors as well as internal clients such as NBET and TCN. Capacity-building programs were carried out to build capacity for the ERSU to properly address and manage project safeguard issues (section 2.4). Other communication and support activities included a HIV/AIDS prevention and awareness campaign conducted for PHCN employees in collaboration with the National Action Committee on AIDS.

57. The project supported BPE in carrying out its mandate of privatizing the power sector utilities. Major milestones achieved by BPE include the completed bidding process for the privatization of PHCN successor generation and distribution companies. NEDP financed an international consultant to update the performance indicators in the management contract and provide advisory services on the recruitment process for a management contract for TCN. Under this contract, which came into effect in July 2012, TCN will remain under the government's ownership under a 3+2 year management contract with Manitoba Hydro International. The management contract is designed for improvements in management performance and transparency of operational and investment requirements and decisions. The project also supported BPE in its stakeholder consultation meeting in September 2011 with the PHCN labor union to discuss the implications of privatization.

PDO II. Increase efficiency in the power sector and improve the supply of electricity and service delivery.

Achievement of the PDO is rated **moderately satisfactory**.

58. The project contributed financed transformers and substations' upgrades that led to a significant improvement in grid capacity and efficiency. NEDP financed the installation of 330/132 kV, 150 megavolt amperes (MVA) transformers and 132/33

⁷ See annex 3 for details on the new MYTO.

kV, 60 MVA transformers in priority areas chosen by TCN. A total of 810 MVA were installed at the selected substations, 30 percent more than the target of 620 MVA at project closing. To provide an idea of the size of the contribution in terms of improved efficiency, if converted, 810 MVA are roughly equivalent to a new power station of about 600 MW of available capacity (assuming a power factor of 75 percent).

59. NEDP also ensured uninterrupted supply in Victoria Island, Lagos, the business center of Nigeria, by providing a temporary mobile substation to substitute for the sinking and heavily dilapidated Alagbon substation, thus allowing the urgent rehabilitation work to begin as financed under NEGIP. NEDP intervention was timely to avoid a complete shutdown of the power distribution to the island, with potentially severe consequences for business activities, the hospitality industry, residents, and overall economic growth.

60. Electricity supply improvement was achieved by conversion of the distribution grid from low voltage long lines to shorter high voltage distribution lines in the cluster areas. This improved tail end voltage from 180 V to 220 V, lowered outage hours, and improved the end-user voltage to 33 kV. This had direct positive effects on the living standards of ordinary citizens because less household equipment was burned out by voltage fluctuations. Cluster-level losses were also reduced to less than 12 percent in the Karu, Ogba, Luth, Agege, and Challenge clusters. Furthermore, the introduction of aerial bundled cables for the low voltage grid and pole-mounted transformers, along with prepaid meters (PPMs), made electricity theft more difficult. Taking the Karu cluster as an illustrative example of project impacts in the intervention areas, table 2 reports the situation before and after NEDP, linking the project interventions with benefits and impacts for end-users (extract from the borrower report).

| Indicator | Before NEDP | After NEDP | End-user impact |
|-----------------------------|--|--|---|
| Transmission | | | |
| Energy | 7x10 ⁶ kWh (Oct. 2010) 1–2 hours/day average | 13x10 ⁶ kWh (Mar 2012) 12–18 hours/day average | 6x10 ⁶ kWh more at better voltage to power households and small and medium enterprises |
| Transmission losses | ~40% average losses (29 kV) | ~20–25% average losses (tail-end 33 kV) | Better tail-end quality, more power received and billed, load shedding decreased |
| Transformer specifications | None | Self-protected transformers (integrated external surge protection and LV circuit breakers) | Tamper-proof meters, simpler, quicker operations and maintenance |
| Distribution | | | |
| End-user voltage | 140–180 V | 220 V | Lesser damage to equipment, few trippings |
| Feeder tripping | 25–35 times per Month avg. | None since September 2011 | No feeder faults or trippings since September 2011 |
| Power delivered | 27–35 MW | >100 MW | Increase in delivered power capacity |
| Prepaid meters (PPM) | | | |
| Free PPM | None | More than 60,000 PPMs | Free PPM installation; “managing what you can measure” Prepayment model led to |

| | | | |
|--------------------------------|--|--|--|
| | | | better demand management Reduction in rent-seeking behaviors, enabling more citizen whistle-blowing behavior |
| Split-design meter | Meter at premises or direct, unmetered connections | Metering unit mounted on pole, monitoring and uploading interface unit at customer premises Visible PPM, with accessible interface at customer premises | Customers controlling and paying for power, while at the same time discouraging tampering; encouraging neighborhood policing |
| Card recharge purchase/vending | None | Recharge cards for PPM available at PHCN offices and a few vending locations | Convenience to buy/recharge cards, although at limited locations Plans to increase number of retailing channels, including online |

61. Lower distribution inefficiencies paired with transmission improvements helped DISCOs improve revenue management by improving accounts receivables, replacing the significant commercial losses associated with credit metering and traditional billing with cash flow positive prepayment systems. According to data collected by the Karu Business Unit (KBU) in the Abuja DISCO, the energy received by the DISCO increased about 56 percent between the last two quarters of CY11 and Q1 CY12 (from an average of 8,296,396 kWh to 12,950,250 kWh per month) due to the rehabilitation of the Karu Substation. Over the same period, sales of electricity associated with the PPMs more than doubled (from an average of ₦20,633,409 per month to an average of ₦41,807,582 per month), with considerable effects on the total collections for the KBU. It is worth noting that, as of December 2011, the KBU is consistently raising more revenue from PPM sales than estimated billing (average of ₦41,624,254 per month from sales of PPMs compared to an average of ₦25,731,358 per month from estimated billing).

62. HVDS and PPMs were installed in six geographical clusters: Agege, Luth, and Ogba in Lagos, Challenge in Ibadan, and the Abuja suburbs of Karu and Kubwa. Inconsistency in the number of targeted clusters and their broad definition, however, limit the ability to assess project achievements based on the number of clusters completed.⁸ During the restructuring, additional funds were allocated to this component, but the additional clusters were never named. It is therefore unclear whether new geographical areas were supposed to be included, or, more likely, if the intention was to increase the number of feeders in the existing set of clusters. If this was the case, the project supported investments in 24 11kV feeders, as shown in annex 2.

⁸From page 46 of the NEDP PAD: a cluster could be defined as (i) the network of a distribution transformer and its downstream infrastructure; (ii) a 11 kV feeder emanating from a 22/11 kV substation; or (iii) a 33/11 kV substation and the downstream network.

63. Service delivery has improved, which has added credibility to sector reform and created tangible benefits for households and enterprises. The customer-friendly interface of the meters has made it easier for customers to read and control the amount of energy they consume. This, in turn, provided positive consumer benefits in terms of efficiency and better demand-side management of electricity consumption. Consumers on PPMs are able to “pay what they consume” instead of relying on PHCN-estimated billing.

64. The introduction of PPMs, which are not common in Nigeria, was strongly welcomed in the target areas. One of the indirect benefits of the project was that it induced, among customers, demand-side governance and social accountability behaviors. People today demand better and more transparent service delivery from Nigerian institutions, particularly PHCN and NERC. Based on experiences from areas benefitting from the metering program, other PHCN consumers are voicing their concern on the transparency of estimated billing and requesting more PPMs to be installed, particularly split meters, which allow consumers to better monitor their energy consumption.

65. However, some shortcomings persist: (i) the lack of a plan to address outstanding customer debt; (ii) despite the DISCO launching an awareness campaign stating that meter installation is free to consumers, during the ICR field visits there were reports of customers being asked to pay for PPM installation; and (iii) purchasing the prepaid electricity codes continues to be a time-consuming process for customers, who often must queue for several hours. These issues have been discussed with the concerned entities and remedial actions identified, such as by introducing third party vendors for electricity credit (with NERC support) to facilitate purchasing of electricity codes, and promoting transparency through additional communication. Under current IDA operations, in addition, support will continue to be provided to DISCOs to improve performance and service delivery. Annex 5 and section 3.6 provide further details on project impacts on consumers, summarizing the findings of a beneficiary assessment conducted by an independent consultant in the areas around the Karu cluster in Abuja.

PDO III. Demonstrates models to scale up electricity access.

Achievement of the PDO is rated **moderately satisfactory**.

66. Outcomes under this PDO relate to the provision of grid-based and off-grid rural electrification models.

67. Rural grid-based electrification was expanded in the states of Enugu, Ogun, and the Cross River State. Expansion was achieved through a combination of extending the grid and reinforcing the existing network with LVDS, HVDS, and PPMs. NEDP installed a total of 8,100 meters, connecting up 24,600 households in 40 communities. Benefits arising from these activities are equal in nature to those discussed under PDO II in terms of increased efficiency and improved electricity supply and service delivery (the scale of the intervention, however, was significantly smaller).

68. Electrification was also extended to nine commercial farms in Kaduna State. These farms were selected in synergy with the Commercial Agriculture Development Project. To maximize diversification of benefits, farms operating in different market segments were targeted, particularly poultry, fruit trees, dairy, maize, and fishery. The project intervention improved the productivity and competitiveness of those farms by

providing better and cheaper electricity and by providing considerable savings compared to diesel generators in use before the project intervention.

69. Off-grid pilots were conducted in three selected sites of the National Fadama Development Project, a Bank-supported project to increase the incomes of rural agricultural areas. The three sites, Ogun, Imo, and Kaduna were selected based on the commercial performance of the user groups. The projects also installed 45 solar home systems, 17 solar street lights, including for the community markets, and two solar water pumps to promote the commercial activities of the user groups.

70. A different business model was developed for the Mfaminyen Village in the Cross River State. Mfaminyen is a rural village remotely located 126 km away from the nearest city, Calabar, reachable only by dirt rural roads, which are often impassable during the rainy season. Prior to NEDP, the Mfaminyen Village had no power supply, limited supply of clean water, and the community depended largely on fuelwood for cooking and kerosene lanterns for lighting. A few inhabitants also owned small diesel generators. Due to the remote area, however, and the increasing costs of fuel, operating the generators was very expensive. As part of project activities, NEDP financed the installation of solar photovoltaic (PV) panels for electrification and battery charging, a public community space with an information and communication technology (ICT) business center and television, solar street lights, and a solar-powered water borehole.

71. This was a successful pilot that demonstrated that renewable energy was both feasible and affordable in rural areas. Residents benefited from increased savings (due to the phase out of generators) and improved clean water and sanitation. Furthermore, the village has been able to generate revenue from neighboring villages for use of its battery charging services and water retailing, and is currently marketing itself as eco-tourism attraction in Nigeria. The project involved a conservation society operating in the village, the whole community, the Rural Electrification Agency, and state government very early in the process. Based on the success of the initiative, the state government committed to replicating the intervention in other villages, maximizing the leveraging opportunity created under NEDP (an endorsement letter from the state government is attached in annex 10).

72. TA was provided for the implementation of a renewable energy master plan, which is expected to be finalized in December 2012, and will form an input to the Renewable Energy Act expected in 2013/14.

73. Despite the success of most of the on-grid projects and the Mfaminyen Village pilot, the following shortcomings affected the rating of this PDO:

- i. A microhydro project in Ajassor was considered but abandoned after the state government began grid-based electrification and extending the lines to Ajassor became the least-cost option.
- ii. Some of the contracts for the rural electrification in Ogun, Enugu, and Cross River State were not concluded in time due to procurement and implementation delays.
- iii. GEF resources available for this component (amounting to a total of US\$1 million) were significantly underutilized, causing a loss of grant resources for the project. Only a disappointing 20 percent of the embedded grant funding from GEF was utilized for NEDP (about US\$200,000).

PDO IV. Support gas sector reform to improve gas supply for power generation.

PDO before restructuring: Support for the government's gas sector reform to develop natural gas resources.

Achievement of the PDO is rated **satisfactory** before and after restructuring.

74. NEDP achieved this PDO by supporting the establishment of the Gas Aggregator of Nigeria as well as development of the Gas Unit in PHCN. The support included training, policy dialogue, and short-term TA. In addition, NEDP supported the development of the strategic aggregation rules for the domestic gas market and the preparatory work on the risk mitigation aspects, leading to the development of NEGIP.

75. The FGN's Gas Master Plan, launched in 2009 with the support of NEGIP and NEDP, has marked a major shift in the government's attention to this key driver of economic growth and has gained broad-based support from the upstream oil and gas industry including both by private gas producers as well as government-owned oil and gas companies under NNPC. Master plan implementation has already achieved a number of significant milestones toward establishing a balanced domestic gas market that would provide the right pricing signals and incentives to increase gas production and processing for domestic consumption. These milestones include:

- i. executing the first commercial Gas Supply and Aggregation Agreements (GSAA) with the Shell Petroleum Development Company (SPDC) and Chevron Nigeria Limited Joint Ventures (CNL JVs), backed by NEGIP PRGs—the joint ventures represent approximately 70 percent of domestic gas capacity⁹;
- ii. implementing the revised transitional commodity pricing structure, with an initial increase from US\$0.1/mmbtu to US\$1.0/mmbtu (implemented in Q4 2010), to reach near export parity by 2013 with a target price of US\$2.0/mmbtu;
- iii. establishing the Gas Aggregation Company Nigeria Limited (GACN) in January 2010 to facilitate access and firm gas allocation from domestic gas suppliers to existing power plants and prospective power sector investors (and other gas-based industries); and
- iv. developing a robust contractual framework for gas supply, including a bankable model GSAA and gas transport agreements, and a gas transmission network code to facilitate subsequent gas sales in the sector.

76. The reform actions are starting to yield results in terms of increased domestic gas availability. In 2008, only about 300 mmscfd of gas was available for domestic

⁹ In August 2012, SPDC informed the World Bank that the gas assets in the Western axis supplying the EGBIN Power plant had been sold and thus SPDC would no longer require a PRG for the gas supply to EGBIN GENCO. The asset sale has led to the otherwise finalized SPDC PRG transaction being put on hold while an alternative SPDC gas supply to a government owned power plant in the eastern axis is being developed.

consumption against a demand of 600 mmscfd. Severe gas supply constraints have been relieved over the last 18 months with available supplies increasing to 1,000 mmscfd by Q4 2011. Part of the success can be traced to the implementation of the FGN Gas Master Plan. The positive trend is expected to continue as the FGN pursues the 12 month Gas-to-Power Emergency Development Plan, which aims to double the amount of gas available to the power sector to fuel the new power plants being commissioned under NIPP.

77. *Overall Efficacy Rating.* Based on the assessment above and the sub-ratings as summarized in Table 1, the achievement of Project Development Objectives (efficacy) has been rated *moderately satisfactory* before and after restructuring. A different weight has been attributed for each PDO statement. In particular, given the project relevance to the reform process, the overall outcome ratings have been guided by project achievements with respect to this key PDO. The other PDOs were given less weight because: (i) investments underpinning PDO 2 were designed to be supporting the reform efforts under PDO 1; (ii) the rural and renewable electrification activities underpinning PDO 3 were confined to piloting of concepts, and thus were limited in scope, even in the original design of the project; and (iii) the activities in the gas sector underpinning PDO 4 were mainly aimed at providing TA and limited in scope

3.3Efficiency

Project efficiency is rated substantial.

78. *Methodology.* As part of the ICR process, an economic and financial re-evaluation of the Project was carried out. This re-evaluation took into account changes in assumptions for some parameters, namely: (i) actual project costs; (ii) revision of the project implementation schedule; (iii) lower volume of incremental energy generated and therefore delivered to the transmission and distribution system; and (iv) the new MYTO introduced in June 2012.

79. A new economic and financial model has been developed, due to the unavailability of the one used during original appraisal and restructuring. To ensure consistency of results, the new model was designed and tested based on the details available in the PAD. Results of the tests confirmed the values found in the PAD and restructuring paper (see Table below). At restructuring, the new model appears to be more conservative in terms of values, but confirms the trend of improved Economic Internal Rate of Return (EIRR) and the Financial Internal Rate of Return (FIRR).

80. *Project Costs and Benefits.* Actual project costs and yearly disbursement figures were used for the re-evaluation. In line with the original analysis, the Project investments yielded five distinct benefits: (i) reduction of losses (technical and non-technical); (ii) improved power quality and supply reliability; (iii) avoided captive generation; (iv) improved revenues; and (v) enhanced customer satisfaction.

81. *Results.* The table below provides a summary of the result of the economic and financial re-evaluation and comparison with the original PAD and restructuring paper (considering both the original and new models).

| Table 3. Re-evaluation Summary | | | |
|--------------------------------|-----------------|----------------|-------------|
| | | Original Model | New Model |
| Original Project | | | |
| Total | EIRR (%) | 43.2 | 43.2 |
| | FIRR (%) | 16.6 | 16.6 |
| Restructuring | | | |
| Total | EIRR (%) | 47.01 | 43.4 |
| | FIRR (%) | 19.07 | 18.6 |
| ICR | | | |
| Total | EIRR (%) | N/A | 46.4 |
| | FIRR (%) | N/A | 24.8 |

82. It appears clear that the economic and financial feasibility of investments remains in the same range of the estimation at the time of appraisal and restructuring. The EIRR and the FIRR remain strong, reflecting the economic and financial benefits arising from the project. The lower load growth and the delays in project implementation had only limited impacts on the EIRR and FIRR.

83. *Sensitivity Analysis.* A sensitivity analysis was carried out, assuming the load increase forecasted during original appraisal and restructuring (4 percent). In this case, the EIRR and FIRR for the project are equal to 50.76 percent and 28 percent respectively, representing higher rate of returns compared with the original project and confirming even more the robustness of the project efficiency.

84. A separate analysis was also carried out for the rural and renewable electrification component, not included in the economic and financial analysis of the original project and restructuring. EIRR and FIRR for this component are 37.8 percent and 22.3 percent, conforming also in this case the economic and financial viability of the project.

85. Considerable nonquantifiable benefits also materialized from the project, such as overall improvements in beneficiaries' life standards, as outlined in the beneficiary assessment, as well as reduced time spent on water and firewood collection and better health and safety conditions caused by the phasing out of fuel-based electricity generation (both in terms of reducing emissions and decreasing the risks of accidents caused by kerosene and candles). Further details on the economic reevaluation are presented in annex 3.

3.4 Justification of Overall Outcome Rating

86. *The overall project outcome rating is moderately satisfactory.* This rating combines the assessment of project relevance (section 3.1), efficacy (section 3.2) and efficiency (section 3.3), and takes into account the World Bank Operations Policy and Country Services guidelines on rating formally restructured projects.¹⁰

¹⁰ For projects with formally revised objectives, project outcomes are assessed against both the original and revised project objectives. The separate outcome ratings were weighed in proportion to the share of actual credit disbursement in the periods before and after restructuring. In the case of NEDP, disbursement prior to restructuring amounted to 70 percent of the credit.

3.5 Overarching Themes, Other Outcomes, and Impacts

Poverty impacts, gender aspects, and social development

87. NEDP contributed directly to broad social development by providing communities in cluster areas with improved access to power, connecting the rural poor to the grid, and promoting community involvement in the rural electrification pilots. NEDP's poverty impact component was met by installation of PPMs, which allowed customers to control their energy spending, while shorter outage hours reduced spending on generators. The MYTO also safeguarded a life-line tariff that protects poor consumers from power price increases.

88. Annex 5 describes some observed benefits in the Karu distribution cluster in Abuja. These include reduced pollution due to the replacement of diesel generators, increased productivity and income for small and medium enterprises, increased consumer awareness on energy management and savings, and reduced electricity theft and meter tampering.

Institutional change/strengthening

89. Institutional strengthening was at the heart of the project design and implementation. Intensive dialogue and consultations with stakeholders and support for policy reforms, especially post-2010, contributed significantly to institutional changes in the power sector.

Other unintended outcomes and impacts (positive or negative)

90. There were no other unintended outcomes and impacts observed under this project.

3.6 Summary of Findings of Beneficiary Assessment

91. A qualitative beneficiary assessment was conducted upon completion of NEDP to measure the socioeconomic results of the transmission and distribution improvement components as perceived by the residents of some of the intervention areas. The Karu cluster was selected on the basis of its perceived success as a complete rehabilitation and CREST roll-out scheme and was compared to a nonintervention area, Zuba. Results from two other full intervention areas (those that received pole-mounted transformers and PPMs), Mararaba and Nyana, were also captured and compared to partial intervention areas (received either pole-mounted transformers or PPMs).

92. The survey's main findings are¹¹:

- i. *Overall*: Most of the people interviewed in Karu agreed that the project brought significant benefits in terms of better electricity availability, services, and quality. In full intervention areas, the majority of respondents now have between 10 to 24 hours of power per day, every day of the week, with most reporting more than 18 hours.
- ii. *Residential customers*: In Karu and Nyanya, residential customers reported as much as a 60 to 90 percent reduction in generator fuel expenditure, with the

¹¹ Further details on the methodology, results, and case studies are reported in annex 5.

sharpest reductions cited in Karu. Respondents also provided several anecdotes illustrating improvements in the quality of their personal and family lives due to the improvement of electricity services.

- iii. *Small and medium enterprises:* Among small and medium enterprises, savings on generator fuel have been used to expand operating capital or otherwise increase disposable income. Some businesses pass on the savings to their customers, as in the case of print shops that have reduced the unit cost of printing and photocopying by as much as 50 percent when power is available.
- iv. *Social service providers:* The impact of improved power supply on the ability of social service organizations to meet their objectives is significant. Many health centers are able to store vaccines for longer and generally dispense their services more efficiently. In schools, teaching and learning processes have been enhanced, especially on computer-based modules. By contrast, those schools that have been unaffected by the improvements still find it difficult to deliver even the most basic practical courses in science and technology.
- v. *More attention to energy efficiency and better demand-side management:* Billing is now widely perceived to be more transparent and commensurate to usage.

93. Despite the positive impacts mentioned above, a series of shortcomings were reported during the survey. Some examples include: (i) although meters were installed free of charge, people reported that they were told to pay for “wiring and connection” rather than for the meters; (ii) long queues to top-up meters; and (iii) mixed results in partial intervention areas. These issues were discussed with the PMU and other stakeholders to identify remedial actions, such as intensification of the public awareness campaign to inform the public about the installation of meters free of charge, increasing the number of third party vendors for electricity credits, and the replication of NEDP activities to continue CREST-like investments in other clusters.

4. Assessment of Risk to Development Outcome

94. *The rating of risk to development outcome is assessed as significant.* The borrower is committed to ensure that the investments carried out under NEDP are not only sustained over time, but also scaled up to improve the performance of the Nigerian power sector. There is, however, a series of risks affecting the sustainability of development outcome, which are outlined in this section.

95. *Sector reform.* Commitment to the presidential power sector reform roadmap remains well entrenched at all levels of government. However, vested interests are still active and may lead to some loss of momentum in the implementation of the reforms (in addition to the recent departure of the Minister of Energy and the director of BPE). For the PHCN privatization process itself, the relatively stringent application of due process, including the voluntary disclosure of conflict of interest by the Minister, lends some credibility to the vetting process by BPE and National Council on Privatization and will hopefully set precedence for other members of government with similar interests. If the minister’s conflict of interest issues had not been disclosed during this early stage, it would have risked discrediting the evaluation process with the possibility of derailing the entire process later, after contracts had been awarded. Given the wide scope and complex context of the reform process, future setbacks are still to be expected. Continuous engagement with government

stakeholders, also as part of the PSGP project preparation, will be needed to keep supporting reform momentum.

96. *Rural and renewables electrification.* Stakeholders and local governments provided strong positive feedback and commitment to long-term sustainability on NEDP rural and renewable activities. Strong community ownership of project activities provides reassurances regarding proper maintenance and operation of project assets. The FGN, however, needs to remain involved in and fund rural and renewable electrification schemes. One of the positive outcomes of power sector reforms was the establishment of a Rural Electrification Agency and the associated Rural Electrification Fund, which are imperative and important for developing countries like Nigeria with a large rural and poor population. To be able to meet this important mandate, the Rural Electrification Agency needs substantial financial and technical support paired with a comprehensive capacity-building plan. There is also the need to introduce provisions, currently lacking in government privatization plans, delineating targets for rural and renewable energy, or incentives to serve either of these areas. Once targets or models are established, the government needs to take actions to ensure their implementation, effectiveness, and efficacy. This requires strong commitment from all levels within government, significant resource mobilization in support of rural electrification, and an increased use of renewable resources in Nigeria to ensure sustainability and long-term success.

97. *Investments.* Design and implementation of all investments under NEDP were carried out in close partnership with the government agencies responsible for the sector. Those institutions have strongly committed to maintaining and operating project assets to guarantee continuous delivery of benefits to consumers. However, availability of O&M funds remains a concern. On the transmission side, the management contractor for TCN provides reassurances on its commitment to proper and well-funded O&M for project assets. There has been pressure, however, to cancel the contract due to lack of clarity over the responsibility to sign the contract between BPE and the Bureau of Public Procurement (BPP). BPP requested the President Office to cancel the management contract, claiming that the procurement and signing of the contract was in BPP's institutional mandate and not BPE. As of today, however, the President did not accept BPP's argument and the management contract is still valid. This contract is a pillar in the reform process. Its cancellation would not only slow down the much needed performance enhancement of TCN, but also give a strong negative signal to the market as the FGN is embarking on a series of IPPs and privatization of GENCOs and DISCOs. On the distribution side, some of NEDP investments have already been included in the assets evaluation of DISCOs to be privatized, and the private owner will ensure proper O&M. For the DISCOs that will remain in public hands, there is a risk of unfunded O&M and sufficient steps may not be taken to improve the performance of those DISCOs.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

Bank performance in ensuring quality at entry

98. *The Bank's performance in ensuring quality at entry was rated **moderately satisfactory**.* The project's fast-track preparation was in direct response to the government's request for a flagship operation to support the implementation of the

recently passed Energy Sector Reform Act. The team was able to respond to the request in record time, building on the implementation arrangements already established under TDP. A series of preparatory studies and consultancy services were carried out to ensure proper preparation of project investments and identification of TA activities. However, rapid project preparation left little time to prepare the necessary procurement documentation to allow rapid launch of the investment program, and while the risks to project activities were properly identified, the initial three-year time frame required for project implementation was underestimated.

Quality of supervision

99. *The overall rating for quality of supervision was **satisfactory**.* Positive aspects of supervision included a strong focus on policy dialogue on long-term development goals and technology solutions, supervision, and implementation support to drive accelerated performance after initial slow disbursement. The dialogue included detailed discussions and advice to government and utilities on energy reform, cost-reflective tariffs, privatization and other policy issues, close involvement in portfolio reviews, and site visits. Because of the presence of Bank specialists in the areas of procurement, financial management and safeguards, fiduciary issues were monitored continuously and they were able to quickly react and identify mitigating measures for fiduciary issues that emerged during the project.

100. The deep level of dialogue and strong sector relationships built over successive projects allowed the Bank to be proactive and quickly adapt to emerging issues, as reflected by the restructuring of the project in 2010. Despite the lack of proactivity in the government strategy, the Bank remained strongly engaged in the sector and was able to quickly process the restructuring after the government's formal request. The Bank team also provided continuity, with two task team leaders for the project during project preparation and implementation. Since July 2010, the project has been supervised by a task team leader based in Abuja, which means daily client contact. To increase stakeholders' participation and highlight the project benefits, the World Bank's implementation support also focused on community outreach and communication, in particular during the launch of the PPM campaign. The flexibility built into the restructuring allowed the project to achieve its development objectives despite the shift in government strategy in 2010.

Justification of rating for overall Bank performance

101. *Bank performance is rated as **satisfactory**.* This rating is a combination of strong Bank performance during supervision and the moderately satisfactory rating for quality at entry. The rating takes into account that there were compelling reasons for expediting Board approval, and that the Bank team did proactively monitor changing circumstances and restructured the project to address those circumstances and flexibly supported a homegrown reform process while providing intensive hands-on implementation.

5.2 Borrower Performance

Government performance

102. *Government performance is rated **satisfactory**.* The government was very active during project preparation. Despite some initial delays in the ratification process for the credit, it demonstrated strong ownership and commitment to achieve development objectives. After 2008, due to the shift in FGN's priority, the reform

momentum, which delivered important results such as the unbundling of PHCN and the creation of new institutions in the sector and supported the results and investments under NEDP, came to a halt. In 2010, however, with the relaunch of the Roadmap for the Power Sector Reform, a clear strategy was put in place and the government steered the sector in the right direction again. Multiple changes in government strategy and periodical lack of ownership caused delays in project implementation and project restructuring, but they are not deemed significant enough to reduce the performance rating.

Implementing agency(ies) performance

103. *The performance of the implementing agency (PMU) is rated as **satisfactory**.* PHCN-PMU was effective in implementing the project and monitoring the progress of various components. The PHCN-PMU helped achieve project objectives through extensive collaboration with the BPE and NERC. The success of the PMU in project implementation has caused it to be given the responsibility to implement additional projects such as NEGIP. In terms of fiduciary capacity, shortcomings were noted in the PMU's FM aspects of project implementation (although they have been addressed during project implementation with the support of the Bank's fiduciary specialists).

Justification of rating for overall borrower performance

104. *On balance, borrower performance is rated **satisfactory**.* This rating takes into account that the minor shortcomings in FGN performance did not affect the borrower's overall commitment to the project and the satisfactory performance of the implementing agency, which continued to implement the project even when reform momentum slowed.

6. Lessons Learned

105. The project offers several strategic and operational lessons for the design of future power sector projects.

106. *Leverage IDA financing, creating scalable islands of excellence.* NEDP's investment program demonstrates best practice on how limited IDA financing can drive change through a combination of investment to create visible results on the ground and using TA to improve the effectiveness of larger government-funded programs. The CREST approach did not only provide investment capital to replace dilapidated infrastructure, but provided tangible examples of the solutions available to the utilities in addressing core operational and technical challenges. Full-scale implementation of these technical and commercial innovations, customized to the Nigerian context, have been critical in convincing an often conservative cadre of engineering and utility experts of the feasibility and direct benefits that can be realized by addressing entrenched technical, commercial, and social challenges affecting the performance of urban power distribution.

107. Because the privatization program is expected to trigger dramatically increased investments in distribution infrastructure, new operators will look for solutions to the same challenges addressed under NEDP. It is therefore likely that the examples provided by the project will continue to influence the distribution utility turnaround efforts for years to come. Some of these best practices that could be widely replicated in other operations include:

- i. *Cluster approach:* NEDP has actively targeted selected geographical areas, addressing the full electricity distribution value chain, from upstream

transmission-distribution delivery capacity to downstream service provision and commercial interfaces. The HVDS cluster approach has, through this comprehensive approach, achieved not only technical performance, but also clear and measurable commercial impact.

- ii. *Customized specifications (transformers and PPMs)*: The technical design of distribution investments aimed at addressing long outage times and frequent overloading of transformers (often leading to complete destruction of the equipment) by the introduction of “self-protected” transformers, better suited to Nigerian operational and maintenance specificities than the off-the-shelf transformers.
- iii. *PPM split design*: The introduction of split-type PPMs, with the metering function located on the pole outside the customer premises and only the recharge interface inside the customer premises, has reduced the ability to defraud and tamper with the metering function and makes it easier for the utility to maintain and verify the meters (because access to customer premises is no longer necessary).
- iv. *Stakeholder engagement*: Involving communities and village governance structure and other NGOs/agencies working in the area facilitated project implementation, in addition to assuring sustainability over time. Involving local community not only helped in creating local ownership, but also transferred capacity and knowledge. The project’s cluster approach built a strong bond with the host communities and beneficiaries because the project was seen as providing complete solutions and lasting results rather than piecemeal investments where real improvements are held back by remaining deficiencies.¹²
- v. *Project readiness for implementation during preparation*: When designing projects, emphasis should first be placed on having adequate procurement and accounting capacity in place rather than project effectiveness. Procurement staff should be identified early and given adequate training. The team should ensure that adequate procurement capacity and draft documents (bidding document, requests for proposals, terms of reference, and so forth) are also put in place before effectiveness.
- vi. *Flexibility in project design*: Reform processes of the magnitude envisaged in Nigeria take time to mature, and are often subject to unforeseen changes in policy and/or implementation timeline. Increased flexibility in project design and adapted PDOs might have allowed the project to avoid the restructuring process.
- vii. *Use Bank projects to pilot innovative approaches for service delivery and access*: The project demonstrated that it is possible to implement models for alternative renewables and rural off-grid solar PV that can be replicated in other projects and regionwide. The projects in Mfaminyen Village and Kaduna’s commercial farms have been completed successfully and are functioning well.
- viii. *Strong sector institutions are important to reform sustainability*: As the sector reforms mature, and privatization and competition increase, FGN’s emphasis will shift from financing and building infrastructure to building institutions

¹² This is also evident from the beneficiary assessment, where areas only receiving metering investments were much less satisfied, because the overall supply improvements had not been realized due to remaining grid constraints.

and capacity for policy formulation, regulation, and electricity market operations. NEDP's early support to the development of these institutional pillars of the new sectoral landscape allowed these institutions to play a crucial role as co-anchors of the day-to-day actions needed to move the reform forward and broaden the public and business appeal through outreach and consultation programs. It is difficult to see how the tariff reform implemented on June 1, 2012, could have been developed without the emergence of a strong regulator able to reconcile the needs of the investment community, consumer interests, and policy objectives into a coherent tariff model and regulatory order. FGN needs to continue the dedicated and targeted efforts to strengthen and improve the governance of NERC, Bulk Trader and TCN, as well as other key institutions in the sector, to ensure that the gains already achieved are not lost in future changes in administration.

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

108. The ICR was submitted to the Borrower (Implementing Agency) and the comments received were integrated in the text.

Annex 1. Project Costs and Financing

Project Cost by Component (in US\$ million equivalent)

| Components | Appraisal estimate (US\$ millions) | Estimate at restructuring (US\$ millions) | Actual (US\$ millions) ^a | Percentage of appraisal (original/restructuring) |
|--|------------------------------------|---|-------------------------------------|--|
| 1. Transmission system development | 125.7 | 54 | 56 | 45/104 |
| 2. Distribution efficiency enhancement | 33.2 | 92 | 99 | 298/108 |
| 3. Access expansion and renewables | 10 | 12 | 7 | 70/58 |
| 4. TA for PMU | 8.2 | 11 | 6 | 73/55 |
| 5. TA for reform and private participation | 3.9 | 3 | 4 | 103/133 |
| Total project costs | 181 | 181 | 172 | 95/95 |

a. Disbursement data per component only approximate.

Financing

| Source of funds | Type of cofinancing | Appraisal estimate (US\$ millions) | Actual (US\$ millions) | Percentage of appraisal |
|-----------------|---------------------|------------------------------------|------------------------|-------------------------|
| Borrower | | 8.00 | 8.00 | 100 |
| GEF | | 1.00 | 0.2 | 20 |
| IDA | | 172.00 | 164.00 ^a | 95 |

Annex 2. Outputs by Component

Component 1: Transmission System Development

Original amount allocated: US\$120 million

Restructured amount: US\$54 million

Actual disbursed amount: US\$53.35 million

- Transformers supplied:

| Transformers | Substations |
|-------------------------|--|
| 2 x 60 MVA, 132/33 kV | Alagbon |
| 1 x 60 MVA, 132/33 kV | Mando (Kaduna commercial farms) |
| 2 x 60 MVA, 132/33 kV | Karu cluster |
| 2 x 60 MVA, 132/33 kV | Kubwa cluster |
| 1 x 150 MVA, 330/132 kV | Shiroro (primarily for Abuja upstream voltage) |
| 4 x 60 MVA, 132/33 kV | Various (deployed by TCN for Ibadan cluster and Lagos) |
| Total = 810 MVA | |

- SCADA system extension to the 33 kV level, making load shedding at the 33 kV level, sparing essential services, when possible.
- Installation of MIS for TCN at headquarters, regional and subregional offices, and in transmission work centers. This was an activity that was transferred to NEDP from TDP during TDP restructuring.
- TA work to support PMU with supervision of supply and installation contracts for transmission work, including implementation of environmental safeguards work.

Component 2: Distribution Efficiency Enhancement

Original amount allocated: US\$32 million

Restructured amount: US\$92 million

Actual disbursed amount: US\$95.65 million

- Equipment, installation, and supervision of distribution upgrades in Agege, Luth, and Ogba in Lagos, Challenge in Ibadan, and the Abuja suburbs of Karu and Kubwa.
- Installed equipment: concrete poles, cross-arms, insulators, bare aluminum conductors for 11 kV lines, distribution transformers, insulated bundled conductors for low voltage lines, PPMs, and associated information technology (IT) equipment.
- Customer service centers set up to serve each cluster. Customers can purchase recharge cards for PPMs and submit complaints.
- Procurement of equipment for Idi-Araba cluster in Lagos has been completed and installation work will take place under NEGIP.
- Capacity building and training in utility management for DISCO executives conducted at Virginia Polytechnic University in the United States.

| Geographical Cluster | No. of 11 kV feeders | No. of distribution transformers | No. of customers connected |
|-----------------------------|-----------------------------|---|-----------------------------------|
| Karu, Abuja | 3 | 900 | 13,500 |
| Kubwa, Abuja | 3 | 915 | 13,725 |
| Ogba, Lagos | 6 | 1,890 | 28,350 |
| Luth, Lagos | 4 | 960 | 14,400 |
| Agege, Lagos | 7 | 1,725 | 25,875 |
| Challenge, Ibadan | 1 | 450 | 8,000 |
| Total | 24 | 6840 | 103,850 |

Note: Transformers in Kubwa have been procured under NEDP and will be installed under NEGIP. Costumers will be connected only once the installation is completed.

Component 3: Access Expansion, Intensification, and Renewables

Original amount allocated: US\$8 million

Restructured amount: US\$12 million

GEF grant: US\$1 million

Actual disbursed amount: US\$7.17 million

- Grid-based electrification in Enugu, Ogun, and the Cross River State.
- Electrification of nine commercial farms (Alheri, Ajarms, Arfa, Emwey, Intercity, Kakaki, Katifi, Dankande and Saida) as cross-sectoral support to the Commercial Agriculture Development Project. The farms produce dairy, fisheries, fruits, maize, and poultry for the local market.
- Off-grid electrification in Mfaminyen in Cross River State: installation of solar PV panels for electrification and battery charging, a public community space with an ICT business center and TV, solar street lights and a solar-powered water borehole.
- Off-grid electrification in Ogun, Imo, and Kaduna: 45 solar home systems and 17 solar street lights, including for community markets, and two solar water pumps to promote the commercial activities of Fadama user groups.
- Cross-sector energy applications (using GEF grant) developed two model agreements with telecommunication companies that require electricity for telecom towers in off-grid rural areas.
- Support drafting of renewable energy master plan, which is due to be reviewed by mid-2013. Once reviewed, it will be an input into the Renewable Energy Act.

Component 4: Technical Assistance to PMU for Electricity Sector Work

Original amount allocated: US\$8 million

Restructured amount: US\$11 million

Actual disbursed amount: US\$7.01 million

- Completed TA for gas sector development, preparatory work for contractual frameworks and strategic aggregator rules that enable the framework.
- Training for ERSU at PMU and build ERSU capacity in hydroelectric stations of Kainji, Jebba, and Shiroro.
- Completion of strategy for evolution of PMU to a corporate planning and strategy unit in the Electricity Management Services Company that will support clients in the power sector in project management activities.

- Supported incremental operating costs of PMU during implementation of NEDP.
- Implementation of an HIV/AIDS awareness campaign for PHCN workers, coordinated with the National Action Committee on AIDS.]

Component 5: Policy Reform and Private Participation

Original amount allocated: US\$4 million

Restructured amount: US\$3 million

Actual disbursed amount: US\$4.76 million

- Support to BPE in awarding of Manitoba Hydro International 3 + 2 operate and manage contract of TCN.
- Support to BPE in issuing requests for proposals for bidding process for privatization of GENCOs (25 bids were received for the purchase of 6 assets on July 18, 2012) and DISCOs (bids received on July 31, 2012).
- Capacity building to support NERC in the technical, financial, and management capacity required to function as a credible new entity. This included advisory work on the MYTO and lifeline tariffs.

Activities to be transferred to NEGIP: Total amount equal to US\$3,700,000

- Conversion of LVDS to HVDS Kubwa cluster
- Remaining installation for rural electrification in Ogun, Enugu, and Cross River State
- Supply and installation of management information system (MIS) for TCN
- Supervision of MIS for TCN contract
- Supply of mobile substations (in Alagbo)
- Review of feasibility studies and engineering design for rehabilitation of Alagbon 132/33kV

Annex 3. Economic and Financial Analysis

The economic analysis of the project prepared during the processing of NEDP and reviewed during the restructuring in 2010, concluded that the Economic Internal Rate of Return (EIRR) of the Project was 47.01 percent and its Financial Internal Rate of Return (FIRR) was 19.07 percent (from respectively 43.2 percent and 16.6 percent in the original PAD).

Methodology. As part of the ICR process, an economic and financial re-evaluation of the Project was carried out. This re-evaluation took into account changes in assumptions for some parameters, namely: (i) actual project costs; (ii) revision of the project implementation schedule; (iii) lower volume of incremental energy generated and therefore delivered to the transmission and distribution system; and (iv) the new MYTO introduced in June 2012.

The key assumptions¹³ used in the calculation of the Economic and Financial Internal Rates of Return in the original PAD for the transmission & distribution components were:

| Assumption | Value |
|---|-------------------------|
| Average Alternative Costs, Captive Generation, Full Costs | 10.4 US\$/kWh |
| Cost of Service | 6.2N/kWh (4.6 US\$/kWh) |
| Load Factor | 0.806 |
| Load Growth | 4% |
| Non Incremental Sales | 15% |
| O&M cost | 1.5% |
| Oil Price | 400\$/per barrel |
| Power Factor | 0.85 |
| Shadow Pricing, Adjustment SCF | 1 |
| Shadow Pricing Adjustment Skilled labor | 0.67 |
| Tariff | 4.6 US\$/kWh |
| Technical Losses | 20% |

For this analysis, the same assumptions were considered, except for (i) the *load growth*; and (ii) *tariff*. The load growth was considered 0 percent since no significant increase over the long term was observed in the energy generated in the Nigerian grid. As consequence, all incremental sales were revised downwards due to the constraint in available generation. As for the tariff value, the analysis took into account the latest increase in MYTO tariff introduced in June 2012, strongly supported by the project. Details on the new MYTO are provided in the Box below.

Box A3.1 Revision of the Nigeria MYTO (2)

NERC was established pursuant to the Electric Power Sector Reform Act (Act) of 2005. Section 76(2) of the Act requires NERC to adopt electricity tariffs that:

- (i) allow full recovery of efficient operating costs, including a reasonable rate of return,
- (ii) give incentives to sustain improvement in efficiency and quality,

¹³The extra energy made available by the investment is estimated at about 15% of total energy injected (*non-incremental sales figure in the matrix*) resulting from fewer breakdowns subsequent to replacement of life-expired transformers with new transformers (source: PHCN's actual figures of breakdowns but assuming a conservative figure).

- (iii) send appropriate signals to customers to encourage increased efficiency in system use, and
- (iv) phase out or reduce cross-subsidies.

In discharging this obligation, NERC adopted an incentive-based, two-part tariff methodology in the first MYTO in 2008, which was originally pioneered by the United Kingdom in 1980s/1990s and widely adopted in many countries since. The MYTO's assumptions are subject to a minor annual review to reflect changes in inflation rate, gas prices and foreign exchange assumptions, and a major review of all the assumptions every five years to keep the tariff in line with current circumstances. While minor revisions have been implemented annually by NERC since 2008, it accelerated the major review due in 2013 upon request from DISCOs to reflect major changes in the companies' operating environments and the anticipated reform process outlined in FGN's roadmap, which was released in August 2010.

The roadmap estimates the long-term, cost-reflective end-user tariffs to be close to ₦22 per kWh (US\$0.14/kWh), more than double the previous average retail tariff of ₦10 per kWh (US\$0.6/kWh). Because FGN recognized that these reforms were a high priority, NERC implemented the new MYTO tariff starting from June 1, 2012, which allows a phased increase of electricity retail tariffs to cost-reflective levels, contemporaneously with a similar increase in the domestic gas prices.

The tariff structure includes specific tariff classes for residential, commercial, industrial, and special/street lighting consumer groups. NERC intends to maintain an R1 residential tariff class with life-line social safety net features, including no fixed charge and a low energy charge of approximately ₦4/kWh (approximately US\$0.025/kWh), making this one of the lowest tariffs charged in the region. The funding of the R1 tariff class will be levied through cross-subsidies from the other tariff classes and therefore will have to be well targeted and defined to include only the most vulnerable and poorest consumers. The other tariff classes will see marked increases ranging from 20–50 percent over 2012 with the main residential class R2 (as well as the lowest commercial and industrial tariff groups) expected to benefit from transitional subsidies allocated to reduce the incremental increase in fixed charges over two years.

A new economic and financial model has been developed, due to the unavailability of the one used during original appraisal and restructuring. To ensure consistency of results, the new model was designed and tested based on the details available in the PAD. Results of the tests confirmed the values found in the PAD and restructuring paper (see Table below). At restructuring, the new model appears to be more conservative in terms of values, but confirms the trend of improved Economic Internal Rate of Return (EIRR) and the Financial Internal Rate of Return (FIRR).

Project Costs and Benefits. Actual project costs and yearly disbursement figures were used for the re-evaluation. In line with the original analysis, the Project investments yielded five distinct benefits: (i) reduction of losses (technical and non-technical); (ii) improved power quality and supply reliability; (iii) avoided captive generation; (iv) improved revenues; and (v) enhanced customer satisfaction.

Results. The table below provides a summary of the result of the economic and financial re-evaluation and comparison with the original PAD and restructuring paper (considering both the original and new models).

| | | Original Model | New Model |
|-------------------------|-----------------|----------------|-------------|
| Original Project | | | |
| Transmission | EIRR (%) | 43.6 | 45.0 |
| Component | FIRR (%) | 13.2 | 11.0 |
| Distribution | EIRR (%) | 37 | 40.5 |
| Component | FIRR (%) | 25 | 25 |
| Total | EIRR (%) | 43.2 | 43.2 |
| | FIRR (%) | 16.6 | 16.6 |

| Restructuring | | | |
|----------------------|-----------------|--------------|-------------|
| Transmission | EIRR (%) | N/A | 58.16 |
| Component | FIRR (%) | N/A | 18.23 |
| Distribution | EIRR (%) | N/A | 33.5 |
| Component | FIRR (%) | N/A | 18.8 |
| Total | EIRR (%) | 47.01 | 43.4 |
| | FIRR (%) | 19.07 | 18.6 |
| ICR | | | |
| Transmission | EIRR (%) | N/A | 52.5 |
| Component | FIRR (%) | N/A | 29.18 |
| Distribution | EIRR (%) | N/A | 37.6 |
| Component | FIRR (%) | N/A | 18 |
| Total | EIRR (%) | N/A | 46.4 |
| | FIRR (%) | N/A | 24.8 |

It appears clear that the economic and financial feasibility of investments remains in the same range of the estimation at the time of appraisal and restructuring. The EIRR and the FIRR remain strong, reflecting the economic and financial benefits arising from the project. The lower load growth and the delays in project implementation had only limited impacts on the EIRR and FIRR.

Sensitivity Analysis. A sensitivity analysis was carried out, assuming the load increase forecasted during original appraisal and restructuring (4 percent). In this case, the EIRR and FIRR for the project are equal to 50.76 percent and 28 percent respectively, representing higher rate of returns compared with the original project and confirming even more the robustness of the project efficiency.

A separate analysis was also carried out for the rural and renewable electrification component, not included in the economic and financial analysis of the original project and restructuring. EIRR and FIRR for this component are 37.8 percent and 22.3 percent, conforming also in this case the economic and financial viability of the project.

Considerable nonquantifiable benefits also materialized from the project, such as overall improvements in the life standards of the beneficiaries, as highlighted in the beneficiary assessment, as well as reduced time spent on water and firewood collection and better health and safety conditions caused by the phasing out of fuel-based electricity generation (both in terms of reducing emissions and decreasing the risks of accidents caused by kerosene and candles).

Annex 4. Bank Lending and Implementation Support/Supervision Processes

Table A4.1 Task Team Members

| Names | Title | Unit | Responsibility/ specialty |
|-------------------------------|--|-------|------------------------------|
| Lending | | | |
| Subramaniam V. Iyer | Director | SEG | |
| Erik Magnus Fernstrom | Senior Energy Specialist | AFTG1 | |
| Prasad V. S. N. Tallapragada | Lead Energy Specialist | AFTEG | |
| Mohua Mukherjee | Senior Energy Specialist | SASDE | |
| Adenike Sherifat Oyeyiola | Senior Financial Management Specialist | AFTME | |
| Mos Abu | Senior Environmental Specialist | AFTN1 | |
| Karan Capoor | Senior Financial Specialist | AFTG1 | |
| John Gabriel Goddard | Senior Economist | ECSF1 | |
| Christophe de Gouvello | Senior Energy Specialist | LCSEG | |
| Supervision/ICR | | | |
| Manuel Berlingiero | Energy Specialist | AFTG1 | |
| Yasmeen Tabbaa | Young Professional | EASER | |
| Bassem Abou-Nehme | Consultant/Energy Economist | AFTG2 | |
| Rita Ahiboh | Program Assistant | FEUFS | |
| Brenda Uche Anugwom | Team Assistant | AFCW2 | |
| Mary Asanato-Adiwu | Senior Procurement Specialist | AFTPE | |
| Bayo Awosemusi | Lead Procurement Specialist | AFTPE | |
| Syed WaqarHaider | Sector Leader | AFTG1 | |
| Yash Pal Kedia | Consultant | AFTTR | |
| Helena Mamle Kofi | Consultant | AFTG1 | |
| Regina Oritshetemeyin Nesiama | Program Assistant | ECSHD | |
| Comfort Onyeje Olatunji | Program Assistant | SASDO | |
| Kirtan Chandra Sahoo | Senior Carbon Finance Specialist | ENVCF | |
| Thomas E. Walton | Consultant | EASIS | |
| Lily Wong Chun Sen | Program Assistant | AFTG1 | |

Table A4.2 Staff Time and Cost

| Stage of project cycle | Staff time and cost (Bank budget only) | |
|------------------------|--|--|
| | No. of staff weeks | US\$ thousands (including travel and consultant costs) |
| Lending | | |
| FY05 | 45 | 364.69 |
| FY06 | | 0.00 |
| FY07 | | 0.00 |
| FY08 | | 0.00 |
| Total: | 45 | 364.69 |
| Supervision/ICR | | |
| FY05 | | 0.00 |
| FY06 | 37 | 229.95 |
| FY07 | 56 | 291.22 |
| FY08 | 82 | 600.75 |
| FY09 | 2 | 0.00 |
| Total: | 177 | 1,121.92 |

Annex 5. Beneficiary Assessment

*“When there’s light, I just enjoy my stay, because light makes me happy.
It gives me happiness when I see light. When I don’t see light, I just feel sad...
Even if I don’t have any movie or anything to use the light for,
I’m just happy seeing light.
Light is just a source of happiness, I guess for everybody.”*

Residential customer in Nyanya

A beneficiary assessment was conducted after NEDP was completed to measure the socioeconomic results of the transmission and distribution improvement components as perceived by the residents of some of the intervention clusters. The Karu cluster was selected on the basis of its perceived success as a CREST electricity rehabilitation scheme, and was compared with a nonintervention area, Zuba. Results from two other full intervention areas (those that received pole-mounted transformers and PPMs), Mararaba and Nyanya, were also captured and compared with partial intervention areas (received either pole-mounted transformers or PPMs).

The main tool used in the assessment were semistructured interviews, conducted with three respondent categories: category A consisted of residential customers (making a distinction between residents living in single rooms, flats or those in detached housing); category B consisted of owners or employees of small and medium enterprises; and category C consisted of personnel in social service institutions such as schools, health centers, and places of worship.

Table A5.1 Number of Interviews Conducted across All Categories in Full, Partial, and Nonintervention Areas

| | Category A (residential) | Category B (business) | Category C (social) | Total |
|---|-----------------------------|--------------------------|------------------------|-------|
| Full intervention areas (excluding Mararaba) | 142 | 87 | 29 | 258 |
| Partial intervention areas (excluding Mararaba) | 48 | 24 | 13 | 85 |
| Mararaba ^a | 61 | 37 | 12 | 110 |
| Zuba | 45 | 26 | 9 | 80 |
| Total | 296 | 174 | 63 | 533 |

a. Mararaba is listed separately because it is both a full and a partial intervention area.

The survey’s main findings are:

- *Prior to the project:* Rationing of power was a common trend in all areas, with most neighborhoods having power for three or four days in the week and having no power at all the rest of the time, leading to the coinage of the terms “on” and “off” days. In the partial and nonintervention areas especially, off days could last from a few weeks to a few months. The distribution of on and off days was generally perceived by customers to be subject to the whims of PHCN staff. Low or inconsistent voltage output was another problem that seemed endemic to all areas.
- *Impact on power supply:* In full intervention areas, the majority of respondents now have between 10 to 24 hours of power a day, every day of the week, with

most reporting more than 18 hours. Episodes of power outage have become very brief, sometimes lasting only a few minutes.

- *Comparison of full intervention, partial intervention, and nonintervention areas:* While customers in full intervention areas are reporting 18 hours of power a day, those in partial intervention areas still rely on private or community transformers. The assessment revealed that customers who only received PPMs had expected their power situation to improve drastically, despite still being connected to faulty transformers. Even in full intervention areas, many respondents attributed improved power to the advent of PPMs, perhaps because this is the aspect of the project that is closest to them. Some expectations management is required here. Customers in nonintervention areas are still facing acute power shortages, and for many residents of Zuba, a generator is considered a luxury good, and so they are simply making do without power with resultant reductions in productivity and income.
- *Socioeconomic benefits to residents:* In Karu and Nyanya, residential customers cited several anecdotes illustrating improvements in the quality of their personal and family lives. Women in particular appreciate the ability to shop in large quantities and store perishable food items in their refrigerators and freezers. Parents are pleased that their children have more outlets for education and entertainment and can sleep better at night with the aid of fans and air conditioning units. Other simple comforts cited were a reduction in noise pollution as a result of a general decline in the use of generators and the ability to get a cold drink from the fridge when it is desired.
- *Fuel expenditure reductions:* Residential customers reported as much as a 60–90 percent reduction in generator fuel expenditure, with the sharpest reductions cited in Karu.
- *Benefits to small and medium enterprises:* Among business customers, savings on generator fuel have been used to expand operating capital or otherwise increase disposable income. Some businesses pass on the savings to their customers, as in the case of print shops that have reduced the unit cost of printing and photocopying by as much as 50 percent when power is available. Box A5.1 illustrates the benefits of the project for a photography studio in Karu.

Box A5.1 Impact on a Photography Studio in Karu

In Karu market, business has never been better for Simon, who now has near-constant power supply to operate his flash, lights, and computers—the major pieces of equipment in his photography studio. Though Simon finds it more expensive to run his new PPM, he has factored the expense into his operating costs and concluded that it is much better than, even incomparable to, the options he had prior to the intervention. His cost-benefit analysis suggests that the current PPM system works well for businesses like his that are power intensive, because they formerly had to run on generators most of the time.

With the recent tariff increase, Simon now spends about ₦4,000 every month on electricity. In the past, Simon asserted, a 25 liter jerry can of petrol would last for between five and seven days. This translated into a monthly petrol expenditure of between ₦12,000 and ₦18,000, in addition to the ₦600 he paid to PHCN for the unreliable electricity supply. The situation now

is vastly different: at the time of the interview, the 20 liter jerry can of petrol he had been using for a month had not yet been exhausted because he had only needed to use the generator three times so far. The generator is now essentially a standby source of power for the few times that grid supply is interrupted.

- *Benefits to social service providers:* The impact of improved power supply on the ability of social service organizations to meet their objectives is significant. Many health centers are able to store vaccines for longer and generally dispense their services more efficiently. In schools, teaching and learning processes have been enhanced, especially on computer-based modules. By contrast, those schools that have been unaffected by the improvements still find it difficult to deliver even the most basic practical courses in science and technology. In one place of worship, there is increased attendance at evening services because worshippers are sure that they will be able to find their way home afterward by the light reflected from buildings along the path. Boxes A5.2 and A5.3 provide two examples from an orphanage and a health center in Karu.

Box A5.2 Impact on an Orphanage in Karu

The staff at Future Leaders Orphanage in Karu cares for 57 orphans ranging from babies to children in their early teens. Of the many end uses of power in the “home,” as it is referred to by staff, health care delivery and food preservation are among the most important. The home operates a small clinic for the children that is also open to the public at no cost. Prior to intervention, power supply in the home was episodic and voltage output was often low. The alternative source of power was a diesel generator that was needed most of the time, but was only switched on between 6 p.m. and 10 p.m. every night to minimize fuel expenditure.

Beginning in January 2011, however, the power situation in the home changed dramatically. Residents are now assured of daily power supply, “from morning to evening,” perhaps with a few interruptions in between. The potential for energy use in the home is only now beginning to be realized: a lot of appliances like televisions and fans are now kept on constantly; ironing can be done at more convenient times during the day, instead of waiting for the former 4-hour window of power availability in the evenings. The greatest positive impact has been felt in the kitchen, where the refrigerator and freezer now work at almost full capacity.

Table A5.3 Impact on a Health Center in Karu

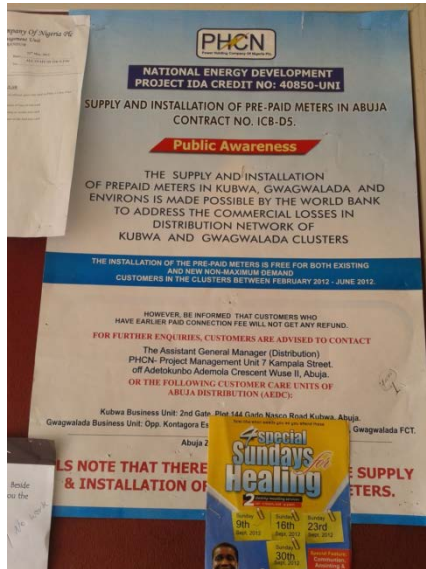
All Saints Clinic, a faith-based health center in Karu, suffered severe power shortages; power only came on “sometimes,” and when it did, it was “with very low voltage output.” Sam, the clinic administrator, had to ensure that there were always enough diesel for the generator that was needed for running laboratory tests and for lighting at night. In addition, the clinic paid “outrageous” monthly bills to PHCN.

The power situation improved dramatically after 2012, when a pole-mounted transformer was installed in the area. Power supply is now “far much better than ever” and goes uninterrupted for days. The clinic still uses its diesel generator when the power goes out, but that is a rarer occasion now. Nowadays Sam often forgets to check diesel availability. Laboratory staff can run their equipment without fear of constant interruption, patients no longer have to wait in pain while staff runs around trying to buy diesel for the generator, the grounds are well lit at night and patients can sleep well at night—all at significantly reduced cost to the clinic.

- *Impact of PPMs:* Prior to project implementation, the majority of customers in full, partial and no intervention areas either had analog meters or none at all, the latter group being directly connected to neighborhood transformers. Customers with NEDP-supported PPMs report that they appreciate the degree of freedom and control that the pay-as-you-go system gives them over their energy consumption and expenditure. A customer can now decide how much electricity to buy and even influence how long their supply lasts. Billing is now widely perceived to be more transparent and commensurate to usage. An indirect consequence of the pay-as-you go system is that customers intuitively conserve power.
- *More attention to energy efficiency and better demand-side management:* Across the residential, business and social service categories, the single most cited disadvantage of the PPM is the much higher rate of billing compared to the old system, especially following the recent increases in single phase tariffs and fixed access charges. However, the hike in tariffs has pushed customers to use electricity more efficiently. Specifically, most customers seem to have figured out that the way to minimize their PPM bills is simply to regulate the amount of electricity they consume. Therefore, lights and appliances are usually switched off whenever they are not in use. The PPMs are in fact promoting energy efficiency and demand-side management.

Despite the positive impacts mentioned above, some shortcomings were reported during the assessment. Some examples include:

- *Meter installation charges:* Although meter installation charges were meant to be free of charge, the beneficiary assessment highlighted numerous instances where customers were told to pay for “wiring and connection” rather than for the meters. The PMU was aware of the problem and in fact posted notices across Karu and other intervention areas to raise awareness that there should be no installation charges on PPMs.
- *Long queues to top up meters:* A commonly cited issue by customers with PPMs were the long queues they face when they go to top up at service centers. At the Karu and Nyanya service centers, the average wait time per customer when operations are going smoothly was two minutes. However, customers could face a wait time anywhere between 30 minutes to a few hours if the telecommunication network that transmits information between the PHCN server and customer accounts is down. This was also observed during the ICR mission and discussed with the Nigerian authorities. While some of the communication challenges were identified as teething problems during initial start-up, it was recommended to increase the number of third party vendors (as in the case of telephone operators) to facilitate the sales of billing codes.
- *Mixed results in partial intervention areas.* As mentioned above, results were mixed in partial intervention areas, with project benefits not materializing as expected. Only rehabilitating the full electricity distribution chain from substation to PPMs delivers the expected results. This is important when considering scale-up of NEDP activities.



Poster announcing details of meter installation under NEDP



Top-up queue at Nyanya service center

Annex 6. Stakeholder Workshop Report and Results

No stakeholder workshop was organized specifically for this ICR. Instead, stakeholder views were gathered during the beneficiary assessment. In addition, under NEGIP, at least two workshops per year are organized with a broad range of stakeholders to discuss main issues in the power and gas sector. These workshops provide an opportunity for all stakeholders (including civil society, business organizations, and government) to provide feedback on the reform and take an active role in the oversight of the activities in the sector.

Annex 7. Executive Summary of Borrower's ICR (extract)

FGN gives NEDP a satisfactory overall rating, because the project delivered most of its proposed technical outputs and achieved its most important development objectives. The project achieved its immediate outcomes of efficiency, supply, and service improvements; demonstration of potential models to scale-up electricity access; and preparatory work for gas reforms and related power generation project. NEDP has led to the emergence of stronger power companies (especially DISCOs), policy and regulatory institutions, and rural energy access models with mixed stakeholder participation and accountability (private, community, NGOs, and others). Other than the direct technical improvements and financial revenue/cost savings potentials, the investments made in transmission and distribution infrastructure seemed to have helped in economic goals and importantly contributed to increasing asset valuations and in attracting global capital for privatization.

Although the project had a few setbacks leading to uncertainty, time overruns and implementation delays, including initial procurement and contract completion delays in addition to a prolonged restructuring phase midway, finally it did manage to finish on a satisfactory note. Also during the long run of the project (2005–12), average inflation in Nigeria rose from about 11 to 13 percent, which might have negatively impacted the basket of goods and services that could have been bought had the project been implemented within its initial designated run between 2005–8.

Eight hundred and ten megavolt amperes were financed under the restructured NEDP PAD, and recommendations after restructuring proposed an increase in the number of clusters¹⁴ from five to nine (details below).

Table A7.1

| Installation substation | Transmission transformers | Transformers at transmission–distribution juncture | Comments |
|-------------------------|-----------------------------|--|--|
| Various | 240 MVA (4x60) (132/33 kV) | | Deployed by TCN (Lagos, Ibadan clusters) |
| Alagbon | | 120 MVA (2x60 mobile) (132/33 kV) | More enhancements under NEGIP |
| Karu (Abuja) | | 120 MVA (2x60) (132/33 kV) | For Karu cluster feed |
| Kubwa (Abuja) | | 120 MVA (2x60) (132/33 kV) | For Kubwa cluster feed |
| Shiroro | 150 MVA (330/132 kV) | | Primarily for Abuja upstream voltage |
| Mando | | 60 MVA (132/33 kV) | For Kaduna commercial farms |
| Total | 150 MVA | 660 MVA | 810 MVA |

NEDP: Transformers and Clusters

The project increased transformer capacity at the critical interface between transmission and distribution by a cumulative 660 MVA, (out of total ~810 MVA transformer capacity installed), thus helping to address an important constraint to power quantity and quality, and impacting both tail and end-user voltages. In addition, it provided reactive-power compensation equipment that helped improve substantially the voltage users receive (voltage at 29 sites post-NEDP is at ~33 kV), resulting in

¹⁴ The nine clusters under NEDP: Ogba, Luth, Agege, Challenge, Kubwa, Karu (3 clusters), and Idi-Araba.

better quality at tail end of low voltage networks, assisting in the HVDS¹⁵ model. HVDS increased enhancements to service quality and distribution efficiency in well demarcated clusters, reduced energy losses within those clusters, and increased revenues and customer satisfaction for their respective DISCOs.

Systemic investments in transmission and distribution improvements targeting critical interfaces within contained geographic areas and a turnkey approach to PPM deployment not only led to quicker installation of components and completion, but also manifested in “perceptible” improvements in power indicators at the consumer level, that is, power availability and reliability (12–18 hours/day), loss reduction (~20 percent), and voltage quality (220 V). Perception became an important leading indicator for customer satisfaction and PPM uptake. Visible improvements in quality and quantity of power, consumption linked to billing, and customer service improvements had a domino effect leading to multiple financial and economic benefits, for example, faster awareness and mobilization at consumer levels. Consumers proactively demanded PPM, resulting in a PPM “pull demand” instead of “push demand”¹⁶ (> 65,000 PPMs installed) with demand outstripping supply. Another benefit is the positive stance toward power reforms and support of government efforts (expecting similar outcomes like for telecoms). This is translating into significant visible financial¹⁷ impacts: power sales through PPM are up 1,800 percent; customers are being billed (> 65,000 new connections); revenues are up 50–80 percent; collections are up 55 percent and rising; debt reduction in maintenance resources and positive cash flows. There have also been several economic benefits, for example, expanding small-scale industry units and cooperatives, rising property markets, gender inclusion, and others. It is still early, but overall total cost of ownership of assets should also show a significant decline in the medium and long run.

Importantly, a gradual mind-set shift from a public sector to a private/commercial sector and customer-services orientation at all levels at the Distribution Business Unit (DBU) level seems to be in motion, from chief executive officers to the managers at service centers. DBUs now compete among each other for performance-based bonuses and O&M allocations. Consumers are happy both with power quality and quantity and the new customer-focused approach by DBU staff, and consumers’ expectations are that power privatization will lead to even more sector improvement, similar to the telecom sector privatization.

NEDP has also established some best practices for the sector (business models, deployment configurations, implementation techniques, contract and bidding documents, and technology specifications). Almost all of these are already being replicated and scaled up by NIPP, the (state) REA, and NERC. For example, transmission enhancement for distribution cluster configuration; PPMs; turnkey prepayment implementation; off-grid solar; conversion from LVDS to HVDS model; contract and procurement bidding documents; “self-protected” transformer specifications; “loss capitalization” model for technical bid assessment; and the business model for off-grid solar at Mfaminyen Village are becoming prototypes for

¹⁵ HVDS uses several lower-capacity distribution transformers, mostly of 50 kVA, which are typically pole mounted with therefore shorter LV lines (415/220 V).

¹⁶ Customer-led “pull” demand for PPMs installation (as opposed to DISCOs “push” for PPM uptake) that resulted in saving resources by DISCO and hastening the installation process.

¹⁷ Figures given for Karu cluster (details in annex 4).

replication. NEDP also demonstrated rural grid and off-grid electrification models (Enugu, Cross River State, and Imo). Additionally, the technical and functional capacity built by NEDP within PMU, PHCN, and NERC are being leveraged across other projects and in train-the-trainer initiatives across the sector.

Government is gradually moving toward its reduced role of policy maker and planner. The regulator, bulk trader, Market Operator, 18 successor companies of PHCN, Rural Electrification Agency and Rural Electrification Fund and other organizations have been established. Between 2007 and 2009, there was a slowdown from FGN's side in the reform process, which impacted NEDP's objective. This led to project restructuring in 2010, and to a change in two of the PDOs. However, in 2010, the incumbent president took over and FGN fast forwarded the reforms and privatization process. A Presidential Action Committee and task force was set up to drive reforms within deadlines.

Total disbursement has reached 96 percent (85 percent disbursed, 11 percent outstanding payments, as of June 2012) of the financing available, though FGN disbursements did lag behind schedule throughout the project.. Around US\$9.84 million are committed to component 2 under the "Outstanding Special Commitment" provision. As of December 2011, about US\$112 million have been spent on fixed assets and about US\$6 million on development operating expenditures, which constitute major project expenditures. Overall, the project has been well managed with adequate fiduciary and performance oversight, despite key staff changes over the seven-year duration of project (especially in contract, procurement, and accounting).

However, even though 70 percent (about US\$126 million) of funds were disbursed before restructuring in 2010, there is no evidence of regret costs or material impact in PDO outcomes. The investments made in initial NEDP years were (almost) completed by 2010 (HVDS, substation transformers, and PPMs) and were instrumental in illustrating positive outcomes and models. Further, these models were also being replicated and scaled up by NIPP, which is running in parallel. NEDP, as a precursor, undertook initial risks, built practices, established models that can/are being replicated by FGN/NIPP, effectively making FGN investments, risk free. NEDP investments in 2006–9 were in various stages of installation, performance, and replication when FGN suddenly fast-tracked the reform process in 2010. The timely investments in infrastructure rehabilitation and reinforcement contributed to enhancing asset quality and performance, hence, attracting global investors and increasing valuations. Further, benefits of investment were realized immediately by FGN before depreciation reduced values (although more work is required to quantify precisely). The NEDP balance sheet has seen an improvement of about 15–20 percent year on year (2010–2011).¹⁸

Further, when the FGN scaled up its investments in the sector to enable privatization, both NIPP and NERC replicated and adopted almost all the methods and models, thereby leveraging learning economies and best practices already demonstrated by NEDP. Annex 1 highlights major investments, primarily for components 1 and 2, over the project lifetime, through transmission and distribution rehabilitation and reinforcements that not only improved power quality and quantity delivered, but also improved customer services, positively impacting revenue collections in target clusters. The majority of equipment procurement and supply and installation of these

¹⁸NEDP Financial Statements, December 2011.

components was contracted around 2006–7, contracts that were implemented through 2010, illustrating successful working models and methods that were replicated by NIPP and NERC. Also by 2010, NEDP had invested in capacity building, particularly for PMU, NERC, and BPE.

The remaining 30 percent of funds (about US\$45 million) offered flexibility to quickly ramp up targeted support for reforms and implement FGN’s decision to fast forward reforms and fund projects in transmission and contingencies (Jos-Makeri, Alagbon). Anticipating the change in FGN strategy, the PHCN-PMU managed the procurement process for all the remaining subcomponents, including TA that helped in assisting and expediting implementation after restructuring. Detailed analysis by components is in annexes 2 and 3.

Annex 8. List of Supporting Documents

- Project Appraisal Document (August 1, 2005)
- Restructuring Paper for NEDP (June 8, 2010)
- Restructuring Paper (reallocation of funds, September 1, 2010)
- Implementation Status and Results Reports
- Development Credit Agreement and amendments
- Aide memoires
- Borrower's ICR
- Beneficiary assessment for the Karu cluster
- Various memos and communications listed in project files and World Bank documents

Annex 9. Results Framework Timeline

| Indicator | Baseline value (August 1, 2005) | Original target values | Actual value achieved at restructuring (June 8, 2010) | Formally revised target values | Actual value achieved at completion (June 30, 2012) |
|--|--|---|--|---|---|
| <p><i>Sector-level outcomes:</i> Increased private participation in the electricity market</p> <p><i>Changed at restructuring:</i> Emergence of new institutions: NERC, REA, Market Operator and system operator, new companies from NEPA restructuring.</p> | <p>Institutions do not exist, and limited private sector involvement. Bank supported government to ESPR Act.</p> | <p>Emergence of NERC, REA, Market Operator and System Operator. Preparation for achieving increased private participation in the Nigerian electricity market.</p> | <p>NERC, Market Operator, and NEPA successor companies established.</p> | <p>Delivery of these institutions, except for systems operator.</p> | <p>NEPA, 18 successor companies, NERC, and Market Operator established. DISCOs, GENCOs, TCN, and Market Operator entering into contractual agreements with each other and bidding for privatization of DISCOs and GENCOs completed; REA reactivated in 2012.</p> |
| <p>Launch of gas sector reform for development of natural gas resources.</p> <p><i>Changed at restructuring:</i> Completion of enabling framework for gas contracts.</p> | <p>Associated gas being flared due to lack of infrastructure to use it.</p> | <p>Preparatory work to launch gas pipeline and power providers.</p> | <p>Gas contractual and frameworks put in place by FGN. Board has approved NEGIP.</p> | <p>Strategic aggregator rules established for gas contractual frameworks.</p> | <p>Gas aggregator established and gas supply and aggregation agreements signed with CNL and SPDC and strategic aggregator rules established.</p> <p>Due diligence of public sector power plants and transmission infrastructure completed.</p> |
| <p>(a) Completion of microhydro and solar demonstration models and grid-based projects to scale up electricity access.</p> <p>(b) Degree of private/community/state involvement (qualitative measure).</p> | <p>0</p> | <p>5</p> | <p>New sustainable models of rural electrification being explored.</p> | <p>(a) Pilots completed: 1 microhydro project and 4 solar electricity projects.</p> <p>(b) Private /community/ state participation in</p> | <p>(a) Three solar pilots in FADAMA sites and 1 solar PV pilot in Mfaminyen village in Cross River State.</p> <p>(b) In the FADAMA sites, the best commercially performing user groups were selected for the pilots to promote their commercial viability. At Mfaminyen, the state government has</p> |

| Indicator | Baseline value (August 1, 2005) | Original target values | Actual value achieved at restructuring (June 8, 2010) | Formally revised target values | Actual value achieved at completion (June 30, 2012) |
|---|---|--|--|--------------------------------|---|
| | | | | management of the pilots. | showed interest in replicating the model across the Cross River State and a local community committee has taken over the maintenance of the solar infrastructure. |
| End-user voltage | Input voltage at 200V and distribution system at 29 kV. | 220V ($\pm 10\%$) | 180 V | 220 V ($\pm 10\%$) | 220 kV in completed HVDS clusters of Ogba, Luth, Agege, and Challenge |
| <p>Voltage at 33 kV in identified clusters. System losses reduced by 10%. Revenue increased by 10%. Number of customers connected increased by 10%.</p> <p><i>Changed at restructuring:</i> Voltage at 33 kV in identified clusters. Other indicators were dropped because distribution component now only focused on clusters and not systemwide improvements.</p> | End-user voltage at 29 kV; system losses at 42%; 3.5 million customers connected. | 33 kV; system losses reduced by 10%; revenue increased by 10%; number of customers connected increased by 10%. | 29 kV | 33 kV | <p>Voltage stabilized at 33 kV from 29–30 kV; energy losses less than 12% in clusters.</p> <p>Billed revenue (tariff) increased in Abuja from ₦1.6 billion/month (2010) to 2.1 billion/month (2011) (according to PMU, this is directly related to the PPMs).</p> |

Annex 10. Rural and Renewable Electrification—Endorsement from Cross River State Government



STATE ELECTRIFICATION AGENCY EKORINIM, CALABAR

Our Ref: CRSEA/AG/VOL.1/58

16th Dec, 2010

The General Manager
Power Holding Company of Nigeria PLC
Project Management Unit
No 7, Kampala Street
Wuse 11, Abuja


COMMISSIONING OF MFAMIYEN SOLAR PHOTO-VOLTAIC ELECTRIFICATION PROJECT: AN APPRECIATION

I am directed to refer to the official commissioning and handover ceremony of the completed Mfamiyen Solar Photo-Voltanic Electrification Project and to convey to you, on behalf of the Government of Cross River State, the Cross River State Electrification Agency's gratitude for the project.

The completion of the Mfamiyen project elicits excitement in the Agency as it will become a veritable reference in the efforts to replicate it in others communities like Mfamiyen in the state.

The Agency wishes to assure you that every effort will be made to ensure that the project is sustained. To this end arrangement are being made to recruit staffers from the community to see to the day to day running of the installation. Budgetary provision will henceforth be made yearly for the maintenance of the installation. The project will indeed be properly used.

Thank you.


Engr. N. M. Mogbor
For Director General

