

Document of  
The World Bank

Report No: ICR00003505

IMPLEMENTATION COMPLETION AND RESULTS REPORT  
(IDA-42150 IDA-42160 IDA-42170 IDA-46450 IDA-46460)

ON A CREDIT TO THE REPUBLIC OF MALI  
IN THE AMOUNT OF SDR 16.9 MILLION  
(US\$25 MILLION EQUIVALENT)

AND AN ADDITIONAL CREDIT  
IN THE AMOUNT OF SDR 27.4 MILLION  
(US\$42.5 MILLION EQUIVALENT)

ON A CREDIT TO THE ISLAMIC REPUBLIC OF MAURITANIA  
IN THE AMOUNT OF SDR 16.9 MILLION  
(US\$25 MILLION EQUIVALENT)

ON A CREDIT TO THE REPUBLIC OF SENEGAL  
IN THE AMOUNT OF SDR 16.9 MILLION  
(US\$25 MILLION EQUIVALENT)

AND AN ADDITIONAL CREDIT  
IN THE AMOUNT OF SDR 27.4 MILLION  
(US\$42.5 MILLION EQUIVALENT)

FOR A

FELOU HYDROELECTRIC PROJECT  
OF THE  
US\$350 MILLION WEST AFRICA POWER POOL (APL) PROGRAM

September 30, 2015

Energy and Extractives Global Practice  
Africa Region

## CURRENCY EQUIVALENTS

(Exchange Rates Effective June 8, 2015)

Currency Unit = FCFA  
FCFA 58 5= US\$ 1.00  
SDR 1.00 = US\$ 1.3965  
SDR 1.00 = Euro 1.2511  
Euro 1.00 = US\$ 1.1213

## FISCAL YEAR

January 1 – December 31

## ABBREVIATIONS AND ACRONYMS

AIC	Average Incremental Costs
APL	Adaptable Program Lending
CAS	Country Assistance Strategy
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFAA	Country Financial Accountability Assessment
CNC	<i>Comité National de Coordination</i> (National Coordination Committee)
CO <sub>2</sub>	Carbon Dioxide
CTPI	<i>Comité Technique Permanent de l'Interconnexion</i> (Permanent Technical Committee for the Interconnection)
ECOWAS	Economic Community of West African States
EDF	<i>Electricité de France</i> (French Electricity Company)
EDM	<i>Electricité du Mali</i> (Power Company in Mali)
EEM	Eskom Energie Manantali SA
EEP	ECOWAS Energy Protocol
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EPC	Engineering, Procurement and Construction
ESMP	Environmental and Social Management Plan
EMS	Energy Management System
EOI	Expression of Interest
ESKOM	South African electricity supply utility
ESMAP	Energy Sector Management Assistance Program
FCFA	<i>Franc Communauté Financière Africaine</i> (West African CFA Franc)
FM	Financial Management
GHG	Greenhouse gas
GWh	Gigawatt hour

HEP	Hydroelectric Project
IDA	International Development Association
IDC	Interest During Construction
ISR	Implementation Supervision Report
IRR	Internal Rate of Return
kV	Kilovolt
kWh	Kilowatt hour
M&E	Monitoring and Evaluation
MTR	Mid Term Review
MW	Megawatt
NPV	Net Present Value
OMVS	<i>Organisation pour la Mise en Valeur du Fleuve Sénégal</i> (Senegal River Basin Development Organisation)
O&M	Operation and Maintenance
PAD	Project Appraisal Document
PDO	Project Development Objective
RAP	Resettlement Action Plan
RHDP	Regional Hydropower Development Project
RIAS	Regional Integration Assistance Strategy
SCADA	Supervisory Control and Data Acquisition
SEMAF	<i>Société d'Exploitation de Manantali et de Felou</i> (Felou and Manantali's Operation Company)
SENELEC	<i>Société Nationale d'Electricité du Sénégal</i> (National Power Utility in Senegal)
SDR	Special Drawing Right
SOGEM	<i>Société de Gestion de l'Energie de Manantali</i> (Manantali Energy Management Company)
SOMELEC	<i>Société Mauritanienne d'Electricité</i> (Power Company in Mauritania)
UNFCCC	United Nations Framework Convention on Climate Change
WAGP	West Africa Gas Pipeline
WAPP	West Africa Power Pool

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**AFRICA**  
**The Félou Hydroelectric Project**

**CONTENTS**

**Data Sheet**

- A. Basic Information
- B. Key Dates
- C. Ratings Summary
- D. Sector and Theme Codes
- E. Bank Staff
- F. Results Framework Analysis
- G. Ratings of Project Performance in ISRs
- H. Restructuring
- I. Disbursement Graph

1. Project Context, Development Objectives and Design.....	1
2. Key Factors Affecting Implementation and Outcomes .....	9
3. Assessment of Outcomes .....	20
4. Assessment of Risk to Development Outcome.....	29
5. Assessment of Bank and Borrower Performance .....	30
6. Lessons Learned .....	33
7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners .....	34
Annex 1. Project Costs and Financing.....	36
Annex 2. Outputs by Component .....	37
Annex 3. Economic and Financial Analysis.....	40
Annex 4. Bank Lending and Implementation Support/Supervision Processes .....	43
Annex 5. Beneficiary Survey Results .....	45
Annex 6. Stakeholder Workshop Report and Results.....	46
Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR.....	47
Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders .....	48
Annex 9. Carbon Finance Project (P099312)-ICR.....	49
Annex 10. List of Supporting Documents .....	59

MAP IBRD 34462R



A. Basic Information			
Country:	Africa	Project Name:	WAPP APL 2 - OMVS Felou Hydroelectric Project
Project ID:	P094916	L/C/TF Number(s):	IDA-42150 IDA-42160 IDA-42170 IDA-46450 IDA-46460
ICR Date:	08/28/2015	ICR Type:	Core ICR
Lending Instrument:	APL	Borrower:	Governments of Senegal, Mali, Mauritania
Original Total Commitment:	XDR 50.70M	Disbursed Amount:	XDR 98.01M
Revised Amount:	XDR 105.5M		
<b>Environmental Category: A</b>			
<b>Implementing Agencies: SOGEM</b>			
<b>Cofinanciers and Other External Partners: EIB</b>			

B. Key Dates				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	12/15/2005	Effectiveness:	04/30/2007	04/30/2007
Appraisal:	04/17/2006	Restructuring(s):		08/27/2009 09/11/2012 06/28/2013 12/23/2014
Approval:	06/29/2006	Mid-term Review:	11/21/2011	11/21/2011
		Closing:	06/30/2010	12/31/2014

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Moderately Satisfactory
Risk to Development Outcome:	Moderate
Bank Performance:	Moderately Satisfactory
Borrower Performance:	Moderately Satisfactory

<b>C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)</b>			
<b>Bank</b>	<b>Ratings</b>	<b>Borrower</b>	<b>Ratings</b>
Quality at Entry:	Moderately Satisfactory	Government:	Moderately Satisfactory
Quality of Supervision:	Moderately Satisfactory	Implementing Agency/Agencies:	Moderately Satisfactory
<b>Overall Bank Performance:</b>	Moderately Satisfactory	<b>Overall Borrower Performance:</b>	Moderately Satisfactory

<b>C.3 Quality at Entry and Implementation Performance Indicators</b>			
<b>Implementation Performance</b>	<b>Indicators</b>	<b>QAG Assessments (if any)</b>	<b>Rating</b>
Potential Problem Project at any time (Yes/No):	Yes	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	Moderately Satisfactory		

<b>D. Sector and Theme Codes</b>		
	<b>Original</b>	<b>Actual</b>
<b>Sector Code (as % of total Bank financing)</b>		
General public administration sector	7	7
Hydropower	93	93
<b>Theme Code (as % of total Bank financing)</b>		
Regional integration	33	33
Regulation and competition policy	33	33
Trade facilitation and market access	17	17
Water resource management	17	17

<b>E. Bank Staff</b>		
<b>Positions</b>	<b>At ICR</b>	<b>At Approval</b>
Vice President:	Makhtar Diop	Gobind T. Nankani
Country Director:	Colin Bruce	Mark D. Tomlinson
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Project Team Leader:	Fatouma Toure Ibrahima Wane	Amarquaye Armar
ICR Team Leader:	Fatouma Toure Ibrahima/ Nash Fiifi Eyison	
ICR Primary Author:	Nourredine Bouzaher	



## F. Results Framework Analysis

### Project Development Objectives (from Project Appraisal Document)

The Project Development Objective of Felou Hydroelectric Project of the OMVS Power System Development Sub-program of WAPP (WAPP APL 2) is to alleviate power supply deficits in WAPP Zone “B” OMVS countries (Mali, Mauritania and Senegal) by augmenting the supply of low cost hydroelectricity.<sup>1</sup>

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

The PDOs were not revised.

#### (a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Indicator 1 :</b>	Quantity of hydroelectricity supplied by OMVS Power System Operator to the electric utilities of the WAPP Zone B OMVS Countries (EDM, SENELEC, SOMELEC) (Gigawatt-hour (GWh), Custom)			
Value quantitative or Qualitative)	807 GWh - EDM: 315 - SENELEC: 273 - SOMELEC: 219	1143 GWh - EDM: 427 - SENELEC: 385 - SOMELEC: 331	1142 GWh - EDM: 594 - SENELEC: 377 - SOMELEC: 171	1121 GWh - EDM: 562 - SENELC:346 - SOMELEC: 213
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	This PDO indicator is for all practical purposes achieved (98.2%).			
<b>Indicator 2 :</b>	Operating rules in place on the basis of sound economic dispatch criteria (Yes/No)			
Value quantitative or Qualitative)	No	NA	Yes	Yes (*)
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	This indicator was added at additional financing. (* ) See section 2.3 for details.			

<sup>1</sup> The PAD of June 5, 2006 only mentions one objective (see PAD page 12 and Project Development Objective above). The Project Agreement of September 13, 2006 between IDA, OMVS and SOGEM, and all ISRs, mention two objectives: “The objectives of the Project are to: (a) augment the supply of low cost hydroelectricity from the OMVS Power System to the national power utilities of Mali, Mauritania, and Senegal; and (b) develop a nucleus of a well-functioning, cooperative, power pooling mechanism for the WAPP Zone “B” OMVS Countries of West Africa.” The assessment of this ICR will rely on the definition of objectives given in the Project Agreement as per OPCS guidelines.

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

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
<b>Indicator 1 :</b>	Commissioning and performance testing of Felou HEP completed on schedule			
Value (quantitative or Qualitative)	No	Yes	Yes	Yes
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Commissioned on April 30, 2014.			
<b>Indicator 2:</b>	Commercially sound (power exchanges) agreements put in place and adhered to by OMVS Power System Operator			
Value (quantitative or Qualitative)	No	Yes	Dropped	NA
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	This indicator was dropped with the additional financing.			
<b>Indicator 3 :</b>	Generation Capacity of Hydropower constructed under the project			
Value (quantitative or Qualitative)	0MW	60MW	60MW	60MW
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	This is a core indicator and was added starting with ISR #7. Generation capacity was constructed and commissioned in April 30, 2014.			
<b>Indicator 4 :</b>	Availability of the power generation units of Felou HEP			
Value (quantitative or Qualitative)	0%	95%	95%	95%
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Target reached on April 30, 2014			
<b>Indicator 5 :</b>	Owner's engineer has been recruited.			
Value (quantitative or Qualitative)	No	NA	Yes	Yes
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Indicator added with additional financing. Owner's engineer recruited on November 04, 2009.			
<b>Indicator 6 :</b>	Design-build contractor has been employed			

Value (quantitative or Qualitative)	No	NA	Yes	Yes
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Indicator added during additional financing. Design-build contract signed on May 18, 2009.			
<b>Indicator 7 :</b>	Adoption of Tariff Protocol for Felou HEP by the OMVS Power System Operator. - EDM - SENELEC - SOMELEC			
Value (quantitative or Qualitative)	No	NA	Yes	Yes
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Indicator added with additional financing. The tariff protocol was signed on April 30, 2010.			
<b>Indicator 8 :</b>	Power sector monitoring and evaluation data of the WAPP Zone B-OMVS Countries collected, analyzed and disseminated by the WAPP.			
Value (quantitative or Qualitative)	0%	100%	100%	100%
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	WAPP is already collecting data on a regular basis.			
<b>Indicator 9 :</b>	Database at the WAPP level is put in place and power sector M&E data of the WAPP Zone B OMVS Countries are developed.			
Value (quantitative or Qualitative)	No	NA	Yes	Yes
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	WAPP is already collecting data on a regular basis,			
<b>Indicator 10 :</b>	Communication and data acquisition facilities upgraded.			
Value (quantitative or Qualitative)	No	NA	Yes	No
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	The SCADA system could not be acquired before the closing date of the project.			
<b>Indicator 11 :</b>	Necessary software licenses acquired			
Value (quantitative)	No	NA	Yes	No

or Qualitative)				
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	The necessary software licenses could not be acquired before the closing date of the project.			

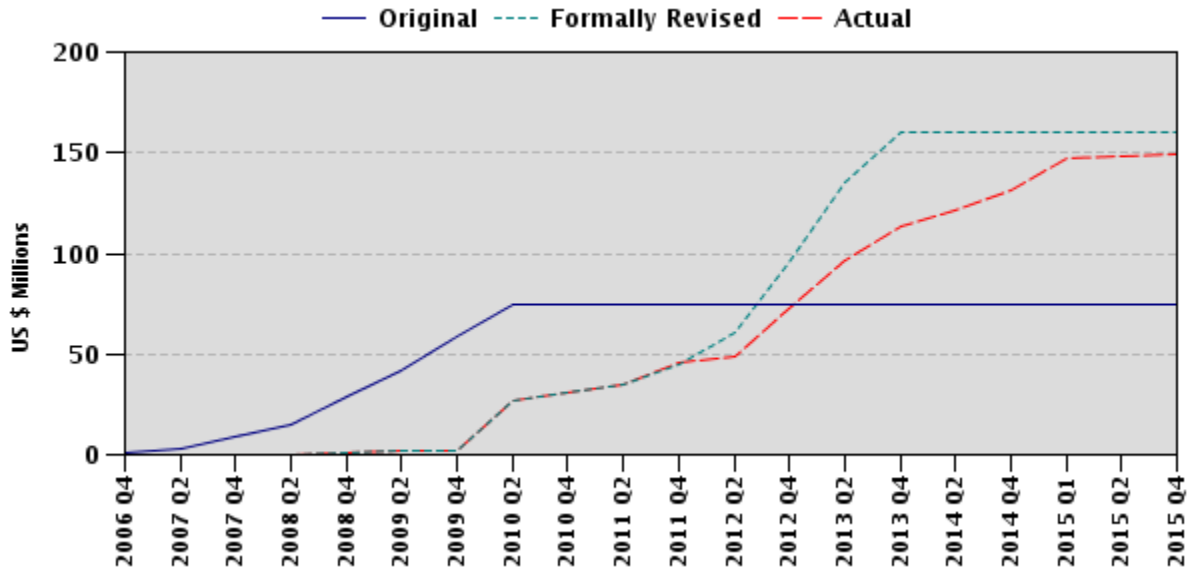
### G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	10/05/2006	Satisfactory	Satisfactory	0.00
2	06/27/2007	Satisfactory	Satisfactory	0.00
3	12/17/2007	Satisfactory	Satisfactory	0.36
4	06/02/2008	Satisfactory	Moderately Satisfactory	0.98
5	12/23/2008	Satisfactory	Moderately Satisfactory	1.79
6	05/13/2009	Satisfactory	Moderately Satisfactory	2.15
7	12/06/2009	Satisfactory	Satisfactory	27.19
8	04/14/2010	Satisfactory	Satisfactory	28.16
9	03/28/2011	Satisfactory	Moderately Satisfactory	34.55
10	10/29/2011	Satisfactory	Moderately Satisfactory	48.71
11	06/12/2012	Satisfactory	Moderately Satisfactory	64.49
12	03/27/2013	Moderately Satisfactory	Moderately Satisfactory	106.03
13	11/07/2013	Moderately Satisfactory	Moderately Satisfactory	120.00
14	06/10/2014	Moderately Satisfactory	Moderately Satisfactory	131.00
15	12/24/2014	Moderately Satisfactory	Moderately Satisfactory	148.19

## H. Restructuring (if any)

Restructuring Date(s)	Board Approved PDO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in USD millions	Reason for Restructuring & Key Changes Made
		DO	IP		
08/27/2009		S	MS	2.15	Additional financing: Project costs increased from US\$125 to an estimated US\$241 million. An additional financing for about US\$85 million for two credits to Senegal and Mali was approved by the Board to fully fund the project. IDA was not then in a position to make credits available to Mauritania. <b>The project objectives and the original project design with its three components remained unchanged.</b> The only changes concerned the arrangements for project implementation, the extension of the closing date by 3 years (from June 30, 2010 to June 30, 2013) and the financing plan to which IDA contributed an additional US\$85 million. The reasons that led to the additional financing and the key changes made are further described in Section 1.
09/11/2012		S	MS		Reallocation of Credits proceeds
06/28/2013		MS	MS		Extension of the closing date of the project by 18 months (i.e. until December 31, 2014)
12/23/2014		MS	MS		Cancellation of part of the projected undisbursed funds at project closing (SDR 5.92 out of 7.49 million).

## I. Disbursement Profile



## **1. Project Context, Development Objectives and Design**

*(this section is descriptive, taken from other documents, e.g., PAD/ISR, not evaluative)*

### **1.1 Context at Appraisal**

*(brief summary of country and sector background, rationale for Bank assistance)*

#### **A. Regional Context:**

1. At the time of appraisal, the member countries of the Economic Community of West African States (ECOWAS) faced a number of energy sector challenges among which were:

(i) ***Low access to electricity.*** The poverty reduction action plans of many of ECOWAS member States emphasized increasing access rates as well as encouraging productive uses of energy as important challenges to be addressed. Despite the region's large energy endowment, the region's per capita consumption of electricity was among the lowest in the world. In 2003, the combined total consumption of electricity was about 40,000 GWh (approximately 60 kWh per capita) and peak power demand was 6,500MW. Electricity demand is projected to grow by over 7% per year until 2020, with electricity requirements reaching 140,000 GWh (approximately 370 kWh per capita) and the peak power demand exceeding 22,000MW. It was estimated that only 20% of the population of ECOWAS member States had access to electricity. The access was higher in the *Organisation pour la Mise en valeur du Fleuve Sénégal* (OMVS) countries with about 30% of the population connected;

(ii) ***Widespread supply shortfalls.*** Across the region, electricity supply was characterized by unreliable service caused by supply shortfalls. These shortfalls made it difficult to expand access. It was estimated that the capacity shortfall in the OMVS countries was about 200 MW;

(iii) ***Use of expensive emergency thermal generation plants.*** To ease the immediate supply shortfalls, several ECOWAS member states, including OMVS member states, were compelled to procure on an emergency basis, generation plants fueled with imported petroleum products primarily because they are quick to install and involve relatively lower capital outlays. However, the high running cost of these facilities meant that the tariff paid by consumers was often below cost recovery levels. The utilization of such plants had in general proven to be unsustainable and the challenge for the region was to search for and implement projects from more sustainable sources such as hydro power;

(iv) ***Undeveloped indigenous hydroelectric resources.*** The indigenous fossil fuel resources (coal and petroleum) of the region commonly used for electricity production are concentrated in one or two member states. There was however a substantial economic hydroelectric potential of about 1000 MW in the region that remains untapped. The challenge for the West Africa Power Pool (WAPP) was to find ways to mobilize these resources in an environment where the individual governments did not have adequate resources to meet the investment requirements; and

(v) ***Weak institutional and human capacities.*** The size of the power infrastructure in many of the member states of ECOWAS and OMVS can be described as small or very small.

The local capacities for system operation, maintenance and especially project implementation were correspondingly low.

2. The vision of ECOWAS was to develop and put in place a cooperative power pooling mechanism for integrating national power system operations into a unified regional electricity market - with the expectation that such mechanism would, over the medium to long term, assure a stable and reliable electricity supply at affordable costs. The long term scenario was to establish the WAPP as the principal vehicle to help meet the region's projected electricity requirement by harnessing electricity from: (a) several large capacity hydropower facilities (e.g., Kainji, Akosombo, Manantali) sited on the region's major rivers (Niger, Volta, Senegal) which produce relatively low-cost electricity (US\$0.01 - 0.03kWh); (b) the substantial but as yet untapped hydro resources of Guinea, some 6,000 MW of which was potentially economic to develop and generate around 20-25 TWh per year of electricity at relatively low cost (between US\$0.02-0.03kWh); and (c) an expansion of gas-fired power generation, leveraging the West Africa community's parallel track strategy to expand access to Nigeria's enormous natural gas reserves (3,500 billion cubic meters of proven natural gas reserves) via the West Africa Gas Pipeline (WAGP). In order to provide a robust infrastructure platform for the WAPP, a four-fold increase in power system interconnection capacity among ECOWAS Member States (the "Community") was required over the period 2005-2020.

3. Power pools benefits expected from developing interconnections and operating the power pool included the following: (i) reduction in capital and operating costs through improved coordination among power utilities; (ii) optimization of generation resources and scale economies with large generating units; (iii) improved power system reliability with reserve sharing; (iv) enhanced security of supply through mutual assistance; (v) improved investment climate through pooling risks; (vi) coordination of generation and transmission expansion; (vii) increase in inter-country electricity exchanges; and (viii) development of a regional market for electricity.

4. Among the many constraints and challenges facing the WAPP (such as mobilizing investment for power projects), two constraints were particularly relevant to the West Africa region (including OMVS): (i) Inadequate generating capacity and reserve margin; and (ii) lack or underdeveloped transmission networks. ECOWAS and OMVS, with the support of the Bank and other donors, particularly the European Investment Bank (EIB), addressed the problem by strengthening generation and transmission throughout the region through three Adaptable Program Loans (APLs):

- APL 1: Coastal Transmission Backbone
- APL 2: OMVS Power System Development; and
- APL 3: Inter-zonal Transmission hub

This ICR deals with APL 2: OMVS Power System Development.

5. West Africa is endowed with significant energy resources for electricity generation, but these resources are unevenly distributed and the gap between supply and demand was increasing. In 2003, the combined total consumption of electricity was about 40,000 GWh (approximately 160 kWh per capita) and peak power demand was 6,500MW. Electricity demand was projected to grow by over 7% per year until 2020, when electricity



requirement would reach 140,000 GWh (approximately 370 kWh per capita) and the peak power demand would exceed 22,000 MW.

6. OMVS was mandated by the governments of Mali, Senegal and Mauritania to ensure a multi-purpose water resources development, including electric power generation in the Senegal River Basin. The hydropower potential of the Senegal River Basin is estimated at 1,200 MW, of which only about 200 MW have so far been developed. During the 1990s, the Regional Hydropower Development Project (RHDP), implemented by a special purpose company (*Societe de Gestion de l'Energie de Manantali*, SOGEM – Manantali Energy Management Company), led to the establishment of a unique sub-regional power system: the OMVS Power System. It comprises a 200 MW hydroelectric plant at the foot of the Manantali dam, a 1000 kilometer long system of 225kV transmission lines and sub-stations that evacuate electricity produced at the Manantali hydroelectric plant to the main load centers in Mali, Mauritania, and Senegal, both operated in real-time by a central load dispatching system. The Felou 60MW run-of-the-river power plant was located on the Senegal River in Mali about 200 km downstream of the Manantali Hydropower Station with an interconnection to the 225 kV transmission system which links Dakar (Senegal), Nouakchott (Mauritania) and Bamako (Mali). The Felou hydroelectric Project (HEP) took advantage of an existing small hydro plant (600 kW) and excess transmission capacity available in the OMVS network.

## **B. Rationale for Bank Assistance**

7. The Felou HEP primary purpose was to support the OMVS Governments' efforts to provide affordable energy to their energy starved economies. To support this objective, the Bank pursued a two-pronged strategy at the regional and national levels.

8. At the regional level, the Bank followed a well-defined and phased integration effort in key sectors where the countries would benefit significantly from cross-border trade - notably road and air transport, energy and telecommunications. This strategy was articulated in the Regional Integration Assistance Strategy (RIAS) for West Africa which the Bank adopted in 2001 and whose objective was to help the countries concerned create a unified regional economic space through the integration of markets of goods, financial and infrastructure services.

9. To achieve this objective, the Bank and other donors such as EIB (which parallel financed the Felou Build-Design contract) in consultation with the WAPP and ECOWAS, agreed to put in place a multi-year programmatic framework in support of WAPP. In addition, national energy projects in the Bank Country Assistance Strategies (CAS) for each ECOWAS member state (including OMVS) were aligned with the broader goals of WAPP. For the OMVS countries, the Felou HEP was aligned with the objectives of: (a) broad based growth and private sector development, including improving infrastructure of the FY04-06 Mali CAS; (b) wealth creation of the Senegal FY03-06 CAS; and (c) accelerating private sector-led growth of the Mauritania CAS.

10. At the national level, the development of the OMVS Felou HEP under the WAPP APL 2 operation provided a least-cost energy source and strategically complemented country-specific IDA energy lending operations in the OMVS member countries (i.e. Mali,

Senegal, and Mauritania) to address various energy sector challenges outlined in paragraph 1 above.

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

11. The objectives of the project were to: (a) augment the supply of low cost hydroelectricity from the OMVS Power System to the national power utilities of Mali, Mauritania, and Senegal; and (b) develop a nucleus of a well-functioning, cooperative, power pooling mechanism for the WAPP Zone “B” OMVS Countries of West Africa.

12. The PAD only mentions the first objective. However, the Project Agreement included the second objective. The ICR analysis is based on both objectives as stated the Project Agreement, as per OPCS guidelines. All implementation status and results reports (ISRs) mention the two objectives.

13. The two PDO level key performance indicators are:

- Quantity of low cost hydroelectricity that OMVS power system supplies to the electricity utilities of the WAPP Zone B OMVS countries (EDM, SENELEC, and SOMELEC); and
- Operating rules in place on the basis of sound economic dispatch criteria.

14. The first PDO level indicator was included in the original results framework, while the second PDO level indicator was added to the results framework of the project as part of the changes made during the additional financing in 2009.

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

15. The original project objectives were not revised during the life of the project. Only the first PDO level key indicator was included in the original results framework in the PAD. The second PDO level indicator (i.e., operating rules in place on the basis of sound economic dispatch criteria) was introduced through the additional financing in 2009.

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Comment(s)
<b>Indicator 1 :</b>	Quantity of hydroelectricity supplied by OMVS Power System Operator to the electric utilities of the WAPP Zone B OMVS Countries (EDM, SENELEC, SOMELEC) (GWh).			
Value quantitative or Qualitative)	807 GWh - EDM: 315 - SENELEC: 273 - SOMELEC: 219	1143 GWh - EDM: 427 - SENELEC: 385 - SOMELEC: 331	1142 GWh - EDM: 594 - SENELEC: 377 - SOMELEC: 171	This indicator was in the original results framework
Date achieved	06/29/2006	06/29/2006	08/27/2009	

<b>Indicator 2 :</b>	Operating rules in place on the basis of sound economic dispatch criteria (Yes/No)			
Value quantitative or Qualitative)	No	No original target	Yes	This indicator was added at additional financing (See section 2.3 for details).
Date achieved	08/27/2009	06/29/2006	08/27/2009	

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

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Comment(s)
<b>Indicator 1 :</b>	Commissioning and performance testing of Felou HEP completed on schedule.			
Value (quantitative or Qualitative)	No	Yes	Yes	This indicator was in the original results framework
Date	06/29/2006	06/29/2006	08/27/2009	
<b>Indicator 2:</b>	Commercially sound (power exchanges) agreements put in place and adhered to by OMVS Power System Operator.			
Value (quantitative or Qualitative)	No	Yes	Dropped	This indicator was dropped with the additional financing
Date	06/29/2006	06/29/2006	08/27/2009	
<b>Indicator 3 :</b>	Generation Capacity of Hydropower constructed under the project.			
Value (quantitative or Qualitative)	0MW	60MW	60MW	Core indicator added starting with ISR Sequence 7
Date	08/27/2009	06/29/2006	08/27/2009	
<b>Indicator 4 :</b>	Availability of the power generation units of Felou HEP.			
Value (quantitative or Qualitative)	0%	95%	95%	This indicator was in the original results framework
Date	06/29/2006	06/29/2006	08/27/2009	
<b>Indicator 5 :</b>	Owner's engineer has been recruited.			
Value (quantitative or Qualitative)	No	NA	Yes	Indicator added with additional financing.
Date	08/27/2009	06/29/2006	08/27/2009	
<b>Indicator 6 :</b>	Design-build contractor has been employed.			
Value (quantitative or Qualitative)	No	NA	Yes	Indicator added with additional financing
Date	08/27/2009	06/29/2006	08/27/2009	
<b>Indicator 7 :</b>	Adoption of Tariff Protocol for Felou HEP by the OMVS Power System Operator EDM, SENELEC, SOMELEC.			

Value (quantitative or Qualitative)	No	NA	Yes	Indicator added with additional financing
Date	08/27/2009	06/29/2006	08/27/2009	
<b>Indicator 8 :</b>	Power sector monitoring and evaluation data of the WAPP Zone B-OMVS Countries collected, analyzed and disseminated by the WAPP.			
Value (quantitative or Qualitative)	0%	100%	100%	This indicator was in the original results framework
Date	06/29/2006	06/29/2006	08/27/2009	
<b>Indicator 9 :</b>	Database at the WAPP level is put in place and power sector M&E data of the WAPP Zone B OMVS Countries are developed.			
Value (quantitative or Qualitative)	No	NA	Yes	Indicator added with additional financing
Date	08/27/2009	06/29/2006	08/27/2009	
<b>Indicator 10 :</b>	Communication and data acquisition facilities upgraded.			
Value (quantitative or Qualitative)	No	NA	Yes	Indicator added with additional financing
Date	08/27/2009	06/29/2006	08/27/2009	
<b>Indicator 11 :</b>	Necessary software licenses acquired.			
Value (quantitative or Qualitative)	No	NA	Yes	Indicator added with additional financing
Date	08/27/2009	06/29/2006	08/27/2009	

#### **1.4 Main Beneficiaries,**

*(original and revised, briefly describe the "primary target group" identified in the PAD and as captured in the PDO, as well as any other individuals and organizations expected to benefit from the project)*

16. The primary target groups identified in the PAD are the OMVS member countries of Mali, Senegal and Mauritania and through their respective power utilities, their respective populations. Furthermore, as a source of clean, renewable energy, the OMVS 60 MW Felou Hydroelectric Project benefits the global environment as it displaces thermal power generation powered by fossil fuels.

## 1.5 Original Components (as approved)

17. The Felou HEP had three components:

(a) **Component 1 (US\$ 177.6 million)<sup>2</sup>**: Design, construction and commissioning of a 60 MW run-of-the-river hydroelectric plant at Felou. This component represents about 92% of total project cost (excluding price contingencies and interest during construction). The design build contract included the provision of the following goods and services: (a) site preparation; (b) civil works; (c) studies and services; (d) electro-mechanical equipment (3x21 MW generating sets); (e) equipment assembly; (f) mechanical auxiliaries; (g) electrical equipment and materials; (h) interconnection to the OMVS transmission system; (i) environmental and social mitigation; (j) assistance in operation and maintenance during the guarantee period; and (h) spare parts. These components are further broken down into sub-components in Annex 2 below.

(b) **Component 2 (US\$ 8.56 million)<sup>2</sup>**: Two-Stage "Project Cycle Management Contract". Provision of services of an experienced engineering consulting firm to provide comprehensive project cycle management support to oversee the design, construction and commissioning of the hydroelectric plant at Felou through a two-stage sequential contracting arrangement, as follows:

- (i) *Phase 1 ("Transaction Adviser")*. Contract with a consulting firm to provide transaction advice and support required to: (a) perform detailed planning and scheduling of project implementation arrangements, including pre-qualification of prospective bidders, (b) prepare and issue bidding documents for the selection of an independent contractor, (c) prepare a comprehensive set of power supply agreements for use by the OMVS Power System Operator, and (d) conduct the two-stage bidding process, evaluate bids and make recommendation for the award of the design-build contract; and
- (ii) *Phase 2 ("Owner's Engineer")*. Contract to oversee the day-to-day performance of the design-build contractor over the entire "design-build performance testing" cycle, up until the critical milestone involving the hand-over of the "use and control" of a fully operational Felou hydroelectric plant to the OMVS Power System Operator.

(c) **Component 3 (US\$7.79 million)<sup>2</sup>**: WAPP Action Plan for the OMVS Power System. Support in facilitating joint operations and coordination between *Electricite du Mali* (EDM), *Societe Nationale d'Electricite du Senegal* (SENELEC), *Societe Mauritanienne d'Electricite* (SOMELEC) and the OMVS Power System Operator by: (i) upgrading communication and data acquisition facilities to enable real-time information exchange with the load dispatching center at Manantali and the three national power utilities; and (ii) acquiring the necessary software licenses (with

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<sup>2</sup> Excluding price contingencies and interest during construction. See Annex 1 for details.

relevant training) to support optimization and scheduling of the combined hydro and thermal power generation capacity of the recipients.

## 1.6 Revised Components

18. There was no change in the project components.

## 1.7 Other significant changes

*(in design, scope and scale, implementation arrangements and schedule, and funding allocations)*

19. The original project design with its two development objectives and three components remained unchanged throughout. The changes introduced with the additional financing were those related to the arrangements for project implementation, the extension of the project's closing date, the financing plan and revisions to the results framework.

20. **Arrangements for project implementation:** Under the original *project implementation arrangements*, OMVS was responsible for the overall coordination of the implementation of the project. OMVS, with the support of SOGEM, was also responsible for component 2 of the project, including: (i) detailed planning and scheduling of project implementation arrangements; (ii) preparing and issuing bidding documents for the selection of an independent contractor; and (iii) conducting the bid evaluation and contract award processes. In August 2008, OMVS informed the Bank that the Council of Ministers had decided to entrust the responsibility for project implementation entirely to SOGEM<sup>3</sup>. While OMVS had played a coordinating role and helped with mobilizing the financing for the project, this decision of the Council of Ministers helped focus the responsibility for implementation on SOGEM which was already carrying out most of the coordination of project implementation activities with the assistance of its consultants. This change in project implementation arrangements was considered acceptable and was formalized as part of the additional financing package.

21. **Extension of the Closing Date:** Given the delays experienced in awarding the design and build contract and the time needed to mobilize the additional financing required to complete construction, the project could not be completed by the original closing date of June 30, 2010. Taking into account the implementation period for the design build contract, the closing date of the project was extended by three years (from June 30, 2010 to June 30, 2013). The closing date was later again extended by one year and a half to December 30, 2014.

22. **Project Financing:** In line with OMVS policies, the costs of new regional assets were to be equally shared between the member states independently of how project benefits are shared. Therefore, in the original financing plan, Mali, Mauritania and Senegal each borrowed one third of the funds made available from IDA and the EIB. SOGEM had estimated that the total financing required to implement the project increased from US\$125 million to about US\$241 million (or 193% increase). The main reason was the increase in

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<sup>3</sup> OMVS' Council of Ministers: Decision N 0461/ER/CM (July, 30, 2008)

the cost of the design build contract, but the estimates for the Project Cycle Management Contract, price contingencies and Interest During Construction (IDC) had also to be adjusted because of the increase in the cost of the design build contract to which they were tied. The cost of IDC which was underestimated during appraisal of the original project was made, during additional financing, to reflect the 4.5% on-lending rate for IDA and EIB funds from the three governments to SOGEM.

23. In 2009 and because of policy reasons, IDA was not in a position to extend new credits to Mauritania, but given the high priority accorded to completing the Felou HEP, the significant economic benefits and the high cost of delays, the governments of Mali and Senegal requested that they be allowed to borrow the full amount of the additional financing required. The Government of Mauritania had indicated to the Governments of Mali and Senegal: its full commitment to an early completion of the Felou project and had demonstrated that by settling the arrears from SOMELEC to SOGEM as well as by signing off on the new guarantee mechanism which was to ensure regular bill payments to SOGEM. Given this evidence of commitment to OMVS, SOGEM and the Felou HEP, Bank management provided a waiver from OP 7.30 (Dealings with De Facto Governments<sup>4</sup>) to allow disbursements on the existing Credit to Mauritania for the Felou HEP subject to approval of the additional financing by the Board. This was done on August 29, 2009 which accorded Senegal and Mali an additional financing of SDR 27.4 million (equivalent to US\$42.5 million) each.

**Revision of the Results Framework:** The additional financing project paper of July 30, 2009 introduced the following changes to the project's results framework (Section 1.3 above for details):

- Addition of a PDO indicator to the second project objective of creating a nucleus of a power pooling mechanism, namely "Operating rules in place on the basis of sound economic dispatch criteria".
- Addition of seven intermediate performance indicators; and
- Deletion of one intermediate indicator.

## **2. Key Factors Affecting Implementation and Outcomes**

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

*(including whether lessons of earlier operations were taken into account, risks and their mitigations identified, and adequacy of participatory processes, as applicable)*

#### **Project Preparation**

24. The project was well grounded in the need of the region and the OMVS countries for a reliable source of affordable energy to sustain a broad-based growth and employment called for in country assistance and poverty reduction strategies.

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<sup>4</sup> A "de facto government" comes into, or remains in, power by means not provided for in the country's constitution, such as a coup d'état, revolution, usurpation, abrogation or suspension of the constitution.

25. The project was also well grounded in existing OMVS conventions and operating rules for jointly owned infrastructure, such as the OMVS power system and followed an output-based approach to the main design build contract. In parallel a consulting engineer support was provided to enable SOGEM to oversee the entire project cycle, including engineering supervision.

26. At the time of appraisal, the project benefitted from the experience gained in the implementation of:

- the Regional Hydropower Project of Manantali which was partly financed by IDA through three credits to Mali, Senegal and Mauritania as well as from lessons learned, including the option of a Fixed- Price Date Certain Turnkey Contract for the dam and power station, with a pre-qualification process (i.e. a two stage bidding process); and
- national projects and sector work done by the Bank in Mali, Senegal and Mauritania, all of which had an impact on the Felou HEP project and the OMVS system, such as the Energy Support Project (ESP) in Mali or the Electricity Sector Efficiency Enhancement Project in Senegal.

27. Existing hydrological data on the Senegal river and the data collected at the site of the existing small run-of-river power plant (600 kW), which was replaced by the Felou hydroelectric power plant, were used to develop a comprehensive set of high-quality baseline data, including reasonable candidates such as Felou and Gouina hydroelectric projects, downstream of the Manantali hydroelectric project. The feasibility study carried out by Coyne et Bellier (2003) delineated the dam and power plant characteristics and these technical specifications were used in the call for the first stage bids toward the choice of an Engineering, Procurement, and Construction (EPC) contractor.

28. The project also benefitted from the Scandinavian experience in the design of power pooling mechanisms. A key lesson learned was the requirement of active involvement of all transmission system operators. In the specific WAPP APL 2 project context, a unique multi-country regional transmission system operator – Eskom *Energie Manantali SA* (EEM) – was established to coordinate operations through the *Comité Technique Permanent de l'Interconnexion* (CTPI) with the national power utilities.

### **Assessment of project design and Quality at entry.**

29. The objectives of the project responded to Bank priorities for the ECOWAS region in general and OMVS region in particular. They also fitted Government priorities to supply their economies with affordable energy. The CASs and poverty reduction strategies of each country for the year 2005-2006 when the Felou project was prepared and appraised, invariably called for higher, sustainable and broad-based growth to generate employment and raise the living standards and affordable energy was a key ingredient in achieving this.

30. The project's strategy to remain simple and focus on two objectives, the main of which was increasing the power generation capacity to alleviate the power and energy shortages in Mali, Senegal and Mauritania and designing the project to only include three components was commendable. The project development objectives were structured around two categories of outcomes expected from the project, namely (a) alleviate power supply deficits in Mali, Senegal and Mauritania through an increase supply of low cost



hydroelectricity from the OMVS power system, including Felou; and (b) develop a nucleus of a well-functioning WAPP power pooling mechanism. The second outcome was added at additional financing.

31. The project was designed with three components that reflected the categories of outcomes mentioned above (a “design build” component, a “Project cycle management contract” component, and a “WAPP Action plan for the OMVS Power System” component); consequently, project design followed a well-defined structure, from components to objectives and from objectives to outcomes. The scope of the first two components was reasonable and in line with international experience in run-of-river power plants. The scope of the third component was also reasonable. However, the outcome it supported has no easy interpretation (see Section 2.3 below for more details).

32. An important feature of the project was the retention of a private company as OMVS Power System Operator. However, promoting private sector participation needs to be accompanied with a strengthening of the public entity’s capacity to oversee a private sector operator. The Manantali project succeeded in involving a private operator for the management and operation of project facilities, as well as in reviewing and establishing tariff principles and mechanisms, and energy purchase agreements. However, legal disputes between SOGEM and the operator **over contract responsibilities and remuneration** which were not clear in the Manantali concession agreement showed that the objective of promoting private sector participation needs to be accompanied with a strengthening of the public entity’s capacity to manage and negotiate operations and maintenance (O&M) contracts.

33. As a category A project in regards to safeguards, the project design took into account the Bank’s safeguards policies, including procedures and implementation arrangements to ensure full consideration of environmental and social safeguards. Four Bank safeguard policies were triggered: Environment Assessment (OP/BP 4.01); Involuntary Resettlement (OP/BP 4.12); Dam Safety (OP/BP 4.37) and Projects on International Waterways (OP/BP 7.40). See Section 2.4 below for details.

34. The implementing agency was supported by an engineering consultant to assist in bid evaluation and supervision during construction. This was an appropriate measure to supplement SOGEM’s implementation capacity. However, project implementation still proved to be challenging (see section 2.2 below) due to: the lack of advanced procurement actions including readiness of the bidding documents before project approval; the adoption of a comprehensive bidding process including prequalification and two-stage bidding; the unexpected rebidding process conducted to comply with the Bank’s procurement eligibility requirements; and the rise in the cost of civil works and equipment for the design-build contract. Multiple reasons were given to explain the substantial increase in the estimated cost of the design-build contract despite an open international competitive bidding process. In US Dollar terms, the estimated base price of the Design-Build contract increased from US\$ 100 to US\$ 176 million. The cost increase was due to the devaluation of the USD exchange rate relative to the Euro in which the contract was denominated and the worldwide increase in commodity and equipment prices that was witnessed in comparable projects over the few years after the base price was estimated till the contract was procured. Other factors may also have contributed to the high contract price, such as the worldwide market volatility when the contract was procured, and the contract model selected (while

its selection might have been justified for its other merits): a fixed lump-sum price contract on design-build basis, covering construction of the large civil works, supply and installation of hydrogenation plant for a multi-year period.

35. In addition to IDA, EIB was the only other external co-financier of the project. EIB provided parallel financing for design-build contract under component 1 of the project.

### **Adequacy of governments' commitments**

36. The commitment to, and ownership of the project was strong at the time of preparation and appraisal. This strong commitment was sustained throughout the life of the project. The governments of Mali, Senegal and Mali requested and obtained five (5) IDA credits (three original and two additional financing) towards the financing of the project which was also co-financed by EIB. The three governments also pushed for the settlement of arrears to SOGEM by their respective national utilities as well as accepting a tariff increase of 10% in July 2013.

### **Assessment of risks**

37. The table below shows the risks and mitigation measures identified in the PAD along with a brief description of how these risks evolved during the implementation of the project.

Original perceived risk	Risk rating	Original mitigation measure	Comments
Non-application by the OMVS riparian countries of third party access to power generation and transmission facilities as well as free transit of electricity within ECOWAS.	Not rated	The OMVS High Commission and the General Secretary of the WAPP organization agreed to align the functions and operations of the OMVS power system with those drawn up for the WAPP Zone B.	This risk did not materialize
Poor state of communication facilities that the national power utilities rely on for real-time information exchange with the OMVS central load dispatching system in Manantali.	Not rated	The technical assistance, communication equipment and software to be provided under the project were to help address this shortcoming.	This risk was to be addressed through Component 3 of the project which could not be implemented before the closing date of the project because of delays in agreeing on the terms of reference between the OMVS, WAPP, SOGEM, EDM, SENELEC and SOMELEC and delays in the recruitment of the consultant
Relatively weak capacity of the OMVS		Adoption of a two stage bidding procedure and	This risk was adequately identified.

and SOGEM to oversee the construction of the OMVS Felou Hydroelectric project	Not rated	recruitment of a consultant to prepare, issue and evaluate bids and oversee the construction of the dam and power station and the supply and installation of the communication equipment	However, the mitigation measure proved by itself insufficient to remedy the lack of capacity of SOGEM, the implementing agency.
Fiduciary risk in the selection of the two main contracts: (i) Design-Build contract; and (ii) the contract for the supply and installation the SCADA, communication equipment and software.	Moderate	Same as above.	The risk was adequately identified. This risk was mitigated through the recruitment of a consulting engineer to launch and help evaluate the bids.
Technological soundness of investments	Not rated	All investments supported under the project use proven designs and carry no particular risk or controversial aspect	-

38. Other risks (not *formally* identified at appraisal):

- Hydrology and O&M: As with most hydroelectric projects, the hydrology is an important risk to project outcome. SOGEM set up a Hydrology Risk Fund to ensure that payment obligations are met in the event of a disaster or a poor rainfall year and a Maintenance and Operation Fund. Despite resources constraints, SOGEM did its best to ensure that these were adequately funded. The coming on stream of Felou would allow more resources to be allocated to the Funds.
- Non regular payment of electricity bills: Another risk not formally identified is the non-regular payment of bills by EDM, SENELEC and SOMELEC which created serious financial difficulties for SOGEM. SOGEM in turn had difficulties repaying the loans including some on-lent to it by the three governments for the purpose of project financing. However, financial covenants were put in place whereby the Governments of Mali, Senegal and Mauritania were to cause their respective utilities to establish an escrow account to backstop payments obligations for electricity purchases from the OMVS power system. This provision however proved ineffective as the three national utilities continued to accumulate arrears. The situation improved after the commissioning of Felou and as of early June 2015, only EDM had arrears of about FCFA 3.3 billion, of which 1.43 billion are in dispute with SOGEM.

## **2.2 Implementation**

*(including any project changes/restructuring, mid-term review, Project at Risk status, and actions taken, as applicable)*

39. The project was approved in June 2006 and closed in December 2014. The eight and a half years implementation period was characterized by two distinct phases: a period of significant delays, which lasted roughly four years, until mid-October 2010, and a period of active implementation, which lasted about four years and a half until project closure in December 2014.

40. The early implementation period (2006-2009) was characterized by a slow start. The parent project was approved in 2006 and became effective 10 months later. In 2008, the cost overrun resulted in processing the additional financing, which was approved in 2009 with additional delays because legal documents needed amendments after a coup d'état in Mauritania and a waiver was needed to proceed. The new set of effectiveness conditions attached to the additional financing further delayed implementation. As a result, three years after Board approval, as of August 2009, less than 3 % of the project funds had been disbursed, against an original expectation of about 75%. During this period, the overall implementation progress and project development objectives ratings of the Felou HEP were consistently satisfactory to marginally satisfactory even though start-up was slow, the Bank and the three Governments/implementing agency were able to adapt to the unforeseen challenges posed and project implementation proceeded more rapidly.

41. The active implementation period (2010-2014) was characterized by implementation progress but also significant project management challenges such as management contract issues, financial problems, governance and country instability. With improved perspectives of achieving its objectives, the project was restructured in August 2009 with the additional financing with adjustments to some component indicators and a three-year extension of the closing date. By mid-October 2010, with many of the earlier challenges addressed, the project started to make significant progress. The bidding process was successful and the design-build-contractor started construction. The Mid Term Review (MTR) took place in November 2011 to examine the issues that had slowed implementation. It focused on remedial measures to accelerate implementation, improve operational efficiency, and strengthen SOGEM's financial position and operating performance. It also suggested steps to ensure that the environmental and social issues in the Environmental Action Plan and the Resettlement Action Plan, whether they were the responsibility of SOGEM or the EPC contractor, be undertaken or completed. The mission finally focused on the financial situation of SOGEM which was worrying because of an increase in operating costs and a high level of arrears built up by participating utilities. The expected tariff increase of three times 10 % each starting in July 2011 and stretching to January 2013 did not take place, further exacerbating SOGEM's cash-flow problems. The MTR requested that SOGEM implements a cost cutting program to alleviate the situation. However, an increase in tariffs was seen as the most important instrument to redress the situation. SOGEM's performance in financial management was rated moderately unsatisfactory because of the four months delay in submitting the 2010 audit reports. The MTR, while insisting that SOGEM strengthen the capacities of its financial department, otherwise confirmed the continued relevance of the project development objectives and its three components.

42. Thereafter, the project progressed well until closure. The development objective (DO) rating was Satisfactory until June 2012 and moderately satisfactory until the project closing date in December 2014. Implementation progress was rated moderately satisfactory from early 2011 until the closing date of the project.

43. In summary, the following factors affected project implementation at various stages:

- Procurement Process: The procurement process for the design-build contract started only after the project was approved in June 2006. Following a comprehensive process, including prequalification and two-stage bidding, four bidders were prequalified but only two of them submitted bids in the final stage. Because the lowest evaluated bidder could not meet the eligibility requirements under the Bank's Procurement Guidelines and the other bidder's price was too high, a fast-track rebidding was then conducted in late 2008, which resulted in awarding the contract to Sinohydro of China for a value of about 126 million Euros or about US\$ 176 million (excluding physical and price contingencies). The contract was signed in May 2009 after a satisfactory financing plan was in place to fund the cost overrun.<sup>5</sup> Since the project was designed to have a design-build contract, the procurement method i.e. prequalification plus two-stage bidding, might have been a suitable approach. However, it should not be taken for granted for future projects and a thorough assessment of various procurement options should be carried out. Procurement actions should also be carried out well in advance of the project approval and the processing of additional financing.
- Delayed Project Effectiveness: It took 10 months between appraisal and effectiveness of the original project due mainly to having the three Governments sign/ratify the legal documents and meet the conditions of effectiveness. The additional financing took about the same time (about 10 months) between appraisal and effectiveness.
- Additional financing: IDA, at the request of the Governments of Mali and Senegal, approved two additional credits of about US\$42.5 million each towards the financing of the project. The reasons for the increase noted above. Construction of the dam and power station started in November 2009 with the signature of the contract. As already mentioned earlier on delayed project effectiveness, it took about 10 months for the additional financing to become effective. The reasons were the satisfaction of the conditions of effectiveness (two of which were tied to the readiness of the draft bidding documents for Design-Build Contract and the draft phase 2 contract "Owner's Engineer" (which required the recruitment of the consulting engineer) and the lengthy legal approval process by the countries involved (Mali and Senegal).
- Management Contract Issues: Disputes between SOGEM and EEM over contract responsibilities and remuneration which were not clear in the Manantali concession agreement led to an unanticipated termination of the 15-year contract between them with effect end October 2011 with the possibility of extending the contract until June 30, 2012.

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<sup>5</sup> Bid validity expired on March 28, 2009, but SOGEM had already obtained an extension of two months to allow more time to put the additional financing in place.

Eventually the EEM contract was extended and closed in July 2014 after successive extensions. While waiting for the recruitment of a new private operator, a new company, *La Société d'exploitation de Manantali et de Félou* (SEMAF) was set up as a subsidiary of SOGEM. SEMAF has already started the operation and maintenance of Manantali. For Felou, SOGEM signed a temporary contract with the EPC constructor, Sinohydro which will expire in October 2015 (before the end of the April 2016 warranty period). An O&M expert provided recommendations on the future transfer of Sinohydro's responsibility to the newly created subsidiary, SEMAF.

- Financial Issues: Payment arrears reached nearly FCFA 45 billion at the end of December 2007. In addition, funds for maintenance and upgrading of the hydroelectric plant and transmission lines (Main Equipment Rehabilitation Fund) were not set aside by SOGEM as originally planned and agreed. The same happened to the Hydrology Risk Fund (15 billion FCFA) that SOGEM had set up to ensure that payment obligations are met in the event of a disaster or a poor rainfall year. The situation improved only in 2009, when a resolution from the OMVS Council of Ministers called upon member countries to ensure the regular payments of their electricity bills and authorized EEM to cut electricity supply to the defaulting electricity companies.

Following the resolution of the OMVS Council of Ministers, the level of arrears decreased: According to the Annual EEM technical report released in March 2011, the recovery rate of new bills was up to 100% (Eskom, 2003-2010). As for the old arrears, 75% of the outstanding 2007 total arrears were settled at the end of April 2009. This situation however proved unsustainable and the build-up of arrears reemerged as a major concern: FCFA 11 billion compared to turnover of FCFA 35.8 billion or about 31% in December 2013. SOGEM's financial situation improved following the commissioning of Felou and as of early June 2015, only EDM had arrears of about 3.3 billion FCFA, of which about 1.4 billion FCFA are in dispute. SENELEC and SOMELEC are current.

- Coup d'Etat and Insecurity in Mali: In Mali, the civil war, the 2012 coup d'etat and the resulting insecurity resulted in higher costs, including security fees, for goods and services. In addition, in periods of heightened tensions, constructors and consultants withdrew their staff from the Felou site and often worked through (heavily guarded) short visits. Furthermore, this situation had an impact on project supervision as often during this period, supervision was done remotely through video conference.
- Lack of Agreement on Acquisition of SCADA and other IT equipment and Software Licenses: Except for a minor expense on a study and preparation of bidding documents, component 3, a very small component of the whole project (about 4% of project costs), was not implemented. The procurement of SOGEM's enhanced SCADA system was delayed by almost two years, as a result of prolonged technical discussions between SOGEM, EDM, SENELEC, SOMELEC, and the WAPP Secretariat about the integration of existing and future SCADA systems in the sub-region, together with procurement delays for consulting services for the design of SOGEM's enhanced SCADA system.
- Lack of Capacity of SOGEM: SOGEM lacked technical, administrative, financial and environmental and social capacity to carry out the project as implementing agency. A supervising engineer and direct recruitment in the needed specialties (procurement, financial management, environmental and social) helped strengthen SOGEM's capacities

in implementing the project. As with other countries, a future Bank engagement with SOGEM could focus on capacity building.

- Contractor's Underestimation of Highest Floods: The design-build contractor's underestimation of highest floods/size of diversions/cofferdams, twice resulted in flooding of the construction site. This led to implementation delays and financial claims between SOGEM and the contractor.

44. SDR7.49 million (or about US\$ 10.46 million) of the credits were not disbursed and were thus cancelled.

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

45. Design: The baseline data for the indicators (original and revised) were prepared and the monitoring system was simple and based on measurable outputs especially for components 1 and 2. The original project documentation only had one PDO indicator. A second indicator was added at the time of the additional financing. At the time of the additional financing, seven new intermediate indicators were added and one was dropped. Furthermore, one core indicator related to generation capacity of hydropower constructed under the project was added starting with ISR 7 (see Section 1.3 above for details). The second project objective to "develop a nucleus of a well-functioning, cooperative, power pooling mechanism for the WAPP Zone "B" OMVS Countries of West Africa" and its outcome indicator of "operating rules in place on the basis of sound economic dispatch criteria" were somewhat vague.

46. Some indication of what the outcome indicator was meant to be is given in the Results Framework of the additional financing "...a measurement for the functioning of the WAPP power pooling mechanism" or in the description of component 3 (PAD, para. 23) which was meant to support the achievement of the project's second objective "This component will help upgrade the functional and operational capabilities of the CTPI *to fully deploy the power pooling provisions of the OMVS Power System*. Specifically, this component will facilitate *joint operations and coordination* between EDM, SENELEC, SOMELEC and EEM". Or from the description of component 3 in the additional financing Project Paper (para. 15): "...acquiring the necessary software licenses with relevant training *to support optimization and scheduling of the combined hydro and thermal power generation capacity of the recipients*". Ultimately component 3 was not implemented.

47. Implementation: The M&E system was well-embedded institutionally and the OMVS Power System Operator and SOGEM carried out the overall monitoring of the project and the achievement of the output indicators. These indicators were reported to the Bank in progress reports. The monitoring included separate detailed reporting by SOGEM, covering progress on physical implementation, procurement, financial commitments and other elements of the project progress. The data collected were evaluated and used to inform decision-making.

48. Utilization: The information provided by the monitoring and evaluation system is critical to the operation and energy dispatch of the OMVS power system and to the three utilities of Mali, Senegal and Mauritania. Due to the criticality of the information provided, the sustainability of the M&E arrangements beyond the project implementation period is

likely. However joint operations and coordination between EDM, SENELEC, SOMELEC and the OMVS Power System Operator has been postponed to a future date as the conditions for this to happen are not yet in place (e.g. power shortage in all OMVS countries, power exchange agreements, etc.).

## **2.4 Safeguard and Fiduciary Compliance**

*(focusing on issues and their resolution, as applicable)*

49. **Environmental and social safeguards:** Four safeguards policies were triggered: Environment Assessment (OP/BP 4.01); Involuntary Resettlement (OP/BP 4.12); Dam Safety (OP/BP 4.37) and Projects on International Waterways (OP/BP 7.40)

50. Over the life of the project, the compliance with environmental safeguards was rated from satisfactory to moderately satisfactory mainly because of the lack of reporting by SOGEM particularly on the status of implementation of the RAPs, and the call for the strengthening of its social unit. The team however noted considerable efforts in the implementation of safeguard mitigation measures. The detailed action plan showed that all planned mitigation measures under Sinohydro (the design-build contractor) or OMVS responsibility were satisfactorily implemented: feeder road; water supply; fence of Lontou School; providing funding for the construction of the health center; etc. An improved water waste management system was built and the safety of workers and population in the Felou site was improved and no incident was recorded.

51. The environmental audit of the Felou HEP which was due within six months of the closing of the project was received. Its conclusions are that: (i) every person affected has been equitably compensated and complaints resolved to the satisfaction of the parties; (ii) the measures included in the RAP have been for the most part implemented; (iii) the mechanisms of dispute resolution have worked well; and (iv) there has been an improvement in the social conditions such as through the provision of potable water supply. It however recommends a number of minor corrective measures, part of the Environmental and Social Management Plan (ESMP), to be addressed by SOGEM/Sinohydro while Felou is still under the operating warranty (e.g. Reforestation of the site, follow up on the maintenance of the trash management system and a plan of what would become of the Sinohydro's base camp now that the work was completed).

52. **Financial Management (FM):** The FM performance of the project was rated mostly moderately satisfactory during project implementation and the related risk was deemed moderate taking into account that minimum FM arrangements were put in place at the coordination unit and that 100 % of projects expenditures were made through direct payments. Starting in 2012, audit reports noted gradual improvements on SOGEM's financial statements that evolved from a qualified opinion with substantial shortcomings to an unqualified opinion in 2013. However, SOGEM's weak internal control environment and its FM system to which the overall FM performance of the project was closely tied, was often criticized by external auditors and Bank FM supervision reviews. As documented in ISRs, staffing of SOGEM's finance department remained an issue and SOGEM failed, over the life of the project, to take appropriate action to adequately reinforce it.



53. Financial management was rated unsatisfactory in November 2011 because the audit report revealed serious weaknesses in SOGEM's financial management and internal controls. The rating was subsequently upgraded to moderately satisfactory after SOGEM improved its financial and accounting practices and reorganized its finance department. This rating was kept until the end of the project.

54. **Procurement:** The project was implemented in accordance with Bank's Procurement and Consultant Guidelines and the Standard Bidding Documents were used. As noted in section 2.2, for the Design-Build contract a rebidding process was conducted in order to comply with the Bank's procurement eligibility requirements. Allegations of fraudulent and corrupt practices by a firm involved in the implementation of the project resulted in an investigation by the Bank that has led to a pending sanctions case against the firm and related risk mitigation measures.

55. The ISRs noted weaknesses in capacity and recommended training and recruitment of procurement specialists. After the effectiveness of the additional financing in October 2010 and except for component 3, procurement proceeded and the Felou HEP fully entered operation in April 30, 2014<sup>6</sup>.

## **2.5 Post-completion Operation/Next Phase**

*(including transition arrangement to post-completion operation of investments financed by present operation, Operation & Maintenance arrangements, sustaining reforms and institutional capacity, and next phase/follow-up operation, if applicable)*

56. The Felou HEP is operated as a unit of the OMVS power system that now includes Manantali and Felou, but is expected to include more power plants in the future such as the Gouina HEP, now under construction with non-World Bank financing. The OMVS member countries have a clear strategic interest in the effective operation of the OMVS system that delivers power sustainably at a reasonable cost. As indicated earlier, Governments' commitment to the project and to the OMVS system in general have for the most part been strong and steady. The alternatives to the predominantly hydro based OMVS power system (such as relying on thermal power generation even if the economics of thermal power has been altered by the rapid fall in oil prices) are worse. Hydropower has to stand on its own merit but it still provides a cheaper source of energy to meet the three OMVS countries' energy needs. The risks to project outcome have been evaluated as modest as Felou HEP is likely to serve the three countries' energy needs well into the future (see para. 85 below). Furthermore, there is still a significant hydro potential on the Senegal River (about 1200 MW of which only 260 have so far been developed) that has not been yet tapped that could be developed to supply OMVS/WAPP countries in the future.

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<sup>6</sup> The ratings of procurement in ISRs up to sequence 9 of March 2011, were however consistently satisfactory. This rating was downgraded to moderately satisfactory in sequence 10 of October 2011 because of the time taken to procure component 3 of the project (SCADA system, associated software and licenses). The project retained this rating until project closing because this component could not be acquired before December 31, 2014.

57. While addressing their energy needs through the pooling of their own resources, the OMVS countries are also looking further into the future to meet their energy needs through a wider power pooling and exchange of energy with other West African countries through the WAPP.

58. Transition operation and management arrangements are being put in place through an affiliate of SOGEM to manage the OMVS power system effectively. The management of the system is likely to be enhanced once the SCADA system is acquired.

59. Sinohydro is currently acting as a temporary OMVS system operator<sup>7</sup>. In July 2014, SOGEM created an affiliate (SEMAF) to take over the role of OMVS system operator for an initial period of four years at the end of Sinohydro's contract at the end of October 2015. SEMAF has started doing so for Manantali and some of its staff has been seconded to Felou to undergo training in the operation and management of hydro assets under the supervision of Sinohydro. After an initial four-year period, a determination will be made whether to proceed with the recruitment of a private firm or continue with this or other arrangements.

60. The Bank support is critical in supporting OMVS, SOGEM and the WAPP in further developing economic exchange for electricity throughout the West Africa region and particularly through short and medium capacity building programs and investment in generation, transmission and distribution assets.

### **3. Assessment of Outcomes**

#### **3.1 Relevance of Objectives, Design and Implementation**

*(to current country and global priorities, and Bank assistance strategy)*

**Rating: High**

61. Relevance of objectives: The project objectives and the activities supported by the Project were, and still are, highly relevant to the power sectors of Mali, Mauritania and Senegal and regionally, as more electric power becomes available, to the WAPP.

62. The development of the Felou HEPs in line with the Bank's regional integration strategy in Africa which remains a critical piece of the Bank's strategy to improve connectivity, leverage economies of scale, and enhance productivity. Furthermore, better infrastructure is key to promote broader growth, including in manufacturing and services. More abundant, reliable power is fundamental for competitiveness. Too little electricity remains the most serious infrastructure obstacle. Tapping Africa's tremendous potential to generate its own power from hydro, geothermal, natural gas, and solar resources is a priority for African countries, including OMVS, and the World Bank Group.

63. The development of the Felou HEP also strategically complements country-specific IDA energy lending operations that are ongoing or planned in the OMVS countries of the Senegal River Basin to increase the power supply to meet the needs of industry, commerce

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<sup>7</sup> It has done so at SOGEM's request, after EEM left.

and households. The Felou HEP is aligned with the FY14-15 Mali Interim Strategy Note on the preparation of the conditions for economic recovery. The growth in domestic electricity demand resulted in Mali absorbing the entirety of its share (50%) of generation from the Manantali hydropower scheme. To meet further growth in demand, the Government adopted a strategy combining more expensive short-term domestic thermal generation with longer term regional solutions that would result in lower generation costs, including the construction of an interconnection with Cote d'Ivoire, and development of Mali's hydropower potential, estimated at about 1,000MW. Of this potential, about 250MW has been developed so far at the Selingué and Sotuba dams on the Niger River, and the Manantali dam on the Senegal River. Also on the Senegal River, the Félou hydro plant will add to the generation mix.

64. The project supports the two pillars of the Senegal FY13-17 Country Partnership Strategy of accelerating inclusive growth and creating employment and improving service delivery which focus on infrastructure investments in the energy sector to improve the availability of reasonably priced electricity and to reduce the sector's dependence on costly thermal generation. The high cost of energy coupled with unreliable supply (especially for electricity), is a key constraint to private sector growth and also contributes to undermining the fiscal framework. The challenge for Senegal is to ensure a competitive supply of electricity in the industrial zones and agricultural areas that have the greatest potential. Demand had increased by about 10% per year. In 2010, power outages occurred 270 days out of 365, with the impact of these outages on economic growth as high as 1.4 percentage points of GDP. Senegal will need to diversify its energy mix, including by attracting private sector investments and improving sector governance. Senegal's heavy dependence on imported oil products for its energy supply has hurt its competitiveness, weakened its fiscal framework, and continues to severely undermine growth. Investments in low cost hydropower projects and regional cooperation offer a solution to Senegal's energy problem.

65. The project objectives are also aligned with the two pillars of the Mauritania Country Partnership Strategy FY14-16 of growth and diversification and, economic governance and service delivery through developing and expanding growth-supporting infrastructure, including transport, electric power production, and ICT.

66. Relevance of Design and Implementation: The project design was basically sound. The project comprised three components; (i) a large design-build component whose main objective was the construction of the Felou HEP to meet the energy demand of the participating utilities; (ii) closely tied to the first component, engineering consulting services to supplement SOGEM's capacity in the bidding process and construction supervision; and (iii) a component comprising the acquisition of information technology for the management of the OMVS power system. The first two components were tied to the first project objective which was to increase the quantity of electricity made available to the participants. The third component was logically tied to the second project objective which was to develop a nucleus of a well-functioning power pooling mechanism between OMVS countries. The second objective had no PDO indicator until the additional financing and the link between this project objective and its PDO indicator was somewhat tenuous (see Section 2.1 above).

67. Improvements in design could have included: a clearer definition of the second PDO as well as its indicator with the benefit of hindsight, a more straight forward procurement process, although the team was acting on a lesson learned from the Manantali project; in pursuing the two-stage bidding process, a capacity building element to support SOGEM in its management of the project.

### 3.2 Achievement of the Project Development Objectives

(including brief discussion of causal linkages between outputs and outcomes, with details on outputs in Annex 2)

#### Rating: Substantial

68. The PDOs, namely: (a) Augment the supply of low cost hydroelectricity from the OMVS Power System to the national power utilities of Mali, Mauritania, and Senegal; and (b) Develop a nucleus of a well-functioning, cooperative, power pooling mechanism for the WAPP Zone “B” OMVS Countries of West Africa, **remained unchanged throughout the project’s life**. A split assessment (more below) is carried out because a PDO indicator was added at the time of the approval of the additional financing.

69. Achievement of the project objectives

Indicator	Original Target	Revised Target	Actual Value Achieved at Completion Dec 2014	% of target
1. Quantity of low cost hydroelectricity that OMVS power System supplies to WAPP Zone B OMVS countries, disaggregated by national power utility	1143 GWh	1142 GWh (EDM: 427 GWh – SENELEC: 385 GWh – SOMELEC: 331 GWh)	1121 GWh (EDM: 562 GWh – SENELEC: 346 GWh – SOMELEC: 213 GWh)	Achieved for all practical purposes (98.2%)
2. Operating rules in place on the basis of sound economic dispatch criteria (Yes/No)	(*)	Yes	Yes	Achieved

(\*) No PDO key outcome indicator was attached to this PDO in the original project. One was introduced with the additional financing.

70. The quantity of electricity generated in December 2014 was 1121 GWh (EDM: 562 GWh; SENELEC: 346 GWh; and SOMELEC: 213 GWh) or 98.2% of the project target of 1142 GWh. The target can be considered substantially achieved. It is estimated that without the operational problems experienced at Manantali, the energy generated at Felou which is close to 300 GWh today would have reached 330 GWh, leading to a total

combined generation of Manantali and Felou close to 1151 GWh. The breakdown of this composite target of 1121 GWh shows that the electricity off take by SENELEC and SOMELEC were lower than anticipated and lower than that of EDM due to demand and supply conditions in each country. Manantali and Felou provide the cheapest energy option (about US\$ 0.11 cents/kWh) knowing that the cost of electricity generation is very high as a result of the region's high dependence on expensive oil-based thermal generation translating into high tariffs of US\$0.20-30 per kWh still not sufficient to cover the cost of supply.

71. About 96% of the project's resources (excluding price contingencies and interest during construction) were devoted to the achievement of the first objective against only about 4% to the second objective of the project. Taking into account the relative weights of the components of the project and the high achievement of the first objective (98.1%) as well as its high significance to the immediate well-being of the populations of Mali, Senegal and Mauritania, the overall assessment of the achievement of the project development objectives is rated as **Substantial**.

72. Causal Chain: There was a clear and logical causal chain between all of the activities that the project was designed to carry out under components 1 and 2 and the expected attainment of the objective of supplying *an increased quantity of low cost hydroelectricity that OMVS power System supplies to WAPP Zone B OMVS countries*. The logical causal chain between the activities under component 3 and the expected attainment of the objective *to develop a nucleus of a well-functioning, cooperative, power pooling mechanism for the WAPP Zone "B" OMVS Countries of West Africa* was also relatively clear to follow.

73. Outputs: **A 60 MW capacity run-of- river hydroelectric plant at Felou (Mali)** which was fully commissioned on April 30, 201 and **consulting services**.

74. Outcomes: Increased access of consumers of Mali, Senegal and Mauritania to reliable electricity at an affordable price and increased revenues from the sales of electricity for SOGEM. The project will also lead to improvements in revenue and operating efficiency of EDM, SENELEC and SOMELEC through higher sales and fuel substitution of expensive diesel generation by hydro energy. This will increase their ability to pay their bills to SOGEM.

75. With regard to the second project objective of creating a nucleus power pooling mechanism among OMVS countries, the key PDO level indicator on operating rules on the basis of sound economic dispatch was reached. The rules that are put in place play a vital role in ensuring an effective dispatch of the energy produced to the three participating utilities. The rules for allocation of electricity for Felou were agreed between the members were 45 percent dispatched to Mali, 30 percent to Mauritania and 25 percent to Senegal. This allocation adjusted at times to optimize the economic benefits of the electricity dispatch, for instance in periods where the Manantali hydropower plant experienced operational problems. The project also helped to build capacity to implement the operating rules of the jointly owned infrastructure managed by SOGEM more professionally. The technical and economic management system will be further enhanced with the acquisition and installation of a SCADA system, which is expected to be acquired under a new OMVS project under preparation.

76. Overall assessment of the achievement of the PDOs. The assessment of the overall achievement of the PDOs (efficacy) of the project follows the ICR guidelines (Appendix B) on the rating of the outcome of projects with formally revised objectives and/or outcome indicators.

**Split Evaluation**

		<b>Against original Objectives</b>	<b>Against Revised Objectives</b>	<b>Overall</b>
1.	Rating	Moderately Satisfactory	Satisfactory	
2.	Rating Value	4	5	
3.	Weight (% disbursed before/after Objective change)	1.4%	98.6%	100%
4.	Weighted Value (2 x 3)	0.056	4.93	4.986
5.	Final Rating			<b>Satisfactory</b>

77. The split evaluation yields a Satisfactory rating on the achievement of PDOs, which equates to a **Substantial** rating

78. At the closing date of December 31, 2014, eight out of 10 intermediate outcome indicators were achieved as follows:

<b>Indicator</b>	<b>Baseline Value</b>	<b>Original Target Values (from approval documents)</b>	<b>Formally Revised Target Values</b>	<b>Actual Value Achieved at Completion or Target Years</b>
<b>Indicator 1 :</b>	Commissioning and performance testing of Felou HEP completed on schedule			
Value (quantitative or Qualitative)	No	Yes	Yes	Yes
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Commissioned on April 30, 2014.			
<b>Indicator 2:</b>	Commercially sound (power exchanges) agreements put in place and adhered to by OMVS Power System Operator			
Value (quantitative or Qualitative)	No	Yes	Dropped	NA
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	This indicator was dropped with the additional financing			
<b>Indicator 3 :</b>	Generation Capacity of Hydropower constructed under the project			
Value (quantitative or Qualitative)	0MW	60MW	60MW	60MW

Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	This is a core indicator. Generation capacity was constructed and commissioned in April 30, 2014.			
<b>Indicator 4 :</b>	Availability of the power generation units of Felou HEP			
Value (quantitative or Qualitative)	0%	95%	95%	95%
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Target reached on April 30, 2014			
<b>Indicator 5 :</b>	Owner's engineer has been recruited			
Value (quantitative or Qualitative)	No	NA	Yes	Yes
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Indicator added with additional financing. Owner's engineer recruited on November 04, 2009			
<b>Indicator 6 :</b>	Design-build contractor has been employed			
Value (quantitative or Qualitative)	No	NA	Yes	Yes
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Indicator added during additional financing. Design-build contract signed on May 18, 2009.			
<b>Indicator 7 :</b>	Adoption of Tariff Protocol for Felou HEP by the OMVS Power System Operator - EDM - SENELEC - SOMELEC			
Value (quantitative or Qualitative)	No	NA	Yes	Yes
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	Indicator added with additional financing. The tariff protocol was signed on April 30, 2010			
<b>Indicator 8 :</b>	Power sector monitoring and evaluation data of the WAPP Zone B-OMVS Countries collected, analyzed and disseminated by the WAPP			
Value (quantitative or Qualitative)	0%	100%	100%	100%
Date achieved	06/29/2006	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	WAPP is already collecting data on a regular basis, but an M&E system is yet to be completed.			

achievement)				
<b>Indicator 9 :</b>	Database at the WAPP level is put in place and power sector M&E data of the WAPP Zone B OMVS Countries are developed			
Value (quantitative or Qualitative)	No	NA	Yes	Yes
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	WAPP is already collecting data on a regular basis,			
<b>Indicator 10 :</b>	Communication and data acquisition facilities upgraded			
Value (quantitative or Qualitative)	No	NA	Yes	No
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	The SCADA system could not be acquired before the closing date of the project.			
<b>Indicator 11 :</b>	Necessary software licenses acquired			
Value (quantitative or Qualitative)	No	NA	Yes	No
Date achieved	08/27/2009	06/29/2006	08/27/2009	12/31/2014
Comments (incl. % achievement)	The necessary software licenses could not be acquired before the closing date of the project.			

### 3.3 Efficiency

*(Net Present Value/Economic Rate of Return, cost effectiveness, e.g., unit rate norms, least cost, and comparisons; and Financial Rate of Return)*

#### Rating: Modest

79. An economic analysis has been undertaken for the project at completion. The main quantifiable economic benefits of the project for the three countries are the increased supply of electricity evaluated at the assumed value of unserved energy of US\$0.14/kWh. However, given that this value is a broad measure for the whole West Africa region per project preparation documents, a higher value (e.g., increased by 20%) was tested for the OMVS countries. The economic costs are the total investment cost of the project disbursed (excluding price contingencies and interest during construction), the operation and maintenance (O&M) and transmission and distribution costs. The investment costs include the construction of the plant, equipment and buildings. The O&M costs mainly include repairs and other regular maintenance costs. The delays are taken into account through the process of discounting. The cost of delays is simply the difference between the net present value of the project without delays and the net present value of the project with delays). The table below summarizes the results of the economic analysis at completion.



**Economic Analysis for Félou (medium case hydrology scenario of 335 GWh)**

<b>(in US\$ Million, NPV at 10%)</b>				
	<b>Mali</b>	<b>Mauritania</b>	<b>Senegal</b>	<b>Global</b>
<b>PV of Costs</b>	\$72.24	\$48.16	\$40.13	<b>\$160.53</b>
<b>PV of Benefits</b>	\$93.73	\$62.49	\$52.07	<b>\$208.30</b>
<b>Net Benefits</b>	\$21.49	\$14.33	\$11.94	<b>\$47.76</b>
<b>IRR</b>				<b>15%</b>

80. **Sensitivity Analysis:** A sensitivity analysis was also carried out to quantify the impact of alternative assumptions on the Net Present Value (NPV) and the Internal Rate of Return (IRR) under the medium case scenario of hydroelectricity generation of 335 GWh/year. The results are summarized below.

	<b>Medium case scenario</b>	
	<b>NPV</b> US\$ Million	<b>IRR (%)</b>
<b>Base case</b>	\$47.76	14.74%
<b>20% reduction in sales</b>	\$7.82	10.84%
<b>20% increase in value of unserved energy</b>	\$89.42	18.42%

81. This analysis shows that the results of the project are still positive in the base case but are very sensitive to a reduction in critical variables. This includes the changes in sales due to, for example, poor hydrology, breakdown of one or both generating sets, incident on the transmission line, etc.). An increase in the value of unserved energy by 20% would almost double the NPV.

82. The economics of the project deteriorated because of the cost overrun that necessitated the additional financing and the delayed stream of benefits because of the implementation issues already discussed (see Section 2 above).

	<b>NPV</b> (USD million)	<b>IRR (%)</b>
At appraisal	221	30
At Additional financing	62	14
At Completion	48	15

83. **Average Incremental Cost (AIC):** The average incremental costs indicate the price which would recover the investment and operating and maintenance costs over the life of the project. Since these costs are in constant terms, they would need to be adjusted periodically to take into account the effect of inflation and other real price changes. The AIC for the average hydrology scenario is US\$0.11 US/kWh.

### **3.4 Justification of Overall Outcome Rating**

*(combining relevance, achievement of PDOs, and efficiency)*

Rating: **Moderately Satisfactory**

84. The project development objectives and design of the project have a high relevance in terms of increasing the supply of electricity to the OMVS system and to the three utilities' power systems that were, and continue to be, subject to severe load shedding. The overall achievement of the project objectives is rated as satisfactory. The recalculated efficiency (NPV and IRR) in this ICR confirms the positive efficiency of the project, albeit lower than either the original or the additional financing because of the cost overrun and the delays in effectiveness and procurement. The combination of the relevance of objectives and design, the achievement of the project development objectives and efficiency ratings, results in an overall outcome rating of **Moderately Satisfactory**.

### **3.5 Overarching Themes, Other Outcomes and Impacts**

*(if any, where not previously covered or to amplify discussion above)*

#### **(a) Poverty Impacts, Gender Aspects, and Social Development**

85. The direct impact of the project on lower-income rural and urban population and other vulnerable groups was not explicitly taken into consideration at appraisal, and no poverty analysis was conducted at the preparation stage. Gender issues were not addressed during the preparation stage nor was the gender impact monitored during the implementation of the project. However, as a source of clean, renewable energy, the Felou HEP qualified for carbon emission reduction credits, the proceeds of which are earmarked for electrification of rural communities that reside along the transmission "right of way" of the OMVS Power System. Furthermore, there are no adverse indirect and/or long-term impacts anticipated as a result of the project. The main social development issue in the project area (Kayes, Bafoulabe) pertains to the negative impacts on fishing activities and acquisition of about 1.25 ha of land planted with orchards and vegetable gardens for project facilities. The RAP determined the adequate level of compensation for these losses and the compensation was effected. The project also implemented additional social enhancement measures to benefit neighboring villages (Lontou, Bengassi) in the project zone of influence (e.g. water supply).

#### **(b) Institutional Change/Strengthening**

*(particularly with reference to impacts on longer-term capacity and institutional development)*

86. The project's institutional development impact, which is defined in ICR guidelines as the extent to which the project "has improved the agency's or country's ability to make effective use of its human and financial resources", has been modest. The institutional strengthening provided in this project by a technical assistance in two phases for preparation, issuance and evaluation of bids and works control and supervision (owners' engineer). Given the limited scope of work of engineering consultants, this choice was sub-optimal recruitments of accountants, financial management, environmental and other specialists were made by SOGEM often late and at the insistence of the Bank.

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

87. **Carbon offset:** The project also offers a substantial global environmental benefit related to reduced greenhouse gas emissions: electricity delivered to the grid by the project

would have otherwise been generated by the operation of existing or new power plants that mainly use fossil fuels. The Felou HEP was registered on May 6, 2010 as a Clean Development Mechanism (CDM) project activity according to the standards of the United Nations Framework Convention on Climate Change (UNFCCC). The project has the potential to generate 1,342,355 Certified Emission Reductions (CERs) for the first seven years of operation. The Bank signed an Emission Reduction Purchase Agreement (ERPA) with SOGEM for the purchase 280,000 Certified Emissions Reductions (CERs) on June 29, 2007 under the Spanish Carbon Fund (SCF). The ERPA was later transferred to the Tranche 2 of the Umbrella Carbon Facility (UCF T2) on December 13, 2011. On January 23, 2015, the ERPA was amended to: (i) capture the delay in the commissioning date, and (ii) to adjust the contracted CERs volume according to the amended commissioning date of the project on July 2, 2013. The CER volume contracted under the UCF T2 was reduced from 734,300 CERs in the original ERPA to 701,665 CERs to be generated from July 2, 2013 to December 31, 2018. Also, the project successfully completed the independent validation of its compliance report to the World Commission on Dams. In June 2015, the Felou HEP was issued its first carbon credits of about 90,000 CERs and delivered them to UCF T2 as a result of the first successful verification, which covered 6 month period from July 2 to January 1, 2014. This is the second issuance in West Africa (after Nigeria with cook stoves and gas flaring), and the first issuance for a hydro project in West Africa. The proceeds are to be earmarked for electrification of rural communities that reside along the transmission “right of way” of the OMVS Power System. The second verification is completed and the issuance of about 172,000 CERs for the second reporting period is expected by end of September 2015. From the carbon finance point of view, the Felou HEP is demonstrating high performance and should be able to deliver more than the contracted CERs according to the agreed schedule, if SOGEM maintains the current monitoring best practices. The registration of the Felou HEP as a CDM activity also provides a substantial demonstration effect, leading to more development of renewable energy-based projects and reduced greenhouse gas (GHG) emissions from the region. More details about the carbon offset are provided in Annex 9.

### **3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops** *(optional for Core ICR, required for ILI, details in annexes)*

## **4. Assessment of Risk to Development Outcome** Rating: **Moderate**

88. The Felou HEP is expected to serve the energy needs of Mali, Senegal and Mauritania in years to come. There is a modest likelihood that some changes, detrimental to the project’s main development outcome may occur due to:

- (i) Technical: (a) poor hydrology; (b) lack of proper maintenance of Manantali and Felou HEP installations; and/or
- (ii) Institutional and Financial: The situation improved significantly in recent years. The three participating utilities of Mali, Senegal and Mauritania paid their bills to SOGEM regularly even though they themselves are constrained by the tariffs allowed nationally by their respective governments and regulatory authorities.

## 5. Assessment of Bank and Borrower Performance

(relating to design, implementation and outcome issues)

### 5.1 Bank Performance

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

(i.e., performance through lending phase)

Rating: **Moderately Satisfactory**

89. This ICR assesses the Bank's performance during identification, preparation, and appraisal of the project as **Moderately Satisfactory**.

90. The Bank took into account the adequacy of project design and all major relevant aspects, such as technical, environmental, financial and economic. Less attention was given to the institutional, procurement and financial management aspects. A number of alternatives were considered for the project design and the Bank made use of the transfer of experience from similar projects such as the Manantali project.

91. The composition and balance of the Bank team at appraisal was adequate. It consisted of four core sector specialists, including a hydropower specialist and six fiduciary and safeguards members, including a senior environmental specialist. However, frequent changes of task managers (about one task manager every 14 months on average,) may have been disruptive to dialogue with the implementing agency. The period for the original project preparation was adequate (four months between the concept review and appraisal). Strategic choices were made appropriately at the design and preparation stage including: (i) the focus on two objectives and a few components; and (ii) combining specialized technical assistance and physical investments. This focus was kept unchanged with the additional financing of the project.

92. Some of the potential risks were correctly identified. Some potential risks were not identified such as hydrology (see Section 2). The risk, posed to SOGEM's financial situation by the non-regular payment of bills by EDM, SENELEC and SOMELEC was not *formally* identified in the project documentation. Nonetheless, the three utilities were required, as condition of effectiveness, to open an escrow account to guarantee the payment of their bills to SOGEM. Eventually, this measure proved ineffective and the level of arrears remained high. The Bank also drew attention of the authorities about the negative consequences on SOGEM's financial situation of postponing promised tariff adjustments. Furthermore, there were capacity issues such as SOGEM's financial management, environmental and procurement capacity that were not adequately addressed which led to implementation delays. The original project readiness for implementation could therefore have been improved through early preparation of bidding documents and the implementation of capacity building measures. The lack of such measures was one of the major contributing factors in the slow implementation of component 1 and the non-implementation of component 3 of the project (see Section 2).

93. Overall, the project design was basically sound in terms of the focus on two objectives and the choice of limited number of components, the time for preparation was adequate and the preparation team was adequately staffed. The project cost was underestimated, though unforeseen factors came into play and thus necessitated additional

financing. The project was extended from June 30, 2010 to December 31, 2014 after two extensions of the closing date. There was no quality at entry review.

94. Quality at entry, as a whole, is therefore rated as **Moderately Satisfactory**.

**(b) Quality of Supervision**

(including of fiduciary and safeguards policies)

Rating: **Moderately Satisfactory**

95. The quality of project supervision carried out by the Bank is rated **Moderately Satisfactory**.

96. The Bank allocated sufficient budget and staff resources, and the project was adequately supervised, except in the early first two years of project implementation. The quality of supervision reporting in these first two years was poor (e.g., lack of aide memoires and limited information in ISRs). The quality of supervision reporting improved markedly in later years and the team's proactive supervision in later years allowed a quick re-launch and award of bids after allegations of fraudulent and corrupt practices. The intervention of the Bank was appropriate, well-coordinated, and satisfactory<sup>8</sup> with its insistence on compliance with financial, environmental and social safeguards as well as the management of the OMVS power system such as the continuity or choice of another OMVS System Operator. The team also had the support of management and the comments on ISRs were very supportive. The Bank's financial management and procurement staff worked closely with the SOGEM staff to explain the rules and procedures to be applied during project implementation, with regard to procurement of goods and works, and selection of consultants, as well as audit requirements, based on the financing agreements. The financial management aspects of the project were carefully reviewed, and specific recommendations to strengthen the financial management system were made. Shortcomings in accounting software were also identified and recommendations made to address them. Environmental and social specialists were most often associated to supervision missions to monitor the quality of environmental and social compliance. The Bank also provided guidance and oversight in the preparation of the operational manual for SOGEM, the final version of which was completed in July 2010. The last ISR archived on December 24, 2014 rated the performance of the project achievement of development objectives and overall implementation progress as moderately satisfactory.

97. Based on the above the ICR rates the project's quality of supervision as **Moderately Satisfactory**.

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

Rating: **Moderately Satisfactory**

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<sup>8</sup> The supervision mission scheduled for May 26-30, 2014 was cancelled because of the coup d'etat in Mali. The meetings were therefore held through video conference and the Bank conducted a follow-up field mission in August 2014 to monitor project implementation progress, and exchange on the operation and maintenance of the plants and the repair of the Manantali HEP that broke down in April 2013.

98. The rating of overall Bank performance is **Moderately Satisfactory**, being moderately satisfactory at entry and moderately satisfactory during supervision with the rating on overall outcome as moderately satisfactory.

## **5.2 Borrower Performance**

### **(a) Government Performance**

Rating: **Moderately Satisfactory**

99. The Governments of Mali, Senegal and Mauritania's performance is assessed as **Moderately Satisfactory**. The commitment to the ownership of the project and to the achievement of the project's development objectives, as discussed in Section 2.1, was strong at the time of project preparation and appraisal, and remained largely supportive during implementation, except when it came to tariff adjustments. The Governments did not have a direct implication in the implementation of the project but had power to decide on the financing of capital investments, tariff adjustments and implementation arrangements. For example, in July 2008, they designated SOGEM as the sole implementing agency while the implementation was earlier shared between OMVS for component 2 and SOGEM for components 1 and 3 of the project. The three Governments also pushed for the settlement of arrears to SOGEM by their respective national utilities as well as accepting, with delay, a tariff increase.

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

Rating: **Moderately Satisfactory**

100. Implementing agency performance is rated **Moderately Satisfactory** for: First, the implementing agency/agencies were pro-active in very difficult circumstances (war and civil disturbances) that made it an out-of-norm endeavor. There was, to be sure, Bank prodding on many issues related to project management: staffing, procurement, financial management, submission of audit reports and, reporting on environmental and social safeguards. This is normal in the process of project implementation and Bank advice was always taken into account and accommodated by the implementing agency. Second, there was stellar implementation of the environmental and social safeguards. Third, the dedication of SOGEM's Project Implementation Unit (PIU) staff and its manager in dealing with implementation challenges (many of which are described above), including in the procurement of the relatively large number of goods, works (through a complex two-stage bidding process), and consultancy services and the implementation of the relevant infrastructure.

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

Rating: **Moderately Satisfactory**.

101. The rating of overall Borrower performance is **Moderately Satisfactory**, being moderately satisfactory for Governments' performance and moderately satisfactory for the implementing agency's performance with the rating on overall outcome as moderately satisfactory.

## Lessons Learned

*(both project-specific and of wide general application)*

102. **Capacity building:** Although there is more to be done and additional capacity building measures could have been incorporated into the project, SOGEM has gained experience and know-how from the implementation of the Felou HEP, including interactions with large contractors, consultants and donors. The closing of the Felou project offers an opportunity to: (i) develop a sustainable operation and maintenance of the OMVS power system; (ii) focus on the safety of dams and the reliability of transmission lines (in coordination with needed reinforcements of national distribution systems); (iii) devote some thinking into finding and designing a mechanism to ensure the regular payment of bills by national utilities to ensure the sustainability and expansion of OMVS facilities; and (iv) review in depth the capacity of SOGEM to undertake large investments and develop enhancements in various areas (procurement, project management, accounting and financial management, environmental compliance, etc.) through reorganization, staffing and training.

103. **Require bidding documents to be ready before Board presentation:** Especially those of major components (e.g., component 1) of large projects and/or those requiring a two-stage bidding process. The highlight of the Felou project implementation is the inordinate amount of time taken on a two-stage bidding process to contract the design-build contractor and the economic losses incurred as a consequence. Requiring bidding documents to be ready before Board presentation is a step towards addressing this type of problems, especially when large projects are involved;

104. **Address the buildup of accounts receivable:** To resolve the recurrent problem of significant buildup of accounts receivable, grant real (i.e. credible) autonomy to OMVS System Operator to cut supplies for non-payment of bills and some leeway in tariff adjustment under a regulatory arrangement to be defined. Another possible and perhaps more sustainable solution would be a partial credit guarantee(s) by the three governments of Mali, Senegal and Mauritania to the OMVS System Operator. This (these) guarantee(s) would be called in case of non-payment by EDM, SENELEC or SOMELEC. The existing state of play is a threat to the development of OMVS and its three participating utilities but also to the future of the WAPP. This regional electric power arrangement cannot develop into a market unless the electricity sellers have some assurance that they will be paid;

105. **Plan ahead for the system operator set-up:** Hydro projects are relatively cheap to operate, but the consequences of flawed operation or maintenance can be extremely severe (safety issues, loss of production, heavy rehabilitation costs even for relatively recent projects, etc.). Those in charge of O&M must have a strong interest in ensuring the flawless and sustainable capacity of the project to deliver the services and revenues which were expected at the investment stage. The overwhelming pattern which can be observed worldwide is the one by which the owner of the hydro project also assumes O&M responsibility, possibly with the temporary or permanent assistance of experienced specialists. Most attempts to have the O&M responsibility borne by a separate (often foreign) firm which has no long term interest in the project's performance in term of reliability, safety, durability, etc. have not been fully satisfying as the Manantali experience has shown.

106. In the case of Manantali, the creation of SEMAF is currently considered as a temporary arrangement, merely meant to solve the immediate problem of ensuring the continuing operation of the plant despite Eskom's departure, with a view of recruiting another independent operator as soon as possible through competitive bidding. There could be some merit in analyzing the pros and cons of a reverse proposal, considering that the independent operator was a temporary approach for the first few years of operation, and that the creation of the subsidiary would in fact be a first step towards a possibly more sustainable solution, more consistent with the standard practice, by which the owner retains O&M responsibility either directly or through a subsidiary. This option would obviously require providing a strong technical and organizational support to this entity for some years, with the main objective of increasing the company's own capacity to eventually be able to operate largely in an autonomous manner. There would be a key role for the Bank and other international financial institutions in providing such support.

107. The EEM experience also points out to the necessity of: (a) a trained and competent staff to negotiate/interact with the independent operator; (b) well financed reserves to undertake the O&M, including heavy maintenance and to mitigate the effects of a poor hydrology; (c) a careful drafting of the bidding documents and contract of the System Operator, whether public or private; and (d) a periodic audit of the System Operator, including a technical and financial audit.

108. **If covenants are imposed, ensure the implementing agency has direct control, over them.** Two financial covenants were imposed on SOGEM requiring it to maintain a level of accounts receivable of less than 90 days and to have net revenues to be at least 1.2 times the estimated maximum debt service requirements. It was not in the power of SOGEM to have the level of revenues necessary to meet these covenants. Those who could have made the fulfillment of these covenants possible were the three national utilities (by paying their bills regularly) and their respective governments/regulatory agencies (by authorizing tariff adjustments when justified). In the case of SOGEM, the two financial covenants that were imposed were not credible and the lack of compliance with at least one of them and the cyclical compliance with the other were not unexpected.

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

### **(a) Borrower/implementing agencies**

109. On July 7, 2015, SOGEM provided the Bank with its own evaluation of the implementation of the Felou HEP<sup>9</sup>. A summary of this evaluation is given in Annex 7. Its main conclusions are the following:

- The works were carried out to the satisfaction of all project actors;
- All performance indicators have been met;

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<sup>9</sup> SOGEM : Élément du rapport d'Achèvement du Projet élaboré par l'IDA – Bamako, 7 juillet 2015



- All performance tests were judged satisfactory by the consulting engineer and the operational acceptance was pronounced on April 30, 2014;
- The supporting and mitigation measures to the negative impacts of the project have been put in place in line with the recommendations of the ESMP and the RAP. The regular follow up by the World Bank has contributed to the achievement of this result.
- Following the environmental and social management audit which took into account the observations/comments of the World Bank, the Malian Ministry in charge of the Environment has indicated to SOGEM its agreement with the findings;
- Since the power generation began, the rate of availability of the generators is more than 98% and the energy produced as of June 30, 2015 is 600 GWh;
- The closing of IDA on December 31, has put a stop to the procurement process of Component 3. SOGEM has considered putting this component in the new project now being prepared.
- Finally, the project has been implemented within the limits of the available financing.

**(b) Cofinanciers**

110. The EIB commented on this ICR as follows. (see also Annex 8)

“.....We agree on the content of the report and share its conclusions, especially with regard to the assessment and the weaknesses of SOGEM and the lessons learned section. However, if you allow us, the following two items could be taken in consideration for the final version of the Completion report:

- The Sinohydro underestimation of highest floods /size of diversions/coffer dams (that resulted into twice flooding of the construction site)
- The Claim/acceptance/defect situation between Sinohydro and SOGEM would be useful to explain more in detail in the PCR, especially as Sinohydro remains under contract with SOGEM for the time being” .

111. WB comment: In accordance with the Bank’s decision, a partial amount of the claims were cleared. Since the project is now closed, the balance will be borne by SOGEM.

**(c) Other partners and stakeholders**  
(e.g. NGOs/private sector/civil society)

## Annex 1. Project Costs and Financing

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

Components	Appraisal Estimate (USD millions)	Revised at Additional Financing (USD million)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Design-Build Contract	100.00	176.29	169.07	169%
SCADA/EMS & Communications Equipment and Software	7.5	7.79	0.62	8%
Project Cycle Management – Phase 1	0.5	1.91	10.27	354%
Project Cycle Management – Phase 2	2.4	6.65		
Pre-investment activities	1.1	1.14	0.648	59%
Environment and Resettlement Action Plan	1.0	1.04	(*)	
Project Management Support SOGEM	-	2.89	2.89	
<b>Total Baseline Cost</b>	<b>112.5</b>	<b>197.70</b>	<b>183.50</b>	<b>163%</b>
Physical Contingencies	1.3	1.32	(*)	
Price Contingencies	6.3	23.16	(**)	
<b>Total Project Costs</b>	<b>120.10</b>	<b>222.18</b>	<b>183.50</b>	<b>153%</b>
Interest During Construction	4.90	19.13	17.75	362%
<b>Total Financing</b>	<b>125.00</b>	<b>241.31</b>	<b>201.26</b>	<b>161%</b>

(\*) Included in the Design-Build Contract

(\*\*) Included in the Design-Build Contract and the Project Cycle Management Contract

### (b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Revised at Add. Financing (USD million)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
SOGEM	Joint	10	36.76	25.45	<b>255</b>
EC: European Investment Bank	Parallel	40	44.55	26.13(*)	<b>65</b>
International Development Association (IDA)		75.00	160	149.68	<b>200</b>
<b>Total</b>		<b>125.00</b>	<b>241.31</b>	<b>201.26</b>	<b>161</b>

(\*) The total amount disbursed by EIB on their three loans of 11 million Euros each to the three OMVS countries was 23,331,000 Euros as at December 31, 2014. The exchange rate used to convert Euros into USD is 1.12 USD to the Euro.

## Annex 2. Outputs by Component

### Component 1: Design-Build-Operate-Transfer (DBOT) of the OMVS Félou HEP (Component 1 is a turnkey contract)

1. Site preparation
2. Civil works
  - a. Felou substation
  - b. 225 kV transmission line Felou-Kayes
  - c. Kayes substation
  - d. Access roads
  - e. Head works (Headwater structure)
  - f. Power station
  - g. Release channel
  - h. Steel
  - i. casings
  - j. Rehabilitation of the existing weir
  - k. Water supply channel
  - l. Temporary derivation channel cofferdam
3. Studies and services
4. Electro-mechanical (3 x 21 MW generating sets)
  - a. Turbine alternators G1, G2 and G3
  - b. Speed regulators G1, G2 and G3
  - c. Voltage regulators G1, G2 and G3
5. Equipment assembly
6. Mechanical auxiliaries
  - a. Heavy lifting equipment
  - b. Industrial and potable water supply production and distribution system
  - c. Engine oil treatment equipment
  - d. Workshop's electrical and mechanical equipment
  - e. Sewerage treatment system
  - f. Instrumentation
  - g. Air conditioning system
  - h. Fire protection system
7. Electrical equipment and materials
  - a. Material medium voltage
  - b. Alternative current auxiliaries
  - c. Direct current auxiliaries
  - d. Emergency generation
  - e. Lighting
  - f. Alarm systems and fire detection
  - g. Telecommunication equipment

- h. Generators' control system (first rank)
  - i. Generators' control system (second rank), including data transmission network
  - j. Protection systems
  - k. Grounding equipment
  - l. Cables and installation.
8. Interconnection with the OMVS transmission system,
- a. Transformers G1, G2 and G3
  - b. A 225 kV substation t Felou (with the possibility of connecting the future Gouina project)
  - c. Equipment for energy metering, protection and control of the Felou substation
  - d. Equipment for the Kayes 225 kV substation and extension (instruments, pylons, isolators, conductors and cables)
  - e. Equipment for the extension for the Kayes substation
9. Environmental and social mitigation
10. Assistance to operation and maintenance during the guarantee period
11. Spare parts

**Component 2: Consulting Services – Project Cycle Management.** Experienced engineering consulting firms provided comprehensive project cycle management support to oversee the design, construction and commissioning of the hydroelectric plant at Felou through a two-stage sequential contracting arrangement, as follows:

- a. **Phase 1 ("Transaction Adviser").** A consulting firm to provided transaction advice and support to: (a) carry out detailed planning and scheduling of project implementation arrangements, including pre-qualification of bidders, (b) prepare and issue bidding documents for the selection of an independent contractor, (c) prepare a comprehensive set of power supply agreements for use by the OMVS Power System Operator, and (d) conduct the two-stage bidding process, evaluate bids and make recommendation for the award of the design-build contract; and
- b. **Phase 2 ("Owner's Engineer").** An experienced consulting engineering firm was recruited to oversee the day-to-day performance of the design-build contractor until the fully operational Felou hydroelectric plant was handed over to the OMVS Power System Operator; and

**Component 3: Capacity Building Support (Comité Technique Permanent de l'Interconnexion – OMVS Power System). (\*)**

- a. Consultant (drafting terms of reference, preparing bid documents and assisting in the evaluation);
- b. Supply of SCADA/EMS and associated communication equipment;
- c. Software for hydro-thermal optimization;
- d. Transportation and installation on site;
- e. Testing and operational conformity; and
- f. Training.

(\*) This component was not implemented.

### Annex 3. Economic and Financial Analysis

1. At appraisal in 2006, a benefit-cost analysis (BCA) was carried out to assess the economic viability of the Felou hydroelectric project. In 2009, a new BCA was carried out with the additional financing. At completion, the economic efficiency is assessed again.
2. To ensure comparability with the appraisal and additional financing estimates, the economic analysis at project completion adopted the same methodology, and in some cases, the same unit valuations, such as those for the value of unserved energy (USD0.14/kWh and USD0.12/kWh for the original project and the additional financing respectively) and the average sales out of the Felou hydroelectric project (HEP).
3. However, due to the long project implementation period expanding almost a decade, the benefit streams were delayed by about four years. The main project benefit, the electricity generated at Felou, will be shared between the shareholder countries of Mali, Mauritania and Senegal. In the context of the economic analysis, the rules for allocation of electricity for Felou will be as agreed between the members, i.e. Mali: 45%, Mauritania: 30% and Senegal: 25%.
4. The investment costs include the construction of the machinery and equipment, buildings, and land purchase. The O&M costs include mainly repair and maintenance costs. Transmission and distribution have also been included.
5. At appraisal, a cost-benefit analysis was undertaken to ascertain the economic justification of the Felou HEP. Costs included the capital and operating costs of the Felou HEP. As the analysis was presented into a condensed form, it is not at all clear if transmission and distribution costs were taken into account. Benefits included mainly the sale of energy. At appraisal, the reduced CO<sup>2</sup> emissions and carbon revenues were also estimated. However, these revenues were a minor benefit in the economic justification and were not taken into account in the economic analysis of the additional financing. They are not also taken into account at completion though they are described in detail in this report. Benefits are valued at the value of unserved energy in the ECOWAS region of USD 0.14 used as a proxy for customer willingness to pay for incremental electricity supply. The economic rate of return as estimated at the time of appraisal was 30% and the NPV was estimated at about USD 221 million. This is in sharp contrast to the economic values found at additional financing and at completion stages. The cost of the project has, of course, increased with the additional financing and benefits were delayed. The project is still economically justified with a largely positive NPV and an economic rate of return higher than the assumed discount rate of 10%. The cost of the delays is given by the difference between the NPV without delays and the NPV of the project with delays.

	NPV (USD million)	IRR (%)
At appraisal	221	30
At Additional financing	62	14
At Completion	48	15

6. However, the sensitivity analysis whose results are shown below shows that these positive results are very vulnerable to a reduction in sales (due for example to a poor

hydrology or an incident at the plant that would prevent it from delivering the assumed quantity of energy) and to the assumed value of unserved energy.

**Distribution at Closing**

	<b>Mali</b>	<b>Mauritana</b>	<b>Senegall</b>	<b>Total</b>
<b>PV Total Costs</b>	\$72.24	\$48.16	\$40.13	<b>\$160.53</b>
<b>PV Total Benefits</b>	\$93.73	\$62.49	\$52.07	<b>\$208.30</b>
<b>PV Net Benefits</b>	\$21.49	\$14.33	\$11.94	<b>\$47.76</b>

**Sensitivity Results**

	<b>Medium case scenario</b>	
	<b>NPV</b>	
	<b>US\$Million</b>	<b>IRR (%)</b>
<b>Base case</b>	\$47.76	14.74%
<b>10% increase in capital costs</b>	\$31.71	12.94%
<b>20% reduction in sales</b>	\$7.82	10.84%
<b>20% increase in value of unserved energy</b>	\$89.42	18.42%
<b>20% decrease in value of unserved energy</b>	\$6.11	10.65%

7. Average Incremental Cost (AIC): The average incremental costs indicate the price which would recover the investment and operating and maintenance costs over the life of the project. Since these costs are in constant terms, they would need to be adjusted periodically to take into account the effect of inflation and other real price changes. The AIC for the average hydrology scenario is 0.11 US\$/kWh.

Total Cost	169 US\$ million		(excluding price contingencies and IDC)				
Mali's share	45%						
Mauritania's share	30%						
Senegal's share	25%						
Mariginal cost Transmission and Distributor	0.04 USD/kWh						
Operations and maintenance	0.02						
Value of unserved ene in ECOWAS region	0.14 USD/kWh						
	2010	2011	2012	2013	2014	2015	
Disbursements	0.19	0.11	0.26	0.3	0.11	0.03	
Sensitivity Analysis							
			Hydrology =>Generation (GWh)				
Total Costs	0		Low case	320			
Energy Sold	0		High case	350			
Cost of unserved ene	0		Average	335			
Total Project							
	Invest	O&M	MC	Total	Energy Sc	Total	Net
year	cost		T&D	Cost	GWWh	Benefits	Benefits
2006	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0
2010	32.11	0	0	32.11	0	0	-32.11
2011	18.59	0	0	18.59	0	0	-18.59
2012	43.94	0	0	43.94	0	0	-43.94
2013	50.7	0	0	50.7	0	0	-50.7
2014	18.59	2	8	28.59	200	28	-0.59
2015	5.07	3.38	13.4	21.85	335	46.9	25.05
2016		3.26	13.4	16.66	335	46.9	30.24
2017		3.26	13.4	16.66	335	46.9	30.24
2018		3.26	13.4	16.66	335	46.9	30.24
2019		3.26	13.4	16.66	335	46.9	30.24
2020		3.26	13.4	16.66	335	46.9	30.24
2055		3.26	13.4	16.66	335	46.9	30.24
2056		3.26	13.4	16.66	335	46.9	30.24
2057		3.26	13.4	16.66	335	46.9	30.24
2058		3.26	13.4	16.66	335	46.9	30.24
2059		3.26	13.4	16.66	335	46.9	30.24
2060		3.26	13.4	16.66	335	46.9	30.24
<b>PV@10%</b>				160.53	1487.83	208.30	47.76 million
					<b>IRR</b>		14.74%
<b>Distribution</b>							
	<b>Mali</b>	<b>Mauritani:</b>	<b>Senegal</b>	<b>Total</b>			
PV Total Costs	72.24	48.16	40.13	160.53			
PV Total Benefits	93.73	62.49	52.07	208.30			
PV Net Benefits	21.49	14.33	11.94	47.76			
<b>Sensitivity Results</b>							
				<b>Medium case scenario</b>			
				<b>US\$Million</b>			
				<b>NPV</b>	<b>IRR (%)</b>		
Base case				47.76	14.74%		
10% increase in capital costs				31.71	12.94%		
20% reduction in sales				7.82	10.84%		
20% increase in value of unserved energy				89.42	18.42%		
20% decrease in value of unserved energy				6.11	10.65%		
<b>Average incremental cost</b>	0.11 USD/kWh						



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

### (a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
<b>Lending</b>			
Amarquaye Armar	Lead Energy Specialist	EWDEN	Task Team Leader
Ousmane Dione	Senior Water Resources Management Specialist	AFTU2	
Fanny Missfeldt-Ringius	Energy Economist	AFTEG	
Robert Robelus	Senior Environmental Specialist	AFTS1	
Sidi Mohammed Boubacar	Senior Counsel	LEGAF	
Mohammed Khatouri	Senior Monitoring and Evaluation Specialist	AFTKL	
Renee Desclaux	Finance Officer	LOAG2	
Yvette Djachechi	Senior Social Development Specialist	AFTS3	
Aissata Zerbo	Procurement Analyst	AFTU2	
Nestor Coffi	Senior Financial Management Specialist	AFTFM	
Fily Sissoko	Senior Financial Management Specialist	AFTFM	
Ramon Lopez-Rivera	Consultant – Power Engineer	AFTEG	
Federico Ciampitti	Consultant – Hydropower Specialist	AFTEG	
R. Gopalkrishnan	Consultant – Procurement Specialist	EAPCO	
Margaret Wilson	Consultant – Financial Economist	AFTEG	
Marie-Adele Tchakounte-Sitchet	Senior Program Assistant		
Rita Ahiboh	Program Assistant	AFTEG	
<b>Supervision/ICR</b>			
Bernard Abeille	Consultant	GGODR	
Rita Ahiboh	Senior Program Assistant	GEEDR	
Salamata Bal	Senior Social Development Spec	GSURR	
Federico Ciampitti	HQ Consultant ST	GWADR	
Issa Diaw	Senior Power Engineer	GEEDR	
Ousmane Dione	Practice Manager	GWADR	
Philippe J-P. Durand	Consultant	GEEDR	
Rahmoune Essalhi	Procurement Assistant	GGODR	
Maimouna Mbow Fam	Senior Financial Management Specialist	GGODR	
Stephan Claude Frederic Garnier	Lead Specialist	GEEDR	
Julie Godin	Carbon Finance Specialist	GCCCCF	
Fatouma Toure Ibrahima Wane	Senior Program Officer	GCPPP	

Tjaarda Storm van Leeuwen	Adviser	AFTG1 HIS	
Helena Mamle Kofi	Procurement Analyst	AFTG1 - HIS	
Ramon Lopez-Rivera	Consultant	GEEDR	
Peggy Mischke	Energy Specialist	AFTG1 - HIS	
Robert A. Robelus	Consultant	GENDR	
Oshal Rocha Andrade Romao	Financial Management Specialist	AFTMW - HIS	
Seynabou Thiaw Seye	Program Assistant	AFCF1	
Thanh Lu Ha	Sr. Program Assistant	GEEDR	

**(b) Staff Time and Cost**

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
<b>Lending</b>		
FY06	24.15	189.62
FY07	7.67	23.14
FY08	0.77	2.32
<b>Total:</b>	32.59	215.08
<b>Supervision/ICR</b>		
FY06	0.00	0.00
FY07	9.42	74.38
FY08	8.17	76.51
FY09	11.28	108.71
FY10	15.07	95.16
FY11	17.60	97.88
FY12	14.51	90.87
FY13	13.38	90.44
FY14	25.28	157.69
FY15	16.89	115.23
<b>Total:</b>	131.60	832.49

**Annex 5. Beneficiary Survey Results**  
*(if any)*

**Annex 6. Stakeholder Workshop Report and Results**  
*(if any)*

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

1. On July 7, 2015, SOGEM provided the Bank with its own evaluation of the implementation of the Felou hydroelectric project (HEP)<sup>10</sup>. A summary of which is given below:
2. The report provides some important dates in the life of the project and describes the status of implementation of components 1 and 3, the environmental and social management plan, carbon offset component, the beefed up security around the Felou installations, the operation of the power plant and the financial claims of the Design Build contractor. It also describes a number of difficulties encountered during implementation.
3. Its main conclusions are the following:
  - The works were carried out to the satisfaction of all project actors;
  - All performance indicators have been met;
  - All performance tests were judged satisfactory by the consulting engineer and the operational acceptance was pronounced on April 30, 2014;
  - The supporting and mitigation measures to the negative impacts of the project have been put in place in line with the recommendations of the ESMP and the RAP. The regular follow up by the World Bank has contributed to the achievement of this result;
  - Following the environmental and social management audit which took into account the observations/comments of the World Bank, the Malian Ministry in charge of the Environment has indicated to SOGEM its agreement with the findings;
  - Since the power generation began, the rate of availability of the generators is more than 98% and the energy produced as of June 30, 2015 is 600 GWh;
  - The closing of IDA on December 31, has put a stop to the procurement process of Component 3. SOGEM has considered putting this component in the new project now being prepared; and
  - Finally, the project has been implemented within the limits of the available financing.

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<sup>10</sup> SOGEM : ELEMENT DU RAPPORT D'ACHEVEMENT DU PROJET ELABORE PAR L'IDA – Bamako, 7 juillet 2015

## **Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders**

4. The European Investment Bank (EIB) commented on this ICR as follows: (\*)
5. “As requested you will find below our comments on the Implementation Completion and results report for the Felou Hydroelectric project.
6. We agree on the content of the report and share its conclusions, especially with regard to the assessment and the weaknesses of SOGEM and the lessons learned section. However, if you allow us, the following two items could be taken in consideration for the final version of the Completion report:
  - The Sinohydro underestimation of highest floods /size of diversions/coffer dams (that resulted into twice flooding of the construction site); and
  - The Claim/acceptance/defect situation between Sinohydro and SOGEM would be useful to explain more in detail in the PCR, especially as Sinohydro remains under contract with SOGEM for the time being”

(\*) EIB’s Email of August 3, 2015

**Annex 9. OMVS Felou Hydroelectric Carbon Finance Project (P099312)  
Implementation Completion and Results Report**

Document of  
The World Bank

IMPLEMENTATION COMPLETION AND RESULTS REPORT

ON A

PURCHASE OF EMISSION REDUCTIONS

TO

SOCIÉTÉ DE GESTION DE L'ENERGIE DE MANANTALI (SOGEM)

FOR THE

OMVS FELOU HYDROELECTRIC PROJECT





# IMPLEMENTATION COMPLETION AND RESULTS REPORT

## CONTENTS

<b>1. DATA SHEET</b> .....	52
<b>A. Basic Information</b> .....	52
<b>B. Key Dates</b> .....	52
<b>C. Ratings Summary</b> .....	52
<b>D. Sector and Theme Codes</b> .....	52
<b>E. Bank Staff</b> .....	53
<b>F. ERPA payments and emission reductions (ERs) delivery to date</b> .....	53
<b>G. Supervision of Carbon Finance Operations Guidelines</b> .....	53
<b>2. ACHIEVEMENT OF IMPLEMENTATION OBJECTIVES AND OUTCOMES</b> .....	54
<b>3. BANK AND PROJECT ENTITY PERFORMANCE</b> .....	55
<b>5. COMMENTS FROM PROJECT ENTITY AND OTHER PARTNERS</b> .....	56
<b>6. SAFEGUARDS COMPLIANCE</b> .....	56
<b>7. LESSONS LEARNED</b> .....	57
<b>8. JUSTIFICATION FOR MOVING TO THE SECOND PHASE (CARBON FINANCE MONITORING PHASE) AND SAFEGUARDS COMPLIANCE</b> .....	57

## Acronyms

UCF T2	Tranche 2 of Umbrella Carbon Facility
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
GCCCF	Climate and Carbon Finance Unit of the Climate Change Group
DOE	Designated Operational Entity
ER	Emission Reduction
ERPA	Emission Reduction Purchase Agreement
GHG	Greenhouse Gases
GWh	Gigawatt hour
ICR	Implementation Completion and Results Report
SOGEM	Société de Gestion de l’Energie de Manantali
MW	Megawatt
PAD	Project Appraisal Document
PDD	Project Design Document
PDO	Project Development Objective
PE	Project Entity
tCO <sub>2</sub> e	Tons of carbon dioxide equivalent
UNFCCC	United Nation Framework Convention on Climate Change
OMVS	Organisation pour la Mise en Œuvre du Fleuve Sénégal
SCF	Spanish Carbon Fund

**IMPLEMENTATION COMPLETION REPORT (ICR)**  
OMVS Felou Hydroelectric Project (P099312)

**1. DATA SHEET**

**A. Basic Information**

Country: Mali  
 Project Name: OMVS Felou Hydroelectric Project  
 Project ID: P099312 (Parent project is P094916)  
 ICR Date: September 1, 2015

Emission Reduction Purchase Agreement volume in Certified Emission Reductions

	<b>Tranche 2 of the Umbrella Carbon Facility (UCFT2)</b>
<b>CERs</b>	701,665

Bank/IFC lending or grant (in loan/grant currency): XDR 105.5 million  
 Environmental Category: A  
 Project entity: Société de Gestion de l’Energie de Manantali  
 Co-financiers and Other External Partners: European Investment Bank (EIB)  
 ICR prepared by: Affouda Leon Biaou/Fatouma Toure Ibrahima/  
 Nash Fiifi Eyison  
 Approved by CD: Indira Konjhodzic  
 Approved by PM: Meike van Ginneken

**B. Key Dates**

ERPA signing date	First ERPA signing date (SCF): June 29, 2007 Second ERPA signing date (UCF T2): December 13, 2011
ERPA amendment date	January 23, 2015
ERPA effectiveness date	June 29, 2007
ERPA termination date	December 31, 2019

**C. Ratings Summary**

Progress towards achievement of PDO	Moderately Satisfactory
Overall Implementation Progress	Moderately Satisfactory
Overall Safeguards Rating	Moderately Satisfactory

**D. Sector and Theme Codes**

Sector Codes (in %)

Renewable Energy	100%
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Theme Codes (in %)

Climate Change	100%
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**E. Bank Staff**

<b>Position</b>	<b>At ICR</b>	<b>At ERPA Signing</b>
Practice Manager	Meike van Ginneken	Subramaniam V. Iyer
Task Team Leader	Fatouma Toure Ibrahima Wane	Amarquaye Armar
Deal Manager	Affouda Leon Biaou	Bertand Loiseau

**F. ERPA payments and emission reductions (ERs) delivery to date**

<b># Payment</b>	<b>Payment Type</b>	<b>Monitoring Period</b>	<b>CERs Delivered</b>	<b>Value Date</b>	<b>Currency</b>
1	ER Payment	2/07/2013 – 31/12/2013	90,237	12/06/2015	EUR

**G. Supervision of Carbon Finance Operations Guidelines**

According to the Bank Guidelines (Office Memorandum, December 1, 2011) oversight (supervision and monitoring) of Carbon Finance operations is conducted in two phases: (a) the implementation phase, from effectiveness of the ERPA to project completion; and (b) the monitoring phase, from project completion to termination of the ERPA. Between these phases, oversight responsibility is transferred from the Region to GCCCF. Since the Project is fully operational and capable of generating emission reductions, the present ICR summarizes the achievements of this project, and issues and lessons learned, in order to transfer it to GCCCF for the monitoring phase.

## **2. ACHIEVEMENT OF IMPLEMENTATION OBJECTIVES AND OUTCOMES**

### ***2.1 Basic project description and summary of any significant changes since Emission Reduction Purchase Agreement (ERPA) signature***

2.1.1 The OMVS Felou Hydroelectric Project reduces greenhouse gas emission through the supply of clean energy which displaces fossil-fuel based electricity generation to the interconnected grid in the sub-region including Mali, Mauritania and Senegal. Total installed capacity of the project is 63.45 MW consisting of 3 Bulb-type turbines, with a predicted gross power generation of 333.5 GWh per annum.

2.1.2 Sponsored by the governments of Mali, Mauritania, and Senegal, acting through the High Commission of the Organisation pour la Mise en Valeur du Fleuve Sénégal (OMVS), the project was developed and overseen by the Société de Gestion de l’Energie de Manantali (SOGEM). The operation of the project was contractually delegated to a grid operator.

2.1.3 The Félou hydroelectric project was designed in 2006 to alleviate power supply deficits in WAPP

Zone “B” OMVS countries (Mali, Mauritania and Senegal) by augmenting the supply of low cost hydroelectricity. The project has the potential to generate 1,342,355 Certified Emission Reductions (CERs) for the first seven years of operation. The Bank signed an Emission Reduction Purchase Agreement (ERPA) with SOGEM for the purchase 280,000 Certified Emissions Reductions (CERs) on June 29, 2007 under the Spanish Carbon Fund (SCF). The ERPA was later transferred to the Tranche 2 of the Umbrella Carbon Facility (UCF T2) on December 13, 2011. On January 23, 2015, the ERPA was amended to: (i) capture the delay in the commissioning date, and (ii) to adjust the contracted CERs volume according to the amended commissioning date of the project on July 2, 2013. The CER volume contracted under the UCF T2 was reduced from 734,300 CERs in the original ERPA to 701,665 CERs to be generated from July 2, 2013 to December 31, 2018.

2.1.4 As a source of clean renewable energy, the OMVS Felou Hydroelectric Project generates carbon emission reductions, the proceeds of which were earmarked for electrification of rural communities that reside along the transmission “right of way” of the OMVS Power System.

### ***2.2 Project implementation and commissioning***

2.2.1 *Original Project Development Objective:* the original PDO of the Félou HEP was to generate electricity and GHG emissions reductions from a run-of-the-river hydroelectric installation on the Senegal River in Mali. The Félou project will deliver clean energy to national power utilities in the sub-region (Mali, Mauritania and Senegal) and the GHG credits to international buyers through the creation of additional 63.45 MW<sup>11</sup> of installed hydropower generation capacity at an existing weir of an old 600 kW hydroelectric facility. The construction and operation of the Félou HEP is supported by financing from the International Development Agency (IDA) under the WAPP APL 2 - OMVS Félou Hydroelectric Project and from the European Investment Bank (EIB). The Félou HEP started delivering electricity to the grid on July 2, 2013 and can supply 320-350 GWh to the interconnected grid displacing the same amount of electricity from existing fossil fuel based plants in the regional grid.

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<sup>11</sup> Total nameplate capacity of three generators.

2.2.2 The Félou HEP was registered as a CDM project on May 6, 2010. So far, 90,237 CERs have been issued and delivered to UCF T2, corresponding to the first verification, which covered the period from July 2 to January 1, 2014. The second verification is completed and the issuance of about 172,000 CERs for the second reporting period are expected by end of September 2015. The project preparation costs incurred have been reimbursed to SCF from the payment made for the first CERs issued as stipulated in the UCF T2 ERPA. As of June 2015, approximately 90% of contract ERs remain to be delivered under the UCF T2 ERPA. The project successfully completed the validation of the compliance report to the World Commission on Dams.

2.2.3 As per the PAD and PDD, SOGEM committed to provide electricity to selected villages surrounding the project site. As part the resettlement action plan (RAP), three villages (Médine, Lontou and Bengassi) in the OMVS priority rural electrification program were electrified with grid electricity. The project supports the local community development with its plan to electrify seven more villages through connection to the grid. These villages Kaffa, Kounda, Fatola Mamoubougou, Lomba, Keniou and Boteguekourou. SOGEM will use revenues from the sales of carbon credits to finance the electrification of these villages. A special rural electrification account was created to hold the payment of carbon revenues.

### **2.3 *Monitoring, reporting, verification and issuance of emission reductions***

2.3.1 The monitoring of Félou HEP has been carried out by SOGEM in accordance with the Monitoring Plan as described in the PDD<sup>12</sup>. With the Bank's support, SOGEM has prepared all monitoring reports.

## **3. BANK AND PROJECT ENTITY PERFORMANCE**

### **3.1 *Assessment and rating of overall Bank performance***

3.1.1 Overall, the Bank's performance has been Moderately Satisfactory in regards of the carbon finance operations. The Bank's involvement was critical in the CDM registration and verification stages. Since the beginning of the project, the Bank has collaborated closely with SOGEM and has built the capacity needed to overcome many of the obstacles the project encountered, such as the concerns raised by the designated operational entity (DOE) during the verification stage on the project's installed capacity and monitoring system alignment with the registered PDD.

### **3.2 *Assessment and rating of overall project entity performance***

3.2.1 The performance of SOGEM is rated Moderately Unsatisfactory for the parent project. However, the project entity performance is rated Moderately Satisfactory in regards of the carbon operation because of the delay in the commissioning date. SOGEM has complied with all of the obligations and requirements expected, such as assisting with the development of the PDD, implementing the monitoring plan, executing the resettlement action plan and compensation of local stakeholders, (i.e., municipalities, communities, and nongovernmental organizations). SOGEM monitors the performance of the equipment to ensure compliance with the PDD and implements the Environmental Management and Monitoring Plans. SOGEM is complying with the safeguards of the WAPP APL 2 - OMVS Félou Hydroelectric Project (the parent project).

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<sup>12</sup> For the PDD and UNFCCC related documents, please refer to: <http://cdm.unfccc.int/Projects/DB/DNV-CUK1256566709.38/view>

#### 4. BENEFITS, TARGET POPULATION, AND RATE OF SUCCESS

4.1 The OMVS Félou Hydroelectric Project was the first CDM project registered in a regional project, and the first hydro project to issue CERs in West Africa. ERs have been calculated using information verified by a DOE, an “independent auditor accredited by the CDM Executive Board to verify whether implemented projects have achieved planned greenhouse gas emission reductions,” as well as the CERs issued by the CDM Executive Board. Estimated electricity generated has also been extracted from these reliable sources.

Benefits Action	Indicators	Baseline Values	Estimated Amount*		Results*	
			2013	2014	2013	2014
Emission Reductions	Tons of carbon dioxide equivalent per year	0	96,145	191,765	90,127	171,949
Electricity Generated and Exported to the Grid	Gigawatt hours/year	0	165.5	330	156	296

\*As of December 31, 2014.

4.2 Three villages were electrified. As more CERs are certified by the UNFCCC, more resources will be used for the implementation of the rural electrification activities. For that purpose, SOGEM created a special rural electrification account to receive carbon credits payments and track the use of the fund.

#### 5. COMMENTS FROM PROJECT ENTITY AND OTHER PARTNERS

5.1 SOGEM contributed to the preparation of this Implementation Completion and Results (ICR) report, providing the Bank ICR team with information and data, and facilitating site visits. SOGEM also provided the lessons learned section, and the information to describe Félou HEP’s commissioning and implementation experiences. SOGEM participated in regular Bank supervision and safeguard missions.

#### 6. SAFEGUARDS COMPLIANCE

6.1 Four safeguards policies were triggered: Environment assessment (Full, Category A project) (OP/BP 4.01); Involuntary resettlement (OP/BP 4.12); Dam safety (OP/BP 4.37) and Projects on international waterways (OP/BP 7.40)

6.2 There were no significant and/or irreversible impacts expected from the Project nor adverse indirect and/or long-term impacts foreseen as a result of project activities. The main social development issues in the project area (Kayes/ Bafoulabe) related to the negative impacts on fishing activities and acquisition of 1.25 ha of land planted with orchards and vegetable gardens for project facilities as well as the interruption of the power supply from the small existing run-of-river power plant at Felou during the construction of the Project. The latter temporary impact was mitigated by the provision of electricity with a supply from the site generator.

6.3 An Environmental Impact Assessment (EIA) and Resettlement Action Plan (RAP) were prepared and disclosed prior to project appraisal. The RAP determined the adequate level of compensation for the loss of assets resulting from the acquisition of 1.25 ha of land.

6.4 The Project also implemented additional social enhancement measures to benefit neighboring villages (Lontou, Bengassi) in the Project zone of influence. A large part of the mitigation measures (particularly infrastructure improvements) was implemented as part of the main design and built contract. The last ISR of September 2014 rated the compliance with environmental safeguards as moderately satisfactory because of the lack of reporting by SOGEM particularly on the status of implementation of the RAPs.

## **7. LESSONS LEARNED**

7.1 **Capacity building and climate change awareness.** As in many countries in Sub-Saharan Africa, several capacity building activities were conducted in Mali financed by donors and multilateral agencies. However, little has been achieved in terms of the retention of the capacity because of the lack of direct connection between these capacity building initiatives and concrete projects on the ground. The Félou hydro power project was able to bring this real case in the region, providing the ground for practicing greenhouse gas accounting. The Bank was able to help develop a CDM capacity within SOGEM and more importantly to raise awareness on carbon and climate finance at the company management level as well as at the level of governing bodies of the OMVS.

7.2 **Carbon finance to provide benefits to local communities.** The project is unique in its design where at the early stage, the project entity with support from the World Bank has decided to use the revenues from the sales of carbon credits to support local development through the electrification of villages. The decision is supported by the OMVS and additional climate finance are sought to provide energy access to rural communities.

7.3 **Independent nature of CDM project cycle and Bank capability to deal with it.** Access to project development financing and CDM project registration is key to maximizing the benefits from CDM projects. In this case, a Project Idea Note was submitted to the Bank in June 2006, and the project was registered in December 2010 with many challenges such as the demonstration of additionality using barriers analysis. Later on, the registered PDD was revised to take into account the monitoring system implemented on the ground and simplify the system. The Bank was able to support SOGEM to navigate through the CDM pitfalls and implement a smooth monitoring system.

7.4 **Replication effect.** The Felou hydropower project was the first CDM project to issue CERs in West Africa. Within SOGEM, this achievement created strong interest to explore additional climate finance opportunities, to support local development. The lessons learnt will be useful to the OMVS where the hydro potential remains untapped, when countries like Guinea are included.

## **8. JUSTIFICATION FOR MOVING TO THE SECOND PHASE (CARBON FINANCE MONITORING PHASE) AND SAFEGUARDS COMPLIANCE**

### ***8.1 Compliance with safeguards and implementation challenges in the first phase - supervision phase***

8.1.1 The project was rated A due to environmental and social safeguards which were triggered during implementation. During implementation, suitable measures were taken to mitigate these safeguard issues.

### ***8.2 Project entity's capacity to carry out key functions related to safeguard requirements***



8.2.1 SOGEM's capacity to address safeguards was satisfactory.

**8.3 *Potential issues in post completion operation, including project entity's capacity and ability of the project to deliver the contracted ERs***

8.3.1 No issues are likely to arise in the post completion of the project. Emission reductions are on schedule for delivery, as estimated.

**8.4 *Justification for moving to the second phase - carbon finance monitoring phase***

8.4.1 All safeguard requirements are fulfilled and the ESMP is fully complied with. No substantial outstanding material issues exist and no potential issue is anticipated during the remaining term of the ERPA. The environmental audit of the Felou HEP which was due within six months of the closing of the project was received. Its conclusions are that: (i) every person affected has been equitably compensated and complaints resolved to the satisfaction of the parties; (ii) the measures included in the RAP have been for the most part implemented; (iii) the mechanisms of dispute resolution have worked well; and (iv) there has been an improvement in the social conditions such as through the provision of potable water supply.

8.4.2 For the remaining monitoring activity, SOGEM has the capacity to operate the project and to carry out key functions related to safeguards requirements. The monitoring system is proven to be suitable, and the risk was assessed as minimal at the time of the Implementation Completion Report (ICR).

**8.5. *Recommendations and guidance for project monitoring in the second phase - carbon finance monitoring phase***

8.5.1 The team noted considerable efforts in the implementation of safeguard mitigation measures. The detailed action plan showed that all planned mitigation measures under Sinohydro (the Design Build contractor) or OMVS responsibility were satisfactorily implemented.

8.5.2 As of today, all major safeguard issues and compensation are closed. However, the team should continue to monitor on yearly basis the implementation of rural electrification activities. The environmental audit recommends a number of minor corrective measures, part of the ESMP, to be addressed by SOGEM/SINOHYDRO while Felou is still under the operating warranty (e.g. Reforestation of the site, follow up on the maintenance of the trash management system and a plan of what would become of the Sinohydro's base camp now that the work was completed).

## **Annex 10. List of Supporting Documents**

- ICR Guidelines (August 2006, last updated on October 5, 2011);
- Guidelines for Reviewing World Bank Implementation Completion and Results Reports. A Manual for Evaluators (IEG, Nov. 12, 2013);
- PAD: WAPP APL-2, OMVS Felou Hydroelectric Project (June 5, 2006);
- Project Paper: Additional Financing for the Felou Hydroelectric Project (July 30, 2009);
- Project Agreements;
- Financing Agreements;
- Aide-memoires; and
- IRSs (15 sequences)
- SOGEM : Elément du Rapport d'achèvement du projet élaboré par l'IDA – Bamako, 7 juillet 2015 ; and
- EIB's Email of August 3, 2015.

# WEST AFRICA WEST AFRICA POWER POOL APL PROGRAM FELOU AND GOUINA HYDROELECTRIC PROJECTS, APL 2

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