

**AFRICAN DEVELOPMENT FUND**



---

**MULTINATIONAL**

**ETHIOPIA DJIBOUTI POWER INTERCONNECTION PROJECT**

**SUPPLEMENTARY LOAN**

**INFRASTRUCTURE DEPARTMENT (OINF)  
ENERGY & ICT DIVISION (OINF3)**

**MAY 2008**

## TABLE OF CONTENTS

	<u>Page</u>
EQUIVALENTS AND ABBREVIATIONS, LIST OF ANNEXES, UPDATED PROJECT MATRIX	(i-vi)
1. <u>INTRODUCTION</u>	1
2. <u>THE INITIAL PROJECT</u>	1
2.1 Objectives	1
2.2 Description of Components	1
2.3 Project Cost	2
2.4 Financing Conditions	3
3. <u>STATUS OF IMPLEMENTATION OF THE INITIAL PROJECT</u>	3
4. <u>THE REAPPRAISED PROJECT</u>	4
4.1 Rationale for the Supplementary Loan	4
4.2 Objectives and Description	5
4.3 Project Cost Estimates	5
4.4 Sources of Finance	6
4.5 Executing Agency and Implementation Mechanism	8
4.6 Revised Expenditure Schedule	8
5. <u>REVISED PROJECT BENEFITS</u>	8
5.1 Financial Analysis	8
5.2 Economic Analysis	9
5.3 Social Impacts	9
5.4 Environmental and Social Impacts Assessment	9
6. <u>CONCLUSIONS AND RECOMMENDATIONS</u>	10

---

This report has been prepared by Messrs E. NZABANITA (Principal Power Engineer), D.T. LEKOETJE (Senior Public Utilities Economist) and J. MALAN (Senior Financial Analyst) following their mission to Ethiopia and Djibouti in May 2008. Any enquiries relating to this report may be directed to the authors or to Mr. Amadou T. DIALLO, Manager, OINF.3 (ext. 2125) and Mr. G. MBESHERUBUSA, Director OINF (ext. 2034).

**LIST OF TABLES**

	<b>Page</b>
Table 2.1	Initial project cost estimates
Table 2.2	Initial financing plan by source of financing
Table 4.1	Revised project costs estimates
Table 4.2	EEPCO's Transmission System
Table 4.3	Comparative analysis between Initial and revised costs estimates
Table 4.3(a)	Revised financing plan by source of financing for Ethiopia
Table 4.3(b)	Revised financing plan by source of financing for Djibouti
Table 4.4(a)	revised expenditure schedule by Component
Table 4.4(b)	Revised expenditure schedule by category
Table 4.4(c)	revised expenditure schedule by source of financing

**LIST OF ANNEXES**

	<b>N° of Pages</b>	
Annex 1	: Project location Map	1
Annex 2	: Initial project costs estimates	1
Annex 3	: Initial project financing plan by source of financing	1
Annex 4	: Revised Project Implementation Schedule	1
Annex 5	: Revised project costs estimates	1
Annex 6	: Comparative analysis between initial and revised project costs estimates	1
Annex 7	: Financial and Economic Analysis	3

**EQUIVALENTS AND ABBREVIATIONS****CURRENCY EQUIVALENTS**

(AUGUST 2004 / March 2008 Exchange Rates)

1 UA	=	ETB 12.5299 /14.5394
1 UA	=	USD 1.45776 / 1.64450
1 USD	=	ETB 8.5953 / 8.841228337
1 UA	=	DJF 260.578 /280.844
1 USD	=	DJF 178.7523 / 174.05229551

**WEIGHTS AND MEASURES**

1 metric tonne (t)	=	2,205 lbs
1 kilogramme (kg)	=	2.205 lbs
1 Km = Kilometer	=	1000 meters
1 kV = Kilovolt	=	1000 volts
1 kW = Kilowatt	=	1000 watts
1 kVA = Kilovolt ampere	=	1000 volt ampere
1 MW = Megawatt	=	1000 kW
1 GW = Gigawatt	=	1000 MW
1 MVA = Megavolt	=	1000 kVA
1 kWh = Kilowatt hour	=	1000 watt hour
1 MWh = Megawatt hour	=	1000 kWh

**FISCAL YEAR**

July 7<sup>th</sup> – July 6<sup>th</sup> (Ethiopia)  
 January –December (Djibouti)

**ABBREVIATIONS**

ADB	=	African Development Bank
ADF	=	African Development Fund
ARP	=	Abbreviated Resettlement Plan
DG	=	Djibouti Government
DJF	=	Djibouti Franc
EA	=	Executing Agency
EBIT	=	Earnings before Interest and Tax
EdD	=	Electricité de Djibouti
EEPCO	=	Ethiopian Electric Power Corporation
ENPV	=	Economic Net Present Value
ERR	=	Economic Rate of Return
ETB	=	Ethiopian Birr
ETFO	=	Ethiopia Field Office
FIRR	=	Financial Internal Rate of Return
FY	=	Financial Year
GOE	=	Government of Federal Democratic Republic of Ethiopia
HVTL	=	High Voltage Transmission Line
ICB	=	International Competitive Bidding
LRMCS	=	Long Run Marginal Cost of Supply
O&M	=	Operations and maintenance
PIU	=	Project Implementation Unit
UA	=	Unit of Account
USD	=	United States Dollar

**MULTINATIONAL –ETHIOPIA-DJIBOUTI INTERCONNECTION PROJECT MATRIX**

Hierarchy of objectives (HO)	Expected Results	Reach	Performance Indicators Source/Method	Indicative Targets/ Time Frame/	Assumptions/Risks
<p><b>Sector Goals:</b></p> <p>The Sector Goal is to improve the environment for job creation and poverty reduction through provision of modern, affordable energy services</p>	<p><b>Long Term Outcomes:</b></p> <ol style="list-style-type: none"> <li>1. Increased electricity access to Ethiopia and Djibouti.</li> <li>2. Improved socio-economic conditions and well being in the two countries.</li> <li>3. Reduced cost of electricity in both countries due to sharing of development costs.</li> <li>4. Accelerated economic growth.</li> </ol>	<p><u>Beneficiaries:</u></p> <ol style="list-style-type: none"> <li>1. Rural &amp; urban population in both countries.</li> <li>2. Industries and commercial centers in both countries.</li> <li>4. Social infrastructure (schools, health Centers) in both countries.</li> </ol>	<p><u>Indicators:</u></p> <ol style="list-style-type: none"> <li>1. Increased economic growth rates</li> <li>2. Improved well being of the people in both countries.</li> </ol> <p><b>Source/Method:</b></p> <ol style="list-style-type: none"> <li>1. Ministry of Energy (Ethiopia and Djibouti) Statistics.</li> <li>2. Statistics of both EdD &amp; EEPCo.</li> <li>3. UNDP – Ethiopia and Djibouti Human Development Reports.</li> <li>5. Ethiopia and Djibouti National Household Survey/ Bureau of Statistics.</li> </ol>	<p><b>By 2015:</b></p> <ol style="list-style-type: none"> <li>4. GDP growth rates increased from 5% to 8% in Ethiopia and maintained at just above 5% in Djibouti.</li> <li>5. Population below poverty line to be reduced from 44.2% to 37% and from 60% to 40% in Ethiopia and Djibouti respectively.</li> </ol>	<ol style="list-style-type: none"> <li>1. Governments of Ethiopia and Djibouti commitment to the full implementation of the energy sector reforms and programmes.</li> <li>2. Political and economic stability in the region.</li> <li>4. The current electricity demand continues at the projected rate. This risk is mitigated by continued sound microeconomic policies which encourage foreign investment</li> </ol>
<p><b>Project Objectives:</b></p> <ol style="list-style-type: none"> <li>1. To establish power trade between Ethiopia and Djibouti and increase electricity access at affordable prices.</li> </ol>	<p><b>Medium Term Outcomes:</b></p> <ol style="list-style-type: none"> <li>1. Electricity Access in Ethiopia is increased.</li> <li>2. Electricity access in Djibouti is increased.</li> <li>3. Electricity trade between Ethiopia and Djibouti is established.</li> <li>4. Availability of Electricity in Djibouti is increased.</li> <li>5. Average Electricity tariff in Djibouti is reduced.</li> </ol>	<p><b>Beneficiaries1. The population</b></p> <ol style="list-style-type: none"> <li>1. Rural &amp; urban population in both countries</li> <li>2. Industries and commercial centers in both countries.</li> <li>4. Social infrastructure (schools, health Centers) in both countries.</li> </ol>	<p><b>Indicators:</b></p> <ol style="list-style-type: none"> <li>1. Reduced tariff/kwh in Djibouti</li> <li>2. Increase of Ethiopia’s revenue from electricity sales to Djibouti.</li> <li>3. Increased electricity access in border towns in Ethiopia</li> <li>4. Increased availability of power in Djibouti and trade</li> </ol> <p>Source/Method:</p> <ol style="list-style-type: none"> <li>1. EdD and EEPCO statistics/ National Statistics in both</li> </ol>	<p><b>Target Indicators:</b></p> <ol style="list-style-type: none"> <li>1. Average tariff in Djibouti is reduced at least by 60% by 2010.</li> <li>2. Foreign exchange revenue for EEPCo is increased from nil to at least US\$ 20 Million.</li> <li>3. Electricity is connected in the four Border towns by 2010. (Over 8000 consumers connected)</li> <li>4. 100 MW of export from Ethiopia. Electricity trade is increased from zero in 2008 to in excess of 400 GWh buying energy.</li> </ol>	<ol style="list-style-type: none"> <li>1. Continued availability of cheap energy resources in Ethiopia.</li> <li>2. Continued commitment of the Governments to implement the power interconnection project.</li> <li>3. The Bank approving the supplementary loan.</li> <li>4. The Djiboutian Government passes some benefits of the interconnection to consumers through reduced tariff.</li> <li>5. EEPCO and EdD are well managed. The training provided under the institutional supports will mitigate this risk.</li> </ol>

					countries.																																																	
<b>Activities:</b> <u>Project Costs (UA million)</u> <u>Overall Project Costs</u> <table border="1"> <thead> <tr> <th>Component</th> <th>Original</th> <th>New</th> <th>Addition</th> </tr> </thead> <tbody> <tr> <td>Transmission Network</td> <td>26.69</td> <td>56.12</td> <td>29.43</td> </tr> <tr> <td>Electrify border towns Ethiopia</td> <td>5.97</td> <td>8.18</td> <td>2.21</td> </tr> <tr> <td>Supervision, Management</td> <td>4.67</td> <td>4.30</td> <td>-0.37</td> </tr> <tr> <td>Institutional Support</td> <td>0.52</td> <td>1.24</td> <td>0.72</td> </tr> <tr> <td>Sub-total</td> <td>37.85</td> <td>69.84</td> <td>31.99</td> </tr> <tr> <td>Physical Contingencies</td> <td>3.79</td> <td>0.40</td> <td>3.39</td> </tr> <tr> <td>Price Contingencies</td> <td>1.12</td> <td>3.54</td> <td>2.42</td> </tr> <tr> <td>Total</td> <td>42.76</td> <td>73.78</td> <td>31.02</td> </tr> </tbody> </table> <u>New Financing Plan</u> <table border="1"> <thead> <tr> <th>Source</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>ADF</td> <td>59.40</td> </tr> <tr> <td>GOE</td> <td>12.43</td> </tr> <tr> <td>GDJ</td> <td>1.96</td> </tr> <tr> <td>TOTAL</td> <td>73.79</td> </tr> </tbody> </table> Requirement for Supplementary loan: UA 5.20 million for Ethiopia and UA 15.72 million for Djibouti.				Component	Original	New	Addition	Transmission Network	26.69	56.12	29.43	Electrify border towns Ethiopia	5.97	8.18	2.21	Supervision, Management	4.67	4.30	-0.37	Institutional Support	0.52	1.24	0.72	Sub-total	37.85	69.84	31.99	Physical Contingencies	3.79	0.40	3.39	Price Contingencies	1.12	3.54	2.42	Total	42.76	73.78	31.02	Source	Total	ADF	59.40	GOE	12.43	GDJ	1.96	TOTAL	73.79	<b>Short Term Outputs:</b> 1. Construction of 220 kV, 63 kV and 33 kV lines between Diredawa substation in Ethiopia and PK 12 in Djibouti. 2. Expansion of substation & construction of new ones. 4. Electrification of border towns in Ethiopia. 5. PPA signed between EdD and EEPCo. 6. Telecommunications infrastructure constructed	<b>Beneficiaries:</b> 1. Electricity users in Ethiopia and Djibouti. 2. EEPCO & EdD 3. Suppliers, contractors & Consultants	<b>Targets:</b> 1. Length of 220 kV transmission lines in Ethiopia and Djibouti constructed. 2. Length of 63 kV transmission lines in Djibouti constructed 3. Length of 33 kV transmission lines in Djibouti constructed 4. Number of substations in Ethiopia and Djibouti constructed. . 5. Number of Border towns electrified 6. Length of fiber optic cable 7. Power sale agreement between the two countries negotiated.	<b>Target Indicators:</b> By 2010. 1. 283 km of 220 kV transmission line between Diredawa substation in Ethiopia and PK 12 in Djibouti constructed 2. 84.5 km of 63 kV transmission line in Djibouti constructed. 3. 239 km of 33 kV lines 4. One substation in Ethiopia (Diredawa) expended and 2 new substations in Ethiopia and in Djibouti constructed 5. Four border towns in Ethiopia electrified by 2010. 6. 12 km of fiber optic cable installed in Ethiopia and Djibouti 7. PPA signed by 2010.	<b>Assumptions/Risks:</b> 1. No significant price increase. This is mitigated by the price contingency built in the revised costs. 2. Conducive environment
Component	Original	New	Addition																																																			
Transmission Network	26.69	56.12	29.43																																																			
Electrify border towns Ethiopia	5.97	8.18	2.21																																																			
Supervision, Management	4.67	4.30	-0.37																																																			
Institutional Support	0.52	1.24	0.72																																																			
Sub-total	37.85	69.84	31.99																																																			
Physical Contingencies	3.79	0.40	3.39																																																			
Price Contingencies	1.12	3.54	2.42																																																			
Total	42.76	73.78	31.02																																																			
Source	Total																																																					
ADF	59.40																																																					
GOE	12.43																																																					
GDJ	1.96																																																					
TOTAL	73.79																																																					

## **EXECUTIVE SUMMARY**

### **1. Project Background**

Ethiopia is endowed with huge hydro electric potential, estimated at over 30,000MW, with corresponding annual electricity production of over 162 GWh. Ethiopia's power system is predominantly hydro electric based and production cost is low. On the other hand, Djibouti primarily depends on oil-fired electricity generation whose supply cost depends mainly on imported petroleum products pricing. As result, the unit cost of power production in Djibouti is many folds higher than in Ethiopia.

In the spirit of regional cooperation and given the huge advantage of Djibouti profiting from using the hydropower from Ethiopia rather than the high cost thermal power, in November 2002, the two countries agreed to cooperate in developing their energy resources for mutual benefit and signed an agreement to implement the power interconnection project. The project was subsequently approved by the Bank Group Board of directors on December 13, 2004. The ADF approved loans from the multinational window of the Bank Group amounting UA 20.88 Million (equivalent to USD 30.4) and UA 17.60 Million (equivalent to USD 25.6) to the Federal Democratic Republic of Ethiopia and to the Republic of Djibouti respectively. The loans were signed on May 16, 2005 for Ethiopia and July 22, 2005 for Djibouti both becoming effective on August 8, 2006.

The implementation of the project is currently in progress. The project implementation Unit has completed the tendering process in accordance with Bank rules of procedure for procurement of goods and works and for use of Consultants. However, the tender prices for all components of the project are higher than initially estimated at appraisal. This is due to two main reasons. Firstly, there was a substantial worldwide increase in price for various items of the project component such as cement, petroleum, steel, aluminum, transportation costs, etc. Secondly, unexpected demand growth in the region which was not foreseen during the appraisal stage, necessitate the construction of a double circuit transmission line instead of a single circuit. While both governments of Ethiopia and Djibouti have contributed some funds towards funding of the project, both Governments are unable to cover the total additional financing required for completing the project. Therefore, both Governments requested the Bank for a supplementary loan to complete the project.

### **2. Project Objectives**

The common sector goal for Ethiopia and Djibouti is to improve the environment for job creation and poverty reduction through provision of modern, affordable energy services. The primary objective of the project is to establish power trade between Ethiopia and Djibouti and to improve electricity access at affordable prices.

### **3. Description of the Project**

The project comprises the following components: (A) Development of Power Transmission Network (construction of transmission lines and substations); (B) Electrification of Border Towns; (C) Project Supervision and Management; and (D) Institutional Support to EdD and EEPCCO

### **4. Project Costs**

The total cost to complete the project, net of taxes and duties, is UA 73.79 million, of which UA 60.77 million (82.36%) is in Foreign exchange and UA 13.02 million (17.64%) is in local currency.

## 5. Sources of Finance

The ADF, EEPSCO and EdD will co-finance the project. ADF will finance 95.26% of the foreign exchange cost (UA 57.89 million) and 11.60% of local cost (i.e. UA 1.51 million) of the project. EEPSCO will finance 4.74% of the foreign cost (UA 2.88 million) and 73.35% of local costs (9.55 million). EdD will finance 15.05% of the local costs of the project (i.e. UA 1.96 million).

## 6. Project Implementation

EEPSCO and EdD are the Executing Agencies with EEPSCO taking the overall responsibility for coordination activities. The revised project implementation period is sixty (60) months taking into account the activities already completed and initiated.

## 7. Conclusion and Recommendations

The objective of the project is to provide an interconnection between Ethiopia and Djibouti with the aim of making possible power trade between the two countries and allow the sharing of cheap hydropower resources of Ethiopia. As such, the project will help reduce the cost of energy and contribute to poverty reduction by encouraging industrial and commercial development that will create jobs in both countries.

The project is progressing smoothly at this stage with all construction works in progress. However, due to an unexpected increase in energy demand in Djibouti, it has become necessary to alter the initial design to cater for the expected demand at the completion of the project. In addition, the high cost of fuel has also led to a substantial increase in cost of power generation for base load in Djibouti through fossil fuel. Therefore, it is anticipated that by project completion, the high cost of thermal generation in Djibouti will be replaced by hydropower from Ethiopia.

The cost increase as a result of constructing a double circuit is UA 12.30 million (UA 5.34 million for Ethiopia and UA 6.96 million for Djibouti). Furthermore, there is an increase of project cost as a result of high prices of materials and equipment from those prevailing at appraisal amounting to UA 18.73 million (UA 9.97 million for Ethiopia and 8.76 for Djibouti). Therefore, there is a total shortfall of UA 31.03 million including contingencies to the overall cost of the project. The cost increase notwithstanding, the project is still economically and financially viable with the FIRR estimated at 14.5% and EIRR at 29%. All other project benefits at appraisal still apply.

In view of the above, it is recommended that the ADF approves a supplementary loan not exceeding UA 5.20 million to Ethiopia and a grant to Djibouti not exceeding UA 15.72 million, subject to the terms and conditions specified in the respective loan/grant agreements. Ethiopia will provide a 1/3 of Bank contribution through their national allocation (2/3 from multinational allocation) and Djibouti will provide 10% of Bank contribution through their national allocation (90% from multinational allocation) according to the Bank's policy on multinational operations.

## **1. INTRODUCTION**

1.1 Ethiopia's power system is predominantly hydroelectric based and production cost is low. However, Djibouti's power system depends on oil-fired electricity generation, whose supply cost depends mainly on the price of imported petroleum products. As a result, the unit cost of power production in Djibouti is about 4 times higher than in Ethiopia.

1.2 The Governments of the two countries signed an agreement in November 2002 for implementing the power interconnection project for mutual benefit of both countries. The two Governments jointly requested the African Development Bank Group to fund the proposed project. The Bank included the project in its lending program for the year 2004 and fielded an Appraisal Mission to the two countries from 16 August to 3 September 2004. Accordingly, for the purpose of implementing the project, the African Development Fund approved loans from the multinational window of the Bank Group amounting UA 20.88 million (equivalent to USD 30.4) and UA 17.60 million (equivalent to USD 25.6) to the Federal Democratic Republic of Ethiopia and to the Republic of Djibouti respectively.

1.3 The implementation of the project is currently in progress. The project implementation Unit has completed the tendering process in accordance with Bank rules of procedure for procurement of goods and works and for use of Consultants. However, the Tender prices for all components of the projects are higher than initially estimated at appraisal. This is due to two main reasons. Firstly, there was a substantial worldwide increase in price for various items of the project component including steel, aluminum, local construction prices such as cement, gravel, sand, fuel and erection prices. Secondly, unexpected demand growth in the region which was not foreseen during the appraisal stage, necessitated construction of a double circuit transmission line instead of a single circuit. While both governments of Ethiopia and Djibouti have made contributions towards the funding of the project, both Governments are unable to cover the total additional financing required for completing the project. Therefore, both Governments requested the Bank for a supplementary loan to complete the project.

1.4 A Bank mission visited Ethiopia and Djibouti in May 2008 to appraise the supplementary loan to complete the project. This report is based on the information gathered during the mission.

## **2. THE INITIAL PROJECT**

### **2.1 Objectives**

The common sector goal for Ethiopia and Djibouti is to improve the population access to electricity in both countries through regional cooperation in the energy sector. The primary objective of the project is to establish power trade between Ethiopia and Djibouti and to improve electricity access at affordable prices.

### **2.2 Description of Components:**

The project comprised the following components:

(A) Development of Power Transmission Network: this component comprises (a) construction of 283 km 230 kV transmission line and substations. The transmission line includes 201 km within Ethiopia and 82 km within Djibouti. The transmission line will have three phase single circuit, single optical fiber cable shield wire (OPWG) on self supporting,

tapered configuration, vertical formation galvanized steel lattice towers. The construction of substations include extension of the existing substation at Dire Dawa (Ethiopia) by installing an additional 230 kV line bay to supply Adigala, construction of 230/33 kV substation at Adigala and a 230 kV line bay for supplying Djibouti and Border towns. A new substation comprising of two 230/63/20kV and 63/40/23 MVA transformers will be constructed at PK 12 in Djibouti.

(B) Electrification of Border Towns: this component includes (a) electrification of 4 border towns in Ethiopia; namely Adigala, Ayasha, Dewelle and Harewa by constructing 239 km of 33 kV lines and installation of distribution transformers (4x 25 kVA, 10x50 kVA, and 4 x100 kVA), and (b) supply of electricity to Ali Sabieh and Djibouti town by constructing 75 km of 63 kV line and installing 1x12MVA 63/20 kV substation at Ali Sabeih, and laying a 9.5 km of 63 kV underground cable, and a 12 km of optical fiber cables. The optical fiber cables are provided to facilitate communication between EdD facilities and EEPCo Load Dispatch System.

(C) Consultancy Services for the Project Supervision and Management: this component includes (i) consultancy services for supervision of construction of the inter-connector, reviewing of design as well as carrying out studies required for ensuring stable operation of the inter-connector and (ii) preparation of operation manual for the integrated operation of the two utilities as well as making recommendations for the grid code to be implemented.

(D) Institutional Support: this component includes (i) establishment of the internal Audit unit at EdD, (ii) carrying out a tariff study for EdD, and (iii) training of engineers and commercial staff of EdD and EEPCO at home and abroad. The tariff study will recommend a tariff structure to be applicable after the interconnection is established in accordance with LRMC principles and pursuant to Government's objective.

### 2.3 Project Cost

The total cost for the components in Ethiopia was estimated at UA 23.20 million including a foreign exchange cost of UA 19.32 million and a local cost of UA 3.88 million. The total cost for Djibouti was estimated at UA 19.56 million, including a foreign exchange cost of UA 16.33 Million and local cost of UA 3.23 million. The initial total project costs estimates exclusive of taxes are summarized below in Table 2.1. Details per country are shown Annex 2 (Tables A2.1 and A2.2).

Table 2.1: Initial project cost estimates

Components	F.E	L.C	Total	F.E	L.C	Total
	In 'million US\$			In 'million UA		
Transmission Network Development						
Construction of Transmission Lines	23.11	3.57	26.68	15.85	2.45	18.3
Construction of Substations	10.55	1.67	12.22	7.24	1.15	8.39
Electrification of Border Towns	7.09	1.62	8.71	4.86	1.11	5.97
Project Supervision & Management	4.48	2.3	6.78	3.08	1.59	4.68
Institutional Support	0.77	0	0.77	0.52	0	0.52
<b>Base Cost</b>	<b>46</b>	<b>9.16</b>	<b>55.16</b>	<b>31.55</b>	<b>6.3</b>	<b>37.85</b>
Physical contingency	4.59	0.92	5.51	3.16	0.63	3.79
Price contingency	1.38	0.28	1.66	0.94	0.18	1.12
<b>Total</b>	<b>51.97</b>	<b>10.36</b>	<b>62.33</b>	<b>35.65</b>	<b>7.11</b>	<b>42.76</b>

## 2.4 Financing Conditions

The initial overall financing plan of the project by source of financing is presented in table 2.2 below. On the Ethiopia side, the ADF was financing UA 20.88 million (90%) and EEPCO was providing the balance amounting to UA 2.32 million, while in Djibouti the Bank was financing UA 17.60 million (90% of the total), whereas EdD was financing UA 19.56 million. Details per country are given in Annex 3 (Table 3A.1 and 3A.2)

Table 2.2: Initial financing plan by source of financing

Components	ADF			EEPCO			Djibouti		
	F.E	L.C	Total	F.E	L.C	Total	F.E	L.C	Total
	In 'Million UA			In 'Million UA			In 'Million UA		
Transmission Network Development	23.0	2.83	25.92	0	0.76	0.76	0	0.01	0.01
Electrification of Border Towns	4.86	0	4.86	0	0.45	0.45	0	0.66	0.66
Project Supervision & Management	3.08	0	3.08	0	0.68	0.68	0	0.91	0.91
Institutional Support	0.52	0	0.52	0	0	0	0	0	0
<b>Base Cost</b>	<b>31.5</b>	<b>2.83</b>	<b>34.38</b>	<b>0</b>	<b>1.89</b>	<b>1.89</b>	<b>0</b>	<b>1.58</b>	<b>1.58</b>
Physical contingency	3.16	0	3.16	0	0.34	0.34	0	0.29	0.29
Price contingency	0.94	0	0.94	0	0.09	0.09	0	0.09	0.09
<b>Total</b>	<b>35.6</b>	<b>2.83</b>	<b>38.48</b>	<b>0</b>	<b>2.32</b>	<b>2.32</b>	<b>0</b>	<b>1.96</b>	<b>1.96</b>

## 3. STATUS OF IMPLEMENTATION OF THE INITIAL PROJECT

3.1 Following the approval of the project on December 2004, the loan agreements were signed on 16 May and 26 July 2005 for Ethiopia and Djibouti respectively. The two loans became effective on 8 August 2006. The Conditions precedent to first disbursement of the loans were fulfilled by EEPCO and EDD in July 2006. The revised project implementation schedule presented in Annex 4 shows that tentatively the project would be completed by April 2010.

3.2 Procurement of services: the consultants for the project supervision and management and institutional support components have been successfully recruited in accordance with Bank's Rules of Procedures for the use of Consultants. The consultant for the institutional support component was recruited in 2006 and has since then accomplished about 85% of the required tasks. The consultant for the Supervision and Management was also recruited in August 2006 and is actively involved in the supervision and management of the project.

3.3 Procurement of Goods and Works: the contractors for the construction of the transmission lines, substations and electrification of border towns have been successfully recruited in accordance with the Bank's Rules of Procedures for Procurement of Goods and Works.

3.4 The contract for the transmission line sub-component was signed in September 2007 and became effective in Mid April 2008 soon after receipt of the down payment from both Ethiopia and Djibouti. The contract for the substation sub-component was also signed in September 2007 and became effective in January 2008 soon after receipt of the down payment from both countries. Both contractors have since been involved in front-end activities and construction work is expected to be completed within 20 months.

3.5 The rural electrification component of the Djibouti side was included in the transmission line and substation packages of the Djibouti side since much of it involved

construction of a transmission line from Djibouti town to the border town of Ali-Sabieh and construction of a new substation. Therefore, the Electrification of border towns' component only consists of border towns in Ethiopia and work has already started. The survey of the lines has been completed and approval for the design of the materials has already been given. Manufacturing of concrete poles is starting in the coming few weeks and all materials required are expected to be on site within the next three months.

3.6 It is worth noting that before issuing the bids, it became clear to both EEPCO and EdD that the single circuit that had been foreseen at appraisal would not support the load in Djibouti soon after the completion of the interconnection. The tender documents therefore included a requirement for bidding for a second circuit to accommodate the additional load. EEPCO and EdD negotiated with the winner to implement the project with a single circuit but with a provision of a second circuit if funds became available within the time frame of the project implementation. Four (4) additional poles would be required in case the second circuit is to be implemented. The Bank allowed EEPCO and EdD to sign the contracts provided that the government of Ethiopia and Djibouti would cover the budget deficit. The contracts were subsequently signed in September 2007 after an assurance by EEPCO and EdD that they would meet the shortfall for at least the single circuit option.

3.7 Financial Implementation: so far out of UA 28.88 million allocated for Ethiopia portion, UA 4.88 million (23.36%) has been disbursed while out of UA 17.60 million allocated for the Djibouti portion, UA 4.18 million (23.74%) has been disbursed.

#### **4. THE REAPPRAISED PROJECT**

##### **4.1 Rationale for the Supplementary Loan**

4.1.1 The project is the first in the Horn of Africa that is aimed at improving the power trade within the region. When completed, it will be a component of the Eastern Africa Power Pool that is currently under development. Others similar projects planned include Ethiopia - Kenya power interconnection project whose study the Bank is co-financing with other development partners and Ethiopia-Sudan power interconnection project that is being financed by the World Bank. The project will therefore contribute to the regional cooperation efforts.

4.1.2 The additional loan is intended to cover the additional costs arising from (a) substantial worldwide increase in price for various items of the project component including steel, aluminum, local construction prices such as cement, gravel, sand, fuel and erection prices, and (b) unexpected high growth demand in Djibouti which was not foreseen during the appraisal that necessitated construction of a double circuit transmission line instead of a single circuit originally envisaged.

4.1.3 The project implementation unit has completed the tendering process in accordance with Bank rules of procedure for procurement of goods and works and for use of Consultants. The least cost evaluated bidder's price indeed shows that there is an increase in the estimated cost on the original project design amounting to about UA 9.97 million (43%) for the Ethiopian portion and UA 8.76 million (44%) for Djibouti. The inclusion of the double circuit option further increases the estimated cost by UA 5.34 million (23%) on the Ethiopian side and UA 6.96 million (34%) on the Djibouti side. This amounts to a total cost increase of UA 31.03 million.

4.1.4 Djibouti's generation has been mainly thermal with heavy oil being used as the main fuel. However the recent price increase in fuel has meant that the cost of generation in Djibouti has been rising. The forecast maximum demand for EdD in the year 2015 is 145.6 MW. On the other hand, the design of the project at appraisal had anticipated a long term maximum demand of 102 MW by the year 2025. By current estimates, the single circuit that had been envisaged at appraisal will be overloaded by 2012 thus requiring construction of another line beginning 2010. The economic analysis undertaken by EdD recommends that a double circuit line should be constructed between Diredawa and Djibouti with the following advantages:

- ◆ In the past few years, the cost of transmission line has been rapidly increasing. The additional cost required to add the second circuit at present is much less than constructing another single circuit line soon after commissioning of the first line. As an example the price of a 230 kV transmission line has almost doubled in the last eight years.
- ◆ There has been a marked increase in foreign investments in Djibouti mainly from Middle East investors who view Djibouti's port as very strategic, with the anticipation that power will be cheaper in Djibouti after the completion of the current project. The second circuit will therefore mean this momentum in foreign investments is not lost.

4.1.5 The project remains economically and financially profitable. The project will save Djibouti from using fossil fuel for power generation whose cost is ever rising and contributing to carbon emissions that are very harmful to the people and to the environment.

## 4.2 Objectives and Description

4.2.1 There are no changes to the sectoral and specific objectives of the re-appraised project. The common sector goal for Ethiopia and Djibouti is to improve the population access to electricity in both countries through regional cooperation in the energy sector. The primary objective of the project is to establish power trade between Ethiopia and Djibouti and to improve electricity access at affordable prices. The description of the project remained the same except for the following changes in component A.

**4.2.2 Component A: (i) Transmission line Sub- component:** A double circuit three phase transmission line will be constructed instead of a single circuit three phase transmission line originally envisaged at appraisal. This requires heavier steel towers with the number remaining the same. Also required are additional conductors and line accessories. (ii) **Substations sub-component:** This component would also only include an additional 220 kV bay at Diredawa in Ethiopia and another a similar one at PK 12 in Djibouti to cater for the additional circuit.

## 4.3 Project Cost Estimates

4.3.1 The revised total project costs estimates, net of all taxes and duties amount to UA 73.79 million comprising of: UA 60.77 million in foreign costs and UA 13.02 million for local costs. For Ethiopia the project cost amounts to UA 38.51 million comprising of UA 28.96 million in foreign costs (75.2%) and UA 9.55 million (24.8%) in local costs. As for Djibouti, it amounts to UA 35.28 million comprising of UA 31.81 million in foreign costs (90.2%) and UA 3.47 million (9.8%) in local costs.

4.3.2 The project costs estimates are derived from the actual tender prices (lowest evaluated bid), physical contingencies and price contingency. The revised overall project cost estimates for the project is summarized in Tables 4.1 below. Details per country are shown in Annex 5 (Tables 5A.1 and 5A.2).

Table 4.1: Revised project cost estimates

Components	in million US\$			in million UA		
	F.E	L.C	Total	F.E	L.C	Total
Transmission Network Development	77.60	14.68	92.29	47.19	8.93	56.12
Electrification of Border Towns	7.55	5.90	13.45	4.59	3.59	8.18
Project Supervision & Management	6.64	0.43	7.07	4.04	0.26	4.30
Institutional Support	2.02	0.03	2.05	1.23	0.02	1.25
<b>Base Cost</b>	<b>93.81</b>	<b>21.04</b>	<b>114.85</b>	<b>57.05</b>	<b>12.80</b>	<b>69.85</b>
Physical contingency	0.59	0.07	0.66	0.36	0.04	0.40
Price contingency	5.51	0.30	5.81	3.36	0.18	3.54
<b>Total</b>	<b>99.91</b>	<b>21.41</b>	<b>121.32</b>	<b>60.77</b>	<b>13.02</b>	<b>73.79</b>

4.3.3 The lowest evaluated bidder's costs for the Ethiopian portion of the project amounted to UA 38.51 million exceeding the original estimated costs amounting to UA 23.2 million at appraisal by UA 15.31 million (65%). On the Djibouti portion, the lowest evaluated bidder's cost amounted to UA 35.28 million exceeding the estimated cost at appraisal of UA 19.56 million by UA 15.72 million (80%). It is worth noting that four bidders participated in the transmission component while three participated in the substation component. A comparative analysis between appraisal and re-appraisal cost, and additional requirements estimates are shown in Table 4.2. Details per country are shown in Annex 6 (Tables 6A.1 and 6A.2)

Table 4.2: Comparative analysis between initial and revised costs estimate

Contract Name	Original Estimate			Project Cost including Second circuit			Additional Financing		
	FC	LC	Total	FC	LC	Total	FC	LC	Total
<b>Works</b>									
Construction of Transmission Lines	15.85	2.45	18.3	26.4	4.97	31.37	10.55	2.52	13.07
Construction of Substations	7.24	1.15	8.39	20.79	3.96	24.75	13.55	2.81	16.36
Electrification of border towns Ethiopia	4.86	1.11	5.97	4.59	3.59	8.18	-0.27	2.48	2.21
<b>Total Contract amount for Works</b>	<b>27.95</b>	<b>4.71</b>	<b>32.66</b>	<b>51.78</b>	<b>12.52</b>	<b>64.3</b>	<b>23.83</b>	<b>7.81</b>	<b>31.64</b>
<b>Service</b>									
Project Supervision and Management	3.08	1.59	4.67	4.04	0.26	4.3	0.96	-1.34	-0.37
Institutional Support	0.52	0	0.52	1.23	0.02	1.24	0.71	0.02	0.73
<b>Total for Services</b>	<b>3.6</b>	<b>1.59</b>	<b>5.19</b>	<b>5.27</b>	<b>0.28</b>	<b>5.54</b>	<b>1.67</b>	<b>-1.32</b>	<b>0.36</b>
Physical Contingencies	3.16	0.63	3.79	0.36	0.04	0.4	-2.8	-0.59	-3.39
Price Contingencies	0.94	0.18	1.12	3.35	0.18	3.54	2.41	0	2.42
<b>Total for works and Services</b>	<b>35.65</b>	<b>7.11</b>	<b>42.76</b>	<b>60.77</b>	<b>13.02</b>	<b>73.79</b>	<b>25.11</b>	<b>5.91</b>	<b>31.03</b>

#### 4.4 Sources of Finance

The Tables 4.3 (a) and 4.3 (b) below give sources of finance for the revised cost

**Table 4.3(a): Revised financing plan by source of financing for Ethiopia (million UA)**

Component/Sub Component name	Total Cost			ADF			EEPCO		
	FC	LC	Total	FC	LC	Total	FC	LC	Total
<b>Works</b>									
EDPIP-A1 –Transmission Lines	15.33	3.65	18.98	12.45	0.00	12.45	2.88	3.65	6.53
EDPIP-A2 –Substations	5.54	1.97	7.51	5.54	0.00	5.54	0.00	1.97	1.97
Electrification of border towns Ethiopia	4.59	3.59	8.18	4.59	0.00	4.59	0.00	3.59	3.59
<b>Total Contract amount for Works</b>	<b>25.47</b>	<b>9.21</b>	<b>34.67</b>	<b>22.59</b>	<b>0.00</b>	<b>22.59</b>	<b>2.88</b>	<b>9.21</b>	<b>12.09</b>
<b>Service</b>									
Project Supervision and Management	2.60	0.22	2.82	2.60	0.00	2.60	0.00	0.22	0.21
Institutional Support	0.13	-	0.13	0.13	0.00	0.13	0.00	0.00	0.00
<b>Total for Services</b>	<b>2.73</b>	<b>0.22</b>	<b>2.95</b>	<b>2.73</b>	<b>0.00</b>	<b>2.73</b>	<b>0.00</b>	<b>0.22</b>	<b>0.21</b>
Physical Contingencies	0.19	0.03	0.22	0.19	0.00	0.19	0.00	0.03	0.03
Price Contingencies	0.57	0.09	0.67	0.57	0.00	0.57	0.00	0.09	0.09
<b>Total for Works and Services</b>	<b>28.96</b>	<b>9.55</b>	<b>38.51</b>	<b>26.08</b>	<b>0.00</b>	<b>26.08</b>	<b>2.88</b>	<b>9.55</b>	<b>12.43</b>

**Table 4.3(b): Revised financing plan by source of financing for Djibouti (million UA)**

Component/Sub Component Name	Total Cost			ADF			EdD		
	FC	LC	Total	FC	LC	Total	FC	LC	Total
<b>Works</b>									
EDPIP-A1 –Transmission Lines	11.07	1.32	12.39	11.07	0.32	11.39	0.00	1.00	1.00
EDPIP-A2 –Substations	15.25	1.99	17.24	15.25	1.17	16.42	0.00	0.82	0.82
<b>Total Contract amount for Works</b>	<b>26.32</b>	<b>3.31</b>	<b>29.63</b>	<b>26.32</b>	<b>1.49</b>	<b>27.81</b>	<b>0.00</b>	<b>1.82</b>	<b>1.82</b>
<b>Service</b>									
Project Supervision and Management	1.44	0.04	1.48	1.44	0.00	1.44	0.00	0.04	0.04
Institutional Support	1.10	0.02	1.12	1.10	0.02	1.12	0.00	0.00	0.00
<b>Total for Services</b>	<b>2.54</b>	<b>0.06</b>	<b>2.60</b>	<b>2.54</b>	<b>0.02</b>	<b>2.56</b>	<b>0.00</b>	<b>0.04</b>	<b>0.04</b>
Physical Contingencies	0.17	0.01	0.18	0.17	0.00	0.17	0.00	0.01	0.01
Price Contingencies	2.78	0.09	2.87	2.78	0.00	2.78	0.00	0.09	0.09
<b>Total for works and Services</b>	<b>31.81</b>	<b>3.47</b>	<b>35.28</b>	<b>31.81</b>	<b>1.51</b>	<b>33.32</b>	<b>0.00</b>	<b>1.96</b>	<b>1.96</b>

4.4.1 According to the above proposed financing plan, ADF is required to provide an amount of UA 26.08 million for the Ethiopia portion of the project. Originally, the ADF provided a loan amounting to UA 20.88 million. The supplementary loan required for the Ethiopian side is UA 5.20 million and Ethiopia will provide the balance amounting to UA 12.43 million. One third (1/3) of ADF contribution will be provided from the national allocation while the remaining two thirds (2/3) will be provided from the multinational window in accordance with Bank policy on multinational operations.

4.4.2 According to the above proposed financing plan, ADF is required to provide UA 33.32 million for the Djibouti portion of the project. Initially the Bank provided a loan of UA 17.60 million. The supplementary loan required for the Djibouti side is UA 15.72 million leaving a balance amounting to UA 1.96 million which will be provided by the Djibouti

government. Similarly, ten percent (10%) of ADF contribution will be provided from the national allocation while the remaining ninety percent (90%) will be provided from the multinational window in accordance with Bank policy on multinational operations. Djibouti's allocation is small (below the UA 20 million threshold) to allow the application of the 1/3 and 2/3 rule.

#### 4.5 Executing Agency and Implementation Mechanism

EEPCO and EdD remain the Executing Agencies as originally envisaged with EEPCO taking the overall responsibility for overall coordination of project implementation activities in accordance with the institutional arrangements envisaged at appraisal.

#### 4.6 Revised Expenditure Schedule

The yearly expenditure plans by component, category and by sources of finance are presented in Tables 4.4 (a), 4.4(b), and 4.4(c).

**Table 4.4(a): Revised Expenditure Schedule by Component (UA million)**

<b>Component</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>Total</b>
EDPIP-A1 –Construction of Transmission Lines		18.82	9.41	3.14	31.37
EDPIP-A2 –Construction of Substations		9.90	12.38	2.47	24.75
Electrification of border towns		3.27	4.09	0.82	8.18
Project Supervision and Management	0.89	1.29	0.78	1.35	4.30
Institutional Support	0.25	1.00	0.00	0.00	1.25
Base cost	1.14	34.28	26.66	7.78	69.85
Physical Contingency	0.00	0.05	0.20	0.15	0.40
Price contingencies	0.02	1.08	1.33	1.11	3.54
<b>Total</b>	<b>1.16</b>	<b>35.41</b>	<b>28.19</b>	<b>9.04</b>	<b>73.79</b>

**Table 4.4(b): Revised Expenditure Schedule by Category (UA million)**

<b>Category</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>Total</b>
A Goods		31.85	27.44	6.58	65.87
B Services	0.75	3.30	2.05	1.30	7.40
C Others - Resettlement	0.00	0.25	0.22	0.05	0.52
<b>Total</b>	<b>0.75</b>	<b>35.40</b>	<b>29.71</b>	<b>7.93</b>	<b>73.79</b>

**Table 4.4(c): Expenditure Schedule by Source of Finance (UA million)**

<b>Source</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>Total</b>
ADF Loan	0.82	28.77	23.30	6.51	59.40
GOE	-	8.70	3.11	0.62	12.43
GDJ	-	1.37	0.49	0.10	1.96
<b>Total</b>	<b>0.82</b>	<b>38.84</b>	<b>26.90</b>	<b>7.23</b>	<b>73.79</b>

## 5. REVISED PROJECT BENEFITS

### 5.1 Financial Analysis

5.1.1 Financial Internal Rate of Return (FIRR) and Net Present Value (FNPV) were calculated according to the underlying assumptions stated in Annex 7. The results of the analyses, using a discount rate of 7.5%, yielded an FNPV of US\$ 117.9 million and FIRR of 14.5%, which are highly favorable results. The project is therefore still adjudged as financially viable as the FIRR is

higher than the weighted average cost of capital of both companies, estimated respectively at 6% for EEPCo and 7.5% for EdD.

5.1.2 Sensitivity analysis was carried out to gauge the impact of changes in key variables to the project's rate of return. In the case of a 10% increase in investment costs with the revenue streams unchanged, the FIRR drops to 13.2%. As before, the FIRR exhibits more sensitivity to changes in the benefits streams, namely the earnings from power exports and distribution revenues in the four Ethiopian border towns. A reduction of these benefits by the same magnitude reduces the FIRR to about 12.7%. In the scenario of the occurrence of a combined increase in investment costs and decrease in project benefits of 10%, the FIRR drops to 11.9%. The results reiterate the robustness of the project's financial viability.

## 5.2 Economic analysis

5.2.1 The economic internal rate of return (EIRR) of the whole project is estimated at 29% (as indicated in Annex 7) based on the revenues generated by exports and electrification of border towns, the establishment of new business enterprises induced by the availability of electricity in the four border towns, the cost saving from using import power in Djibouti and consumer surplus or increased consumption as result of reduced price of electricity tariff in Djibouti.

5.2.2 Sensitivity analysis was carried out on the project. A 10% increase in investment result in EIRR reducing to 27%, while a decrease in investment cost increase EIRR to 34%. Thus the project is more sensitive to cost. A 10% reduction in power sales marginally affects the EIRR.

## 5.3 Social Impacts

5.3.1 Availability of affordable and reliable electricity will improve the wellbeing and livelihoods of citizens in the two countries. Benefits will include (i) use of electrical cooking appliances instead of using wood based cooking stoves which are inefficient and have negative health consequences; (ii) freeing labor at household and institutional levels (schools and health facilities) which have to allocate large amount of labor to wood gathering; (iii) reduction of smoke inhalation which is a health hazard to those preparing food in most cases women and girls; (iv) expansion of the cold chain hence enabling hospitals and health centers to store vaccines and expand the immunization programs, and in addition hospitals will be able to operate advanced hospital technologies, (v) enhancement of water supply especially in Djibouti by driving water pumps, and (vii) boosting of the informal and small scale enterprises including mechanical and electrical repairs, battery charging, welding, commercial agricultures, etc.

5.3.2 The availability of electricity in the villages will enable both women and men to pursue life enhancing activities such as education where boys and girls would pursue secondary and tertiary education through evening classes. Health indicators show a significant level of high infant and maternal mortality. Therefore, the provision of electricity would benefit women through the expanded programs of immunization and availability of referral services. As incomes progressively increase in the two countries, availability of affordable and reliable electricity would facilitate the use of cooking appliances hence shifting the demand from fuel wood and fossil fuels to electricity. This would in turn free up time for women to engage in economic activities and also protecting them from fumes that are harmful to their health.

## 5.4 Environmental and Social Impacts Assessment

The project was classified as Category 2 at appraisal and no changes are envisaged as a result

of the second circuit. The right of way remains the same and the affected persons have already been compensated as required by Bank guidelines.

## 6. CONCLUSIONS AND RECOMMENDATIONS

6.1 The project cost increase is largely due to is the unforeseen global general price hike of petroleum products and other construction material, and the construction of a double circuit transmission line instead of a single circuit as originally foreseen at appraisal. The double circuit has been necessitated by the unexpected demand growth in the region which was not foreseen during the appraisal stage. From the foregoing analysis, the investment in Ethiopia Djibouti transmission line is technically sound, economically viable, environmentally sustainable and socially desirable. The successful implementation of the project will be facilitated by the provision of the supplementary loan in order to achieve its development objectives. Results of the analyses indicate that the project is financially viable, posting a FIRR of 14.5% and also has significant economic benefits, with an EIRR of 29%.

6.2 In view of the above, it is recommended that the Fund extends to the Governments of Ethiopia and Djibouti supplementary loan/grant not exceeding UA 5.20 million for Ethiopia and UA 15.72 million for Djibouti to complete the project. Taking into account the original conditions for the project, the award of these additional loans shall be subject to the following conditions:

### Ethiopia

#### **Condition Precedent to Supplementary Loan effectiveness**

6.3 The entry into force of the Supplementary Loan Agreement shall be subject to the fulfillment by the Borrowers of the provision of the Section 5.01 of the General Conditions Applicable to Loan Agreements and Guarantee Agreements of the ADF.

#### **Conditions Precedent to First Disbursement of the Supplementary Loan**

6.4 The obligations of the Fund to make the first disbursement of the supplementary loan shall be conditional upon the entry into force of the agreement and the fulfillment by the Borrower of the following conditions:

The Borrower shall have provided evidence, satisfactory to the Fund, that:

- (i) It has concluded a Subsidiary Loan Agreement with EEPCO for on-lending the supplementary loan of the Fund, on terms and conditions acceptable to the Fund.

### Djibouti

#### Conditions Prior to Entry into Force of the Supplementary Grant Agreement

6.5 The Supplementary Protocol Agreement shall enter into force on its signature.

#### **Conditions Precedent to First Disbursement**

6.6 The obligations of the Fund to make the first disbursement shall be conditional upon the entry into force of the Protocol agreement and the fulfillment by the Recipient of the following conditions:

The Recipient shall have provided evidence, satisfactory to the Fund, that:

- (i) It has concluded a Subsidiary Loan Agreement with EdD for on-lending the proceeds of the grant of the Fund, on terms and conditions acceptable to the Fund.

**MULTINATIONAL**  
**ETHIOPIA – DJIBOUTI POWER INTERCONNECTION PROJECT**  
**PROJECT LOCATION MAP**



**MULTINATIONAL**  
**ETHIOPIA –DJIBOUTI POWER INTERCONNECTION PROJECT**  
**INITIAL PROJECT COSTS ESTIMATES**

Table 2A.1: Initial project cost estimates for Ethiopia

Components	F.E	L.C	Total	F.E	L.C	Total
	In 'Million US\$			In 'Million UA		
Transmission Network Development						
Construction of Transmission Lines	16.41	2.89	19.30	11.26	1.98	13.24
Construction of Substations	4.40	0.49	4.89	3.02	0.34	3.36
Electrification of Border Towns	1.01	0.65	1.66	0.69	0.45	1.14
Project Supervision & Management	2.90	0.97	3.87	2.00	0.68	2.68
Institutional Support	0.20	0.00	0.20	0.13	0.00	0.13
<b>Base Cost</b>	<b>24.92</b>	<b>5.00</b>	<b>29.92</b>	<b>17.10</b>	<b>3.45</b>	<b>20.55</b>
Physical contingency	2.49	0.50	2.99	1.71	0.34	2.05
Price contingency	0.75	0.15	0.90	0.51	0.09	0.60
<b>Total</b>	<b>28.16</b>	<b>5.65</b>	<b>33.81</b>	<b>19.32</b>	<b>3.88</b>	<b>23.20</b>

Table 2A.2: Initial Cost Estimates for Djibouti

Components	F.E	L.C	Total	F.E	L.C	Total
	In 'Million US\$			In 'Million UA		
Transmission Network Development						
Construction of Transmission Lines	6.70	0.68	7.38	4.59	0.47	5.06
Construction of Substations	6.15	1.18	7.33	4.22	0.81	5.03
Electricity Supply to Border Towns	6.08	0.97	7.05	4.17	0.66	4.83
Project Supervision & Management	1.58	1.33	2.91	1.08	0.91	2.00
Institutional Support	0.57	0.00	0.57	0.39	0.00	0.39
<b>Base Cost</b>	<b>21.08</b>	<b>4.16</b>	<b>25.24</b>	<b>14.45</b>	<b>2.85</b>	<b>17.30</b>
Physical contingency	2.10	0.42	2.52	1.45	0.29	1.74
Price contingency	0.63	0.13	0.76	0.43	0.09	0.52
<b>Total</b>	<b>23.81</b>	<b>4.71</b>	<b>28.52</b>	<b>16.33</b>	<b>3.23</b>	<b>19.56</b>

**MULTINATIONAL**  
**ETHIOPIA –DJIBOUTI POWER INTERCONNECTION PROJECT**  
**INITIAL PROJECT FINANCING PLAN BY SOURCE OF FINANCING**

**Table 3A.1: Initial financing plan by source of financing for Ethiopia**

Components	ADF			EEPCO		
	F.E	L.C	Total	F.E	L.C	Total
	In 'Million UA			In 'Million UA		
Transmission Network Development	14.28	1.56	15.84	0.00	0.76	0.76
Electrification of Border Towns	0.69	0.00	0.69	0.00	0.45	0.45
Project Supervision & Management	2.00	0.00	2.00	0.00	0.68	0.68
Institutional Support	0.13	0.00	0.13	0.00	0.00	0.00
<b>Base Cost</b>	<b>17.10</b>	<b>1.56</b>	<b>18.66</b>	<b>0.00</b>	<b>1.89</b>	<b>1.89</b>
Physical contingency	1.71	0.00	1.71	0.00	0.34	0.34
Price contingency	0.51	0.00	0.51	0.00	0.09	0.09
<b>Total</b>	<b>19.32</b>	<b>1.56</b>	<b>20.88</b>	<b>0.00</b>	<b>2.32</b>	<b>2.32</b>

**Table 3A.2: Initial Financing Plan by Source of Financing (Djibouti)**

Components	ADF			Djibouti		
	F.E	L.C	Total	F.E	L.C	Total
	In 'Million UA			In 'Million UA		
Transmission Network Development	8.81	1.27	10.08	0.00	0.01	0.01
Electrification of Border Towns	4.17	0.00	4.17	0.00	0.66	0.66
Project Supervision & Management	1.08	0.00	1.08	0.00	0.91	0.91
Institutional Support	0.39	0.00	0.39	0.00	0.00	0.00
<b>Base Cost</b>	<b>14.45</b>	<b>1.27</b>	<b>15.72</b>	<b>0.00</b>	<b>1.58</b>	<b>1.58</b>
Physical contingency	1.45	0.00	1.45	0.00	0.29	0.29
Price contingency	0.43	0.00	0.43	0.00	0.09	0.09
<b>Total</b>	<b>16.33</b>	<b>1.27</b>	<b>17.60</b>	<b>0.00</b>	<b>1.96</b>	<b>1.96</b>

**MULTINATIONAL**  
**ETHIOPIA DJIBOUTI POWER INTERCONNECTION PROJECT**  
**REVISED PROJECT IMPLEMENTATION SCHEDULE**

COMPONENTS	2004			2005			2006			2007			2008			2009			2010		
Loan Approval			—																		
General Procurement Notice					—																
Loan Signature					—																
Loan effectiveness									—												
Procurement of Consultants					—	—															
Procurement of Contractors								—	—	—	—	—									
Design, review and approval of tender documents									—	—	—	—									
SPN issuance											—										
Bidding Period											—	—									
Evaluation, contract Award & Mobilization											—	—	—	—	—						
Manufacturing														—	—	—	—	—			
Testing and Commissioning																				—	—
Audit Services														—			—			—	

**MULTINATIONAL**  
**ETHIOPIA –DJIBOUTI POWER INTERCONNECTION PROJECT**  
**REVISED PROJECT COSTS ESTMATES**

Table 5A.1: Revised project cost estimates for Ethiopia

Components	Cost in 'Million US\$			Cost in 'Million UA		
	F.E	L.C	Total	F.E	L.C	Total
Transmission Network Development	34.32	9.24	43.56	20.87	5.62	26.49
Electrification of Border Towns	7.55	5.90	13.45	4.59	3.59	8.18
Project Supervision & Management	4.28	0.36	4.64	2.60	0.22	2.82
Institutional Support	0.21	0.00	0.21	0.13	0.00	0.13
<b>Base Cost</b>	<b>46.36</b>	<b>15.51</b>	<b>61.87</b>	<b>28.19</b>	<b>9.43</b>	<b>37.62</b>
Physical contingency	0.31	0.05	0.36	0.19	0.03	0.22
Price contingency	0.95	0.15	1.10	0.58	0.09	0.67
<b>Total</b>	<b>47.62</b>	<b>15.71</b>	<b>63.33</b>	<b>28.96</b>	<b>9.55</b>	<b>38.51</b>

Table 5A.2: Revised project cost estimates for Djibouti

Components	Cost in 'Million US\$			Cost in 'Million UA		
	F.E	L.C	Total	F.E	L.C	Total
Transmission Network Development	43.28	5.44	48.73	26.32	3.31	29.63
Electrification of Border Towns	-	-	-	-	-	-
Project Supervision & Management	2.37	0.07	2.43	1.44	0.04	1.48
Institutional Support	1.81	0.03	1.84	1.10	0.02	1.12
<b>Base Cost</b>	<b>47.46</b>	<b>5.54</b>	<b>53.00</b>	<b>28.86</b>	<b>3.37</b>	<b>34.23</b>
Physical contingency	0.28	0.02	0.30	0.17	0.01	0.18
Price contingency	4.57	0.15	4.72	2.78	0.09	2.87
<b>Total</b>	<b>52.31</b>	<b>5.71</b>	<b>58.02</b>	<b>31.81</b>	<b>3.47</b>	<b>35.28</b>

**MULTINATIONAL**  
**ETHIOPIA –DJIBOUTI POWER INTERCONNECTION PROJECT**  
**COMPARATIVE ANALYSIS BETWEEN INITIAL AND REVISED PROJECT COSTS**  
**ESTIMATES**

Table 6A.1: Comparative analysis between initial and revised cost estimates for Ethiopia

No	Contract Name	Original Estimate			Total Project Cost including Second circuit			Additional Financing		
		FC	LC	Total	FC	LC	Total	FC	LC	Total
<b>1</b>	<b>Works</b>									
1.1	EDPIP-A1 –Ethiopia Construction of Transmission Lines	11.26	1.98	13.24	15.33	3.65	18.98	4.07	1.67	5.74
1.2	EDPIP-A2 – Ethiopia Construction of Substations	3.02	0.34	3.36	5.54	1.97	7.51	2.52	1.63	4.15
1.3	Electrification of border towns Ethiopia	0.69	0.45	1.14	4.59	3.59	8.18	3.90	3.14	7.04
	<b>Total Contract amount for Works</b>	<b>14.97</b>	<b>2.77</b>	<b>17.74</b>	<b>25.47</b>	<b>9.21</b>	<b>34.67</b>	<b>10.50</b>	<b>6.43</b>	<b>16.93</b>
<b>2</b>	<b>Service</b>									
2.1	Project Supervision and Management	2.00	0.68	2.68	2.60	0.22	2.82	0.60	(0.47)	0.14
2.2	Institutional Support	0.13	-	0.13	0.13	-	0.13	0.00	0.00	0.00
	<b>Total for Services</b>	<b>2.13</b>	<b>0.68</b>	<b>2.81</b>	<b>2.73</b>	<b>0.22</b>	<b>2.95</b>	<b>0.60</b>	<b>(0.47)</b>	<b>0.14</b>
	Physical Contingencies	1.71	0.34	2.05	0.19	0.03	0.22	(1.52)	(0.31)	(1.83)
	Price Contingencies	0.51	0.09	0.60	0.57	0.09	0.67	0.06	0.00	0.07
	<b>Total for works and Services</b>	<b>19.32</b>	<b>3.88</b>	<b>23.20</b>	<b>28.96</b>	<b>9.55</b>	<b>38.51</b>	<b>9.65</b>	<b>5.65</b>	<b>15.31</b>

Table 6A.2: Comparative analysis between initial and revised cost estimates for Djibouti

No	Contract Name	Original Estimate at appraisal			Revised Cost estimates			Additional Financing		
		FC	LC	Total	FC	LC	Total	FC	LC	Total
<b>1</b>	<b>Works</b>									
1.1	EDPIP-A1 – Djibouti Construction of Transmission Lines	4,59	0,47	5,06	11,07	1,32	12,39	6,48	0,85	7,33
1.2	EDPIP-A2 – Djibouti Construction of Substations	4,22	0,81	5,03	15,25	1,99	17,24	11,03	1,18	12,21
1.3	Electrification of border towns Djibouti	4,17	0,66	4,83	0,00	0,00	0,00	-4,17	-0,66	-4,83
	<b>Total Contract amount for Works</b>	<b>12,98</b>	<b>1,94</b>	<b>14,92</b>	<b>26,32</b>	<b>3,31</b>	<b>29,63</b>	<b>13,34</b>	<b>1,37</b>	<b>14,71</b>
<b>2</b>	<b>Service</b>									
2.1	Project Supervision and Management	1,08	0,91	1,99	1,44	0,04	1,48	0,36	-0,87	-0,51
2.2	Institutional Support	0,39	0,00	0,39	1,10	0,02	1,11	0,71	0,02	0,73
	<b>Total for Services</b>	<b>1,47</b>	<b>0,91</b>	<b>2,38</b>	<b>2,54</b>	<b>0,06</b>	<b>2,59</b>	<b>1,07</b>	<b>-0,85</b>	<b>0,22</b>
	Physical Contingencies	1,45	0,29	1,74	0,17	0,01	0,18	-1,28	-0,28	-1,56
	Price Contingencies	0,43	0,09	0,52	2,78	0,09	2,87	2,35	0,00	2,35
	<b>Total for works and Services</b>	<b>16,33</b>	<b>3,23</b>	<b>19,56</b>	<b>31,81</b>	<b>3,47</b>	<b>35,28</b>	<b>15,48</b>	<b>0,24</b>	<b>15,72</b>

**MULTINATIONAL:**  
**ETHIOPIA –DJIBOUTI POWER INTERCONNECTION PROJECT**  
**FINANCIAL & ECONOMIC ANALYSES**

**A. Assumptions for Computation of FIRR**

**Costs**

1. Investment Cost: Include only investment (including contingencies) as of 2008 and a cost of replacement for equipment after 10 years. Salvage values were ignored.
2. O&M Costs: Estimated at 2.5% of total investment cost per annum.

**Benefits**

3. Energy Export Sales: Initially assumed at 300 GWh per annum, and is projected to increase by 3% per annum over the project life of 30 years.
4. Energy Export Revenues: The average tariff is assumed at USc 6/kWh and is multiplied by volume (in GWh) of power exported by Ethiopia to Djibouti.
5. Distribution Revenue: Revenue calculations for the 4 Border Towns in Ethiopia assume 8,571 connections at an average consumption of 303 kWh/year, multiplied by EEPCo's average tariff, which is maintained at USc 6/kWh.

**B: Assumptions for EIRR Calculations**

1. Based only on cash flow generated by the project (a) on the Ethiopian side, the incremental cost streams include investment costs, operation and maintenance costs and the cost of power exported to EdD grid as originally appraised.. The incremental benefits consist of power sales (export power). (b) On the Djibouti side EdD expenditure on power generation and or purchase of power (import power) from EEPCo generate the without and with the project scenarios. The resulting cost saving is the net benefit as a result of the project. Because of the high tax content in the EdD generation cost, a conversion factor was applied at 0.50. The sum of the two resulted in the considerable cost. The costs were accordingly adjusted by an applicable conversion factor of 1.05.
2. Additional benefits were computed for the four border towns. The availability of electricity will increase productivity for small commercial enterprises. The resulting time saving for tailoring shops working 240 days in a year producing additional 2 shirts per day, earning a profit of ETB 25 for each additional shirt assuming that about 15% of the electrified commercial establishment are tailor shops and the applying the standard conversion factor of 1.05. The cost of the sewing machine is 2500. Also benefits derived from sales of ice as result of investing in refrigerator (8ft) costing ETB 3000. Assuming that 25% commercial establishment mostly food shops will be electrified. Each of these activities will generate annual revenue of ETB 1,130,794 and 1,978,890 respectively. To this is added the distribution revenue from the four towns.
3. Increased consumption (Consumer surplus) generated by the project computed due to the difference in the prevailing average tariff in Djibouti at 22 US cent per kWh and the off peak LRMC price in Ethiopia at 6 US cent per kWh and EdD being able to resort to 50% usage of the capacity in Djibouti for reserve purposes.

**MULTINATIONAL**  
**ETHIOPIA –DJIBOUTI POWER INTERCONNECTION PROJECT**

FINANCIAL RATE OF RETURN ('000 US \$)						
Year	Investment Cost	O&M Cost	Total Cost	Export Revenues	Border Town Revenues	Net Cash Flow
2008	58,232	-	58,232	-	-	(58,232)
2009	46,358	715	47,073	-	-	(47,073)
2010	14,866	1,891	16,758	9,000	312	(7,445)
2011	-	2,353	2,353	14,752	318	12,717
2012	-	2,353	2,353	18,233	325	16,205
2013	-	2,353	2,353	20,867	331	18,845
2014	-	2,353	2,353	21,493	338	19,478
2015	-	2,353	2,353	22,138	345	20,129
2016	-	2,353	2,353	22,802	351	20,800
2017	-	2,353	2,353	23,486	359	21,491
2018	-	2,353	2,353	24,190	366	22,203
2019	10,000	5,298	15,298	24,916	373	9,991
2020	-	4,256	4,256	25,664	380	21,789
2021	-	2,353	2,353	26,434	388	24,469
2022	-	2,353	2,353	27,227	396	25,269
2023	-	2,353	2,353	28,043	404	26,094
2024	-	2,353	2,353	28,885	412	26,943
2025	-	2,353	2,353	29,751	420	27,818
2026	-	2,353	2,353	30,644	428	28,719
2027	-	2,353	2,353	31,563	437	29,647
2028	-	2,353	2,353	32,510	446	30,603
2029	-	5,298	5,298	33,485	455	28,642
2030	-	4,256	4,256	34,490	464	30,698
2031	-	2,353	2,353	35,525	473	33,645
2032	-	2,353	2,353	36,590	483	34,720
2033	-	2,353	2,353	37,688	492	35,827
2034	-	2,353	2,353	38,819	502	36,968
2035	-	2,353	2,353	39,983	512	38,142
2036	-	2,353	2,353	41,183	522	39,352
2037	-	2,353	2,353	42,418	533	40,598
<b>NPV</b>	<b>\$117,900</b>					
<b>FIRR</b>	<b>14.5%</b>					

