Ethiopian Electric Utility

Electricity Network Reinforcement and Expansion Project (ENREP)

Project: 8 Major Cities Distribution Network Rehabilitation and Upgrading Project

Contractor: **China Electric Power Equipment and Technology Co. Ltd. (CET)**

March, 2011 E.C.

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1. Introduction

Under Electricity Network Reinforcement and Expansion Project (ENREP), 8 Major Cities Distribution Network Rehabilitation and Upgrading Project is consisting of one contract, financed by The World Bank and Ethiopian Electric Utility (EEU). The construction contractor is China Electric Power Equipment and Technology Co. Ltd. (CET) - (CHINA)).

2. Description of the Project

This Project is Distribution Network Rehabilitation and Upgrading in eight (8) major Cities, consists of three lots: namely; Lot 1- **Addis Ababa** (only rehabilitation of LV networks at some selected Areas), Lot 2-**Bahirdar**, **Mekelle** and **Dessie** sites, and Lot 3- **Dredawa**,**Adama**, **Hawasa** and **Jimma sites.**

Lots	Contract Amount	Contract Signing Date	Original Completion Date	Revised Completion Date	Financer
Lot 1- Addis Ababa site	USD 6,204,917.26 Plus ETB 46,284,061.95	Feb 05, 2015	End of March 2017	End of March 2019	The World Bank
Lot 2- Bahirdar, Mekelle and Dessie Sits	USD 19,216,185.11 Plus ETB 127,213,695.98	Feb 05, 2015	End of March 2017	End of March 2019	The World Bank
Lot 3- Dredawa, Adama, Hawasa and Jimma sites	USD 24,895,894.12 Plus ETB 159,511,951.54	Feb 05, 2015	End of March 2017	End of March 2019	The World Bank
Total	**USD 50,316,996.51 Plus ETB 333,009,709.47 Equivalent to: USD 67,503,086.47**				
Construction of SCADA system buildings at seven Cities (Mekelle, Bahirdar, Dessie, Diredawa, Adama, Awassa and Jimma)	ETB 148,340,293.04	June 20, 2016	Completed		EEU

3. Objectives of the Project

The main objectives of the Project are to insure safe system operation by improving reliability and quality of the distribution network and also to upgrade the system for the connection of new customers and meet their electrical energy requirements.

In order to meet these objectives, the following activities have been planned to be done:

- **Reinforce the MV network back bone**:- This is Construction of 15 kV Express feeder lines (lines from Substation to Switching stations)
- **Rehabilitate Sections of the MV Network:** This is Construction of 15 kV outgoing lines from switching stations that will be connected to the existing 15 kV load lines. And this also includes replacement of existing 15 kV lines that are very old.
- **Improvement of Network Configuration:** This includes:
  - Interconnection of Switching stations for load sharing so that to improve reliability of power supply
  - Installation of Switched capacitors and Voltage boosters to improve voltage profile and power quality
  - Installation of Autorelcosers, Automatic sectionalizers and Load break switches to improve reliability of power supply
  - Implementation of SCADA system for better control of distribution system and to improve reliability of distribution network
- **Replacement of parts (some selected areas) of LV network with ABC in phase-**1: This is replacing of existing LV networks at some selected areas with new AB cables 95 mm^2
- **Rehabilitate /add new Distribution Transformers:** This is rehabilitation of existing distribution transformers and addition of new distribution transformers under the LV networks indicated above.

4. Scope of the Project

The scope of the project includes design, supply and construction is subdivided into three lots namely:

Lot 1: Addis Ababa:

- Installation of 33 new distribution transformers and 6 new compact substations, rehabilitation of 61 existing distribution transformers and replacing of the existing 213 Km of LV distribution network under these transformers with new AB cable 95mm^2.

Lot 2: Mekelle, Bahirdar and Dessie:

Mekelle:-

- Design, Supply and Installation five (5) 15 kV Express feeders, three (3) 15 kV Interconnection lines and fourteen (14) 15 kV outgoing feeders from switching stations.
- Design, Supply and installation of 15 kV distribution line control equipment (5 Switching Stations, 2 Auto reclosure, 6 Auto Sectionalizers, 38 Load break switches, 30 Switched Capacitors and 2 Voltage boosters)
- Design, Supply and Installation of SCADA system for 15 kV distribution network
- Design, Supply and installation of 9 new distribution transformers, one new1 compact substation, and rehabilitation of 22 existing distribution transformers and replacing of existing LV networks under these distribution transformers with new AB cable.

Bahirdar:

- Design, Supply and installation six (6) 15kVExpress feeders, four (4) 15 kV Interconnection lines and twelve (12) 15kV outgoing feeders from switching stations.
- Design, Supply and installation of 15 kV distribution line control equipment (6 Switching Stations, 2 Auto reclosure, 6 Auto Sectionalizers, 37 Load break switches, 43 Switched Capacitors and 1 Voltage boosters)
- Design, Supply and installation of SCADA system for 15 kV distribution network
- Design, Supply and installation of 11 new distribution transformers, 7 new compact substations and rehabilitation of 24 existing distribution transformers and replacing of existing LV networks under these distribution transformers with new AB cable.

Dessie:-

- Design, Supply and installation of three (3) 15 kV Express feeders, two (2) 15kV Interconnection lines and eleven (11) 15kV outgoing feeders from switching stations
- 15 kV distribution line control equipment (3 Switching Stations, 3 Auto reclosure, 9 Auto Sectionalizers, 44 Load break switches, 10 Switched Capacitors and 1 Voltage boosters)
- Design, Supply and installation of SCADA system for 15 kV distribution network
- Design, Supply and installation of 21 new distribution transformers, rehabilitation of 22 existing distribution transformers and replacing of existing LV networks under these distribution transformers with new AB cable.

Lot 3: Adama, Diredawa, Hawassa and Jimma:

Adama:-

- Design, Supply and installation of twelve (12) 15kV Express feeders, eight (8) 15kV Interconnection lines, sixteen (16) 15kV Outgoing feeders and five (5) replacement of 15kV existing line segments
- Design, Supply and Installation of 15 kV distribution line control equipment (8 Switching Stations, 1 Auto reclosure, 3 Auto Sectionalizers, 40 Load break switches, 22 Switched Capacitors and 1 Voltage boosters)
- Design, Supply and installation of SCADA system for 15 kV distribution network
- Design, Supply and installation of 16 new distribution transformers, one new compact substations, rehabilitation of 38 existing distribution transformers and replacing of existing LV networks under these distribution transformers with new AB cable.

Diredawa:-

- Design, Supply and installation of eight (8) Express feeders, four (4) 15 kV Interconnection lines and fifteen (15) 15kV outgoing feeders from switching stations
- Design, Supply and installation of 15 kV distribution line control equipment (6 Switching Stations, 1 Auto reclosure, 3 Auto Sectionalizers, 33 Load break switches, 21 Switched Capacitors and 1Voltage boosters)
- Design, Supply and installation of SCADA system for 15 kV distribution network

- Design, Supply and installation of 7 new distribution transformers, one new compact substations, rehabilitation of 25 existing distribution transformers and replacing of existing LV networks under these distribution transformers with new AB cable.

Hawassa:-

- Design, Supply and installation of Seven (7) Express feeders, six (6) 15 kV Interconnection lines and thirteen (13) 15kV outgoing feeders from Switching stations.
- Design, supply and installation of 15 kV distribution line control equipment (7 Switching Stations, 1 Auto reclosure, 3 Auto Sectionalizers, 44 Load break switches, 16 Switched Capacitors and 1 Voltage boosters)
- Design, Supply and installation of SCADA system for 15 kV distribution network
- Design, Supply and installation of 9 new distribution transformers, rehabilitation of 14 existing distribution transformers 1 compact substations and replacing of existing LV networks under these distribution transformers with new AB cable.

Jimma:-

- Design, Supply and installation of four (4) 15 kV Express feeders, two (2) 15 kV Interconnection lines and seven (7) 15 kV outgoing feeders from switching stations
- Design, Supply and Installation of 15 kV distribution line control equipment (3 Switching Stations, 1 Auto reclosure, 3 Auto Sectionalizers, 18 Load break switches, 7 Switched Capacitors)
- Design, Supply and installation of SCADA system for 15 kV distribution network
- Design, Supply and installation of 7 new distribution transformers, 1 new compact substation, rehabilitation of 16 existing distribution transformers and replacing of existing LV networks under these distribution transformers with new AB cable.

5. Status of the Project

The construction status of each site is coming to end all sites are under commissioning and energizing. With some remarks noted during test and commission, the energized new lines and equipment have been put in to operation; giving power supply to the customers. The status at each site is summarized as follows.

No	Name of Site	Main activities done as of December 22, 2011	Remaining Activities	% Of Completion	Outstanding Issues	Expected Completion Date
Lot 1	Addis Ababa	➢ Installation of 47 new transformers and associated new LV networks have been done and energized. ➢ Rehabilitation of 46 existing transformers and installation of associated new LV networks have been done and energized ➢ Installation of 6 new Compact Substations and energizing all of them	➢ Commissioning of few Networks which have already been energized and giving power supply	99.00		End of March 2019
Lot 2	Mekelle	➢ Installation of 15kV 5 Express feeders, 3 Interconnection lines and 15 Outgoing feeders from Switching stations has been finalized ➢ Test, commissioning and energizing have been done for 19 MV lines out of 23 MV lines and giving service now ➢ Installation and energizing of all 15 kV line control equipment has been done ➢ Installation of 11 new Transformers, 1new Compact substation and associated new LV networks have been done and energized. ➢ 21 existing transformers have been rehabilitated and installation of associated new LV networks have been done and energized. ➢ Test and commissioning has been done for all 32 LV networks ➢ Installation of SCADA systems has been done, except Trouble Call Management system, and test and commissioning has been done and now on operation	➢ Energizing of four (4) MV lines ➢ Other remarks given to the contractor for rectification works	97.00	➢ Lack of access road ➢ Land escape is a challenge for the remaining lines	End of March 2019

Lot 2	Bahirdar	➢ Installation of 15kV 6 Express feeders, 4 Interconnection lines and 12 Outgoing feeders from Switching stations has been finalized ➢ Out of 22 15kV lines 19 of them have been energized and giving service now ➢ Installation of all 15 kV line control equipment has been done and now under energizing process ➢ Installation of 15 new Transformers, 7 new Compact substations and associated new LV networks have been done and energized. ➢ 27 existing transformers have been rehabilitated and installation of associated new LV networks have been done and energized. ➢ Test and commissioning of 42 LV networks is ongoing ➢ Installation of SCADA systems has been done, except the Trouble Call Management system, and test and commissioning has been done and now on operation.	➢ Energizing of the remaining one (1) 15kV lines ➢ Other remarks given to the contractor for rectification works	98.00	Overloading of the Old Substation is becoming obstacles to energize the other two MV lines	End of March 2019
Lot 2	Dessie	➢ Installation of 15kV 3 Express feeders, 2 Interconnection lines and 11 Outgoing feeders from Switching stations has been finalized ➢ Out of 16 15kV lines 11 of them have been energized ➢ Installation of all 15 kV line control equipment has been done and now under energizing process ➢ Installation of 27 new transformers and associated new LV networks have been done and energized ➢ 12 existing transformers have been rehabilitated and installation of associated new LV networks have been done and energized ➢ Test and commissioning of 39 LV networks has been done ➢ Installation of SCADA systems has been done, except Trouble Call Management system, and test and commissioning has been done and now on operation	➢ Energizing of the remaining 5 MV lines ➢ Other remarks given to the contractor for rectification works	97.00		End of March 2019

Lot 3	Adama	➢ Installation of 15kv 12 Express feeders, 8 Interconnection lines, 16 Outgoing feeders and 5 Replacement lines have been completed ➢ Out of 41 15kV lines 33 of them have been energized ➢ Installation and energizing of all 15 kV line control equipments has been done ➢ Installation of 15 new Transformers, 1 new Compact substation and associated new LV networks have been done and energized ➢ 38 existing transformers have been rehabilitated and installation of associated new LV networks have been done and energized. ➢ Test and commissioning has been done for all 55 LV networks ➢ Installation of SCADA systems has been done, except the Trouble Call Management system, and test and commissioning has been done and now on operation	➢ Connection of 3 express feeders to Mobile substation ➢ Energizing of remaining 8 MV line ➢ Other remarks given to the contractor for rectification works	97.50	➢ Overloading of old substation and it is needed to connect the remaining express feeders to Mobile substation. Need of additional UG cables which is on process to deliver the additional UG cable	End of March 2019

Lot 3	Hawassa	➢ Installation of 15 kV 7 Express feeders, 6 Interconnection lines and 13 Outgoing feeders from switching stations have been completed ➢ All 26 15kV lines have been energized. Test and commissioning of all 15kV lines have been finished ➢ Installation and energizing of all 15 kV line control equipments has been done ➢ Installation of 13 new Transformers, 1 new Compact substation and associated new LV networks have been done and energized ➢ Rehabilitation of 11 existing transformers and installation of associated new LV networks have been done and energized ➢ Test and commissioning has been done for all 24 LV networks ➢ Installation of SCADA systems has been done, except Trouble Call Management system, and test and commissioning has been done and now on operation	➢ Other remarks given to the contractor for rectification works	99.00		The physical works are completed
Lot 3	Jimma	➢ Installation of 15kV 4 Express feeders, 2 Interconnection lines and 9 Outgoing feeders from Switching stations has been finalized ➢ Out of 15 MV lines 9 of them have been energized and giving service now ➢ Installation of all 15 kV line control equipment has been done ➢ Installation of 13 new Transformers, 1 new Compact substation and associated new LV networks have been done and energized ➢ 10 existing transformers have been rehabilitated and installation of associated new LV networks have been done and energized ➢ Test and commissioning of 23 LV networks is ongoing	➢ Energizing of the remaining 9 MV lines	97.00		End of March 2019

		➢ Installation of SCADA systems has been done, except the Trouble Call Management system. Test and Commissioning of SCADA system is undergoing				
Lot 3	Diredawa	➢ Installation of 15kV 8 Express feeders, 4 Interconnection lines and 15 Outgoing feeders from Switching stations has been finalized ➢ Installation of all 15 kV line control equipment has been done and now under energizing process ➢ Out of 26 15kV lines 19 of them have been energized and giving service now ➢ Installation of 15 new Transformers, 1 new Compact substation and associated new LV networks have been done and energized ➢ 15 existing transformers have been rehabilitated and installation of associated new LV networks have been done and energized ➢ Test and commissioning of all 30 LV networks is ongoing ➢ Installation of SCADA systems has been done, except the Trouble Call Management system, and test and commissioning has been done and now on operation	➢ Energizing of the remaining 3 (seven) MV lines ➢ Other remarks given to the contractor for rectification works	98.00	• The two substations are not ready now for connection of 15 kV lines and hence it is not possible to energize 3 express feeders	End of March 2019
Over all % of Completion				**97.80**		

6. Disbursement

The contract amount and the disbursement up to date for the project are as follows:

Description	Currency	Contract Amount	Disbursed Amount	Balance Amount
Supply of Distribution Materials and Installation Service	USD	50,316,996.50	36,991,261.29	13,325,735.21
	ETB	333,009,709.37	277,989,802.38	55,019,906.99
	Total in USD	**67,503,086.46**	**51,337,863.26**	**16,165,223.20**
	%		**76.05%**	**23.95%**
Construction of SCADA Buildings at Seven Cities	**ETB**	**148,340,293.04**	**115,102,936.66**	**33,273,356.40**
	%		**77.59%**	**22.41%**

7. Problems faced during implementations

There is some challenges encounter during the implementation of this project and which contributed a lot for the delay of the project

a) From Contractor side

- Focusing on the parts of the work which have ROW issues instead of working the other parts and using this opportunity for the claim
- Lack of safety materials and equipment for contractor's employees which was the major causes for the loss of life due to accidents happened during construction

b) From External Factor

- Unforeseen underground utility lines like water pipe and telecom line that hinders the progress of the work;
- Right of way problems within the Cities; especially at Diredawa, and Jimma, Dessie
- Inaccessibility due to narrow corridor in some Cities
- Difficulties to get on time permission from the Municipalities and Road Authorities for location confirmation
- Need of frequent design change to overcome the obstacles like ROW issues and Unforeseen underground utility lines

c) Internal Factor

- The need of long time and frequent power interruption as the activities of the project is under the existing power line and it is not an easy task for the project office to get power interruption permission which rises complain from the customer side.