



# **HARNESSING THE NILE TO INCREASE ACCESS TO ELECTRICITY**

The Ethiopia-Sudan Transmission Interconnection Project

December 2014



**Nile Basin Initiative**



Increased electricity supply will raise economic productivity in cities like Bahir Dar in Ethiopia (Photo: NBI)

## Background

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145,000 MW

Hydropower potential of the Nile Basin

65%

Proportion of the Nile Basin's energy that hydropower can provide

December 2013

Full commissioning of the Ethiopia-Sudan Transmission Interconnection Project

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Whereas the Nile Basin states have limited access to modern energy, research conducted under the 2011 Comprehensive Basin-Wide Study of Power Development Options and Trade Opportunities led by the Nile Basin Initiative (NBI) identified more than 145,000MW of hydropower potential across the Basin. However, less than three per cent of it in upstream countries had been developed.

The study uncovered an interesting set of scenarios:

- High demand for power across the region;
- Availability of a wide range of power options including solar, wind, coal, and geothermal;
- The potential for hydropower to provide 65 per cent of the region's energy.

Against that backdrop, the study recommended ways to develop and implement investment projects across the Nile Basin following a regional, as opposed to national, approach. The Ethiopia-Sudan Interconnection, which was officially fully commissioned at the end of 2013, is a remarkable case in point.

# Turning potential into tangible investments

## Quick Facts

### Beneficiary countries



Ethiopia



The Sudan

**Project cost:** USD 55.8 million

**Funding:** Ethiopia (USD 29.26 million)  
The Sudan (USD 26.54 million)

**Transmission capacity:** 100MW

**Transmission lines:** 297 kms

**Geographic location:** Ethiopia

**Period:** 2009 - 2013

**Thematic areas:** Power transmission interconnection, Power trade

“Collaboration has created good relations between Ethiopia and The Sudan and has benefits beyond power sharing.”

Mr. Andarge Eshete, Head of Technical Support (Generation), Ethiopian Electric Power Corporation

Until the Interconnection project was conceived, the region’s existing resources for power production – though substantial – and the infrastructure for trade were largely undeveloped. Only six and 22 per cent of the populations of Ethiopia and The Sudan, respectively, had access to electricity.

The Ethiopia-Sudan Transmission Interconnection project has now been a game changer. Through the joint stewardship of both governments and the Nile Basin Initiative, the two countries now have in place a framework and an infrastructure to trade electric power and the gains are mutual.

By exporting its surplus hydropower to The Sudan, Ethiopia earns foreign exchange. In just under six months during the latter half of 2014, Ethiopia exported over 61.5MW of electricity to The Sudan, a decent increase on the 55MW it exported to its neighbour in the entire 2013.

By the same token, The Sudan is able to replace a fraction of its predominantly thermal electricity sources with clean energy, thereby cutting back on greenhouse gas emissions and contributing to climate change mitigation.

From his vantage point as Head of Technical Support for Generation at the Ethiopian Electric Power Corporation, Mr. Andarge Eshete has a good view of the ‘power relations’ between Ethiopia and The Sudan.

“Collaboration has created good relations between Ethiopia and The Sudan and has benefits beyond power sharing,” says Mr. Eshete. He is one of many technical specialists in the governments and power utilities of NBI Members States who are leading the task of translating “transboundary thinking” in energy planning into tangible investments and wider socio-economic benefits.



➤ The Regional Nile Day, such as this eighth edition which was celebrated in Kampala-Uganda, on 21 February 2014, is a symbol of the spirit of collaboration among Nile Basin Member States (Photo: NBI).

## Success factors

**N**otwithstanding the low development of power systems, there has always been a strong desire in both the governments of Ethiopia and The Sudan to improve access to electricity for domestic, industrial, and commercial uses.

This resolve has proven critical in building the momentum to exploit the region's extensive yet untapped sources for power generation.

Ethiopia is endowed with cheap hydro

resources, with hydro installations generally at half the cost of those in many neighbouring countries.

So when the World Bank granted the government an International Development Association credit of USD 41.05 million in 2007 to finance its segment of a new transmission line connecting its power grid to that of The Sudan, NBI's concept of regional power trading and pooling got a shot in the arm.

## Investment in infrastructure

**The interconnection project, with a capacity of 100MW, consists of:**

- \* A new 194 km double circuit 230/220 KV transmission line linking Shehedi in Ethiopia to Gedaref in The Sudan;
- \* Reinforcement of Ethiopia's existing 260 km single circuit line linking Bahir Dar to Gondar and on to Shehedi;
- \* A new 36.5 km high voltage, double circuit, 230/220 kV, three-phase alternating current transmission line linking Shehedi to Metema at the border with The Sudan.

**A**part from the transmission lines, there have been extensions and additions to the Bahir Dar, Gondar, and Shehedi sub-stations, including the addition of bays to connect the new transmission lines. A monitoring and control system to facilitate effective power trade and ensure reliable operation of the interconnector has been installed as well.

The Ethiopian phase of the interconnection cost USD 39.55 million and was commissioned in November 2011. Equipment for upgrading of the three sub-stations was delivered, installed, and commissioned by June 2013.

Construction of The Sudan's portion of the interconnector was completed in June 2010. The investments on The Sudan's side include an upgrade of the sub-stations and the addition of telecommunications and control equipment that constitute the monitoring system. The works, at a cost of USD 25.5 million, were financed through a bilateral credit agreement with India's Export/Import Bank.

This infrastructure has allowed Ethiopia to interconnect with a parallel transmission line on the The Sudan side. The two lines are linked at the border towns of Metema in Ethiopia and Gallabat in The Sudan.

## Investment in human resources

USD 3.55 million

**Expenditure on institutional  
strengthening and capacity  
development**

The Ethiopia-Sudan Interconnection project invested USD 3.55 million in institutional strengthening and capacity development. The goal has been to convey the skills needed to ensure effective operation of the transmission infrastructure. The capacity development initiative has delivered a wide range of skills to enable technical staff do the following:

- Establish the operating rules for the interconnection;
- Undertake power system planning and design;
- Handle the operation and regulation of the interconnected system;
- Implement the environmental and social plans;
- Manage the institutional, technical, and commercial mechanisms for regional power trade.

## Remarkable benefits

The Ethiopia-Sudan Interconnector, as the pioneering power pooling project within the framework of the NBI, has broken new ground towards cross-border power trade and regional interconnection.

As one of the first tangible investments supported by the NBI, it has helped to convert the collaborative intentions of the NBI Member States into actual investments and benefits.

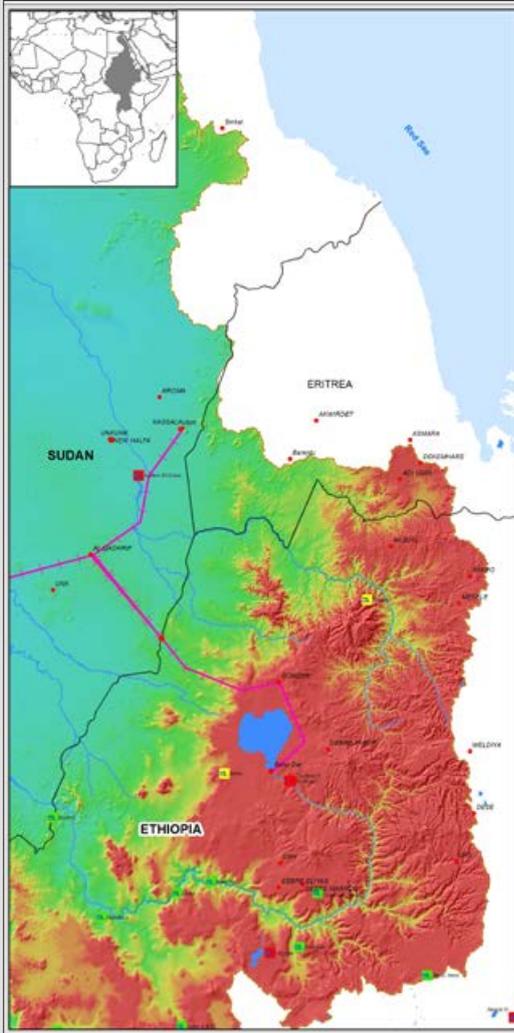
What's more, the project invested in institutional strengthening and capacity development to improve the skills of electricity company staff in Ethiopia to implement and operate the transmission line.

Consequently, the staff is in a stronger position to support the country to participate meaningfully in the development of a wider regional power market.



With cheaper and more reliable power supply, Ethiopia is looking towards the transformation of rural livelihoods (Photo: NBI).

### ETHIOPIA-SUDAN TRANSMISSION INTERCONNECTION



## Tangible results

Since full commissioning of the Interconnector at the end of 2013, both Ethiopia and The Sudan have a lot to celebrate:

- The people of Ethiopia and The Sudan (approximately 1.4 million households) are able to access affordable electricity;
- Both countries have been able to better integrate their reserve capacities, and in the process improve reliability of supply on the interconnected system and save on capital and operating costs;
- Improvements in reliability and security of supply in both countries have yielded benefits like lighting of schools and homes, better access to social services, and greater opportunities for business development;
- In both countries, small- and medium-sized industries such as flour mills, rural water supply installations, tanneries, and coffee processing plants are creating employment and contributing to poverty alleviation.
- Ethiopia has raised its capacity to generate revenue from exporting power, to about USD 8.8 million annually;
- Ethiopia's predominantly hydro system has reaped from being part of a larger power system with The Sudan, whose significant thermal generation provides security of supply in periods of low rainfall;
- Apart from improved reliability of supply, consumers in The Sudan have gained from lower tariffs of USD 0.05 per kWh for imported electricity as compared to USD 0.096 per kWh from power generated domestically;
- There have been global benefits arising from reduced greenhouse gas emissions through the substitution of thermal generation in The Sudan with hydropower generation imports from Ethiopia;

## Role of the NBI

While the Ethiopia-Sudan Transmission Interconnection Project was implemented nationally by Ethiopia and Sudan, the NBI, through ENTRO, was instrumental in:

- Setting up a Power Coordination Unit (PCU) at ENTRO, financed by the power utilities of The Sudan and Ethiopia. The PCU was responsible for updating the feasibility study and mobilising funds;
- Facilitating negotiations for the tariff between the power utilities of Ethiopia and The Sudan;
- Supporting the implementation of the Resettlement Action Plan and Environmental Management Framework;
- Nurturing cooperation among NBI Member States by providing the only Nile Basin-wide platform for regional dialogue on shared water issues;
- Creating an enabling environment for joint planning and implementation of investment projects in power.

## Foundation for future growth

“NBI Member States are now witnessing the benefits of cooperation such as the now operational Ethiopia-Sudan Power Transmission Interconnection which has made power trade and the creation of synergy between the power utilities of Ethiopia and The Sudan possible.”

H.E. Ayalew Gobeze, former President of the Amhara National Regional State

The Ethiopia-Sudan Interconnection project has been successful in initiating power exchange between the two Nile Basin states and increasing export revenues for Ethiopia. With the completion of the upgrades at the three sub-stations in Gondar, Bahir Dar, and Shehedi, and with the installation of the telecommunications system, the basic infrastructure required to successfully operate the interconnector is now in place.



Increased access to electricity is essential to modernising economic life in the cities of the Nile Basin such as Bahir Dar in Ethiopia's Amhara Region. (Photo: NBI)



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