

IMPROVING ELECTRICAL POWER SYSTEMS PRODUCTION IN CHAD

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ABSTRACT

The Republic of Chad has immense problems with its electrical power systems. It has high losses, low overall effectiveness, and a little dependability. This work aims to improve the production of an electrical system in Chad. A reliable power system is essential for economic growth, development, and poverty reduction. The electrical system's production, transport, and distribution offer a wide service to companies and consumers. This system is affected by various problems that undermine production. Electricity is the embodiment of the modern world's economic growth and sustainable employment. A deep investigation and analysis can find a better technical solution to improve a power system. The main challenge is to increase the power systems from generating points up to consumers. The paper reviewed reveals such deficits in the Chadian power system and describes a wide range of possible solutions. Furthermore, it needs new power plants and enhancing the transmission line, distribution, and increasing reliability.

KEYWORDS

Improving, power systems analysis, Transmission systems, productivity

1. INTRODUCTION

Located in the heart of the African continent with an area of 1,284,000 km² (20th in the world and 5th in Africa), between 7° and 24° North latitude and 13° and 24° East longitude. With an estimated population of 17.41 million, twenty-three administrative regions spread across the country, a gross domestic product of 820 USD/inhabitant (US dollar per person), and a life expectancy of 54.9 years of the population. Almost half of the population is living in rural where agriculture occupies an important place in working life and is less industrialized. With the oil production of the Doba fields in 2003 inaugurated, the country began to boost its economy significantly [1].

The reserves of the deposits currently exploited will be exhausted by 2035, which is why another prospecting is already planned. The reserve of the Doba basin is 914 million barrels with a 30% recovery on the total reserve of 4 billion barrels which continues until the year 2030 and will be exhausted. However, this concerns the recoverable reserve with current techniques. Other prospecting fields in (Mangara, Belanga, and Mbikou) have been found to increase oil resources [1].

Despite its potential, it remains today largely deficient in electrical power systems. This problem is of great importance because a large part of the area is deprived of this essential element of life. The realization of this approach will make it possible to solve most of the problems suggested and make people suffer by the number of populations at the big urban area and the rural levels in

terms of energy deficient, which hinders the establishment of factories of all kinds, small and medium-sized enterprises and public lighting to ensure the safety of people. and their property.

Access to electrical energy is difficult for the population both for production plans and consumption, it is very expensive for the taxpayer 83 XAF (Central African Franc) local currency for the first 30 kilowatt-hours. With the split of the energy company STEE (Chadian Water and Electricity Company) into two companies (SNE and STE) in May 2010. The non-renewable resources (oil, gas, minerals) will be held as an accompanying reserve to meet the expectations of the population to be able to ensure sustainable development [1].

Electricity is a vital means for harmonious socio-economic development. None of the nations in the world can do without it to achieve sustainable growth [2]. To solve this problem of cyclic load shedding those electrical systems in Chad experienced, electrical engineers must deeply diagnose this problem at its genesis. For this, we manage to provide a range of long-lasting and sustainable solutions. That can help a policymaker to provide more solutions and a better way of doing it.

The production, transportation, distribution, and securing of electrical systems must be the elements to have quality energy that meets the needs of consumers and users.

Addressing the Chadian power systems case where a more resilient solution deficit is the main motivation that made it possible to undertake this work.

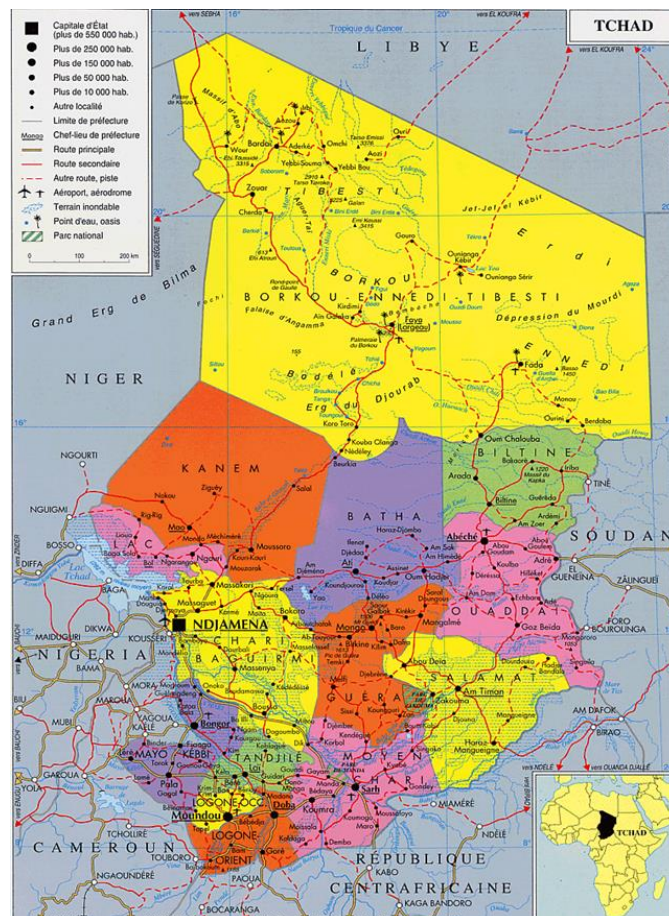


Figure 1. Chadian Map [3]

Table 1. Data on access to infrastructure for certain regions of the world [4].

Indicator	Africa	Asia	Europa	Latine America
Transport				
The density of paved roads (km of paved road per 100 km ² of surface)	2	25	122	3
Ligne ferroviaire (km)	46380	197610	85986	89002
ITC				
Number of fixed broadband Internet subscriptions per 100 inhabitants	1	6	15	9
Number of mobile cellular subscriptions per 100 inhabitants	73	85	119	115
Energy				
Electricity production per capita (kWh)	572	1930	3355	2116
Access to electricity (% of the total population)	46	88	100	97
Water and sanitation				
Improved water sources (% of the total population)	69	90	99	94
Improved sanitation (% of the total population)	39	61	93	82

Source: ADB (African Development Bank) statistics and World Bank WDI database

Note: Data is for 2013

Table 2. Impact of unreliable Infrastructure services on the productive sector [4].

<i>Service issue</i>	<i>Sub-Sahariens Africa</i>	<i>Developing Countries</i>
Electricity		
Time to obtain the electrical connection (number of days)	79,9	27,5
Power outages (number of days per year)	90,9	28,7
Value of lost production due to power outages (percentage of revenue)	6,1	4,4
The business that maintains its production equipment (percentage of total)	47,5	31,8
Telecommunication		
Time to obtain telephone line (number of days)	96,6	43,0
Telephone outages (number of days per year)	28,1	9,1

Source: World Bank (2014)

The access map for Electric Power in Africa is proportioned according to the country.

- i. Production of the very expensive conventional diesel power plant
- ii. Aged transmission line
- iii. Automation of electrical controls in real-time
- iv. National network standardization
- v. Improved agent career management
- vi. Training of technical and commercial operations agents
- vii. Re-diagnosis of Chadian electro-energetic systems
- viii. Revitalization of energy systems upstream and downstream
- ix. Productivity and operationalization
- x. Lack of competition and market competitiveness

As the country is facing its development many infrastructures need to operate continuously. But that situation is increasing gradually to their limits. Most of the electrical power systems supplied come from thermal plants over 95%, due to the lack of hydropower and other sources, which is rare except for solar sources.

As all the CEMAC (The Economic and Monetary Community of Central Africa) known as CEMAC, the French acronym for (Communaute Economique de l'Afrique Centrale) is an organization of Central African States established by: Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea and Gabon. [8]

3. PROPOSED SOLUTION

The method consists of evaluating all the existing equipment upstream and downstream to produce and complete guidance for technicians, operators, and the decision-maker with all due respect to specifications. Different investigations will be deeply examined to improve the electrical power system at all levels.

- i. Rebalancing electrical loads
- ii. Preliminary studies due to losses
- iii. Redistribution of charges to consumers
- iv. Productivity and sustainability
- v. Provide ongoing employee training.
- vi. Rationalization of viable management
- vii. Harmonization of the electro-energetic system
- viii. Installation of new power plants (gas, geothermal, wind, solar, hybrid)
- ix. Resizing of the transmission line (Ultra High Voltage, High Voltage, Middle Voltage, and Lower Voltage)
- x. Production of clean non-fossil and renewable energies
- xi. Training of schools of electrical engineers
- xii. Cyber-attack protection and system recovery

Improving the electrical power system supply in Chad becomes more important because of the lower quality of the power system. As shown in Fig. 2 the country is not attending the average production and distribution. Table 1 and Table 2 show that infrastructures emerge and are shared among the continents and countries. It means that is very low and it needs huge investment to achieve certain goals and prosperity for people's lives. This present work was carried out within the framework of an improvement in electrical systems production.

The government should allow competition through the private sector and also encourage them to produce and distribute power systems. It is important to allow small and medium enterprises to grow and promote direct foreign investment, create local jobs and improve life for the population.

4. CONCLUSION

This approach has allowed us to build and provide solutions that challenge the electrical systems in the Republic of Chad. Finally, this work allows for more resilience and results in improving the electrical energy sector in Chad. Following this guidance and procedure to reach reliability and efficiency. A better procedural and efficient solution is proposed. To avoid any interruption or disruption a new generation should be introduced to the power system.

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