

Performance of Jirama, a State Owned Electricity Company In Madagascar: A Literature Review

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ABSTRACT

Due to finding that the image of the development and performance of the Malagasy electricity sector during the last decade appears to essentially negative, the objective of this paper reviews is to collect, organize and synthesize existing knowledge related to the performance of the JIRAMA. It is also to analyze how research in this area has evolved in recent years. By using online databases relating to publishers such as Google Scholar, this standard literature review included also international journals, reports from smaller journals, conference papers, and grey literature. In general, literature reviews showed that for the JIRAMA, his poor performances are reflected by the following factors: high production costs; bad quality of service and system reliability; not accessible electricity for all; uninsured sustainability.

Keywords: *literature review, electricity sector, performance of JIRAMA*

1.INTRODUCTION

The performance of the Malagasy Energy sector during the last decade is generally perceived as unsatisfactory. In the case of JIRAMA, the national company which provides water and electricity, recurrent blackouts repeatedly trigger complaints from the customers. A preliminary analysis of the problem indicates that several causes could lead to this situation [5]: they can be political, economic, social, technical or commercial.

The objective of this research is to collect, organize and synthesize existing knowledge related to the performance of the JIRAMA, it is also to analyze how research in this area has evolved in recent years and to identify some areas for further research, that is, it provides practitioners and academicians with a comprehensive source of information to draw

from, and help them identifying areas and directions for future work.

2.LITERATURE REVIEW METHOD

The literature review was undertaken using online databases relating to publishers such as Google Scholar. This standard literature review included also international journals, reports from smaller journals, conference papers, grey literature and the internet material. Initially some key words like "performance measurement of Electricity company", "Performance of the JIRAMA: The Malagasy electricity company", "performance of Electricity company in Africa", "Electricity in Madagascar", etc. were queried to get the list of papers. In the next step, abstract and conclusions were reviewed to finally select the articles and data as the base for review. These

articles and data were found much more relevant for the study as they clearly reveal trends and importance of the performance of JIRAMA during the last decade.

3.RESULTS AND DISCUSSIONS

The results of the World Bank's study to prepare the report Doing Business 2015 showed that Madagascar is ranked 189th country out of 189, in access of the population to electricity [11]. In fact, with a national access to electricity evaluated at 15% in 2014, the country presents major difficulties regarding electrification, whether in urban or rural areas. Therefore, the Big Island does not escape the problem of most African countries. Indeed, CHRISTINE HEREAUX said that in electricity sector, Africa is the continent of paradoxes: it is both a giant of energy with the resources available, and an electric dwarf with the actual capabilities that it can rely today [3]. This is confirmed in the case of Madagascar. Specifically, following the diagnosis of the energy sector made by the Ministry of Energy in 2012, it was found that contrary to its strong potential energy, shortages of electricity supply throughout the country were increasing since the beginning of 2000 and the growth rate of electricity sector still very low [8].

Historically, in the case of Madagascar, the production and supply of electricity are generally provided by the JIRAMA who is the national Company that supplies the urban area and the ADER agency, who is in charge of promoting and developing rural electrification. But depending on the installed power throughout Madagascar, the production of electricity is mostly provided by the JIRAMA. In fact, JIRAMA is the national water and

electricity company in Madagascar. Created on October 17, 1975 by Ordinance No. 75-024, it results from the merger of two companies who held similar activities: Malagasy Electricity and Water Company (SMEE) and the Society of Energy of Madagascar (SEM). This company whose capital is about 17.53 billion Ariary is wholly owned by the Malagasy State, while being governed by ordinary company law (SA). JIRAMA generates, transmits and distributes electricity in Madagascar, at the same time it ensures the supply of drinking and industrial water across the country. It ensures almost all of the public water and electricity, with almost 340,000 subscribers in 114 localities for electricity and nearly 110 000 subscribers in 65 centers for water. The installed power of the Company is estimated at 484MW in 2015 following two modes of production which 161 MW of hydroelectric and 323MW of diesel thermal source. However, the company starts to operate from other renewable energy sources such as solar, but it is still insignificant now, as always the report of the diagnosis of the Energy sector.

But in 1999, the electricity sector underwent a reform on governance and management of the national electricity system. This reform of the electricity sector is summarized, firstly by the liberalization of all activities of the sector's value chain. Secondly, the creation of organizations directly related to the Ministry in charge of energy, including the ORE and ADER. And thirdly by the establishment of a favorable environment for investment in the field of Electricity. According to the statement of Law 98-032 of 20 January 1999, the reform aims to open up to new operators the opportunity to intervene in the sector in order, firstly, to relay the Malagasy government in

financing the electrical infrastructure of the country and, secondly, to promote the efficiency and quality of service offered to users by the competition. This liberalization as well means the end of state monopoly and JIRAMA in operating the production, transmission and distribution of electricity in Madagascar. However, this liberalization of the sector does not mean deregulation, since the sector is still regulated. The Ministry of Energy, the ORE and ADER are the structures that work for the development of the electricity sector in Madagascar [7].

But FABRICE BERTHOLET and VONJY RAKOTONDRAMANANA, experts from the World Bank said that the image of the development and performance of the Malagasy power sector during the last decade appears to essentially negative. Customers of JIRAMA had to complain about repeated blackout episodes. The tariff increases applied from 2005 to 2012, made necessary by changes in oil prices, have not allowed a significant improvement in the quality of service or improved access rates. In fact, JIRAMA is currently in a period when all indicators considered are deteriorated, weakening its cash flow and slowing the necessary maintenance of production parks. This situation severely hinders the maintenance and development of the production park. In particular, new connections to the national grid are rationed out since 2004, there by crippling the development of new economic activities throughout the country. In other words, the crisis in the energy sector constitutes an impediment for economic and social development [5].

Theoretically, the field of energy, particularly electricity, combines economic, political, social,

technical, and environmental and climate change [9]. In other words, this area is comparable to a complex system with many interrelated factors which dictate its performance. According to EBERHARD and AI, in Africa sub-Saharan, which includes Madagascar, a number of "paradoxes" characterize the production of electricity including insufficient production capacity, irregular supply, high prices and access to the electricity grid very limited [4].

The first paradox is related to the ineffectiveness of the reforms. In fact, most African countries have implemented reform measures such as the introduction of new legislation, the opening of the private sector, the establishment of a management contract, the establishment of regulatory body, the existence of private electricity producers. However, the results are not up to the expectations. For example, we have the small increase or stagnant of electricity access and the prohibitive price of the electricity [1].

The second paradox concerns the abundance of energy resources contrasts with limited access to electricity: 23%. Africa had 10% of world oil reserves, 7.9% of gas and 3.8% of coal and consumes respectively 3.4%, 3.1% and 0.5% of world consumption in these products. This big potential is weakly exploited for the benefit of the exploitation of the thermal energy to deal with the failure of electricity generation. The use of thermal generation is that the establishment of a heavy fuel and diesel central is faster and easier. On the other hand, the exploitation of hydro potential requires substantial and expensive facilities for which investments are lacking [6].

The third paradox is the differences pricing between countries whose system is based on

hydropower (less than \$0.05/kWh) and countries with systems based on diesel and island such as Madagascar and Chad (over \$0.30 / kWh) .In these countries, despite high prices, the costs are even higher. ".the Average revenues in Sub-Saharan countries to diesel-based system are far from covering the average operating costs, which amounted to \$ 0.27 / kWh), although they have risen sharply in five recent years, from \$ 0.08 to \$ 0.17 / kWh)". In fact, the inefficiency of energy production in Africa sub-Saharan includes hidden costs arising from pricing services below cost pricing, distribution losses (estimated at 30%), inefficiencies in the billing and recovery [6].

The fourth paradox reported higher expenses but insufficient funding. EBERHARD and Al showed that the average spending of African sub-Saharan countries for the electricity sector is amounted to 2.7% of GDP and may even reach 4% in some of them. However, these high costs do not contribute to adequate funding of the sector whose running costs absorb much. Low incomes do not allow the financing of capital that is most often subsidized by the government or donors.

In general, literature reviews showed that Madagascar is no exception to these paradoxes. Indeed, especially in the case of JIRAMA, his poor performances are reflected by the following factors:

- A high production costs;
- A bad quality of service and system reliability;
- A not accessible electricity for all;
- An uninsured sustainability.

In what follows, we will try to clarify these factors that illustrate the poor performance of the JIRAMA.

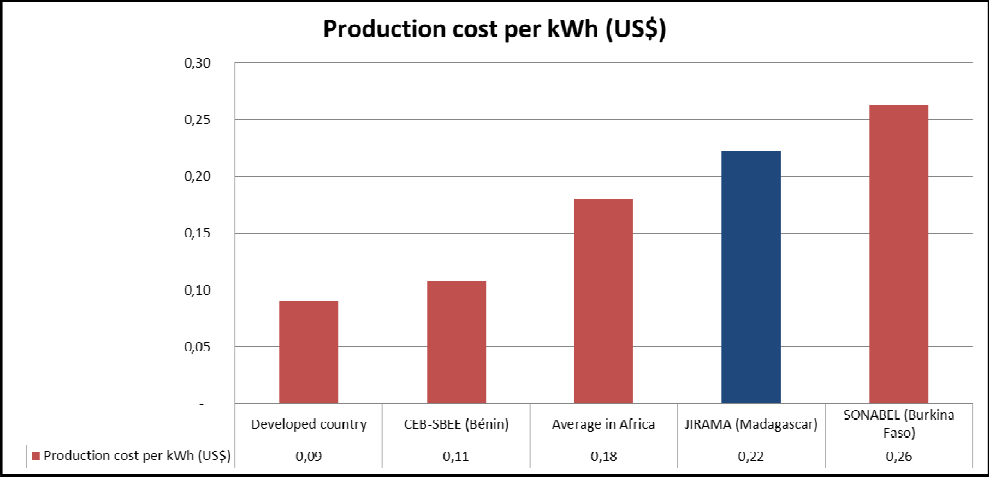
3.1. HIGH PRODUCTION COSTS \$ 0.22 / kWh on average

According to the report of the diagnosis of energy sector in Madagascar conducted in 2012 by the Ministry in charge of energy, the energy sector as it functions during the recent years in its operations, in production, in consumption and in its overall organization has not yet reached its goal. We can talk about the access to lower cost of energy (electricity) and the contributing to socio-economic development. This difficult situation is due to a lack of political decision to steer the sector towards renewable energy, at a low valuation of our local natural resources, lack of clarity and visibility on the evolution of sector, the lack of a mechanism that can consistently manage the set of all sub-sectors, a lack of consistency, perseverance, rigor in the management of the sector. On the other hand, Madagascar has considerable assets: its potential natural energy resources (hydropower , wind energy, solar energy, biomass, huge surface availability compatible with the culture of agro fuel, and rapid growth trees for wood energy requirements, ...) [8].

Clarification on this subject was given by TSIRY ANDRIANTAHINA. Indeed, a Benchmarking study on Electricity companies in African sub-Saharan countries provided information for a better assessment of JIRAMA. Data collected in 2010 showed that the average production costs of JIRAMA was \$ 0.22 / kWh, which is clearly above the average in Africa which was in this period \$0.18 / kWh[2]. The production cost is from

CHRISTINE HEREAUX dependent firstly on the geographical position of Madagascar and the lack of oil resources in the Big Island [3]. Indeed Madagascar is a large importer of fuels due to technological production choices based

mostly by diesel thermal centers which representing 67% of the installed power. This system is considered to be a quick solution to fill gaps on the production of electricity due to the growing demand in the country.



Source: Improving the performance of JIRAMA, 2014

FAVENNEC and G called to mind that expensive oil remains the main source of electricity production in African sub-Saharan countries. Globally, electricity is mainly produced from coal (40%), gas (20%), nuclear (20%) and hydropower. In North Africa, natural gas is widely used to generate electricity and in South Africa coal covers most requirements. However in Africa sub-Saharan countries oil is the dominant energy to generate electricity. Most African countries have a production capacity less than 1000 MW which represent unit size of a single plant in the developed countries. The construction of gas, coal or even nuclear power plant is uneconomical because the facilities for the development of gas or coal would be expensive given the size of existing plants and the complexity of the distribution. A heavy fuel oil or diesel power plant is easier and quicker to set up, but the

unit cost of production of electricity becomes prohibitive with the current oil prices [6].

3.2.BAD SERVICE QUALITY AND RELIABILITY OF THE SYSTEM

The electricity infrastructure is generally outdated and vulnerable to changes in demand. This situation gave rise to blackouts in many sub-Saharan countries. According to the World Bank, line losses due to outdated distribution facilities may reach 2% of GDP in many countries of Africa sub-Saharan countries. The lack of investment in the electricity sector, 0.7% of GDP in average, explains this inefficient situation [6].In what follows, we will see the JIRAMA electrical system to analyze the sources of poor service quality.

In summary, the available power in Madagascar is 450 MW, of which about half

comes from 10 hydroelectric power plants and the other 700 power plants, all feeding 63 independent networks. Current production has difficulty to satisfied current demand (blackouts, limited service at certain times).

According FAVENEC and AI, the African continent is the least electrified in the world. More than 60% of Africans do not have access to electricity. Worldwide, only a quarter of the population does not benefit. In Africa, regional inequalities are large. The North countries are benefiting about 35% of the consumption, South Africa about 45%. Sub-Saharan Africa is only a little over 20%.

Since 1970, the electrification rate in Africa was raising from 14 to 38%. He is still only 23% in sub-Saharan Africa that consumes less than 1% of the electricity produced in the world. Yet 10% of the population lives in this part of the continent. These low rates are blocking the implementation of the Millennium Development Goals and result low productivity of the economy. The productivity of an African farmer is just 1/200 of a European farmer.

Many African states adopt on some optimal solutions and ultimately much more expensive. Despite abundant sources of energy, electricity in Africa sub-Saharan is higher than the average prices of international standards, and it is rare and expensive.

The difficulties encountered in extending the distribution network of electricity are not due to technical problems while planning challenges remain. All diagnostics converge on that fact. The whole distribution network will not respond to challenges. The organization of the service should be organized around the pallet of the most suitable technical solutions to each context (expansion of network / mini network / decentralized/Use of renewable or thermal).

The slow pace of electrification process stems from the low level of investment which is itself the result of governance challenges. So project support must be accompanied by structural progress.

Sub-Saharan Africa also presents specific aggravating difficulties:

- With low consumption, networks are not interconnected. This situation penalizes the integration of high capacity (for example Hydraulic equipment of Central Africa,);
- The availability of facilities is very low; the park is often outdated and ineffective maintenance: 25% of the installed capacity is out of working order. So, blackouts reached 56 days per year and penalize the power companies and the economy in general;
- Electricity consumers often use inefficient appliances. A practice that strike their budget;
- A large proportion of electricity consumption is used by insolvent populations (unpaid bills, wild connections). Most of the time, this energy is subsidized by the state or suffers from low public fares. Consequence: the imbalance of accounts prevents the extension of networks;
- The renewable sectors, adapted to the serving isolated populations remain very expensive.

3.3.NOT ACCESSIBLE ELECTRICITY TO ALL: access rate 15%

Access to electricity is low in Madagascar. According to INSTAT, periodic household

survey conducted in 2010 (EPM 2010) showed that 12% of Malagasy households have electricity. The survey also showed wide disparities in access to electricity in rural areas and in urban areas. Indeed, in rural areas, where over 70% of the population lives, only 4.8% of rural households had electricity in 2010. In the same year, 39% of urban households had electricity, while the rate was 42% in 2001. The kerosene remains the main source of lighting for Malagasy households till now [12].

The comparison exercise showed unfavorable conclusions for Madagascar if we examine recent trends in the field of electrification. Indeed, the sector has largely stagnated in recent years. Over the period 2004-2008, the number of JIRAMA subscribers remained almost stable (+ 0.6% per year on average), while the Malagasy population is growing about 2.5% per year. The access rate of Madagascar has therefore not increased over the period. Regarding production of JIRAMA, it grew by 4.2% per year on average over the same period, which shows lower growth in real GDP.

This stagnation of the Malagasy power sector is an under-performance between comparable African countries. From 2003 to 2008 Madagascar had a political stability system and economic growth. The vast majority of other countries in the sample, with a similar experience during the same period (Burkina Faso, Mali, Mozambique, Rwanda, Uganda ...), undertook to increase levels of access and ambitiously production capacity.

And, comparing the results of 2013 and 2014, access to electricity at national level has still declined slightly, despite the growth in

subscribers during the year. The cause is always the fact that the rate of population growth, 2.83%, is well above the growth rate of access to electricity service in Madagascar.

In rural areas, access to electricity is still quite low. However, a slight increase was observed between 2013 and 2014. The number of subscribers between 2011 and 2014, especially where there are private operators declined because of a hand, the operation stop certain sites operating, using generators, which represent 70% of the installed total power and secondly to the low average density of the rural population [10].

Acces rate in electricity in Madagascar (%)			
Year	Urban	Rural	National
2012	57,87	4,77	15,35
2013	57,59	4,72	15,25
2014	55,38	5,21	15,02

3.4.UNINSURED SUSTAINABILITY

The legal framework and regulation of the sector has changed considerably in the last decade. The sectorial Act 2000 and subsequent implementing legislation have helped to establish a fairly comprehensive institutional framework. A significant advance consisted in the creation of a sector economic regulator, the Electricity Regulation Body (ERO), who texts entrust the regulating conventional skills in determining the levels of tariffs and investment review. The texts provide a clear pricing methodology, designed to cover economic costs for each major categories of consumer. The existence of pricing by region is an asset for the development of the sector, by aligning prices on costs and reducing structural deficits created by the electrification of isolated centers. The institutional mechanism has been supplemented by the establishment of a rural

electrification agency (ADER), responsible for promoting electrification in areas outside the scope of JIRAMA. Moreover, a major objective of the reform was to encourage private investment and competition in the sector. To do this, the legislation has opened to competition the production activity. Different legal procedures and terms prescribed by the texts to allow private investment in independent power generation, depending on the power level of the facilities.

Madagascar has on paper a complete and adequate institutional and legal framework, in outline, for good governance of the sector. The practical implementation of new sector regulation proved however very insufficient. Firstly, the mechanics of regular tariff adjustments prescribed by the regulation was not followed. From 2001 to 2005, no tariff adjustment has taken place, even though the price of oil steadily increased and the value of the national currency had depreciated sharply. Degradation of JIRAMA's financial situation in which the company was been in 2005 led to a crisis and blackouts in 2005-2006. This situation led also to negative effects like delays in maintenance and investment [5].

Madagascar has implemented reform measures such as the introduction of new legislation, the opening of the private sector, the establishment of a management contract of the national company JIRAMA, the establishment of a regulator (ERO), the existence of private electricity producers. However, the results are not up to the expectations: small increase otherwise stagnant access to electricity, the prohibitive price of the electricity. Some authors ask "if

reform on principles and programs applied to Africa sub-Saharan ... an electricity sector restructuring to create competition only makes sense in countries large enough to run several plants above the minimum level of efficiency. However, the systems are so small in most sub-Saharan countries that this requirement does not mean much "[1].

4.CONCLUSION

Analyzes have shown the roots of poor performance of JIRAMA, and electrical system in most African countries. In general, the insights from experts converge in the same direction, except for the liberalization of the sector. Indeed, KATE BAYLISS defends the reforms implemented in the 90s are not appropriate for most African countries. In fact, decisions were taken according to donor requirements without taking into account the realities in African countries. The result is: delay and or even the lack of investments during the implementation of reforms. Experts from the World Bank are convinced that in the case of Madagascar, the texts governing the sector and the system thereon constitute a highlight of the electricity in Madagascar. However, governance has held back the results as expected.

5.ACKNOWLEDGMENTS

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