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Improving the Treasury Of Jirama, A State Owned Company In Madagascar, By Benchmarking: A Case Study Of Production Costs

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ABSTRACT

This article analyzes the impacts of the production cost on the JIRAMA's treasury. After using benchmarking method to compare the JIRAMA's system with other electricity companies in South Saharan Africa (SSA), the impacts on the treasury were assessed considering two scenarios: (i) 25% reduction of average production costs; (ii) and 50% reduction of the average production costs. The results showed that the average production cost of JIRAMA is exceeding the average in Africa. Which led to formulate recommendations focused on technology choices such renewable energy. Furthermore, given the significant impact of the production cost on the treasury, it is recommended that in the short term, fund supply is necessary to improve its treasury.

Keywords: *Benchmarking, Production costs, Treasury*

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. Moreover, rate increases practiced from 2005 to 2012, following increases in oil prices, have failed to bring any significant improvement in the access rate or in the quality of service. Currently, the JIRAMA treasury exhibits clear deteriorations in all indicators considered. 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 **(1).**

Latest researches have not particularly highlighted any major difficulties in the JIRAMA treasury. However, these difficulties are detrimental to the JIRAMA quality of service and performances. A preliminary analysis of the problem indicates that several causes could lead to this situation: they can be political, economic, social, technical or commercial. The identification of the main causes will facilitate the adoption of remedial measures.

The aims of this research are (i) to compare the JIRAMA's system with other suppliers of electrical energy in Africa, mostly in terms of production cost, and (ii) to analyze the impact of the production cost on the treasury. Hence the research questions: How is JIRAMA comparing with others companies in term of production cost , and to which extent do existing data illustrate the impact of production cost on the JIRAMA treasury?

2. LITERATURE REVIEW

2.1. The production costs of electricity:

According to experts of the Ministry of Energy and Ecology of the French Republic, the production

costs of electricity are considered high if their values are above the reference costs assessed periodically by the groups of International experts. These reference costs are based on normative hypothesis, especially as regards fuel prices, the discount rate and the economic life of the installations. Furthermore, sometimes analysis of production costs disregard the characteristics of the demand of electricity and considerations related to the supply-demand balance of electrical system **(2)**. In practice, the specific site conditions (fuel supply, cooling conditions, climate conditions of wind, sunlight or water conditions) and the characteristics of each power plant can lead to significant differences from the reference installation. However, electricity has some problems differentiating with other products or services.

2.2. Problems of Electric Energy (3) (4)

The fundamental problem of electricity is its storage method. Once produced, electricity must be issued and must be consumed immediately because of technical difficulties and high costs of storage. In this regard, electricity can be considered as a single commodity whose production must be balanced with consumption.

The demand of electricity is not always constant and changes occur:

- at different times of the day depending on the model of working hours and electric lighting effects, cooking, etc.;
- different days of the week reflecting the business activity models;
- different months of the year, reflecting the different climate conditions.

Therefore, throughout its operating life, the energy produced by a power plant is not always consumed at any time. And this specific characteristic is important for the analysis of production costs of electricity. It can be observed that a power plant with a low load relative to its capacity will have a high production cost. In fact investment and fixed operating and maintenance costs are not dependent on its charge rate.

2.3. Components of production cost (2) (3)

The production cost of electricity is usually expressed per unit kWh produced. This cost can be divided into two categories:

- Fixed costs including initial investment expenditure required for the construction, fixed operation and maintenance costs include: staff salaries, insurance, taxes ...;
- Variable costs including operating variable costs, such as lubricants, chemicals that are consumed during the production phase; and the cost of fuel consumed for generating electricity.

2. 4. Difficulty of treasury

In general, difficulties arise in treasury following deficiencies of Working Capital (WC) or excessive Working Capital Requirement (WCR).The deficiency of WC is the main cause of difficulty of treasury. It results from the combination of several short and medium-term factors such as weak social capital, financial losses, excessive withdrawals, and poorly studied investment financing.

The excessive WCR is directly related to the economic environment in which the company operates. It can either be the result of surplus stocks or uncollected receivables or a poor recovery system.

The crisis scenarios and the ideal situation

There are various possible difficulties in treasury, in particular the crisis of profitability scenario (Figure 1) and the ideal situation scenario (Figure 2).In both figures, the cash is represented in terms of turnovers (CA), working capital (WC) and working capital requirement (WCR). The emergency actions to overcome these situations of difficulty are given in each figure. T+ shows positive treasury and T- : negative treasury.

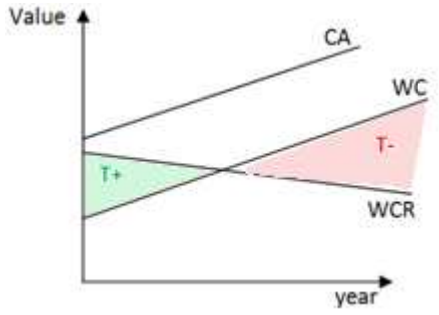

Figure 1. The crisis of profitability scenario

Under the Crisis of profitability scenario, the losses accumulate, thereby causing the fall of WC. It quickly changes from a positive to a negative cash flow. In case of emergency, a fund supply is necessary and causes of declining profitability must be sought to find a solution.

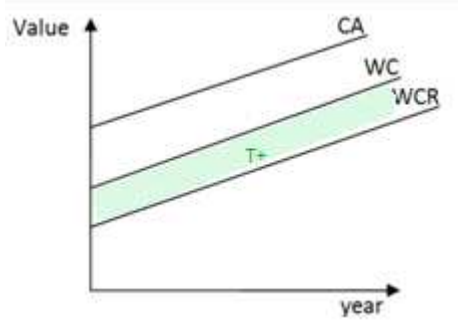

Figure 2 : The ideal situation scenario

Under the ideal situation scenario, WC also increases regularly and as quickly as CA. Consequently, profitability is preserved. WCR is boosted by the activity grows but at a rate not faster than that of CA.

3. METHODOLOGY

The following steps will be taken in the research process:

- Benchmarking study of electricity companies in SSA;
- Analysis of the production cost and the treasury of the JIRAMA.

3.1. Benchmarking (5) (6) (7) (8)

This methodology will used to compare the JIRAMA's system with other companies suppliers of electrical energy, and to analysis their production cost.

a) Definitions

Benchmarking is a marketing technique or quality management for studying and analyzing management techniques, modes of organization of companies in order to be inspired and to get the best. This is an ongoing research process, comparative analysis, adaptation and implementation of best practices to improve the performance of processes in an organization. In other words, it is a method for organizational assessment which consists in comparing and measuring elements of processes with "competitors" in order to identify differences and for improvement.

A benchmark is a numerical indicator of performance in a given area (quality, productivity, speed and time, etc.) derived from the results of the company. This indicator can be used to define objectives. His choice is determined by the study's area and by the type of analysis to be made (6).

b) The four types of benchmarking

- *Internal benchmarking*

It is used whenever a company identifies similar process on several sites, regions, countries or continents. It is possible for them to compare the practices in these different places of activity without going to see what happens elsewhere. The advantage is characterized by ease in comparing the results as they apply to the same sector, to link contacts and carry out the visits. Adaptation is also facilitated because it concerns the same sector. However, this type of benchmarking does not generally leads to very innovative practices, since they are placed in a corporate culture with a mission context, projects and goals. Moreover, mutations and internal promotions often bring personal transport habits of a workplace to another.

- *The competitive benchmarking*

This type of benchmarking is widely practiced in some sectors of the industry. He obviously does not concern the most critical processes in terms of

market position. But it is related to productivity, administrative costs and relationships with subcontractors, which are often common.

The advantage of this type of benchmarking is the ease of measurement of final elements. As well as for internal benchmarking, adaptation is facilitated by the similarity practices. However, it is quite difficult to practice true competitive benchmarking, which always finds its limits in confidentiality. Sometimes competitive benchmarking is not really if competitors do not operate on the same catchment areas, or even for a given area, they are not directed to the same customers.

- *Functional benchmarking*

In the same sector, companies compare their support processes (administration, human resource management, logistics, etc.) and adapt ideas that improve their competitiveness. The benefits are the same as those found practicing internal benchmarking: ease of connection and comparison, relatively simple adaptation. The limits are the scope, which is not about strategic processes, and lack of innovativeness due to a culture linked to the industry. There are many examples in the fields of chemicals / pharmaceuticals, energy, automotive, information technology and telecommunications.

- *Generic benchmarking*

This is definitely the kind of benchmarking that makes its value to the tool: compare their practices with different industry. One can thus find in the partner practices that are even better justifying the main reason for his performance. The advantages are many: partnership without confidentiality constraint, source of innovative ideas and lasting relationships because based on reciprocal and permanent need information. The few remaining difficulties linked to greater difficulty in adapting practices that come from a different sector.

The following table summarizes the characteristics of four types of benchmarking cited above:

Table1: Types of Benchmarking (6)

	CONTEXT OF USE	ADVANTAGES	DISADVANTAGES
Internal benchmarking	Comparison of indicators (usually cost) with similar organizations	- Confidential information Accessible - link Between processes and performance	-Limited to universal and comparable process - time investment
Competitive benchmarking	-Possible all the time -With or without the cooperation of competitors	- easy identification of the partners - definition of priorities for relevant improvement	- Difficulty to collect Information - sometimes No real revelations - superficial vision
Functional benchmarking	For comparison of indicators (usually cost) with similar organizations	- Confidential information Accessible - link Between processes and performance	-Limited to universal and comparable process - time investment
Generic benchmarking	Acquire new ideas	Opportunities for Improvement	- difficulty to identify potential partners -time investment

c) Approach:

The success of a benchmarking may be obtained by the application of the 5 steps:

- The measurement of internal performance:

This is the phase during which the structure evaluates its own process and determines the evaluation indicators for comparison with competitors. The aims are to highlight the strengths and weaknesses of the structure and suggest future improvements.

- Pre-benchmarking

Identify the competitor or the best mastering processes.

- Benchmarking or collecting information

This phase concerns the collect of data on the different benchmarked and their analysis. As part of a pushed benchmarking, it is recommended to meet and conduct visits to competitors.

- The post-benchmarking

Phase of adapting in its own structure, the "best practices" which have been analyzed and selected for their relevance. Note that it is not a question of reproducing the organization of a benchmarked but to adapt to the context of own organization. Also this phase is to capitalize knowledge collected in a database, to make comparisons at the next benchmarking.

- Observation and adjustment

Phase for judging progress and adjust action plans.

The following figure summarizes the benchmarking process:

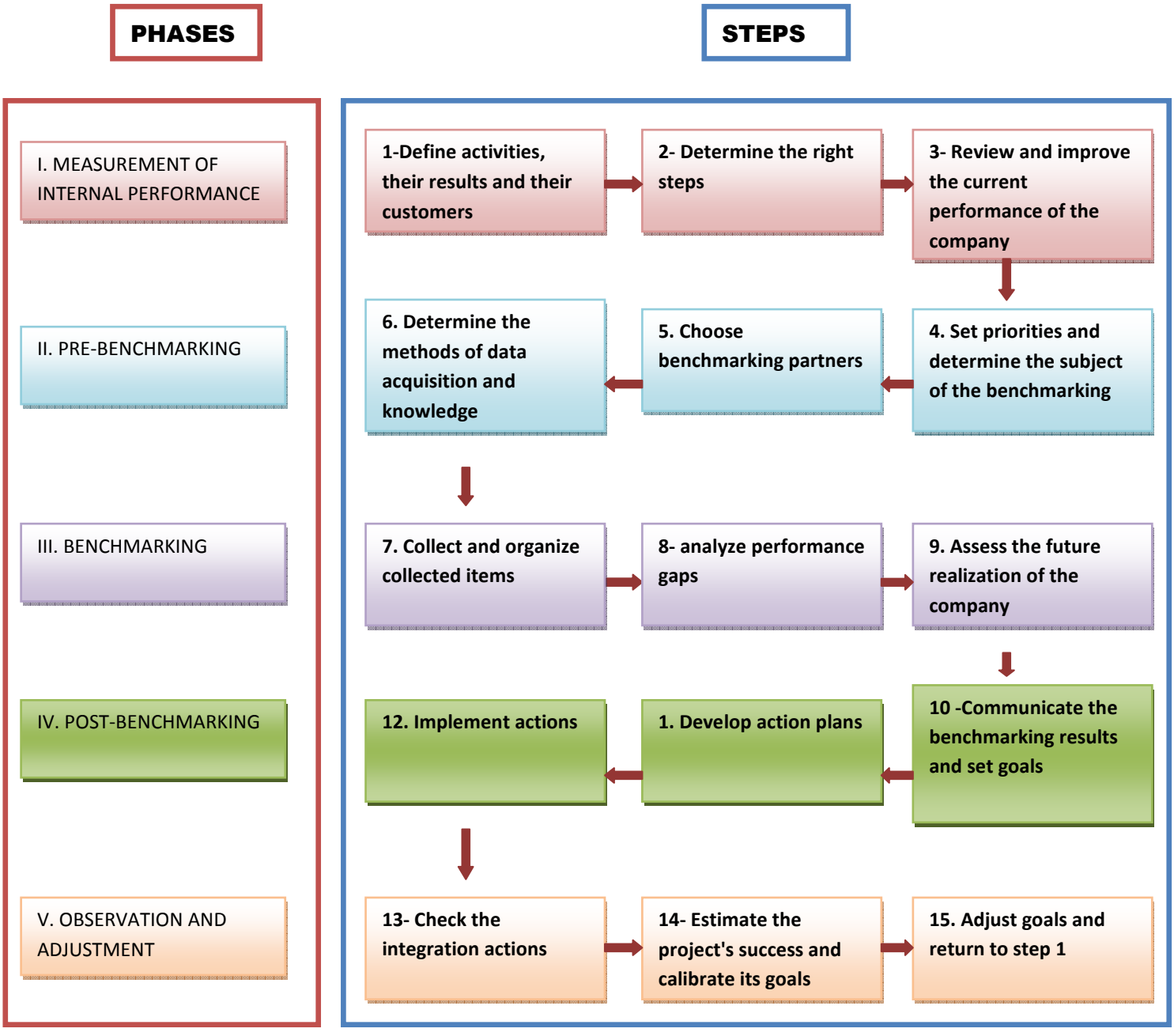

Figure 3: Benchmarking Process

3.2. Analysis of the production cost and the treasury of the JIRAMA.

This is to assess the production cost in order to ascertain their relationship with the treasury of the company. For this, it is necessary to consider various difficulties of treasury as discussed in the literature review above. Simulations were therefore conducted according to the two following situations:

- Scenario 1: "25% reduction in average production costs";

- Scenario 2: "50% reduction in average production cost".

4. RESULTS

4.1. Benchmarking study of Electricity Companies in SSA:

The first phase of the process of benchmarking allowed to ten relative performance index the cost of production, the system of production and distribution. These include: the production cost per kWh, the average selling price, the installed capacity as well as their distribution according to different types of existing technology, the overall performance of the network and other important indicators considered for the analysis. These indicators are the fields to compare with other suppliers of electricity companies in the table below.

In the second phase of the process ten Electricity Company in SSA include: JIRAMA **(9)** CEB SBEE **(9)** SONABEL **(10)**, REGIDESO **(11)**, AES SONEL **(12)**, CIE **(13)** NAWEK **(11)**, VRA ECG (**11)** EDM **(14)**, CEB (**15)** NIGELEC **(16)**, NEPA SNEL **(11)**, SENELEC (**11)**, TANESCO **(11)**, ZESCO **(11)**, ESKOM **(11)** were selected. However, situations concerning the developed countries and the average in Africa have been benchmarked to enrich the analysis. **(17) (11) (18) (19) (20)**

The following table shows the result of the collection of annual data, and according to their availability, which is the result of the third step of the benchmarking. Data were mostly collected online, and from the websites of companies given above.

Table 2: Benchmarking of Societies of Electricity in Africa

NUMBER OF PERFORMANCE INDICATORS (BENHCMARK): 14

COMPANY	YEAR	Production Cost per kWh (US$)	Average selling price (US$)	Turnover (MUS$)	Power installed (MW)	Hydroelectric capacity (MW)	Thermal capacity (MW)	Others (MW)	Production center (u)	Growth rate of production capacity (%)	Load (MW)	Energy produced(GWh)	Energy sold (GWh)	Length of transmission and distribution lines (Km)	overall performance(%)	Subscribers / agent	Electrification acces rate (%)
JIRAMA (Madagascar)	2013	0,27	0,17	165,38	484	160	324		120			1405	941		67		36,6
	2012	0,28	0,17	159,91	512	160	352				275	1330	918		69		37,1
	2011	0,27	0,17	152,10	447	128	319				294	1268	883	7144	70		35,6
	2010	0,22	0,17	142,11	428	132	296				285	1190	844		71		36,1
	2009	0,16	0,19								233						
CEB-SBEE (Bénin)	2011	0,12	0,11	228,38							338,3	2157	2061		95,54		
	2010	0,11	0,11	199,70							326,7	1957	1881		96,13		
	2009	0,10	0,11	182,62							301,1	1876	1793		95,55		
	2008	0,09	0,10	144,02							250,8	1507	1430		94,91		
	2007	0,08	0,10	133,36							226,9	1348	1294		96,01		
SONABEL (Burkina Faso)	2011	0,32		199,87	238	32	206		28			1 107	857	9917	77,39	262	
	2010	0,26		187,20	237	32	205		31			950	802	9256	84,43	242	
	2009	0,27	0,25	170,62	251	32	219		31			844	714	8780	84,56	232	
	2008	0,28		155,37	232	32	200		32			755	635	7844	84,09	213	
REGIDESO (Burundi)	2009		0,09														
SONEL AES (Cameroun)	2012			496,04	929								4 535				
	2010			407,44	1033	735	297,2					3920		54844		193	
	2009		0,13														
CIE (Cote d'Ivoire)	2012											5987	5139	40578	85,84		
	2011			541,44	1 390							5 995					
	2009		0,17														
NAWEK (Gambie)	2009		0,20														
VRA-ECG (Ghana)	2010			566,94	1 856								9 669				
	2009		0,11														
EDM (Mali)	2006				291,4	156,6	134,8					882,5		3900			
	2004			128,00								720,8		3900			
	2009		0,24														
CEB (Maurice)	2010				739								2174	9027		221	
	2009		0,11														
NIGELEC (Niger)	2010											649				211	
	2009		0,12														
NEPA (Nigéria)	2009																
SNEL (RDC)	2012				2 442							6 723					
	2009		0,09														
SENELEC (Sénégal)	2010			498,16	687							2 063					
	2009		0,21														
TANESCO (Tanzanie)	2012			277,30	1 271							3 770					
	2009		0,10														
ZESCO (Zambie)	2012			350,00	1 830							10 688					
	2009		0,05														
ESKOM (Afrique du Sud)	2012			12 873,67	44 170								224 785				
	2009		0,04														
AVERAGE IN AFRICA	2010	0,18	0,01 à 0,34														
France	2010	<0,09	0,09														
Britain	2010	<0,09	0,14														
DEVELOPED NATIONS	2010	≤0,09															

Benchmarking JIRAMA production costs with other countries

The average production cost of JIRAMA is represented by the red stick.

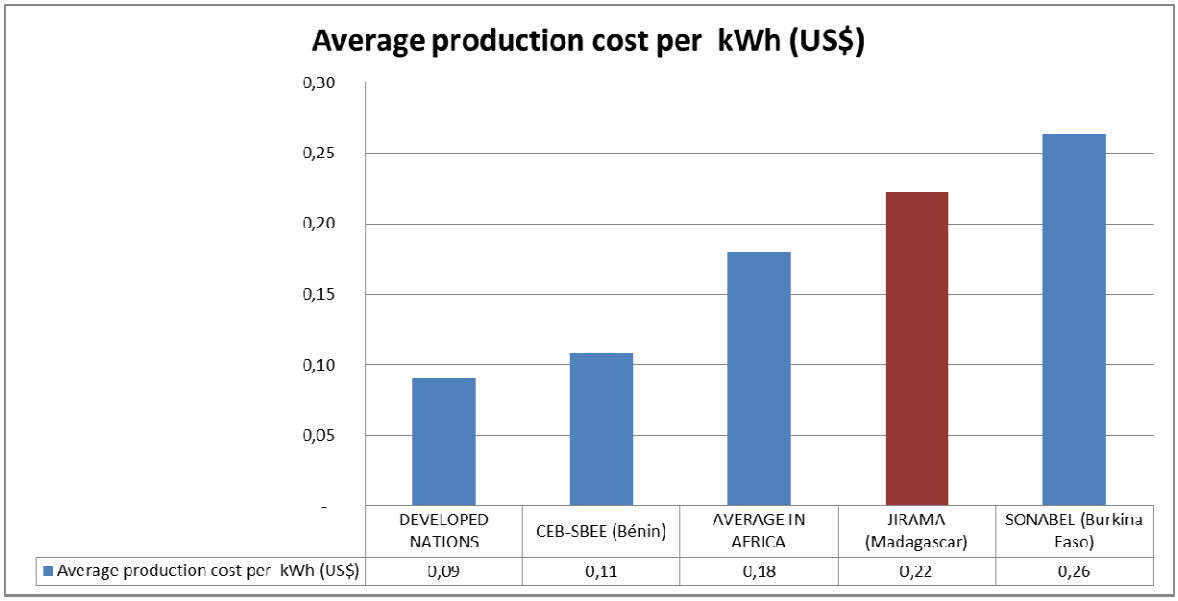

Figure 4: Comparative analysis of average production costs

Comparative analysis of average selling prices JIRAMA

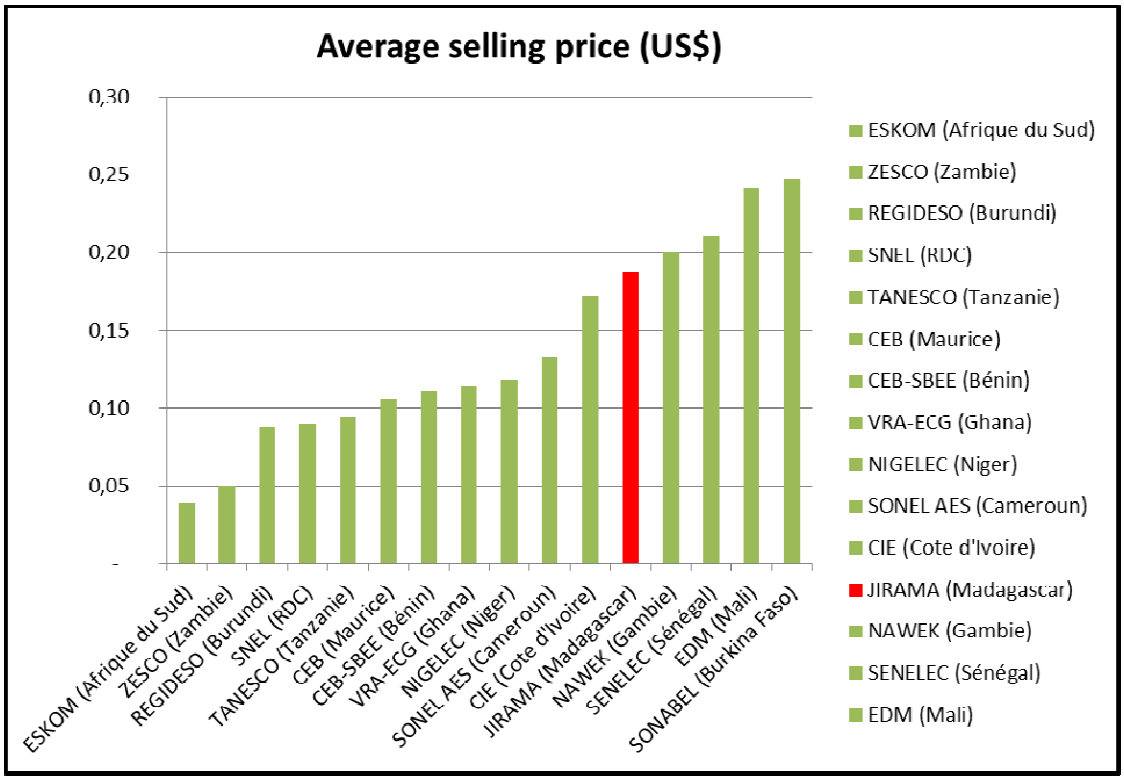

Figure 5: Comparative analysis of average sales price

4.2. Analysis of the production cost and the treasury of the JIRAMA:

Weight of fuels compared to annual turnover at JIRAMA

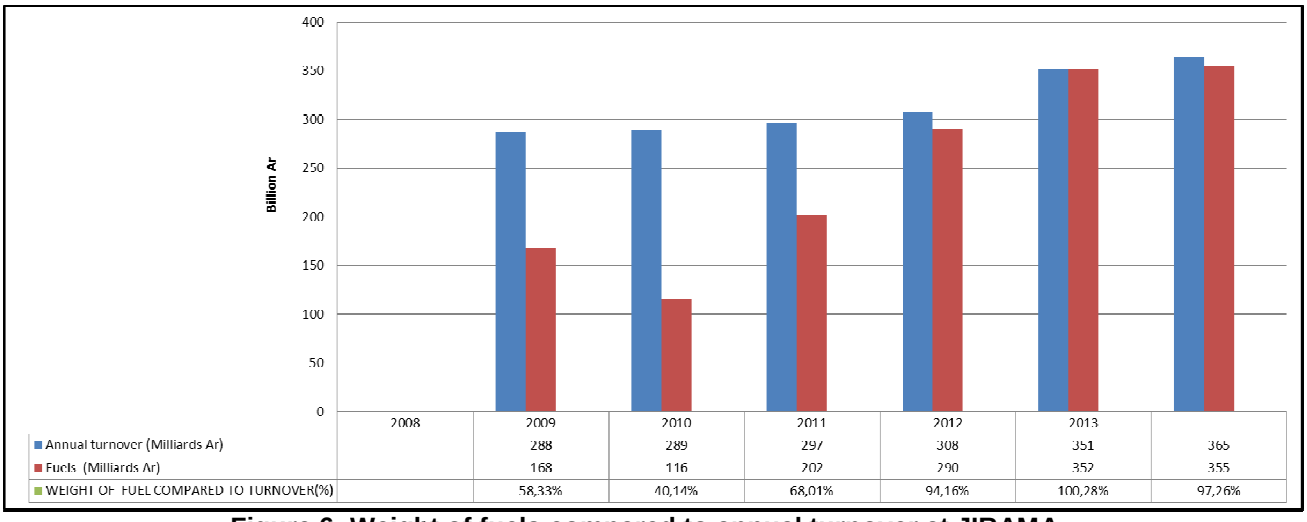

Figure 6: Weight of fuels compared to annual turnover at JIRAMA

Situation of the JIRAMA's treasury since 2010

The figure below shows the situation of JIRAMA's treasury since 2010. The result shows that the company is in trouble called "profitability crisis". The rate change in 2010 is about 1USD = 2020 MGA and in 2013, 1USD = 2200 MGA.(1 Ariary=1MGA)

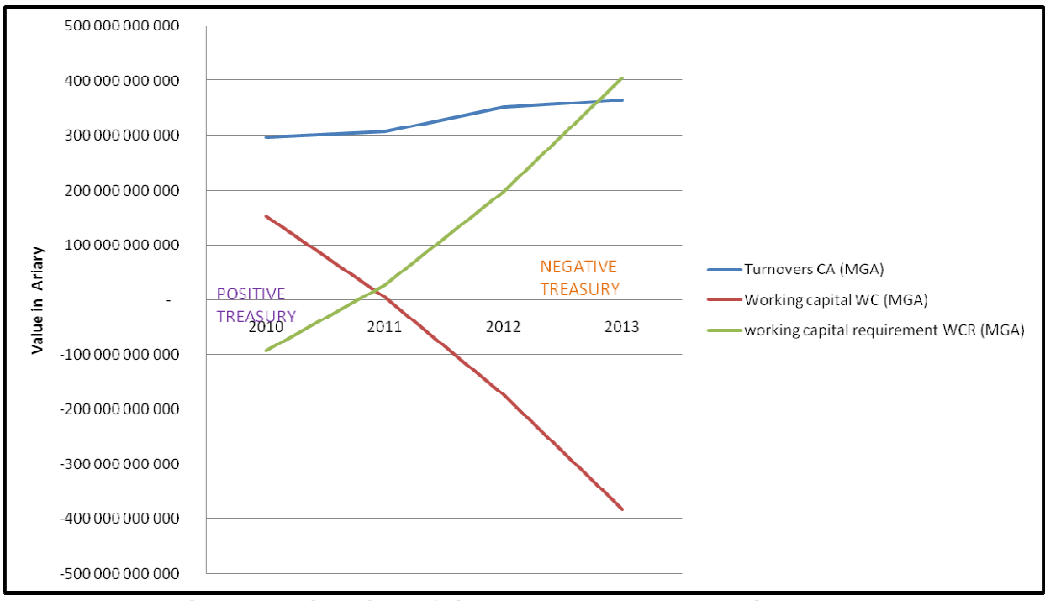

Figure 7: Situation of the JIRAMA's treasury since 2010

The graphs below show the results of the scenarios.

Result of the scenario "reducing 25% of the average production cost"(1 Ariary=1MGA)

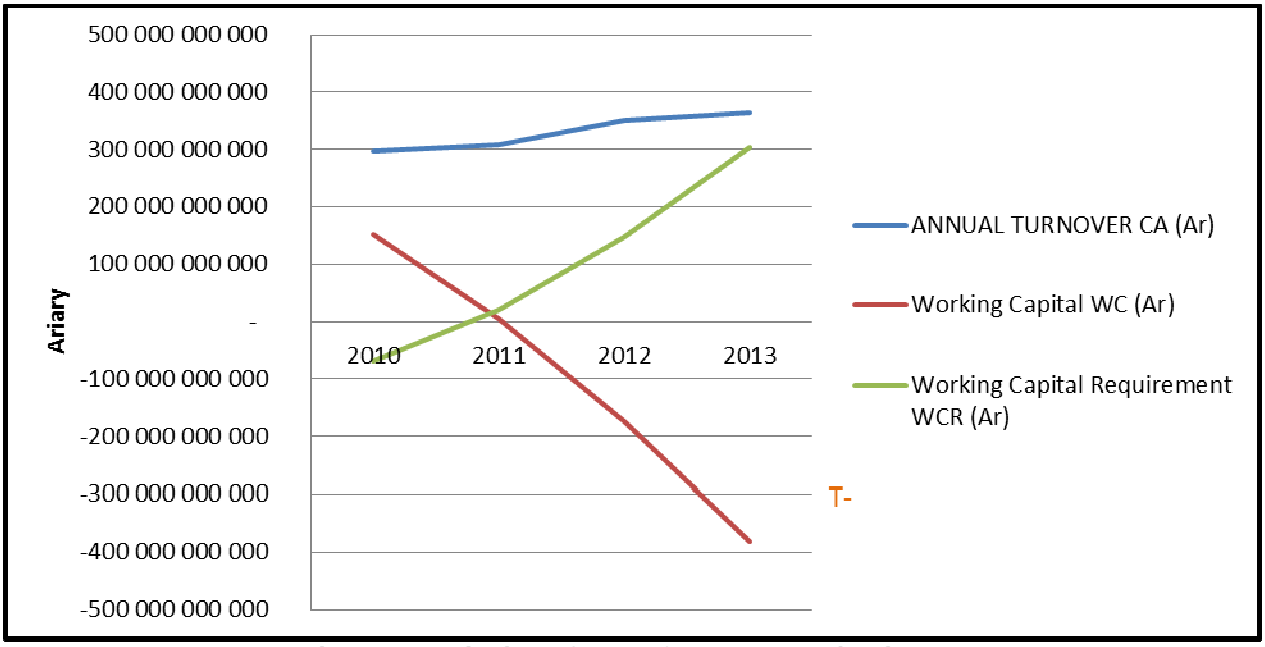

Figure 8: Reducing of 25% of average production cost

Result of the scenario "reducing 50% of the average production cost"(1 Ariary=1MGA)

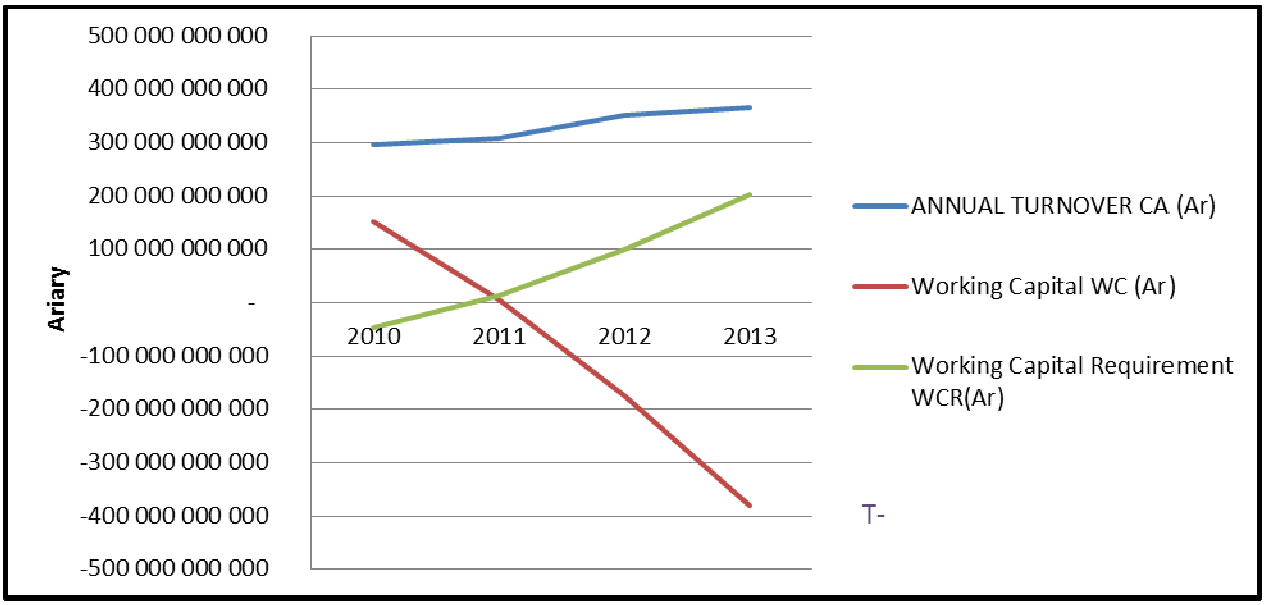

Figure 9: Reduction 50% of average production cost

5. DISCUSSION

A Benchmarking of Electricity companies in SSA provides interesting information for a better assessment of JIRAMA Company. However on 17 benchmarked companies, data on the average production costs and the production systems are not all accessible. In fact most companies do not

disclose some data on their website or from those the annual reports. This confirms the assertion of Fabien Pepper on the difficulty of information gathering in some benchmarking types **(5).**

With data collected in 2010, the analysis shows that the average production cost of JIRAMA Company was USD0.22/kWh, which is clearly above the average in Africa which was during this period around USD 0.18/ KWh, and it exceed twice those of developed countries estimated at USD0.09/KWh. And Christine Hereaux says that the production cost dependents firstly on the geographical position of Madagascar and the lack of oil resources in Madagascar **(21)**. Indeed Madagascar is a large importer of fuels for due to the production system based mainly by thermal diesel representing 67% of the installed power. This system is considered as a quick solution to fill gaps on generation of electricity in front of growing demand in the country. Note that the Burkina Faso SONABEL company had an average production cost of USD0.26 / kWh in 2010. In fact at the production bases of installed capacity of 238MW, the share of hydropower is only 32MW, representing 13% of the available power. On the other hand in 2010, with the same annual energy produced (around 1000 GWh), the two companies didn't have the same turnover: USD 187 million for SONABEL and USD 142 million for JIRAMA. The reason for this situation is that SONABEL's overall performance is well than the JIRAMA: 84% against 71%. And also note the overall efficiency of the CEB-SBEE Company of Benin, which reached 96% in 2010.

Regarding the average selling prices of the 16 companies in which we obtained data in 2009, the JIRAMA is 12th with an average selling price of USD0.19/kWh. This rate is considered high compared to other competitors. To illustrate, consider the case of ESKOM of South Africa, in 2009 this company has a lowest rate with USD 0.04/ kWh. In fact this company has production bases from the nuclear system that is among the most competitive. Country such as Zambia with USD 0.05/kWh is also remarkable due to the potentials of this country in terms of hydro.

Concerning the charges of fuel necessary for the production of electricity, their parts relative to turnovers are highly significant. In fact in 2008, expenses of fuel represented 168 billion MGA to reach 355 billion MGA in 2013; respectively compared to business figures these costs represented 58% in 2008 to 97% in 2013. This can also justify the high cost of production. In general, the cost of production and the electricity prices are generally lower in countries where nuclear and hydraulic play an important part in the energy mix, so South Africa, but also Zambia and most developed countries like France or Britain.

The results given by the two scenarios show the direct impact that can cause changes in the production cost on the JIRAMA's treasury. Indeed, the reduction in production costs can soften the slope of WCR that will certainly improve cash flow of the Company. Certainly the change in WCR was simulated with the actual situation of the WC which led to note that treasury remains negative since 2011, but against an improvement of its value is noted after significant reduction in working capital.

So as part of the industrial reality, and based on the results, we recommend to JIRAMA, and to improve the treasury situation the following strategies:

a) In the short term, the contribution of new fund is essential to ensure the survival of the society, and to recover very quickly Working Capital;
b) Reducing the average cost of production by using renewable energy such as hydro or solar as a base of the electrical power system;

c) The establishment of a tariff system consistent with the parameters that influence the production cost of electricity.

6. CONCLUSION

The objective of this study was to compare the JIRAMA's system with other electricity companies in South Saharan Africa mainly in terms of production cost, but also to see at what level the production cost impact its treasury. This approach has allowed to measure the performance of JIRAMA compared to other African power companies. Indeed, the average producing cost of JIRAMA Company is above the average in Africa, which helped to formulate recommendations centered on technology choices including renewable energy. Furthermore, given the significant impact of the production cost on treasury of the Company, it is recommended immediately a new fund to improve its cash flow.

Admittedly, the objective of this study is to try to bring a contribution to the resolution of blackouts in Madagascar, but other highlights already require thorough studies such as the enterprise management system, management production, recoveries systems etc. These results will serve as the basis for the recovery and revitalization of the Company.

ACKNOWLEDGMENTS

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