

Accessibility to Electricity for Rural Population in Madagascar: a Literature Review

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ABSTRACT

The electricity access in Madagascar for rural area remains very low. In May 2014 [09], only 6,2% of Malagasy rural population have access to electricity. However the access to energy especially electricity is commonly considered as a prerequisite to economic and social development as all production activities require an energy input. The aim of this paper is to inventory and synthesis the barriers of the access to electricity service in the rural area of Madagascar. In this way a literature reviews about rural electricity and rural electrification project have been carried out to collect relevant problems, and then problems have been clustered. Mainly, online documents comprising reports paper, conference paper and rural related document have been referred.

Keywords: Electricity access, Rural Electrification, Rural locality

1. INTRODUCTION

The Act N ° 98-032 reforming electricity sector in Madagascar aims on the one hand to give opportunity for new operators to operate in the electricity sector and on the other hand relieving the Malagasy government in financing the electric infrastructure of the country, to promote the effectiveness and the quality of the service offered to the users by competition. Thus private operators can intervene in the activities of production, transport and distribution of electric power after obtaining an authorization and/or concession. This structure commonly interests as well other organization and development partner to bring their aids for the development of electricity sector in the country.

Hence, electricity sector activities are broadened to several actors. However the electricity access in Madagascar especially for rural area remains very low. In May 2014 [09], only 6,2% of Malagasy rural inhabitant have access to electricity. However the access to energy especially electricity is commonly considered as a prerequisite to economic and social development as all production activities require an energy input.

The objective of this paper is to inventory and synthesis the barriers of the access to electricity service for the rural population in Madagascar.

2. METHODS

The following figure shows method used

Figure N°1: Literature review process

Inventories of problem are carried out, problem are synthesized and clustered in order to

detect and show the root cause for each problems. Mainly, we refer to online documents

comprising reports paper, conference paper, Madagascar rural related document. But considering that the context is common in a developing country especially in Africa Sub Saharian, document sources has been broaden to international level that are relevant in this context.

3. FINDINGS

Figure 2: Problem tree

3.1. Difficulty of integration to the national grid

Cost of the extension of the national grid relatively high

To ensure the electrification of a rural area, the first and common method consists in extending the national grid. In fact, in certain cases, the extension of the grid can prove to be the least expensive option.

However, when localities are very far from the national grid, the high cost associated with the expansion of the Medium Voltage transmission lines makes many of these projects impracticable [12]. As example, a comparative study undertaken jointly by the International Energy Agency (IEA) and the club of African national agencies and structures in charge of rural electrification (CLUB-ER) in July 2013 [14], shows that when the distance between the locality to be electrified and the available Medium Voltage transmission lines is more than ten kilometers, the initial investment is relatively high compared to other methods and technologies.

JIRAMA deficiency

In other side, the JIRAMA (Jiro sy RAno Malagasy) the national electricity company is in a difficult situation for a long time [01][09]. The

Some of problems related to low electricity access of rural area are linked in former times, some of them have not yet been resolved or have effect enduring till now. Other ones are current problems, but the clustering is based upon root causes and consequences. Hereafter the main problem tree.

situation of the JIRAMA worsened more since 2009, during the crisis, the Government forced the JIRAMA to reduce its tariffs to safeguard the purchasing power of the population, and the competitiveness of the Malagasy private companies.

Mid-2014 JIRAMA fell down in a situation of financial difficulty. Its equity became negative MGA 500 billions, the deficit for 2013 reached MGA 240 billions, the suppliers debts are of more than MGA 300 billions [09].

This situation is due partly to the more important resort to diesel for electricity production (about 67% of the installed power) to satisfy the growing demand. In fact, the JIRAMA and economic operators cooperated for the fast installation of these diesel solutions to face the urgency. Although the investments necessary to maintain and improve the performances of the distribution lines were not carried out, the requests for new customer connections were satisfied, which contributed to worsen more the deficit of the JIRAMA.

The takings are not collected in time. Especially the public administration invoices remain too long time unpaid. The frauds on the energy meters and illicit connections increase the deficit.

The tariffs applied by the JIRAMA are largely lower than the tariffs ceilings. In addition to the problem of the inadequacy of the formulas with the real conditions of JIRAMA activities, the periodic revision has not applied. The real cost of average kWh is MGA 633 but the average tariff of sale applied of MGA 382 [09].

In this context JIRAMA is not able to deploy alone its infrastructures especially connecting more rural areas in its grid. Even though, within the rural electrification projects carried out by the national agencies in charge of rural electrification (Agence de Developpement de l'Electrification Rurale, ADER) between 2005 and 2014 [09], 31,25% of the electrified villages (60 in 192) are performed by the extension of the JIRAMA grid. But which, in other side, increases the diesel production of the JIRAMA and consequently amplifies the difficulty of the JIRAMA.

For the re-establishment of JIRAMA mainly, the Project to Improve Governance and Operations in the Electricity Sector (PAGOSE) has started since 2016.

3.2. Exploitation not viable [09]

The viability of exploitation not sure is also causes of low access to electricity according to two point view: the return to the dark of the electrified localities and the amplification of dissuasion for new investment.

The achievements of the ADER since its beginning in 2005 are around 190 electrified villages (May 2014) [09]. The development of the equipment and the increase in the rate of access are remarkable, but the situation of the exploitation is worse, because 40% of the centers are stopped for various reasons, mainly related to breakdowns of the technical infrastructures and bankruptcy of operators.

Infrastructure failure

The fund lacking and Rural Electrification (RE) high investment risk lead investors to decrease investment and therefore affect the project quality especially the technical infrastructures and the project sustainability [01].

Bankruptcy of the operators

Mainly the installation which production is based on diesel falls easily in difficulty. Indeed, in front of the rise in the price of the fuels, the production cost becomes relatively high and consequently exploitation is stopped. Although Madagascar has many potential of **Renewable Energy (REn)** [22], the resort to the diesel production is often common due to:

- Renewable technologies, adapted to the rural area populations, are very expensive [03].

- Knowledge and competencies of the local actors on energy in rural area and REen are limited to the theoretical aspects [5]

- Long duration of deployment REen [07]

- Technologies of manufacture, assembly of components and workshops of maintenance involved in the installations of REen technologies are locally nonexistent [03]

- Energy produced by EnR intermittent.

Exp: wind turbine performance depend on the wind speed [11]

In the other side, the material thefts (cables, solar panels, turbines), the insolvency of the users such as the public administrations induce also the bankruptcy of operators [09].

3.3. Private operator not motivated in RE [04]

The Act N ° 98-032 reforming electricity sector in Madagascar aims on the one hand to give opportunity for new operators to operate in the electricity sector and on the other hand

relieving the Malagasy government in financing the electric infrastructure of the country, to promote the effectiveness and the quality of the service offered to the users by competition. Thus private operators can operate in the activities of production, transport and distribution of electric power after obtaining an authorization and/or concession in accordance with the power of system according to the production technology used. Currently there is several active operators, however their motivation on RE is not relevant. This lack of motivation is due to the two great reasons: (I) the investment in rural zones is not profitable [04][06], (II) Lack of financing for the new RE project [01].

3.3.1. RE investments in rural area not profitable

The financial logic of the operators of electricity leads them to invest mainly in the localities where the return on investment is sure, fast and most important, whereas the situations of the localities not electrified today oppose to those criteria. Indeed, it is generally noticed that the investment carried out in the localities not yet electrified is not and cannot be profitable.

The cost of the deployment is relatively high [02]

The solutions grid extension or decentralized system for electrified rural localities involves more investments [02]. The costs are generally raised due to the following facts:

- Difficulties of access to the localities for a certain period or even during all the year, because of road infrastructure very limited and which posing logistic problems for the implementation of RE projects. Possibly the existence of natural obstacles (protected forests, surfaces, mountains, lakes, river, etc)

complicate the layout of the power lines. That in a side increases the project cost in installation phases as well as during the operation [01][02].

- Certain regulations are very strict. Moreover, they are generally copied on those of the industrialized countries (mainly European countries) even if the natural, economic or sociological environment is basically different [16]. To lower the capital cost and possibly the cost of exploitation, the adoption of the new technical standards less constraining and adapted better for the context rural should be considered (for example lower height of posts, quality and availability of service, etc) [16].

- Dispersed localities and low density of the population [04][08] ∴ Although the definition of the rural zone is necessarily fuzzy in the RE context, dispersions of the villages as well as a low density of population inside these villages are generally noted. Heterogeneous space configuration, in one side some zones of relative more concentration of population, having economic activities or administrative (public services, decentralized community, etc), in opposition to the primarily agricultural zones with low inhabitant. The dispersion of the villages involves an important requirement in Medium Voltage line for transport and also requires an important numerous electricity transformers.

Typically, the case of France [04] , “it is necessary for rural case and for the same number of inhabitants connected, serve 18 times more surface, to build 7 times more lines and 4 times more transformers and to install 2 times more power” than the case of urban customers (Rene Massé, 2004).

Electricity, a public utility

The access to electricity is commonly considered as public utility. Consequently, the selling prices of electricity take account of this aspect, thus the profitability of the investments, calculated on the basis of these selling prices, would be also to reconcile with the concept of public utility.

Although the sector electricity is liberalized, the historical has effects and traces. Especially the Act 75-024 of October 17, 1975 granting a quasi monopoly for the JIRAMA company the operation of the public electricity and water utilities furthers the detention of the Government of the services of Electricity which wants to maintain socio-politic national balances and careful about balanced of the whole country [04]. For instance [09], during the crisis of 2009 the Government forced the JIRAMA to reduce the tariffs to safeguard the purchasing power of the population, and the competitiveness of the companies.

Although provisions are in the course of setting-up, the concept electricity a public utility, makes the RE projects not profitable.

Low electricity consumption [02]

Rural localities energy needs are relatively low, except in the case of a particular productive application requests (agricultural processing industries, sawmill, irrigation, mills, decorticators, oil presses, etc) or Community activities (water pumping). The use of electricity is mainly for lighting.

Moreover, inside of the villages already electrified, the rate of connection is also low. The assumptions are that the households have a bad perception of the benefits of electricity and lack knowledge of the uses of electricity. Those can rise from a lack of demonstration effect of the use of electricity [02].

Rural household incomes are low, instable and seasonal [01]

Most of the rural inhabitants are farmer. They are vulnerable to shocks. An external shock like a bad crop, a hurricane, or an increase in energy prices can suddenly reduce the revenue expected. Generally, their annual revenues are concentrated in one period which occurs after the crop is harvested. Rice is the main agricultural product produced in the country and generally farmers get one crop of rice a year after the rainy season.

This rural situation makes impossible to practice an electricity price slightly high compared to the urban [02].

In addition, in Madagascar the price of electricity is high compared to other energy sources for applications outside lighting, for example cooking a meal with electricity is 5 to 10 times more expensive than cooking with coal [07].

3.3.2. Lack of financing

Government scarce resources more allocated to urban

The scarce resources of the government are assigned to the urban zones. This urban tendency is a paradox commonly met in the developing countries which the economy depends mainly on the agricultural sector and thus on the rural area [01].

Lack of commitment in favor of RE is one of causes [02], as well as the JIRAMA recovery which ensures urban electricity. And finally, the political interest to target several people at low the cost is also cause [01].

Subsidy

In the context of difficulty on profitability only the subsidy allows to create the conditions of profitability of a commercial deal of rural

electrification. [04], indeed historically all programs of rural electrification were always subsidized, including those countries now industrialized.

It is difficult to attract financing for electrification in rural areas. Even if JIRAMA has the experience to develop electricity in rural area, this company is not able to handle it. Therefore, the RE will be developed out of the grid and depends on the rural electrification financing mechanism. The rural electrification financing mechanism is based on FNE (Fond National de l'Electricité).

The FNE results from article 3 of the Act N° 98-032 and creates by the Act N° 2002-001 of October 7, 2002. It is managed by the ADER and is intended to finance the programs of RE development. It however always lacks methods of management which would be to fix by a decree thus compromises its credibility.

The FNE its operation is tributary of 1,25% on the sales with the consumers of more than 20 kWh/month by the JIRAMA. The government budget of investments contributes also for FNE. Except these internal financings, the ADER is supported by international partners.

This subsidy proposed is needed to develop rural electrification. However, the FNE is not sufficient to finance all the projects and the 70% subsidy ceiling is not sufficient for most of Malagasy private operators involved in rural electrification. The FNE needs to be increased but JIRAMA is the primary funding opportunity for both governments and international agencies. This leads to a competition for funding with the FNE.

Bank loans not favorable [01]

Most of the private operators involved in rural electrification do not have the independent

resources to finance the 30% left. Therefore they need access to bank loans. But the interest rate attached to bank loans is quite high (between 15% to 25%) and is given for a short period (around 5 years on average but could be extended). Indeed, commercial banks do not have a lot of knowledge on rural electrification and thus increase the interest rates and decrease the period of loans in order to reduce risks. Therefore, these constraints lead to a decrease in the benefits and an increase the risk supported by the operators in the long run.

3.4. ADER was in difficulty [9][03]

The Agence de Développement de l'Electrification Rurale (ADER) was created in 2002 by the decree n°2002-1550 and operational in 2004. ADER is placed under the technical supervision of the Minister in charge of Energy, under the budgetary supervision of the Minister in charge of the Budget and under the countable supervision with the Minister in charge of the public accounts. The ADER is the public national agency in charge of the rural electrification development, according to the decree n°2002-1550, the ADER aims to:

- promote the access to the services of the electricity of the population to support and back the rural development initiatives and the basic social services functioning.

- promote and support the private sector to develop viable exploitation, under the concession and/or authorization regime, to serve the populations outside of the inter-connected grid and power central, by technical support and financing the investments and management of the customers.

The projects of rural electrification carried out by the ADER results either from a spontaneous

application of a private operator or the decentralized community or from a call for tenders initiated by ADER. However, in the realization of its activities, the ADER was in difficulty about the insufficiency of resources especially human resources, funds and material resources, organizational instabilities as well as the cumbersome of certain administrative and legal procedures [9].

4. CONCLUSION

Through a literature review performed we can infer that the cause of low rural electricity access is firstly from the difficulty of integration to the national grid, then the exploitation not viable. The low interest of private operator is also a main cause and finally the difficulty of the public entity ADER in charge of rural electrification. So to increase the electricity access for rural populations, relevant solutions to those problems and their specific root cause should be carry out.

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