Evaluation of Rural Electrification Concessions in sub-Saharan Africa

Detailed Case Study:

Mali

Report to World Bank

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Executive Summary

Mali has had success developing mini-grids using a concession approach. Spontaneous "bottom-up" concessions, authorized and subsidized by the rural electrification agency AMADER, have built around 250 small power projects connecting 78,000 rural households. Despite some difficulties, these small power projects have been financially sustainable, as evidenced by operators staying in the industry without ongoing subsidies from donors or governments.

History: The state-owned vertically-integrated power company, Energie du Mali (EDM), was privatized using a concession contract in 2000. However, the company returned to Government hands in 2005 due to disagreements with proposed rate increases. In 2004, the Government created the rural electrification agency, AMADER (*Agence Malienne pour le Développement de l'énergie Domestique et de l'Electrification Rurale*), with the main goal of extending access to electricity in rural and peri-urban areas. AMADER, with help from the World Bank, tried to tender out large zonal area concessions of around 10,000 customers. This approach was unsuccessful. AMADER also issued public tenders for concessions. This approach was also unsuccessful. The third approach, Projets de Candidatures Spontanées d'Electrification Rurale (PCASER), attracted significant interest from small, local entrepreneurs, who developed hundreds of projects between 2004 and 2015.

Bottom-Up Concessions: Under PCASER, interested parties can approach AMADER with proposals to build out projects with a capacity smaller than 250 kW. There are now more than 250 mini-grids operating in the country operated by around 68 private operators and the state-owned vertically integrated utility Energie du Mali (EDM). The majority of the projects are powered by diesel-fired generators, and some are in the process of converting to larger hybrid solar-diesel generators. The private operators usually manage between 1 and 4 mini-grids each, although the largest, KAMA, manages 15 mini-grids covering 31 municipalities. Several private operators built grid extension projects, but were unsuccessful in negotiating power purchase agreements with EDM. As part of an agreement mediated by the Government, EDM bought these installations at the cost of the investment made by the developers, which is around 25 percent of their book value.

Rural Electrification Agency as Promoter and Regulator: The rural electrification agency, AMADER subsidizes the initial investment costs of new connections to users. AMADER is responsible for promoting and regulating mini-grids. It has played an important role in investing in projects in Mali. It has on average subsidized 75 percent of the capital investment cost of new installations, with private operators financing the rest, usually by themselves. Private operators must recover their initial investment and their ongoing operations and maintenance costs through their tariffs. As a result, the price of electricity for households in these mini-grids is currently around US$0.50 kWh. This tariff is around three times higher than the tariff paid by customers attached to the EDM national grid.

New Directions: Mali has been in a precarious state since 2012 when a civil war broke out between northern rebels and Government forces in the South. However, AMADER is building on its experience with the PCASER concessions and encouraging private concessionaires to build out larger projects based on solar-diesel hybrid generators.

Key Lessons: The PCASER projects illustrate lessons for governments considering using a concession approach to rural electrification:

- **A poorly functioning state-owned national utility creates a drag on the whole sector and has negative repercussions on rural areas.** EDM absorbs significant amounts of subsidies and sells power below cost. The difference between the EDM tariff and rural tariffs has been the cause of significant problems for private rural concessionaires, and the Government has had to intervene in several cases to mediate disputes.
- **There is a trade-off between project approval speed and good governance.** AMADER is a central agency with a great deal of responsibility over the rural electricity sector. Some people in the sector have bemoaned how much discretion AMADER has, and how difficult it can be to understand how they reach their decisions, or if they are procuring at "least-cost." However, imposing technocratic requirements of good governance may in fact hamper efforts to build projects quickly, albeit imperfectly. Mali's approach may have benefited from the fact that AMADER awards authorizations without requiring up-front competition for each authorization.
- **Giving formal regulatory authority to the rural electrification agency may be the most effective way to implement mini-grid concessions.** Mali's success with bottom up development of private mini-grids seems attributable, at least in part, to the fact that AMADER performs two roles: it gives grants and technical assistance but it also regulates the mini-grids in its authorization and grant agreements (through regulation by contract). In contrast, in other countries (including for example Senegal), these two functions are performed by two different government agencies. This divided regulatory arrangement may make it more difficult to manage mini-grid concessions.
- **Mini-grids power by diesel-fired generators can be financially sustainable.** Despite their high unit costs and other shortcomings, diesel-fired generators have been a key part of Mali's rural electrification success. However, whether Mali's mini-grid concessions will be able to recover their long-run costs (including replacement equipment), remains to be seen.

1 Introduction

In Mali, public-private concessions for rural electrification have been widely used since 2003. The purpose of this report is to review Mali's experience of rural electrification concessions and evaluate their performance of the concession approach. For the purposes of this report, a rural electrification concession is a public-private partnership in which a private entity is granted a long-term right to provide electricity service in rural areas through a distribution grid. The Mali case study is one of six detailed case studies that form a body of evidence on the experience and successes of rural electrification concessions across sub-Saharan Africa.

Mali's rural electrification approach and background information on the power market are presented in Section 0. The Government of Mali has granted "authorizations" that are similar to concessions to dozens of small private operators to build and operate mini-grids in rural areas. These concessions, started under the "PCASER" program (Projets de Candidatures Spontanées d'Electrification Rurale), are discussed in Section 3. We conclude in Section 4 with an evaluation of the relative success of these concessions at sustainably increasing access to electricity. Appendix B is a detailed study of the experience of one of Mali's largest rural concessionaires, KAMA. Appendix B is a catalogue of all the mini-grid authorizations and concessions in Mali, and the technology used by their generation plants.

2 Mali Background

To put Mali's rural electrification concessions in context, we first present the country's historical, economic, and political context. Table 2.1 gives references.

Table 2.1: Mali Summary Statistics

Indicator	Value
Demographics	
Population, total (2014)	15,768,227
Population growth, 10-year average (2004-2014)	3.09%
Rural population (% of total population) (2014)	60.86%
Rural population growth, 10-year average (2004-2014)	1.89%
Population density (people per sq. km of land area) (2014)	12.09
Economy	
GDP per capita (2014, current US$, market exchange rate)	766
Real GDP per capita growth, 10-year average (2004-2014)	1.19%
Debt to GDP (2014)	32.10%
Electricity Sector	
Access to electricity, rural (2012, % of rural population)	11.90%
Access to electricity, national (2012, % of total population)	25.60%
Electric power consumption (kWh per capita) (2012)	Not available
Governance	
Ease of Doing Business index (2015 ranking out of 189 countries)	146
CPIA property rights and rule-based governance rating (2014); 1=low to 6=high	2.5
Government bond ratings (S&P Long-Term)	Not rated
Corruption Perceptions Index (2014) - scale of 0 (highly corrupt) to 100 (very clean)	32
Legal system	Civil law and customary law
Administrative tradition	French
Fragile or conflict-affected state (any year, 1990-2015)	Yes

Economy and demographics

Mali has a population of 15.8 million, of which 9.6 million live in rural areas.[1] Income levels are low at US$766 annual GDP per capita. Over the 10 years between 2004 and 2014, the

[1] World Bank Open Data (2014)

population has been growing at 3.09 percent per year. GDP per capita (in real PPP terms) has grown at 1.25 percent per year over the same period. 60 percent of the population is rural. The rural population growth rate is just 1.87 percent per year. Population density is low. The population is dispersed and unevenly distributed as about 60 percent of Mali's surface area is desert.[2]

Figure 2.1: Map of Mali

Source: CIA World Factbook

Politics and governance

A former colony which gained independence from France in 1960, the country was ruled by a single party until 1991, when multi-party democracy was introduced.[3] However, in 2012, a military coup replaced the civilian government and an interim administration was put in place.[4] Rebel groups in Northern Mali started a secessionist rebellion that is ongoing as of September 2015.

In 2014, Transparency International's corruption perceptions index ranked Mali at 115 out of 175. The legal system is based on civil law, with the final court of appeal being the Cour Suprême du Mali (Supreme Court). The administrative tradition is French.

Mali has been a fragile or conflict-affected state since 2012.[5]

[2] World Bank. Project Appraisal Document: Rural Electrification Hybrid System Project. (2013)

[3] United States Department of State. Background Note: Mali. (2015)

[4] United States Department of State. Background Note: Mali. (2015)

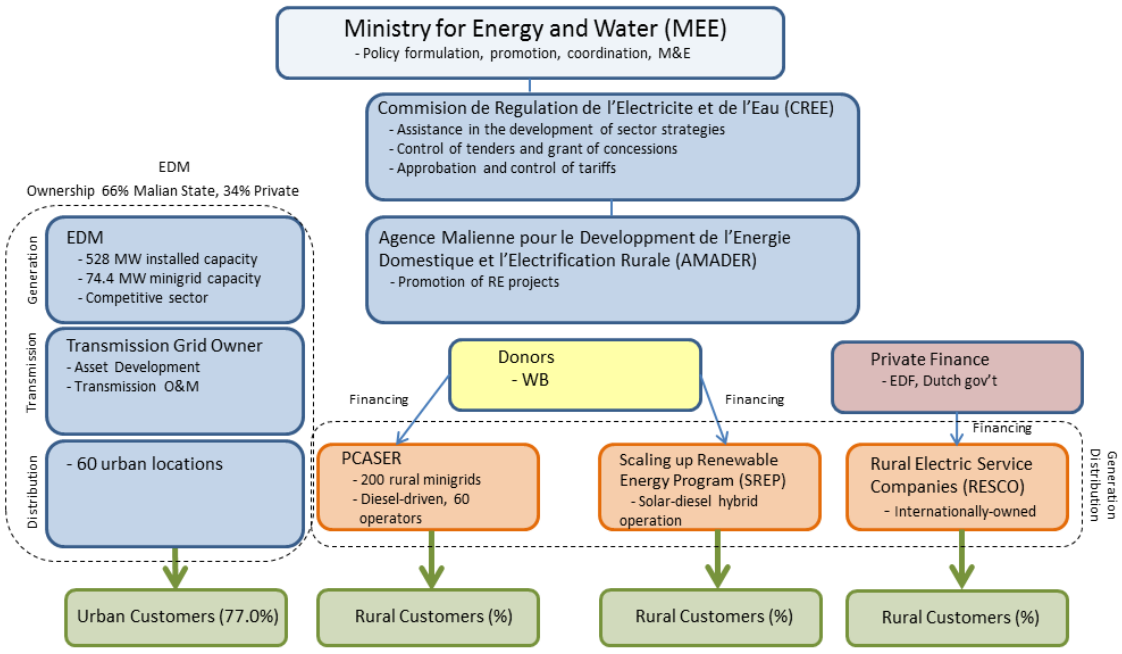
[5] According to the World Bank's Harmonized List of Fragile Situations for Fiscal Year 2015, available online at: http://www.worldbank.org/content/dam/Worldbank/document/FY15%20Fragile%20states%20list.pdf

2.1 Power Market Structure

The current structure and legal framework of the electricity sector in Mali results from a major reform undertaken following the "Sector Policy Letter of Electricity and Water Supply" dated 10 November 1999. At the time, the Government of Mali noted that only 8 percent of the Malian population and less than 1 percent of the rural population had access to electricity. The main principles of the reform are provided for by an Ordinance enacted in March 2000 (the "Electricity Ordinance").[6] The Regulatory Commission of Electricity and Water (*Commission de Régulation de l'Electricité et de l'Eau* - CREE) is the sector regulator, established at the same time.[7]

The power market in Mali is presented in Figure 2.2.

Figure 2.2: Mali Power Market Structure



Energie du Mali (EDM) is the state-owned vertically-integrated power company. It owns most of the country's electricity production, transport and distribution facilities, except for hydroelectric facilities. The Government sold 60 percent of EDM in 2000 to a consortium that included the French company Bouygues and a subsidiary of the Agha Khan Development Fund. A concession agreement was signed between the State and EDM.

Following a difference of views between SAUR and the Malian authorities, SAUR sold back its shares to the Government and to AKFED group. It seems that the dispute started with the refusal of the government to apply the second price revision requested by the concessionaire. The parties were not inclined to settle this dispute since the new government of Mali was not in favor of private management of utilities and Bouygues was willing to

[6] Ordinance n°00-019/P-RM dated March 15, 2000 on the reorganization of the electricity sector and implementation Decreen°00-184/P-RM dated April 14, 2000.

[7] Ordinance n°00-021/P-RM dated March 15, 2000 and implementing Decree n°00-185/P-RM dated April 15, 2000.

disengaged from utilities. As a result the Government and the AKFED group respectively hold 66 percent and 34 percent of EDM share capital.

Since 2010, EDM received a significant amount of subsidies to cover operating costs, especially fuel purchases. The level of subsidy in 2014 and 2015 was around FCFA30 billion (US$51.5 million). It is expected to be maintained at this level in 2016.[8]

EDM rights and obligations vis-à-vis the State are still governed by the concession agreement.[9] EDM's concession perimeter includes 98 localities.[10] This EDM perimeter may interfere with rural electrification projects as rural electrification projects have been conducted in these same areas. The EDM concession provides for the right of independent mini-grid operators to operate within the EDM concession perimeter, with EDM's permission, until EDM can expand its activities. The development of rural electrification includes projects in 36 isolated municipalities within EDM concession perimeter, which are in the process to be transferred back to EDM[11], identified in Appendix B.

The rural electrification agency is called the Malian Agency for the Development of Domestic Energy and Rural Electrification (AMADER - *Agence Malienne pour le Développement de l'énergie Domestique et de l'Electrification Rurale*). AMADER is a public establishment (*Etablissement Public à caractère Administratif*) with legal personality and financial autonomy, under the supervision of the Ministry in charge of Energy. AMADER's main task is extending access to electricity in rural and peri-urban areas.

The Rural Electrification Fund (FER - *Fonds d'Electrification Rurale*) is a fund under the control of AMADER and held with the Ministry of Finance.

The Ministry for Energy and Water (MEE) is one of Mali's largest and most important ministries. The National Directorate of Energy (DNE - *Direction Nationale de l'Energie*) is a division of the MEE. The head of DNE is appointed by Decree of the Council of Ministers on the proposal of the Minister in charge of energy. This Directorate was reorganized in 2007 in view of the reinforcement of its role in terms of definition of development and control strategies.[12] DNE is currently in charge of:

- Participating in defining strategies of the Ministry, preparing technical studies, action programs, draft laws and regulations in all branches of the energy sector, including infrastructures, energy management
- Coordinating, controlling and monitoring the implementation of energy policies and regulations by public administration and by the operators in the energy sector
- Conducting preliminary investigations on the content of decisions to be taken and activities to be undertaken by public authorities as well as the right to approve, suspend or amend decisions already made.

Other agencies involved in the electricity sector include:

[8] EDM and AMADER interviews

[9] EDM and AMADER interviews

[10] EDM, « La société », available at https://www.edm-sa.com.ml/index.php/2014-05-27-14-04-15 (accessed December 1st 2015).

[11] EDM interview, September 2015.

[12] Decree n°07- 254/P-RM dated August 2, 2007

- The **Agency for Renewable Energies** (l'Agence des Energies Renouvelables du Mali AER-MALI), established in October 2014[13], which replaces the Center of Solar Energy and Renewable Energies (Centre National de l'Energie Solaire et des Energies Renouvelables - CNESOLER). Unlike CNESOLER, AER MALI is a public establishment with legal and financial autonomy and may raise funding to carry on its activities
- The **National Agency for the Development of Biofuels** (Agence nationale pour le Development des Biocarburants – ANADEB), established in 2009, which cooperate with AMADER to develop biofuels power plants in rural areas.[14]

Some concessions have been granted to independent power producers, which have entered into exclusive power purchase agreements with EDM. It appears however that only one of these independent power plants is currently operating:

- A five-year concession agreement has been granted in 2007 to the company SOPAM for the financing, construction and operation of a 56MW heavy fuel thermal power plant in Sirakoro; the plant has started operation on mid-2011 and is producing 35MW;
- A concession agreement was concluded in 2010 for a period of 10 years with the company Albatros for the construction and operation of a heavy fuel thermal power plant of an installed capacity of 70MW and 51MW guaranteed capacity, located in Kayes; works were suspended in 2012 due to the troubles. An amendment has been signed in 2015 in view of increasing the guaranteed capacity of the plant to 66MW and extending the term of the concession up to 20 years
- A concession agreement was concluded in 2009 for a period of 15 years with the US company Vica technologies for the construction and operation of an 30MW biomass power plant in Noumoubougou, with 15MW guaranteed capacity.

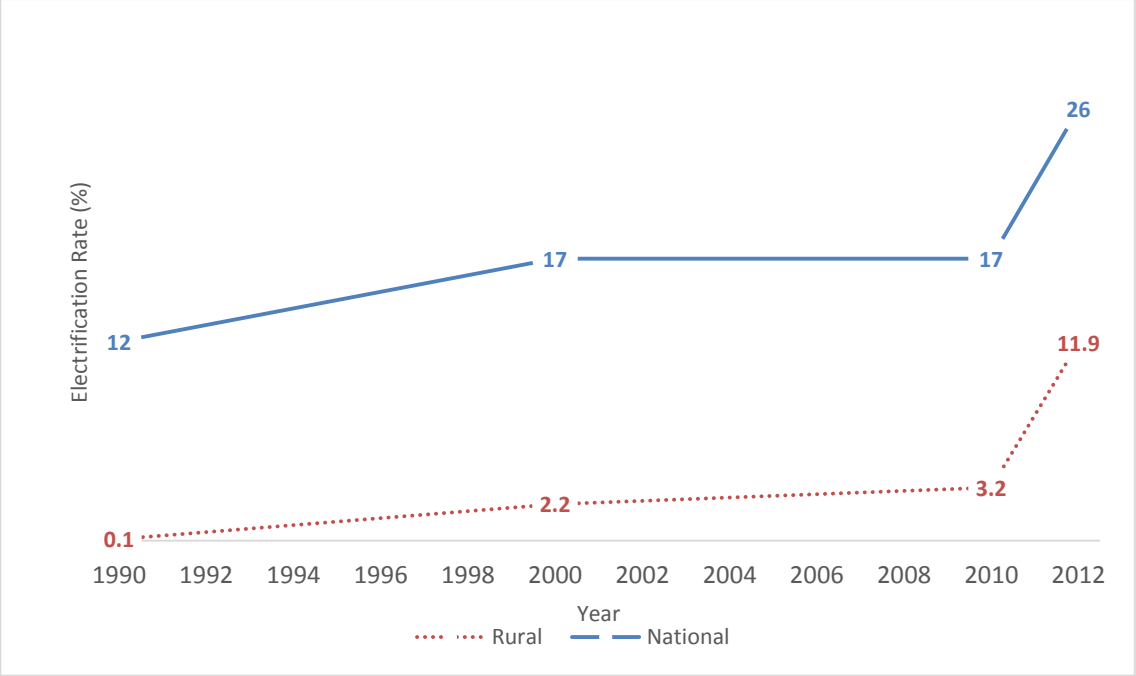
In 2009 the Government of Mali adopted, a new scheme for the reorganization of the management of public water and electricity services (*Schéma Optionnel de Réorganisation de la Gestion des services publics de l'Eau et de l'Electricité* - SORGEE), the premises and personnel related to the water utility have been transferred to a new entity with effect from 1 January 2011.

According to the unbundling principles set forth by the Electricity Ordinance, production, transport and distribution of electricity may be carried out separately by public or private operators in accordance with a concession or an authorization.

[13] By Ordinance n° 2014 – 012 dated October 1st, 2014

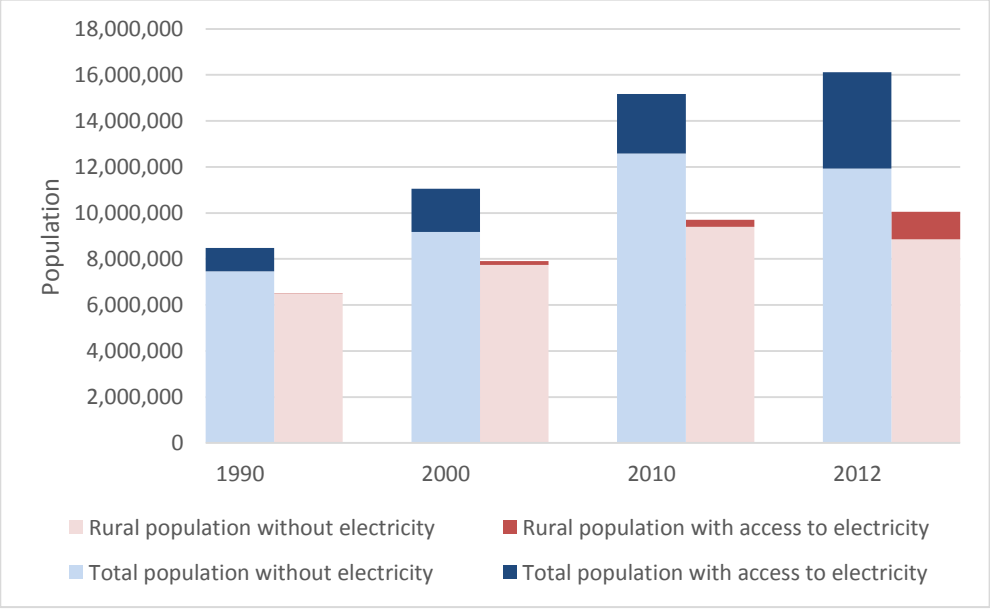
[14] By Ordinance n°006/P-RM dated March 4, 2009

Figure 2.3: Change in Electrification Rate in Mali (1990-2012)



Source: World Bank Open Data

Figure 2.4: Population with Access to Electricity, Mali (1990-2012)



Source: World Bank Open Data

Concessions and Authorizations

The following activities may only be delegated through a **concession**, awarded following a call for bids, in accordance with the procedure determined by the Regulatory Commission of Electricity and Water (*Commission de Régulation de l'Electricité et de l'Eau* – CREE):

- Hydroelectric production regardless of the capacity;
- Thermal energy production exceeding 250 KW;
- Building and operation of electricity transport networks;
- Distribution requiring medium voltage equipment.

A concession for production, transport and distribution may be granted to the same concessionaire. A concessionaire can therefore operate a vertically integrated business. This is currently the case for EDM.

An **authorization** on the other hand is granted by the Minister in charge of Energy to operators called "*permissionnaire*" with respect to:

- Thermal power production with an installed capacity exceeding 50 kW and up to 250 kW; a new authorization must be requested in case of any significant increase of the installed capacity and the *permissionnaire* must request the granting of a concession in case the installed capacity exceed 250 kW (however AMADER allows a *permissionnaire* exceeding this threshold to continue to operate under its authorization[15])
- Distribution of low voltage electricity through a grid extension.

The procurement method is a key difference between a "concession" and an "authorization". Concession contracts are tendered using a competitive process, whereas authorization contracts can be granted following unsolicited bids from candidate operators. In the "authorization" process, if AMADER accepts an unsolicited bid, it files a public notice that it has awarded a preliminary permit. Competing proposals are then allowed within a 60-day period. This process is discussed in more detail in Section 2.2 under the heading "authorization process".

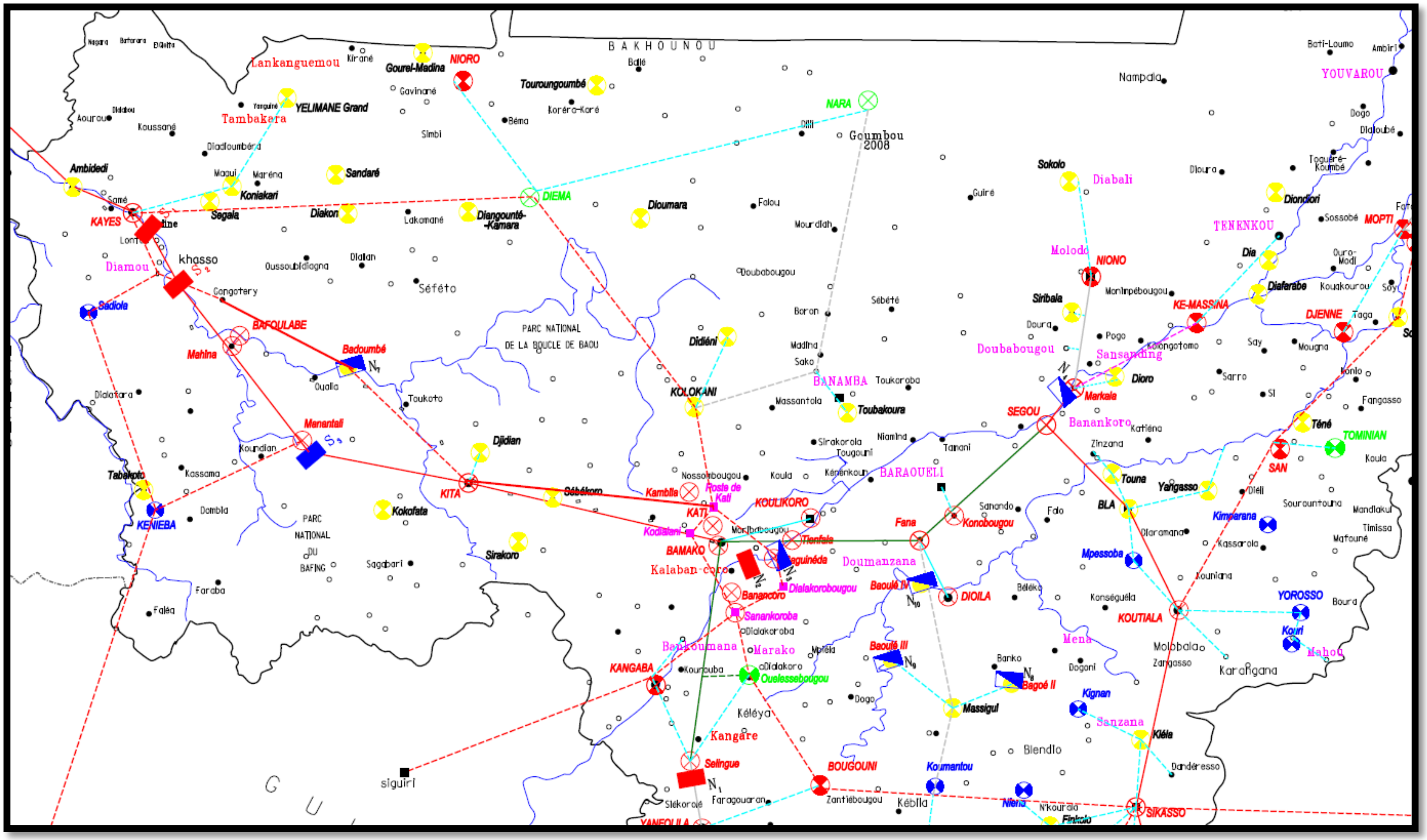
In this case study, we consider "authorizations" to be concession contracts. Authorizations grant an entity the right to build and operate an electricity asset for a relatively long period of time.

Figure 2.5 is an electricity map of Mali. It shows the following:

- Towns and population centers (in small black dots)
- The main EDM grid and EDM grid-connected and off-grid localities (in red lines and red circles)
- Private operators of mini-grids powered by thermal energy (yellow circles) and by hybrid systems (blue circles).

[15] This policy is adopted pursuant to the reference framework for the development of rural electrification prepared by the government but is in contradiction with the Ordinance and would require the Ordinance to be amended accordingly.

Figure 2.5: Electricity Map of Mali (Focus on More Populated Southern Half of Country)



Source: Direction Nationale de l'Energie (Mali)

2.2 Rural Electrification Approach

The Electricity Ordinance (enacted in March 2000) addressed the development of rural electrification in few provisions, whereby:

- The Minister in charge of energy is responsible for establishing and updating a electricity sector development program;
- The Minister encourages and supports the creation of a network of private enterprises capable to supply the equipment and provide services related to rural electrification;
- Authorizations to develop and operate production and distribution premises may be granted to those rural communities that lack access to the public service;
- Investment subsidies may be granted by the government through the Rural Electrification Fund (*Fonds d'Electrification Rurale – FER*) established by the Electricity Ordinance as a special account of the public treasury and not as an entity.

In 2000, access to electricity in rural areas was very low. The World Bank estimated that the rural electrification rate was less than 1 percent.[16] The state-owned electricity company, EDM, was poorly managed and unable to finance expansion of the network to rural areas.[17] The importance of developing rural areas through infrastructure building including "broadening the energy mix, its diversification and its extension to rural areas to the rural sector" was highlighted by the Framework Letter from the President of Mali to the Prime Minister, dated 23 October 2002.

In May 2003 AMADER was established[18] and a document called "Reference Framework for the Development of Rural Electrification" (*Cadre de Référence pour le Développement de l'Electrification Rurale* - CdR-ER) was prepared by the Government. The CdR-ER sets the main principles and modalities guiding the implementation of rural electrification programs by AMADER.

The CdR-ER provides for the granting of authorizations or concessions to operators through three approaches:

1. In the **top-down approach**, eight large concession areas were drawn up (Zones d'Electrification Multi-sectorielle – "ZEMs") and AMADER solicited bids through a competitive process. Private operators submitted proposals to AMADER, and were to be selected on the basis of lowest tariff.[19] The rural electrification fund financed feasibility studies in the poorer areas. The ZEMs were originally expected to have a potential client base of at least 5,000 clients each.[20] The larger size of the top-down approach was meant to attract international operators. A map of the eight ZEMs is given in Figure 2.6. This map shows that the regions were expected to have 10,000

[16] World Bank. Project Appraisal Document: Household Energy and Universal Access (October 6th 2003).

[17] World Bank. Project Appraisal Document: Household Energy and Universal Access (October 6th 2003).

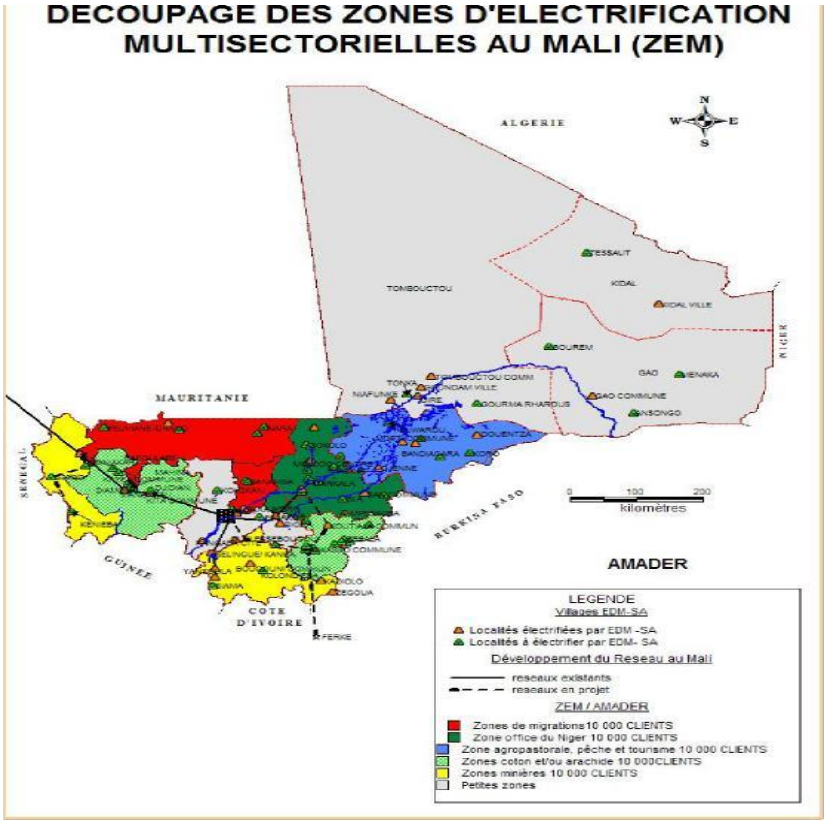
[18] Law n°03 - 0 0 6 dated May 21, 2003 and implementing Decree n° 03 – 226 P-RM dated May 30, 2003.

[19] CdR-ER section V and Alassane Agalassou, AMADER (March 17, 2011) ESMAP Knowledge Exchange Forum

[20] World Bank, HEURA Mali, Project Appraisal Document,

clients each. The top-down ZEMs approach was, however, unsuccessful.[21] Two bidders eventually responded to a tender offer but they fail to conclude concession agreements.[22] This approach was not pursued because of the government's desire for a more rapid approach in agreement with donors.

Figure 2.6: Zones d'Electrification Multi-sectorielle – « ZEMs »



Source: AMADER

2. The second approach described by the CdR-ER consists of selecting operators for mini-grids or grid extensions following **calling for expressions of interests** and selecting candidates on the basis of objective criteria such as the number of clients targeted, the tariff and the amount of investment subsidy requested. This approach has not been used so far since it was not considered by the Government and donors to be fast enough. However, public tenders are now being issued by AMADER as part of their program to deploy hybrid solar/diesel generators to established mini-grid operators.
3. In the bottom-up approach, **spontaneous project proposals** under the "PCASER" program (Projets de Candidatures Spontanées d'Electrification Rurale) are selected based on private operators' perceived ability to develop and operate a commercially viable project. In accordance with the CdR–ER, investment subsidies of up to 80%

[21] World Bank (March 28, 2013) Implementation Completion and Results Report, Mali Household Energy and Universal Access Project (Report No ICR2627)

[22] AMADER, Interview with Castalia, September 2015.

of the amount of capital expenditures may be granted through the FER (rural electrification fund).

The bottom-up "PCASER" approach remains the primary concession method used by AMADER and is described in Section 3.

The PCASER approach attracted significant interest from local private sector operators. As of September 2015, 68 private operators are operating in 215 municipalities and 39 single village projects are operated by communities.[23] These figures include grid extensions projects and projects within the initial EDM concession perimeter, as well as projects that have been transferred to or are in the process of being transferred to EDM.

Central Role of AMADER

AMADER plays a central role as the agency responsible for developing household energy and rural electrification. In this respect, according to the Law establishing the agency, AMADER: (i) promotes electrification in rural and peri-urban areas, (ii) works with all types of operators, national and international private, operators, NGOs, decentralized groups, cooperatives, (iii) provides technical assistance and financial support (investment subsidies), and (iv) is responsible for managing the Rural Electrification Fund.

AMADER also analyzes subsidy requests and business plans and prepares all the documents in relation to the granting of authorizations to rural operators by the Minister in charge of Energy. The agency concludes 15-year "authorization contracts" (which are concession-type agreements) as well as financing conventions with the operators. As part of its monitoring rights under the authorization contracts, AMADER authorizes electricity price adjustments for rural operators. The extent of these latest tasks may appear to go beyond the mission defined by the Law, which might be adjusted accordingly.

Rights and obligations of Permissionnaires

According to Decree n°00-184/P-RM implementing the Electricity Ordinance, the beneficiary of an authorization is a "*permissionnaire*". Rights and obligations of the *permissionnaire* are similar to those of a concessionaire, both benefitting from a delegation of the public service. The *permissionnaire* must comply with the same general principles deriving from the operation of a public service than a concessionaire, as set forth in particular by the implementing decree of the Electricity Ordinance. The *permissionnaire* has the right to directly collect the tariff from users.

While a call for bids in accordance with the procedure determined by the Regulatory Commission of Electricity and Water (*Commission de Régulation de l'Electricité et de l'Eau* - CREE), according to the Electricity ordinance and its implementation Decree, authorizations are granted upon the application made to the Minister in charge of energy with no obligation of any competitive process, provided that the applicant is deemed to have the capacity to fulfil its obligations. In case of several applicants the choice is made on the basis of the same criteria.

Authorization process

The process of granting authorization to an operator may be summarized as follows:

- A private entrepreneur or a community within the municipality concerned obtains an opinion from the representative of the municipality on the positive impact of

[23] Data supplied by AMADER

the Project and its consistency with municipality's development plan existing or contemplated;

- The applicant then files an application for a preliminary permit in attaching the opinion from the municipality and a project description sheet summary describing the scope of the project, its demographic and economic characteristics, the intended electrification system and goals. The application contains an undertaking to file an application for authorization (in accordance with the Electricity Ordinance) including the results of a technical and economic study of the electrification project within a six-month period
- After granting the preliminary permit, AMADER must publish its decision. This begins a 60-day period during which any other third party candidate can make a better proposal to AMADER for the same project. To our knowledge, in the case another applicant declares its interest within this 60-day period, there is no formal evaluation procedure based on pre-determined criteria. These competing applications have been relatively rare. There have been no more than 3 cases where another applicant declared is interest in an authorization sought by another operator.[24]
- When the 60-day period has expired, the operator with the preliminary permit is the only candidate allowed to submit the final application for obtaining the authorization.
- The authorization is granted on the basis of the AMADER's analysis of the business plan submitted by the applicant.

Where the authorization is granted by the Minister on the basis of AMADER's analysis, AMADER and the operator enter into the authorization contract and the financing convention. This procedure appears to be a formality rather than a genuine opportunity for the Minister to evaluate projects.

World Bank Involvement

In 2003, the World Bank's Household Energy and Universal Access (HEURA) project supported Mali's implementation of a concession approach to rural electrification. This project included support to develop AMADER, support for "top-down" zonal concessions and the "bottom-up" PCASER program.[25]

Many benefits were anticipated by the establishment of the rural electrification approach and the HEURA project, including:

- Increasing the capacity and the number of staff at AMADER, CREE DNE (Direction Nationale de L'Energie), and DNCN (Direction Nationale de la Conservation de la Nature)
- Increasing the private operators offering decentralized electricity services from two to ten

[24] AMADER, Interview with Castalia, September 2015.

[25] World Bank. Project Appraisal Document: Household Energy and Universal Access (October 6th 2003).

- Increasing access to modern energy outside the EDM concession area to: 40,000 homes, 1,080 enterprises, 125 rural schools and 107 health clinics.[26]

By 2008, the World Bank HEURA project had performed satisfactorily and succeeded in a number of areas: 41 electrification projects proposed by local private operators had been financed; 20 business plans had been selected and were awaiting financing; 36 business plans were being reviewed to ascertain their technical and financial viability; and 44 business plans were under development by promoters.[27] Connections were extended to 690 public and community institutions and centers, including 82 schools and 45 health centers.[28] The targets for the HEURA project, and the expected benefits, grew in 2008 when additional World Bank financing of US$35.0 million of was secured for the HEURA project.

More recently the World Bank's Rural Electrification Hybrid System Project (*Systemes Hybrides pour lElectrification Rurale – SHER*) is aiming at increasing access to electricity and electricity production from renewable energy sources. The SHER project is structured around three main components:

1) Increasing renewable energy generation capacity in approximately fifty existing rural mini-grid power stations currently relying exclusively on diesel generation by including hybrid systems (including photovoltaic panels, inverters, batteries, and control electronics; this component includes as well extension and densification of distribution network;
2) Expand off-grid lighting and solar lanterns in targeted rural areas through catalyzing the markets, and improve energy efficiency and promote a rational and efficient use of electricity on targeted mini-grids, and
3) Project implementation and capacity building.

[26] World Bank. Project Appraisal Document: Household Energy and Universal Access (October 6th 2003).

[27] World Bank. Project Paper on Proposed Additional Financing Credit to the Republic of Mali for a Household Energy and Universal Access Project (July 31, 2008). pg. 11.

[28] World Bank. Project Paper on Proposed Additional Financing Credit to the Republic of Mali for a Household Energy and Universal Access Project (July 31, 2008). pg. 11.

3 Mali's Rural Electrification PCASER Concessions

The PCASER projects in Mali today are operated by a combination of community organizations, private enterprises, entrepreneurs, and a few international companies.[29]

According to data received from AMADER, 68 private operators are operating in 215 municipalities and 39 projects are operated by communities, for a total of 254 projects in operation. Among the private operators only four are operating more than three projects. A list of projects and operators is given in Schedule 1.

17 operators are operating in more than two municipalities and four of them are operating in more than 20 municipalities. The four operators who are present in more than 20 municipalities are presented in Table 3.1.

Table 3.1: Private Operators with Operations in more than 20 Municipalities

Operator	Number of Projects	Number of municipalities connected
ACCESS	12	22
KAMA	15	31
SSD KURAYE	4	26
SSD YEELEN KOURA	5	21

Source: AMADER

AMADER estimates that all the projects listed in Appendix B have connected approximately 78,000 customers to electricity connections.[30] This figure includes customers connected to mini-grids managed by EDM, the state-owned utility.

All projects operated by private operators or communities cover both production and distribution. Thirteen grid extension projects to be connected to EDM grid have never been operated by their promoters as a result of the lack of agreement between EDM and the operators on electricity sale and purchase conditions. A PPA agreement couldn't be reached. These grid extensions projects are or will be transferred to EDM, upon the government's decision. As a compensation for the transfer, EDM pays to the private operator the portion of the net book value of the investment in proportion of the financing brought by the private operator (usually 25 percent).

The localities, where these grid extensions were built and the 36 localities which were initially within EDM perimeter and will be transferred back to EDM, in applying the same financial terms as above mentioned, are identified in the list of PCASER projects given in Appendix B.

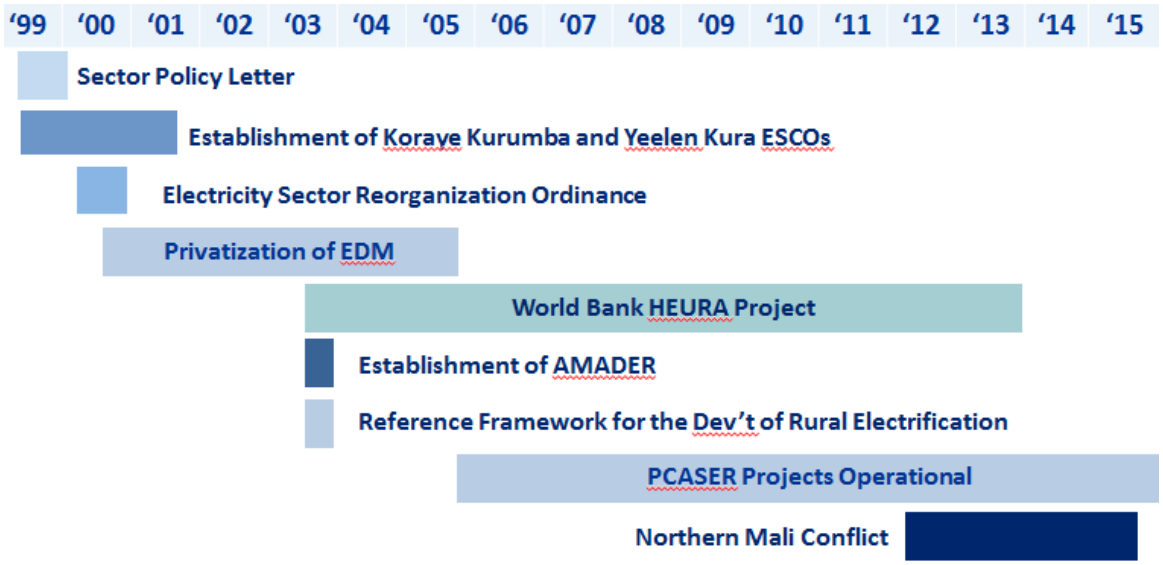
[29] Interview, World Bank (July 2015)

[30] AMADER interview: according to estimates made by operators in their feasibility studies, 75328 households should have access to electricity in 2013 and an additional 2,600 in 2014.

3.1 Stages of Development

A timeline showing the major stages of development leading up to the concession is presented in Table 3.2.

Table 3.2: Stages of Development of Concession



3.2 Operations and Management

The permissionnaires have diverse ranges of skills sets and management capacity. Many are small and do not have extensive operational or management know-how. However, some are ambitious and growing their businesses through adding connections or offering alternative services to their customers. The extent to which international partners involved in operations and management is generally limited.

Tariffs

The tariffs charged by the private rural operators are significantly above those charged by EDM. This difference creates "rate envy," angers rural customers, particularly in areas near the EDM grid. In 2011, the government forced EDM to connect its grid to 7 mini-grids near the EDM concession area.[31] This example shows how 1) mini-grids can be an intermediate stage for the electrification of communities; and 2) mini-grid operators need to evaluate how grid electrification might impact their service areas.

The tariff differences have created tension in communities about to be served by rural operators. In some cases, there has even been violence when new rural operators try to offer electricity services. In one case, customers became violent and threatened to burn a new generation unit, thinking that, as a result, they would receive later on the less expensive grid electricity.

[31] EUEI PDF, "Mini-Grids Policy Toolkit", 2014, available online at http://euei-pdf.org/sites/default/files/files/field_pblctn_file/RECP_Mini%20Grid%20Policy%20Toolkit-web-%28pdf%2C%2014%20MB%2C%20FR%29_0.pdf (accessed October 8th 2015).

3.3 Financing Arrangements

In accordance with the Reference Framework, a subsidy of investment costs is allocated for up to 80 percent of the amount of the investment. At least 20 percent of the initial capital investment is provided by the private operator. The amount of the grant depends on the number of contemplated subscribers, the purchasing power of the population, the rural electrification technology.

We understand that the 20 percent of the capital is raised from operators' own funds or those of local entrepreneurs or partners. There is very little formal bank lending to private operators.

In practice, AMADER has been financing on average about 75 percent of the investments in new rural mini-grids, with the operators providing the remaining 25 percent of the financing[32].

Subsidies are currently funded by multilateral and bi-lateral development aid. AMADER would like to secure the sustainability of rural electrification development through financing investment subsidies by the payment of a portion of the energy income received by EDM.

The terms and conditions for the payment of the subsidy are defined in a financing convention signed between the permissionnaire and AMADER acting as manager of the Rural Electrification Fund. In accordance with this convention:

- The permissionnaire must provide evidence of the existence of its portion of the financing within 60 days from the signature of the financing convention and use it to invest in the equipment before any disbursement of the subsidy;
- When the financing to be provided by the permissionnaire is disbursed and invested a fist payment of 25 percent maximum of the subsidy is paid; other payments are made depending on the progress of the works in accordance with the time schedule agreed between the permissionnaire and AMADER.

We learned that some entrepreneurs have been inflating their capital investment estimates in order to receive larger subsidies.

3.4 Contractual Arrangements

Private rural operators are granted an authorization relating to power production with an installed capacity exceeding 50 kW and up to 250 kW. There is no competitive process.

They receive first a preliminary permit on the basis of an application including a certificate from the representative of the municipality on the positive impact of the Project, upon submission of an application to AMADER and undertakes to apply for authorization within a six month period. The authorization is granted by the Minister on the basis of the AMADER's analysis of the business plan submitted by the applicant.

Contracts in practice

When the authorization from the Minister is granted, the applicant and AMADER sign an "authorization contract" which defines the rights and obligations of the permissionnaire in a way similar to a concession agreement, including technical specifications attached.

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[32] World Bank, "Mali: Rural Electrification Hybrid System Project," November 15th 2013, Project Appraisal Document, Report No: PAD688.

It may be noted that AMADER, represented by its chairman, is signing these contracts on its own name and not on behalf of the Minister in charge of Energy, who delivers the authorization. It seems that the conclusion of this contract by AMADER on behalf of the Minister would better correspond to the allocation of powers and provide more legal safety.

The authorization contract is concluded for 15 years. Under the authorization contract the permissionnaire undertakes to:

- Build out the proposed investment, maintain and renew the equipment;
- Realize inside electrical installation of the subscribers;
- Provide the service during at least seven consecutive hours per day;
- Pay to AMADER a "regulation fee" of 2 percent of turnover.

In the case that an entity obtains a **concession** contract for an area that includes an area where an entity operates under an **authorization** contract, the permissionaire agrees to negotiate in good faith the terms of surrender of his authorization to the concessionaire. The payment of financial compensation should cover at least the net book value of the investment financed by the permissionnaire. This commitment is part of the application file and of the authorization contract.

Growing from a permissionnaire to a concessionaire

When the installed capacity of a mini-grid grows from below 250 kW to above 250 kW, a conflict appears between the law and the practice. Under the Electricity Ordinance[33], a new authorization must be requested in the case of any significant increase of the installed capacity. However, in practice, AMADER allows a *permissionnaire* exceeding this threshold to continue to operate under its authorization, in order to avoid the competitive procedure required for a *concession* agreement.

The AMADER policy of allowing authorizations to exceed the 250 kW threshold is adopted pursuant to the Reference Framework (CdR-ER) for the development of rural electrification prepared by the Government of Mali.[34] The CdR-ER policy document (2003) states that "in the event the capacity of the power plates for a given territory exceeds 250 kW, this territory can have several authorizations for each village or group of villages".[35] The practice could be brought into compliance with the law by amending the Ordinance accordingly.[36]

3.5 Technological Approach

The majority of the Mali's permissionaires use vertically-integrated mini-grids backed by diesel-fired generators. Increasingly, hybrid solar/diesel systems are being deployed.

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[33] Ordinance n°00-019/P-RM dated March 15, 2000 on the reorganization of the electricity sector and implementation Decreen°00-184/P-RM dated April 14, 2000.

[34] Ministry of Mines, Energy and Water (Mali), "*Cadre de Référence pour le Développement de l'Electrification Rurale* - CdR-ER", May 2003.

[35] Ministry of Mines, Energy and Water (Mali), "*Cadre de Référence pour le Développement de l'Electrification Rurale* - CdR-ER", May 2003, pg. 5.

[36] This policy is adopted pursuant to the reference framework for the development of rural electrification prepared by the government but is in contradiction with the Ordinance and would require the Ordinance to be amended accordingly..

Twenty permissionaires built out grid-extension projects, but none were able to agree on power-purchase agreements with EDM. EDM sees the private operators as competitors. As a result of a settlement negotiated by the President, EDM was allowed to buy the grid extension projects from the private operators at around 25 percent of their book value—the investment cost that was incurred by the private operators. The Government of Mali may have favored this option under pressure from prospective new clients preferring to become EDM customers (and pay the EDM tariff) rather than becoming customers of small operators (and paying a relatively higher tariff).

Other than the grid extension projects, the permissionaires don't interact with the existing transmission and generation sectors.

The number of electrified localities broken down by technologies serving them is presented in Table 3.3.

Table 3.3: Breakdown of Localities by Type of Energy (2015)

Type of Energy	Number of localities
Diesel-fired generators	133
Hybrid Solar/Diesel:	28
Biofuel	15
Grid extension	20
Multi-functional Platforms (MFP)	42
Individual Solar Kits	15
Micro-hydro energy	1
Total	**254**

Source: AMADER

3.6 Regulatory Arrangements

The PCASER projects are regulated by AMADER.

The Electricity Ordinance provides for the principles of tariff regulation. Sales by *concessionaires* are subject to regulation by the directives from the national regulator (Regulatory Commission of Electricity and Water – CREE). On the other hand, sales by *permissonnaires* are free. In practice, the prices set by *permissionnaires* are regulated by AMADER on the basis of the authorization contract entered into between the *permissionnaire* and AMADER. In effect, this is "regulation by contract".

The law and the contracts allow for the initial tariff to be changed in accordance with a tariff indexation formula depending on the variation of the fuel prices, the wage index for the Public Service in Mali, the price index for capital goods in OECD countries. AMADER still needs to agree to any requested tariff change. Authorization holders initiate the tariff adjustment by applying to AMADER. However, whether this tariff indexation process has

been implemented as intended is not clear. One concessionaire, KAMA (examined in detail in Appendix A) applied for a revision of the tariff but never received it.

4 Assessment of Concession

We evaluate Mali's PCASER concession approach to rural electrification against its targets, analyze the reasons for the results, and present lessons for future concessions.

4.1 Evaluating Success of Concession

The PCASER concessions succeeded at extending 78,000 connections to rural households. However, the results of the concession depend on the dimension of success:

4.1.1 Access

At the outset of the concession approach, the Government of Mali had no explicit targets in terms of number of connections. However, in 2003 the World Bank had a target of 40,000 connections within 5 years from effective date. In 2009, the Government of Mali set an electrification coverage target of 50 percent by 2015. The people we met with in Bamako said the target was politically oriented and that few people at the time believed this target to be achievable.

78,000 rural households have been connected to electricity as a result of the bottom-up PCASER concession approach.[37] To our knowledge, Mali is the best developed case of mini-grids increasing access at this scale. AMADER shared with us how they arrived at this estimate. They added the number of connections established during 2013 and 2014 to a World Bank estimate of 74,787 connections published in March 2013. The 74,787 figure appears in the Implementation Completion and Results Report (ICR) for the HEURA project as an estimate for the number of connections on June 30th 2012.[38]

We estimate that the number of people with electricity connections in their households is **577,200**. We arrive at this number by assuming that a household in Mali has 7.4 people,[39] and multiplying that figure by the 78,000 rural households that have access to electricity.

The PCASER approach has quite clearly been a success at extending access to rural households.

However, this success may not be as high as one might be led to believe by other estimates. A number of sources estimate the rural electrification rate in Mali to be between 11 percent and 18 percent.[40] These estimates would suggest that between 1.05 million and 1.73 million rural people have access to electricity in Mali.[41]

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[37] AMADER, Interview with Castalia, September 2015.

[38] World Bank, "Mali: Household Energy and Universal Access Project," March 28th 2013, Implementation Completion and Results Report (ICR), Report No: ICR2627.

[39] We base this assumption on four recent surveys in Mali that reported household sizes from 5.7 to 9.1. From "Do Household Definitions Matter in Survey Design? Results from a Randomized Survey Experiment in Mali" by Lori Beaman, Northwestern University, June 2011.

[40] These sources include the World Bank Open Data bank, the World Bank PADs and ICRs for the most recent Mali projects, and people Castalia met in Bamako.

[41] Based on a Malian rural population estimate of 9.60 million from World Bank Open Data (2014).

Because the rural electrification rate was nominal in 2003, we find it difficult to explain the discrepancy between these estimates. The discrepancies could be due to:

1. **Differences in the definition of "rural" vs. "urban"**. In many countries, government officials had different approaches to defining what areas were considered rural.
2. **Differences in the definition of "access"**. We believe that these estimates could derive from a broad interpretation of "access to electricity". The 2013 Rural Electrification Hybrid System Project Appraisal Document suggests this could be the case as it estimates that "1,200,000 people gained access to modern energy services through the project (based on a fairly extensive definition of access including some populations benefiting from public lighting)."[42]
3. **Other energy access projects undertaken outside of PCASER**. It is possible that other actors, such as EDM or off-grid energy services companies could have added connections during this time.

4.1.2 Quality of service

AMADER specifies technical standards and a minimum number of hours per day that electricity must be supplied. However it is not clear how Mali's rural private operators are faring against these standards and minimum requirements.

4.1.3 Sustainability

In our assessment, many of the operating concessions are sustainable. They receive no ongoing donor funding and are able to recover their costs through tariffs. We reviewed the financials for one of the bigger private rural operators, KAMA. They show that five of its 15 concessions are profitable.

4.1.4 Efficiency

We are not able to assess whether the deployment of diesel-fired mini-grids in Mali was the 'least-cost' approach. The deployment of mini-grids in Mali has mostly been the result of private operator's decisions about what was viable rather than optimizing techno-economic outcomes. The majority of the private operators elected to invest in diesel-fired generation sets.

In theory, an 80 percent capital expenditure subsidy favors technologies such as solar and hydro that have a higher ratio of upfront capital costs to operations and fuel costs. However, these technologies have been used in few projects.

4.1.5 Other Impacts

The concessions had a number of reported social and economic impacts in Mali's rural areas. For example, over time the need for installing and maintaining generators has led to the creation of skilled jobs in rural areas. AMADER estimates that around 800 skilled jobs have been created by rural private operators. There are now training programs specialized in rural electrification.

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[42] World Bank, "Mali: Rural Electrification Hybrid System Project," November 15th 2013, Project Appraisal Document, Report No: PAD688, pg. 17.

4.2 Arrangements that Could Have Delivered Better Results

Ex-post, it is difficult to say whether alternative arrangements could have delivered better results. We identified several short-comings in the approach. Specifically, AMADER may not be getting the best deal because its procurement process is not very competitive and its project evaluation process is fairly opaque. There are institutional remedies for these problems, such as:

- Increasing competition by using calls for election of interests for the PCASER projects, instead of spontaneous or unsolicited proposals
- Improving the assessment of business plans by setting clear, objective, quantifiable evaluation criteria and using independent experts to assess proposals;
- Strengthening transparency of the process by having the assessment of the business plans and recommendation for granting the authorization conducted by an independent committee. This committee could, for example, be composed of professionals from government or civil society, and chaired by AMADER.

However, we also believe that these institutional changes may have hindered the entire PCASER process because of the difficulties associated with running competitive tenders.

AMADER's recent steps to promote hybrid systems[43] seek to rectify some of the perceived shortcomings of PCASER while building on its successes. The new approach seeks to:

- Encourage projects of a larger scale;
- Reduce the unit investment costs;
- Improve the operating performance and capacity of the operators
- Move towards sector consolidation.[44]

4.3 Reasons for Results

The results of the concession are explained by the following key factors:

- **Leveraging local capacity.** In the early 2000s, the hope was to attract international operators to large concession areas. It's likely that these larger concessions, had they occurred, would have had difficulties dealing with the realities of operating in Mali.
- **A combined promoter and regulator for rural electricity can be very effective.** AMADER is powerful and well-resourced relative to rural electrification agencies in other countries. As a result, it has been able to institute its vision in rural areas.
- **National utilities are threatened by competition.** EDM is a state-owned company but its efforts have undercut rural electrification efforts by AMADER and by private operators.

[43] Supported by the World Bank Rural Electrification Hybrid System Project.

[44] World Bank, "Mali: Rural Electrification Hybrid System Project," November 15th 2013, Project Appraisal Document, Report No: PAD688.

4.4 Replicability of Experience and Success

The concession model used in Mali and its success can be replicated elsewhere. Bottom-up concessions like those envisaged in PCASER can be quite rapidly deployed and tap local entrepreneurs quickly. Top-down concessions are slower to implement, require a more capable rural electrification agency and more institutional support. However, electrification progress has slowed since the Northern Mali conflict, and it remains to be seen if mini-grids can form the foundation for a larger electrification roll-out.

4.5 Lessons for Future Concessions

The PCASER projects illustrate lessons for governments considering using a concession approach to rural electrification:

- **A poorly functioning state-owned national utility creates a drag on the whole sector and has negative repercussions on rural areas.** EDM absorbs significant amounts of subsidies and sells power below cost. The difference between the EDM tariff and rural tariffs has been the cause of significant problems for private rural concessionaires, and the Government has had to intervene in several cases to mediate disputes.
- **There is a trade-off between project approval speed and good governance.** AMADER is a central agency with a great deal of responsibility over the rural electricity sector. Some people in the sector have bemoaned how much discretion AMADER has, and how difficult it can be to understand how they reach their decisions, or if they are procuring at "least-cost." However, imposing technocratic requirements of good governance may in fact hamper efforts to build projects quickly, albeit imperfectly. Mali's approach may have benefited from the fact that AMADER awards authorizations without requiring up-front competition for each authorization.
- **Giving formal regulatory authority to the rural electrification agency may be the most effective way to implement mini-grid concessions.** Mali's success with bottom up development of private mini-grids seems attributable, at least in part, to the fact that AMADER performs two roles: it gives grants and technical assistance but it also regulates the mini-grids in its authorization and grant agreements (through regulation by contract). In contrast, in other countries (including for example Senegal), these two functions are performed by two different government agencies. This divided regulatory arrangement may make it more difficult to manage mini-grid concessions.
- **Mini-grids power by diesel-fired generators can be financially sustainable.** Despite their high unit costs and other shortcomings, diesel-fired generators have been a key part of Mali's rural electrification success. However, whether Mali's mini-grid concessions will be able to recover their long-run costs (including replacement equipment), remains to be seen.

Appendix A: Small Concessionaire Summary – KAMA

Background and motivation

KAMA carries on various activities in the energy sector including supply and installation of generators, lines and substations.

Founded in Mali, KAMA has established subsidiaries in Guinea and Ivory Coast.

In 2006, Mr Mamadou SAKO, KAMA's CEO, decided to submit a project for producing and distributing electricity in four villages (with four 80kW generators) within the town of Diakon, his native town, in the Kayes Region.

Extent of rural electrification operation

KAMA now operates 16 projects and serves more than 5000 clients in 31 villages located in five different regions (mainly in the Kayes Region). See Table A.1.

Table A.1: KAMA Number of subscribers by type of clients and by project (cumulative average) in 2014

Project	Residential Customers	Businesses	Health Centers	Public Institutions	Schools	Cult Places	Public Lightening Places	TOTAL
Sadiola	1 008	6	3	6	2	6	54	**1 085**
Keniéba	814	72	2	28	3	7	87	**1013**
Siribala	713	64	1	5	1	5	53	**842**
Diafarabé	343	28	1	2	1	3	72	**450**
Fourou	501	23	1	3	1	1	70	**600**
Trentoumou	71	3	1	0	1	1	12	**89**
Kembélé	31	10	1	0	1	1	12	**56**
Bendougou	131	21	0	1	0	1	14	**168**
Sibendi	103	0	1	0	0	1	12	**117**
Diakon	99	0	1	2	1	1	12	**116**
Sangafé	17	3	1	0	1	1	14	**37**
Diabadji	58	0	0	0	0	2	40	**100**
Diataya	123	0	0	0	1	0	40	**164**
Loulouni	195	4	1	0	0	4	60	**264**
Sandaré	174	29	1	3	1	3	39	**250**
Kembé	58	5	0	0	0	1	9	**73**
TOTAL	**4 439**	**268**	**15**	**50**	**14**	**38**	**600**	**5 424**

Source: KAMA

None of the projects are connected to EDM network. A project generally includes several generators located in several villages.

Service hours are always beyond the compulsory seven hours per day, as provided for in the AMADER specifications. It may be up to 15 hours per day in the largest villages.

All the generators are diesel generators, except for two of them where hybrid photovoltaic/diesel power plants have been installed. According to KAMA, hybrid generators do not result in reducing the cost of kW/h due to the higher investment cost. However, hybrid solutions allow (i) more rapid expansion of access without waiting for a minimum number of clients, (ii) a more regular service in remedying the lack of diesel supply and (iii) to stabilize the costs.

Tariffs

Most of the clients are billed on a monthly lump sum basis. Monthly subscriptions vary depending on the category of service chosen.

Table A.3 shows the average kW/h charge per project in 2014.

KAMA never obtained a revision of the tariff provided for in the Authorization Agreement, in applying the conditions of revision provided for by the general specifications attached to the Agreement.

The average rate of collection efficiency established from KAMA data is always above 70 percent, except in two localities where it is below 60 percent. See Table A.2.

Table A.2: KAMA Collection Performance (2014)

Location	Average recovery rate (%)
Sadiola	91
Keniéba	71
Siribala	72
Diafarabé	85
Fourou	75
Sandaré	80
Trentoumou	73
Kembélé	82
Bendougou	58
Sibendi	81
Diakon	77
Kembé	83
Sangafé	79
Diabadji	59
Diataya	80
Loulouni	78
TOTAL	**77**

KAMA complains about collection difficulties and is contemplating to invest in systems allowing prepayments. However, such systems are too expensive compared to the number of clients in a number of cases.

Financials[45]

KAMA has in most cases financed its capital expenditures in using the average rate of subsidy. However in some instances KAMA share of investment financing has been larger.

The following examples of financing the reinforcement of capacities and extension of grids have been given:

SADIOLA: reinforcement of production capacity and extension of grids

Cost: XOF 754,387,322

KAMA share: XOF 529,387,322 XOF, i.e.: 70.17%

AMADER financing: XOF 225,000,000, i.e.: 29.83%

It seems that such examples of apportionment of the financing are seldom.

SANDARE : reinforcement of production capacity and extension of grids

Cost: XOF 201,797,100

KAMA share: XOF 46,413,333, i.e.: 23%

AMADER financing: XOF 155,383,767 i.e.: 77%

Fuel generally represents more than 80% of operating expenses (excluding depreciations and provisions). Table 4 attached shows operating expenses, revenues, profit or loss per project. Only five projects (those with the largest number of clients) show a profit.

Main challenges and problems

The discrepancy between EDM tariff and tariff applied by rural electrification projects is too big and is difficult to understand by consumers. Kamma had to face violent reactions from consumers at the occasion of tariff collection.

The lack of profitability of its power generation and distribution activity reduces KAMA's capacities to invest in order to reinforce its production capacity or convert power plants into hybrid systems.

KAMA recognizes AMADER's role in the quality control, in particular by having the services rendered controlled by independent surveyors.

However, AMADER's efficiency has been questioned on two specific topics.

- In one occasion, KAMA received an Authorization to invest in a new project and started to disburse its share, while the subsidy could not be supplied since the corresponding financing was not anymore available due to the elapse of time. According to KAMA, AMADER did not inform them of the risk of unavailability of funds and this caused damages to KAMA.
- Another important concern is related to the non-reimbursement of VAT applicable to purchase of diesel for the generators. Procedures requested from AMADER and custom authorities are so strict and burdensome that KAMA never received any reimbursement of VAT, while it should benefit from it. In 2014, this represents approximatively FCFA 81 millions of VAT paid on 820,000

[45] Throughout this study we use the following exchange rate: 1 West African CFA Franc equals 0.001545 US Dollars.

liters of diesel consumed. KAMA believe that an exemption mechanism should be put in place rather than a reimbursement and pointed out that EDM is benefitting from such direct exemption.

Table A.3: Average Price, in XOF per kWh (2014)

Month	FOROU	SADIOLA	KENIEBA	SIRIBALA	DIAFARABE
January	973	295	278	315	0
February	715	280	430	300	420
March	705	247	255	316	458
April	1 476	273	245	323	1 069
May	410	253	230	335	533
June	0	262	240	321	550
July	0	264	317	415	530
August	0	285	250	375	440
September	0	292	260	401	560
October	0	268	275	233	506
November	0	255	202	208	493
December	0	279	270	227	534

Month	SANDARE	TRENTOMOU	KEMBELE	BENDOUGOU	SIBENDI
January	484	1 787	1 364	377	491
February	482	2 122	1 281	437	603
March	383	1 594	1 102	383	532
April	0	1 687	779	499	588
May	461	1 318	898	577	468
June	368	1 315	1 262	486	535
July	444	1 579	1 244	523	698
August	255	1 587	1 071	345	397
September	424	1 044	1 195	345	477
October	546	1 906	1 475	474	539
November	373	1 686	2 284	364	441
December	357	816	1 086	366	508

Month	DIAKON	KEMBE	DIATAYA
January	490	706	728
February	486	837	928
March	342	805	568
April	464	799	614
May	398	1 269	794
June	382	1 016	710
July	476	991	652
August	364	986	583
September	471	1 003	458
October	385	806	552
November	0	642	486
December	484	574	0

Source: KAMA

Table A.4: Cumulative Operating Expenses and Revenues by Project in XOF (2014)

Operating expenses (excluding depreciation and provisions)	Sadiola	Kéniéba	Siribala	Diafarabé
Fuel (Generator)	142 165 000	210 938 000	41 336 400	20 369 000
Lubricants (Generator)	2 037 595	1 504 350	885 000	483 800
Consumables	6 000	1 000	0	0
Office supplies	208 100	134 150	102 050	18 400
Fuel and lubricant (Vehicle)	421 715	645 550	169 250	119 900
Travels	0	20 000	7 500	5 000
Rent and rental expenses	455 000	690 500	18 500	137 500
Generators maintenance (external services)	5 097 960	4 405 692	2 750 800	562 300
Miscellaneous maintenance	265 900	663 532	58 975	280 675
Miscellaneous management costs	840 000	814 300	0	0
Personnel costs	7 418 109	7 141 568	4 773 732	3 240 000
Miscellaneous expenses	270 200	88 606	0	169 500
TOTAL Operating expenses	**159 185 579**	**227 047 248**	**50 102 207**	**25 386 075**
Operating revenues				
Sale of energy	256 260 440	375 024 256	64 783 946	26 402 444
Subscription fees	1 346 280	1 058 620	90 000	278 600
TOTAL Operating revenues	**257 606 720**	**376 082 876**	**64 873 946**	**26 681 044**
Gross operating profit/loss	**98 421 141**	**149 035 628**	**14 771 739**	**1 294 969**

Operating expenses (excluding depreciation and provisions)	Fourou	Sandaré	Trentoumou	Kembélé
Fuel (Generator)	26 591 800	16 885 000	3 489 100	2 706 800
Lubricants (Generator)	225 000	626 147	70 000	65 000
Consumables	400 000	0	328 000	132 500
Office supplies	16 500	28 000	62 200	23 400
Fuel and lubricant (Vehicle)	39 735	247 050	178 750	105 850
Travels	0	119 500	34 000	5 000
Rent and rental expenses	160 000	70 000	0	100 000
Generators maintenance (external services)	0	349 000	140 000	45 000
Miscellaneous maintenance	46 000	250 700	166 850	90 800
Miscellaneous management costs	111 600	204 300	25 700	0
Personnel costs	2 520 000	1 786 004	300 000	300 000
Miscellaneous expenses	15 500	326 400	455 750	82 000
TOTAL Operating expenses	**30 126 135**	**20 892 101**	**5 250 350**	**3 656 350**
Operating revenues				
Sale of energy	24 387 464	16 772 359	5 685 080	2 237 360
Subscription fees	614 335	358 000	122 550	41 000
TOTAL Operating revenues	**25 001 799**	**17 130 359**	**5 807 630**	**2 278 360**
Gross operating profit/loss	**-5 124 336**	**-3 761 742**	**557 280**	**-1 377 990**

Operating expenses (excluding depreciation and provisions)	Bendougou	Sibendi	Diakon	Kembé
Fuel (Generator)	14 320 200	7 462 550	9 515 200	5 405 225
Oil purchase (Generator)	177 000	68 000	75 000	300 500
Consumables	8 000	0	0	0
Office supplies	5 000	14 750	5 000	9 000
Fuel and lubricant (Vehicle)	179 412	165 300	98 800	103 450
Travels	15 000	10 000	0	5 000
Generators maintenance (external services)	1 235 750	210 250	187 300	492 000
Miscellaneous maintenance	54 300	68 850	76 100	7 500
Miscellaneous managment costs	0	0	52 000	0
Personnel costs	480 000	420 000	420 000	420 000
Miscellaneous expenses	1 620 340	37 300	758 240	17 000
TOTAL Operating expenses	**18 095 002**	**8 457 000**	**11 187 640**	**6 759 675**
Operating revenues				
Sale of energy	14 611 470	7 248 838	8 001 550	3 463 003
Subscription fees	148 540	127 700		52 540
TOTAL Operating revenues	**14 760 010**	**7 376 538**	**8 001 550**	**3 515 543**
Gross operating profit/loss	**-3 334 992**	**-1 080 462**	**-3 186 090**	**-3 244 132**

Operating expenses (excluding depreciation and provisions)	Sangafé	Diabadji	Diataya	Loulouni
Fuel (Generator)	2 233 758	1 076 000	5 243 000	13 649 750
Lubricants (Generator)	71 000	13 500	372 900	298 000
Consumables	0	0	0	143 000
Office supplies	4 000	0	11 400	8 575
Fuel and lubricant (Vehicle)	45 950	12 000	54 100	104 250
Travels	8 000	0	0	27 525
Rent and rental expenses	0	0	0	180 000
Generators maintenance (external services)	102 500	38 000	202 500	55 000
Miscellaneous maintenance	9 000	0	35 000	43 550
Miscellaneous management costs	0	0	7 200	13 600
Personnel costs	300 000	300 000	1 014 000	1 320 000
Miscellaneous expenses	14 500	30 000	210 900	76 600
TOTAL Operating expenses	**2 788 708**	**1 469 500**	**7 151 000**	**15 919 850**
Operating revenues				
Sale of energy	1 445 540	974500	6 343 070	15 411 029
Subscription fees		67400	25 000	396 400
TOTAL Operating revenues	**1 445 540**	**1 041 900**	**6 368 070**	**15 807 429**
Gross operating profit/loss	**-1 343 168**	**-427 600**	**-782 930**	**-112 421**

Appendix B: List of PCASER Projects

Table B.1: List of PCASER Projects

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
1 ***Kayes***	***90 Localities***			
	1. Ambidédikoré	SSD KURAYE KURUMBA	Diesel	
	2. Awoiny	GTE	Diesel	
	3. Badinko	SOGEP	Diesel	
	4. Batama	GIE KALAOU-MOULINE	Diesel	
	5. Bendougou	KAMA	Diesel	
	6. Bongourou	Comité Local-Bongourou	MFP	
	7. Diakon	KAMA	Diesel	
	8. Dialaka	SSD KURAYE KURUMBA	Diesel	
	9. Dialaya	Comité Local-Dialaya	MFP	
	10. Diandioumbéra	Comité Local-Diandioumbéra	MFP	
	11. Diankounté	KAGNELA	Diesel	
	12. Diataya	KAMA	Diesel	
	13. Diboli	SEF	Diesel	
	14. Diéma	EGB	Diesel	x
	15. Digokory	MECOF	Diesel	
	16. Dioncoulané	SSD KURAYE KURUMBA	Diesel	
	17. Diongaga	SSD KURAYE KURUMBA	Diesel	
	18. Djabadji	KAMA	Diesel	
	19. Djédigui Kassé	KAMA	Hybrid Diesel/Solar	
	20. Djidjan	SOGEP	Diesel	x
	21. Djoumara	BECI	Diesel	
	22. Dogofiry	SSD KURAYE KURUMBA	Diesel	
	23. Doualé	KAMA	Hybrid Diesel/Solar	
	24. Dramanekoré	SSD KURAYE KURUMBA	Diesel	
	25. Gagny	SSD KURAYE KURUMBA	Diesel	
	26. Gakoura	SSD KURAYE KURUMBA	Diesel	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
	27. Gory	SSD KURAYE KURUMBA	Diesel	
	28. Gouméra	BLUE SKY	Diesel	
	29. Gourel	GTE	Diesel	
	30. Guindinta	KAMA	Hybrid Diesel/Solar	
	31. Kabou	MECOF	Diesel	
	32. Kakoulou	GIE DJEYASO	Diesel	
	33. Kalaou	GIE KALAOU-MOULINE	Diesel	
	34. Kandia	KAMA	Hybrid Diesel/Solar	
	35. Kassaro	ESE2	Biofuel Diesel	
	36. Kembé	KAMA	Diesel	
	37. Kembélé	KAMA	Diesel	
	38. Kéniéba	KAMA	Hybrid Diesel/Solar	x
	39. Kersignané	SSD KURAYE KURUMBA	Diesel	
	40. Kersignané Kaniaga	SSD KURAYE KURUMBA	Diesel	
	41. Kirané	SSD KURAYE KURUMBA	Diesel	
	42. Kodié	SSD KURAYE KURUMBA	Diesel	
	43. Kokofata	SABOU	Diesel	
	44. Koméolou	SSD KURAYE KURUMBA	Diesel	
	45. Koniakary	SSD KURAYE KURUMBA	Diesel	x
	46. Korokodjo	BMB	Hybrid Diesel/Solar	
	47. Kourounidifing	KAMA	Hybrid Diesel/Solar	
	48. Kourounikoto	SOGEP	Diesel	
	49. Koury	KAMA	Diesel	
	50. Krémis	SSD KURAYE KURUMBA	Diesel	
	51. Lakanguémou	SSD KURAYE KURUMBA	Diesel	
	52. Lambidou	ABIS DISTRIBUTION	Diesel	
	53. Lany	MECOF	Diesel	
	54. Logo sabouciré	GIE DJEYASO	Diesel	
	55. Loumbama	KAMA	Diesel	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
	56. Loumbougana	GTE	Diesel	
	57. Madina	KAMA	Hybrid Diesel/Solar	
	58. Madina	GTE	Diesel	
	59. Maréna Diombougou	SSD KURAYE KURUMBA	Diesel	
	60. Mélo	BLUE SKY	Diesel	
	61. Mouliné	GIE KALAOU-MOULINE	Diesel	
	62. Nomo	BMB	Hybrid Diesel/Solar	
	63. Oussoubidiagna	MOHA COM	Diesel	
	64. Sadiola	KAMA	Hybrid Diesel/Solar	x
	65. Sagabary	EGEC	Diesel	
	66. Sambaga	SSD KURAYE KURUMBA	Diesel	
	67. Sambakanou	SSD KURAYE KURUMBA	Diesel	
	68. Sandaré	KAMA	Diesel	
	69. Sangafé	KAMA	Diesel	
	70. Sébékoro	ESE2	Diesel	
	71. Ségala	SSD KURAYE KURUMBA	Diesel	x
	72. Sélinkégni	MOHA COM	Diesel	
	73. Séro	BLUE SKY	Diesel	
	74. Sibendi	KAMA	Diesel	
	75. Sirakoro	EJD	Diesel	
	76. Sobokou	MECOF	Diesel	
	77. Somankidy	SSD KURAYE KURUMBA	Diesel	
	78. Soroané	MOHA COM	Hybrid Diesel/Solar	
	79. Tabakoto	ETL	Diesel	
	80. Tambacara	SSD KURAYE KURUMBA	Diesel	
	81. Tambaga	ESE2	Biofuel Diesel	
	82. Tigana	MOHA COM	Hybrid Diesel/Solar	
	83. Toukoto	REXMETAL	Diesel	
	84. Trentoumou	KAMA	Diesel	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
	85. Tringa Maréna	SSD KURAYE KURUMBA	Diesel	
	86. Troun	Comité Local-Troun	MFP	
	87. Troungoumbé	BMB	Diesel	
	88. Yaguiné	SSD KURAYE KURUMBA	Diesel	
	89. Yélimané	SSD KURAYE KURUMBA	Diesel	x
	90. Yéréré	BMB	Hybrid Diesel/Solar	
2 *Koulikoro*	***43 localities***			
	1. Baguineda	SGEI	EDM Grid	Transferred
	2. Daral	DENTAL	EDM Grid	Transferred
	3. Djalakorodji	GIE YELENBA	EDM Grid	Transferred
	4. Fanafièkoro	DENTAL	EDM Grid	Transferred
	5. Fanafièkoura	DENTAL	EDM Grid	Transferred
	6. Kambila	DENTAL	EDM Grid	Transferred
	7. Kanadjiguila	EOK	EDM Grid	Transferred
	8. Mamaribougou	EOK	EDM Grid	Transferred
	9. Ouézindougou	EOK	EDM Grid	Transferred
	10. Samaya	EOK	EDM Grid	Transferred
	11. Sanankoroba	ERD	EDM Grid	Transferred
	12. Tienfala	CATERES	EDM Grid	Transferred
	13. Banankoro	ERD	EDM Grid	
	14. Bancoumana	ACCESS	Hybrid Diesel/Solar	
	15. Dialakoroba	MES	Biofuel Diesel	
	16. Diawanèbougou	DENTAL	EDM Grid	
	17. Didiéni	BECI	Diesel	
	18. Digan	SAFEELEC	Diesel	
	19. Dioliba	EMS	Biofuel Diesel	
	20. Farabougou	Comité Local-Farabougou	MFP	
	21. Kafara	SAFEELEC	Diesel	
	22. Kéla	Comité Local-Kéla	MFP	
	23. Kerouané	HORONYA	Diesel	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
	24. Kolokani	SBNIF	Diesel	x
	25. Koloni	ACCESS	Biofuel Diesel	
	26. Korokoro	Comité Local-Korokoro	Diesel	
	27. Kourémalé	SPE	Hybrid Diesel/Solar	
	28. Madiga Sacko	KAMA	Diesel	
	29. Madina Sacko	AFRIMPEXE	Diesel	
	30. Markacoungo	KNEM	Diesel	
	31. Nara	EES	Hybrid Diesel/Wind	
	32. Naréna	Comité Local-Naréna	MFP	
	33. Nionsombougou	MES	Diesel	
	34. N'Tobougou	Comité Local-N'Tobougou	MFP	
	35. Sanankoro Djitoumou	SAFEELEC	Diesel	
	36. Siby	CHARBEL	Diesel	
	37. Simidji	Comité Local-Simidji	MFP	
	38. Soninkégni	DENTAL	EDM Grid	
	39. Sougoula	SAFEELEC	Diesel	
	40. Tiendo	Comité Local-Tiendo	MFP	
	41. Tigui	Comité Local-Tigui	MFP	
	42. Tinkélé	SAFEELEC	Diesel	
	43. Touba	HORONYA	Diesel	x
3 *Sikasso*	***62 localities***			
	1. Banankoro	KAMA	Diesel	
	2. Baramba	SSD YEELEN KOURA	Individual Solar	
	3. Blindio	SSD YEELEN KOURA	Individual Solar	
	4. Bougoula	ACCESS	Biofuel Diesel	
	5. Dembéla	Comité Local-Dembéla	MFP	
	6. Denié	ACCESS	MFP	
	7. Dessina	ACCESS	MFP	
	8. Fanidiama	COGEACOM	Diesel	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
	9. Faragouara	ACCESS	MFP	
	10. Finkolo	SSD YEELEN KOURA	Individual Solar	
	11. Finkolo Ganadougou	ACCESS	Diesel	
	12. Foh	Comité Local-Foh	Biofuel Diesel	
	13. Foulalaba	ACCESS	MFP	
	14. Fourou	KAMA	Diesel	
	15. Garalo	ACCESS	Biofuel Diesel	
	16. Goualala	ACCESS	MFP	
	17. Kalana	ERD	EDM Grid	
	18. Karangana	SSD YEELEN KOURA	Individual Solar	
	19. Kébila	ACCESS	Biofuel Diesel	
	20. Kéléya	MES	Biofuel Diesel	
	21. Kerekoumana	ACCESS	MFP	
	22. Kifosso	SSD YEELEN KOURA	Individual Solar	
	23. Kignan	SSD YEELEN KOURA	Hybrid Diesel/Solar	x
	24. Kléla	SSD YEELEN KOURA	Individual Solar	
	25. Kologo	ACCESS	Diesel	
	26. Kolondiéba	SSD YEELEN KOURA	Hybrid Diesel/Solar	x
	27. Konséguéla	SSD YEELEN KOURA	Individual Solar	
	28. Koualé	Comité Local-Koualé	Biofuel Diesel	
	29. Koumantou	SSD YEELEN KOURA	Hybrid Diesel/Solar	x
	30. Koury	SSD YEELEN KOURA	Hybrid Diesel/Solar	x
	31. Lobougoula	EAT	Diesel	
	32. Localités Solaires	SAFEELEC	Individual Solar	
	33. Loulouni	KAMA	Diesel	
	34. Madina Kouroulamini	ACCESS	MFP	
	35. Mafelè	ACCESS	Diesel	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
	36. Manankoro	ACCESS	Biofuel Diesel	
	37. Masssigui	ACCESS	Diesel	
	38. Missirikoro	Comité Local-Missirikoro	Biofuel Diesel	
	39. Molobala	SSD YEELEN KOURA	Individual Solar	
	40. M'Pessoba	SSD YEELEN KOURA	Hybrid Diesel/Solar	x
	41. Nampasso	Comité Local-Nampasso	Biofuel Diesel	
	42. N'Goko	COGEACOM	Diesel	
	43. Niaradougou	Comité Local-Niaradougou	MFP	
	44. Niena	SSD YEELEN KOURA	Hybrid Diesel/Solar	x
	45. Ouassada	Comité Local-Ouassada	MFP	
	46. Ouré	Comité Local-Ouré	MFP	
	47. Ouré	ACCESS	Hybrid Diesel/Solar	
	48. Ourikila	SSD YEELEN KOURA	Hybrid Diesel/Solar	
	49. Samogossoni	Comité Local-Samogossoni	MFP	
	50. Sansana	SSD YEELEN KOURA	Individual Solar	
	51. Sanso	SSD YEELEN KOURA	Individual Solar	
	52. Sekorolé	ACCESS	MFP	
	53. Sido	Comité Local-Sido	Biofuel Diesel	
	54. Sincina	SSD YEELEN KOURA	Individual Solar	
	55. Sirakorobougou	KAMA	Hydroelectric	
	56. Sotien	Comité Local-Sotien	MFP	
	57. Yangasso	DJENNE PROXIMITE	Diesel	
	58. Yiridougou	ACCESS	MFP	
	59. Yorobougoula	ELECTRIMAX	Diesel	
	60. Yorontiéla	ACCESS	MFP	
	61. Yorosso	SSD YEELEN KOURA	Hybrid Diesel/Solar	x
	62. Zantiébougou	ACCESS	Hybrid Diesel/Solar	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
4 Ségou	**18 localities**			
	1. Barouéli	CTEXCEI-GNETA	Diesel	x
	2. Bla	SSD YEELEN KOURA	Diesel	x
	3. Boidié	GIE FITINE	Diesel	
	4. Cinzana	SDD	Diesel	
	5. Dioro	EPRODED	Diesel	x
	6. Dougoukouna	SDD	Diesel	
	7. Farakala	Comité Local-Farakala	MFP	
	8. Kamba	GIE FITINE	Diesel	
	9. Kimparana	SSD YEELEN KOURA	Hybrid Diesel/Solar	x
	10. Kokry	GIE BEESAGO	Diesel	
	11. Kondogola	Comité Local-Kondogola	MFP	
	12. Konobougou	GTE	EDM Grid	Transferred
	13. Sékoro	SDD	Individual Solar	
	14. Siribala	KAMA	Diesel	
	15. Sokolo	EENTGEC	Diesel	x
	16. Tènè	FASO TRAVAUX	Diesel	
	17. Ténéni	SEECO	Hybrid Diesel/Solar	
	18. Touna	EJD	Diesel	
5 *Mopti*	***18 localities***			
	1. Bankass	SEB	Diesel	x
	2. Baye	Comité Local-Baye	MFP	
	3. Boni	EGI	Diesel	
	4. Dia	SEER	Diesel	x
	5. Diafarabé	KAMA	Diesel	x
	6. Dinangourou	KAMA	Diesel	x
	7. Diondjory	GIE BELDEHORE	Diesel	
	8. Douary	KAMA	Diesel	
	9. Gangafani	KAMA	Diesel	
	10. Hamdallaye	Comité Local-Hamdallaye	MFP	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
	11. Irébane	Comité Local-Irébane	MFP	
	12. Konna	GES	Diesel	x
	13. Korientzé	HAOUKOUNA	Diesel	
	14. Koro	SEK	Diesel	x
	15. Nouh Peul	Comité Local-Nouh Peul	MFP	
	16. Sofara	SPGE	Diesel	x
	17. Téninkou	MOYERE SB	Diesel	x
	18. Yerendourou	KAMA	Diesel	
6 *Tombouctou*	***14 localities***			
	1. Almoustrat	Comité Local-Almoustrat	MFP	
	2. Atta	Comité Local-Atta	Individual Solar	
	3. Bintagoungou	Mairie Bintagoungou	Diesel	
	4. Douékiré	EMC	Diesel	
	5. Essouk	Comité Local-Essouk	MFP	
	6. Gossi	GOURMA CONSTRUCTION	Diesel	
	7. Guindigata	Comité Local-Guindigata	MFP	
	8. Léré	ENORD	Diesel	
	9. M'Bouna	ALBARKA YERKOYE	Diesel	
	10. Meykoré	EMC	Diesel	
	11. Tin Tellout	Comité Local-Tin Tellout	MFP	
	12. Tonka	Mairie Tonka	Diesel	x
	13. Toukabangou	Comité Local-Toukabangou	MFP	
	14. Yourmi	Comité Local-Yourmi	MFP	
7 *Gao*	**9 localities**			
	1. Ansongo	TILGAZ	Hybrid Diesel/Solar	x
	2. Bagoundjé	SGE	EDM Grid	
	3. Bavaria	SGE	EDM Grid	
	4. Bentia	Comité Local-Bentia	MFP	
	5. Bourem	TILGAZ	Diesel	x
	6. Gounzoureye	SGE	EDM Grid	

Region	Locality	Operator	Type of energy	Projects to be transferred to EDM
	7. Labézanga	Comité Local-Labézanga	MFP	
	8. Menaka	TILGAZ	Diesel	x
	9. Ouatagouna	Comité Local-Ouatagouna	MFP	

Source: AMADER and EDM interview (on projects to be transferred back)