Feasibility Study on Business Opportunities for Women in a Changing Energy Value Chain

NIGERIA PROJECT
DEVELOPMENT OF LIQUEFIED PETROLEUM GAS DISTRIBUTION (LPG) BUSINESSES IN NIGERIA

ESEF 2019 - 24th Oct
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✓ Projects specific description
✓ Business and entrepreneur profile
✓ Market data and opportunity analysis
✓ Funding needs and financial potential
Cooking gas (LPG) refilling and distribution business is a very lucrative business to venture into. Liquefied Petroleum Gas is environmental-friendly, much cheaper and cooks meal faster. The market for this product is growing constantly as even rural areas are shifting from using kerosene and firewood.

The LPG distribution value chain in Nigeria starts either from the Gas Processing Plant/Crude Oil Refineries or the LPG Carrier (cargo ship) that imports LPG into the country.

Wholesale and retail buyers purchase LPG from the Refill/Bottling Plant to sell to both commercial and domestic end users. The end-users can also buy LPG directly from the LPG Refill/Bottling Plant.

Plans to develop a marketer cylinder owned model instead of the current consumer cylinder owned model to eliminate the consumers' up-front purchase of LPG cylinders which, in some cases, are substandard, replacing it with a cylinder exchange, whereby the consumer only pays for the content. This policy will improve LPG adoption and penetration.

The Federal Government has announced plans to buy 600,000 cylinders and distribute to gas stations and Micro Distribution Centres (MDCs) and, the government is encouraging more people to open/own MDCs.
Projects specific description (2/3)

- The proposed project is to build a market focused on LPG, especially for domestic use (cooking), driven by female entrepreneurs.
- A female entrepreneur is in fact expected to start the setting up of an **LPG Refill/Bottling Plant (40MT Storage Capacity)** around Port Harcourt and their environs and build the distribution chain around it, accordingly.
- The LPG Refill/Bottling Plant (40MT Storage Capacity) will serve as a mini depot for LPG retailers within the vicinity of the Plants thus creating job opportunities for other women interested in venturing into retailing of LPG.
- Besides selling LPG, the new plant is expected also to sell LPG cookers, cylinders and accessories and to provide technical services e.g. gas cooker repair and servicing workshop, maintenance of cylinder valves etc.

Example of an LPG Refill/Bottling Plant
Projects specific description (3/3)

- **LPG Market**: Investment in infrastructural development will aid effective LPG distribution and penetration in Port Harcourt.

- **Female Empowerment**: Empowerment of other female entrepreneurs (rural or urban women) through collaboration with the main investment champion in the aspect of retail supply of LPG;

- **Employment**: Job creation especially for females interested in working in the LPG sector;

- **Reduction in energy poverty**: It is assured for women, girls and children, who will be freed more time by their cooking with LPG, which time they will channel towards more productive wealth creation activities, which will generally improve national productivity, grow Gross Domestic Product, GDP and improve tax revenue collections;

- **Environment**: Reduction in tree felling for purposes of making fire wood used in cooking, and with more efforts, desertification can be reversed for good, with attendant benefit in reduction of human animal migration with related communal clashes;
Business and entrepreneur profile

Satlatena Nigeria Limited (Satlatena Gas)
SATLATENA GAS is a distributor of Liquefied Petroleum Gas (LPG); for residential and commercial purposes to rural communities in Port Harcourt, Rivers State, Nigeria; as well as sales, maintenance and installation of gas cylinders and accessories. They also provide free tips and trainings on the use and management of LPG.

Satlatena is a player in the market that masters the technology, the value chain, the process and the market of LPG Sector.

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Email: imite_sohia@yahoo.com

70% Female Share
3 Years in the market
7 Staff
The per capita consumption of LPG in Nigeria is just above 1 kg per annum, much lower than other West African countries. Although households may use more than one cooking fuel (primary/secondary), the gas utilization is modest and do not exceed 5%. Cooking habits have to change from wood and kerosene to cooking gas, with kerosene considered as the competitive fuel to LPG, prices being at the same level.
Market data and opportunity analysis (2/3)

LPG Supply in Nigeria

More than 47% of the LPG demand in Nigeria is covered by imports in 2019, mainly from USA.

As per recent information (December 2018) the LPG demand reached **600,000 MT per annum**, displaying an increase of 1,000% in just a decade.

In the next 10 years the LPG demand is expected to reach **5,000,000 MT**.

In early 2017 Nigeria has about **350 filling Plants** across the country.

Demand vs LPG Supply in Nigeria

source: LPG Supply Strategies to Stimulate Market Growth, NLPGA Conference, 2018
Market data and opportunity analysis (3/3)

Targeted Market in Port Harcourt

In the area of Port Harcourt where the filling unit will be built, lives more than 6% of Nigeria’s population

With approximately 2 million people living in the area of Port-Harcourt, it could be assumed that approximately 50,000 MT are sold in Port-Harcourt per year (considering the yearly consumption of 600,000 MT in the country)

With a filling potential of 550 MT per year, the targeted market share in the Port-Harcourt area is approximately 1% in terms of sales volume.
### Funding needs and financial potential (1/2)

**Financing Assumptions:**

- **Budget**: ≈ 0.45 M USD + 60 k USD
- **Working Capital** includes:
  - Licensing & implementation of an LPG filling plant
  - 30 000 USD first filling
  - 30 000 USD running

#### Project costs

<table>
<thead>
<tr>
<th>CAPEX for investment</th>
<th>USD</th>
<th>NAIRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensing / Development Costs etc</td>
<td>42 300</td>
<td>12 900 000</td>
</tr>
<tr>
<td>Land Purchase</td>
<td>50 000</td>
<td>15 300 000</td>
</tr>
<tr>
<td>Filling Plant</td>
<td>333 900</td>
<td>102 171 000</td>
</tr>
<tr>
<td>Office Equipment</td>
<td>1 600</td>
<td>500 000</td>
</tr>
<tr>
<td>Truck for delivery of bottles</td>
<td>11 400</td>
<td>3 500 000</td>
</tr>
<tr>
<td>Display / Training Room</td>
<td>4 900</td>
<td>1 500 000</td>
</tr>
<tr>
<td>Other</td>
<td>1 600</td>
<td>500 000</td>
</tr>
<tr>
<td><strong>Total Investment Cost</strong></td>
<td>445 700</td>
<td>136 371 000</td>
</tr>
<tr>
<td><strong>Working Capital</strong></td>
<td>60 000</td>
<td>18 000 000</td>
</tr>
</tbody>
</table>

**Financial support requested:** 30% equity, 70% debit

**Interest Rate on LT Debt:** 25%

**Duration of LT Debt:** 5 years
Funding needs and financial potential (2/2)

Sales ($)

Actual Cash flows from operations

Net Revenues ($)

Internal Rate Of Return And Net Present Value (15yrs)

<table>
<thead>
<tr>
<th></th>
<th>On Equity</th>
<th>On Equity &amp; Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Present Value</td>
<td>82,000 USD</td>
<td>78,000 USD</td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>≈ 35%</td>
<td>≈ 30%</td>
</tr>
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</table>
Feasibility Study on Business Opportunities for Women in a Changing Energy Value Chain

GHANA PROJECT
DEVELOPMENT OF A SOLAR HOME SYSTEM (SHS) BUSINESS TO SERVE RURAL AND SUBURBAN OFFGRID USERS

ESEF 2019 - 24th Oct
Topics to be discussed

- Project specific description
- Business and entrepreneur profile
- Market data and opportunity analysis
- Funding needs and financial potential
Project description – policy background

- Ghana’s abundant solar power potential has been identified as a key resource for matching the increasing demand for electricity.
- The Government of Ghana has introduced a number of regulatory frameworks over time to improve the supply and availability of electricity.
- The renewable energy goal in the National Energy Policy is to “increase the proportion of renewable energy in the total national energy mix and ensure its efficient production and use.”
- The policy objective is to be achieved by the Government ensuring that renewable energy constitutes 10% of the national energy mix by 2030, and by imposing a mandatory purchase obligation on off-takers.
- These policy objectives were given legal basis through the Renewable Energy Act, 2011 (Act 832).
Project description – proposed business

- The Project involves the creation of a Solar Home Systems (SHS) business serving rural and sub-urban areas of Ghana.

- Off-grid SHS components to suit different system sizes (from 50W to ~1kW) will be imported into Ghana, with assembly and packaging to take place locally.

- Components will be stored at local warehouses, before being distributed to the target regions in the north and in the east of the country (Northern and Volta regions).

- In-country manufacturing of some components may be considered at a later stage, as soon as adequate market volume has been established.
The size of the systems will be tailored to different users and needs, ranging from very low income people living in rural areas to slightly higher income groups in rural or suburban areas.

The developer will manage the import of the equipment into Ghana, including assembly and packaging, storage, distribution, marketing, sale, maintenance and after sales support.

There is an emphasis on female empowerment and entrepreneurship and the creation of local employment. This would be done through:

- Teaching system users basic maintenance skills
- Training of local technicians, with a focus on women, for the installation, servicing and maintenance of the SHS
Project specific description (4/4)

The solar business to be established in Ghana will provide several products and services.

- Solar PV panels, range of sizes, together with balance of system components, including inverters, battery, switches, wiring.
- Civil work components, such as mountings.
- Technical consultancy, to evaluate the energy needs for a given location.
- Financial and administrative consultancy, to help customers to understand the financing mechanisms on offer to them so that they can select the right one for their situation and apply for it.
- Training of trainers and technicians in the maintenance and operation of SHS.
EcoSolar is a developer of small solar and infrastructure projects with a focus on Ghana and West Africa. Solar experience includes SHS projects (up to 3kW) as well as large scale commercial projects (up to 1.2MW). EcoSolar works in collaboration with two installation companies: ABBA Energy and SunPower Innovations which provide technical and execution capabilities.

EcoSolar has competitive advantages:
- Team with international experience
- Partnership with larger companies, combined team of 50 direct employees
- Relatively large equity contribution of 250k USD resulting in high impact

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Business and entrepreneur profile – GN Power

**GN Power** is an electrical and mechanical building Engineering Service Provider. The company undertakes energy audits, providing recommendations for energy savings, as well as supply, installation and maintenance of solar systems with projects ranging between 0.5 to 63 kW.

**GN Power** has so far served the B2B market, but is now looking at expanding into the smaller scale residential sector of SHS, with system size of 100 to 1000 W.

**GN Power** has many competitive advantages:
- Very good market knowledge, with an existing network of agents and distributors
- Focus on after sales services and maintenance
- Focus on innovation – e.g. Solar Van

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Market data and opportunity analysis - background

- Roughly half of the 29M population of Ghana live in rural areas.
- Around 30% of this rural population (~10M), does not have access to electricity. The situation improves in urban areas with 10% not having access to electricity.
- Given the remoteness of many of these underserved areas as well as their rural nature, extending and connecting to the national electricity grid is not viable. Solar energy is the cheapest (and fastest) option for electrification, also being cheaper than diesel generators.
- However, in spite of their decreasing costs, SHS are not affordable by a significant part of the population due to the high upfront investment required.
Microfinance can almost double the cost of a product even if one year’s credit is used.

Approximately 70% had been recorded to have a monthly income of less than ≈200$ (2010 exch. Rate)

Typical income Distribution in rural areas of Ghana (2010)


Upfront cost & financing cost of small SHS.

<table>
<thead>
<tr>
<th>Size</th>
<th>USD/unit</th>
<th>MF@ 50%</th>
<th>MF@ 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>50W</td>
<td>500</td>
<td>750</td>
<td>1 000</td>
</tr>
<tr>
<td>100W</td>
<td>900</td>
<td>1 350</td>
<td>1 800</td>
</tr>
<tr>
<td>200W</td>
<td>1 600</td>
<td>2 400</td>
<td>3 200</td>
</tr>
</tbody>
</table>

Significant portion of annual income is required to buy a SHS

APR: Annual Percentage rate
http://www.mftransparency.org/microfinance-pricing/ghana/
Market data and opportunity analysis - solution

- Financing from grants not ideal as it does not encourage a sustainable business model that generates a return
- Current Microfinance loan terms do not enable market sustainability

<table>
<thead>
<tr>
<th>Gap:</th>
<th>Proposal:</th>
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<tbody>
<tr>
<td>High interest rates</td>
<td>Innovative Financing Options</td>
</tr>
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</table>

- Innovative financing options can be the solution to make SHS affordable to a larger percentage of the population
  - Rent to buy (Hire Purchase)
  - Pay as You Go
- High quality systems with ongoing maintenance for system lifetime = satisfied customers = referrals to additional customers
Market data and opportunity analysis - solution

- Innovative financing options could unlock a large and untapped market for SHS
- Rural electrification would result in socio-economic development of the regions, having a knock on effect and increasing overall demand

The programme will initially cover 60 communities in 4 districts in the initial 5-year period. It has been calculated that over 95,000 households will directly benefit from SHS solutions in the programme, i.e. over 500,000 people.
Funding needs and financial potential

Overall Budget: ≈ 5 M USD

Budget includes:
- 0.6 M USD development costs (i.e. establishment of the business, sales points, development of infrastructures, training, procurement of necessary installation equipment/tools, as well as
- 4.5 M USD, i.e. the cost of goods which is considered to be debt financed

Financing Assumptions:
Financial support requested: 30% equity, 70% debit (on the initial investment cost)

Debt in 4 yearly tranches to cover cost of sales of the first 4 years

<table>
<thead>
<tr>
<th>Interest Rate on LT Debt:</th>
<th>10 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of LT Debt:</td>
<td>5 years</td>
</tr>
</tbody>
</table>

Project Budget

<table>
<thead>
<tr>
<th></th>
<th>TOTAL COST ($)</th>
<th>TOTAL COST (G. Cedis)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establishment Costs</td>
<td>15 000</td>
<td>82 050</td>
</tr>
<tr>
<td>Buildings and Infrastructure</td>
<td>200 000</td>
<td>1 094 000</td>
</tr>
<tr>
<td>Regional offices</td>
<td>200 000</td>
<td>1 094 000</td>
</tr>
<tr>
<td>Office equipment + Vehicles</td>
<td>130 000</td>
<td>711 100</td>
</tr>
<tr>
<td>Tools and other Equipment</td>
<td>30 000</td>
<td>164 100</td>
</tr>
<tr>
<td>Training</td>
<td>40 000</td>
<td>218 800</td>
</tr>
<tr>
<td><strong>ASSETS TOTAL</strong></td>
<td><strong>615 000</strong></td>
<td><strong>3 364 050</strong></td>
</tr>
<tr>
<td><strong>Cost of Goods</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>378 000</td>
<td>2 068 000</td>
</tr>
<tr>
<td>Year 2</td>
<td>649 740</td>
<td>3 554 000</td>
</tr>
<tr>
<td>Year 3</td>
<td>1 368 180</td>
<td>7 484 000</td>
</tr>
<tr>
<td>Year 4</td>
<td>1 974 300</td>
<td>10 799 000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>4 370 220</strong></td>
<td><strong>23 905 000</strong></td>
</tr>
</tbody>
</table>
Feasibility Study on Business Opportunities for Women in a Changing Energy Value Chain

COTE D’IVOIRE PROJECT
IDENTIFICATION AND DEVELOPMENT OF SMART APPLICATIONS FOR ENERGY CONSUMERS

ESEF 2019 - 24th Oct
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✓ Projects specific description
✓ Business and entrepreneur profile
✓ Market data and opportunity analysis
✓ Funding needs and financial potential
Abidjan has gradually positioned itself as the new catalyst of innovation across Francophone Africa and has seen its number of active tech hubs double between 2016 and 2017.

Several relevant initiatives in the field of energy management are underway. The "Audit project of lighting and air conditioning systems in administrative buildings", aims to carry out:

- the audit of 10 energy-intensive public buildings and to implement the recommendations of the audits for energy and financial savings in these buildings,
- the supply and installation of capacitor banks in administrative to monitor and control public sector electricity subscription expenditure,
- the distribution of 5 million compact fluorescent energy-saving lamps co-financed by the State and its financial partners.
- The implementation of the GEF/UNEP project to promote energy efficiency in public sector lighting.
The project will deliver **a smart application**, in its different versions (Basic, Advanced, PRO) and for different platforms (e.g. Android, IoS) and a kit for smart management of energy, composed by smart meters, sensors for collecting energy consumption data.

This smart application enables users to manage their energy in an efficient way via a web-based (mobile) platform.

In partnership with the local electricity company and an IT consulting firm, the sponsor will coordinate the development of the smart application, its deployment, its promotion, and maintain the relationship with the B2B (Businesses) and B2C (Residential users) customers.
The aim of the app is to provide:

- User classification and profiling
- Monitoring and visualization of energy consumption: real time data; historical data; set targets achievement;
- Control all the devices/equipment on the network and switch them on and off when possible;
- Recommendations on how to improve energy consumption based on users’ habits and set targets;
- Notifications when consumption is higher than expected or close to target;
- User data driven consumption prediction
- gamification: will keep the users engaged with the application;
- comparison of the level of energy consumption with the average of the same user segment;
- comparison of the level of energy consumption with that of most efficient users.
- Access to further external services on the web
Business and entrepreneur profile

NACH SARL
Is an Ivorian company specialised in Renewable Energies, particularly solar energy and energy efficiency. Its main goal is to offer Ivorian companies and households innovative services relating to new technologies and energy saving.

NACH SARL previously HICOM
Technology is a player in the market since 2009 aiming to reach a turnover about 250 K$ in 2020.

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Market data and opportunity analysis (1/5)

Country Facts

- Over 26 million inhabitants in July 2018 with 2.3% growth rate (CIA, The World Factbook, 2019)
- Over 2.2 million subscribers at Ivorian electricity company (CIE) in 2018 => +16% more subscribers than in 2017 (CIE, 2019)
- 3 Mobile Network Operators covering the majority of the country (ARTCI, 2019)
- New Internet operator, "Konnect Africa", since January 2019 offering Internet via Satellite. Currently covers 60% of the territory and intends to cover over 99% in 2020
- About half of the population uses Internet via mobile; One of the highest in West Africa (GSMA Intelligence)
- Number of active tech hubs in Abidjan has doubled between 2016 and 2017
- New generation of entrepreneurs materializing opportunities on the energy sector by utilizing ICT and impacting businesses
Market data and opportunity analysis (2/5)

Why this smart application?

- App pro-actively remind/suggest energy saving tips to its users, giving them better control over their energy consumption;
- App helps lower energy consumption => Lower power bill;
- “Smart” way to raise Awareness about energy saving habits;
- Possibility to reach a large number of customers, thanks to CIV’s high accessibility to the Internet and monopoly on energy distribution;
- Business opportunity for women who will pioneer smart applications in the Energy Sector

Potential Competition

- **SMART ENERGY**: Subsidiary of CIE
  - Promoting EE and assisting Enterprises to take relevant measures
  - Promoting Renewable Energy Sources and Distributing EE equipment
  - Helps to reduce energy consumption between 5% to 60%

- **LYNAYS**: Helps to reduce 15% to 45% power consumption
  - Uses Field Commander Management Technology to manage energy movement
  - Design a mobile application to control devices (ON/OFF)
Target Consumers

- Residential and non-residential users.

Total number of CIE’s clients reached **2,196,725**

**2,191,290** were LV clients and **5,435** were HV clients.

**Year to year increase** of CIE’s clients was **16%**

(i.e. 298,899 new clients in a year (LV = 298,579 and HV = 320))

At the same time **overall sales of electricity in the domestic market** have been virtually at the same levels, with an increase of approximately **1%** from 2017 to 2018.
Market data and opportunity analysis (4/5)

EE initiatives

- Implementation of the NEEAP in accordance with the ECOWAS Energy Efficiency Policies
- Energy audits for lighting and Air-Conditioning in administrative buildings
- Energy audits in public buildings
- Promotion of Efficient lighting
- Establishment of Energy Efficiency standards for large public and private buildings
- 20% of the industries audited by 2020 and 50% by 2030. The target is 100% of the audited industries to have energy efficiency measures implemented by 2030.

Evolution of CIE’s Sales

http://www.anare.ci

Energy Efficiency in the Industrial Sector
Market data and opportunity analysis (5/5)

Target Consumers

- Residential and non-residential users.
- Construction and Smart home automation companies.
- Energy Service Companies (ESCOs).
- Social housing association/Municipalities.

Target Market

- The company will cover the whole country, where electricity network exists.
- The project targets to reach approximately
  - 30000 clients in 4-5 years, including residential / commercial / productive users;
  - up to 500 in 4-5 years big customers (4 % of the market)
Funding needs and financial potential (1/2)

Budget: ≈ 2.6 M USD

Budget includes
- development costs (i.e. establishment of the business, development of the Application, Infrastructures, etc.), as well as
- 1st year's running costs

Financing Assumptions:

Financing: 30% equity, 70% debt
Interest Rate on LT Debt: 7%
Duration of LT Debt: 5 years

<table>
<thead>
<tr>
<th>Project costs</th>
<th>TOTAL COST (US)</th>
<th>TOTAL COST (FCFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIXED ASSETS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase and installation of equipments (technical Equipments)</td>
<td>242 200</td>
<td>145 320 000</td>
</tr>
<tr>
<td>Design &amp; Implementation of the application</td>
<td>85 000</td>
<td>51 000 000</td>
</tr>
<tr>
<td>Administrative Spendings (Permits and official documents, insurances)</td>
<td>70 000</td>
<td>42 000 000</td>
</tr>
<tr>
<td>Office equipments + Vehicles</td>
<td>327 500</td>
<td>196 500 000</td>
</tr>
<tr>
<td>Costs of land</td>
<td>420 000</td>
<td>252 000 000</td>
</tr>
<tr>
<td>Costs of buildings</td>
<td>252 000</td>
<td>151 200 000</td>
</tr>
<tr>
<td><strong>ASSETS TOTAL</strong></td>
<td>1 396 700</td>
<td>838 020 000</td>
</tr>
<tr>
<td><strong>1st Year Running Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Facilitation of local project activities</td>
<td>186 000</td>
<td>111 600 000</td>
</tr>
<tr>
<td>6. Distribution and management</td>
<td>1 052 800</td>
<td>631 680 000</td>
</tr>
<tr>
<td><strong>OPERATING TOTAL</strong></td>
<td>1 238 800</td>
<td>743 280 000</td>
</tr>
</tbody>
</table>
Funding needs and financial potential (2/2)

Sales ($)
Sales Volumes ($)

Actual Cash flows from operations

Net Revenues ($)

Net Earnings ($)

Internal Rate Of Return And Net Present Value

<table>
<thead>
<tr>
<th></th>
<th>On Equity</th>
<th>On Equity &amp; Debt</th>
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</thead>
<tbody>
<tr>
<td>Net Present Value</td>
<td>2.2 million USD</td>
<td>2.1 million USD</td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>≈ 50%</td>
<td>≈ 30%</td>
</tr>
</tbody>
</table>

-3,000,000
-2,000,000
-1,000,000
0
1,000,000
2,000,000
3,000,000

2019 2020 2021 2022 2023 2024

2020 2021 2022 2023 2024

2020 2020 2020 2020 2020

Lamps | Audits | Efficient Equipment | Application Royalty fees

0 2,000,000 4,000,000 6,000,000 8,000,000 10,000,000 12,000,000

2020 2020 2020 2020 2020

0 500000 1000000 1500000 2000000 2500000

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Feasibility Study on Business Opportunities for Women in a Changing Energy Value Chain

SENEGAL PROJECT
DEVELOPMENT OF CLEAN ENERGY POWERED MINI AND MICRO GRID ELECTRICITY GENERATION AND DISTRIBUTION BUSINESSES

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<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td>Projects specific description</td>
</tr>
<tr>
<td>Business and entrepreneur profile</td>
</tr>
<tr>
<td>Market data and opportunity analysis</td>
</tr>
<tr>
<td>Funding needs and financial potential</td>
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</tbody>
</table>
Since 2014, Senegal’s economic and social development policy has been based on the Plan for the Emerging Senegal (PSE). The (PSE) is based on three priorities:

- Promote a transformation of the economic structure through a strong and sustainable economic growth dynamic;
- Expanding social services, social security and conserve sustainable development conditions;
- Meeting good governance requirements through institutions strengthening and promoting peace, transparency and African integration.

The (PSE) identified Energy as a key pillar to impact economic development and reduce social and territorial inequalities.

Due to the high cost of grid extension to remote areas and limited state/utility budgets for electrification, the extension of the central grid should be done only where it is economically feasible.

Mini-grids are a valuable option where grid extension is not economically attractive.
The project foresees the installation of mini-grids powered by PV-Diesel Hybrids, in areas located around 10 km from the national electrical Medium Voltage (MV) Transport-grid.

This solution involves implementation of several mini grids with a capacity between 40 and 100 kW.

These mini grids will provide electricity to villages with population between 500 and 1000 people including health centres and schools.

The idea is to start with 1-2 mini grids and to reach approximately 50 mini grids in the next years.

Electricity will be sold to residential/commercial/industrial customers and public facilities.
The first mini-grid is foreseen to be implemented in Dahra area, in the Louga Region.

Data on power demand for the area has indicated that the size of this first mini-grid will be 80 kW;

Electricity will be supplied to **two local clinics & two schools**.

Several activities will be served, such as: ice making, catering, hairdressing, cyber (photocopy and internet connection), metalworks, woodworks, tailors, battery/phone charging, mechanics, etc;

The agricultural value chain will benefit from the supply of electricity at a cost lower than diesel generated electricity, e.g. two dairies will be served;

Direct and indirect **employment** will be created. Around 10 people during construction and operation and more than 100 hundred indirectly through the improvement of electricity supply and increase of **productivity**;
Projects specific description (4/4)
Business and entrepreneur profile

SOLAR AFRICA ENERGY
Is an innovative company operating in the renewable energy sector. The company offers a complete range of renewable energy products (solar, wind, hydro, biomass, ...)

in partnership with leading international companies.

Contact Person: Mrs Awa DIOP
Designation: General Manager
Mobile: +221 77 030 99 99
Email: awa.diop@solairafricaenergy.com

SOLAR AFRICA ENERGY is a player in the market with an international network.
Solar potential in Senegal is significant with an average global daily irradiation of 5.43 kWh/m²/day which results in a yearly electricity production of more than 1600 kWh/year per installed kWp.

Due to the high cost of grid extension to remote areas and limited state/utility budgets for electrification, the extension of the central grid is considered as a solution that meets the energy needs of the population living and working inside the isolated areas.
Senegalese Rural Electrification Agency (ASER) has already mapped areas that can be electrifiable by solar mini-grids.
By 2025, **14,234 rural villages** and more than **1 million rural clients** should be electrified mostly through **grid extension** (12,556 villages and 95% of rural clients), but also through **solar only or solar-diesel hybrid mini-grids** (1,215 villages and 4% of rural clients).

Additional generation capacity requirement of **180 MW by 2025**

**Rural electrification achievements 2012 - 2016**

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2015</th>
<th>2016</th>
<th>Evolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrified villages</td>
<td>1,648</td>
<td>2,840</td>
<td>3,173</td>
<td>+72%</td>
</tr>
<tr>
<td>Electrified rural households</td>
<td>170,000</td>
<td>216,000</td>
<td>-</td>
<td>+27%</td>
</tr>
<tr>
<td>Rural Electrification rate</td>
<td>24%</td>
<td>31.5%</td>
<td>-</td>
<td>+7.5%</td>
</tr>
</tbody>
</table>


So far, the progress has been moderate, for instance, at the end of 2015, only **5,679 households** (5% of the Target compared to a target of end-2017) and **710 villages** (49% of the Target compared to a target of end-2017) were electrified. This is due to many factors.

- **Mini-grid operators usually struggle to secure loans** from commercial banks because they aren’t contracted by the government
- **Selling prices** that **makes investments difficult to make profitable**
- **A tariff model** often **beyond the reach of poor households**;
In Louga region, the women’s entrepreneurship support program (APEFE) supports the women entrepreneurs in agri-food processing (dairy, fruits, vegetables and fish farming) and helps these groups of female entrepreneurs in the dairy sector with milk processing equipment that has remained unused due to the lack of electricity.

With the implementation of the first mini grid project, the women entrepreneurs in the dairy sector will increase their capacity to collect, store and process milk with positive impact on their businesses.

The project will also enable other beneficiaries to have access to electricity such as:
- Primary industries (e.g. agriculture)
- Light Manufacturing (Welding, Tailoring and Ice making);
- Commercial and retail enterprises (Phone charging businesses, hair salons, restaurants and small freezers);
- Small villages
Funding needs and financial potential (1/2)

Budget: ≈ 1.4 M USD (10 minigrids for phase 1 / Target = 50 minigrids)

Budget includes:
- Development of PV/battery/diesel minigrid including distribution grid, to provide electricity to community, commercial/productive uses, as well as diaries.

NB. Tariff in Senegal is currently fixed at 0.15 $/kWh. MG will become viable if project receives grant.

Financing Assumptions:

Financial support requested: 15% equity, 15% debt, 70% Grant
Interest Rate on LT Debt: 8%
Duration of LT Debt: 8 years
Funding needs and financial potential (2/2)*

Sales & Net Revenues ($)

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales &amp; Net Revenues ($)</th>
</tr>
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<tbody>
<tr>
<td>2020</td>
<td>150,000</td>
</tr>
<tr>
<td>2021</td>
<td>150,000</td>
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<tr>
<td>2022</td>
<td>150,000</td>
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<td>2033</td>
<td>150,000</td>
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<tr>
<td>2034</td>
<td>150,000</td>
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</tbody>
</table>

Discounted cash flow from operations ($)

<table>
<thead>
<tr>
<th>Year</th>
<th>Discounted Cash flow ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>-500,000</td>
</tr>
<tr>
<td>2021</td>
<td>-400,000</td>
</tr>
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<td>2033</td>
<td>400,000</td>
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<tr>
<td>2034</td>
<td>450,000</td>
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</table>

Internal Rate Of Return And Net Present Value

<table>
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<th>On Equity</th>
<th>On Equity &amp; Debt</th>
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</thead>
<tbody>
<tr>
<td>Net Present Value</td>
<td>≈90 000</td>
<td>≈75 000</td>
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<tr>
<td>Internal Rate of Return</td>
<td>17%</td>
<td>13.7%</td>
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</tbody>
</table>

NB. Analysis has assumed a period of 15 years