

A Greennovative Chain White Paper



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**Climate Change and Power Supply Solutions: LFGE / MSWE
Project development in Nigeria**

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Introduction

Waste everywhere and electricity barely here! This statement summarizes to a large extent the situation in several urban cities in Nigeria, the most populous country in Sub-Saharan Africa. These are just a few of the problems driven by rapid urbanization and the inability of the existing infrastructure to support this growth.

Waste collection and appropriate disposal is a major challenge although some states in the Federation are making significant headway in the Waste Management process. Electricity generation and distribution as we are all aware continues to be a major challenge. Most Nigerian consumers and businesses with the economic means have to supplement power supply through private fossil fuel electricity generating sets a vast majority of the time.

Problem

Global warming, climate change and pollution impacts are quite evident in Nigeria. Endemic power shortage in the country and open waste disposal sites are major drivers of air and noise pollution. With fragile enforcement governing the disposal of waste and the placement of private electricity generating sets, greenhouse gas (GHG) emissions are constantly being released into densely populated residential and commercial areas thereby leading to adverse environmental and health impacts.

Fossil fuel generators powering our homes and commercial enterprises are another major source of anthropogenic GHG emissions. Nigeria currently has an installed capacity of approximately 3,000 megawatts (MW) to serve its population of 130M+ people. As a result of this major shortfall in capacity, most households and businesses have to resort to private fossil fuel generating sets to supplement power supply. These private fossil fuel generating sets (now an essential part of the Nigerian landscape) are major sources of anthropogenic greenhouse gas emissions. Given the average utilization factor of these generators, we can only shudder at the amount of environmental pollution caused by GHG emissions released into the atmosphere on every street.

Disposal of waste in open dumpsites (both regulated and non-regulated) is one of the major sources of anthropogenic GHG emissions in the urban areas. Methane (a component of landfill gas) which is generated as a result of the anaerobic decomposition of waste has a global warming potential of 21. This means it has 21 times the heat trapping potential of CO₂. Greenhouse house gases aggregated globally are major contributors to climate change.

Solution

As we can all attest, there is a great need for consistent power supply in Nigeria. Consumers and businesses alike are eager to have alternative lower cost energy solutions. It is imperative to deploy sustainable and innovative energy solutions in order to achieve positive contributions in the development and economic enhancement of consumers and businesses in Nigeria.

Part of the economic and environmental solution involves reusing waste generated from daily living to produce electricity. Steps to generating sustainable waste to energy solutions in Nigeria include the following:

1. Recognizing generated waste as a reusable resource for generating electricity supply rather than an unfortunate urban and rural menace. Through energy recovery processes, collected and disposed waste serves as a reusable resource for generating electricity supply.
2. Designing robust and sustainable municipal waste management plans that are based on strategic goals.
3. Identifying and recommending appropriate disposal infrastructures that reduce environmental pollution caused by combustion of waste in regulated and non-regulated waste disposal sites.
4. Identifying sustainable energy solutions using Landfill Gas to Energy (LFGE)/ Municipal Solid Waste to Energy (MSWE) technologies to address the endemic power supply shortage in Nigeria while mitigating greenhouse gas emissions.
5. Providing lower cost alternative LFGE / MSWE energy solutions as compared to the current prohibitive acquisition costs for private fossil fueled electricity generating sets.
6. Financing LFGE / MSWE projects through the Clean Development Mechanism (CDM).

Benefits of LFGE / MSWE

There are several environmental and social benefits from implementing LFGE / MSWE solutions. A few are listed below:

1. Improved Security: With improved power supply, it can be expected that night crimes will be reduced.
2. Increased Productivity: Countless hours are lost each day due to a) power outages and b) health related issues caused by hazardous air pollutants.
3. Increased Profitability for Businesses: Lower energy costs compared with the current alternate solution of private generating sets. This will lead to lower costs of doing business and subsequently increases in returns to shareholders.
4. Increased Ownership and Accountability: If consumers and businesses understand the correlation between appropriate waste disposal and power supply, it is anticipated that consumers will be motivated to ensure appropriate disposal of waste takes place within their communities.
5. Sustainable Electricity: Landfill Gas and Municipal Solid Waste is available for combustion to electricity 24/7.
6. Improved Air Quality in the Urban areas: Methane is 21X more potent than CO₂. Therefore, channeling methane from landfills to generate electricity reduces environmental pollution and health hazards caused by natural combustion of waste. Generation of electricity from LFG / MSW will also reduce the usage of private generating sets thereby reducing the air pollution caused by emissions from fossil fuel generators which are the prevalent alternative energy source today in Nigeria.
7. Noise Reduction: Reducing the noise pollution caused by fossil fuel generators which are the current prevalent source of electricity.
8. Optimal Land Use: Reclaiming land from landfill and waste disposal occupation – both regulated and non-regulated sites. High generation levels of methane in landfills (50 – 60%) and leachate generation makes dumpsites unsafe areas to develop on every street corner.
9. Sustainable Feedstock: Providing sustainable and affordable electricity to our communities. The feedstock (waste) will always be generated in every household and commercial enterprise as a by-product of daily living.
10. Job creation: Creating public and private sector jobs in the area of waste collection and disposal, facilities operations and maintenance, recycling etc.

Summary and Recommendations

Nigeria with a population of 130M+ and a few urban areas where the population is concentrated provides fertile grounds for LFGE / MSWE projects. The waste disposal sites in these concentrated urban areas provide a vast supply of renewable energy sources. Methane gas which is created naturally through anaerobic waste decomposition is a readily available renewable energy source that can be collected and used directly as medium or high Btu gas for industrial use or to fuel turbine driven generators of electricity.

The inability of the existing power infrastructure to consistently meet the power demand needs in the urban and rural areas provides an opportunity for the public and private sector to explore alternative energy sources using existing sustainable resources. The existing alternative energy solutions (residential and industrial generators) are prohibitively expensive to acquire and maintain and are not environmentally sound.

In order to ensure success and sustainability of LFGE / MSWE projects in Nigeria, Greenovative Chain recommends the following keys:

- The Federal Government of Nigeria should incorporate energy from waste (efW), biomass and biogas, as a key component of its energy production strategy. Currently, efW is not one of the key components of energy production. The focus has been more geared to conventional energy sources i.e. Fossil fuels, Hydro, Coal etc as evidenced in the Renewable Energy Action Program (REAP) document. The manifold benefits include avoiding waste to unregulated sites, reduction in environmental pollution, renewable and sustainable energy value chain solutions.
- Eliminating regulatory barriers that could be key obstacles to potential LFG recovery projects. In Nigeria, alternative energy prices i.e. fossil fuel generating sets and the cost of maintenance are relatively high thus the LFG cost could be an attractive alternative. My calculation of the real cost of energy procurement was approx. \$0.10/Kwh based on a 60KVa residential generator. My assumed utilization factor was 50% i.e. the consumer only uses their private fossil fueled generators 50% of the time. A generous assumption that PHCN has a 50% availability factor!
- Waste disposal acts and relevant Municipal regulations must be in place to support waste collection, recycling, transportation, disposal and operation.
- Laws must be enforced to ensure that waste is transported to regulated waste disposal areas. This would result in a sanitary environment void of dispersed waste and a reduction in environmental pollution in the communities. No one is immune from keeping these laws.
- Policies and regulations should be put in place to support energy production and sales from renewable resources. Examples of such policies based on best practices in the United States are the Renewable Portfolio Standards.
- LFGE projects need to comply with local, state, and national regulatory and permitting requirements. However, the regulatory and permitting requirement process must doable within an acceptable timeframe. Unduly burdensome and bureaucratic permitting processes are totally unnecessary and create barriers to progress.

- Assess and take inventory of the number of landfill sites in all urban areas. To-date we do not have a comprehensive national inventory of all the landfill sites in Nigeria.
- Establish reliable solid waste delivery systems in order for the proposed LFGE plant to have sustainable input. Leverage existing processes where they exist, otherwise implement new processes. Absence or inadequate enforcement of waste management legislation will lead to the demise of the project.
- Conduct robust and thorough project feasibility studies and economics. Waste generation rates and LFG recovery rates should be realistic and not overly optimistic. Project execution should be within estimated budget limits. If the project proves to be more expensive than was originally planned, this could lead to additional funding constraints. If the actual LFG generation rates are lower than forecasts, this could also lead to a shortfall in financing.
- Technology adaption to the local environment. Selection of appropriate LFGE technology for the local operating environment is imperative for successful deployment. The existing landfills in Nigeria differ in construction and operation. The composition of waste in Nigeria also differs from the US / Europe where these efW technologies have been developed. Segregation of waste is minimal and typically includes household, commercial, industrial and possibly hazardous materials. Technology deployment and infrastructure construction is not a one-size fits all approach.
- Initiate the CDM process early. The CDM project cycle is anywhere between 18 – 24 months which is the approximate time it takes to implement an LFGE project. Both processes should be worked simultaneously in order not to create bottlenecks.
- Publicity and Outreach. Outreach to landfill site neighbours, community groups, educational institutions, policy makers, consumers and businesses on efW benefits is an essential ingredient to successful project development and implementation. Communicate, communicate and communicate! Let's face it, we all like to be kept informed. Besides everyone is a project stakeholder by virtue of the fact that we all generate waste. As such, everyone should be involved in publicizing the project successes!

Greennovative Chain Consulting Services

The vision of Greennovative Chain is to provide clean sustainable value chain solutions by recognizing generated waste as a reusable resource for generating electricity. Implementation of these solutions creates access to reliable, affordable and clean energy for households and businesses. Our services include carbon audits, identification of clean energy project development opportunities, feasibility studies of clean energy project opportunities, evaluation and recommendation of available renewable energy technologies, evaluation and recommendation of global, federal and state project financing options and incentive programs, project proposal evaluation and project management.

About the Author

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