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ENERGY AUDIT AND NEEDS ASSESSMENT REPORT FOR GOVERNMENT INSTITUTIONS ACROSS DIFFERENT STATES IN NIGERIA

(PHASE 1)

Executive Summary:

This comprehensive Energy Audit and Needs Assessment Report offers a detailed analysis of various government agency facilities across Nasarawa State and Abuja, FCT, focusing on their energy usage, demands, and potential improvements. Conducted by Green Protocol Ltd. in collaboration with RegisHum Energy, the assessment aimed to identify critical energy loads and provide actionable recommendations to enhance energy efficiency and sustainability.

Key Findings:

The assessment covered diverse government agencies, including the Nasarawa State Ministry of Local Government and Chieftaincy Affairs, Nasarawa Urban Development Board Office, Nasarawa State Ministry of Finance, Budget, and Economics, Nasarawa State Ministry of Justice, Dalhatu Araf Specialist Hospital Lafia, National Boundary Commission, Nigeria Hydrological Services Agency, Sharia Court of Appeal Headquarters, National Agency for Science and Engineering Infrastructure (NASENI), and National Automotive Design and Development Council (NADDC).

- Across the facilities audited, common findings included heavy reliance on the national grid and backup diesel generators, with limited integration of renewable energy sources such as solar PV systems.
- Energy demand varied among the agencies, with critical loads primarily encompassing lighting, ICT equipment, and Air Conditioners.
- One of the major challenges identified during the assessment was the lack of robust facility management practices within the audited institutions. This deficiency hindered effective energy optimization and contributed to inefficiencies in energy usage.

- Air conditioners emerged as a critical load across the audited institutions, driven by the tropical climate of Nigeria. The necessity for consistent cooling in indoor environments, particularly in office spaces, significantly contributed to high energy demands and reliance on conventional energy sources
- Despite the recognition of the importance of energy efficiency measures, achieving optimal energy management practices proved challenging due to the lack of a stable electricity supply. The increasing cost of diesel further exacerbated the situation, leading some institutions to ration their energy usage. Consequently, during periods of intense heat, such as those common in Nigeria's tropical climate, the inefficiency of workers due to discomfort caused a decline in productivity and fostered a lackadaisical work ethic.

Recommendations:

- Implementing solar PV systems with backup capabilities is a key recommendation to mitigate dependency on the national grid and diesel generators, particularly for critical loads. This can significantly reduce energy costs, enhance reliability, and contribute to environmental sustainability
- Capacity building initiatives is also being suggested to educate facility managers and staff on energy-saving practices and the effective utilization of solar PV systems.
- In addition to implementing solar PV systems, emphasis should be placed on the adoption of energy-efficient appliances and practices. This includes, but is not limited to, the use of energy-efficient lighting, heating, and cooling systems. Integrating energy-efficient appliances alongside solar PV systems will not only enhance energy resilience but also contribute to long-term energy savings and sustainability.

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Introduction

The energy audit project embarked upon aimed to comprehensively assess the energy infrastructure and needs of various public institutions within Nasarawa State and Abuja, FCT, Nigeria. The primary objectives were to identify critical energy loads, evaluate existing energy sources and consumption patterns, and provide recommendations for enhancing energy efficiency and sustainability. The scope of the audit encompassed several key institutions, including the Nasarawa State Ministry of Local Government and Chieftaincy Affairs, Nasarawa Urban Development Board Office, Nasarawa State Ministry of Finance, Budget, and Economics, Nasarawa State Ministry of Justice, Dalhatu Araf Specialist Hospital Lafia, National Boundary Commission, Nigeria Hydrological Services Agency, Sharia Court of Appeal Headquarters, National Council on Climate Change (NCCC), National Agency for Science and Engineering Infrastructure (NASENI), National Automotive Design and Development Council (NADDC), and Abuja Environmental Protection Board (AEPB).

The methodology employed involved conducting on-site energy audits, analyzing energy usage data, and assessing the infrastructure of each institution. This involved evaluating the reliance on the national grid, backup generators, and potential for renewable energy sources such as solar PV systems. The audit also considered the specific energy needs of each institution and their critical loads, particularly focusing on factors like lighting, air conditioning, and ICT equipment.

The selection of these locations was based on their significance in providing essential services to their community and the nation as a whole and their potential for energy optimization. By assessing a diverse range of institutions, from government ministries to healthcare facilities, the audit aimed to provide insights applicable across various sectors. Ultimately, the goal was to develop tailored recommendations to improve energy efficiency, reduce costs, and enhance the overall operational resilience of these vital public institutions.

Chapter 01

ASSESSMENT REPORT OF ENERGY AUDIT AT NASARAWA STATE MINISTRY OF FINANCE, BUDGET AND ECONOMIC, NASARAWA

Introduction

This comprehensive Assessment Report delves into the energy landscape of the Nasarawa State Ministry of Finance, Budget, and Economics. Strategically located at GG2C+M3M, Ministries, Makurdi - Jos Rd., Lafia, the ministry plays a pivotal role in shaping economic policies critical to the state's development. We aim to present actionable recommendations to address the agency's critical energy needs, particularly those reliant on electricity, thereby prioritizing services crucial for the agency's operational continuity.

Overview of the Organization

The Nasarawa State Ministry of Finance, Budget, and Economics operates from a central building, supplemented by additional compacted structures to support its operations. Within these premises, the ministry's dedicated staff formulates economic policies in response to prevailing economic and global dynamics. Equipped with modern amenities, including monitors, printers, and air conditioning units, the offices facilitate efficient budget planning and implementation, land allocation, and economic policymaking.

Located in Nasarawa State, the ministry's multifaceted responsibilities include:

- Formulating economic policies tailored to governmental considerations and informed by contemporary economic and global realities.
- Collaborating and liaising with relevant federal, state, and local government agencies to craft and monitor financial plans and guidelines.
- Coordinating the mobilization, utilization, and management of internal and external financial resources, encompassing loans, grants, and technical assistance.
- Exercising control over the receipt, custody, and disbursement of state government funds, along with the production and maintenance of final accounts.
- Overseeing procurement activities through the state government central store and safeguarding financial security books and documents.
- Managing the payment of pensions and gratuities within the state.
- Conducting internal inspections on all state financial transactions.
- Facilitating the payment of privately hired accommodations for civil servants.

The on-site walkthrough audit, conducted on 9th January 2024, provided invaluable insights into the ministry's energy usage patterns across its approximately 50 offices, departmental units, and specialized departments. This report outlines tailored recommendations aimed at enhancing energy efficiency and sustainability within the Nasarawa State Ministry of Finance, Budget, and Economics, thereby fortifying its operational resilience.


Nasarawa state
Ministry Of Finance...


NASARAWA STATE
MINISTRY OF FINANCE BUDGET AND PLANNING
P. M. B. 047, LAFIA, NASARAWA STATE

Current Energy Situation

At present, the Nasarawa State Ministry of Finance, Budget, and Economics Office relies on the national grid as its primary source of electricity, with the connection point situated within the facility. Additionally, the office is equipped with 2 sets of 150KVA backup diesel generators, serving as a contingency measure for uninterrupted power supply. However, the absence of a solar photovoltaic (PV) system means that the office is yet to capitalize on renewable energy sources. The compound housing essential facilities such as lighting and other appliances, registers a daily electrical energy demand of approximately 697kWh/day.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the Nasarawa Urban Development Board Office (NUDB) Lafia Office adopts a 60KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 9th of January, 2024, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the Nasarawa State Ministry Of Finance, Budget And Economic. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the

gathered data to identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all aplliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL N0.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	84	26	2184	9	19656
	EXTERIOR	25	26	650	15	9750
	ICT	3	26	78	9	3645
	FENCE	18	26	468	15	7020
	CAR PARK	21	26	546	15	8190
ICT	PRINTER/ PHOTOCOPIER	5	50	250	9	2250
	COMPUTERS	5	250	1250	9	11250
	SERVERS	2	700	1400	9	12600
OTHERS	FAN	39	80	3120	9	28080
	AC	26	1125	29250	9	263250
	WATER PUMP	1	1560	1560	9	14040
	TV	26	230	5980	9	53820
	AC (SPLIT)	26	1125	29250	9	263250
PEAK POWER				75986		
AVERAGE DAILY CONSUMPTION						696801

Current Electrical Energy Status

Energy Demand

The building sustains a steady energy demand of 697 kWh per day. This demand spans essential utilities including lighting, refrigeration units, air conditioning, and continuous power requirements for various equipment distributed throughout its units.

Recommendation

Considering the actual energy consumption of 697 kWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of approximately 60KVA. This recommendation aligns with the building's energy requirements while promoting energy independence and environmental responsibility. By implementing a solar PV system of appropriate capacity, the building can effectively offset its energy demand and reduce its reliance on conventional energy sources.

System recommendation: 60KVA Solar PV System

System Design Overview

The proposed Solar PV System, rated at 60KVA, is tailored to meet the building's energy demand effectively. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

The following system is recommended to meet the proposed Solar PV demand:

Proposed System Overview.

Parameter	Value
Electricity Demand	697kWh/day
Type of Configuration	Facility level Solar PV
System Size	60KVA
System Voltage	Power Supply: 240VAC PV System: 48VDC

Energy Efficiency Measures Recommendations

Energy Efficiency Recommendations: Organizational Perspective

- **Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. Optimizing solar energy utilization and strategically managing generator operation will minimize reliance on diesel until it's necessary.
- **Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.

- **Automation for Efficiency:** Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- **Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.
- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.

Chapter 02

ASSESSMENT REPORT OF ENERGY AUDIT AT NASARAWA URBAN DEVELOPMENT BOARD OFFICE (NUDB) LAFIA OFFICE

Introduction

This comprehensive Assessment Report delves into the energy landscape of the Nasarawa Urban Development Board Office (NUDB) Lafia Office, situated at Bukan Sidi, Lafia 950101, Nasarawa. Our primary objective is to provide strategic recommendations to address the critical energy needs of the agency, particularly those reliant on electricity, thus prioritizing services crucial for the operational continuity of the NUDB.

Overview of the Organization

The Nasarawa Urban Development Board Office (NUDB) serves as a key entity responsible for spearheading urban development initiatives within Nasarawa State. Located in Lafia, the state capital, the NUDB plays a pivotal role in the provision of social and economic infrastructure and services to Lafia, as well as other designated urban centers and local government headquarters across Nasarawa State.

Key functions of the Nasarawa Urban Development Board Office include:

- Planning and implementing urban development projects and initiatives aimed at enhancing the socio-economic landscape of Nasarawa State.
- Facilitating the provision of essential infrastructure such as roads, drainage systems, water supply, and sanitation facilities to foster urban growth and development.
- Collaborating with relevant stakeholders to ensure the effective implementation of urban development policies and programs.
- Conducting assessments and surveys to identify areas in need of infrastructural development and devising strategies to address these needs.
- Monitoring and evaluating the progress of urban development projects to ensure adherence to quality standards and timely completion.

Site Infrastructure

The Nasarawa Urban Development Board Office (NUDB) Lafia Office operates within a single building located at Bukan Sidi, Lafia 950101, Nasarawa. The NUDB plays a central role in advancing the socio-economic landscape of Nasarawa State, focusing on providing essential infrastructure and services to Lafia, the state capital, as well as to all local government areas headquarters, and other designated urban centers across the state. The NUDB's core activities encompass urban development initiatives aimed at enhancing the quality of life and fostering sustainable growth within Nasarawa State.


NUDB
HEADQUARTERS


Nasarawa Urban
Development Board

Current Energy Situation

At present, the Nasarawa Urban Development Board Office (NUDB) Lafia Office relies on the national grid as its primary source of electricity, with the connection point situated within the facility. Additionally, the office is equipped with a 60KVA backup diesel generator, serving as a contingency measure for uninterrupted power supply. However, the absence of a solar photovoltaic (PV) system means that the office is yet to capitalize on renewable energy sources. The compound housing essential facilities such as lighting and other appliances, registers a daily electrical energy demand of approximately 734kWh/day.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the Nasarawa Urban Development Board Office (NUDB) Lafia Office adopts a 60KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 9th of January, 2024, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the Nasarawa Urban Development Board Office (NUDB) Lafia Office. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the gathered data to

identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL N0.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	49	26	1274	9	11466
	EXTERIOR	23	26	598	15	8970
	FENCE	19	26	494	15	7410
	CAR PARK	17	26	442	15	6630
ICT	TV	16	230	3680	9	33120
	COMPUTERS	18	250	4500	9	40500
	SERVERS	2	700	1400	9	12600
OTHERS	FAN	21	80	1680	9	15120
	REFRIDGERATOR	9	630	5670	9	51030
	PRINTER/ PHOTOCOPIER	12	50	600	9	5400
	PUMP MACHINE	1	1560	1560	9	14040
	AC	52	1125	58500	9	526500
PEAK POWER				80398		
AVERAGE DAILY CONSUMPTION						732786

Current Electrical Energy Status

Energy Demand

The building sustains a steady energy demand of 733 kWh per day. This demand spans essential utilities including lighting, refrigeration units, air conditioning, and continuous power requirements for various equipment distributed throughout its units.

Recommendation

Considering the actual energy consumption of 733 kWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of approximately 60KVA. This recommendation aligns with the building's energy requirements while promoting energy independence and environmental responsibility. By implementing a solar PV system of appropriate capacity, the building can effectively offset its energy demand and reduce its reliance on conventional energy sources.

System recommendation: 40KWp Solar PV System

System Design Overview

The proposed Solar PV System, rated at 60KVA, is tailored to meet the building's energy demand effectively. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

The following system is recommended to meet the proposed Solar PV demand:

Proposed System Overview.

Parameter	Value
Electricity Demand	733kWh/day
Type of Configuration	Facility level Solar PV
System Size	60KVA
System Voltage	Power Supply: 240VAC PV System: 48VDC

Energy Efficiency Measures

Energy Efficiency Recommendations: Organizational Perspective

- **Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. By optimizing solar energy utilization and strategically managing generator operation, this will minimize reliance on diesel until it's absolutely necessary.
- **Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV-battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.

- **Automation for Efficiency:** Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- **Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.
- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.

Chapter 03

ASSESSMENT REPORT OF ENERGY AUDIT AT NASARAWA STATE MINISTRY FOR LOCAL GOVERNMENT AND CHIEFTAINCY AFFAIRS

Introduction

This comprehensive Assessment Report provides an in-depth analysis of the energy situation at the Nasarawa State Ministry for Local Government and Chieftaincy Affairs, located at Nasarawa State Government House on Shendam Road, Lafia, Nasarawa. Our primary objective is to offer strategic recommendations to address the critical energy needs of the agency, particularly those reliant on electricity, with a focus on prioritizing services vital for the seamless operation of the Ministry.

Overview of the Organization:

The Nasarawa State Ministry for Local Government and Chieftaincy Affairs serves as a pivotal government agency dedicated to implementing programs aimed at fostering agricultural development and enhancing local governance within Nasarawa State. Situated within the Nasarawa State Government House, the Ministry plays a crucial role in facilitating initiatives that support farmers, cattle rearers, and beef processing marketers through government loans, crop schemes, and agricultural programs.

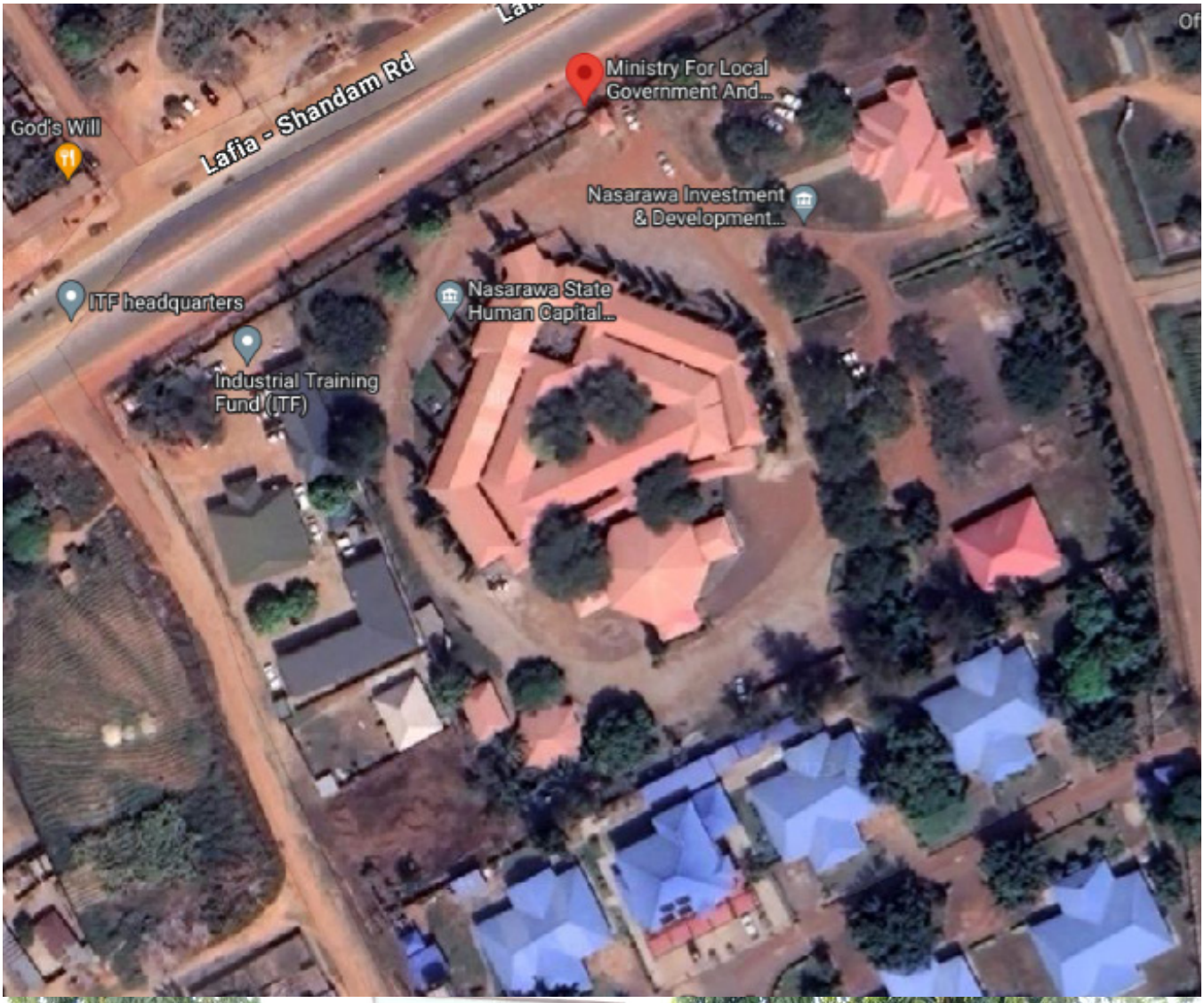
Key functions of the Nasarawa State Ministry for Local Government and Chieftaincy Affairs include:

- Implementing agricultural programs and initiatives designed to boost agricultural productivity and support rural development.
- Providing support services to farmers, cattle rearers, and beef processing marketers through the provision of government loans, agricultural schemes, and incentives.
- Managing and overseeing local governance structures, including local government councils and traditional chieftaincy affairs.
- Developing and implementing policies aimed at enhancing local governance, community development, and grassroots participation in governance.
- Collaborating with relevant stakeholders to promote sustainable agricultural practices and ensure the effective utilization of land and grazing resources within Nasarawa State.

Site Location and Layout:

The Nasarawa State Ministry for Local Government and Chieftaincy Affairs is strategically situated within Nasarawa State, serving as a crucial government agency dedicated to enhancing agricultural development and local governance. The facility boasts vast land and grazing resources conducive to cattle rearing and poultry farming. In a bid to harness this agricultural potential, the state government initiated several initiatives to capitalize on these resources effectively.

One notable endeavor includes the establishment of the Nasarawa Beef Processing Company in Masaka-Karu, strategically located along the corridor to the Federal Capital Territory, Abuja. This strategic positioning allows the company to leverage the available market opportunities in the nation's capital. Furthermore, the state government also pioneered the development of the Keffi Modern Abattoir, designed to complement the operations of the Nasarawa Beef Processing Company in Masaka-Karu. These initiatives underscore the government's commitment to maximizing agricultural productivity and bolstering economic growth within Nasarawa State.


Lafia - Shandam Rd
Ministry For Local Government And...
God's Will
Nasarawa Investment & Development...
ITF headquarters
Nasarawa State Human Capital...
Industrial Training Fund (ITF)


NASARAWA STATE GOVERNMENT
MINISTRY FOR LOCAL GOVER
AND CHIEFTAINCY AFFA
LAFIA


NASARAWA STATEGOVERNMENT


NASARAWA STATE GOVERNMENT
MINISTRY FOR LOCAL GOVERNMENT
AND CHIEFTAINCY AFFAIRS
LAFIA

Current Energy Situation

At present, the Nasarawa State Ministry for Local Government and Chieftaincy Affairs Office relies on the national grid as its primary source of electricity, with the connection point situated within the facility. Additionally, the office is equipped with a 150 & 200KVA backup diesel generator, serving as a contingency measure for uninterrupted power supply. However, the absence of a solar photovoltaic (PV) system means that the office is yet to capitalize on renewable energy sources. The compound housing essential facilities such as lighting and other appliances, registers a daily electrical energy demand of approximately 813kWh/day.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the Nasarawa State Ministry for Local Government and Chieftaincy Affairs Office adopts a 70KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 9th of January, 2024, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the Nasarawa State Ministry For Local Government And Chieftaincy Affairs. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed

the gathered data to identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL NO.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	53	26	1066	9	9594
	EXTERIOR	29	26	754	15	11310
	ICT	2	26	52	9	468
	FENCE	24	26	624	15	9360
	CAR PARK	20	26	520	15	7800
ICT	PRINTER/ PHOTOCOPIER	14	50	700	9	6300
	COMPUTERS	28	250	7000	9	63000
OTHERS	FAN	36	80	2880	9	25920
	WATER PUMP	1	1560	1560	9	14040
	TV	36	210	7560	9	68040
	AC (SPLIT)	59	1125	66375	9	597375
PEAK POWER				46341		
AVERAGE DAILY CONSUMPTION						813207

Current Electrical Energy Status

Energy Demand

The building sustains a steady energy demand of 813 kWh per day. This demand spans across essential utilities including lighting, refrigeration units, air conditioning, and continuous power requirements for various equipment distributed throughout its units.

Recommendation

Considering the actual energy consumption of 813 kWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of approximately 70KVA. This recommendation aligns with the building's energy requirements while promoting energy independence and environmental responsibility. By implementing a solar PV system of appropriate capacity, the building can effectively offset its energy demand and reduce its reliance on conventional energy sources.

System recommendation: 70KVA Solar PV System

System Design Overview

The proposed Solar PV System, rated at 70KVA, is tailored to meet the building's energy demand effectively. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

The following system is recommended to meet the proposed Solar PV demand:

Proposed System Overview.

Parameter	Value
Electricity Demand	813kWh/day
Type of Configuration	Facility level Solar PV
System Size	70KVA
System Voltage	Power Supply: 240VAC PV System: 48VDC

Energy Efficiency Measures

Energy Efficiency Recommendations: Organizational Perspective

- **Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. By optimizing solar energy utilization and strategically managing generator operation, this will minimize reliance on diesel until it's absolutely necessary.
- **Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV-battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.
- **Automation for Efficiency:** Embracing automation technologies like light and motion sensors

is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.

- **Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.
- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.

Chapter 04

ASSESSMENT REPORT OF ENERGY AUDIT AT NASARAWA STATE MINISTRY OF JUSTICE, LAFIA OFFICE

Introduction

This report presents the results of a walkthrough energy audit and needs assessment conducted at Nasarawa State Ministry of Justice, Lafia Office, located in Lafia, Nasarawa State. It provides an assessment of the center's main building energy usage (demand and supply) and makes recommendations on how to improve the availability and quality of energy services at the facility.

Site Location and Layout

The Nasarawa State Ministry of Justice, Lafia Office, located in Lafia, Nasarawa State, Nigeria, comprises two main buildings, each fulfilling distinct functions within the ministry:

Administrative Building: This building serves as the nerve center for managing the ministry's day-to-day operations. It houses administrative offices responsible for coordination, communication, and administrative tasks essential for the smooth functioning of the ministry.

Legal Advisory Services Building: The Legal Advisory Services Building is dedicated to providing comprehensive legal advice and counsel to the government, state agencies, and other entities on a wide range of legal matters. It serves as a hub for legal consultations, research, and expertise, supporting informed decision-making across various sectors.

These two buildings form the core infrastructure of the Nasarawa State Ministry of Justice, Lafia Office, collectively contributing to the effective delivery of legal services, administrative support, and governance functions within the state.

Functions The Ministry of Justice, Lafia Office, is tasked with several key functions:

- Legal Advisory Services: Providing legal advice to the government and state agencies.
- Prosecution: Initiating and conducting criminal prosecutions on behalf of the state.
- Administration of Justice: Ensuring the proper administration of justice within Nasarawa State.
- Legal Representation: Representing the state government in legal proceedings.
- Law Enforcement: Collaborating with law enforcement agencies to enforce laws and regulations.
- Policy Implementation: Implementing legal policies and reforms to improve the legal framework.

The Ministry plays a pivotal role in upholding the rule of law, safeguarding legal rights, and ensuring justice for the residents of Nasarawa State.


MINISTRY OF JUSTICE


MINISTRY

Current Energy Situation

The facility is connected to the national grid with the connection point located inside the facility and a 60KVA & 30KVA backup diesel generator. Therefore, the facility depends on the national grid and the 60KVA & 30KVA backup diesel generator for electricity supply. It currently does not have a solar PV system. The Main Building lighting and ICT equipment have an estimated daily electrical energy demand of 497kWh/day.

Audit Scope/Recommendation

The audit scope is to identify the facility's critical loads which can be powered with Solar PV Backup System. Nasarawa State Ministry of Justice, Lafia Office is recommended to have a 40KVA Backup Solar Power System for the critical loads. It is recommended that the Building be connected to the Solar Power System to provide backup power for the main building lighting, corridor, director's office, and official workers' offices.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 9th of January, 2024, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the Nasarawa State Ministry of Justice, Lafia Office. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the gathered data to identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable

insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL NO.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	91	26	2366	9	21294
	EXTERIOR	15	26	390	15	5850
	ICT	2	26	52	9	468
	FENCE	21	26	546	15	8190
	CAR PARK	12	26	312	15	4680
ICT	PRINTER/ PHOTOCOPIER	10	50	500	9	4500
	COMPUTERS	10	250	2500	9	22500
	SERVERS	2	700	1400	9	12600
OTHERS	TV	29	230	6670	9	60030
	WATER PUMP	1	1560	1560	9	14040
	FAN	41	80	3280	9	29520
	AC (SPLIT)	22	1125	24750	9	222750
	REFRIDGERATOR	16	630	10080	9	90720
PEAK POWER			54406			
AVERAGE DAILY CONSUMPTION						497142

Current Electrical Energy Status

Energy Demand

The building has a consistent energy demand of 497 kWh per day. This demand encompasses various essential utilities such as lighting, refrigeration units, air conditioning, and continuous power requirements for equipment distributed across its units.

Recommendation

Based on the actual energy consumption of 497 kWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of 40KVA. The recommendation of a 40KVA Solar PV System offers a sustainable solution to meet the building's energy requirements, fostering energy independence and environmental responsibility.

System Design Overview

The proposed Solar PV System, rated at 40KVA, is tailored to meet the building's energy demand effectively. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

Proposed System Overview.

Parameter	Value
Electricity Demand	497kWh/day
Type of Configuration	Facility level Solar PV
System Size	40KVA
System Voltage	Power Supply: 240VAC PV System: 48VDC

Energy Efficiency Measures

Energy Efficiency Recommendations: Organizational Perspective

- **Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. By optimizing solar energy utilization and strategically managing generator operation, this will minimize reliance on diesel until it's absolutely necessary.
- **Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV-battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.
- **Automation for Efficiency:** Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- **Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.

- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.

Chapter 05

ASSESSMENT REPORT OF ENERGY AUDIT AT DALHATU ARAF SPECIALIST HOSPITAL LAFIA

Introduction

This report presents the findings of a walkthrough energy audit and needs assessment conducted at Dalhatu Araf Specialist Hospital Lafia. It evaluates the energy usage and requirements of the hospital's main building, aiming to improve the availability and quality of energy services.

Site Location and Layout

Dalhatu Araf Specialist Hospital Lafia is located in Lafia, Nasarawa State. The hospital complex is divided into three main sections, each serving distinct purposes. The first section accommodates outpatient clinics, diagnostic laboratories, and imaging facilities, ensuring efficient patient care and diagnostic services. The second section comprises inpatient wards, providing accommodation for patients requiring hospitalization and specialized medical care. Lastly, the third section houses administrative offices, staff facilities, and support services, facilitating smooth hospital operations and management. The layout is designed to optimize patient flow, staff productivity, and overall hospital functionality.

Additional Information on Dalhatu Araf Specialist Hospital Lafia:

- **History:** The hospital was established following the creation of Nasarawa State on October 1, 1996. Commissioned in April 1999 by General Abdulsalam Abubakar (GCFR, DOS, MNI), the hospital was further developed under the administration of Governor Abdullahi Adamu (Sarkin Yakin Keffi) to function as a tertiary healthcare institution.
- **Objectives:** Dalhatu Araf Specialist Hospital Lafia aims to provide high-quality health services to patients with a strong commitment to excellence in health service delivery. The hospital was built with concrete objectives to ensure its efficient functioning and service delivery.
- **Services:** The hospital offers a wide range of medical services, including general outpatient and inpatient care, specialized medical and surgical services, diagnostic services, maternity and neonatal care, emergency services, and public health interventions.
- **Facilities:** Equipped with modern medical facilities, Dalhatu Araf Specialist Hospital Lafia features operating theaters, diagnostic laboratories, imaging facilities, intensive care units, pharmacy services, and outpatient clinics to support its services.
- **Training and Research:** The hospital serves as a center for medical education and research, providing clinical training to medical students, interns, and resident doctors. It contributes to the advancement of medical knowledge and skills through research initiatives and collaborations.


DALHATU ARAF
SPECIALIST HOSPITAL
LAFIA
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Dalhatu Araf
Specialist Hospital

Current Energy Situation

At present, the Dalhatu Araf Specialist Hospital Lafia relies on the national grid as its primary source of electricity, with the connection point situated within the facility. Additionally, the office is equipped with two (2) sets of 500KVA & two (2) sets of 250KVA backup diesel generators, serving as a contingency measure for uninterrupted power supply. However, the absence of a solar photovoltaic (PV) system means that the office is yet to capitalize on renewable energy sources. The compound housing essential facilities such as lighting and other appliances, registers a daily electrical energy demand of approximately 4.3mWh/day.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the Dalhatu Araf Specialist Hospital Lafia adopts an 85KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 9th of January, 2024, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the Dalhatu Araf Specialist Hospital Lafia Office. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the gathered data to identify

opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL NO.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	132	26	3432	9	30888
	EXTERIOR	31	26	806	15	12090
	FENCE	25	26	650	15	9750
	CAR PARK	14	26	364	15	5460
ICT	PRINTER/ PHOTOCOPIER	18	50	900	9	8100
	TV	37	120	4440	15	66600
	COMPUTERS (LAPTOP)	20	70	1400	9	12600
	COMPUTERS (DESKTOP)	14	250	3500	9	31500
	SERVERS	2	700	1400	24	33600
OTHERS	FAN	34	80	2720	9	64260
	AC (SPLIT)	62	1125	69750	9	627750
	PUMP MACHINE	1	1560	1560	9	4680
	ALL MEDICAL MACHINES AND EQUIPMENT	-	-	-	-	3409000
PEAK POWER				98870		
AVERAGE DAILY CONSUMPTION						4316278

Current Electrical Energy Status

Energy Demand

The building has a consistent energy demand of 4.3mWh per day. This demand encompasses various essential utilities such as lighting, refrigeration units, air conditioning, and continuous power

requirements for equipment distributed across its units.

Recommendation

Based on the actual energy consumption of 4.3mWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of 85KVA. The recommendation of an 85KVA Solar PV System offers a sustainable solution to meet the building's energy requirements, fostering energy independence and environmental responsibility.

System Design Overview

The proposed Solar PV System, rated at 85KVA, is tailored to meet the building's energy demand effectively. This will cater to all essential appliances including medical lab refrigerators for storage, excluding air conditioners. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

Proposed System Overview.

Parameter	Value
Electricity Demand	4.3mWh/day
Type of Configuration	Facility level Solar PV
System Size	85KVA
System Voltage	Power Supply: 240VAC PV System: 48VDC

Energy Efficiency Measures

Energy Efficiency Recommendations: Organizational Perspective

- **Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. By optimizing solar energy utilization and strategically managing generator operation, this will minimize reliance on diesel until it's absolutely necessary.
- **Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV-battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.
- **Automation for Efficiency:** Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- **Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time

energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.

- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals

Chapter 06

ASSESSMENT REPORT OF ENERGY AUDIT AT NATIONAL AUTOMOTIVE DESIGN AND DEVELOPMENT COUNCIL

Introduction

This report presents the findings of a comprehensive energy audit conducted at the headquarters of the National Automotive Design and Development Council (NADDC). The audit aims to assess the energy consumption patterns and identify areas for improvement within the agency's premises. Prepared by [Your Company Name], the report seeks to provide actionable recommendations to enhance energy efficiency and sustainability at the NADDC headquarters.

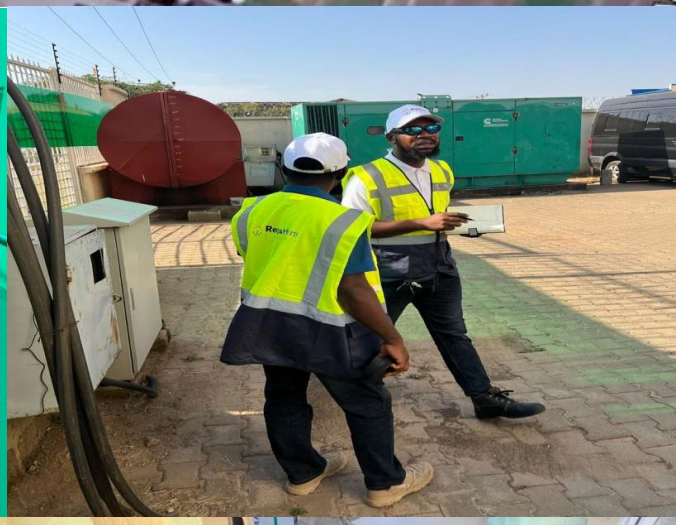
Site Layout

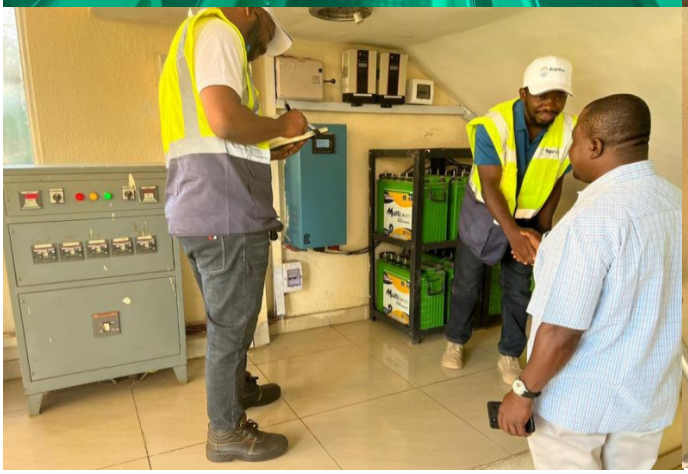
The NADDC headquarters is strategically located in Abuja, Nigeria's capital city, occupying a prominent position within the automotive industry hub. The site layout is designed to optimize functionality and workflow efficiency, with key facilities organized to facilitate seamless operations. The headquarters comprises administrative offices, research and development laboratories, training centers, and collaboration spaces, all interconnected to promote collaboration and innovation within the agency.

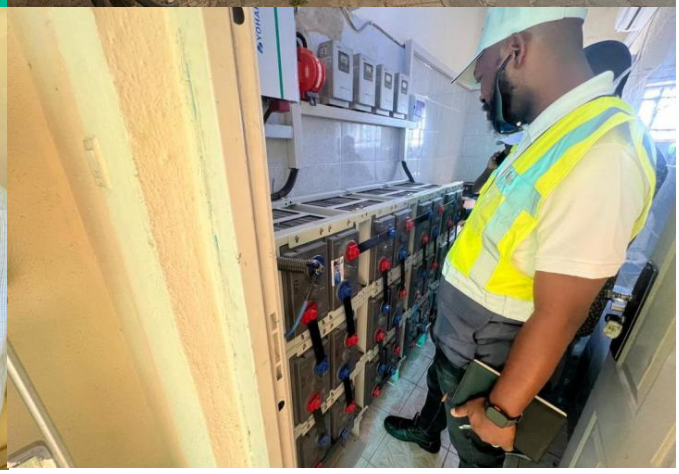
The National Automotive Design and Development Council (NADDC) is a pioneering institution in Nigeria's automotive sector, established under the Federal Ministry of Industry, Trade, and Investment. Since its inception, NADDC has been at the forefront of driving innovation, research, and development initiatives aimed at promoting local manufacturing and technological advancement in the automotive industry.

NADDC's mandate encompasses a wide range of activities, including policy formulation, research and development, capacity building, and industry collaboration. The agency is committed to fostering the growth and competitiveness of Nigeria's automotive sector while contributing to job creation, economic diversification, and national self-reliance.


Divine Choice
Catering Services
David Ejoor
National Automotive
Design And...
David Ejoor
David Ejoor







Current Energy Situation

At present, the National Automotive Design and Development Council (NADDC) relies on the national grid as its primary source of electricity, with the connection point situated within the facility. Additionally, the office is equipped with a set of 500KVA backup diesel generators, serving as a contingency measure for uninterrupted power supply. In terms of renewable energy infrastructure, the office has no solar PV system. The absence of a functional solar photovoltaic (PV) system means that the office is yet to capitalize on renewable energy sources. The compound housing essential facilities such as lighting and other appliances, registers a daily electrical energy demand of approximately 1.1mWh/day.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the National Automotive Design and Development Council (NADDC) adopts a 95KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while

embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 7th of December 2023, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the National Automotive Design and Development Council (NADDC) Office. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the gathered data to identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL NO.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	350	26	9100	9	81900
	EXTERIOR	47	26	1222	15	18330
	FENCE	30	26	780	15	11700
	CAR PARK	20	26	520	15	7800
ICT	COMPUTERS	42	250	10500	9	94500
	SERVERS	1	700	700	9	6300
	ONLINE UPS	2	20000	40000	9	360000
OTHERS	REFRIDGERATOR	14	869	12166	9	109494
	PUMP	1	1704	1704	9	15336
	FAN	16	96	1152	9	10368
	TV	11	250	2750	9	24750
	AC (SPLIT)	42	1125	47250	9	425250
PEAK POWER				127844		
AVERAGE DAILY CONSUMPTION						1165728

Current Electrical Energy Status

Energy Demand

The building has a consistent energy demand of 1.1mWh per day. This demand encompasses various essential utilities such as lighting, refrigeration units, air conditioning, and continuous power requirements for equipment distributed across its units.

Recommendation

Based on the actual energy consumption of 1.1mWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of 95KVA. The recommendation of a 95KVA Solar PV System offers a sustainable solution to meet the building's energy requirements, fostering energy independence and environmental responsibility.

System Design Overview

The proposed Solar PV System, rated at 95KVA, is tailored to meet the building's energy demand effectively. This will cater to all essential appliances, excluding air conditioners. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

Proposed System Overview.

Parameter	Value
Electricity Demand	1.1mWh/day
Type of Configuration	Facility level Solar PV
System Size	95KVA
System Voltage	Power supply: 240VAC PV: 48V

Energy Efficiency Measures

Energy Efficiency Recommendations: Organizational Perspective

- **Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. By optimizing solar energy utilization and strategically managing generator operation, this will minimize reliance on diesel until it's absolutely necessary.
- **Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV-battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.
- **Automation for Efficiency:** Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- **Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.
- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.

Chapter 07

ASSESSMENT REPORT OF ENERGY AUDIT AT NATIONAL BOUNDARY COMMISSION, ABUJA

Introduction

This report unveils the findings of a comprehensive energy audit and needs assessment conducted at the National Boundary Commission's premises in Abuja. By evaluating the energy consumption patterns and supply dynamics within the facility located at 54 Aguiyi Aguiyi Ironsi St, Wuse, Abuja 904101, Federal Capital Territory, we offer strategic recommendations to enhance energy availability and quality.

Site Location and Layout

Situated in Maitama FCT, Abuja, the National Boundary Commission serves as a pivotal government agency dedicated to addressing the developmental needs of border areas and offering counsel to the government on internal boundary matters. It plays a significant role in resolving intrastate and interstate boundary disputes, monitoring border relations with neighboring states, and assessing the developmental necessities of border regions. The commission is instrumental in establishing internal boundary technical committees to manage boundary and border issues between states, local governments, and communities.

Site Infrastructure

The agency operates from a single building, housing essential facilities for its core activities, including resolving boundary disputes and overseeing border relations. Equipped with standby generators, the premises also host an Information Technology Unit (ICT) and various staff offices furnished with essential equipment such as monitors, printers, standing ACs, split ACs, e.t.c. These amenities facilitate efficient operations and support the agency's mandate in addressing boundary-related matters.

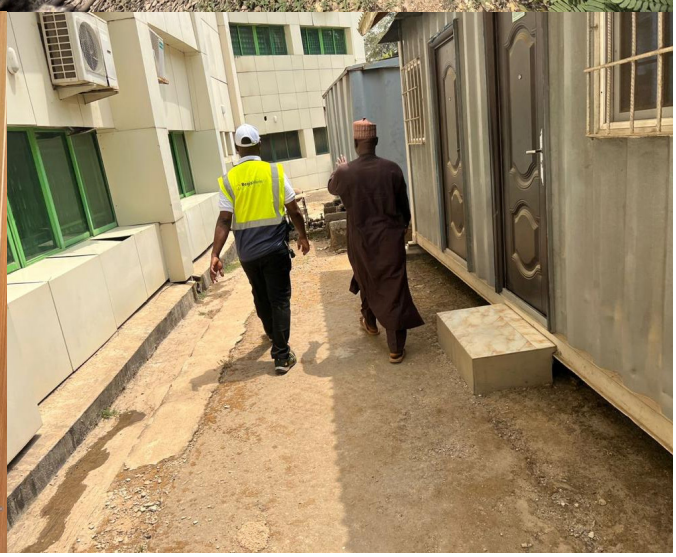
Key Functions of the National Boundary Commission, Abuja:

- **Resolving Boundary Disputes:** The commission plays a crucial role in resolving intrastate and interstate boundary disputes between states, local governments, and communities.
- **Monitoring Border Relations:** It oversees border relations with neighboring states, ensuring compliance with established boundaries and facilitating peaceful coexistence.
- **Assessing Developmental Needs:** The commission assesses the developmental requirements of border areas and provides recommendations to the government for appropriate interventions.
- **Establishing Technical Committees:** It establishes internal boundary technical committees to manage boundary and border issues effectively, fostering dialogue and cooperation among stakeholders.
- **Advising the Government:** The commission offers expert advice and recommendations to the government on internal boundary matters, guiding policy formulation and decision-making processes.


NATIONAL BOUNDARY COMMISSION
THE PRESIDENCY
HEADQUARTERS OFFICE: No. 54 Aguiyi Ironsi Street,
Cadastral Zone 6, Maitama - Abuja.


Coralworker.com
Red Sea Road
National Boundary Commission
Trinity Gard
Snowball Travel & Tours
Siam's Garden
Newark Security Systems Limited


Shehu Shagari Wy
National Boundary Commission
Google



Current Energy Situation

The National Boundary Commission Office currently relies on the national grid as its primary electricity source, with the connection point located within the facility. Additionally, the office has fortified its energy resilience with the installation of two sets of 250KVA backup diesel generators, ensuring continuous power supply during unforeseen grid outages. However, despite these provisions, the office is yet to fully harness renewable energy sources, lacking a comprehensive solar photovoltaic (PV) system. Although individual departments have implemented mini solar installations to supplement energy needs, a centralized solar solution remains absent. This gap is particularly noticeable given the office's substantial daily electrical energy demand, estimated at approximately 1.7MWh per day.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the National Boundary Commission adopts a 100KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 20th of February 2024, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the National Boundary Commission Office. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the gathered data to identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL NO.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	178	26	4628	9	41652
	EXTERIOR	67	26	1742	15	26130
	ICT	6	26	156	9	1404
	FENCE	57	26	1482	15	22230
	CAR PARK	21	26	546	15	8190
ICT	PHOTOCOPIER/ PRINTER	27	214	5778	9	52002
	TV	34	250	8500	9	76,500
	REFRIGERATOR	9	300	20160	9	181440
	COMPUTERS	96	250	9600	9	86400
	SERVERS	2	700	1400	9	12600
OTHERS	STANDING AC	8	2100	16800	9	151200
	PUMP MACHINE	2	1560	3120	3	9360
	AC (SPLIT)	104	1125	117000	9	1053000
PEAK POWER				190912		
AVERAGE DAILY CONSUMPTION						1722108

Current Electrical Energy Status

Energy Demand

The building has a consistent energy demand of 1.7mWh per day. This demand encompasses various essential utilities such as lighting, refrigeration units, air condition and continuous power requirements for equipment distributed across its units

Recommendation

Based on the actual energy consumption of 1.7mWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of 100KVA. The recommendation of a 100KVA Solar PV System offers a sustainable solution to meet the building's energy requirements, fostering energy independence and environmental responsibility.

System Design Overview

The proposed Solar PV System, rated at 100KVA, is tailored to meet the building's energy demand effectively. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

Proposed System Overview.

Parameter	Value
Electricity Demand	1.7mWh/day
Type of Configuration	Facility level Solar PV
System Size	100KVA
System Voltage	Power supply: 240VAC PV: 48V

Energy Efficiency Measures

Energy Efficiency Recommendations: Organizational Perspective

- **Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. Optimizing solar energy utilization and strategically managing generator operation will minimize reliance on diesel until it's necessary.
- **Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.
- **Automation for Efficiency:** Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- **Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.
- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.

Chapter 08

ASSESSMENT REPORT OF ENERGY AUDIT AT NIGERIA HYDROLOGICAL SERVICES AGENCY

Introduction

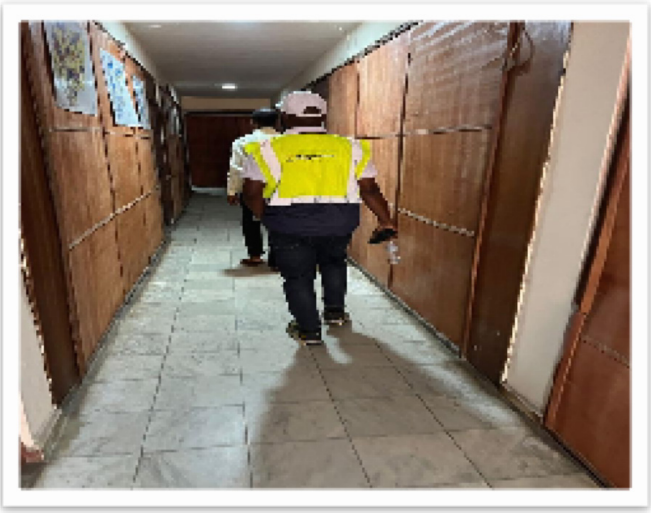
This Chapter provides a comprehensive assessment of the energy landscape at the Nigeria Hydrological Services Agency, situated at Ground Floor, Plot 792, Foundation Plaza, Ekene Dili Transportation Company, Foundation Plaza, Plot 22, Shettma Ali Monguno Crescent, Shetima Ali Mungono Cres, Utako, Abuja 75, Federal Capital Territory, Abuja, Federal Capital Territory. Our primary objective is to deliver strategic recommendations for meeting the agency's critical energy demands, particularly those reliant on electricity. This assessment prioritizes essential services vital for the seamless operation of the agency.

Overview of Location

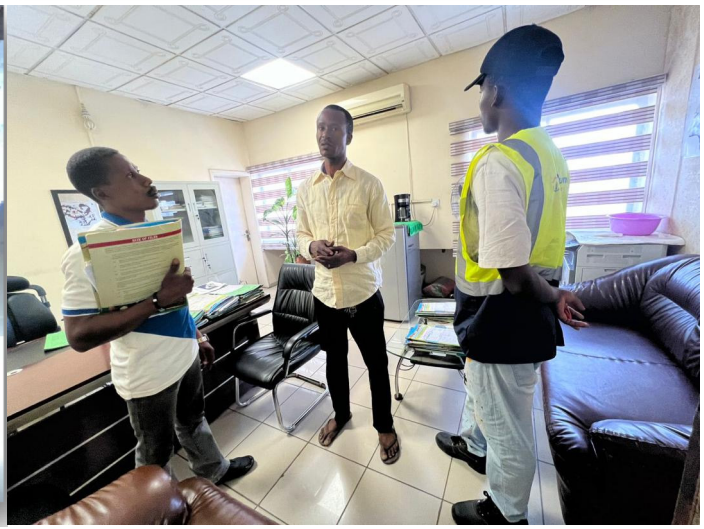
The Nigeria Hydrological Services Agency operates within a single building, serving as the central hub for hydrological stations across the country. Its primary function involves conducting groundwater exploration and monitoring, utilizing various scientific techniques. These activities are integral in providing essential hydrological and meteorological data necessary for the planning, design, execution, and management of water resources and allied projects nationwide.

Conducted on-site on 14th December, 2023, our thorough walkthrough audit encompassed approximately 80 offices, departmental units, and ICT rooms within the agency's premises.

This report presents the findings of the energy audit and needs assessment conducted at the Nigeria Hydrological Services Agency. It meticulously evaluates the energy utilization dynamics, encompassing both demand and supply aspects within the main building. Subsequently, it offers tailored recommendations aimed at enhancing the accessibility and quality of energy services within the facility.





Current Energy Situation

Current Energy Situation: The Nigeria Hydrological Services Agency Office currently relies on the national grid as its primary electricity source, with the connection point situated within the facility. Additionally, the office is equipped with a set of 400KVA backup diesel generators, serving as a contingency measure for uninterrupted power supply. However, the absence of a solar photovoltaic (PV) system means that the office is yet to capitalize on renewable energy sources. The compound,

housing essential facilities such as lighting and other appliances, registers a daily electrical energy demand of approximately 1.07mWh/day.

In terms of renewable energy infrastructure, the office does not currently possess a solar PV system. However, there was previously a battery setup of 15KVA installed, which relied on AEDC supply for charging. This setup is now inactive as the batteries have deteriorated.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the Nigeria Hydrological Services Agency Office adopts a 90KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 14th of January, 2024, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the Nigeria Hydrological Services Agency. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the gathered data to identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL NO.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	186	26	4836	9	43524
	EXTERIOR	67	26	1742	15	26130
	FENCE	48	26	1248	15	18720
	CAR PARK	20	26	520	15	7800
ICT	TV	14	250	3500	9	31500
	COMPUTERS	68	250	17000	9	153000
	SERVERS	1	700	700	9	6300
OTHERS	PHOTOCOPIER/ PRINTER	12	300	3600	9	32400
	AC (SPLIT)	67	1125	75375	9	678375
	REFRIDGERATOR	12	600	7200	9	64800
	PUMPING MACHINE	1	1704	1704	9	15336
PEAK POWER				119621		
AVERAGE DAILY CONSUMPTION						1077885

Current Electrical Energy Status

Energy Demand

The building sustains a steady energy demand of 1.07mWh per day. This demand spans across essential utilities including lighting, refrigeration units, air conditioning, and continuous power requirements for various equipment distributed throughout its units.

Recommendation

Considering the actual energy consumption of 1.07mWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of approximately 90KVA. This recommendation aligns with the building's energy requirements while promoting energy independence and environmental responsibility. By implementing a solar PV system of appropriate capacity, the building can effectively offset its energy demand and reduce its reliance on conventional energy sources.

System recommendation: 90KVA Solar PV System

System Design Overview

The proposed Solar PV System, rated at 90KVA, is tailored to meet the building's energy demand effectively. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

The following system is recommended to meet the proposed Solar PV demand:

Proposed System Overview.

Parameter	Value
Electricity Demand	1.07mWh/day
Type of Configuration	Facility level Solar PV
System Size	90KVA
System Voltage	Power Supply: 240VAC PV System: 48VDC

Energy Efficiency Measures Recommendations

Energy Efficiency Recommendations: Organizational Perspective

- **Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. By optimizing solar energy utilization and strategically managing generator operation, this will minimize reliance on diesel until it's absolutely necessary.
- **Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV-battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.
- **Automation for Efficiency:** Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- **Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.
- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.

Chapter 09

ASSESSMENT REPORT OF ENERGY AUDIT AT SHARIA APPEAL COURT APO, GUDU, ABUJA

Introduction

This comprehensive Assessment Report delves into the energy landscape of the Sharia Court of Appeal Headquarters Apo, Gudu Abuja, specifically the Sharia Court of Appeal Headquarters situated in Gudu District, Apo Abuja. Our primary objective is to present strategic recommendations to address the critical energy needs of the agency, particularly those reliant on electricity, thereby prioritizing services crucial for the court's operational continuity.

Overview of the Organization:

The Sharia Court of Appeal Headquarters, located in Gudu District, Apo Abuja, serves as a pivotal institution within the judicial system. Operating from its Apo location, the court upholds the principles of Sharia law and administers justice in alignment with Islamic jurisprudence.

The Sharia Court of Appeal Headquarters is tasked with several responsibilities, including:

- Resolving legal disputes and adjudicating matters under Sharia law.
- Providing legal guidance and interpretations of Sharia principles to litigants and legal practitioners.
- Overseeing the appellate process, ensuring fair and impartial hearings for all parties involved.
- Collaborating with other judicial bodies to uphold the rule of law and promote justice within the Islamic legal framework.
- Facilitating the execution of court judgments and orders, maintaining the integrity of the judicial process.

Site Infrastructure

The court complex boasts a modern and functional infrastructure designed to meet the needs of judicial proceedings while providing a conducive environment for justice administration. It is divided into 4 sections. The layout of the complex is purposefully organized to optimize workflow efficiency, security, and accessibility.


SHARIA COURT OF APPEAL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Current Energy Situation

At present, the Nasarawa State Ministry for Local Government and Chieftaincy Affairs Office relies on the national grid as its primary source of electricity, with the connection point situated within the facility. Additionally, the office is equipped with a 250 & 500KVA backup diesel generator, serving as a contingency measure for uninterrupted power supply. However, the absence of a solar photovoltaic (PV) system means that the office is yet to capitalize on renewable energy sources. The compound housing essential facilities such as lighting and other appliances, registers a daily electrical energy demand of approximately 3.8mWh/day.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the Sharia Court of Appeal adopts an 85KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 22nd of January, 2024, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the Sharia Court of Appeal Headquarters Office. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the gathered data to identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis,

tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL NO.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	218	26	5668	9	51012
	EXTERIOR	67	26	1742	15	26130
	ICT	12	26	312	9	2808
	FENCE	59	26	1534	15	23010
	CAR PARK	17	26	442	15	6630
ICT	TV	31	250	7750	9	69750
	COMPUTERS	83	250	20750	9	186750
	SERVERS	2	700	1400	9	12600
OTHERS	REFRIDGERATOR	21	630	5670	9	51030
	PRINT/PHOTO	18	530	3990	9	35910
	PUMP MACHI	2	1560	4680	9	42120
	AC (SPLIT)	286	1125	321750	9	2895750
	STANDING FAN	35	2100	73500	6	441000
PEAK POWER				449188		
AVERAGE DAILY CONSUMPTION						3844500

Current Electrical Energy Status

Energy Demand

The building has a consistent energy demand of 3.8mWh per day. This demand encompasses various essential utilities such as lighting, refrigeration units, air conditioning, and continuous power requirements for equipment distributed across its units.

Recommendation

Based on the actual energy consumption of 3.8mWh per day, the optimal solution involves the

installation of a Solar PV System with a capacity of 175KVA. The recommendation of a 175KVA Solar PV System offers a sustainable solution to meet the building's energy requirements, fostering energy independence and environmental responsibility.

System Design Overview

The proposed Solar PV System, rated at 175KVA, is tailored to meet the building's energy demand effectively. This system is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

Proposed System Overview.

Parameter	Value
Electricity Demand	3.8mWh/day
Type of Configuration	Facility level Solar PV
System Size	175KVA
System Voltage	Power supply: 240VAC PV: 48V

Energy Efficiency Measures

Energy Efficiency Recommendations: Organizational Perspective

- **I Intelligent Solar PV Integration:** Prioritizing seamless integration of solar PV technology is paramount for your organization. Optimizing solar energy utilization and strategically managing generator operation will minimize reliance on diesel until it's necessary.
- **I Capacity Building Initiatives:** Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.
- **I Automation for Efficiency:** Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- **I Real-Time Energy Monitoring:** Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.
- **Energy-Efficient Equipment Upgrades:** Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.

Chapter 10

ASSESSMENT REPORT OF ENERGY AUDIT AT NATIONAL AGENCY FOR SCIENCE AND ENGINEERING INFRASTRUCTURE (NASENI)

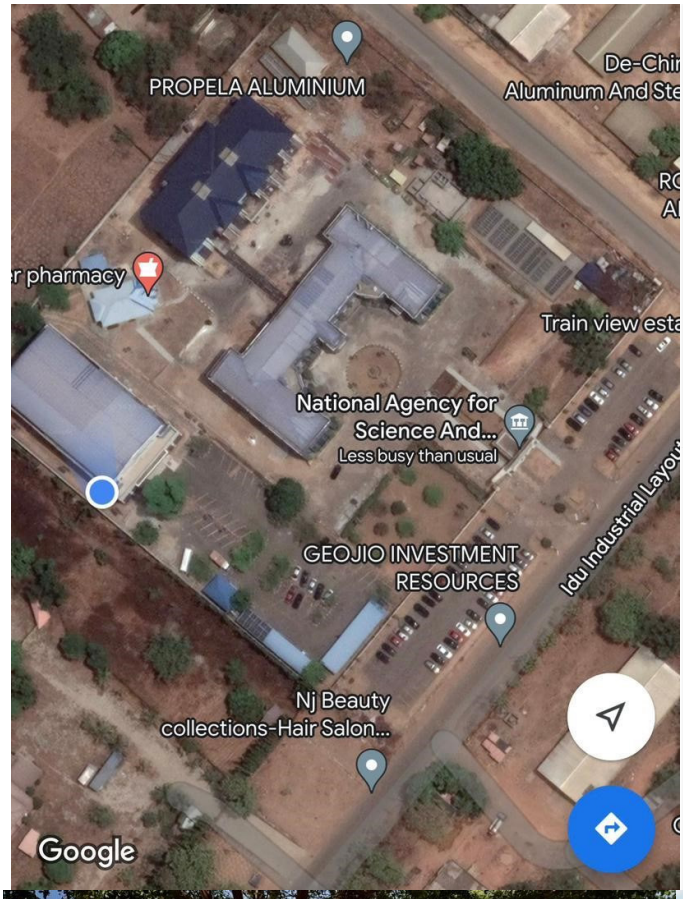
Introduction

This report presents the findings of a walkthrough energy audit and needs assessment conducted at National Agency for Science and Engineering Infrastructure (NASENI). It evaluates the energy usage and requirements of the hospital's main building, aiming to improve the availability and quality of energy services.

The National Agency for Science and Engineering Infrastructure (NASENI) stands as a beacon of technological advancement in Nigeria, pioneering indigenous innovation across a spectrum of sectors. Established in 1992 under the Federal Ministry of Science and Technology, NASENI plays a pivotal role in propelling Nigeria towards self-reliance and sustainable development through cutting-edge research, development, and dissemination of science and engineering solutions.

Site Location and Layout

The National Agency for Science and Engineering Infrastructure (NASENI) is located in the Federal Capital Territory, Abuja. It serves as the nerve center for its diverse range of activities. The site layout reflects the agency's commitment to fostering collaboration, innovation, and efficiency. The headquarters comprises administrative offices, research laboratories, workshops, and specialized centers of excellence, meticulously designed to facilitate seamless workflow and interaction among multidisciplinary teams. It is the only on-purpose built intervention agency of the Federal Government under the Presidency whose mandate include nurturing an appropriate and dynamic Science and Engineering infrastructure base for achieving home initiated and home sustained industrialization for Nigeria. The mandate of the Agency includes the development of relevant processes, capital goods and equipment necessary for job creation, national economic well-being and progress.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NASENI
TECHNOLOGY ORIENTATION CENTRE

Current Energy Situation

At present, the National Agency for Science and Engineering Infrastructure (NASENI) relies on the national grid as its primary source of electricity, with the connection point situated within the facility. Additionally, the office is equipped with a set of 500KVA & 250KVA backup diesel generator, serving as a contingency measure for uninterrupted power supply. In terms of renewable energy infrastructure, the office has a solar PV system of 30KVA, but it is inactive. The absence of a functional solar photovoltaic (PV) system means that the office is yet to capitalize on renewable energy sources. The compound housing essential facilities such as lighting and other appliances, registers a daily electrical energy demand of approximately 2.9mWh/day.

Audit Scope and Recommendations

The audit's primary scope is to identify critical loads within the facility that can be effectively powered by a solar PV backup system. Consequently, it is recommended that the National Agency for Science and Engineering Infrastructure (NASENI) adopts a 140KVA Backup Solar Power System tailored to meet its critical energy demands. Moreover, integration with the proposed solar power system is advised to ensure backup power availability for vital areas such as the main building's lighting, corridors, director's office, and other essential offices. This strategic initiative aims to enhance energy resilience and reduce dependence on conventional power sources while

embracing sustainable energy solutions.

The Table below summarizes the proposed power solution for the critical load.

Proposed Energy Solution for the Critical loads at the Main Building

Critical Load	Current Energy Source	Proposed Energy Source
Main Building Lighting	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV
ICT equipment, Office gadgets (Fridge, Air-conditioner etc)	Mains + Backup Generator	Mains + Backup Generator + Backup Solar PV

Methodology

As RegisHum, our approach to energy audits and needs assessments is systematic and thorough. Our process commenced with meticulous planning, coordinating with the facility management to schedule the audit. On the 7th November, 2023, we conducted an on-site energy audit, meticulously inspecting key infrastructure and energy systems at the National Agency for Science and Engineering Infrastructure (NASENI) Office. During this audit, we collected comprehensive data on energy usage, focusing on critical loads and areas of inefficiency. Subsequently, our team analyzed the gathered data to identify opportunities for enhancing energy efficiency and sustainability. Based on our analysis, tailored recommendations were formulated to address specific energy needs and challenges identified during the audit. These recommendations are presented in this detailed report, providing actionable insights to improve energy management practices and optimize resource utilization.

The table below represents the load calculation exclusively for the lighting fixtures and all appliances installed within the main building. The quantities and power ratings of the appliances in various locations are listed, along with the total power consumption derived from their cumulative usage.

SN	APPLIANCE	TOTAL NO.	UNIT POWER CONSUMPTION	TOTAL POWER CONSUMPTION	HOURS OF USE (DAILY)	ENERGY (WH/DAY)
LIGHTS	INTERIOR	500	26	13000	9	117000
	EXTERIOR	120	26	3120	15	46800
	FENCE	30	26	780	15	11700
	CAR PARK	42	26	1092	15	16380
ICT	PRINTER/ PHOTOPCOPIER	27	300	8100	9	72900
	COMPUTERS	102	250	25500	9	229500
	SERVERS	5	700	3500	9	31500
OTHERS	AC (SPLIT)	184	1125	207000	9	1863000
	STANDING	29	1500	43500	9	391500
	TV	34	250	8500	9	76500
	REFRIDGERATOR	18	600	10800	9	97200
	PUMPING MACHINE	2	1704	3408	9	30672
PEAK POWER				328300		
AVERAGE DAILY CONSUMPTION						2984652

Current Electrical Energy Status

Energy Demand

The building has a consistent energy demand of 2.9mWh per day. This demand encompasses various essential utilities such as lighting, refrigeration units, air conditioning, and continuous power requirements for equipment distributed across its units.

Recommendation

Based on the actual energy consumption of 2.9mWh per day, the optimal solution involves the installation of a Solar PV System with a capacity of 120KVA. The recommendation of a 140KVA Solar PV System offers a sustainable solution to meet the building's energy requirements, fostering energy independence and environmental responsibility.

System Design Overview

The proposed Solar PV System, rated at 140KVA, is tailored to meet the building's energy demand effectively. This will cater to all essential appliances, excluding air conditioners. This system

is strategically designed to align with the specified consumption pattern and ensure seamless integration with the existing electrical infrastructure.

Proposed System Overview.

Parameter	Value
Electricity Demand	2.9MWh/day
Type of Configuration	Facility level Solar PV
System Size	140KVA
System Voltage	Power supply: 240VAC PV: 48V

Energy Efficiency Measures

Energy Efficiency Recommendations: Organizational Perspective

- Intelligent Solar PV Integration: Prioritizing seamless integration of solar PV technology is paramount for your organization. By optimizing solar energy utilization and strategically managing generator operation, this will minimize reliance on diesel until it's absolutely necessary.
- Capacity Building Initiatives: Educating your team members on energy conservation is a core initiative. Empowering them to maximize benefits from your solar PV-battery system builds a culture of energy consciousness within your organization, enabling you to reduce reliance on conventional energy sources.
- Automation for Efficiency: Embracing automation technologies like light and motion sensors is a strategic move for your organization. These systems intelligently regulate utilities based on occupancy and conditions, allowing you to minimize your environmental footprint and operational costs.
- Real-Time Energy Monitoring: Incorporating sophisticated monitoring systems for real-time energy consumption analysis is essential for your organization. This data-driven approach enables informed decision-making, ensuring your energy systems operate at peak efficiency and reducing diesel dependency whenever possible.
- Energy-Efficient Equipment Upgrades: Investing in energy-efficient appliances and equipment can significantly reduce our overall energy consumption. Upgrading to energy-efficient lighting, HVAC systems, and appliances can yield substantial long-term savings and contribute to our sustainability goals.