REA-NEP
NIGERIA ELECTRIFICATION PROGRAMME

THE WORLD BANK

Terms of Reference (TOR)

For

Specialized Consultancy Services for Holistic Data Architecture Development, Unified Geospatial Solutions, Advanced Management Systems Integration, including Strategic Data Optimization, and Enterprise Resource Management Solutions Deployment for the DARES program

REA-NEP/DARES/C/QCBS/057/2025

April, 2025

1. Project Background

In 2018, the Federal Government of Nigeria secured a low-cost loan of US$ 550 million (US $350 million from the World Bank and US$ 200 million from the African Development Bank) for the implementation of the Nigeria Electrification Project (NEP, P161885). The NEP, being the FGN's flagship off-grid access program was launched in 2018 with of aim of connecting more than 3.5 million people, 90,000 MSMEs, and public institutions (15 universities, two teaching hospitals, and 100 COVID-19 isolation centers. The NEP has been successful in delivering clean, reliable electricity to more than seven million people and had created an ecosystem for private sector led electrification in Nigeria supported by catalytic public sector subsidies administered as results-based financing (RBF).

Although the NEP has laid credible foundation to help Nigeria reach universal access by 2030 and achieve its Nationally Determined Contribution (NDC) commitments under Paris Agreement, a lot still has to be done towards achieving these ambitions.

In recognition of the need to further accelerate access to clean, reliable and sustainable power towards bringing to realization Nigeria's Energy Transition ambitions, the FGN in partnership with the World Bank have embarked on the implementation of the Nigeria Distributed Access Through Renewable Energy Scale-Up (DARES) Project with the aim of scaling-up on the existing impact of the NEP.

The DARES was launched by the World Bank in 2022 at COP 27 in Egypt. The Nigeria DARES ("DARES") project is the first World Bank initiative globally and seeks to accelerate electricity access to over 13 million Nigerians in rural, unserved and underserved peri-urban areas through the deployment of mini-grids (Isolated and Interconnected) and stand-alone solar solutions using innovative financial and de-risking instruments to triple the pace of electrification.

The DARES project which is a US$750 million loan facility is funded by the IFC (debt facility) in collaboration with World Bank (IDA financing), to create the platform for scaling up private sector- led electricity access solutions.

Given the success of the NEP and mandate of the REA to further increase the deployment of sustainable energy access solutions to unserved and underserved parts of Nigeria, the DARES just like the NEP will be implemented by the REA through the existing Project Management Unit (PMU), and the REA has signed a subsidiary agreement with the Federal Ministry of Finance to initiate implementation of the DARES.

The DARES project has three components, all of which will be implemented by the REA:

1. Component 1: Solar Hybrid Mini Grids for Rural Economic Development (the total IDA commitment for Component 1 is USD410 million)
2. Component 2: Stand-alone Solar Systems for Homes and MSMEs (the total IDA commitment for Component 2 is US$300 million)
3. Component 3: Technical Assistance (The total IDA commitment for component (US$40 million)

With the entrance of industry 5.0 automation and Web 3.0 engineering, manufacturers and developers (grantees) are inevitably deploying advanced technology infrastructure in the execution of the off-grid renewable energy and solar homes system project. This development has enabled remote monitoring capabilities, smart metering, customers management systems and lots of big data are being generated on the fly. The generated data from these activities have raised compliance concern in-line with the Nigerian data protection and regulatory policies, which places a role on REA as the major data controller.

2. Objectives

The objective of the assignment isto advance the nation's renewable energy landscape in line with the rapid evolution of technology and global industrial trends to, ensure data unification, accuracy and consistency, streamline communication, implement smart work place and catalyze sustainable energy development through standard procedure which will stand as a testament to REA's dedication to effective management and analysis of its data in the energy space in line with the Nation's data processing and protection policies.
The Nigerian Electrification Project (NEP) is a vital initiative implemented by Rural Electrification Agency (REA), to advance the nation's renewable energy landscape and in line with the rapid evolution of technology and global industrial trends, there is a compelling need to harness the power of modern data management, seamless communication, and interoperability in its future programmes.

Rural Electrification Agency (REA) is committed to the success of the Nigerian Energy Transition plan and to advance the nation's off-grid energy landscape by deploying digital solution that will revolutionize how data is identified, accessed and utilized in the Nigerian Off-Grid Space and the Project Management Unit. The REA also seek to advance the nation's renewable energy landscape and in line with the rapid evolution of technology and global industrial trends, there is a compelling need to harness the power of modern data management, seamless communication, and interoperability in its future programmes.

With the entrance of industry 5.0 revolution and Web 3.0 engineering, manufacturers and developers (grantees) are inevitably deploying advanced technology infrastructure in the execution of the off-grid renewable energy and solar homes system project. This development has enabled remote monitoring capabilities, smart metering, customers management systems and lots of big data are being generated on the fly. The generated data from these activities have raised compliance concern in-line with the Nigerian data protection and regulatory policies, which places a role on REA as the major data controller.

Given the pivotal role of the REA in spearheading the revolutionization of the renewable energy space and its responsibility as the data controller, there is an urgent need for the Agency to step up and initiate cutting-edge solutions to service the ecosystem and integrate easily with the advanced technological infrastructure currently being deployed in the space, optimized internal work processes, and optimize how data are identified, accessed, and utilized in compliance the Nigeria Data Protection Regulatory (NDPR) Act.

With the coming of the DARES programme, the REA has envisioned the development of a transformative platform that bridges the gap between disparate data sources and systems and enhance work flow processing. This revolutionary initiative seeks to establish a cutting-edge ecosystem in line with the principles of Web 3.0 engineering and Industry 5.0 period of automation.

The proposed data unification architecture will be designed to serve as a central hub, offering a user-friendly interface that allows users to interact in a single coherent interface seamlessly. By tapping into cloud-based core data systems, the design will facilitate the creation of rich data models, thus enabling highly efficient analytical tools, which will include aggregations, maps, and charts, empowering decision-makers with actionable insights.

Furthermore, the system will empower the REA to navigate the complexities of data integration through the development of an REA standardized Application Programming Interfaces (APIs) documentation for effective data governance. The potential integration of Internet of things (IoT), Global Positioning System (GPS) technology and the conversion of existing assets to Cyber Physical System (CPS) will pave the way for real-time data monitoring and location tracking capabilities for robust data management, predictive and energy pattern analysis, especially for Minigrids, Solar Home Systems (SHS) and Productive Use Equipment (PUE).

Scope of Work

SN	DESCRIPTION	TASKS
1.	Development of the Unified Organized Data Space	- Develop a robust data ecosystem that seamlessly integrates with diverse data sources and systems, ensuring real-time access to a comprehensive repository of information. - Implement highly efficient built-in analytical tools, such as aggregations, maps, and charts, to

		empower data-driven decision-making and strategic planning within the off-grid energy space. - Establish standardized Application Programming Interfaces (APIs), documentation, data governance protocols and integration methods to facilitate data exchange, real-time monitoring, and potential location tracking using Global Positioning System (GPS) integration. - Create a "single" source of truth dataset ensuring data accuracy, consistency, and predictive analysis capabilities. - Design a user-friendly interface that enables stakeholders to seamlessly access, query, store, and retrieve data, democratizing data utilization across the off-grid space.
2.	Development of the DARES program Geospatial tool	- Develop a single geographical reference tool for DARES program achievement - Implement highly efficient built-in analytical tools to retrieve and display projected impact, current project status and important KPIs - Implement browser-side capabilities to enable users to sort and export interested resources and datasets at ease
3.	Development of Office Enterprise Solution to automate and digitalize internal workflow	- Conduct requirement analysis to understand and document the DARES program business processes, user needs, and functional requirements - Develop solution to streamline operations, automate repetitive tasks, and reduce manual procedures - Integrate the solution with the NEP official Gmail account and local file storage server used within the organization to ensure seamless data flow and functionality across different platforms.
4.	Development of Technical Data Sharing Checklist, Data Processing & Protection Documentations and Trainings	- Develop compliance and governance policy, data protection policy framework and data impact assessment and mechanism and consent to ensure data governance policies are followed - Facilitate with the Nigerian Data Protection Commission for Data Protection Compliance Audit and Registration. - Develop Data sharing lifecycle management agreement

		- Develop data classification schemes, backup and recovery strategies for the project - Develop Trainings and workshops on cyber security best practices and responsible data usage, ethical data handling, confidentiality and use of the data management platform
5.	Establishment of an Interactive Digital and Dashboard Center	- Build a center with interactive dashboards and live project monitoring. - Create a platform for real-time data collection and display from project sites. - Design interactive screens for stakeholders to view project data and milestones - Implement tools for data-driven decisions with real-time KPIs and visualizations - Integrate GPS to track project locations and impact. - Automate data collection and reporting for improved operations - Automate data collection and reporting for improved operations - Ensure data protection with security protocols and compliance audits - Provide training on digital tools, cybersecurity, and data governance

2.2 Assumptions

- Data Residency Compliance: In accordance with Nigerian data protection and governance laws, all deployed database solutions must be hosted within Nigeria.

- Existing Vendor Infrastructure: It is assumed that vendors have their data collection infrastructure already established. This project/assignment will focus on integrating with these existing infrastructures rather than developing new ones.

2.3 Capacity Building of REA Staff on ICT, Monitoring and Evaluation:

a. Conduct Information, Communication & Technology (ICT) need assessment survey among REA & PMU staff (including those at the zonal level) and identify ICT capacity gaps;

b. Develop appropriate training package in consultation with REA ICT Department and the DARES Project Management Unit;

c. Organize capacity building training to REA and the DARES PMU staff to minimize capacity gaps among the staff.

The Consultant will be required to carry out other related tasks, within the PMU, for the Project.

3. Methodology

3.1 Approach

This project will adopt a design-centric approach guided by three main principles:

1. Data Regulation and Compliance
2. Business Objectives
3. Technical Feasibility

The following steps will be taken:

Discovery:

- Engage key stakeholders from PMU to gather requirements, identify existing vendor infrastructure, and gain access to data lakes/warehouses.
- Collaborate with the PMU team to study its processes and identify key business activities for automation.

Definition of Success Outcomes:

- Clearly define business objectives and success outcomes for both the unified data space and the internal process workflow solution in consultation with key stakeholders.

Ideation and Brainstorming:

- Conduct a deep analysis of existing vendor systems and database architecture.
- Decide on the best technology protocols for communicating with vendors.
- Brainstorm and identify optimal solutions for the PMU internal workflow tool.

Design and Development of Solutions:

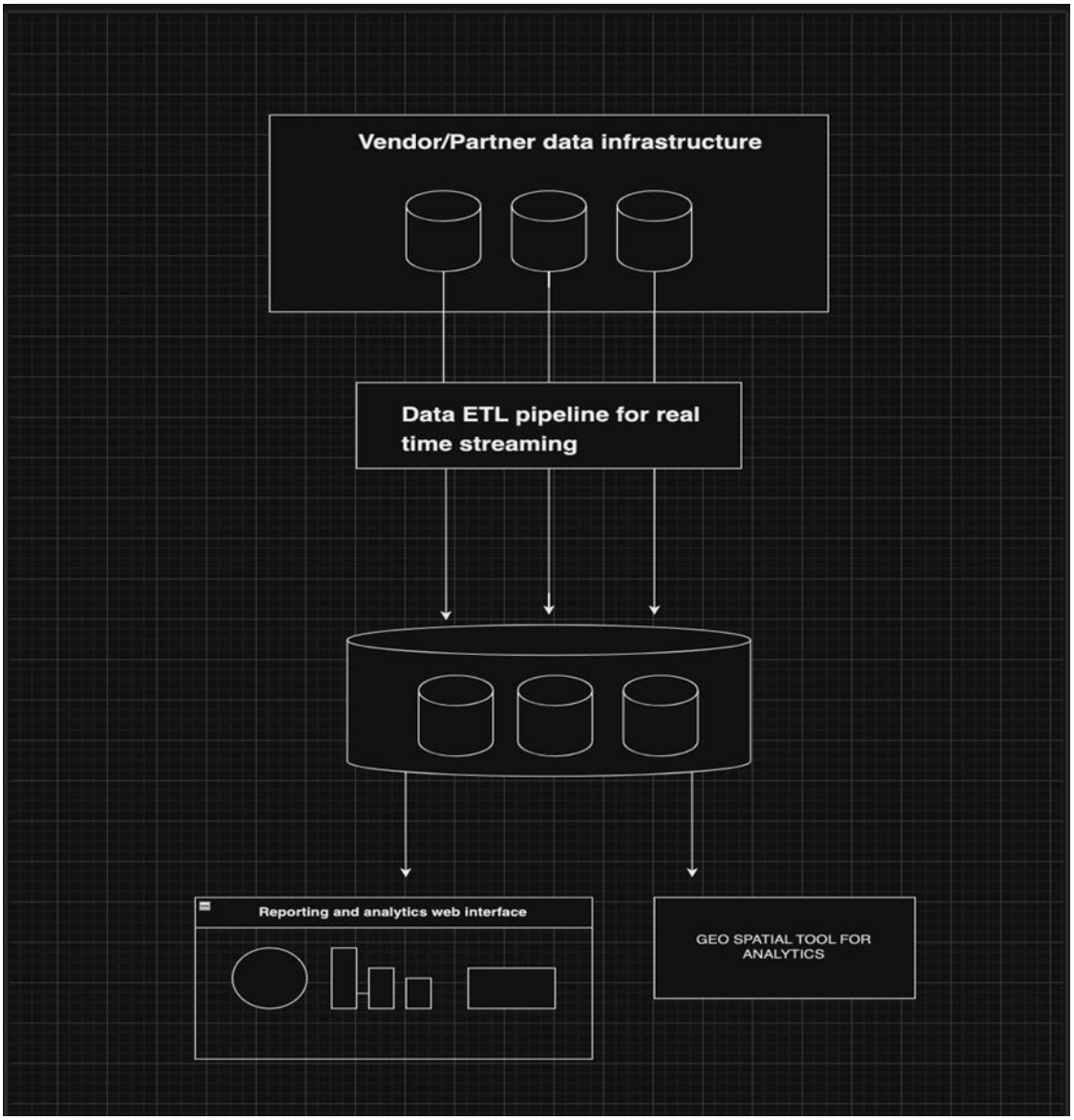
- Design and set up a unified data infrastructure in compliance with NDPR regulations.
- Develop geospatial analytics tools and API protocols to pull data from vendor databases in real-time.
- Design and develop the NEP internal workflow tool.

- Design and develop the DARES website, minigrid fast track application portal and data collection mobile apps

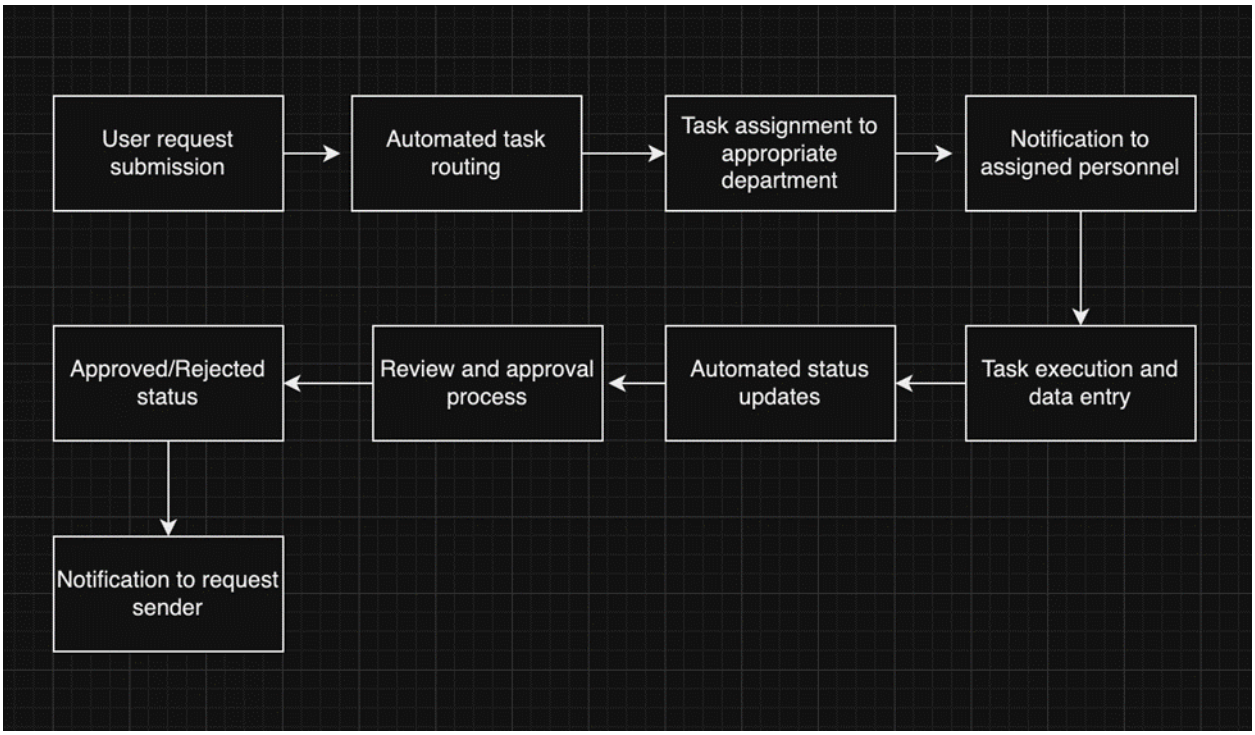
System Testing, Deployment, and Training:

- Conduct quality assurance and system tests to validate that requirements are met and systems are production-ready.
- Deploy the systems and provide staff training on their usage.

3.2 Unified data space conceptual system flow



3.3 Internal workflow tool conceptual system flow



4.1 DELIVERABLES AND PAYMENT TERMS

SN	Deliverables	Duration	Payment Terms (%of contract sum)
1	Inception Report This report outlines the assessment of the Project Management Unit (PMU) and the off-grid energy sector. It involves gathering and analyzing requirements through stakeholder interviews, site visits, and technology reviews to understand operations, current technologies, and data management challenges. Key Activities: Requirements Gathering: Understand PMU operations, off-grid technology infrastructure, and data challenges through interviews and site visits. Data Quality and Integration: Evaluate current data sources, identify gaps, set data standards, and design integration workflows and database solutions. System Design: Propose a microservices-based architecture, including site maps, workflow engines, and database schematics.	10weeks	25%

	Review and Recommendations: Assess existing data solutions and recommend a technology stack that meets project requirements, focusing on data quality and integration. The report sets the foundation for a scalable and flexible data management solution for the off-grid energy sector.		
2	Project Development / Deployment No. 1 This should cover, but not limited to, report on Setting-up development environments and deploy **i.** an Interactive Digital and Dashboard Center. **ii.** Landing page for the DARES launch **iii.** Monthly reporting and approval portal	5 weeks	25%
3	Project Development / Deployment No. 2 i. Mobile Data collection & survey App (android & IOS) ii. Minigrid Application Fast track portal iii . NEP website redesigning and rebranding 1v. Digital visitor's register	5 weeks	10%
4	Progress Report No. 1 This should cover, but not limited to, Setting up development environments for data unification solution, Containerization and orchestration process, deploy microservices functionalities. • Design and deploy the data unification architecture, ensuring compatibility with Web 3.0 and Industry 4.0 standards. • Configure cloud-based services to facilitate seamless data aggregation and real-time access. • Identify sources of data that need to be integrated into the dataspace. • Define the specific use cases for integrating IoTs, CPS, databases, spreadsheets, APIs, files, GPS devices and other relevant data repositories which may include monitoring energy consumption, sensor readings, operational parameters, system health etc • Implement standardized APIs and integration methods for efficient data communication and security •Develop processes to extract, transform, and load (ETL) data from various sources into the unified dataspace •Develop standard API documentation and communication protocols to ensure interoperability •Develop and integrate advanced analytical tools, including aggregations, maps, and charts, to enable	15 weeks	10%

	data-driven insights •Provide rich data visualization capabilities similar to those seen in Odyssey, IET tool, nomap, EAE, Vida, minigrid EMS and cloud core data service. Develop a single geographical reference tool for NEP achievement •Create a user-friendly interface for interacting with the dataspace (users should access, query, store, and retrieve data with ease.) •Build Search and Retrieval Functionality features that allow users to efficiently search for and access relevant data. Implement filters, sorting options, and advanced search capabilities for user convenience conduct unit testing to ensure individual components work correctly and solution meets their needs and expectations.		
5	Progress Report No. 2 This should cover, but not limited to, report on Setting up development environment and deploy modular enterprise solution for processing automated and repetitive tasks, Integration to reporting & approval portal and visitor's register. Document filing, monitoring and tracking dashboards conduct unit testing to ensure individual components work correctly and solution meets their needs and expectations	8weeks	10%
6	Progress Report No. 3 This should cover, but not limited to, report on development of manuals, and documentations training materials and conduct intensive IT training sessions, produce NDPR framework and policies and documentation for the IT Unit & One (1)M&E Staff of NEP and Tw0 (2) Staff from IT Department and One (1) M&E staff from the REA covering system architecture, database unification, usage instructions, and troubleshooting guides and establish a support mechanism to address user issues and provide timely assistance.	4 weeks	10%
7.	Draft Final report To include the details of work carried-out, including the findings/achievements and challenges as well as the actions taken to mitigate. The report should also cover	3weeks	5%

	the assignment completion report/findings. and produce NDPR complaint framework, data governance policies, documentation and the provision of the NEP NDPR Certificates., user guides and technical documentation, to assist users and administrators.		
8	**Final report** The revised and updated version of the draft final report, which has incorporated responses to all the comments on the draft final report.	2 weeks	5%

4.2 ACTIVITIES BREAKDOWN

SN	**Activity**
1	Week 1-5 Requirement gathering, analysis and documentation of business objectives and needs of the unified data source. As well as gaining access to and analysis of vendor data infrastructure. Week 6-10 Requirement gathering, travels, analysis and documentation of DARES program business processes for internal work tool
2	Week 11-35 Software application development Week 36-40 Software application testing Week 41-47 Software deployment
~~3~~	Week 48-50 Staff training
~~4~~	Week 51-52 NDPR Audit and certification

5 Qualifications and Requirements

Qualification of Firm

- The consultancy firm with the following qualifications and meet the stated requirements are invited to participate in this assignment:

The firm will be a consulting firm with a minimum of seven (7) years of operational existence as an organization, and must provide documentary evidence of meeting the following requirements demonstrate Two (2) similar experiences in the last five (5) years that covers at least 3 of these key tasks.

5.1. Development of holistic data architectures, integrating multiple scalable data sources, with compliance to data quality and governance

5.2. Development of unified geospatial solutions, including GIS, spatial data analysis, and system mapping

5,3. Deployment of enterprise resource management solutions, dynamic web services, data collection applications, ERP, CRM including HR, finance, smart contract and supply chain management.

5.4. Optimize data for strategic decision-making, including data analytics, business intelligence, and data visualization,

5.5. Managing large-scalable programs, including project planning, risk management, stakeholder identification and engagement.

5.6 Key individuals in the consulting firm should possess relevant certifications in
i. enterprise resource planning (eg AWS Certified Solutions Architect certification or its equivalent)
ii. Cyber security (Certified Information Systems Security Professional) or its equivalent)
iii. data science & geospatial analysis (Certified Mapping and GIS Specialist or its equivalent)
iv. Project management. (Project management Professional or its equivalent)

5.7. The consultant must be registered with the Nigerian Data Protection Commission (NDPC) and possess deep understanding of the policies of government with adequate knowledge of other regulations around data governance at the global stage.

5.8. Consultant must have built an interactive digital and dashboard center for real time data monitoring and evaluation.

5.9. Consultant must have demonstrated experience working with multiple vendors and stakeholders across different organizations. Firm must have at least 2 projects that demonstrate this in the last 3years.

5.10. The consultant must have demonstrated experience in managing nationwide programs across all 774 local government areas of Nigeria.

5.11. Consultant must have developed solutions utilized by at least 10 state government agencies in the last 2years.

The Consultant shall provide the following experienced key personnel to carry out the assignment with the following minimum qualifications:

i. Technical Project Manager: Bachelors Degree in project management, computer/communication/electronics engineering, software development, or related field; proven experience managing complex software projects; strong leadership and communication skills extensive experience in software system architecture design; conversant with web.30 engineering and industry 4.0. process of automation and experienced in managing technology projects using Agile methodologies. Understanding of business operations and processes and Ability to communicate technical concepts to non-technical stakeholders

ii. UX/UI Engineer: Bachelor's Degree or its equivalent in design, human-computer interaction, computer science or related field; experience in user interface and user experience (UI/UX) design.
Skilled in creating user-friendly interfaces and ensuring a positive user experience. Proficiency in creating user-centric designs for web applications, with experience with Web 3 user interfaces and understanding of decentralized web principles

iii. Solutions Architect: Bachelor's Degree or its equivalent in Computer Science, Information Technology, or related field and certification in at least.

one cloud service (e.g., Google cloud, AWS, Azure). Must be proficient in programming languages (e.g., javascripts, Java, Python, C#), with Knowledge in software development life cycles (SDLCs) and agile methodologies. and familiarity with DevOps practices and tools (e.g., Docker, Kubernetes).

iv. Data protection/governance specialist: Bachelor's Degree or its equivalent in Computer Science, Information Technology, Law, or related field. with at least a certification in one of CIPP, CIPM, GDPR and knowledgeable in data protection regulations (e.g., GDPR, CCPA, HIPAA), data governance frameworks and standards (e.g., COBIT, NIST), data warehousing, and data security measures (e.g.,

encryption, access controls) and experience with data mapping, classification, data subject rights and requests.

v. Quality Assurance Engineer: Bachelor's Degree or its equivalent in Computer Engineering, Computer Science, Information Technology, or related field, with proficiency in testing methodologies and testing tools and familiarity with databases and different operating systems with alteast one certification in software testing, knowledge of DevOps practices and tools.

Vi GIS Expert: Bachelor's Degree or its equivalent in Geography, Computer Science, Environmental Science, or related field and certification in GIS. Must show Proficiency in GIS software (e.g., ArcGIS, and knowledgeable of spatial databases and data formats like shapefiles and Geojson. Must be familiarity with industry-specific GIS applications (e.g., urban planning, natural resources). spatial analysis and modeling and knowledge of remote sensing and photogrammetry and web mapping technologies (e.g., Leaflet, json, JavaScript and Open Layers/map box).

vii. Frontend Software Developers: Degree in design Computer Engineering, Telecommunication and related discipline. Internet webmaster certifications. Knowledgeable in at least 2 front end frame work, preferable REACT.

Viii Backend /API & Database Developers: Degree in design Computer Engineering, Telecommunication and related discipline. Experienced in creating and managing APIs, with expertise in integrating third-party APIs and ensuring seamless data exchange between systems

6. Risk Assessment

6.1 Risk Identification

1. Data breach
2. Data loss
3. Failed NDPR Audit

6.2 Risk Mitigation Strategies

I. **Implement Strong Access Controls:**
   - Use multi-factor authentication (MFA) to ensure that only authorized users can access sensitive data.
   - Regularly review and update user access permissions based on the principle of least privilege.

II. **Encrypt Sensitive Data:**

- Use strong encryption methods for data both at rest and in transit to protect it from unauthorized access.
- Ensure encryption keys are securely managed and regularly rotated.

III. **Conduct Regular Security Audits and Assessments:**
- Perform regular security audits and vulnerability assessments to identify and address potential weaknesses.
- Use penetration testing to simulate attacks and evaluate the effectiveness of security measures.

IV. **Implement Intrusion Detection and Prevention Systems (IDPS):**
- Deploy IDPS to monitor network traffic for suspicious activity and potential threats.
- Ensure that these systems are regularly updated with the latest threat intelligence.

V. **Establish Strong Password Policies:**
- Enforce the use of strong, complex passwords that are regularly changed.
- Implement policies that prevent the reuse of passwords across multiple accounts.

VI. **Implement Data Loss Prevention (DLP) Solutions:**
- Use DLP tools to monitor and control the movement of sensitive data within and outside the organization.
- Set up policies to prevent unauthorized sharing or transfer of sensitive information.

VII. **Develop and Test Incident Response Plans:**
- Create a comprehensive incident response plan that outlines the steps to take in the event of a data breach.
- Regularly test and update the plan to ensure its effectiveness and that all team members are familiar with their roles.

VIII. **Use Secure Communication Channels:**
- Ensure that all communications involving sensitive data are conducted over secure channels, such as VPNs and encrypted email services.

IX. **Monitor Third-Party Vendors:**

Assess the security practices of third-party vendors and ensure they comply with your security standards.

Include data protection clauses in contracts and regularly monitor vendor compliance.

X. **Implement Physical Security Measures:**
- Ensure that physical access to systems and data centers is restricted and monitored.
- Use security measures such as access badges, surveillance cameras, and secure locks.

XI. **Regular Backups**:

- Perform regular backups of all critical data. Use automated backup solutions to ensure consistency.
- Store backups in multiple locations, including offsite and cloud storage, to protect against physical damage or loss.

XII. **Implement Redundant Systems**:

- Use redundant hardware and storage systems, such as RAID (Redundant Array of Independent Disks) configurations, to prevent data loss due to hardware failure.
- Employ failover systems to ensure continuous operation in the event of a component failure.

XIII. **Use Reliable and Secure Storage Solutions**:

- Invest in high-quality, reliable storage solutions with built-in data protection features.
- Regularly monitor and maintain storage hardware to prevent failures.

7. Stakeholder Analysis

7.1 Stakeholder List

Stakeholder name	Designation
Head of PMU	HMPU
Procurement Specialist	Procurement
Project accountant	Project Accountant
Head of ICT	IT Engineer
M&E Specialist	Monitoring & Evaluation
Admin Officer	Head of Admin

8. Duration of the Assignment

The duration of the assignment shall be for an initial period of 12 months with the possibility of extension upon satisfactory performance.

9. Facilities to Be Provided by the Client

The REA will provide the Consultant with the relevant documents and information to enable the consultant meet deliverables.

10. Selection Method

Consultant will be selected in accordance with the Quality Cost Based Selection (QCBS) set out in the Procurement Regulations for IPF Borrowers dated February 2025, *Sixth edition,* available on www.rea.gov.ng/procurement.