TERMS OF REFERENCE FOR THE STUDY OF MOBILE BROADBAND DEPLOYMENT IN RURAL AREAS – LOT 1-50 MASTS SERVING 900 MDA`S AND LOT 2 INSTALLATION OF 80 MASTS FOR VOICE AND DATA IN 13 REFUGEE HOST COMMUNITIES/DISTRICTS

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TABLE OF CONTENTS

1. INTRODUCTION

Project Overview

The Government of Uganda (GOU) represented by the National Information Technology Authority-Uganda (NITA-U) secured financing from the World Bank/IDA toward the cost of the Uganda Digital Acceleration Project – Government Network (UDAP-GovNet) project ID NO. P171305, and it intends to apply part of the proceeds to payments for goods, works, non-consulting services and consulting services to be procured under this project.
The project includes the following components:

Component 1: Expanding Digital Connectivity in selected areas.
Component 2: Enabling Digital Transformation of the Government
Component 3: Promoting Digital Inclusion of Host Communities and Refugees
Component 4: Project Management

Procurement of Contracts financed by the World Bank under these components will be conducted through the procedures as specified in the World Bank's Procurement Regulations for IPF Borrowers (November 2020) (Procurement Regulations) and is open to all eligible firms and individuals as defined in the Procurement Regulations. The World Bank shall arrange the publication on its external website of the agreed initial procurement plan and all subsequent updates once it has provided a no objection.

The Government of Uganda, in its efforts to enhance connectivity across the country, has built the National Backbone Infrastructure largely through the efforts of the National Data Transmission Backbone Infrastructure and eGovernment Infrastructure (NBI/EGI) project. The NBI/EGI Project has been implemented over four phases commencing in 2006 and has since extended high speed optical fiber cable to 60 major towns across the country. In 2020, the last mile connectivity was commissioned, the project extended the NBI to

more districts and connectivity of the National Backbone Infrastructure to more users.

Vision 2040 identified the provision of Information and Communication Technology (ICT) as a key action area to harness socio-economic development and digital transformation. The third National Development Plan (NDPIII) highlights as a national concern about the limited access to broadband and high costs, stating that: "Access to the Internet (specifically broadband) remains low due to limited coverage and the cost of accessing it remains high". The cost target set to be achieved by 2025 is highly dependent on addressing the penetration and usage to spread the cost of transport which has been identified as the primary factor to the high cost. Accordingly, the government has taken an aggressive approach to break the barriers of penetration and high cost as captured in NDPIII and the Uganda Digital Transformation Programme. Through establishment of the National Information Technology Authority Uganda (NITA-U) under the Ministry of Information and Communications Technology (MoICT) and charged it with the overall mandate to coordinate, promote and monitor the development of Informational Technology (IT) in the context of socio-economic development of the country. The government of Uganda is making a stride towards this with the continued rollout of the National Backbone Infrastructure (NBI) and the Electronic Government Infrastructure (EGI)

The MoICT&NG through NITA-U has therefore embarked on connectivity initiatives to improve ICT connectivity in the country, improve service delivery to citizens, increase the range and quality of information from and to the citizens, and increase the government's ability to ensure transparency.

One such initiative has been the implementation of the National Data Transmission Backbone Infrastructure / E-Government Infrastructure (NBI/EGI). Currently, the NBI is connected to 60 towns in Uganda. Phase I of the NBI connected 27 MDAs with Kampala, Mukono, Jinja, Entebbe, and Bombo using 168KM of Optical Fibre Cable (OFC). Phase II added Busia,

Tororo, Mbale, Malaba, Kumi, Soroti, Lira, Gulu, Elegu border, Nakasongola, Masindi, Luwero, Fort Portal, Kasese, Bushenyi, and Kyenjojo on the NBI with the laying of an extra 1368.39 KMs of OFC. Phase III of the NBI added 407.8 KMs of OFC onto the network to connecting Masaka, Mbarara, Kabale, and Katuna border. Phase IV of the NBI connected the entire West Nile, Moroto and Mpondwe border and added 848kms. The last mile project extended the NBI to Wakiso, Mityana, Mubende, Kyegegwa, Kamwenge, Ibanda and Mirama Hills adding 732kms into the network and scaling the number of sites by 764.

As much as the NBI/EGI is fairly spread across the country, there is a need to extend connectivity to the consumers of the services among other churches, Institutions of Education, Industrial parks, refugee hosting communities, tourist sites, Government administrative units at different levels, Justice Law and order Institutions and hospitals. Such efforts of ensuring access by the consumers have been termed as the last mile for the NBI.

The Government of Uganda, therefore, wishes to engage the services of a reputable consultancy firm to undertake studies that will yield technological, designs and costs for the implementation of mobile broadband deployment in rural areas Lot1 installation of 50 masts/towers serving 900MDA`s and Lot 2 installation of 80 masts or towers for voice and data in 12 refugee hosting communities or districts.

2. OBJECTIVES OF THE STUDY FOR MOBILE BROADBAND DEPLOYMENT IN RURAL AREAS/UNDERSERVED AREAS AND REFUGEE HOST COMMUNITIES/DISTRICTS

1. Extend the ICT backbone to cover all districts up to the Sub sub-counties. Implement last-mile connections to underserved areas or rural areas in Uganda, Schools, Universities, Hospitals, Local Governments, Central Government Offices, Sub counties among others.

2. Build a National IXP that shall ensure the security of our data, control of our data and quality of the internet the citizens receive.

3. Public key infrastructure (PKI) encompasses everything used to establish and manage public key encryption. This includes software, hardware, policies, and procedures that are used to create, distribute, manage, store, and revoke digital certificates.

4. Promoting Digital Inclusion of Refugee Host Communities. Focus on the improvement of core digital infrastructure for the 13 Refugee Hosting Communities or districts.

The Key deliverables include the following:
- Build 80 Masts to enhance data and voice services in refugee hosting communities/settlements and districts under Lot 1 and build 50 Masts serving 900 MDAs in rural areas or underserved areas that have challenges with internet connectivity.

3. **SCOPE OF WORK FOR THE STUDY OF MOBILE BROADBAND DEPLOYMENT IN RURAL AREAS/UNDERSERVED AREAS, AND REFUGEE HOST COMMUNITIES/DISTRICTS**

The scope of work for the feasibility study shall include the following in the proposed mobile broadband deployment in rural/underserved areas and refugee settlement areas/hosting districts.

1. Study and provide a benchmarking report on the best industrial model and technology for the deployment of mobile broadband in rural areas /underserved areas in Uganda and refugee-hosting communities/ districts in Uganda.

2. Study and provide an up-to-date detailed report with site names or locations that have challenges of broadband connectivity in rural areas /underserved areas in Uganda in consultation with Uganda Communication Commission (UCC)

3. Study and provide a detailed report on how to determine the best locations to set up telecommunications towers or mast that will serve both ministries, departments, agencies (MDA`s) and Target user groups (TUG`s) in rural areas /underserved areas in Uganda and refugee hosting communities/districts in Uganda that have internet connectivity, voice, and data challenges. The locations of those masts or towers should be provided where they will be set up, this should be done with consultations from all major Mobile Network Operators (MNO`s) and tower or mast companies for the benefit of infrastructure sharing and generating revenue for the Government.

4. Study and provide a detailed report on which type of tower or mast to be used, for example, Monopole, Lattice, Guyed, etc that will be installed and the height of each tower or mast at a specific location should be determined in the study.

5. Study and provide a detailed report on site acquisition process in the tower construction process which includes Land lease acquisition, Uganda Civil Aviation Authority (UCAA) approval, environmental impact assessment from NEMA, Building and work permit where applicable, lease process negotiations and contracting, UWA approval especially in national parks and game reserves, NFA in the forest reserves among others.

6. Study and provide a detailed report on the site list of Ministries, Departments, Agencies, Target User Groups, and private clients that will be connected in this project in rural/underserved areas and refugee host communities/districts that have internet connectivity challenges, and the site list should also include the sites which will be connected using wired (optical fiber cable) and wireless using up to date technologies.

7. Study and provide a detailed report on the best technologies (using wireless or wired), transmission equipment, Power at the site (three sources of power-Solar, hydro and generator with a good capacity) with

up-to-date technologies. The consultant shall provide cost benefit analysis using solar power and diesel generators at the mast or towers to be installed.

8. Cost of deployment, operations and maintenance, Business model (leasing, renting, purchase etc)

9. Establish mechanisms for collaboration with mobile network operators or tower companies for purposes of deployment, utilization, co-sharing of towers or masts.

10. Study and provide a detailed report on the existing policies on infrastructure sharing as it relates to towers or masts.

11. The consultant should identify environmental risks and mitigation measures.

12. The consultant should identify the risk identification and mitigation strategy on infrastructure sharing.

The scope of work for the management model review shall include the following:

1. Provide benchmarking reports on the management of mobile broadband in rural areas or refugee communities using wired or wireless technologies and the masts deployed from at least 3 countries that are government-owned masts. This shall include Government-owned infrastructure that has been both successfully and not successfully managed to enable key lessons to be incorporated.

2. Study the management models for large telecommunications operators with the aim of proposing options for the marketing, operation, and maintenance of mobile broadband masts or towers.

3. Make a cost-benefit analysis for the outsourcing of the marketing, operation and maintenance of large telecommunications infrastructure and the marketing, operation, and maintenance of the infrastructure by the Government as owner and or by state-owned enterprises.

4. The review of the existing model should include a study of the marketing, operations, and maintenance model in comparison to other telecom operators or tower or mast companies in the Region.

5. Carry out a market survey of the telecommunications sector, covering areas such as operation and maintenance costs, market prices for services on the mobile broadband masts, with an aim of preparing revenue projections that shall be included in the proposed management model.

6. Study different business plans of mobile broadband masts deployed that have been commercially successful and otherwise thereby proposing improvements on the existing network to incorporate or interconnect with the existing NBI/EGI.

7. Develop the most optimal management model for the mobile broadband masts upon the analysis of the above studies, and the stakeholder engagement.

8. Conduct a workshop to discuss possible management models with the aim of selecting the most optimal management model for mobile broadband masts.

4. KEY DELIVERABLES FROM THE STUDY ON MOBILE BROAD DEPLOYMENT IN RURAL AREAS

Upon completion of the assignment, the consultant will present to NITA – U a report detailing the proposed internet connectivity (wired or wireless technology) & Wi-Fi technology (a wireless networking technology that uses radio waves to provide wireless high-speed Internet access) and solutions, costing, risks and proposed mitigation, stakeholder management and sustainability plan, deployment of masts or towers, transmission equipment (up-to-date technology), power at the sites, site acquisition process, approvals needed and not forgetting the parameters and/or methodology to ensure

efficient operations and management of the sites after project handover. The report shall include the following, among others:

1. Executive summary: A brief overview of the key findings and recommendations of the study.

2. Report with solutions specifications, designs, and costs for internet connectivity solutions including appropriate mobile broadband deployment in rural areas, underserved areas and refugee areas with up-to-date technologies and cost for setting up each mast in each location identified, and ownership of the towers or masts to be setup.

3. Detailed commercial business plan including billing models for mobile broadband deployment in rural areas, underserved areas, and refugee host communities.

4. Security requirements, specifications, and controls of the recommended solution not forgetting the more details on deploying towers or masts and challenges involved in with guidance from the Uganda Communication Commission (UCC).

5. Report with solution specific to power requirements at the towers or masts to be installed especially solar installations with enough capacity with a cost-benefit analysis of using solar or diesel generators at the towers or masts to be set up.

6. Report with solution specific to network optimization, especially on the physical layer.

7. Risk Analysis and environmental, health and safety report

8. Right of way acquisition process (site acquisition process) including access roads to sites and ownership or leasing site location and Stakeholder Management Approach in rural areas, underserved areas, and refugee areas.

9. Propose project sustainability plan and model based on the internet connectivity solution recommended for implementation.

10. Report on the total cost of ownership of the proposed technology and solution not forgetting the site list for MDA`s, TUG like NGOs, schools, tourist sites and private client.

11. Infrastructure sharing plan to generate revenue to government especially different collaborations with private telecom companies like using our masts or towers or collocation (space provided in a colocation center for servers and equipment that can directly connect to Internet network backbones)

12. And finally, the report with Terms of References will be generated for the mobile broadband deployment in rural areas, underserved areas, and Refugee host communities with all the details requested above.

13. Report on the environmental, health and safety guidelines that should be followed during the implementation of the mobile broadband deployment.

5. KEY QUALIFICATIONS AND EXPERIENCE OF THE FIRM

The National Information Technology Authority – Uganda would like to engage consultancy firms that meet the following requirements:

1. Must provide information relating to their capacity and experience demonstrating that they are qualified to undertake this study (documentation, reference of similar services, experience in comparable missions, availability of qualified personnel, etc.)

2. The consultant should assemble a team of relevant experts that should include the following key personnel:

3. Demonstrate previous experience and expertise in carrying out a feasibility study in Information and Communications Technology (ICT) with at least three (3) assignments of a similar nature in developing Telecommunication infrastructure business plans, and/or development or review of telecom infrastructure deployment or

Telecom business strategic planning in the last three (3) years. The consultancy firm should have experience working in Africa or economies of a similar nature.

- Ability to provide required services.

- Possession of six (6) years of experience in telecom network service extension.

- Possession of relevant industrial accreditation and certifications like ISO certification in Health and Safety, Quality Management and Environment Management.

- Must possess Transactional Tax Clearance from the tax body of the domicile country.

- Traceable references of three (3) assignments of a similar nature undertaken in the past six (6) years

- Proof of compliance with the laws of the land.

- Shall provide audited books of accounts for at least the last three (3) years prepared by a certified accounting firm.

- Legal documents (e.g Constitutions, agreements, deeds, powers of attorney)

- The consultant shall demonstrate experience in infrastructure sharing, ICT policy, and environmental risks in relation to infrastructure deployment.

The consultant should assemble a team of relevant experts that should include the following key personnel:

a) Team Leader

The Team Leader shall possess demonstrated knowledge to lead teams of experts to undertake studies on infrastructure development and management and shall possess 10 years' experience. The team leader shall have experience in advising policy makers/regulators in the ICT sector.

Qualifications and Competencies

The Team Leader should possess:

- A master's degree in IT/Telecom/Electronics/ Communications /Economics/Business Administration or a related field from any well-recognized University.
- A postgraduate Diploma in Project Planning and Management or Monitoring and Evaluation from any recognized University.
- Proven track record in carrying out feasibility studies in similar fields.

b) **Business Analyst**

The Business Analyst shall possess demonstrated knowledge of the business analysis process with at least 4 (four) years' experiences in business analysis work in the telecommunications sector and evidence of a minimum of 5 assignments successfully completed for a large organization or Government.

Qualifications and Competencies

- An undergraduate degree in either Business administration, Economics, or a suitable combination of a degree with Business Analysis training and experience.
- Business intelligence, analytics, forecasting or related functions.
- Market research experience
- Strategic and business planning experience
- Relevant certifications

c) **Network Specialist**

The specialist shall possess network planning, management, supervision and maintenance of large Next Generation Networks Enterprise-Wide Area

Networks, Transmission Networks, Network Operating Centers (NOCs) and any LAN, MAN or WAN infrastructure.

Qualifications and Competencies

- Master's Degree in any ICT-related field.
- Five years' Experience in the design, implementation, and management of Networks in a large enterprise.
- Professional certifications such as CCDA, CCNA, GIMS, CISSP, MCSE, HCNP - Transmission etc, will be an added advantage.

e). Telecommunication Engineer or Transmission Engineer

The personnel shall possess network planning, management, supervision and maintenance of large Next Generation Networks Enterprise-Wide Area Networks, Transmission Networks, Network Operating Centers (NOCs) and any LAN, MAN or WAN infrastructure and Network connectivity.

Qualifications and Competencies

- Bachelor's Degree in telecommunication/Electrical/Computer engineering with a bias in both wired and wireless technologies.
- Five years' Experience in the planning, designing, implementation and management of Networks in a large enterprise.
- Experience in planning, designing, and deploying both wired and wireless networks for both transport and access.
- Proven knowledge in designing low-cost yet efficient power solutions for small and mid-sized networks.
- Wired and wireless network optimization.
- Professional certifications such as CCDA, CCNA, GIMS, CISSP, MCSE, HCNP - Transmission etc, will be an added advantage.
- Wired and wireless network design certifications

f). Civil/Structural Engineer

The personnel shall possess network planning, design and implementation knowledge for a large infrastructure network including Local Area Networks (LAN) and Wide Area Networks (WAN)

Qualifications and Competencies

- Bachelor's degree in civil engineering or architecture and should be a registered Civil engineer or Architect.

- Experience in designing and implementing telecommunications network infrastructure.

- Experience in planning, designing, and deploying both wired and wireless networks for both transport and access.

- Wires and wireless Network design certifications

- Related certifications

g). Radio Frequency Engineer

A radio frequency engineer handles data collection, research radio frequency, and designs wireless communication systems. As an RF engineer, you will analyze collated information, test the effectiveness of existing networks, make sure to follow all regulatory standards and travel to customer locations and sites.

Your roles also include providing solutions to technical issues associated with radiofrequency engineering products. To do this, you will need to interact with quality, engineering, and product management groups in executing product development program plans. Also, you are to clean, test, and pack field equipment. Plus, you will need to conduct laboratory tests on radio frequency equipment, as well as troubleshoot network issues.

Qualifications and Competencies

- Should have a bachelor's degree in electrical engineering, computer science, or a similar field and at least 3 years of experience. He or she should also have advanced knowledge of radio frequency networks and have problem-solving and troubleshooting skills.

h) Demographics Specialist

Good at establishing priorities; scheduling activities to ensure optimum use of time and resources, monitoring performance against development and other objectives and correcting deviations, capable of gathering comprehensive information on complex problems or situations; evaluating information accurately and identifying key issues required to resolve problems and providing advice to defend and negotiate difficult cases: excellent oral and written communication skills and ability to generate professional high-quality documents and products under tight time constraints, consistent approach to work with energy and a positive constructive and result-oriented attitude.

Qualifications and Competencies

- Minimum master`s degree in demography, statistics, social sciences, or economics with emphasis on demography
- A bachelor`s degree in demography, statistics, social sciences, or economics with an emphasis on demography
- Experience of minimum 5 years of professional experience in the area of demographic and statistical analysis, knowledge of methods of demographic analysis and theories pertaining to demographic change and population trends, detail-oriented, advanced experience in statistical programming and ability to work in a team environment.

i) Quantitative Surveyor

Responsible for pre- and post-contract quantity surveying duties including preparation of land surveying, cost estimates, procurement and tendering, contract administration, variation, final account, etc. Provide estimate and cost planning to include producing and presenting the final cost plan.

Qualifications and Competencies

- Bachelor's degree in Bachelor of Quantity Surveying, construction engineering, management, or related field.
- 6 years of general construction estimating experience, financial experience, construction experience, or related field.

- Proficient in computer skills and Microsoft Office Suite
- Able to analyse financial records and apply data to improve results.
- Strong aptitude for numbers, spreadsheets, and financial reports
- Experienced at compiling and following strict budgets, strong estimating, and financial analysis skills.
- In-depth understanding of construction, materials, pricing, and industry
- Able to analyse problems and strategize for better solutions.

j) Environment, Health, and Safety Specialist

Responsibilities Protection of public, workers and Environment Enforcement and independent oversight functions.

Qualifications and Competencies

- A master's degree in environmental, health and safety management
- BSc Environmental Management must be a holder of a practicing license, participated in at least 2 similar projects in the last 6 years.
- 4 years' experience out of which 3 years Specific work experience in tower or mast construction projects.
- Health/safety management certification

- Legal and regulatory knowledge concerning health and safety.
- A good eye for safety and the ability to pay attention to details.
- A comprehensive understanding of the risk assessment process
- Skills in training and motivating colleagues
- Familiarity with the time reporting system
- Strong knowledge of project control
- Excellent interpersonal and communication skills
- Capacity to identify situations requiring improvement in safety.
- Excellent leadership skills and multitasking abilities
- A talent for resolving conflicts and problems.

k) Power Specialist or Electrical Engineer

Electrical engineers design, develop and maintain electrical systems for buildings/towers/masts, and power distribution networks at the towers or masts and at most of the hub sites introduced.

Qualifications and Competencies

- Bachelor's degree in electrical engineering degree from an accredited school.
- Licensed as a professional engineer.
- 5 years experience in using or a desire to learn the required software.
- Knowledge of applicable codes related to electronic engineering.
- Proficient in design and calculation software.

l) Site Acquisition & Permitting Specialist

The site acquisition specialist`s role includes but not limited to, locating appropriate properties, negotiating transactions, and performing zoning or permitting activities in multiple jurisdictions depending on project scope.

Qualifications and Competencies

- Bachelor`s degree or equivalent experience in telecom site acquisition (Preferred)
- A postgraduate diploma in Project planning and management from a recognized University.
- Detailed, extensive and recent experience with project management, contract, negotiation.
- Minimum 3 years of professional work experience, preferably in the wireless/telecommunications industry or other relevant industry (s)
- Advanced knowledge of MS Word, outlook, PowerPoint and Excel.

M) Financial and economic analyst

A financial and economic Analyst is responsible for the financial planning and analysis of a company, allowing the organization to make well-informed commercial decisions, analysing current and past financial data, looking at current financial performance and identifying trends, preparing reports, accounting, budgeting, strategic planning, financial analysis of financial models.

Qualifications and Competencies

- Bachelor`s degree in business, accounting, economics or finance is typically required to become a financial and economic analyst from a recognized university.
- At least three years of experience in Economics/financial analysis/ accounting
- Risk management and analytical skills.
- High level of integrity, communication and report-writing skills.
- Interpersonal skills, financial analysis skills and data interpretation skills.

- Advanced knowledge of MS word, outlook, PowerPoint and Excel.

6. PAYMENT STAGES

	Description	Percentage
1	After acceptance of the Inception Report	10%
2	Detailed Report of the mobile broadband deployment in rural areas study as per the Scope of Works and Deliverables.	40%
3	Hold at least Two (2) workshops with stakeholders to discuss the draft reports as per the scope of the study pre- and post-comments. The cost of the workshops will be borne by the consultant	20%
4	Generate RFPs that clearly articulate the project scope and requirements for the government of Uganda to select the most suitable providers to establish the terms of reference for the mobile broadband deployment in rural areas – lot 1-50 masts serving 900 MDA`s and lot 2 installation of 80 masts for voice and data in 13 refugee settlements.	30%
	TOTAL	**100%**

7. DURATION OF THE STUDY

The maximum period of execution of the services of the consultancy firm under this contract will be **six (6)** months.