**Hybrid Telecommunication Infrastructure Performance Modelling – By Extended Networks** Can you predict power consumption, downtime, and diesel consumption?

**Description:**

With the growing number of hybrid technology deployments (2G, 3G, 4G and 5G) by mobile network operators in Nigeria, there is a growing concern over energy consumption by these deployments and upgrades actively taking place to make 5G and rural internet penetration a reality. For several years, service providers have relied on Diesel Generators, Battery power, Solar power, and a weak failing Grid to power their infrastructure.

Over 90% of Operational expenditure (OPEX) is on energy bills alone. Also, the revenue losses incurred from poor performance such as downtime, diesel leakages, abnormal increase in power consumption are of very deep concern to all stakeholders.

To maintain an average uptime of 99.8% on all sites as prescribed by the Nigerian Communication Commission and Mobile Network Operators, service providers believe that if they can predict power consumption, downtime, and diesel consumption on each site, preventive measures can be put in place to ensure downtime is minimal and improve minimum time to repair (MTTR).

This ML challenge targets addressing the important questions mentioned above. In the challenge, the participants are asked to design machine learning-based solutions that can be trained on datasets of few scenarios and then generalize successfully to data from scenarios not seen before. In particular, the designed machine learning models must be able to achieve the following objectives.

**Objective A:**

i. Develop a model capable to predict downtime before it occurs. The participants are required to develop a model that that can predict date, and time a downtime is likely to occur in different hub sites, taking into consideration the site configurations as shown in Appendix A, B, C and D.

ii. Develop a model capable to estimate power consumption. The participants are required to develop a model that estimates the energy consumed by different hub sites, taking into consideration the power source (Grid, Generator, Battery, Solar) as per the configurations in Appendix A, B, C and D. The model should be able to flag unexpected increase in power consumption never seen before.

iii. Develop a model capable to estimate diesel consumption. The participants are required to develop a model that estimates the rate of change or diesel consumed by different hub sites, taking into consideration the configurations in Appendix A, B and C. Any sudden sharp change (negative change) in diesel level consumption should be flagged by the model.

**Objective B:** Achieve generalization capabilities across different hub sites for (i), (ii), (iii). The model must estimate downtime, power consumption and diesel consumption of a new base station product based on measurements collected from existing ones from configuration A, B, C and D from the Appendix. For example, if training data is available for these four configurations, the model must be able to provide an estimate of the downtime, power consumed and diesel consumption.

**Timeline**

**Start Date** - November 1st, 2023.

**Entry Deadline** - Same as the Final Submission Deadline

**Team Merger Deadline** - Same as the Final Submission Deadline **Final Submission Deadline** - November 25th, 2023.

All deadlines are at 11:59 PM WAT on the corresponding day unless otherwise noted.

**Prizes**

1st Place - XXX,XXX Naira

2nd Place – XXX,XXX Naira

3rd Place - XXX,XXX Naira

**Appendix**

Consider the 4 site configurations below:

A: EOS0001C (Grid, Solar, battery)

Remote 1

Generator Battery

Solar

**Inverter System with Remote monitoring Components**

Remote **N**

Figure 1:Hub Site Configuration with Generator, Battery and Solar B: EAJ0001C (Generator, Grid, Battery)

Remote 1

Generator Battery

Grid Power

**Inverter System with Remote monitoring Components**

Remote **N**

Figure 2: Hub Site Configuration with Generator, Battery and Grid Power C: EKW0005C (Generator, Solar, Battery)

Remote 1

Generator Battery

Solar

**Inverter System with Remote monitoring Components**

Remote **N**

Figure 3:Hub Site Configuration with Generator, Battery and Solar C: EEN0005C (Generator, Battery)

Remote 1

Generator Battery

**Inverter System with Remote monitoring Components**

Remote **N**

Figure 4:Hub Site Configuration with Generator, Battery