



DIRECTIVE No. ERA/001/2017

KEY PERFORMANCE INDICATORS

To: Uganda Electricity Transmission Company Limited
Network Operators in Uganda

1. INTRODUCTION

The Uganda Electricity Transmission Company Ltd (UETCL) holds four (4) licenses issued by Electricity Regulatory Authority (ERA) as follows:-

- i) License for Bulk Power Supply- ERA/LIC/BPS/017/151;
- ii) License for Power Export and Import-ERA/LIC/PEI/153;
- iii) License for System Operator- ERA/LIC/SO/017/154; and,
- iv) License for Operation of High Voltage Transmission Grid- ERA/LIC/HVTG/152.

ERA is required to continuously monitor the operational performance of UETCL with regard to the above licenses.

Under Section 10 of the Electricity Act, 1999 (the “Act”), the ERA has the mandate to:-

- (a) develop and enforce performance standards for the generation, transmission and distribution of electricity;
- (b) to make and enforce directions to ensure compliance with licences issued under the Act; and,
- (c) to ensure that licensees comply with the terms and conditions of their respective licences.

ERA therefore has a mandate to assess, monitor and evaluate the performance of UETCL in accordance with the provisions of the Electricity Act, Regulations, Licence terms and conditions and directives issued by ERA.

Clause 2 of the Licence certificates held by UETCL provides that, the Licence is subject to the Act, Regulations made thereunder and Directives made by the Authority from time to time.

This Directive is issued pursuant to Section 10 of the Electricity Act and the terms and conditions of the respective Licenses held by UETCL.

2. JUSTIFICATION

Uganda operates a single buyer model, whereby all energy is sold and purchased in bulk through UETCL, the System Operator. By virtue of the fact that UETCL is the single buyer, its effectiveness is very important to the energy sector as there are no options available to customers should there be failures within the operations of UETCL.

ERA has sanctioned a number of Key Performance Indicators to facilitate the assessment and monitoring of UETCL's operational performance.

3. KEY PERFORMANCE INDICATORS

The Electricity Regulatory Authority will monitor and enforce the performance of UETCL on the following indicators, on a quarterly basis:-

1. Average Transmission Network Availability
2. Transmission Capacity Factor
3. Transmission Capacity Utilisation efficiency factor
4. Transformer capacity utilisation factor
5. Transmission Technical Loss Factor
6. Reserve Margin

7. Energy Not Supplied [ENS]
8. System reliability
9. Average Interruption Time [AIT]
10. Voltage Deviation Index [VDI]
11. Frequency Deviation Index [VDI]
12. Average absolute deviation of import/export schedule

Table 1 below provides for the definitions of the respective indicators against which UETCL will be monitored, the formula and the rationale for each indicator.

Table 1. Definition, formula and rationale of the KPIs sanctioned by Electricity Regulatory Authority

No.	Indicator	Definition, Formula and rationale
1.	Average Transmission Network Availability	<p>This is defined as the aggregate time a transmission network is ready to receive and distribute electricity in a given period.</p> $= \frac{\sum \text{Circuit available Hours in period}}{\text{Number of circuits} \times \text{period hours}} * 100\%$ <p><i>This KPI is intended to give the available number of hours of the transmission network, measured against the total number of hours in a given period. This indicator can therefore be used to incentivize network operators to maintain high network availability and reliability and ensure minimum level of unsupplied energy.</i></p>
2.	Transmission Capacity Factor	<p>This is the ratio of transmitted energy in a given period to the would be maximum energy if full installed capacity were utilized in the same period</p> $= \frac{\text{Transmitted energy in period}}{\text{Installed capacity} \times \text{period hours}} * 100\%$ <p><i>This indicator is intended to enable planning for the future transmission expansion.</i></p>
3.	Transmission Capacity Utilisation efficiency factor	<p>This is the ratio of the average demand to maximum demand in a given period.</p> $= \frac{\text{Energy transmitted in period}}{\text{maximum demand} \times \text{period hours}} * 100\%$ <p><i>This indicator is intended to measure the useful utilization of the installed capacity.</i></p>

4.	Transformer capacity utilisation factor	<p>This measures the extent of utilization of the transformers with respect to their rated capacities. It is a ratio of the maximum load on a transformer to its rated capacity.</p> $= \frac{\sum \text{Recorded peak load of transformers}}{\sum \text{Total number of substation transformers} \times \text{rated capacity of transformers}} * 100\%$ <p><i>This is aimed at enabling establishment of transformer loading hence planning for additional capacity or network reconfiguration.</i></p>
5.	Transmission Technical Loss factor	<p>This is a measure of the difference between the energy metered at the generation/transmission boundaries to energy metered at the transmission/distribution boundaries.</p> $= \frac{\text{Total energy purchased} - \text{total energy sold}}{\text{Total energy purchased}} * 100\%$ <p><i>Transmission technical loss level gives an indication of the network operations, management of line losses and efficiency. Even though line losses are caused by the physical properties of the transmission system, they can nevertheless be controlled through good operational and maintenance practices, as well as good network design</i></p>
6.	Reserve Margin	<p>It is a measure of the available reserve in the transmission system</p> $= \frac{\text{Available transmission capacity} - \text{maximum peak demand}}{\text{available transmission capacity}} * 100\%$ <p><i>This indicator directly informs the Electricity Regulatory Authority of how much of the transmission capacity is available for additional load utilization.</i></p>
7.	Energy not supplied [ENS]	<p>This is the energy shed during forced outages in a given period</p> $= \sum [\text{Average Interruption power (MW)} * \text{Duration (h)}]$ <p><i>This enables in establishing missed sales and/or deemed energy.</i></p>
8.	System reliability	<p>It is a measure of level of electricity transmission demand satisfaction.</p> $= \left[1 - \frac{\text{ENS}}{\text{ENS} + \text{Total supplied energy in the period}} \right] * 100\%$ <p><i>Reliability determines the attraction levels of new customers to the network and gives an estimate of dependence on non-grid alternative energy sources.</i></p>

9.	Average interruption time [AIT]	<p>This is the total time in hours power is interrupted in a given period.</p> $= \frac{\text{period hours} * ENS}{\text{Period Electricity Consumption (MWh)}} * 100\%$ <p><i>This time informs on how long the consumers need alternative energy sources.</i></p>
10.	Voltage Deviation Index [VDI]	<p>It is a comparison of number of hours that the voltage is out of the allowed limits in a period to the number of hours in that period. This is calculated for each transmission level.</p> $= \frac{\text{number of hours that the voltage is out of allowed limits in a period}}{\text{number of hours in that period}} * 100\%$ <p><i>The Ugandan transmission grid is operated within ±10% of the established voltages (220kV, 132kV and 66kV) in the High Voltage system so are the equipment put on the system or established by consumers. Fluctuations outside this range should therefore be minimized to ensure equipment does not fail.</i></p>
11.	Frequency Deviation Index [VDI]	<p>It is the comparison of number of hours that the Electrical power network frequency is out of the allowed limits in a period to number of hours in that period.</p> $= \frac{\text{number of hours that the frequency is out of allowed limits in a period}}{\text{number of hours in that period}} * 100\%$ <p><i>The Ugandan grid is operated within ±1% of the established frequency (50Hz) in the power system so are the equipment put on the system or established by consumers. Fluctuations outside this range should therefore be minimized to ensure equipment does not fail.</i></p>
12.	Average absolute deviation of import/export schedule	<p>It is defined as the average of all hourly values of the absolute deviation in MWh/h of the import/export schedule with the actual realization.</p> $= \frac{\text{Total exports in period} - \text{Total imports in period}}{\text{total number of hours in period}} [MW]$

4. DIRECTIVE TO UETCL & ANY OTHER FUTURE LICENSED TRANSMISSION COMPANY

UETCL and any other future licensed transmission company in Uganda are directed to monitor performance on the sanctioned Key Performance Indicators on a continuous basis effective 1st January 2018.

UETCL and any other future licensed transmission company in Uganda shall submit to ERA, Quarterly Performance Reports, within thirty days after the end of each Quarter and an Annual Report (*within 60 days after the end of year*) on the licensee performance as regards the Key Performance Indicators.

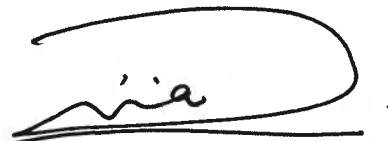
The period October 2017 to December 2017 shall be treated as a test period for UETCL to prepare and fully operationalize the indicators.

ERA will set benchmarks and performance targets based on the Network status and the Licensees' performance and communicate the same to the licensees by the end of 31st December 2017.

ERA shall, through inspection or any other enforcement mode deemed fit, monitor and enforce compliance with this Directive in line with the provisions of the respective license terms and conditions.

ERA reserves the right to review, amend and adopt other applicable indicators which will be duly communicated to UETCL and any other future licensed transmission company in Uganda.

Issued this6th..... day of October 2017



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ENG. Ziria Tibalwa Waako
CHIEF EXECUTIVE OFFICER