



**DRAFT QUALITY OF SERVICE REGULATIONS AND NETWORK PERFORMANCE METRICS FOR
ELECTRONIC COMMUNICATIONS NETWORKS AND SERVICES IN THE BAHAMAS UNDER SECTIONS 45
AND 46 OF THE COMMUNICATIONS ACT, 2009**

PUBLIC CONSULTATION DOCUMENT

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UTILITIES REGULATION & COMPETITION AUTHORITY

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1. INTRODUCTION

- 1.1 The Communications Act, 2009 (Comms Act) prescribes the law applicable to the Electronic Communications Sector (ECS), empowers the Utilities Regulation and Competition Authority (URCA) as the independent regulator of the sector and charges URCA with the responsibility for implementing the Electronic Communications Sector Policy (ECSP) and enforcing the provisions of the Comms Act.
- 1.2 In this document, URCA is proposing certain Quality of Service (QoS) Regulations for Electronic Communications Networks and Services in The Bahamas (“Quality of Service Regulations”). The Regulations are applicable to holders of Individual Operating Licences (IOLs) that provide fixed or fixed wireless telephony services, cellular mobile voice and data services, and internet services, including both legacy services and next-generation services. URCA has considered imposing standards for holders of Class Operating Licences Requiring Registration (COLRRs). However, URCA considers that implementation of the standards may result in a disproportionate burden on COLRRs at this time, considering the relatively limited market share enjoyed by COLRRs in The Bahamas. URCA will consider this issue again once the impact of these Regulations has been assessed following implementation.
- 1.3 Previously, URCA has relied on Consumer Protection Regulations as the means of achieving the aforementioned electronic communications policy objectives that relate to QoS. However, in URCA’s view those regulations have not led to significant sector-wide improvements in the QoS of electronics communications networks and services in The Bahamas. The international experience suggests to URCA that exclusive reliance on market forces or Consumer Protection Regulations, especially in monopolistic markets, does not always lead to an optimal outcome in service quality for customers. URCA, therefore, is of the view that additional measures are required to further promote the ECSP objectives of the high-quality services.
- 1.4 URCA reviewed international best practices and noted that in recent times various national communications regulators have successfully promoted high-quality services through issuing appropriate regulatory instruments (e.g., regulations/directives).¹ These

¹ See for example: Communications Regulatory Authority of Qatar (public consultation on draft Quality of Service Policy and Regulatory Framework issued on 6 Marc 2014); Nepal Telecommunication Authority (Consultation Paper No. 1/2013 on Draft Quality of Service Regulation issued on 12 August 2013); Ireland’s Commission for Communications Regulation (“ComReg”) (Consultation on the Introduction of Key Performance Indicators for Regulated Markets, Document No. 10/74, issued on 27 September 2010); Telecom Regulatory Authority of India (Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009, (#7/2009) issued on 20 March 2009 and subsequent regulations available at http://www.trai.gov.in/content/VerReg/106_0_3.aspx); Channel Island Competition and Regulatory Authorities (Measures of Quality of Telecommunications Services in the Channel Islands consultation paper,

regulations/directives usually require operators to measure and report the quality of the services they provide, which the regulators then publish for public consumption. Additionally, some national regulators have also set performance targets for operators. In the Bahamian context, URCA has the responsibility for setting the obligation on licensees to “publish adequate and up to date information on the quality of its Carriage Services in a format that may be used by End-Users for industry comparison” or to “use reasonable endeavours to provide Carriage Services to a standard that could be reasonably expected by subscribers, having regard to the nature of the services and any advertising or sales information provided by the Licensee”. Although these requirements are already incorporated in the licence conditions², URCA has so far not adopted a framework for monitoring quality of service. URCA is therefore proposing a number of Network Performance Metrics (NPMs) against which the quality of service of the holders of IOLs will be measured. The relevant licensees will be required to report to URCA, on a quarterly basis, on their performance against the NPMs.

- 1.5 Although there are several standards describing QoS measurements, the question of which indicators are to be monitored and the values which they should meet are open for discussion. URCA considers that the standards bodies such as the International Telecommunication Union (ITU) and the European Telecommunications Standards Institute (ETSI) have issued pertinent recommendations, directives and guidelines on Quality of Service (QoS) which are relevant to The Bahamas. This consultation document reviews the QoS NPMs recommended and defined by European Telecommunications Standardization Institute (ETSI).
- 1.6 The proposed Regulations are supplemental to URCA’s Consumer Protection Regulations as specified in ECS19/2013 issued on 26th May, 2014. They are intended to give further effect to URCA’s duties outlined in sections 45 and 46 of the Comms Act. Section 45 of the Act mandates that “URCA shall have a duty to monitor and enforce the consumer protection conditions in the licenses” and in administering those conditions “may issue general regulations relating to the standard of service, quality and safety of the carriage services and equipment” used for the provision of commercial services³. In addition, under section 46 of

Document No: CICRA 13/14 issued in March 2013); Info-communications Development Authority of Singapore (Telecommunications Quality of Service Standards for multiple services available at <http://www.ida.gov.sg/Policies-and-Regulations/Industry-and-Licensees/Standards-and-Quality-of-Service/Quality-of-Service>); Information & Communication Technologies Authority of Mauritius (Consultation Paper on Quality Of Service (Qos) Framework for Information and Communication Services In Mauritius, Consultation Ref: ICTA/2010/01 issued on 17 May 2010); Communications and Information Technology Commission of Saudi Arabia (Quality of Service Scheme for the Kingdom of Saudi Arabia, published in April 2009).

² See section 22.1 of the Individual Operating Licence available at <http://www.urcabahamas.bs/download/002164400.pdf>.

³ See section 45 of the Communications Act, 2009.

the Comms Act, licensees “shall monitor their performance against key performance indicators that may be set out in the licences or any regulations issued by URCA”. Section 46 of the Act also mandates that licensees shall, pursuant to any request from URCA:

“(a) Publish their performance against any such key performance indicators in the manner required by URCA; and

(b) Provide details of their performance against such key performance indicators in the manner required by URCA.”

1.7 In addition to fulfilling the aforementioned duties, these Regulations are aimed at implementing the electronic communications policy objectives under section 4(a)(i), 4(b)(i) and 4(b)(vi) of the Comms Act, which are to further the interests of consumers by promoting competition and in particular to enhance the efficiency of the Bahamian electronic communications sector and the productivity of the Bahamian economy, and to further the interests of persons in The Bahamas in relation to the electronic communications sector by:

“(i) Promoting affordable access to high-quality networks and carriage services in all regions of The Bahamas; and

(vi) Promoting availability of a wide range of content services, which are of high quality.”

OBJECTIVES OF THIS CONSULTATION DOCUMENT

1.8 Pursuant to its duty to consult as defined in section 11 of the Comms Act, URCA has issued this consultation document to solicit public and industry comments on this draft document prior to issuing the Final Quality of Service Regulations for Electronic Communications Networks and Services in The Bahamas. This public consultation document, therefore, has the following objectives:

- i. to establish NPMs against which the quality of service provided by service providers will be measured against;
- ii. to set out the method and manner in which service providers are to report their compliance or lack thereof with the NPMs;
- iii. to solicit responses from licensees and interested parties on URCA’s Draft Quality of Service Regulations.

HOW TO RESPOND TO THIS CONSULTATION DOCUMENT

1.9 Responses to this document should be submitted to URCA by 5:00 p.m. on 12th February 2016. Persons may send their written responses or comments to the Director of Policy and Regulation, either:

- By hand to URCA’s office at Frederick House, Frederick Street, Nassau; or
- By mail to P.O. Box N-4860, Nassau, Bahamas;
- By fax to (242) 393-0153; or

- By email to info@urcabahamas.bs.

1.10 URCA reserves the right to make all responses available to the public by posting responses on its website at **www.urcabahamas.bs**. If a response is marked confidential, reasons should be given to facilitate URCA evaluating the request for confidentiality. URCA may publish or refrain from publishing any document or submission at its sole discretion. URCA will review the responses received on or before 12th March 2016 and publish a Statement of Results of the consultation and issue Final Regulations.

STRUCTURE OF THE REMAINDER OF THIS DOCUMENT

- 1.11 The remainder of this consultation document is structured as follows:
- Section 2 outlines the Regulatory Framework for Quality of Service; and
 - Section 3 presents the draft Quality of Service Regulations

2. REGULATORY FRAMEWORK FOR QUALITY OF SERVICE REGULATIONS

- 2.1 The ITU defines 'quality of service' as the *"totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service"*.⁴ Therefore, QoS NPMs provide an indication of the quality of service a customer experiences when using an operator's network. As previously stated in Section 1.5 above, the ITU and other standardization bodies, such as ETSI, have issued pertinent recommendations and guidelines related to the assessment of QoS. Those recommendations and guidelines have been developed primarily to assist operators in network planning and management of their business operations, assist regulators with developing appropriate regulations and policies with a view to monitoring NPMs and improving quality of service, and assist consumers with making informed choices regarding the selection of their service providers.

POLICY FRAMEWORK

- 2.2 The Government's policy objective regarding Quality of Service Regulations is outlined in paragraphs 78 through 105 of the ECSP. Paragraphs 85 states that *"at the core of the Government policies for the ECS is the promotion of the interests of Bahamian residents, individually and collectively. URCA will ensure that there are adequate regulatory protections in place so that consumers receive electronic communications services that are of high quality, and that are delivered subject to terms and conditions that are fair, non-discriminatory, and reflect the rights of consumers individually and collectively."* The policy therefore directly requires that URCA put in place regulatory measures to address and ensure that high-quality services are delivered to consumers in The Bahamas.
- 2.3 By requiring licensees to report measures of key performance indicators and establishing the minimum QoS, URCA seeks to ensure quality of service is not compromised at the expense of choice and price changes and provide consumer protection by ensuring an acceptable standard of service quality.

LEGAL AND REGULATORY FRAMEWORK

- 2.4 The Communications Act establishes the law applicable to the ECS and empowers URCA to establish regulatory and policy measures in an effort to implement the electronic communications policy objectives. Section 4 of the Comms Act outlines the electronic communications policy objectives relevant to the ECS, which objectives include furthering the interests of consumers by promoting competition and in particular enhancing the efficiency

⁴ Recommendation ITU-T E.800 (09/2008) available at <http://www.itu.int/rec/T-REC-E.800-200809-I>.

of the Bahamian electronic communications sector and the productivity of the Bahamian economy, and furtherance of the public interests by:

- i. promoting affordable access to high-quality networks and carriage services in all regions of The Bahamas; and
- ii. promoting availability of a wide range of content services, which are of high quality.

2.5 Section 5 of the Comms Act requires that while in the process of achieving these policy objectives, URCA should impose regulation only if market forces are unlikely to achieve the result within a reasonable period. As indicated above, URCA is not satisfied, for the reasons stated in section 1.3, that market forces have led to significant improvements in QoS in the ECS. Hence, URCA considers it appropriate to introduce regulations for monitoring the quality of the electronic communications services offered in The Bahamas, but in a manner that shows due regard to the costs and implications of the network quality of service standards for specified licensees. Therefore, in accordance with sections 45 and 46 of the Comms Act, URCA proposes to require holders of IOLs to:

- a. monitor their performance against any key performance indicators set out in this Network Quality of Service Regulations document;
- b. report their performance against any such key performance indicators in the manner described in the relevant Schedules of the Regulations; and
- c. provide details of their performance against such key performance indicators in the manner required by URCA.

LICENCE CONDITIONS

2.6 URCA proposes that licensees issued with an IOL should be required to establish QoS conditions and provide services in accordance with the QoS standards set under Condition 22.1 and Condition 1.19 of the respective licence. Condition 22.1 of the IOL provides that:

The Licensee shall, on the direction of URCA, publish adequate and up to date information on the quality of its Carriage Services in a format that may be used by End-Users for industry comparison.

2.7 Further, where URCA makes a direction under the above condition, Condition 22.2 provides that URCA may direct the following:

22.2.1. The quality of service parameters to be measured;

22.2.2. The consequences of non-compliance with the quality of service parameters to be measured;

22.2.3. The content and form of the information to be published and how the comparability of the information is to be validated;

22.2.4. The manner of publication of the information; and

22.2.5. The timing of publication of the information.

- 2.8 In accordance with the legal and regulatory framework, URCA proposes that the Quality of Service (QoS) Regulations will require the mentioned categories of service providers to monitor the performance of their networks against specified key performance indicators and publish adequate and up-to-date information relating to the quality of service offered in a format that will be prescribed herein.

STANDARDIZATION OF TERMINOLOGY

- 2.9 URCA considers that a standardized set of terms and definitions is required to harmonize QoS reporting within the ECS. In URCA's view, standardization will help to avert potential discrepancies and/or ambiguities that can result from misinterpretation of definitions. Therefore, in Schedule One through Schedule Four of this Draft Quality of Service Regulations for Electronic Communications Networks and Services in The Bahamas, URCA proposes a standardized set of interpretations consisting of terms and definitions that may be universally applied to electronic communications services and networks.

3. ANALYSIS UNDER SECTION 5 OF THE COMMS ACT

- 3.1 Section 5(b)(ii) of the Act requires URCA to analyse the likely costs and implications (i.e., effects) of a proposed new regulation or regulatory change. This analysis should help URCA to identify regulatory options, and determine which option is likely to be most effective in terms of costs and implications, in the absence of market forces, in achieving the proposed regulatory objective. The analysis will also cause URCA to assess the impact of these regulatory options on stakeholders. URCA's ultimate aim in conducting an analysis in accordance with section 5(b)(ii) of the Comms Act is to ensure that all proposed measures are appropriate, proportionate and justified in accordance with URCA's obligations under section 5(c) of the Act. In the present consultation, URCA is considering whether to impose QoS obligations on specified categories of licensees in a number of markets, some of which are already regulated.
- 3.2 In assessing different regulatory options under section 5 of the Comms Act, URCA's approach to such analysis follows five main steps:
- Step 1: describe the electronic communications policy issues and identify the policy objectives
 - Step 2: identify and describe the regulatory options
 - Step 3: determine the impacts on stakeholders
 - Step 4: determine the impacts on competition
 - Step 5: assess the impacts and choose the best option.
- 3.3 In choosing regulatory measures pursuant to section 5 of the Comms Act, URCA must ensure they are:
- based on the nature of the problem identified;
 - proportionate and justified in the light of the electronic communications policy objectives laid down in section 4 of the Comms Act; and
 - only imposed following consultation in accordance with sections 11, 12 and 13 of the Comms Act.
- 3.4 The relevant electronic communications policy objective, as set out in section 4 of the Comms Act which must be taken into account when applying regulatory measures is promoting affordable access to high-quality networks and carriage services in all regions of The Bahamas.
- 3.5 This objective, together with the statutory processes set out in section 45 and 46 of the Comms Act and the conditions in the relevant licenses, guide URCA in its assessment of regulatory options, and ultimately in the selection of a proposed remedy through regulatory and other measures.

Estimated Impact on Licensees of the Draft QoS Regulations:

3.6 The Draft QoS Regulations would impose specific obligations on the designated licensees through the QoS regulatory framework. The main obligations imposed on licensees under the Draft QoS Regulations are as follows:

- Measuring NPMs;
- Reporting results of the measurements every quarter;
- Making improvements in their network to meet established targets or paying fines/penalties if targets are not met.

3.7 These obligations generate costs for licensees, which may decrease their profit margin or which they may pass on to their consumers through small price increases. For the Draft QoS Regulations to be effective, URCA will also have to incur costs. Accordingly, URCA will have to:

- Build the QoS regulatory framework;
- Publish data on QoS in its annual report;
- Review the documents published by licensees;
- Proceed with enforcement actions where necessary;
- Set up dedicated measurement systems and conduct specific studies on key QoS issues such as customer satisfaction studies.

Additionally, consumers will also be impacted (better QoS but possibly higher retail prices as a result of increased costs for licensees).

Regulatory options for URCA

3.8 In this consultation document, URCA has sought to justify why it intends to follow a regulatory approach for QoS consisting in measuring NPMs, in reporting results of the measurements and in following enforcement procedures when targets are not met. URCA could have followed other options. URCA has identified four options including the proposed QoS Regulations:

- Option 1: “do nothing”. Under this option, QoS is not regulated as is currently the situation (i.e., with no NPMs and targets listed in licensees’ licences, no information is provided to URCA).
- Option 2 is URCA’s proposed option in the Draft QoS Regulations whereby specified categories of licensees must measure NPMs, must report the results of the measurements and must meet imposed targets (if not, licensees may pay fines or penalties to URCA or compensate end-users).
- Option 3 is similar to option 2 but licensees are not financially penalised when targets are not met. In practice, this approach is in fact the same as option 1 because in the current situation in The Bahamas, no penalties are applied as no NPMs exist. The only difference between this option and option 2 is that a list of NPMs would exist.
- Option 4: “remove all QoS requirements”. Given the low level of competition in The

Bahamas and the non-existence of any current QoS measurements, this option is not considered as a realistic option for URCA as it highly unlikely to achieve the electronic communications policy objectives.

For each of options 1, 2 and 3, and for each stakeholder, estimated costs and benefits are assessed.

Impact on Licensees:

- 3.9 URCA considers that the obligations defined in the Draft QoS Regulations apply only to those licensees providing fixed and cellular mobile services and internet services. For example, no additional specific obligation is imposed on licensees having Significant Market Power (SMP) only. The proposed Regulations are therefore a symmetric regulation. Estimating the cost of imposing QoS obligations on wholesale services is not relevant for the purposes of this analysis under section 5(b)(ii) of the Comms Act, firstly because the number of wholesale offers in The Bahamas today is very limited, and secondly because the regulation of wholesale services QoS is the direct consequence of obligations to provide wholesale services and not the direct consequence of the Draft QoS Regulations. As a result, the impact on licensees is assessed for all relevant licensees at the same time and for retail NPMs only.

Estimated costs for Licensees

- 3.10 URCA considers that three types of costs would be mainly incurred by the relevant licensees as a result of the proposed draft QoS Regulations coming into effect:
- Cost of measuring NPMs;
 - Cost of reporting results of the measurements;
 - Cost of making improvements in their network to meet established targets or paying fines/penalties if targets are not met.

Estimated costs of measuring NPMS

- 3.11 Under option 1, no additional cost will be incurred by licensees since option 1 is currently the status quo. Under option 2, several NPMs have to be measured. It is not necessary to assess the estimated cost of measuring each NPMs but rather to assess the estimated cost of the methodologies involved to measure a set of NPMs. Once a given methodology has been put in place, the incremental cost of measuring additional NPMs on the basis of this methodology is very low. Indeed, a given methodology enables licensees to measure several NPMs. Several methodologies are employed to collect data on QoS measurement:
- Methodology where data is collected by the ordering system or other administrative systems;
 - Methodology where data is collected within the network from counters;
 - Methodology where data is collected within the network from internal measurements;
 - Methodology where data is collected using a specific test for cellular mobile services;
 - Methodology where data is collected using a specific test for fixed services.

For each of these methodologies, licensees can incur additional costs to acquire measurement equipment (“material cost”) or to purchase third party work (“third party cost”) or to hire staff to conduct the additional QoS requirements (“staff cost”). An assessment of these costs for each measurement methodology is proposed in the table below:

Table 1: Estimated Material cost, third party cost and staff costs related to the measurement methodologies involved

Per annum	Estimated External costs (Material cost and third party cost) per annum	Estimated Internal cost (Staff cost) per annum
Data collected by the ordering system or other administrative systems	Equipment is already existing, but it may require modifications of existing implementations (see “staff cost”)	An (existing) employee who would spend some of their time to implement the system and to collect the results of the measurement
Data collected within the network from counters	Equipment is already embedded in Service Providers’ systems, but it may require modifications of existing implementations (see “staff cost”)	An (existing) employee who would spend some of their time to implement the system and to collect the results of the measurement
Data collected within the network from internal measurements	Equipment is already installed, but it may require modifications of existing implementations (see “staff cost”)	Depending on the size of the network, an (existing) employee who would spend some of their time to implement the system and possibly the same or another employee to collect the results of the measurement (this estimated cost may be lower for smaller operators as one person may handle both roles)
Data collected using a specific test for cellular mobile	Assuming drive and walk tests conducted by third parties, the cost of engaging such third parties	Time required to supervise the third party can be negligible
Data collected using a specific test for fixed	Assuming a campaign conducted by third parties, the cost of engaging such third parties	Time required to supervise the third party can be negligible

Under option 3, URCA considers that the same estimated costs as the estimated costs for

option 2 would be incurred.

Estimated cost of reporting results of the measurements every quarter

- 3.12 Under option 1, licensees would not incur any additional costs because option 1 is the current situation. Under option 2, the relevant licensees would have to produce reports every quarter. Preparing a report requires using the data collected at the end of the NPMs measurement process and filling in the template provided by URCA for reporting purposes. As a consequence, the relevant licensees would have to allocate a staff member to carry out this task in addition to any other duties. URCA estimates that this should not result in any significant additional cost to the relevant licensees. Under option 3, URCA considers that the same level of estimated cost will apply to relevant licensees.

Estimated cost of making improvements in relevant licensees' network to meet established targets or paying fines/penalties if targets are not met

- 3.13 The relevant licensees would have to comply with the proposed targets set by URCA. Targets may require improving the relevant licensees' networks. Network improvements obviously generate extra costs. It is extremely difficult for URCA to estimate the amount of extra cost that might be incurred by relevant licensees to meet the proposed additional targets since it would depend on each relevant licensee's network structure and network topology and actual investments in networks which are not precisely known and might not be undertaken. If the relevant licensees do not comply with the targets, they could be financially penalized by URCA, as a last resort, if targets are not met. Under option 1 and under option 3, this cost is nil as fines do not apply. Under option 2, if a relevant licensee does not meet a target, it may have to pay a fine for each NPMs for which the target is not met. There are around 15 proposed targets. URCA considers that it is possible that relevant licensees will always meet all targets for all services because their current network and organisation provide very high levels of QoS. At the opposite end, URCA considers it is highly unlikely that relevant licensees will not meet any of the targets since URCA believes that some of the targets are already being achieved.

Estimated benefits

- 3.14 URCA is of the view that relevant licensees will also benefit from the proposed QoS Regulations since NPMs measurement and reporting will enable them to:
- Get a better understanding of the QoS delivered to end-users;
 - Compete on equal terms by providing objective comparison information between other licensees in the relevant market and, therefore, to support the transition of the electronic communications sector to a higher level of competition;
 - Stimulate customers' usage as they will be more satisfied with the services being provided.
- 3.15 URCA considers that option 1 will not bring these benefits since there are no existing NPMs

that are sufficiently oriented towards end-users services. Option 2 will generate benefits under all three categories. URCA considers that option 3 will provide the first two benefits but not the last since incentives to improve QoS will be too low.

Table 2: Summary of estimated costs and benefits for relevant Licensees

	Estimated Costs	Estimated Benefits
Option 1 – Do Nothing	No additional costs but poor or limited understanding of QoS delivered to end-users and poor or limited ability to compete	
Option 2 – URCA’s Proposed Approach	<ul style="list-style-type: none"> • Minimum: Unknown but probably not significant if relevant licensee’s network is at a level which is in line with proposed targets • Maximum: Unknown but might be significant if relevant licensee’s network requires significant improvements 	<ul style="list-style-type: none"> • Better understanding of QoS delivered to end-users • Higher usage (i.e., higher revenues)
Option 3 – URCA’s Proposed Approach Without Fines/ Penalties	Should be same as for option 2	Better understanding of QoS delivered to end-users

Impact on URCA: Estimated costs for URCA

3.16 URCA estimates that the budget associated with building the entire QoS regulatory framework and associated activities listed above is incorporated into URCA’s annual work plan and paid for by licensees as part of their annual URCA Fees, therefore licensees would not incur any additional or extra costs beyond those already stated in URCA’s annual budget. The estimated cost under option 1 is therefore nil. Under option 2, the draft QoS Regulations require URCA to:

- Build the QoS regulatory framework;
- Set up dedicated measurement systems and conduct specific studies on key QoS issues such as customer satisfaction studies;
- Publish data on QoS as part of its annual report;
- Review the documents published by relevant licensees;
- Proceed with enforcement actions when targets are not met (mainly conducted by URCA’s Policy & Regulation unit).

These estimated costs will be the same with options 2 and 3.

Impact on URCA: Estimated benefits for URCA

3.17 Under the proposed QoS regulatory framework in this consultation document, URCA is of the view that it will better achieve its role as set out in section 4 of the Comms Act and especially the electronic communications policy objectives:

- to further the interests of consumers by promoting competition and in particular to enhance the efficiency of the Bahamian electronic communications sector and the productivity of the Bahamian economy, and
- to further the interests of persons in The Bahamas in relation to the electronic communications sector by:
 - Promoting affordable access to high-quality networks and carriage services in all regions of The Bahamas; and
 - Promoting the availability of a wide range of content services, which are of high quality.

3.18 In URCA’s view, these policy objectives would not be fully met under option 1 because:

- the quality expected by end-users has not been achieved to date and no specific QoS obligations have been set in the licences or in any regulatory or other measure; and
- URCA considers QoS to be an important issue for the sector.

3.19 Also, in URCA’s view the policy objectives will not be met under option 3 because option 3 does not provide sufficient incentives to relevant licensees to improve QoS.

Table 3: Summary of estimated costs and benefits for URCA

	Estimated Costs	Estimated Benefits
Option 1 – Do Nothing	No additional costs but the electronic communications policy, statutory and licensing objectives are not fully achieved	
Option 2 – URCA’s Proposed Approach	No additional costs as they are already incorporated into URCA’s annual work plan and paid for by licensees as part of their annual URCA Fees	The electronic communications policy, statutory and licensing objectives guiding URCA would be achieved
Option 3 – URCA’s Proposed Approach Without Fines/ Penalties	Should be same as for option 2	URCA’s objectives to increase investment and benefits to customers would not be achieved

Impact on end-users: Estimated costs for end-users

3.20 There is no cost for end-users under option 1. The relevant licensees’ estimated costs for Option 2 and for Option 3 have already been stated and even if they are passed on to end-users through higher prices, this does not need to be counted again as this would result in such costs being counted twice. It could be said, however, that poor or bad QoS levels generate costs for business customers since they could lead to lost business opportunities.

Impact on end-users: Estimated benefits for end-users

3.21 In URCA’s view, end-users will enjoy many benefits from the QoS regulatory framework proposed in the draft Regulations, as follows:

- Higher QoS;
- Better information to select a service provider;
- Better information to understand areas of service where QoS is deficient or inferior.

3.22 If relevant licensees do not conduct network improvement, QoS will not be higher but the draft Regulations propose that end-users should be compensated for poor or deficient QoS from their service provider.

Table 4: Summary of estimated costs and benefits for end-users

	Estimated Costs	Estimated Benefits
Option 1 – Do Nothing	<ul style="list-style-type: none"> • Insufficient level of QoS experienced • Difficulty to assess QoS and to compare QoS from individual service providers 	No risk of increase in prices due to better QoS
Option 2 – URCA’s Proposed Approach	Possibility of increased prices for some services but only if service providers choose to pass on any cost increases to customer	<ul style="list-style-type: none"> • Higher QoS or compensation if targets not met • Better information to select a service provider • Better information to understand areas where QoS is deficient • Potential of receiving financial compensation when QoS targets are not met
Option 3 – URCA’s Proposed Approach Without Fines/ Penalties	Should be same as for option 2	<ul style="list-style-type: none"> • Better information to understand areas where QoS is deficient • Potential of receiving financial compensation when QoS targets are not

		met
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Conclusion on impacts

3.23 In light of this costs and impacts analysis in accordance with the guidelines in section 5 of the Comms Act, URCA is of the view that the estimated benefits expected from the proposed QoS regulatory framework in the draft QoS Regulations largely outweigh any estimated costs which might occur as a result of the introduction in the ECS of The Bahamas of the proposed Regulations in the worst case scenario (no targets being met as none currently exist under the policy, statutory or licensing framework in existence, while URCA is of the view that many of the targets being proposed should be met in today’s market). URCA considers that Option 3 is similar to Option 2 but generates similar estimated costs while not sufficiently encouraging service providers to improve QoS levels in an environment where competition is low. In URCA’s view, the proposed new QoS regulatory framework set out in the draft Regulations should increase the level of QoS in electronic communications networks and services provided in The Bahamas, but also provides much better information on QoS to end-users and therefore fills the gap between expected QoS and experienced QoS. This should, in URCA’s view, also increase competition among service providers and provide The Bahamas with electronic communications infrastructure of high standards. The following table summarizes URCA’s view of the potential impact of the proposed Regulations on affected stakeholders:

Table 5: Potential impact of the proposed QoS Regulations on affected stakeholders

	Option 1 – Do Nothing		Option 2 – URCA’s Proposed Approach		Option 3 – URCA’s Proposed Approach Without Fines/ Penalties	
	Estimated Costs	Estimated Benefits	Estimated Costs	Estimated Benefits	Estimated Costs	Estimated Benefits
Service Providers	No additional costs but poor or limited understanding of QoS delivered to end-users and poor or limited ability to compete		<ul style="list-style-type: none"> • Minimum: Unknown but probably not significant if relevant licensee’s network is at a level which is in line with proposed targets 	<ul style="list-style-type: none"> • Better understanding of QoS delivered to end-users • Higher usage (i.e., higher revenues) 	Should be same as for option 2	Better understanding of QoS delivered to end-users

	Option 1 – Do Nothing		Option 2 – URCA's Proposed Approach		Option 3 – URCA's Proposed Approach Without Fines/ Penalties	
	Estimated Costs	Estimated Benefits	Estimated Costs	Estimated Benefits	Estimated Costs	Estimated Benefits
			<ul style="list-style-type: none"> Maximum: Unknown but might be significant if relevant licensee's network requires significant improvements 			
URCA	No additional costs but the electronic communications policy, statutory and licensing objectives are not fully achieved		No additional costs as they are already incorporated into URCA's annual work plan and paid for by licensees as part of their annual URCA Fees	The electronic communications policy, statutory and licensing objectives guiding URCA would be achieved	Should be same as for option 2	URCA's objectives to increase investment and benefits to customers would not be achieved
End users	<ul style="list-style-type: none"> Insufficient level of QoS experienced Difficulty to assess QoS and to compare QoS from individual service 	No risk of increase in prices due to better QoS	Possibility of increased prices for some services but only if service providers choose to pass on any cost increases to	<ul style="list-style-type: none"> Higher QoS or compensation if targets not met Better information to select a service provider 	Should be same as for option 2	<ul style="list-style-type: none"> Better information to understand areas where QoS is deficient Potential of receiving financial compensation

	Option 1 – Do Nothing		Option 2 – URCA's Proposed Approach		Option 3 – URCA's Proposed Approach Without Fines/ Penalties	
	Estimated Costs	Estimated Benefits	Estimated Costs	Estimated Benefits	Estimated Costs	Estimated Benefits
	providers		customer	<ul style="list-style-type: none"> • Better information to understand areas where QoS is deficient • Potential of receiving financial compensation when QoS targets are not met 		<ul style="list-style-type: none"> • e-ion when QoS targets are not met

4. DRAFT QUALITY OF SERVICE REGULATIONS

PART 1 PRELIMINARY PROVISIONS

1.1 In exercise of the duties conferred upon it under sections 45 and 46 of the Communications Act 2009 (the “Act”), and of all other powers enabling it in that regard, the Utilities Regulation and Competition Authority (“URCA”) hereby makes the following Regulations. These Regulations may be cited as the Quality of Service (QoS) Regulations for Electronic Communications Networks and Services, 2015 (“the QoS Regulations”).

PART 2 APPLICATION

2.1 These Regulations shall apply to all Licensees having been issued by URCA with an Individual Operating Licence (IOL) in accordance with Part IV of the Communications Act.

PART 3 INTERPRETATIONS

3.1 In these Regulations, unless the context requires otherwise, the definitions of each QoS Network Performance Metrics (NPMs) is defined in Schedule One through Schedule Four.

PART 4 OBJECTIVES OF QUALITY OF SERVICE

- 4.1 These Regulations aim to advance the policy objectives of the Communications Act, 2009 by furthering the interests of consumers of electronic communications services by:
- i. creating a set of minimum QoS standards that the holders of IOLs are required to provide to users of their services;
 - ii. requiring the holders of IOLs to measure and report their performance to URCA against the network performance metrics on a quarterly basis;
 - iii. requiring the holders of IOLs to comply with the minimum QoS standards set by URCA within twenty-four months after the publication of these Regulations; and
 - iv. ensuring compliance with the NPMs by reviewing the reports submitted by the holders of IOLs and imposing penalties on licensees that fail to provide the minimum QoS to customers.

PART 5 REGULATED SERVICES

- 5.1 The NPMs for the following services are prescribed under these Regulations:
- i. Fixed and Fixed-Wireless Electronic Communications Services (FFWECS) – Schedule 1;
 - ii. Cellular Mobile Electronic Communications Services (CMECS) – Schedule 2;

- and
- iii. Internet Protocol-based Electronic Communications Services (IBECS) – Schedule 3.

PART 6 QUALITY OF SERVICE NPMS FOR FIXED AND FIXED-WIRELESS ECS NETWORKS

- 6.1 In addition to any other relevant requirement in these Regulations, Licensees providing fixed and/or fixed-wireless electronic communications services shall be required to report their performance to URCA against the QoS NPMS specified in Schedule One of these Regulations.

PART 7 QUALITY OF SERVICE NPMS FOR CELLULAR MOBILE ECS NETWORKS

- 7.1 In addition to any other relevant requirement in these Regulations, Licensees providing cellular mobile electronic communications services shall be required to report their performance to URCA against the QoS NPMS specified in Schedule Two of these Regulations.

PART 8 QUALITY OF SERVICE NPMS FOR INTERNET AND DATA SERVICES

- 8.1 In addition to any other relevant requirement in these Regulations, Licensees providing internet and/or data services shall be required to report their performance to URCA against the QoS NPMS specified in Schedule Three of these Regulations.

PART 9 REVIEW OF TARGETS AND PARAMETERS ON QUALITY OF SERVICE

- 9.1 URCA will review the targets and parameters on the quality of service under these Regulations on a quarterly basis.

PART 10 REPORTING

- 10.1 The Reportable QoS NPMS are defined in Schedule One through Schedule Three of these Regulations.
- 10.2 The Reporting Period, defined as the periods of time over which measurements are taken and recorded, shall be three (3) months in duration, starting on the first day of the January, April, July and October every year and concluding on the last day of the third month, or otherwise any period URCA may from time to time direct or stipulate to licensees in accordance with these Regulations.
- 10.3 The Reporting Areas, defined as geographic territories for which measurements are taken and recorded, shall be the territory defined by URCA, or otherwise each distinct island or cay in The Bahamas, unless URCA permits in writing two or more Reporting Areas to be combined into a single Reporting Area for particular licensees, NPMS, services and reporting periods in

accordance with these Regulations.

- 10.4 For each reportable QoS NPMs, reporting area and reporting period, the holders of IOLs shall:
- i. monitor and record the key performance indicators set forth in Schedule One through Schedule Three;
 - ii. complete and submit to URCA a QoS Report on the forms specified in the relevant Schedules, no later than 30 calendar days after the end of the reporting period. Submission shall commence one hundred and eighty calendar days after the publication date of these Regulations;
 - iii. submit any additional information required and requested by URCA, including details of the times, places and other particulars of the measurements, within thirty (30) calendar days after the end of the reporting period or as may be otherwise directed by URCA in accordance with these Regulations; and
 - iv. retain QoS data, including all measurements and related records, for a minimum of twelve (12) months after the end of the reporting period or as may be otherwise directed by URCA in accordance with these Regulations.

Consultation Question #1: Do you agree with the reporting requirements in Part 10.4?

Consultation Question #2: Do you agree with URCA's proposal to commence the submission of QoS NPMs Reports one hundred and eighty days after the publication of these Regulations?

Consultation Question #3: Do you agree with the requirement to submit QoS Reports to URCA no later than 30 days after the last day of the reporting period?

Consultation Question #4: Do you agree with URCA permitting the combining of two or more reporting areas for particular licensees, NPMs, services and reporting periods?

- 10.4 In considering whether to permit the combining of two or more Reporting Areas into a single reporting area, URCA shall take into account factors such as:
- i. the value of information about variations in QoS between separate Reporting Areas;
 - ii. the relationship between the network structure and corporate organization of the relevant Licensee and the physical boundaries of the Reporting Areas;
 - iii. The numbers of customers using the relevant services in the Reporting Areas; and/or
 - iv. the difference in costs to the relevant licensee that can result from taking measurements for separate Reporting Areas and taking measurements for combined Reporting Areas.
- 10.5 URCA may require the Licensee to commission an audit, by a reputable firm, of some or all of the QoS data retained by licensees under these Regulations and may vary the regularity and

frequency of the audits, as well as the licensees, services, NPMs, reporting areas and reporting periods that require audits.

10.6 URCA may also, after due analysis, mandate or request Licensees to make necessary amendments or corrections to the measurements and reporting format submitted under Regulation.

10.7 For each Reportable QoS NPMs, Reporting Area and Reporting Period, measurements shall be reported to URCA on Forms specified in Schedule One through Schedule Three and must contain:

- i. the name of the licensee and licence number;
- ii. the name and type of service;
- iii. the description of the reporting area;
- iv. the reporting period;
- v. an indication of any target for the parameter and the service that has not been reached by the licensee;
- vi. any explanatory remarks by the Licensee, accepted by URCA, including but not limited to remarks about changes in environmental or operating conditions during the reporting period and/or in respect of the reporting area that could not have been reasonably foreseen by the Licensee; and
- vii. any other information or comparison of service quality that URCA determines to be appropriate, possibly including information that URCA may utilise to help customers to assess the performance of competing Licensees.

10.8 In considering whether to approve explanatory remarks from a Licensee under Part 10.7(vi) of these Regulations, URCA may take into account factors including but not limited to:

- i. any service deficiencies that arise partly or wholly from the utilisation by the licensee of the services of another licensee
- ii. any changes in environmental or operating conditions during the reporting period and/or in respect of the reporting area that could not have been reasonably foreseen by the licensee; and
- iii. any expectations about the quality of service that is appropriate to the tariffs and other commercial terms for the services of the licensee.

PART 11 INVESTIGATION

11.1 URCA may investigate the QoS measurement, reporting and record keeping procedures of a Licensee pursuant to section 9(1) of the Act and may exercise its powers of information gathering pursuant to section 9(2) of the Act and the Conditions of the relevant licence.

PART 12 CONTRAVENTION AND ENFORCEMENT

12.1 For each Reportable QoS NPMs, Reporting Area and Reporting Period, a Licensee providing the service(s) described in Part 5 of these Regulations shall have committed a contravention or breach of these Regulations if:

- i. The Licensee fails to perform the measurement, reporting and record keeping tasks set out in Schedule One through Schedule Three.
- ii. The Licensee fails to achieve the Minimum NPMs within twenty-four months of:
 - a. the publication date of these Regulations; or
 - b. the date when the Target was most recently specified; or
 - c. the date when the Target was most recently changed to require a higher standard of quality than was required immediately before;
- iii. The Licensee fails to submit, within the time specified by URCA, information required and requested by URCA pursuant to Part 10 of these Regulations;
- iv. The Licensee submits or publishes false or misleading information about its QoS; or
- v. The Licensee obstructs or prevents an investigation by URCA relating to verification of QoS measurements, reporting and record keeping procedures.

PT. 13 PENALTIES

13.1 Any Licensee that contravenes any provision of these Regulations shall be liable to a fine or another penalty to be determined by URCA.

13.2 URCA may issue a notice to a Licensee with no record of past breaches of these Regulations, identifying remedial measures to be undertaken but imposing no other penalties or sanctions.

13.3 URCA shall review continuing or repeated breaches of these Regulations by a Licensee to determine if such breaches constitute a breach of provisions of the Comms Act, regulatory and other measures issued by URCA and/or the Licensee's applicable Licence Conditions warranting regulatory or enforcement action to be taken by URCA against the Licensee.

13.4 The possible sanctions available to URCA include a decision to:

- i. issue an order under section 95 of the Communications Act;
- ii. issue a determination pursuant to section 99 of the Communications Act;
- iii. impose a financial penalty under section 109 of the Communications Act; and

- iv. suspend or revoke the licensee’s licence under section 27 and/or section 109 of the Communications Act.

13.5 URCA will consider the following factors in arriving at a decision on the penalties to be imposed:

- i. the seriousness of the breach;
- ii. the past conduct of the Licensee regarding compliance with the Regulations; and
- iii. any representations made by the Licensee regarding the alleged breach and related circumstances.

Consultation Question #5: Do you agree that URCA should consider the factors listed in Part 13.5 when making a decision on the penalties to be imposed? Are there other relevant factors the URCA should consider?

PT. 14 PUBLICATION

14.1 URCA may compile and publish in its annual report, on its website and/or in other appropriate media the licensees’ performance against the NPMs. URCA shall not publish this information earlier than six (6) months after the end of the Reporting Period.

14.2 Where licensees are required to make necessary amendments or corrections to the measurements submitted under these Regulations, URCA may publish the amended or corrected QoS NPMs within six (6) months after the end of the Reporting Period to which the measurements apply, with or without additional notes or comments.

Consultation Question #6: Do you agree with URCA’s proposal to publish in its annual report, on its website and/or in other appropriate media source for public access, the QoS reported by Licensees at least six (6) months after the end of the Reporting Period?

SCHEDULE ONE

Reportable Quality of Service NPMs for Fixed and Fixed-Wireless Electronic Communications Services (FFWECS)

I. Summary of Contents

- 1.0 Preamble
- 1.1 Supply Time for Fixed Network Access
- 1.2 Fault Report Rate Per Fixed Access Lines
- 1.3 Fault Repair Time for Fixed Access Lines
- 1.4 Unsuccessful Call Ratio
- 1.5 Call Setup Time
- 1.6 Speech Connection Quality

1.0 Preamble

The key performance indicators in this Schedule shall be reported by the holders of Individual Operating Licences whose services are provided by means of a fixed network. Licensees shall report NPMs on Form *QoS-Schedule 1: Quality of Service NPMs for Fixed ECS Networks* (Refer to the Appendix to Schedule One).

1.1 Supply Time for Fixed Network Access

(a) Definition

The *Supply Time for Fixed Network Access* is the duration from the instant a valid service order is received by a service provider to the instant a working service is made available for use. A valid service order may be made verbally, or in writing or in any other acceptable form. A valid service order excludes cancelled orders⁵.

Where a service provider and customer agree that an order for multiple connections or service instances will be completed in stages, each agreed delivery time should count as a separate customer order for measurement purposes. Where a customer orders services that must be provided at several sites, the provision of the service at each site counts as a separate customer order.

(b) Measurement and Statistics

The parameter should include all network accesses supplied in the data collection period.

(c) Reporting criteria

The licensee shall report:

⁵ Recommendation from Section 5.1 of ETSI EG 202 057-1: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 1: General, Page 16.

- i. the times by which the fastest 99 % of orders are completed; and
- ii. percentage of orders completed by the date agreed with the customer.

1.2 Fault Report Rate Per Fixed Access Lines

(a) Definition

The *fault report rate per fixed access lines* is a valid report of disrupted or degraded service that is reported by the customer to the designated point of contact of the service provider and is attributable to the fixed access line. Fault reports should be assumed valid unless there is a specific reason to consider that they are invalid. In cases where a customer reports a fault that is found to be cleared when tested, it should be counted as a valid report unless the service provider has reason to believe that the fault did not occur.

(b) Measurement and Statistics

The parameter shall include all valid fault reports in the data collection period. The statistic shall exclude faults caused by any equipment on the customer side of the network termination point and faults, which are attributable to the service provider's core network or other interconnected networks.

Network faults reported against either basic or primary rate access or single or multi-line analogue access, should be counted as a single fault, regardless of the number of channels activated or affected. The count of the number of access lines should be one for basic or primary rate access regardless of the number of channels activated.

The statistic should be calculated by dividing the number of trouble tickets during the data collection period by the average number of access lines in the network under consideration during the same data collection period, where fault reports are recorded by the service provider by the use of trouble tickets.

This statistic should be calculated by dividing the number of valid fault reports observed during the data collection period by the average number of access lines in the network under consideration during the same data collection period where service providers cannot distinguish between:

- i. valid faults attributable to the fixed access line;
- ii. faults attributable to the core network;
- iii. faults attributable to other networks;
- iv. faults attributable to CPE; or
- v. invalid faults.

(c) Reporting criteria

The licensee shall report the percentage of fault reports per fixed access line.

1.3 Fault Repair Time for Fixed Access Lines

(a) Definition

Fault repair time for fixed access lines is the duration from the instant a fault report has been made to the instant when the service element or service has been restored to normal working order⁶.

(b) Measurement and Statistics

This parameter shall include all valid faults and should be provided only in cases where the term of service agreement offers a "standard repair" time to customers. The parameter may be excluded where the service provider does not offer a "standard repair" time or where the service provider agrees with the customer to provide a faster repair service for payment of higher maintenance fees and in cases where lower fees are charged in return for a lower level of repair service.

(c) Reporting criteria

The licensee shall report the mean time taken from the instant a fault report has been made to the instant when the service element or service has been restored to normal working order.

1.4 Unsuccessful Call Ratio

(a) Definition

Unsuccessful call ratio is defined as the ratio of unsuccessful calls to the total number of call attempts for a specified time. An unsuccessful call is a call attempt to a valid number, properly dialed following dial tone, where neither called party busy tone, nor ringing tone, nor answer signal, is recognized at the access of the calling user within 30 seconds from the instant when the last digit of the destination subscriber number is received by the network⁷.

(b) Measurement and statistics

The parameter should be calculated using:

- i. measurements on all real traffic; or
- ii. measurements on real traffic for outgoing calls in a representative population of local exchanges to a representative set of destinations; or
- iii. test calls in a representative population of local exchanges

⁶ Recommendation from Section 5.4 of ETSI EG 202 057-1: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 1: General, Page 20.

⁷ Recommendation from Section 5.1 of ETSI EG 202 057-2: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 2: Voice telephony, Group 3 fax, modem data services and SMS, Page 14.

- iv. a combination of the above.

Measurements may be based on the analysis of tones or on signaling information or on a combination of them. The number of observations shall be chosen such that the samples are based on normal distribution, but is not required to exceed a test call rate of 1 in 1000.

For indirectly connected customers, either measurement should be based on call data from the processor of the originating local exchange for real calls or measurements should be made from the subscriber line side of the local exchange in the access network.

(c) Reporting criteria

The licensee shall report:

- i. the percentage of unsuccessful calls for national calls, together with the number of observations used and the absolute accuracy limits for 95% confidence calculated from this number. A national call is a call that originates and terminates on a national number according to the national/international numbering plan.
- ii. the percentage of unsuccessful calls for international calls, together with the number of observations used and the absolute accuracy limits for 95% confidence calculated from this number. An international call is a call that originates from a national number and terminates on an international number according to the national/international numbering plan.

1.5 Call Setup Time

(a) Definition

Call set up time is the period starting when the address information required for setting up a call is received by the network and finishing when the called party busy tone or ringing tone or answer signal is received by the calling party. Where overlap signaling is used, the measurement starts when sufficient address information has been received to allow the network to begin routing the call⁸.

(b) Measurement and statistics

The statistic shall include calls to ported numbers and shall exclude unsuccessful calls. The statistics should be calculated from the following:

- i. measurements on real traffic for outgoing calls; or
- ii. measurements on real traffic for outgoing calls in a representative population of local exchanges to a representative set of destinations; or

⁸ Recommendation from Section 5.2 of ETSI EG 202 057-2: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 2: Voice telephony, Group 3 fax, modem data services and SMS, Page 16.

- iii. test calls in a representative population of local exchanges or Network Termination Points (NTPs) to a representative set of destinations; or
- iv. a combination of the above.

For cellular mobile services, the addition of a correction factor to the measurement of real traffic (based on the core network signaling information) is needed to take into account the set-up time through the radio access network. For directly connected customers service providers should exclude from the statistics calls that they hand over to an indirect service provider who then completes the call and charges the customer. For indirectly connected customers, measurement may be either:

- i. based on call data from the processor of the originating local exchange for real calls; or
- ii. made from the subscriber line side of the local exchange in the access network; or
- iii. made from the Network Termination Point (NTP).

(c) Reporting criteria

The licensee shall state if en bloc, overlap dialing or a mixture was used and if connections between fixed NTPs, cellular mobile NTPs or a combination of fixed/cellular mobile NTPs were measured, and shall report:

- i. the mean value in seconds for national calls;
- ii. the mean value in seconds for international calls; and
- iii. the number of observations performed for national and international calls.

1.6 Speech Connection Quality

(a) Definition

Speech connection quality is a subjective quality measure of end-to-end (mouth-to-ear) speech quality for the conversational speech of a voice service call. It is expressed in terms of quality categories: best, high, medium, low and poor quality⁹.

(b) Measurement and statistics

The statistic shall be computed from a sample size of at least 100 valid responses. The customers shall be asked:

What was the quality of the connection according to the quality scale in Table 5?

Table 5: Quality scale

Quality	Score
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⁹ Recommendation from Section 5.3 of ETSI EG 202 057-2: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 2: Voice telephony, Group 3 fax, modem data services and SMS, Page 18.

best	5
high	4
medium	3
low	2
poor	1

(c) Reporting criteria

The licensee shall report the Mean Opinion Score (MOS) for answers to the question, what was the quality of the connection according to the following scale? The MOS shall be calculated using the following algebraic formula:

$$\textit{The speech connection quality} = \textit{Mean Opinion Score (MOS)}$$

APPENDIX TO SCHEDULE ONE

Form QoS-Schedule 1: Reportable Quality of Service NPMs for Fixed and Fixed-Wireless Electronic Communications Services (FFWECS)

Licensee Name:

Name of Service:

Reporting Area:

Reporting Period:

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED STANDARD	FORMULAE	STANDARD ACHIEVED BY LICENSEE
<p>Supply Time for Fixed Network Access</p> <p><i>Ref: Section 1.1 of Schedule One</i></p>	<p>i) The time in which the fastest 99% of orders is completed</p>	<p>NP, GB: no more than 5 days AB, BI, EL, EX, AN: no more than 6 days Other Islands: no more than 7 days</p>	<p>List the customer complaint resolution times in ascending order</p> <p>Let the nth time = fastest 99% of calls nth = 0.99[number of observations]</p>	
	<p>ii) The percentage of orders completed by the date agreed with the customer</p>	<p>Not less than 99%</p>	$ST = \frac{S}{N} \times 100$ <p>Where, ST = Supply Time for Fix Network Access</p> <p>S = Number of customer complaints resolve in agreed time</p> <p>N = Total number of agreements</p>	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED STANDARD	FORMULAE	STANDARD ACHIEVED BY LICENSEE
<p>Fault Report Rate Per Fixed Access Lines</p> <p><i>Ref: Section 1.2 of Schedule One</i></p>	<p>The percentage of fault reports per fixed access line</p>	<p>Least than 0.1 %</p>	$FRR = \frac{FR}{N} \times 100$ <p>Where, FRR= Fault Report Rate</p> <p>FR= Number of faults reported on fixed line</p> <p>N = Total number of fixed-lines</p>	
<p>Fault Repair Time for Fixed Access Lines</p> <p><i>Ref: Section 1.3 of Schedule One</i></p>	<p>The mean time taken from the instant a fault report has been made to the instant when the service element or service has been restored to normal working order.</p>	<p>NP, GB: 72 hours AB, BIM, EL, EX, AN: 96 hours Other Islands: 120 hours</p>	$FRT = \frac{RT}{N} \times 100$ <p>Where, FRT = Fault Report Time</p> <p>RT= Sum of all repair times (rounded to the nearest hour) for fixed line faults</p> <p>N = Total number of fixed-line faults report</p>	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED STANDARD	FORMULAE	STANDARD ACHIEVED BY LICENSEE
<p>Unsuccessful Call Ratio</p> <p><i>Section 1.4 of Schedule One</i></p>	<p>i. The percentage of unsuccessful calls for national calls, together with the number of observations used and the absolute accuracy limits for 95 % confidence calculated from this number.</p>	<p>Least than 0.5%</p>	$UCRN = \frac{C_{un}}{N}$ <p>Where, UNCR= Unsuccessful International Call Ratio</p> <p>C_{un} = Number of unsuccessful national calls on fixed line</p> <p>N = Total number of national fixed-lines calls</p>	
	<p>ii. The percentage of unsuccessful calls for international calls, together with the number of observations used and the absolute accuracy limits for 95 % confidence calculated from this number.</p>	<p>≤ 1%</p>	$UICR = \frac{C_{ui}}{N}$ <p>Where, UCRI= Unsuccessful International Call Ratio</p> <p>C_{ui} = Number of unsuccessful international calls on fixed line</p> <p>N = Total number of outgoing international fixed-lines calls</p>	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED STANDARD	FORMULAE	STANDARD ACHIEVED BY LICENSEE
<p>Call Setup Time</p> <p><i>Ref: Section 1.5 of Schedule One</i></p>	<p>i) the mean value for national calls;</p>	<p>≤ 3 seconds</p>	$CST = \frac{CTN}{N}$ <p>Where,</p> <p>CST = Call Setup time</p> <p>CTN = the sum of call setup time (in seconds) for a national call</p> <p>N = Total number of national calls</p>	
	<p>ii) the mean value for international calls</p>	<p>Less than 5 seconds</p>	$CSTI = \frac{CTI}{N}$ <p>Where,</p> <p>CSTI = Call Setup time</p> <p>CTI = the sum of call setup time (in seconds) for an international call</p> <p>N = Total number of outgoing international calls</p>	
	<p>iii) The number of observations performed for national and international calls.</p>	<p>All calls</p>	<p>The observations should be normally distributed with $P(z < -1.96 \text{ or } z > 1.96)$</p>	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED STANDARD	FORMULAE	STANDARD ACHIEVED BY LICENSEE
Speech Connection Quality <i>Ref: Section 1.6 of Schedule One</i>	What was the quality of the connection according to the following scale?	Greater than or equal to 4	Mean Opinion Score	

Consultation Question #7: Do you agree with the Minimum Quality of Service Standards proposed by URCA on **Form QoS-Schedule 1** of this Network Quality of Service Regulations? If not, propose an alternative minimum standard for the network performance metric with which you disagree and provide justification for proposal.

SCHEDULE TWO

Reportable Quality of Service NPMs for Cellular Mobile Electronic Communications Services (CMECS)

III. Summary of Contents

- 2.0 Preamble
- 2.1 Broadband Data Speed
- 2.2 Network Availability (data)
- 2.3 Network Availability (voice)
- 2.4 Call Completion Rate
- 2.5 Dropped Call Rate

2.0 Preamble

The Quality of Service key performance indicators in this Schedule shall be reported by the holders of Individual Operating Licences whose services are provided by means of a public cellular mobile network. Licensees shall report NPMs on *Form QoS-Schedule 2: Quality of Service NPMs for Cellular Mobile ECS Networks* (Refer to the Appendix to Schedule Two).

2.1 Network Availability (data)

(a) Definition

The *network availability (data)* is defined as the percentage of time that the data network achieves full connectivity and functionality, where full connectivity means that all network elements are physically connected and full functionality means that those network elements are working properly.

(b) Measurement and statistics

The statistic should be obtained by monitoring the links at the Open System Interconnection (OSI) layers. Simple Network Management Protocol (SNMP) messages should be generated by the Network Management System (NMS) and sent in 5-minute intervals to the network elements attached to the links. Specific SNMP Management Information Base variables should be used to indicate the state of the link at the different OSI layers and send a SNMP reply message to the NMS. Where the network equipment is not able to respond to SNMP queries, an equipment proprietary interface may be used.

(c) Reporting criteria

The licensee shall report the percentage of time the network achieves full connectivity and functionality during the reporting period.

2.2 Broadband Data Speed

(a) Definition

The *broadband data speed* is defined as the data transmission speed that is achieved separately for downloading and uploading specified test files from a remote website using a

cellular mobile device¹⁰.

(b) Measurement and statistics

The data transmission speed shall be calculated by downloading/uploading a test file and dividing the size of the test file by the transmission time required for a complete and error-free transmission. The test file should consist of incompressible data containing random numbers, a compressed file or the digits of the number Pi and must be at least twice the size (in Kbits) of the theoretically maximum data transmission rate per second (in Kbits/s) of the broadband access under consideration. The transmission time is the time starting when the access network has received the necessary information to start the transmission and ending when the last bit of the test file has been received. The measurement should be taken when the network is lightly loaded.

(c) Reporting criteria

The licensee shall report the data transmission speed that is achieved, on a lightly load network, separately for downloading and uploading specified test files from a remote website using a cellular mobile device.

2.3 Network Availability (voice)

(a) Definition

The *network availability (voice)* is defined as the percentage of time that the voice network achieves full connectivity and functionality, where full connectivity means that all network elements are physically connected and full functionality means that those network elements are working properly.

(b) Measurement and statistics

The statistic shall be calculated:

- i. using the measurements based on network element counters, which must be made using an automatic data collection system, based on network element counters, which register the real traffic of the network; and
- ii. from test calls in a representative population of NTPs.

Measurements should accurately reflect traffic variations over the hours of a day, the days of the week and the months of the year.

(c) Reporting criteria

The licensee shall report the percentage of time the network achieves full connectivity and functionality during the reporting period.

2.4 Call Completion Rate

¹⁰ Recommendation from Section 5.2 of ETSI EG 202 057-4: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 4: Internet access, Page 17

(a) Definition

Call Completion Rate is defined as the ratio of successful calls to the total number of call attempts for a specified time. A successful call is a call attempt to a valid number, while in a coverage area, where the call is answered or called party busy tone or ringing tone, is recognized at the access of the calling user within 40 seconds from the instant when the last digit of the destination subscriber number is received by the network¹¹.

(b) Measurement and statistics

The statistic shall be calculated:

- i. using the measurements based on network element counters, which must be made using an automatic data collection system, based on network element counters, which register the real traffic of the network; or
- ii. from test calls in a representative population of NTPs; or
- iii. using a combination of the above.

Measurements should accurately reflect traffic variations over the hours of a day, the days of the week and the months of the year.

(c) Reporting criteria

The licensee shall report the percentage of calls completed, calculated from all the call attempts in the period including:

- i. Average monthly rate across all cell sites;
- ii. Average completion rate for busiest cell site on each island; and
- iii. Average monthly completion rate for each cell site.

2.5 Dropped Call Rate

(a) Definition

The *dropped call rate* is the proportion of incoming and outgoing calls, which, once they have been correctly established, and, therefore, have an assigned traffic channel, are dropped or interrupted prior to their normal completion by the user, the cause of the early termination being within the operator's network¹².

(b) Measurement and statistics

The statistic shall be calculated using the measurements from an automatic data collection system or based on network element counters that register the real traffic of the network.

¹¹ Recommendation from Section 6.4.1 of ETSI EG 202 057-3: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 2: QoS parameters specific to Public Land Mobile Networks (PLMN), Page 12.

¹² Recommendation from Section 6.4.2 of ETSI EG 202 057-3: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 2: QoS parameters specific to Public Land Mobile Networks (PLMN), Page 13.

Measurements should be calculated from all of the calls in the period, when using the measurements based on network element counters, the measurement must be made via an automatic data collection system, based on the network counters that register the real traffic of the network and accurately reflect traffic variations over the hours of a day, the days of the week and the months of the year.

(c) Reporting criteria

The licensee should report the percentage of dropped calls, including:

- i. Average monthly dropped call rate;
- ii. Average monthly busy hour dropped call rate; and
- iii. Average monthly dropped call rate for the hour with the worst performance.

APPENDIX TO SCHEDULE TWO

Form QoS-Schedule 2: Reportable Quality of Service NPMs for Cellular Mobile Electronic Communications Services (CMECS)

Licensee Name:

Name of Service:

Reporting Area:

Reporting Period:

KEY PERFORMANCE INDICATOR	REPORTING CRITERIA	MINIMUM REQUIRED STANDARD	FORMULAE	STANDARD ACHIEVED BY LICENSEE
<p>Network Availability (data)</p> <p><i>Ref: Section 2.1 of Schedule Two</i></p>	<p>The percentage of time the network achieves full connectivity and functionality during the reporting period calculated from the data in the period.</p>	<p>99%</p>	$A = 100 - \frac{T_{uc} - T_{nf}}{T_s} \times 100$ <p>Where, A = Availability</p> <p>T_{uc} = Total minutes network elements are not fully connected.</p> <p>T_{nf} = Total minutes network elements are not fully functional</p> <p>T_s = Total service time in minutes</p>	
<p>Broadband data Speed</p> <p><i>Ref: Section 2.2 of Schedule Two</i></p>	<p>The data transmission speed that is achieved, on a lightly load network, separately for downloading and uploading specified test files from a remote website using a cellular mobile device</p>	<p>Downlink: 2 Mbps</p>		
<p>Network Availability (voice)</p>	<p>Availability of the voice cellular mobile network is the</p>	<p>99.9%</p>	$A = 100 - \frac{T_{uc} - T_{nf}}{T_s} \times 100$ <p>Where,</p>	

KEY PERFORMANCE INDICATOR	REPORTING CRITERIA	MINIMUM REQUIRED STANDARD	FORMULAE	STANDARD ACHIEVED BY LICENSEE
<p><i>Ref: Section 2.3 of Schedule Two</i></p>	<p>percentage of time when the cellular mobile voice network is operational.</p>		<p>A = Availability</p> <p>Tuc = Total minutes network elements are not fully connected.</p> <p>Tnf = Total minutes network elements are not fully functional</p> <p>Ts = Total service time in minutes</p>	
	<p>the number of observations used</p>	<p>99% of all relevant data</p>	<p>The observations should be normally distributed with $P(z < -1.96 \text{ or } z > 1.96)$</p>	
<p>Call Completion Rate</p> <p><i>Ref: Section 2.4 of Schedule Two</i></p>	<p>The licensee shall report the percentage of calls completed, calculated from all the call attempts in the period.</p>	<p>> Average monthly rate across all cell sites: greater than 99%</p> <p>> Average completion rate for busiest cell site on each island: greater than 95%</p> <p>> Average monthly completion rate for each cell site: greater than 75%</p>	$CCR = \frac{C_{com}}{N} \times 100$ <p>Where,</p> <p>CCR = Call Completion Rate</p> <p>C_{com} = Number of calls completed</p> <p>N = Total number calls attempted</p>	

KEY PERFORMANCE INDICATOR	REPORTING CRITERIA	MINIMUM REQUIRED STANDARD	FORMULAE	STANDARD ACHIEVED BY LICENSEE
Dropped Call Ratio <i>Ref: Section 2.5 of Schedule Two</i>	The percentage of dropped calls including: i. Average monthly dropped call rate; ii. Average monthly busy hour dropped call rate; and iii. Average monthly dropped call rate for the hour with the worst performance.	> Average monthly dropped call rate: less than 1% > Average monthly busy hour dropped call rate; less than %2 > Average monthly dropped call rate for the hour with the worst performance: less than %3	$DCR = \frac{CD}{N} \times 100$ <p>Where, DCR = Dropped Call Ratio</p> <p>C_D = Total Number of dropped calls</p> <p>N = Total number of cellular mobile calls</p>	
	ii) The number of observations performed.	99 % of all relevant data	The observations should be normally distributed with $P(z < -1.96 \text{ or } z > 1.96)$	

Consultation Question #8: Do you agree with the Minimum Quality of Service Standards proposed by URCA on **Form QoS-Schedule 2** of this Network Quality of Service Regulations? If not, propose an alternative minimum standard for the network performance metric with which you disagree and provide justification for proposal.

SCHEDULE THREE

Reportable Quality of Service NPMs for Internet Protocol-based Electronic Communications Services (IBECS)

III Summary of Contents

- 3.0 Preamble
- 3.1 Availability
- 3.2 Loss
- 3.3 Delay
- 3.4 Bandwidth

3.0 Preamble

The Quality of Service Network Performance Metrics (NPMS) in this Schedule shall be reported by the holders of Individual Operating Licensees whose services include the provision of IP services. Licensees shall report NPMS on *Form QoS-Schedule 3: Quality of Service NPMS for Internet Protocol Networks* (Refer to the Appendices to Schedule Three).

3.1 Availability

(a) Definition

The *availability* is defined as the percentage of time that the IP network achieves full connectivity and functionality, where full connectivity means that all network elements are physical connected and full functionality means that those network elements are working properly.

(b) Measurement and statistics

The statistic should be obtained by monitoring the links at the Open System Interconnection (OSI) layers. Simple Network Management Protocol (SNMP) messages should be generated by the Network Management System (NMS) and sent in 5-minute intervals to the network elements attached to the links. Specific SNMP Management Information Base variables should be used to indicate the state of the link at the different OSI layers and send a SNMP reply message to the NMS. Where the network equipment is not able to respond to SNMP queries, an equipment proprietary interface may be used.

(c) Reporting criteria

The licensee shall report the percentage of time the network achieves full connectivity and functionality during the reporting period.

3.2 Loss

(a) Definition

The *loss* is defined as the percentage of IP packet lost in transit from sender to target recipient during a specific time interval¹³.

(b) Measurement and statistics

The statistic should be measured by downloading/uploading a test file. The test file should consist of incompressible data containing random numbers, a compressed file or the digits of the number Pi and must be at least twice the size (in Kbits) of the theoretically maximum data transmission rate per second (in Kbits/s) of the Internet access under consideration.

(c) Reporting criteria

The licensee shall report the percentage of loss data packets.

3.3 Delay

(a) Definition

Delay is the time taken for an IP packet to make the average round trip from the sender to the target recipient and includes the sum of the queuing delay, switching delay, transmission delay and propagation delay.

(b) Measurement and statistics

The statistic should be obtained from at least 1000 test sessions, separated from each other by at least 60 seconds. The sessions should be from traffic-weighted locations inside the Reporting Area to traffic-weighted points of presence of the Licensee inside or outside the Reporting Area during the Busy Time for the Service. The weighting of the traffic should be based on figures specific to the service and should ensure the representation of every location that is responsible for at least 5% of the traffic for the service.

(c) Reporting criteria

The licensee shall report the average delay as a function of RTTs¹⁴.

3.4 Bandwidth

(a) Definition

The *bandwidth* is defined as the data transmission rate that is achieved separately for downloading and uploading specified test files from a remote website and a user's computer or router¹⁵.

¹³ Recommendation from Section 6.4 of Rec. ITU-T Y.1540 (03/2011): Global Information Infrastructure, Internet Protocol Aspects and Next-Generation Network; Internet protocol data communication service – IP packet transfer and availability performance parameters; Page 20

¹⁴ Recommendation from Appendix II, table III.4 of ITU-T Y.1541: Series y; Global Information Infrastructure and internet protocol Aspects – Quality of service and network performance; Network performance objectives for IP services, Page 17

¹⁵ Recommendation from Section 5.2 of ETSI EG 202 057-4: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 4: Internet access, Page 17

(b) Measurement and statistics

The bandwidth shall be calculated by downloading/uploading a test file and dividing the size of the test file by the transmission time required for a complete and error-free transmission. The test file should consist of incompressible data containing the digits of the number Pi and must be at least twice the size (in Kbits) of the theoretically maximum data transmission rate per second (in Kbits/s) of the Internet access under consideration. The transmission time is the time starting when the access network has received the necessary information to start the transmission and ending when the last bit of the test file has been received.

(c) Reporting criteria

The licensee shall report, as separate values, the average bandwidth achieved for downloading and uploading specified test files.

APPENDIX TO SCHEDULE THREE

Form QoS-Schedule 3: Reportable Quality of Service NPMS for Internet Protocol-based Electronic Communications Services (IBECS)

Licensee Name:

Name of Service:

Reporting Area:

Reporting Period:

NPMS	REPORTING CRITERIA	MINIMUM STANDARD	FORMULAE	REPORTED VALUE
<p>Availability</p> <p><i>Ref: Section 3.1 of Schedule Three</i></p>	<p>The percentage of time the network achieves full connectivity and functionality during the reporting period calculated from the data in the period.</p>	<p>99.9%</p>	$A = 100 - \frac{Tuc - Tnf}{Ts} \times 100 (\%)$ <p>Where, A = Availability</p> <p>Tuc = Total minutes network elements are not fully connected.</p> <p>Tnf = Total minutes network elements are not fully functional</p> <p>Ts = Total service time in minutes</p>	
<p>Loss Ratio</p> <p><i>Ref: Section 3.2 of Schedule Three</i></p>	<p>The percentage of loss data packets</p>	<p>Less than 0.2%</p>	$Loss = 100 - \frac{Lp}{Lt} \times 100 (\%)$ <p>Where, Lp = Total number of loss packets</p> <p>Lt = Total number of test packets</p>	
<p>Delay</p> <p><i>Ref: Section 3.3 of Schedule Three</i></p>	<p>The average value of the RTTs , in msec</p>	<p>Less than 233 msec</p>	$D = 100 - \frac{\sum RTT}{\text{Total number of RTT test packets}}$ <p>Where, D = Delay</p>	

NPMS	REPORTING CRITERIA	MINIMUM STANDARD	FORMULAE	REPORTED VALUE
			ΣRTT = sum of round trip times (RTT)	
<p>Bandwidth</p> <p><i>Ref: Section 3.4 of Schedule Three</i></p>	<p>The average bandwidth achieved for downloading and uploading specified test files, in kbps</p>	<p>Not less than 99.99% of bandwidth agreed in Service Level Agreement</p>	<p>Bandwidth = $\frac{\text{mean size of the test file}}{\text{mean time taken to transfer test file}}$</p>	