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TELECOM REGULATORY AUTHORITY OF INDIA

NOTIFICATION

NEW DELHI, THE 20th MARCH, 2009

THE STANDARDS OF QUALITY OF SERVICE OF BASIC TELEPHONE SERVICE (WIRELINE) AND CELLULAR MOBILE TELEPHONE SERVICE REGULATIONS, 2009 (7 OF 2009)

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F. No. 305-25/2008-QoS .----- In exercise of the powers conferred upon it under section 36, read with sub-clauses (i) and (v) of clause (b) of sub-section (1) of section 11 of the Telecom Regulatory Authority of India Act, 1997 (24 of 1997), the Telecom Regulatory Authority of India hereby makes the following regulations, namely: -

SECTION I
PRELIMINARY

1. Short title, commencement and application.--- (1) These regulations may be called the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009.

(2) They shall come into force with effect from the 1st day of July, 2009.

(3) These regulations shall apply to ----

all service providers [including Bharat Sanchar Nigam Limited and Mahanagar Telephone Nigam Limited, being the companies registered under the Companies Act, 1956 (1 of 1956)] providing,--

(i) Basic Telephone Service;

(ii) Unified Access Services;

(iii) Cellular Mobile Telephone Service;

2. Definitions.— (1) In these regulations, unless the context otherwise requires,-

(a) **"Act"** means the Telecom Regulatory Authority of India Act, 1997 (24 of 1997);

(b) "**Authority**" means the Telecom Regulatory Authority of India established under sub-section (1) of section 3 of the Act;

(c) "**Basic Telephone Service**" covers collection, carriage, transmission and delivery of voice or non-voice messages over licensee's Public Switched Telephone Network in licensed service area and includes provision of all types of services except those requiring a separate licence;

(d) **"Cell"** means the radio frequency coverage area of a site in radio access network which is part of a cellular mobile telephone network and ---

(i) in case it is an omni-site, it is synonymous with the site; and

(ii) at a sectored site, it is synonymous with the sector;

(e) "**Cell Bouncing Busy Hour"** means the one hour period in a day during which a cell in a cellular mobile telephone network experiences the maximum traffic;

(f) "**Cellular Mobile Telephone Service**" -

(i) means telecommunication service provided by means of a telecommunication system for the conveyance of messages through the agency of wireless telegraphy where every message that is conveyed thereby has been, or is to be, conveyed by means of a telecommunication system which is designed or adapted to be capable of being used while in motion;

(ii) refers to transmission of voice or non-voice messages over Licensee's Network in real time only but service does not cover broadcasting of any messages, voice or non-voice, however, Cell Broadcast is permitted only to the subscribers of the service;

(iii) in respect of which the subscriber (all types, pre-paid as well as post-paid) has to be registered and authenticated at the network point of registration and approved numbering plan shall be applicable;

(iv) includes both Global System for Mobile Communications (GSM) and Code Division Multiple Access (CDMA) Technology;

(g) "**Call Centre**" means a department or a section or a facility established by the service provider under regulation 3 of the Telecom Consumers Protection and Redressal Grievances Regulations, 2007 (3 of 2007);

(h) **"consumer**" means a consumer of a service provider falling in sub-regulation (3) of regulation 1 and includes its customer and subscriber ;

(i) "**licence**" means a licence granted or having effect as if granted under section 4 of the Indian Telegraph Act, 1885 (13 of 1885) or the provisions of

the Indian Wireless Telegraphy Act, 1933 (17 of 1933);

(j) "**licensee**" means any person licensed under sub-section (1) of section 4 of the Indian Telegraph Act, 1885 (13 of 1885) for providing specified public telecommunication services;

(k) "**message"** shall have the same meaning assigned to it in clause (3) of section 3 of the Indian Telegraph Act, 1885 (13 of 1885);

(l) **"MTTR"** means Mean Time to Repair;

(m) **"OMC"** means Operation and Maintenance Centre;

(n) **"Paging Channel"** means a signaling control channel in a CDMA network to send control, call setup and paging messages used for communication between mobile station (MS), i.e., mobile handset and Base Transceiver Station (BTS) before such mobile station is assigned a Traffic Channel (TCH);

(o) "**Point of Interconnection (POI)"** means a mutually agreed upon point of demarcation where the exchange of traffic between the networks of two service providers takes place;

(p) "**Public Switched Telephone Network**" means a fixed specified switched public telephone network providing a two-way switched telecommunication services to the general public;

(q) "**Public Land Mobile Network"** means a network set up and operated by any of the licensed operators including Mahanagar Telephone Nigam Limited and Bharat Sanchar Nigam Limited, for the purpose of providing land based mobile communication services to the public and which provides communication facilities to subscribers using mobile stations (MS), i.e., mobile handsets;

(r) "**Quality of Service"** is the main indicator of the performance of a telecommunication network and of the degree to which such network conforms to the standards of such quality of service as specified in these regulations for specified parameters;

(s) "**regulations**" means the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009;

(t) "**Stand-alone Dedicated Control Channel"** or **"SDCCH"** means, a GSM control channel for signaling purposes where the majority of call setup occurs, which is used for communication between mobile station (MS), i.e, mobile handset and Base Transceiver Station (BTS) before such mobile station is assigned a Traffic Channel (TCH);

(u) "**service provider"** means any service provider to which these

regulations apply.

(v) **"Traffic Channel"** or **"TCH"** means, a logical channel in a GSM or CDMA network which carries either encoded speech or user data;

(w) "**telecommunication services"** means service of any description (including electronic mail, voice mail, data services, audio-tex services, video-tex services, radio paging and cellular mobile telephone services) which is made available to users by means of any transmission or reception of signs, signals, writing images, and sounds or intelligence of any nature, by wire, radio, visual or other electro- magnetic means but shall not include broadcasting services;

(x) "**Time Consistent Busy Hour" or "TCBH"** means the one hour period starting at the same time each day for which the average traffic of the resource group concerned is greatest over the days under consideration and such Time Consistent Busy Hour shall be established on the basis of analysis of traffic data for a period of ninety days;

(y) "**Unified Access Services**" -

(i) means telecommunication service provided by means of a telecommunication system for the conveyance of messages through the agency of wired or wireless telegraphy ;

(ii) refers to transmission of voice or non-voice messages over Licensee's Network in real time only but service does not cover broadcasting of any messages, voice or non-voice, except, Cell Broadcast which is permitted only to the subscribers of the service;

(iii) in respect of which the subscriber (all types, pre-paid as well as post-paid) has to be registered and authenticated at the network point of registration and approved numbering plan shall be applicable;

(2) Words and expressions used but not defined in these regulations and defined in the Act and the rules and other regulations made thereunder shall have the meanings respectively assigned to them in the Act or the rules or the regulations, as the case may be.

SECTION II

QUALITY OF SERVICE (QoS) PARAMETERS FOR BASIC TELEPHONE SERVICE (WIRE LINE)

3. Quality of Service Parameters in respect of which compliance reports are to be submitted to the Authority.- (1) Every basic telephone service provider shall meet the following Quality of Service benchmarks for the basic telephone service (wireline) in respect of each specified parameter, namely:-

Serial Number	Name of Parameter	Benchmark	Averaged over a period
(i)	Fault incidences (No. of faults/100 subscribers /month)	≤ 5	One Quarter
(ii)	Fault repair by next working day	**For urban areas:** By next working day: ≥ 90% and within 3 days: 100%. **For rural and hilly areas:** By next working day: ≥ 90% and within 5 days: 100%. **Rent Rebate** Faults pending for >3 days and ≤7 days: Rent rebate for 7 days. Faults pending for >7 days and ≤15 days: Rent rebate for 15 days. Faults pending for >15 days: rent rebate for one month.	One Quarter
(iii)	Mean Time To Repair (MTTR)	≤ 8 Hrs	One Quarter
(iv)	(a) Call Completion Rate within a local network shall be better than	≥ 55%	One Quarter
	or,		
	(b) Answer to Seizure Ratio (ASR)	≥ 75 %	One Quarter
(v)	Point of Interconnection (POI) Congestion (on individual POI)	≤ 0.5%	One month
(vi)	Metering and billing credibility – post paid	Not more than 0.1% of bills issued should be disputed over a billing cycle	One Billing Cycle
(vii)	Metering and billing credibility –- pre-paid	Not more than 1 complaint per 1000 customers, i.e., 0.1% complaints for metering,	One Quarter

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		charging, credit, and validity	
(viii)	Resolution of billing/ charging complaints	100% within 4 weeks	One Quarter
(ix)	Period of applying credit/ waiver/ adjust-ment to customer's account from the date of resolution of complaints	within 1 week of resolution of complaint	One Quarter
(x)	Response Time to the customer for assistance		
	(a) Accessibility of call centre/ customer care	≥ 95%	One Quarter
	(b)Percentage of calls answered by the operators (voice to voice) within 60 seconds	≥ 90%	One Quarter
(xi)	Termination/ closure of service	≤ 7 days	One Quarter
(xii)	Time taken for refund of deposits after closures	100% within 60 days.	One Quarter

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(2) The compliance of the parameters specified in sub-regulation (1) shall be reported to the Authority by the service provider.

(3) The Authority may, from time to time, through audit and objective assessment of quality of service conducted either by its own officers or employees or through an agency appointed by it, verify and assess the performance by the basic telephone service provider of the Quality of Service benchmarks of each parameter for the basic telephone service (wireline) specified in sub-regulation (1).

4. Quality of Service parameters in respect of which compliance is to be monitored by the service provider.-(1) Every basic telephone service provider shall meet and monitor the following Quality of Service benchmarks for the basic telephone service (wireline) in respect of each specified parameter, namely:-

Serial Number	**Name of Parameter**	**Benchmark**	**Averaged over a period**
(i)	Provision of a telephone after registration of	100% in ≤ 7 days (subject to technical feasibility)	One quarter

	registration of demand		
(ii)	Shift of Telephone Connection	≤ 3 days (95% of requests to be attended within 3 days)	One quarter
(iii)	Grade of Service	(a) Junctions between local exchanges – 0.002 (b) Outgoing junctions from Trunk Automatic Exchange (TAX) to local exchange – 0.005 (c) Incoming junctions from local exchange to TAX – 0.005 (d) Incoming or out going junctions between TAX's 0.005 (e) Switching network should be non-blocking or should have extremely low blocking probability.	One quarter

(2) The compliance of the Quality of Service benchmarks of each parameter for the basic telephone service (wireline) specified in sub-regulation (1) which are required to be monitored by the concerned service provider, need not be reported to the Authority.

(3) The basic telephone service provider shall maintain records of its compliance of the Quality of Service benchmarks of each parameter for the basic telephone service (wireline) specified in sub-regulation (1).

(4) The Authority may, if it considers it expedient so to do, and to ensure compliance of the provisions of sub-regulation (1), at any time, ---

(a) direct any of its officers or employees or an agency appointed by the Authority to inspect the records maintained under sub-regulation (3); or,

(b) get the records maintained under sub-regulation (3) audited.

SECTION III

QUALITY OF SERVICE (QoS) PARAMETERS FOR CELLULAR MOBILE TELEPHONE SERVICE

5. Quality of Service parameters in respect of which compliance reports are to be submitted to the Authority.-(1) Every cellular mobile telephone service provider shall meet the following Quality of Service benchmarks for cellular mobile telephone service in respect of each specified parameter, namely:-

Serial Number	Name of Parameter	Benchmark	Averaged over a period
A	**Network Service Quality Parameters:**		
(i)	Network Availability		
	(a) BTSs Accumulated downtime (not available for service)	≤ 2%	One Month
	(b) Worst affected BTSs due to downtime	≤ 2%	One Month
(ii)	Connection Establishment (Accessibility)		
	(a) Call Set-up Success Rate (within licensee's own network)	≥ 95%	One Month
	(b) SDCCH/ Paging Channel Congestion	≤ 1%	One Month
	(c) TCH Congestion	≤ 2%	One Month
(iii)	Connection Maintenance (Retainability)		
	(a) Call Drop Rate	≤ 2%	One Month
	(b) Worst affected cells having more than 3% TCH drop (call drop) rate	≤ 5% upto 31.03.2011 ≤ 3% From 01.04.2011	One Month
	(c) connections with good voice quality	≥ 95%	One Month
(iv)	Point of Interconnection (POI) Congestion (on individual POI)	≤ 0.5%	One Month
B	**Customer Service Quality Parameters:**		
(v)	Metering and billing credibility **–** post paid	Not more than 0.1% of bills issued should be disputed over a billing cycle	One Billing Cycle
(vi)	Metering and billing credibility –- pre-paid	Not more than 1 complaint per 1000 customers i.e. 0.1% complaints for metering, charging, credit, and validity	One Quarter

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(vii)	(a) Resolution of billing/ charging complaints	100% within 4 weeks	One Quarter
	(b) Period of applying credit/ waiver/ adjustment to customer's account from the date of resolution of complaints	within 1 week of resolution of complaint	One Quarter
(viii)	Response Time to the customer for assistance		
	(a) Accessibility of call centre/ customer care	≥ 95%	One Quarter
	(b)Percentage of calls answered by the operators (voice to voice) within 60 seconds	≥ 90%	One Quarter
(ix)	Termination/ closure of service	≤ 7 days	One Quarter
(x)	Time taken for refund of deposits after closures	100% within 60 days	One Quarter

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(2) The compliance of the parameters specified in sub-regulation (1) shall be reported to the Authority by the service provider.

(3) The Authority may, from time to time, through audit and objective assessment of quality of service conducted either by its own officers or employees or through an agency appointed by it, verify and assess the performance by the cellular mobile telephone service provider of the Quality of Service benchmarks of each parameter for the cellular mobile telephone service specified in sub-regulation (1).

6. Quality of Service parameter in respect of which compliance is to be monitored by the service provider.(1) Every cellular mobile telephone service provider shall meet and monitor the following Quality of Service benchmarks for cellular mobile telephone service in respect of the specified parameter, namely:-

Serial Number	**Name of Parameter**	**Benchmark**
1	Service Coverage	For In-door coverage the signal strength at street level shall be ≥ -75 dBm and In-vehicle shall be ≥ -85 dBm.

(2) The compliance of the Quality of Service benchmarks of the parameter for the cellular mobile telephone service specified in sub-regulation (1) need not be reported to the Authority.

(3) The service provider shall,....

(a) measure the service coverage through drive tests of the cellular mobile telephone network at periodic intervals and take remedial action to address problems related to coverage including interference, call drop and voice quality revealed during such drive tests;

(b) maintain the records of such drive tests and the action taken on the problems related to coverage including interference, call drop and voice quality revealed during such drive tests; and

(c) provide to the Authority or its authorized agency or representative, on demand, for verification, the records maintained as per clause (b) above.

(4) The Authority may, through drive tests of the cellular mobile telephone network conducted either by its own officers or employees or through an agency appointed by it or through joint drive tests with the service provider, assess the quality of the service coverage, and the service provider shall facilitate such drive tests.

(5) The service provider shall, suo motu, take all remedial action to rectify shortcomings or deficiencies, if any, detected during the joint drive tests referred to in sub-regulation (4) without waiting for any communication from the Authority and submit to the Authority ----

(a) its action plan, within thirty days of such drive tests, for remedying the shortcomings or deficiencies; and

(b) its final compliance report within such time limit as indicated in the action plan or such reduced time limit as may be indicated by the Authority in response to the action plan of the service provider referred to in clause (a), as the case may be.

(6) In respect of a drive test conducted by the Authority under sub-regulation (4) either by its own officers or employees or through an agency appointed by it, the service provider shall submit to the Authority -----

(a) its action plan for removal of the shortcomings or deficiencies, within thirty days of receipt by it of the communication from the Authority about such shortcomings or deficiencies based on such drive test; and

(b) its final compliance report within such time limit as indicated in the action plan or such reduced time limit as may be indicated by the Authority in response to the action plan of the service provider referred to in clause (a), as the case may be.

(7) The Authority may, if it considers it expedient so to do, and to ensure compliance of the provisions of sub-regulation (1), at any time, ---

(a) direct any of its officers or employees or an agency appointed by the Authority to inspect the records maintained under sub-regulation (3); or,

(b) get the records maintained under sub-regulation (3) audited.

SECTION IV

CUSTOMER PERCEPTION OF SERVICE FOR BASIC TELEPHONE SERVICE (WIRELINE) AND CELLULAR MOBILE TELEPHONE SERVICE

7. Quality of Service parameters to be reflected in customer perception of service..... The performance of the service providers in respect of the following Quality of Service benchmarks for the basic telephone service (wireline) or cellular mobile telephone service or both, as the case may be, in respect of each specified parameter, shall be subject to periodic assessment by the authority through customer satisfaction surveys, which may be conducted by the Authority either through its own officers or employees or through any agency appointed by it, namely :-

Serial Number	Name of Parameter	Benchmark
(a)	customers satisfied with the provision of service	≥ 90 %
(b)	customers satisfied with the billing performance	≥ 95 %
(c)	customers satisfied with network performance, reliability and availability	≥ 95 %
(d)	customers satisfied with maintainability	≥ 95 %
(e)	customers satisfied with supplementary and value added services	≥ 90 %
(f)	customers satisfied with help services including customer grievance redressal	≥ 90 %
(g)	customers satisfied with overall service quality	≥ 90 %

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SECTION V

RECORD KEEPING, REPORTING AND PUBLICATION OF QUALITY OF SERVICE PERFORMANCE

8. Record Keeping.....(1) Every service provider shall maintain documented process of collection of data for each Quality of Service parameter specified by the Authority in regulation 3, regulation 4, regulation 5 and regulation 6 and submit to the Authority, within sixty days of notification of these regulations, the documented process of collection of data of each Quality of Service parameter, indicating the correlation with the primary data which are derived from system counters or codes in Operation and Maintenance Centre or Network Management System or Mobile Switching Centre or telephone exchange, along with

record keeping procedure.

(2) Every service provider shall maintain complete and accurate records of its compliance of benchmark of each Quality of Service parameter specified in regulations 3, regulation 4, regulation 5 and regulation 6 in such manner and in such formats as may be directed by the Authority, from time to time.

(3) The Authority may, from time to time, either by order or by direction, specify uniform record keeping procedures and formats, including guidelines on measurement methodology for various Quality of Service parameters specified in these regulations, to be followed by the service providers.

(4) The Authority may, if it considers it expedient so to do, and to ensure compliance of the provisions of sub-regulations (2) and (3), at any time, direct any of its officers or employees or an agency appointed by the Authority to inspect the records maintained under sub-regulations (2) and (3) or to get such records audited.

(5) The Authority may, if it considers it expedient so to do, require the concerned service provider to get the records maintained by it under sub-regulations (2) and (3) audited through an agency as may be specified by the Authority and submit the report in respect of such audit to the Authority and the cost of such audit shall be borne by the concerned service provider.

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9. Reporting..... Every service provider shall submit to the Authority its compliance reports of benchmarks in respect of each Quality of Service parameter specified under regulation 3 and regulation 5 in such manner and format, at such periodic intervals and within such time limit as may be specified by the Authority, from time to time, by an order or direction.

10. Publication.....(1) The Authority may publish, in such manner and in such format, as may be decided by the Authority from time to time ------

(a) the compliance reports of benchmarks of each Quality of Service parameter reported to it by the service providers in accordance with regulation 9;

(b) the results of the audit and objective assessment of Quality of Service undertaken by the Authority or its authorised agency as per sub-regulation (3) of regulation 3 , sub-regulation (3) of regulation 5 and sub-regulations (4) and (5) of regulation 8; and

(c) the results of the customer satisfaction surveys undertaken by the Authority as per regulation 7 ------

through its website or through press releases or through advertisements in the newspapers, for the information of the general public.

(2) Every service provider shall publish, for the information of the

consumers, its performance with respect to the benchmark of Quality of Service parameter specified in regulation 3, regulation 4, regulation 5 and regulation 6, in such manner and in such format, as may be directed by the Authority from time to time.

11. Review…… (1) The Quality of Service parameters specified in regulation 3, regulation 4, regulation 5, regulation 6 and regulation 7 may be reviewed by the Authority from time to time.

(2) The Authority, on reference from any affected party for good and sufficient reasons, may review and modify these regulations.

12. Over-riding Effect …… Wherever higher quality parameter has been stipulated as a condition of licence, the Quality of Service as required by the licence shall have precedence over the parameters specified in these regulations.

13. Repeal and Saving…..(1) The Regulation on Quality of Service of Basic and Cellular Mobile Telephone Services, 2005 (11 of 2005) is hereby repealed.

(2) Notwithstanding such repeal, anything done or any action taken under the said Regulation shall be deemed to have been done or taken under the corresponding provisions of these regulations.

14. **Interpretation**…… In case of any doubt regarding interpretation of any of the provisions of these regulations, the clarification of the Authority shall be final and binding.

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(R.K. Arnold)

Secretary

Note – The Explanatory Memorandum explains the objects and reasons including measurement methodology for various Quality of Service parameters of the " Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009)".

Explanatory Memorandum to the "Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009" (7 of 2009) dated the 20th March, 2009

1. **BACKGROUND:**

1.1 Sub-clause (v) of clause (b) of sub-section (1) of section 11 of the Telecom Regulatory Authority of India Act, 1997 (24 of 1997) mandates the Authority to "lay down the standards of quality of service to be provided by the service providers and ensure the quality of service and conduct the periodical survey of such service provided by the service providers so as to protect interest of the consumers of telecommunication services". In the discharge of these functions and in order to,……..

(i) create conditions for customer satisfaction by making known the quality of service which the service provider is required to provide and the user has a right to expect;

(ii) measure the Quality of Service provided by the Service Providers from time to time and to compare them with the benchmarks so as to assess the level of performance; and

(iii) to generally protect the interests of consumers of telecommunication services,

the Authority, in exercise of its functions under the above provisions in the TRAI Act, had notified the "Regulation on Quality of Services (QoS) of Basic and Cellular Mobile Telephone Services, 2000" vide Notification dated 5th of July, 2000. The benchmarks for these QoS parameters were to be achieved in three stages viz. (i) in the short term before the end of 12 months, (ii) in the medium term before the end of 24 months; and (iii) in the long term of 36 months for cellular and 48 months for basic service operators.

1.2 The Quality of Service (QoS) standards in the above regulation were reviewed in 2005, keeping in view the performance of service providers against the QoS standards, the international standards on QoS and utility of the laid down QoS parameters. Based on the review of QoS standards undertaken by the Authority in 2005, the QoS standards were revised and the revised QoS standards for Basic Service (Wireline) and Basic Service (Wireless) & Cellular Mobile Telephone Service were issued by the Authority on 1st July, 2005. In these regulations the parameters for basic service (wireless) and Cellular Mobile Telephone Service were combined as the Quality of Service aspects associated with wireless medium is common for both the services.

1.3 TRAI has been monitoring the Quality of Service (QoS) of basic service (wireline) and cellular mobile telephone service vis-a-vis the QoS parameters laid down vide TRAI's 'Regulation on Quality of Services of Basic and Cellular Mobile Telephone Services, 2005 (11 of 2005). The experience gained over the last three years in implementing the QoS

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Regulation has revealed the necessity for deletion of some parameters as they are no longer relevant in the present competitive scenario. However, some of the performance parameters may be required to be monitored by the service providers and there are some key performances parameters for which benchmarks are specified and service providers will have to report its compliance. Further, a need has arisen to define each parameter extensively and also to explain the measurement methodology for each parameter so that uniform practice is adopted by all the service providers for measuring, recording and auditing of such performance parameters. In achieving the quality of service, service providers have to continuously plan, upgrade, augment capacity and ensure customer care provisioning. This process involves:

- network design and expansion as per the projected traffic/consumer base
- reliability of various network elements
- continuous monitoring of network and augmentation/optimization
- service repair and service level management of all existing and new customers and ensure that with enrolment of new customers existing customer do not face deterioration in the quality of service

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1.4 In the present scenario the customers do not have adequate information about the Quality of Service being provided by various service providers and therefore, publication of such information for information of consumers has also become necessary. The Authority, therefore, decided to review the existing quality of service parameters. Customer satisfaction is the major determining factor in the emergence of new services, setting standards and designing of networks. Therefore, the customer requirements and expectations have been given paramount considerations while reviewing Quality of service standards. There was also a case to consider the new inputs from the service provider during this review.

1.5 The Authority had undertaken public consultation by releasing a consultation paper on 18th December, 2008 and comments of stakeholders were sought by 2nd February, 2009. Open House Discussion with the stakeholders was held at Delhi on 24th February, 2009.

1.6 The Authority received comments from 23 stakeholders viz Association of Unified Telecom Service Providers of India (AUSPI), Cellular Operators Association of India (COAI), Sistema Shyam Teleservices (Sistema), Bharti Airtel Ltd.(Bharti), Bharat Sanchar Nigam Limited (BSNL), Reliance Communication Limited (RCOM), Tata Teleservices Limited (TTSL), Mahanagar Telephone Nigam Limited (MTNL), Surya Foundation (Surya), Voluntary Organization in Interest of Consumes Education (VOICE), National Centre for Human Settlement & Environment (NCHSE), Bharat Jyoti, Federation of Consumer and

Service Organizations (FCSO), Kerala Consumers Service Society (KCSS), Consumer Forum (CF), Consumer Protection Association (CPA), Upbhokta Sanrankchhan & Kalyan Samiti (US&KS), Sasken Communication Technologies (Sasken), Nielsen Telecom Practice Group (Nielsen), Market Pulse, Mr. Parijat Garg, Mr. Ravi Dhameja and Mr. Joglekar.

1.7 The Authority considered the comments received from stakeholders during the consultation process while finalizing the quality of service parameters and benchmarks for basic telephone service (wireline) and cellular mobile telephone service. The meaning of the various parameters, its measurement methodology, comments of the stakeholders and rationale for the quality of service benchmark are discussed briefly hereinafter. For the sake of clarity, the comments of the stakeholders are given in the *italic font* followed by the analysis and consideration of the Authority.

2. **Regulating Quality of Service:**

2.1 The comments of the stakeholders are summarized in para (a) to (i) and analysed in the paragraphs following thereafter.

(a) The Authority may, keeping in view the competitive market environment and the implementation of mobile number portability, adopt the encouragement policy and limit itself to the monitoring and making appropriate information available for the consumers.

(b) As the competition increases and market evolves, TRAI should progressively reduce the QoS parameters.

(c) Appreciate the efforts being made by TRAI in the direction of improving the quality of Customer service.

(d) The Authority may setup a minimalist set of Qos parameter.

(e) Some aspects such as spectrum shortage, regular availability of power supply, and steady supply / availability of human resources particularly in rural areas may also be considered as these aspects directly affect the QoS compliance costs and achievement of specified parameters.

(f) The extent of regulatory intervention to specify the QoS benchmarks should depend on the competitive scenario of the market. The best regulatory approaches should be examined and the policies which best suit our requirements adopted.

(g) The review was needed and is most timely.

(h) All the Service Providers are racing in marketing their products without considering the safety to the Consumers therefore, TRAI's first and foremost priority should be to ensure harmless and peaceful service to the Consumers.

(i) TRAI should be empowered to take any action against the defaulting service providers by way of imposing fines etc.

2.2 The Authority considered the above suggestions of the stakeholders and is of the view that the time is still not ripe for leaving the Quality of Service to be addressed through competition. From the experience gained during the last three years of implementation of the Quality of Service Regulations, 2005, the Authority feels that regulatory intervention for enforcing Quality of Service is necessary. However, the Authority during review of the Quality of Service parameters has decided to either delete or to remove some of the parameters which have not much relevance in the competitive scenario from mandatory compliance and reporting. At the same time, keeping in view the interest of consumers, the Authority has introduced some new parameters and the benchmarks for some of the parameters have been made more stringent. The Authority has also decided to make provisions for excluding the performance during force majeure conditions such as natural calamities, fire etc. while computing the performance against the quality of service benchmarks. The various quality of service parameters are discussed below:

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3. Quality of Service Parameters for Basic Telephone Service (Wireline)

3.1 Provision of a telephone after registration of demand:

3.1.1 As per the existing Quality of Service Regulation, the telephone has to be provided within 7 days in all areas where telephone is available on demand, subject to technical feasibility. In the consultation paper it was proposed that this parameters may be prescribed for monitoring purposes by the service providers only and need not be reported to TRAI. The comments of the stakeholders are summarized in para (a) to (h) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal.

(b) The period of delay may be excluded from monitoring if fault is at the end of customer. Right of Way should be established for all service providers.

(c) The parameter should be continued as this address the concerns of an ordinary telephone user.

(d) Do not agree, the parameter should continue, as it is essential for the rural consumers, However, a separate benchmark of 30 or 40days may be fixed.

(e) The time limit should be determined for new connection maximum 7 to 10 days.

(f) The existing procedure may continue.

(g) No comments.

(h) *Difficult to achieve the benchmark due to cable breakdown or due to rain or due to subscriber reason and therefore, such cases be exempted from reporting to TRAI.*

3.1.2 The service providers are in favour of removing this parameter from mandatory compliance and reporting to TRAI and also excluding delays on account of conditions not within their control for monitoring this parameter. However, the consumer organizations are in favour of continuing with this parameter with a more relaxed benchmark. The Authority feels that in this era of competition and churn of landline subscribers to mobile connections, it is in the interest of service providers offering wireline connections to provide new connections at the earliest and intervention of the Authority in regulating this parameter may not be appropriate. Hence, the Authority has decided to remove this parameter from mandatory compliance and not to be reported to the Authority. The service providers shall monitor the performance and provide in an appropriate manner the information in this regard to consumers. The benchmark for such monitoring purposes shall continue to be "provisioning of telephone within 7 days (subject to technical feasibility)" of registration for new telephone connection.

IndiaCode

3.2 **Fault incidence (No. of faults/100 subs/month):**

3.2.1 In the consultation paper it was posed for consultation whether the existing benchmark for this parameter should be retained or not. The comments of the stakeholders are summarized in para (a) to (g) and analysed in the paragraph following thereafter.

(a) *This parameter may be identified for the future growth of Subscribers base and quality control.*

(b) *The existing parameter should continue.*

(c) *There is a need to modify the benchmark from <3 to <5.*

(d) *Fault due to customer's internal wiring may also be excluded.*

(e) *Parameter should be reported city wise.*

(f) *No comments.*

(g) *In some cases it is difficult to achieve the value of <3 and such cases be exempted from reporting to TRAI.*

3.2.2 Most of the service providers have not commented on this parameter. Some of the service providers, who are providing basic service, have suggested that the benchmark may be modified from <3 to <5. From the monitoring of performance of service providers against this benchmark it is seen that more than 40% of service providers are not meeting the benchmark and in the case of these operators their performance is around 5. In rainy seasons the number of fault incidences tends to be high due to cable faults, moisture etc. In urban areas and metro cities lot of construction activities are going on and due to this

frequent cable cuts occur and large number of telephone lines get affected. Considering the above, the Authority has decided to modify the benchmark for this parameter to ≤ 5.

3.2.3 **Measurement**

Fault incidences – No. of faults/100 subscriber/month =

$$\frac{\text{Total number of faults in the Quarter (3 months)}}{\text{Total No. of DELs at the end of the Quarter}} \times \frac{100}{3}$$

3.3 **Fault Repair by next working day:**

3.3.1 In the consultation paper it was proposed to continue the parameter with the existing benchmark and also to clarify the calculation of rent rebate. The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

(a) *Agreed with the proposal.*

(b) *Delay at customer' s end, Building owner or Society objections, cable thefts, power outages, and RoW issues should be allowed to be excluded for calculation.*

(c) *The occurrence of faults are more due to overhead cables in rural and hilly areas therefore, parameter may be modified as under:*

Fault repair by next working day	*90%*
Fault repair within 3 days	*95%*
Fault repair within 5 days	*100%.*

(d) *Normal fault of wireline complaint should be attended within minimum 2 to 5 hrs.*

(e) *No comments.*

(f) *It is difficult to achieve the value of 90% in certain cases and such cases be exempted from reporting to TRAI and also the figure be modified to 80% and 100% within 7 days instead of 3 days. Also rent rebate may be prescribed where fault is pending more than 7 days.*

3.3.2 Most of the service providers have agreed to the proposal to continue with the existing benchmark for this parameter. However, they have suggested exclusion of certain factors for calculation purpose. Some of the service providers have suggested different benchmarks for fault repair in rural and hilly areas. Considering the fact that most of the service providers have agreed with the proposal to continue with the existing benchmark for the parameter, the Authority has decided to continue with the existing benchmark for the parameter. However, force

majeure incidences could be excluded for calculation purposes. Regarding fault repair in rural and hilly areas, the Authority appreciates that in such areas the fault repairing could take more time due to topology of the area and other constraints. Considering these, the Authority has prescribed modified benchmark for rural and hilly areas. However, the rent rebate will continue to be uniform for urban and rural/ hilly areas. In the parameter "fault repair by next working day", only those complaints, which have been registered till the close of the business hours of that day, will be taken into account. Complaints registered after the business hours will be taken as being registered in the next day business hours.

3.4 **Mean Time to Repair:**

3.4.1 In the consultation paper no change in the benchmark for this parameter was proposed. The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal. However, delay at customer's end, Building owner or Society objections, cable thefts, power outages, and RoW issues should be allowed to be excluded for calculation.

(b) Hand set related complaints should be excluded.

(c) The duration should be from the time of the complaint till the time to repair of the fault, excluding non working hours (6 PM to 8 AM) and Holidays.

(d) This parameter may be modified as MTTR < 9 hrs.

(e) No comments.

(f) Revise the benchmark to 15 hours.

3.4.2 Most of the service providers agreed with the proposal to continue with the existing benchmark for this parameter. As such, the Authority is of the view to continue with the existing benchmark for this parameter. However, force majeure events could be excluded for calculation purposes.

3.4.3 **Measurement**

$$\text{Mean Time to Repair} = \frac{\text{sum of duration of each repair time in hours for all the fault incidences in a Quarter (3 months)}}{\text{Total number of fault incidences in a Quarter (3 months)}}$$

3.4.4 For counting the duration of repair time only working hours shall be counted. The duration shall be from the time of the complaint till the

time of repair of the fault, excluding non-working hours. Thus only the actual working hours from the time of lodging of the complaint to the time of rectification of the fault shall be taken for computation of performance. For example in case a fault is reported at 3.30 PM on Monday, a working day, and if the fault is rectified at 12.30 PM on Tuesday the duration for repair will be 7 hours, where working hours 8 AM to 6 PM is followed.

3.5 **Grade of Service**

3.5.1 Grade of Service (GoS) is a design parameter of the telephone exchanges for trunk groups. Grade of service basically is used for planning of local and long distance junction network i.e. local exchange to local exchange/tandem and local network to TAX and vice-versa. Similarly, the defined parameters of GoS are used for expansion of network and augmentation of specific circuit group. As per the live traffic measured in erlang during time consistent busy hour or during route busy hour and thereafter taking traffic projections, the service provider has to augment/plan the number of trunk circuits on various traffic destination groups called trunk groups. While projecting the number of circuits for augmentation, the grade of service (GoS) as specified in quality of service regulations or license conditions is to be applied by the service providers. Traffic need to be measured in each destination circuit group generally as per the route busy hour and its augmentation on periodic basis to meet the particular grade of service. Hence, compilation of the data for large number of switches for grade of service could be difficult. Therefore, it was proposed in the consultation paper as to whether this parameter should continue to be specified for mandatory compliance purposes or that it may be specified only for the purpose of designing and augmentation of circuit groups by the telecom service provider as a guideline. The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

(a) There is no need to monitor this parameter as it is difficult to estimate the benchmark.

(b) It should be made "MANDATORY COMPLIANCE".

(c) Grade of Service should be continued.

(d) This parameter can be specified only as a guideline.

(e) Circuit seizure efficiency may be introduced.

(f) No comments.

3.5.2 While the consumer organizations have suggested continuing the parameter, most of the service providers have suggested that the parameter can be specified only as a guideline. Considering the difficulties in measuring and reporting this parameter, the Authority is of

the view that the Grade of Service is to be prescribed only for monitoring purposes by the service provider and need not be reported to the Authority. However, the service providers shall maintained records thereof. The measurement of this parameter shall be made during Time Consistent Busy Hour.

3.6 **Call Completion Rate**

3.6.1 Call Completion Rate (CCR) is defined as the ratio of the number of successful calls to the number of call attempts. Not all call attempts result in successful calls i.e. called party answers. A variety of reasons such as called line busy, no answer and congestion in the network as well as subscriber behavior like premature release, wrong dialing etc. are responsible for the failure. Congestion or blocking occurs due to either common control equipment overload condition in the exchange or congestion in the trunk circuit /junction group to handle the calls. Due to the difference in the Network Architecture with various service providers, there is a constraint in the measurement of the local network Call Completion Rate for some of the service providers. M/s Reliance Communications is furnishing the data of the parameter Answer Seizure Ratio (ASR) in place of local Call Completion Rate. "Answer Seizure Ratio" is generally defined as the ratio of calls answered to the calls processed by the switch. It was proposed in the consultation paper as to whether the parameter Call Completion Rate within local network is to be retained or replaced by the parameter Answer to Seizure Ratio (ASR) and if it is replaced by parameter ASR then it is to be considered as to what should be its benchmark.

3.6.2 The comments of the stakeholders are summarized in para (a) and (f) and analysed in the paragraph following thereafter.

(a) CCR to be replaced with ASR with international norms.

(b) CCR should be retained.

(c) ASR within network has significance only in the circles where service provider has multiple switches because it can be measured on circuit group only.

(d) ASR does not measure the network capacity or efficiency to convert every call attempt into successful seizure of resources.

(e) To provide leverage Reliance Communications may be allowed ASR.

(f) From consumer angle, CCR is better.

3.6.3 The Authority considered the above views of stakeholders and is of the view that since CCR cannot be uniformly measured and reported by all service providers, both the parameters Call Completion Rate and Answer to Seizure Ratio should be there. The Authority has also prescribed benchmarks for both the parameters. The service providers who cannot measure and report Call Completion Rate due to constraint

in network architecture shall measure and report their performance on Answer to Seizure Ratio. The measurement shall be made during Time Consistent Busy Hour.

3.6.4 For computation of the performance against the parameter Call Completion Rate within the local network, the local network means calls originating and terminating within the same Short Distance Charging Area (SDCA).

3.7 **Metering and billing credibility:**

3.7.1 In the consultation paper no change in the benchmark for this parameter for post-paid billing was proposed. However, to make the computation of achievement against the benchmark for this parameter more transparent, it was proposed to clarify the various types of incidences relating to billing complaints. It was also proposed to introduce a new parameter on pre-paid charging as there had been complaints relating to charging, including charging not as per tariff plan or application of credit or deduction of charges for the services without explicit consent of customer. The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

India-TCR

(a) Agreed with proposal.

(b) The existing benchmark may continue in both the case i.e.Prepaid /Post paid billing.

(c) There could be reasons like cheque returned, cheque not completed properly or not signed due to which payments are not credited. Many times payment reflects automatically after customers' complaint is accepted. Hence this parameter should not be part of the billing complaints.

(d) Billing complaint needs to include—Bill for service NEVER ACTIVATED or PROVIDED.

(e) Billing complaints per 100 bills issued- Prepaid charging.-The benchmark for billing complaints per 100 bills- pre paid charging should be increased to 3 %.

(f) No Comments.

3.7.2 Most of the service providers have either not commented on the proposal or agreed with proposal. As such, the Authority has decided to continue with the existing benchmark for the parameter Metering and Billing Credibility – Post paid billing. The types of billing complaints to include could be but is not limited to:-

(a) payment made and not credited to the subscriber account;

(b) payment made on time but late payment charges levied wrongly;

(c) double charges;

(d) charging for toll free services;

(e) local call charges billed as STD/ISD or vice versa;

(f) calls or messages made disputed;

(g) validity related complaint;

(h) credit agreed to be given in resolution of complaint but not accounted in the bill;

(i) charging for services provided without consent;

(j) charging not as per tariff plan or top-up vouchers/special packs etc.;

(k) overcharging or undercharging;

In addition to the above, any billing complaint which leads to billing error, waiver, refund, credit or any adjustment shall also be included as valid billing complaint for calculating the number of disputed bills.

3.7.3 The measurement of the parameter "Metering and Billing Credibility – post-paid" is to be done as per the following formula:

$$\text{Billing complaints (\%)} = \frac{\text{total number of disputed bills X 100}}{\text{total number of bills issued during one billing cycle.}}$$

3.7.4 The measurement of the parameter "Metering and Billing Credibility – pre-paid" is to be done as per the following formula:

$$\text{Pre-paid charging complaints (\%)} = \frac{\text{total number of complaints relating to Charging, credit \& validity during quarter X 100}}{\text{total number of pre-paid customers at the end of the quarter}}$$

3.8 **Resolution of billing/charging complaints:**

3.8.1 In the Consultation Paper it was proposed to introduce this parameter for basic telephone service (wireline) also. The comments of the stakeholders are summarized in para (a) to (c) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal. Monitoring of this parameter will help the service provider in collection of dues and also avoidable bad debts.

(b) Billing correction contain minimum one working hour.

(c) No comments.

3.8.2 Most of the service providers have either agreed with the proposal or have not commented on the proposal. The monitoring of this parameter will help the service provider in collection of dues and also avoidable bad debts. This will also help to increase the customer

satisfaction. As such, the Authority has decided to prescribe the benchmark of 100% within 4 weeks of receiving complaints.

3.8.3 The performance against this parameter is to be measured as per the following formula:

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 4 weeks =

$$\frac{\text{number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 4 weeks during the quarter}}{\text{number of billing/charging, credit / validity complaints received during the quarter}} \times 100$$

3.9 **Period of all refunds/payments due to customers from the date of resolution of complaints.**

India Code

3.9.1 In the consultation paper it was proposed to introduce this parameter for Basic Telephone Service (wireline). The comments of the stakeholders are summarized in para (a) to (c) and analysed in the paragraph following thereafter.

(a) Agreed the proposal.

(b) The refund should be made within 7 days instead of 60 days or a penal interest @ 2% per month may be levied.

(c) No comments.

3.9.2 Most of the service providers and consumer organizations have either agreed with the proposal or have not commented on the proposal. Hence, the Authority has decided that a billing complaint has to be resolved within four weeks and any credit/waiver/adjustment arising out of resolution of that complaint has to be made to the customer's account within one week of resolution of the complaint and intimation thereto the customer, post-paid/pre-paid. Further, in case of post paid customer the same shall also be reflected in the next bill to be issued.

3.10 **Customer care (Promptness in attending to customers request)**

(a) Shift:

3.10.1 In consultation paper it was proposed that the parameter Shift may be taken out of Quality of Service Regulation. The comments of the stakeholders are summarized in para (a) to (c) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal.

(b) The existing procedure may continue.

(c) No comments.

3.10.2 Most of the service providers have either agreed with the proposal or have not commented on the proposal. As such, the Authority has decided to remove this parameter from mandatory compliance and the performance against this parameter need not be reported to the Authority. However, the service provider shall continue to monitor the performance against this parameter and maintain the records thereof.

(b) Closures:

3.10.3 The Authority had issued a direction on 29th August, 2006 on termination of service. This direction provides for termination of service within 24 hrs. in case of request made in writing, within 3 days incase of request made through fax/e-mail ID registered with the service provider and within 7 days in the case of request made through telephone, SMS, e-mail. The benchmark for the parameter closure in the existing Quality of Service Regulation is within 24 hrs. It was proposed in the consultation paper as to whether the existing benchmark of within 24 hrs. to be continued or the benchmark should be as per the direction on termination of service or a new benchmark to be considered. The comments of the stakeholders are summarized in para (a) to (e) and analysed in the paragraph following thereafter.

(a) It may be either as per the direction on termination of service or a new benchmark to be considered.

(b) Service provider should comply with 100% requests or closure of telephone / termination of service to be within 24 hours. Allot unique service request number and called docket number. Arrange collection of CPE. Raise bill / Refund after adjusting the security deposit.

(c) The proposed benchmark should be increased to 3 days.

(d) It should be as per the request of the customer otherwise, 24 hrs should be adhered in computing the performance.

(e) No Comments.

3.10.4 In the written comments, most of the service providers and consumer organizations have either agreed with the proposal or have not commented on the proposal. However, during the Open House Discussion some of the service providers have suggested 14 days to address the concerns of the customer for seeking closure and another 7 days for effecting closure. There were also comments from stakeholders that in case the services are not terminated at the earliest by the service provider the dues will increase and the customer may have to pay charges for not using the services. The Authority has considered the

above views of stakeholders and is of the view that 14 days time for retention efforts and another 7 days for effecting closure is a very long period and the consumer interest would be greatly affected in as much as the consumer may have to pay charges for the increased time for closure. The Authority has therefore decided that the time period for closure shall not be more than 7 days, uniformly for all means of request. This period would cover any effort to be made by the service provider for retention of the customer and for recovery of customer premises equipment (CPE), incase such CPE is the property of the service provider. The service provider shall cease to charge rental or any other charges beyond the period of 7 days of request for closure made by the customer. Further, bills shall be raised only after adjustment of the security deposit and the closure/ termination of service shall not be made conditional upon payment of dues. Also the closure/ termination of service shall not be made conditional upon payment of dues/bills/settlement of dispute. In all cases of request of closure/ termination, the request is to be complied with within 7 days of such request from the customer.

(c) Additional Facility:

3.10.5 It was proposed in the consultation paper that this parameter may be taken out of the Quality of Service Regulation. The comments of the stakeholders are summarized in para (a) and (b) and analysed in the paragraph following thereafter

(a) Agreed with the proposal.

(b) No comment.

3.10.6 In view of the above response of the stakeholders and the fact that the service provider is supposed to provide the additional facility, whenever the customer has made requests, at the earliest, in his own interest and that in the present scenario of competition, customer choice and substitution of wireline phone with mobile phone this parameter has less importance for monitoring by the Authority. As such, it has been decided to take this parameter out of QoS regulations.

3.11 **Response time to the customer for assistance:**

3.11.1 In the consultation Paper the following two sub-parameters with benchmarks were proposed for this parameter:

(i) Accessibility of Call Centre number i.e. % age of calls answered which basically mean that the calls should get connected and answered. The benchmark proposed is minimum 95% calls to be connected successfully and not more than 5% calls shall encounter congestion or busy signal or no reply or any other failure.

(ii) % age of calls answered by operators (voice to voice) within 60 seconds = 90% and not more than 5% calls shall encounter

busy signal or no reply or any other failure in getting connected to operator.

3.11.2 The comments of the stakeholders are summarized in para (a) to (d) and analysed in the paragraph following thereafter.

(a) *After reaching the call centre the customer is hold online for long. The menu option should not be too many and time need to be specified.*

(b) *The response time for customer assistance by operator voice to voice should be 2 minutes for 1. 3 minutes and 5 minutes for 3 minutes.*

(c) *Title of the parameter will now be more clear.*

(d) *Since market is reacting positively to the need, it is requirement that more stringent benchmarks may not be beneficial.*

3.11.3 The Authority has considered the above views of stakeholders and is of the view that accessibility of call centre number is of significant importance to the consumers. As such, the Authority is not in favour of relaxing the benchmark for the sub-parameter accessibility of call centre number and % age of calls answered by operators (voice to voice).

3.11.4 Regarding computation of the performance against the parameter %age of calls answered by operators (voice to voice), the time taken for connecting to the operator shall be calculated from the time the customer has keyed the relevant number in the IVR option menu, if provided, for speaking to the customer care executive/operator. Further, the menu for speaking to the customer care executive/operator shall be given preference in the menu options and this menu shall not be below the first sub-menu at the third layer, the first layer being the choice of language and the second layer the service menu.

3.12 **POI Congestion:**

3.12.1 Presently there is a parameter on POI congestion for Cellular Mobile Telephone Service. Congestion at the POIs is due to inadequate interconnection commensurate with the outgoing traffic at the Point of Interconnection between two telecom networks. This is applicable both for basic telephone service and the Cellular Mobile Telephone Service. Hence it was proposed in the consultation paper to introduce this parameter for basic telephone service (wireline) also with similar benchmark as prescribed for cellular mobile telephone service.

3.12.2 The comments of the stakeholders are summarized in para (a) and (b) and analysed in the paragraph following thereafter.

(a) *The proposal for introduction of this parameter is accepted.*

(b) *Ok.*

3.12.3 The stakeholders have either accepted the proposal or there have been no comments. Since in a multi operator competitive scenario this parameter is of great importance for smooth flow of traffic between networks of different service providers. Therefore, the Authority has decided to prescribe this parameter for basic telephone service (wireline) also with similar benchmark (≤ 0.5%) as for cellular mobile telephone service.

3.13 **Time taken for refund of deposit after closure of telephone/ termination of service:**

3.13.1 As per the existing provisions on refund of security deposit, 100% refund of security deposit is to be made within 60 days, failing which 10% per annum interest is payable. In the consultation paper it was proposed to continue with the same benchmark of 60 days. During the consultation process there has been general acceptance of this proposal as the Authority has not received any comment on this issue from stakeholders. As such, the Authority decided to continue with the existing benchmark of 100% refunds within 60 days after closure/ termination of service. Any delay in refund of deposits will attract interest of @10% per annum. Here the deposit includes security deposit and any other refundable deposit taken from the customer. The same benchmark shall also be followed for payment of any other dues payable to the customer at the time of closure/ termination of service. The Authority would also like to make it clear that the fact that interest is paid to the customer for delay in payment of dues does not absolve the service provider from the responsibility of meeting the prescribed benchmark.

4. Quality of Service Parameters for Cellular Mobile Telephone Service:

4.1 The parameters prescribed in these regulations for cellular mobile telephone service shall be equally applicable for basic service (wireless).

A. Network Service Quality Parameters:

4.2 **Network availability:**

4.2.1. It was proposed in the consultation paper to redefine the existing parameter "accumulated down time for community isolation" to two new parameters "BTSs accumulated downtime (not available for service)" with benchmark of ≤1% and "Percentage of worst affected BTSs due to downtime" with benchmark of ≤ 1%. The comments of the stakeholders are summarized in para (a) to (h) and analysed in the paragraph following thereafter.

(a) *Agreed with the proposal.*

(b) *The parameter for "Percentage of worst affected BTSs due to downtime" should be ≤2%.*

(c) *The benchmark for both parameters should be ≤2% with outages more that 2 hours. The external factors such as Natural Calamities, War, riots etc., Accidental factors like Lightning, Permissions not granted by civic authorities for work like road cutting for cable repair work, Failures outside the control of service providers should be excluded. Some of the service providers have also suggested that rural sites with no State Electricity board connection should be excluded from the calculation.*

(d) *Use of "Network Availability" in place of Accumulated downtime of community isolation" is more rational and desirable.*

(e) *The revised parameter is not desirable, because in a practical scenario the contiguous BTS takes over in case of failure therefore, such BTSs be allowed to be excluded from the benchmark estimation or the existing benchmark should not be made stringent.*

(f) *Only after independent survey across all the circles there should be any change.*

(g) *Accumulated down time of community isolation basically in rural network should be properly monitored by Authority and benchmark of down time should be determined 20 hours during the month i.e. in 30 days but not more than one hour in a day under normal circumstances.*

(h) *No comments.*

4.2.2 The Authority has considered the above views of stakeholders and since the proposal to introduce the two parameters of "BTSs accumulated downtime (not available for service)" and "Percentage of worst affected BTSs due to downtime" has generally been accepted by the stakeholders the Authority has prescribed these two parameters for compliance by service providers. As regards the benchmark for these two parameters, keeping in view the comments of some of the stakeholders, the Authority has prescribed benchmark of ≤2% for both the parameters. This shall mean that the network should be available for service for 98% of the time in a month.

Measurement

4.2.3 "BTSs accumulated downtime (not available for service)" shall basically measure the downtime of the BTSs, including its transmission links/circuits during the period of a month, but excludes all planned service downtime for any maintenance or software upgradation. For measuring the performance against the benchmark for this parameter the down time of each BTS lasting for more than 1 hour at a time in a day during the period of a month shall be taken for computation. The

total duration in hours of all such instances of downtime of BTSs shall be calculated. Thereafter, the performance against the benchmark shall be measured through the following formula:

BTSs accumulated downtime (not available for service) =

$$\frac{\text{Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month} \times 100}{\text{24 X No. of days in the month X No. of BTSs in the network in the licensed service area}}$$

4.2.4 **Worst affected BTSs due to downtime** - For measuring the parameter "Percentage of worst affected BTSs due to downtime" the down time of each BTS lasting for more than 1 hour at a time in a day during the period of a month shall be recorded and wherever the accumulated downtime of a BTS during the period of a month exceeds 24 hours the said BTS shall be taken as worst affected BTS for computation. The total number of such worst affected BTSs in a month shall be determined. Thereafter, the performance against the benchmark shall be measured through the following formula:

Worst affected BTSs due to downtime =

$$\frac{\text{No. of BTSs having accumulated downtime of >24 hours in a month} \times 100}{\text{Total No. of BTSs in the licensed service area}}$$

IndiaCore

4.2.5 Further, for computation of performance against the benchmark for these two parameters, performance affected due to force majeure conditions shall be excluded for calculation purposes.

4.3 Service **Access delay:**

4.3.1 The service access delay comprises of (a) Time to connect Call (Mobile Station originated – Mobile Station connection part); (b) Time to confirm instruction to connect; (c) Time to release call and (d) Time to alert Mobile Set. Since this parameter is generally complied with by the service providers and the measurement of this parameter is not available in the switch it was proposed that this parameter may be taken out of QoS regulations. The comments of the stakeholders are summarized in para (a) and (b) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal.

(b) *No comments.*

4.3.2 Since the stakeholders during consultations have also agreed to the proposal to take this parameter out of QoS regulations, the Authority is not prescribing this parameter for quality of service norms.

4.4 **Connection Establishment (Accessibility)**

4.4.1 For determining the accessibility there are three important parameters to be monitored, namely Call Setup Success Rate (CSSR), Standalone Dedicated Control Channel (SDCCH)/ Paging Channel and Traffic Channel (TCH). These are discussed below:

(a) Call Set-up Success Rate (CSSR)

4.4.2 Call Setup Success Rate is defined as the ratio of Established Calls to Call Attempts. Established Calls means the following events have happened in call setup:

i) Attempt is made

ii) The TCH is allocated and

iii) The call is routed to the outwards path of the concerned MSC.

Thus this includes complete signaling in the call setup process and does not aim to measure the performance of the called exchange or that of the Point of Interconnection (PoI).

IndiaCode

4.4.3 Call Attempt is defined in the ITU –T E600 (03/93)/2.4 as "an attempt to achieve a connection to one or more devices attached to a telecommunication network". At a given point in the network a call attempt is manifested by a single unsuccessful bid, or a successful bid and all subsequent activity related to the establishment of the connection.

4.4.4 It was proposed in the consultation paper to retain this parameter with the existing benchmark of >95%. The comments of the stakeholders are summarized in para (a) to (c) and analysed in the paragraph following thereafter.

(a) Agreed the proposal.

(b) These benchmarks also need to be reported city wise rather than

(c) circle wise.

(d) *No comments.*

Since the above proposal was widely agreed by the stakeholders during consultation process, the Authority has decided to continue with the existing benchmark for this parameter. The CSSR shall be measured during time consistent busy hour using OMC generated data.

4.4.5 (**b) Standalone Dedicated Control Channel (SDCCH) Congestion**

(c) Traffic Channel (TCH) Congestion

4.4.5.1 SDCCH and TCH congestion in the network lead to non-establishment of the call. The congestion can be in the signalling channel known as Standalone Dedicated Control Channel (SDCCH) (in respect of GSM network) /Paging Channel Congestion (in respect of CDMA network) or in the traffic channel (TCH). SDCCH channel/paging channel is the control channel where majority of the call set up occurs and is used for mobile station (mobile handset) to Base Transceiver Station (BTS) communications before the mobile station is assigned to TCH /speech channel. TCH is a logical channel which carries either encoded speech or user data. Blocked call means a call that is not connected because there is no free channel in radio access network of cellular mobile service provider to serve a call attempt. Numbers of blocked calls are those times where there is no free channel to serve a call attempt. Hence connection establishment (accessibility) represents congestion in the radio access network. The congestion may be at SDCCH level or TCH level. In the Consultation Paper it was proposed to continue these parameters with the existing benchmarks for SDCCH/Paging channel congestion and TCH congestion.

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4.4.5.2 The comments of the stakeholders are summarized in para (a) to (c) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal.

(b) These benchmarks also need to be reported city wise rather than circle wise.

*(c) No comments***.**

4.4.5.3 Since the service providers and the consumer organisations have agreed with the proposal to continue these parameters with the existing benchmark, no change is made to the benchmarks for the parameters SDCCH/Paging Channel Congestion and TCH congestion. These parameters shall be measured using OMC generated data in Time Consistent Busy Hour.

4.5 **Connection maintenance (Retainability)** :

(a) Call Drop Rate

4.5.1 The call drop represents the service provider's ability to maintain a call once it has been correctly established. The objective of this parameter is to provide the consumer with an expectation of how successful a mobile network will be at retaining the signal throughout the whole duration of the call. This parameter shall include both incoming calls and outgoing calls which, once they have been established and have an assigned traffic channel (TCH), are dropped or interrupted

prior to their normal completion by the user, the cause of the early termination being within the service provider's network.

4.5.2 The parameter gives a reliable measurement of the mobile network used by the service provider for maintaining a call once it has been correctly established. Failures in coverage, problems with the quality of the signal, network congestion and network failures have important impact on this parameter. This parameter is affected by inadequate coverage, problems with the quality of the signal including interference, radio access network congestion. ETSI EG 202 057-3 v1.1.1 (2005-04) defined Dropped Call Ratio as "The percentage of calls which, once they have been correctly established and therefore have an assigned traffic channel, are interrupted prior to their normal completion by the user, the cause of the early termination being within the operator's network". Call drop in the network can be caused by a number of reasons relating to equipment, transmission, interference, hand-over, antenna etc. It was proposed in the consultation paper to reduce the benchmark for this parameter from <3% to ≤2% as it was seen from the monitoring of performance of service providers against this parameter that their performances against the benchmark of <3% is mostly within the range and that the reasons for call drop lie within the operators network. Further, advancement in technology has enabled the service providers to reduce the call drop rate.

Invoice

4.5.3 The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

(a) Agreed the proposal.

(b) Revisit this benchmark for this parameter.

(c) The existing benchmark should continue.

(d) Proposed change will tighten the performance of the operators.

(e) Only after independent survey across all the circles there should be any change.

(f) No comments.

4.5.4 The service providers in general have suggested either to continue the existing benchmark or to revise the benchmark. The consumer organizations are either in favour of reducing the call drop rate benchmark, as proposed in the consultation paper, or have not commented on the proposal. The Authority has considered the above views of stakeholders and is of the view that a benchmark of ≤2% for call drop could be achievable. Therefore, the Authority has prescribed benchmark of ≤2% for the parameter call drop rate.

4.5.5 The measurement can be made via an automatic data collection system, based on the network counters which register the real traffic of the network. The counter is available on the switch or OMC and is recorded 24 hours a day, every day of the years. However, for reporting the performance the measurements have to be taken during TCBH. The formula for calculating the percentage of dropped calls is:

$$\frac{(A * 100)}{B}$$ where:

A = The total number of interrupted calls (dropped calls)
B = The total number of calls successfully established (where traffic channel is allotted)

The formula includes the interrupted calls which consist of failures which cause the dropping of the call once the TCH has been successfully established, and the successful seizure of TCH for an originated or terminated call.

(b) Worst affected cells having more than 3% TCH drops (call drop rate):

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4.5.6 The reporting of achievement of Quality of Service against the parameter call drop rate does not reveal the extent of number of areas or localities where the call drop rate is worst. Worst affected cells are defined as cells in which the call drop rate exceeds 3% during cell Bouncing Busy Hour (CBBH) or at any other hour of a day. In the consultation paper the benchmark proposed for this parameter is ≤3%.

4.5.7 The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal.

(b) It would not be appreciated to apply a network level benchmark to cell level benchmark due to different level of GoS at cell level. Therefore, the benchmark figure should be decided only after monitoring from the operator's data over a period of time.

(c) Setting a norm which is poorer than the overall norm is therefore not desirable. International benchmarks should be studied and aimed at.

(d) Only after independent survey across all the circles there should be any change.

(e) I do not understand what purpose this benchmark will serve.

(f) No comments.

4.5.8 While some of the service providers agreed with the proposal and some of the service providers have stated that it would not be appreciated to apply a network level benchmark to cell level benchmark due to

different level of GoS at cell level. The consumer organisations have either not commented on this parameter or have agreed with the proposal. The Authority considered the views of the stakeholders and is of the view that the networks are being rolled-out in rural and hilly and remote areas. Till the expansion phase is on, the call drop in cells in rural and remote and hilly areas could be more. In urban areas also where more customers are enrolled in excess of the capacity or where the infrastructure could not support the traffic, call drop in certain cells could be more due to interference. The Authority has been monitoring the information about the additional parameter "percentage of cells having >3% call drop (TCH drop)". As per the information received by the Authority from the service providers from the month of September, 2008 to December, 2008, the Authority noted that most of the service providers are having excessive call drops in some of the pockets. The call drops in these pockets [served by a cell or Base Transceiver Station (BTS)] of the cellular mobile service providers is found more than 3%. The information received from the service providers for the quarter ending December, 2008 reveals that some of the service providers are having even more than 10% of the cells with more than 3 % Call (TCH) drops in many of the service area. Although, the service providers are meeting the benchmark of <3% for the parameter "Call Drop Rate" when averaged over a quarter for the service area as a whole, yet the customers are suffering with frequent call drops in affected cells /locations/areas which results in inconvenience to the customers. Since, the benchmark for the parameter "Call Drop Rate" has been made more stringent modifying it from < 3% to ≤2%, the need has arisen to include the parameter "%age of worst affected Cells having more than 3% TCH drop (Call drop) rate". The Authority has, therefore, prescribed a phased implementation of the benchmark, with a lighter benchmark of ≤5% cells having more than 3% TCH drop (call drop) till 31.3.2011 and beyond that a benchmark of ≤3%.

4.5.9 The formula for calculating the Percentage of worst affected cells having more than 3% TCH drops (call drop rate) is –

$$\text{Percentage of worst affected cells having more than 3\% TCH drops (call drop rate)} = \frac{\text{No. of worst affected cells having call drop rate >3\% during CBBH in a month}}{\text{Total No. of cells in the licensed service area}} \times 100$$

4.5.10 Cell Bouncing Busy Hour (CBBH) means the one hour period in a day during which a cell in cellular mobile telephone network experiences the maximum traffic.

(c) Connections with good Voice Quality:

4.5.11 The quality of voice in cellular mobile telecom services (GSM), is measured on a scale from 0 to 7 in GSM technology. As the quality deteriorates, this value increases. The quality of the voice is considered to

be good, if this value remains between 0 and 4. However, this value may be between 0 to 5 for the network where Frequency hopping phenomenon is used. In the case of CDMA, the fundamental performance measure for voice quality is the Frame Error Rate (FER). It is the probability that a transmitted frame will be received incorrectly. The frame includes signaling information and error detection bits as well as user voice/data. This metric includes the error detection/correction coding inherent in the system. Good voice quality is 0-4 % FER value. For FER of 4% for CDMA Enhance Variable Rate Codec (EVRC) System, the Speech Quality Rating is MOS score of 3.6. Further, for Bit Error Rate of Rx Qual 0 to 4 for GSM enhanced full rate (EFR) system, the Speech Quality Rating is MOS score of 3.4.

4.5.12 The existing benchmark for this parameter is >95%. This parameter is being measured by some of the service providers based on the system derived data. However, some of the service providers are furnishing the data based on the drive test on sample basis. It was proposed in the consultation paper to continue with this benchmark and that there should be system generated measurement for this parameter.

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4.5.13 The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

(a) *Agreed with the proposal.*

(b) *The present benchmark of >95% should be revised and brought down to >90%.However some of the service providers have also mentioned that for operators having AMR, then the good samples should be Rx Qual 0-6.*

(c) *At present there is no system generated report for measuring connections with good voice quality.*

(d) *Only after independent survey across all the circles there should be any change.*

(e) *Suggested to conduct an end-to-end network call quality test as defined in ITU Recommendation and QoS framework should migrate from the measurement of network-centric data to user-centric data.*

(f) *No comments.*

4.5.14 While the CDMA operators have agreed with the proposal, the GSM operators are in favor of revising the benchmark to ≥ 90%. The monitoring of performance of service providers against the benchmark for this parameter through the quarterly Performance Monitoring Reports reveals that more than 90% of the service providers are meeting the benchmark. As such, the Authority has decided to continue the parameter with the benchmark of ≥ 95% being one of the important

parameter for consumer. The performance of service providers against this benchmark shall be based on system generated measurement.

4.6 **Service Coverage:**

4.6.1 This parameter is intended for measuring the coverage in terms of the received signal strength in areas where the service provider has commissioned the service. In the consultation paper no change was proposed to the existing benchmark of in door ≥ -75 dBm, In-vehicle ≥ -85 dBm and Out door- in city >= -95 dBm

4.6.2 The comments of the stakeholders are summarized in para (a) to (d) and analysed in the paragraph following thereafter.

(a) *Agreed with the proposal.*

(b) *Benchmark not agreed , only external coverage for this parameter needs to be considered .*

(c) *TRAI should only prescribe outdoor signal of - 93/95 dBm, building coverage should be left to market forces and publishing such parameter on website would be misleading.*

(d) *No comments.*

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4.6.3 During consultations the service providers have generally opined that only the external coverage benchmark be prescribed. In the existing regulations the benchmark for this parameter is for measurement at street level. The Authority is of the view that measurement of coverage at street level should continue and in the interest of consumers this should not be left to market forces. Also there should be benchmark for coverage measurement in-vehicle. Accordingly, separate benchmarks have been prescribed for indoor coverage for which measurement is to be taken at street level and in-vehicle coverage. The Authority feels that street level coverage of ≥ -75dBm could provide good indoor coverage in normal conditions. Further, as per the test schedule of TEC also for verifying compliance of roll out obligations, the signal strength required for in building coverage is defined as ≥-75 dBm at street level. However, in the case of in-vehicle assessment/ measurement for coverage the benchmark prescribed shall be ≥- 85 dBm.

4.7 **Point of Interconnection (POI) Congestion:**

4.7.1 This parameter signifies the ease by which a customer of one network would be able to communicate to the customer of another network. This parameter also reflects as to how effective is the interconnection between two networks. It was proposed in the consultation paper to retain this parameter with the existing benchmark of < 0.5%, to be monitored on monthly basis.

4.7.2 The comments of the stakeholders are summarized in para (a) to (d) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal.

(b) Issues that are not within the control of operators should be excluded such as Fiber cut, other operator in granting E1s due to port/ equipment issues, outages due to other operator, important festivals, forced majeure and natural calamity.

(c) Emphasis need to be given on removing the shortcomings.

(d) No comments.

4.7.3 The service providers and consumer organizations have generally agreed with the benchmark for this parameter. As such, the Authority has prescribed the benchmark of ≤ 0.5%. As regards the suggestions to exclude issues that are not control of the service providers, the Authority is of the view that only performance affected due to force majeure conditions need be excluded for calculation purpose. The measurement of this parameter shall be made during Time Consistent Busy Hour.

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B. Customer Service Quality Parameters:

4.8 **Metering and billing credibility:**

4.8.1 In the existing regulations three parameters are there relating to billing complaints viz. (i) billing complaints per 100 bills issued (benchmark <0.1%); (ii) Percentage of billing complaints resolved within 4 weeks (benchmark <100%); and (iii) period of all refunds/payments due to customers from the date of resolution of complaints (benchmark <4 weeks). In the consultation paper it was proposed to have separate parameters for post-paid billing and pre-paid charging under the title "Metering and billing credibility". The various types of billing complaints were also proposed to be clarified.

4.8.2 The comments of the stakeholders are summarized in para (a) to (e) and analysed in the paragraph following thereafter.

(a) Agreed.

(b) The scope of the existing parameter should be retained and should not be extended to billing related services. Waiver or refund should not be included.

(c) Benchmark of <0.1 % is right for metering errors only. If other proposed categories are to be included in billing complaints then bench mark should be revised to <5%.

(d) Separate parameter for pre-paid customers is a welcome move. The existing benchmark accepted.

(e) No comment.

4.8.3 The Authority considered the above views of stakeholders and has decided to retain the existing benchmark of not more than 0.1% of bills issued should be disputed over a billing cycle for post-paid billing. Regarding Items to be covered under billing complaint, keeping in view the comments of stakeholders, the Authority has decided to exclude items relating to bills received late and bill not received from the type of billing complaints and the billing/charging complaints will now include, but not limited to, the following:

(a) payment made and not credited;
(b) payment made on time but late payment charges levied wrongly;
(c) double charges;
(d) charging for toll free services;
(e) local call charges billed as STD/ISD or vice versa;
(f) calls or messages made disputed;
(g) wrong roaming charges;
(h) credit agreed to be given in resolution of billing/ charging complaints but not accounted in the bill;
(i) charging for services provided without consent;
(j) charging not as per tariff plan;
(k) overcharging or undercharging

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4.8.4 In addition to the above, any billing/charging complaint which leads to billing/ charging error, waiver, refund, credit or any adjustment shall also be included as billing/charging complaint for calculating the number of disputed bills.

4.8.5 The measurement of the parameter "Metering and Billing Credibility – post-paid" is to be done as per the following formula:

$$\text{Billing complaints (percentage)} = \frac{\text{total number of disputed bills X 100}}{\text{total number of bills issued during one billing cycle.}}$$

4.8.6 Regarding the parameter metering and billing credibility: Pre-paid charging the Authority has prescribed the benchmark of not more than 1 complaint per 1000 customers i.e. 0.1% complaints for metering, charging, credit and validity.

4.8.7 The measurement of the parameter "Metering and Billing Credibility – pre-paid " is to be done as per the following formula:

Pre-paid charging complaints (percentage) = total number of complaints relating to Charging, credit & validity during quarter X 100

total number of pre-paid customers at the end of the quarter

4.9 **Resolution of Billing/ Charging complaints:**

4.9.1 This parameter is intended to facilitate resolution of billing complaints in a timely manner. It was proposed in the consultation paper to continue with the present time limit of 4 weeks for resolution of billing complaints. Monitoring of this parameter will help the service provider in collection of dues and also avoidable bad debts. This will also help to increase the customer satisfaction.

4.9.2 The comments of the stakeholders are summarized in para (a) to (c) and analysed in the paragraph following thereafter.

(a) Agreed.

(b) The existing benchmark should be continued for post paid services and for pre paid, wherein the complaints have been lodged within 30 days of the credit. However the prepaid complaints lodged after 30 days, 6 weeks time may be provided as it takes significant amount of time to retrieve the data from the archive.

(c) No comments.

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4.9.3 The Authority has considered the above views of stakeholders and is of the opinion that the benchmark should be uniformly applicable for all categories of subscribers and that a separate benchmark for pre-paid charging complaints of more than 30 days old is not desirable. From the consumer point of view also longer time period for resolution of billing complaints is also not desirable. As such, the Authority has decided to continue the existing benchmark of 100% resolution of billing complaints (for post-paid customers)/ charging complaints (for pre-paid customers) within 4 weeks of making complaint by consumer.

4.9.4 The performance against this parameter is to be measured as per the following formula:

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 4 weeks =

number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 4 weeks during the quarter X 100

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number of billing/charging, credit / validity complaints received during the quarter

4.10 **Period of applying credit/ waiver/ adjustment to customer's account from the date of resolution of complaints**

4.10.1 It was proposed in the consultation paper that all refunds in the form of credit/ waiver/ adjustment to be applied to customers should be made within one week from the date of resolution of the complaint. The comments of the stakeholders are summarized in para (a) to (d) and analysed in the paragraph following thereafter.

(a) Agreed.

(b) We believe that atleast two weeks time should be given to refund all dues

(c) The existing benchmark should continue.

(d) No comment.

The Authority considered the above views of stakeholders and is of the opinion that resolution of billing complaints and refund in the form of credit/ waiver / adjustment are both inter related activities and therefore one week time should be enough for making credit/waiver/adjustment in case billing/ charging complaint is upheld. Thus a billing complaint has to be resolved within four weeks and any credit/waiver/adjustment arising out of resolution of that complaint has to be made to the customer's account within one week of resolution of the complaint and intimation thereto the customer, post-paid/pre-paid. Further, in case of post paid customer the same shall also be reflected in the next bill to be issued.

4.11 **Response Time to the customer for assistance:**

4.11.1 In the consultation paper similar benchmark for this parameter as in the case of basic telephone service (wireline) (refer para 3.11) was proposed. The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

(a) Agreed.

(b) Since market is reacting positively to the need, it is requirement that more stringent benchmarks may not be beneficial.

(c) It is difficult to even meet the existing benchmark; the calls made may be broadly classified into queries and complaints/grievances.

(d) The response time for customer assistance by operator voice to voice should be 2 minutes.

(e) Agreed only with the second proposal.

(f) No comments.

4.11.2 The Authority has considered the above views of stakeholders and has decided that the same parameter and benchmark as in the case of

basic telephone service (wireline) shall be retained for cellular mobile telephone service also. Thus the sub-parameters and benchmark for the parameter "Response time to the customers" are as under:

(i) Accessibility of Call Centre number i.e. % age of calls answered which basically mean that the calls should get connected and answered. The benchmark proposed is minimum 95% calls to be connected successfully and not more than 5% calls shall encounter congestion or busy signal or no reply or any other failure.

(ii) % age of calls answered by operators (voice to voice) within 60 seconds = 90% and not more than 5% calls shall encounter busy signal or no reply or any other failure in getting connected to operator.

4.11.3 The computation of the performance against these parameters and the provision of menu for speaking to the customer care executive/operator in the IVR option menu shall be as given in para-3.11.4.

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4.12 **Closure of mobile telephone/termination of service:**

4.12.1 As in the case of basic telephone service (wireline), it was proposed in the consultation paper as to whether the existing benchmark of within 24 hrs. to be continued or the benchmark should be as per the direction on termination of service or a new benchmark to be considered. The comments of the stakeholders are summarized in para (a) to (f) and analysed in the paragraph following thereafter.

(a) 15 days time from the date of request for termination of service may be given to retain the customer.

(b) Major chargeable services like STD/ISD calls, monthly rentals could be stopped within 48/72 hrs after receiving the customer request.

(c) The operators may be given 10 working days time.

(d) Clarity required for LTV Cards.

(e) It should be alike to existing parameters for basic service.

(f) No comments.

4.12.2 During open house Discussion some of the service providers have suggested 14 days time to be given to address the concerns of the customer for seeking closure and another 7 days for effecting closure. The issues relating to closure/ termination of service are discussed under para 3.10.3 and 3.10.4 in the context of Basic Telephone Service (wireline) and the Authority has decided to prescribe similar benchmarks for both basic telephone service (wireline) and cellular mobile telephone

service i.e. the time period for closure shall not be more than 7 days uniformly for all means of request for termination/ closure of service

4.13 **Time taken for refund of deposits after termination of service:**

4.13.1 In the consultation paper it was proposed to introduce a parameter on time taken for refund of deposits after termination of service and the benchmark proposed was 100% refund within 60 days of request for termination of service. The comments of the stakeholders are summarized in para (a) to (c) and analysed in the paragraph following thereafter.

(a) This parameter is not required.

(b) Agreed but the period of 60 days should start only after 15 days of request of termination of service.

(c) No comment.

4.13.2 In the case of cellular mobile telephone service also 100% refunds of deposits have to be made within 60 days. Any delay in the refund of deposits will attract interest @10% per annum payable to the customer. Here also the deposit includes security deposit and any other refundable deposit taken from the customer. The same benchmark shall also be followed for payment of any other dues payable to the customer after closure/ termination of service. The Authority would also like to clarify that the fact that interest is paid to the customer for delay in payment of dues and does not absolve the service provider from the responsibility of meeting the prescribed benchmark.

5. Customer perception of service for Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service:

5.1 Section 11(1)(b)(v) of the TRAI Act, 1997 provides for the Authority to conduct periodical survey of service provided by the service providers so as to protect the interest of consumers. Keeping in view this mandatory function, the Authority has been conducting customer satisfaction surveys to assess the customer perception of service against the laid down quality of service benchmarks. As per the existing Quality of Service Regulations issued in July 2005 seven parameters have been prescribed for assessing customer perception of service through surveys, both for basic telephone service (wireline) and cellular mobile service. These parameters, with benchmark in bracket, are (i) % satisfied with the provision of service (>95%); (ii) % satisfied with the billing performance (>90%); (iii) % satisfied with help services (>90%); (iv) % satisfied with network performance, reliability and availability (>95%); (v) % satisfied with maintainability (>95%); (vi) overall customer satisfaction (>95%); (vii) customer satisfaction with offered supplementary service % satisfied (>95%).

5.2 There is a direct relationship between Customer Satisfaction and the Quality of Service. The Quality of Service depends on the provider of the service who is responsible for improving and maintaining the network performance and customer care. The Network Performance is the ability of a network or network portion to provide the functions related to communications between users. Similarly, performance in customer care depends on the ability of the service providers to address the consumer complaints and requests in regard to service, including billing.

5.3 Presently the customer perception is assessed through personal and telephonic interviews, based on questionnaire designed for the purpose. The methodology for assessing the customer perception of service based on percentage satisfaction, presently being followed by the Authority, is that the satisfaction level of subscribers is collected on a four point scale of "very satisfied", "satisfied", "dissatisfied" and "very dissatisfied". The responses against each question is analysed and results computed with weightage assigned to the various degree of satisfaction. In the consultation paper an alternate approach based on Mean Opinion Score (MOS) was also proposed.

5.4 The comments of the stakeholders are summarized in para (a) to (q) and analysed in the paragraph following thereafter.

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Parameters and Benchmarks

(a) *Agreed.*

(b) *The surveys may be conducted only when there the Authority ceases to specify the quality benchmarks and requires regular reporting by the service provider.*

(c) *The existing parameters and the benchmarks are too stringent Therefore, we request you to relax the benchmarks. There is no need to introduce a new parameter such as Mean Opinion Score. The weighted satisfaction scores should be retained. Some of the service providers have also suggested that, Percentage satisfied with provision of service & billing performance should be >60%.*

(d) *Percentage satisfied with billing performance and help service should >95% instead of >90%.*

(e) *The benchmark should be incorporated in the PMR to understand the level of satisfaction.*

(f) *The existing benchmark should be retained However, there should be a regulation for imposing punitive damage upon the defaulter service providers and the damage should be distributed to the customers of the particular service provider*

(g) *Mean of scores is a preferred criterion.*

Assessment Methodology

(h) Not agreed, as the weights for each parameter would differ from customer to customer. Further these scores represent ranking or indexing of the service providers which may influence the customer buying behaviour.

(i) The surveys may be conducted only when there the Authority ceases to specify the quality benchmarks and requires regular reporting by the service provider.

(j) Mean of Opinion Score [MoS] is more suited for assessment. An additional / separate parameter relating to GRIEVANCE Redressal Mechanism is required.

(k) The Semantic Differential scale is not an ordinal scale because the statistically correct method of calculation is to present Percentage of respondent falling in each scale descriptor.

(l) Merger not recommended. Existing parameter be retained.

(m) Instead of conducting surveys, drive tests by independent agency and by having end-to-end call quality measurement systems.

(n) Alternative approach of MOS may be introduced to assess the customer satisfaction data.

(o) Assessment of QoS relating to service provider can be made through feedback.

(p) Mean of scores is a better parameter.

(q) No comments.

5.5 Regarding the parameters and their benchmarks for assessing customer perception of service, the service providers are generally in favour of continuing with the existing parameters/benchmarks. From the service providers' side the views include retaining of the existing benchmarks, relaxing the existing benchmarks and for not prescribing any benchmarks. The Authority has observed that in the recent surveys undertaken by the Authority the performance of the service providers had been much below the existing benchmarks for the various parameters for assessing customer perception level. From the experience of the authority in monitoring the performance against these benchmarks the Authority is of the view that it would be very difficult for the service providers to achieve the existing benchmarks, using the weighted average method for computing customer perception level. In this background the Authority has decided to relax the benchmarks for some of the quality of service parameters for assessing customer perception of service and to assess the satisfaction score with the responses satisfied/ very satisfied with the parameters on customer perception of service.

5.6 The different areas leading to customer satisfaction for different parameters for customer perception of service are further explained below:

(a) **Service provision**:

(i) Satisfaction with time taken to provide/ activate working phone connection.

(ii) Satisfaction with the time taken for shifting of telephone.

(iii) Satisfaction with re-activation of service in case of disconnection due to non-payment.

(iv) Satisfaction with ease of understanding the offer or tariff plan.

(b) **Billing/ Charging Performance:**

Post paid:

(i) Satisfaction with the timely receipt of the bill.

(ii) Satisfaction with the accuracy and completeness of the bill.

(iii) Satisfaction with the clarity in bills/ presentation of the billing information in terms of transparency and understandability.

(iv) Satisfaction with the process of resolution of billing complaints.

Prepaid:

(i) Satisfaction with accuracy of charges i.e correctness of the amount deducted on every usage.

(ii) Satisfaction with the credit and validity correctness.

(iii) Satisfaction with the ease and transparency of recharge.

(c) **Network Performance, reliability and the availability:**

(i) Satisfaction with the network coverage (signal strength or availability of telephones connections).

(ii) Satisfaction with the ability to make or receive calls easily.

(iii) Number of call drops experienced during conversation.

(iv) Satisfaction with the voice quality.

(d) **Maintainability:**

(i) Average duration and frequency of network/ exchange outages (signal or dial tone non-availability).

(ii) Satisfaction with the availability of network (signal or telephone dial tone)

(iii) Satisfaction with the restoration of network (signal/ exchange) problems.

(iv) Number and frequency of faults/ problem experienced.

(e) **Supplementary Services/ Value Added Services :**

(i) Satisfaction with process of activation of supplementary/ value added services.

(ii) Satisfaction with ease of messaging (SMS/MMS)

(iii) Satisfaction with the roaming services.

(iv) Satisfaction with the voice mail.

(v) Satisfaction with the quality of the supplementary/ value added services.

(f) **Help services/ customer care (including customer grievance redressal):**

(i) Satisfaction with ease of access of call centre/ customer care or help line

(ii) Satisfaction with the response time taken to answer (waiting time) the call by the customer care executive.

(iii) Satisfaction with the time taken by call centre/ customer care/ help line to resolve the complaint.

(iv) Satisfaction with the problem solving ability of the customer care executive.

(v) Satisfaction with the achievement of a satisfactory solution or resolution of complaint.

(vi) Satisfaction with the overall grievance redressal mechanism.

(g) **Customer Satisfaction with overall service quality:**

Satisfaction with overall quality of total service offering.

5.7 As regards the methodology for assessment of customer perception of service there are mixed responses from stakeholders. While some are in favour of continuing with the weighted satisfaction scores, some are in favour of introducing mean opinion score (MOS) and some of the stakeholders are also of the view that only statistically correct method to adopt is to calculate the percentage of respondents falling in each scale descriptor (i.e. very satisfied, satisfied, dissatisfied and very dissatisfied). The Authority considered the views of the stakeholders on the methodology and has decided to continue with the survey of customers for perception of quality of service on a four point scale descriptor of "very satisfied", "satisfied", "dissatisfied" and "very dissatisfied". However, no weightage shall be assigned to the above four point scale of customer

perception/ responses. For computation of customer satisfaction against the benchmark, only the responses of "very satisfied" and "satisfied" customers shall be taken into account. The acceptability of a service provider's service shall be determined by the percentage of respondents who are "very satisfied" or "satisfied" with the service. For example if the percentage of "very satisfied" and "satisfied" customers with maintainability is 95% or more than it will be considered that the benchmarks for Maintainability parameter is met and service is at acceptable level to customers. The Authority has decided to prescribe the following parameter and their benchmarks accordingly for determining customer perception of service through customer satisfaction surveys.

(a) customers satisfied with the provision of service ≥ 90 %

(b) customers satisfied with the billing performance ≥ 95 %

(c) customers satisfied with network performance, reliability and availability ≥ 95 %

(d) customers satisfied with maintainability ≥ 95 %

(e) customers satisfied with offered supplementary services ≥ 90 %

(f) customers satisfied with help services including customer grievance redressal ≥ 90 %

(g) customers satisfied with overall service quality ≥ 90 %

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5.8 The results of the survey on customer perception of service may be made public by the Authority for the information of the customers to generate healthy competition amongst service providers to improve service.

6. **Record keeping and reporting:**

6.1 In the consultation paper it was proposed that the service provider shall inform TRAI about their record keeping for different Quality of Service parameters. TRAI will study these record keeping procedures and will come out with a uniform record keeping procedure to be adopted by all service providers. It was also proposed to introduce a system of internal auditing by the service providers. As regards reporting of performance against quality of service benchmarks, it was proposed to continue with the present system of quarterly reporting of performance. As regards reporting of POI congestion it was proposed to continue with the monthly reporting of POI congestion. The comments of the stakeholders are summarized in para (a) to (g) and analysed in the paragraph following thereafter.

(a) Agreed with the proposal.

(b) Internal auditing must be organized through chartered accountants and also internal Departments

(c) *Since the information is directly generated by the system, we do not support any separate mechanism for internal auditing.*

(d) *The existing procedure may continue.*

(e) *Uniform record keeping is essential*

(f) *Uniform record keeping procedure be adopted only after the study of the existing record keeping procedure adopted the service providers*

(g) *No comments.*

6.2 The Authority considered the above views of stakeholders and has decided to continue with the existing practice of reporting of performance against quality of service benchmarks through quarterly Performance Monitoring Reports (PMR) and monthly POI congestion reports. The Authority may review and change the reporting formats, from time to time. As regards uniform record keeping procedures, the Authority will prescribe uniform record keeping procedures including guidelines on measurements methodology to be followed by all the service providers after studying the record keeping processes being followed by the various service providers. The Authority at present is not prescribing internal audit mechanism. However, the Authority may audit/ inspect, either directly or through an agency appointed by it the records/ measurement relating to each quality of service parameter and reporting of its performance to the Authority. The Authority may also require the service provider to get the report submitted to the Authority audited at its own cost through independent and qualified agency.

7. Publication of QoS

7.1 It was proposed in the consultation paper to mandate the service providers to publish information relating to their quality of service performance for information of the consumer. Three formats were also proposed for such publication of quality of service. One format is for publishing the quality of service performance of basis service (wireline). Two formats are for publishing quality of service information of cellular mobile telephone service relating to network related parameters and billing & customer care parameters.

7.2 The comments of the stakeholders are summarized in para (a) to (i) and analysed in the paragraph following thereafter.

(a) *Agreed.*

(b) *One more format giving the details about the performance of the consumer's grievance Redressal mechanism should be included.*

(c) *The format specified in the consultation paper would only confuse the consumers, However, the consumer may be informed about the tariff and service.*

(d) *Publishing the parameters on the respective operator's website is not a good option. The data submitted by operators should only be published at one place, i.e. on TRAI website. The operators however can give the link of TRAI website in their websites.*

(e) *TRAI already is uploading QOS performance of operators on its website. Operators may give link to the same from their website. so that customer can see the comparative performance from single chart.*

(f) *QoS standard should be monitored through complaint attended by the service provider.*

(g) *This information will enable customer to make INFORMED decision and discontent will go down.*

(h) *Since the surveys are conducted by TRAI it is the responsibility of TRAI to publish it in the interest of the consumers.*

(i) *No Comments.*

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7.3 The Authority considered the above views of stakeholders and is of the opinion that the service providers are already publishing the terms and conditions of the service, the tariff plans on offer and also provide customer account related information on their website. The customers generally refer the website of its service provider for new tariff plan offer etc. and it would be proper if the information relating to quality of service is also published on the website of each service provider. Hence, in the regulations the Authority has provided for publication of information relating to quality of service by each service provider on their website. The Authority has been publishing summary of Quarterly Performance Monitoring reports, the results of audit and customer satisfaction survey undertaken by the Authority through agencies appointed by it on its website. The Authority may continue to publish such information for information of stakeholders. In addition, the Authority may also publish, licensed service area wise, information relating to comparative performance of service providers against quality of service benchmarks for key parameters

8. **Benchmarking:**

8.1 In the consultation paper it was proposed to introduce two indexes for cellular mobile telephone service, one related to network parameters named Network Service Quality Index (NSQI) and the other index related to customer service named Customer Service Quality Index (CSQI). It was also proposed to introduce a 10 point score for evaluating the performance against each parameter and to give equal weightage to each parameter. The evaluation of performance on each parameter will be based on whether the service provider has achieved the benchmark or not. Wherever the benchmark is achieved a score of 10 points will be

assigned to that parameter. In case the performance on any parameter is below the benchmark, the score in respect of that parameter would be reduced depending on the level of performance. The performances below the benchmark will be assigned 7 points, 4 points and 1 point depending on the level of performance.

8.2 The comments of the stakeholders are summarized in para (a) to (g) and analysed in the paragraph following thereafter.

(a) Agreed.

(b) TRAI may desist from issuing any index or rating for network service quality or customer service quality.

(c) Since the indexing or rating would impact the fair play of the market, TRAI should standardize the process of measurement before proposing such benchmark.

(d) TRAI should standardize the process of measurement in conjunction with the measurement of these indices and there should be online submission of the data.

(e) There should another parameter CPQI (Customer Perceived Quality Index).The ranking will improve contestability in the market and hence provide incentives to operators to improve their service.

(f) Equal weightage to different parameters is not correct.

(g) No Comments.

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8.3 The Authority considered the above views of stakeholders and is of the view that the users need to have information on delivered performances of various service providers so that they can make also informed choice about the service providers, based on quality of service performance. The benchmarking could also benefit the service providers as they could compare their quality of service with that of their competitors and could face competition effectively. However, at this stage when the cellular mobile telephone service is growing exponentially, the Authority feels that benchmarking and assigning of index of quality of service may not be necessary. Hence, for the time being the Authority may publish the comparative performance of quality of service of cellular mobile service providers and standardize the process of measurement and uniform record keeping. This will be reviewed by the Authority in future.

9. **Financial disincentives:**

9.1 Non-compliance with the Quality of Service standards laid down by TRAI amounts to violation of the Quality of Service Regulations of TRAI. For such violation of the regulations, one of the options for the Authority is to take penal action against the service provider under the provisions of the TRAI Act, 1997. These provisions in the TRAI Act are

available in Section 29, 30 and 34 of the TRAI Act, 1997. The various licences for access service provide for imposition of penalty by Department of Telecommunications for violation of license conditions. Since as per the licence conditions the service providers have to meet the Quality of Service standards laid down by TRAI or the licensor, any failure to meet the benchmarks laid down by TRAI for the various Quality of Service parameters amounts to violation of licence conditions and the Department of Telecommunications has powers to impose penalty. The Authority could recommend to the Department of Telecommunications for imposition of penalty for such violation of licence conditions.

9.2 From the experience of TRAI, for imposing penalty for violation of its direction/order/regulation, it is seen that the process takes considerable time and during this process the consumer gets no relief. A delayed action against the service provider is as good as ineffective and the customer is the main sufferer of poor quality of service. The Authority in the case of basic telephone service (wireline) has provided specific monetary compensation to subscribers such as rent rebate in the case of delayed repair of faults, interest on delayed payment of security deposit. However, in the case of Cellular Mobile Telephone Service direct compensation to customers is not a workable proposition. A combination of financial disincentive and penalty could act as a deterrent against poor Quality of Service. The Authority sought the views of stakeholders for introducing a scheme of financial disincentives for enforcing quality of service and also for providing financial disincentives in the case of specific violation of any of the directions/orders/ regulations of the Authority.

9.3 The comments of the stakeholders are summarized in para (a) to (i) and analysed in the paragraph following thereafter.

(a) *Agreed.*

(b) *The cost of bringing up the service to the desired level should be worked out and the service provider should be asked to pay an amount comparable to this cost.*

(c) *In terms of TRAI Act and the provision of UAS license no provisions has been made for the imposition of penalty/financial disincentives therefore, authority cannot impose specified penalty for violation of regulation. The service providers are only required to meet the benchmark specified by the authority. Regarding the time taken under the procedure cannot be a tenable ground for stipulation of penalty.*

(d) *System of DIRECT COMPENSATION to the customer will be more effective and SATISFYING. For continuous failure PENALTY is essential.*

(e) *In the intensely competitive Indian market, where the market forces are working well, The policy of forbearance and intervention in exceptional/isolated cases may be continued.*

(f) *TRAI should encourage operators to come up with their own charter to customers within which they would pledge penalties to customer directly.*

(g) *Comparative report with data regarding not meeting the benchmark published on website of TRAI itself becomes a punishment and lead to churn ,hence financial penalty is not desirable.*

(h) *In case of large deviation between the performances of operators authority can intervene in terms of issuing a direction wherein the operator can be given fixed time to meet the benchmarks instead of penal action.*

(i) *There should be a penalty at the rate of Rs.X per percentage point below the benchmark. That is if the benchmark is 95% and performance is reported at 87% then at the rate of Rs.10,000/- the service provider should be liable to pay a penalty of Rs.80,000/-.*

(j) *No comments.*

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9.4 The Authority considered the above views of service providers and is of the opinion that apart from indirectly addressing Quality of Service through publication of the Quality of Service provided by the service providers thereby enabling the customers to have an informed choice, the imposition of financial disincentives for ensuring Quality of Service is also an option. The Authority has already provided for financial disincentives in the case of unsolicited commercial communication through the Telecom Unsolicited Commercial Communications Regulations, 2007 (4 of 2007). The Authority may consider issuing similar regulations, separately, for imposing financial disincentives to ensure the compliance of quality of service regulations, after detailed analysis of the performance of service providers once these regulations are implemented.

TO BE PUBLISHED IN THE GAZETTE OF INDIA,
EXTRAORDINARY, PART III, SECTION 4

TELECOM REGULATORY AUTHORITY OF INDIA

NOTIFICATION

NEW DELHI, THE 07TH MAY, 2012

THE STANDARDS OF QUALITY OF SERVICE OF BASIC TELEPHONE SERVICE (WIRELINE) AND CELLULAR MOBILE TELEPHONE SERVICE (AMENDMENT) REGULATIONS, 2012 (10 OF 2012)

F. No. 305-8/2012-QOS.--- In exercise of the powers conferred upon it under section 36, read with sub-clauses (i) and (v) of clause (b) of sub-section (1) of section 11 of the Telecom Regulatory Authority of India Act, 1997(24 of 1997), the Telecom Regulatory Authority of India hereby makes the following regulations to amend the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009), namely:-

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1. (1) These regulations may be called the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Amendment) Regulations, 2012.

(2) They shall come into force from the date of their publication in the Official Gazette.

2. In sub-regulation (1) of regulation 2 of the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7of 2009) (hereinafter referred to as the principal regulations),-----

(a) for clause (f), the following clause shall be substituted, namely:-

"(f) **"Cellular Mobile Telephone Service"** –

(i) means telecommunication service provided by means of a telecommunication system for the conveyance of messages through the agency of wireless telegraphy where every message that is conveyed thereby has been, or is to be, conveyed by means of a telecommunication system which is designed or adapted to be capable of being used while in motion;

(ii) refers to transmission of voice or non-voice messages over Licensee's Network in real time only but service does not cover broadcasting of any messages, voice or non-voice, however, Cell Broadcast is permitted only to the subscribers of the service;

(iii) in respect of which the subscriber (all types, pre-paid as well as post-paid) has to be registered and authenticated at the network point of registration and approved numbering plan shall be applicable;

(iv) includes access service provided through Global System for Mobile Communications (GSM) and Code Division Multiple Access (CDMA) technologies and any other technologies permitted under the CMTS or UASL licence;"

(b) after clause (l), the following clause shall be inserted, namely:-

"(la) **"Node B"** means a logical node responsible for radio transmission or reception in a cell to or from the User Equipment;"

(c) after clause (r), the following clauses shall be inserted, namely:-

"(ra) **"Radio Access Bearer"** or **"RAB"** means a service provided by the Access Stratum to the Non-Access Stratum for the transfer of user data between the User Equipment and the Core Network;

(rb) **"Radio interface"** means the interface between User Equipment and the Universal Terrestrial Radio Access Network access point, which encompasses all the functionality required to maintain such interfaces;

(rc) **"Radio Resource Control"** or **"RRC"** means a sub layer of radio interface Layer 3 existing in the control plane which provides information transfer service to the Non-Access Stratum and is responsible for controlling the configuration of radio interface Layers 1 and 2;"

3. In sub-regulation (1) of regulation 5 of the principal regulations, in the table under the column 'Name of Parameter',.....

(a) Against serial number A (i) below the parameter 'Network Availability',....

(i) in item number (a), after the word "BTSs", the words "and Node Bs" shall be inserted;

(ii) in item number (b), after the word "BTSs", the words "and Node Bs" shall be inserted;

(b) against serial number A (ii) below the parameter 'Connection

Establishment (Accessibility)',……

(i) in item number (b), after the words "Paging Channel", the words "and RRC" shall be inserted;

(ii) in item number (c), after the word "TCH" the words "and Circuit Switched RAB" shall be inserted;

(c) against serial number A (iii) below the parameter 'Connection Maintenance (Retainability)',……

(i) in item number (a), after the word "Drop", the words "and Circuit Switched Voice Drop" shall be inserted;

(ii) in item number (b), after the bracket and words "(call drop)", the words "and Circuit Switched Voice Drop" shall be inserted;

(iii) in item number (c), after the word "quality", the words "and Circuit Switched Voice Quality" shall be inserted.

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(Rajeev Agrawal)
Secretary

Note 1. -- The principal regulations were published in the Gazette of India, Extraordinary, Part III, Section 4 dated the 20th March, 2009 vide notification number No. 305-25/2008-QoS dated the 20th March, 2009.

Note 2. -- The Explanatory Memorandum explains the objects and reasons of the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Amendment) Regulations, 2012.

Explanatory Memorandum

TRAI has laid down the Quality of Service Standards for Basic Telephone Service (wireline) and Cellular Mobile Telephone Service through the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009. These regulations contain the Quality of Service parameters for Cellular Mobile Telephone Service. These parameters were prescribed keeping in view the 2G networks deployed by the service providers. Since the service providers are also providing 3G services currently, the Authority is of the view that for voice service provided by the 3G Networks the existing network related Quality of Service parameters shall suffice, except that the nomenclature for some of the terms used in the existing regulations and the measurement methodologies need to be amended. Accordingly, the network related Quality of Service parameters specified in the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 have been amended in these regulations to cater to 3G Networks. The definitions and measurement methodologies for these parameters are given below:

(a) **BTSs and Node Bs Accumulated downtime (not available for service):** The existing parameter BTSs Accumulated downtime (not available for service) measure non availability of BTSs. In the case of 3G networks, instead of BTS the nomenclature is Node B. The measurement methodology for the parameter Node B Accumulated downtime (not available for service) will be similar to the existing parameter for BTSs Accumulated downtime (not available for service).

(b) **Worst affected BTSs and Node Bs due to downtime:** This parameter is also similar to the existing parameter "Worst affected BTSs due to downtime". This parameter also provides for assessment of worst affected Node Bs due to downtime in 3G Networks. The same measurement methodology for measuring the parameter worst affected BTSs due to downtime shall be used for measuring worst affected Node Bs.

(c) **Call Set-up Success Rate:** This parameter is same for 2G Networks as well as 3G Networks. However, the network elements involved in both the networks are different. Call Set-up Success Rate is defined as the ratio of Established Calls to Call Attempts. For establishing a call in 3G Networks, User Equipment (UE) accesses the Universal Terrestrial Radio Access Network (UTRAN) and establishes an RRC connection. Once RRC connection is established the Non Access Stratum (NAS) messages are exchanged between the UE and the Core Network (CN). The last step of the call setup is the establishment of a Radio Access Bearer (RAB) between the CN and the UE. However, any RAB abnormal release after RAB Assignment Response or Alerting/Connect message is to be considered as a dropped call.

(d) **SDCCH/Paging Channel and RRC Congestion:** This is same as signaling channel congestion in 2G Networks. The existing parameter provides for

assessment of the SDCCH congestion in GSM network and Paging Channel congestion in CDMA network. This parameter has been amended to include RRC Congestion in 3G Networks.

(e) **TCH and Circuit Switched RAB Congestion:** This parameter is same as Traffic Channel congestion in 2G Networks. The existing parameter provides for assessment of Traffic Channel Congestion. Circuit Switched RAB congestion is similar to Traffic Channel Congestion. Therefore, the existing parameter has been amended to include RAB congestion in 3G Networks.

(f) **Call Drop and Circuit Switched Voice Drop Rate:** The Call Drop Rate measures the inability of Network to maintain a call and is defined as the ratio of abnormal speech disconnects with respect to all speech disconnects (both normal and abnormal). In 3G Networks, a normal disconnect is initiated from the Mobile Switching Centre (MSC) at completion of the call by a RAB Disconnect message. An abnormal RAB disconnect can be initiated by either UTRAN or CN and includes Radio Link Failures, Uplink (UL) or Downlink (DL) interference or any other reason. The Circuit Switched Voice Drop Rate (CSV Drop Rate) is given by the following equation:

CSV Drop Rate =

$$100*\left[1-\left(\frac{\#RAB\ Normal\ \mathrm{Re}lease(CSV)}{\#RABNormal\ \mathrm{Re}lease(CSV)+\#RABAbnormal\ \mathrm{Re}lease(CSV)}\right)\right]$$

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The key performance indicator terms associated with CSV drop are defined in the table given below.

Key Performance Indicator Term	Definition
#RAB Normal Release(CSV)	Number of voice RAB normally released
#RAB Abnormal Release(CSV)	Number of voice RAB abnormally released

The total number of established calls shall include the number of TCH/ RAB assignment in a cell for establishment of new call + number of TCH/RAB assigned for incoming handover – number of TCH/RAB made free for outgoing handovers.

(g) **Worst affected cells having more than 3% TCH drop (call drop) and Circuit Switched Voice Drop Rate:** This parameter is similar to the existing parameter for 2G networks "Worst affected cells having more than 3% TCH (call drop) Rate. The existing parameter has been amended to cover 3G Networks to assess worst affected cells having more than 3% CSV Drop Rate. The formula for calculating the Percentage of worst affected cells having more than 3% CSV Drop Rate is given by the following equation:

Percentage of worst affected cells having more than 3% CSV Drop Rate =

$$\left(\frac{\begin{array}{c}\textit{No. of worst affected cells having CSV drop rate >3\% during Cell Bouncing} \\ \textit{Busy Hour (CBBH) in a month}\end{array}}{\textit{Total No. of cells in the licensed service area}} \right) * 100$$

(h) **Connections with good voice quality and Circuit Switch Voice Quality (CSV quality):** This parameter denotes the quality of the voice carried by the network. In 3G Networks, the voice quality could be affected due to higher than permissible block errors either in the uplink direction or in downlink direction. The dedicated radio links may be broken because of block error rate which may get reactivated after a gap of around 6 seconds because of RRC Cell Update. The experience of the customer will be based on the type of service being used. Frequent problems shall significantly influence customer satisfaction. The CSV quality is measured using the following equation:

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CSV quality=100*

$$\left[1 - \left(\frac{\#\,Faulty\,Transport\,Blocks\,In\,Uplink\,/\,downlink\,After\,SelectionCombining\,(Speech)}{\#\,TotalTransport\,Blocks\,In\,Uplink\,/\,downlinkAfter\,SelectionCombining\,(Speech)} \right) \right]$$

The key performance indicator terms associated with CSV quality are defined in the table given below:

Key Performance Indicator Term	**Definition**
#Faulty Transport Blocks in Uplink/downlink after Selection Combining (Speech)	Number of faulty Uplink/downlink DCH transport blocks for speech after selection and combining. Sampling period shall be every 10 (ten) seconds.
#Total Transport Blocks in Uplink/downlink after Selection Combining (Speech)	Total number of Uplink/downlink DCH transport blocks for speech after selection and combining. Sampling period shall be every 10 (ten) seconds.

The key performance indicator of CSV quality shall be measured at 1% BLER operating point set in UTRAN for Voice call.

(i) **Point of Interconnection (POI) Congestion:** This parameter denotes congestion at the outgoing traffic between two networks and is equally applicable for 2G networks and 3G networks.

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EXTRAORDINARY, PART III, SECTION 4

TELECOM REGULATORY AUTHORITY OF INDIA

NOTIFICATION

NEW DELHI, THE 8TH NOVEMBER, 2012

F. NO. 305-8/2012-QOS.----- In exercise of the powers conferred upon it under section 36, read with sub–clauses (i) and (v) of clause (b) of sub-section (1) of section 11 of the Telecom Regulatory Authority of India Act, 1997 (24 of 1997), the Telecom Regulatory Authority of India hereby makes the following regulations further to amend the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009), namely:-

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THE STANDARDS OF QUALITY OF SERVICE OF BASIC TELEPHONE SERVICE (WIRELINE) AND CELLULAR MOBILE TELEPHONE SERVICE (SECOND AMENDMENT) REGULATIONS, 2012 (24 OF 2012)

1. (1) These regulations may be called the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Second Amendment) Regulations, 2012.
(2) They shall come into force with effect from 1st January 2013.
2. After regulation 3 of the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (hereinafter referred to as the principal regulations), the following regulation shall be inserted namely:- "**3A : Consequences for failure of basic service providers to meet the Quality of Service benchmarks.-** (1) If a basic telephone service

provider fails to meet the Quality of Service benchmarks specified under sub-regulation (1) of regulation 3, it shall, without prejudice to the terms and conditions of its licence, or the Act or rules or regulations or orders made, or, directions issued, thereunder, be liable to pay an amount, by way of financial disincentive, not exceeding rupees fifty thousand per parameter, as the Authority may, by order, direct :

Provided that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the basic telephone service provider has been given a reasonable opportunity of representing against the contravention of the regulation observed by the Authority.

(2) If the compliance report furnished by a basic telephone service provider under sub-regulation (2) of regulation 3 is false and which such service provider knows or believes to be false or does not believe to be true, it shall, without prejudice to the terms and condition of its licence, or the Act or rules or regulations or orders made, or, directions issued thereunder, be liable to pay an amount, by way of financial disincentive, not exceeding rupees ten lakh per parameter for which such false report has been furnished, as the Authority may, by order, direct:

Provided that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the basic telephone service provider has been given a reasonable opportunity of representing against the contravention of the regulation, observed by the Authority.

(3) The amount payable by way of financial disincentive under these regulations shall be remitted to such head of account as may be specified by the Authority."

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3. After regulation 5 of the principal regulations, the following regulation shall be inserted, namely:-

"**5A. Consequences for failure of cellular mobile telephone service providers to meet the Quality of Service benchmarks**.- (1) If a cellular mobile telephone service provider fails to meet the benchmark of parameter specified under serial number **A** of sub-regulation (1) of regulation (5), it shall, without prejudice to the terms and conditions of its licence, or the Act or rules or regulations or orders made, or directions issued, thereunder, be liable to pay an amount, by way of financial disincentive, not exceeding rupees fifty thousand per parameter and in case of second or subsequent such contravention, to pay an amount not exceeding rupees one lakh per parameter for each contravention, as the Authority may, by order, direct:

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Provided that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the cellular mobile telephone service provider has been given a reasonable opportunity of representing against the contravention of the regulation observed by the Authority.

(2) If a cellular mobile telephone service provider fails to meet the benchmark of parameter specified under serial number **B** of sub-regulation (1) of regulation (5), it shall, without prejudice to the terms and conditions of its licence, or the Act or rules or regulations or orders made, or, directions issued, thereunder, be liable to pay an amount, by way of financial disincentive, not exceeding rupees fifty thousand per parameter, as the Authority may, by order, direct:

Provided that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the cellular

mobile telephone service provider has been given a reasonable opportunity of representing against the contravention of the regulation observed by the Authority.

(3) If the compliance report furnished by a cellular mobile telephone service provider under sub-regulations (2) of regulation 5 is false and which such service provider knows or believes to be false or does not believe to be true, it shall, without prejudice to the terms and conditions of its license, or the Act or rules or regulations or orders made, or, directions issued thereunder, be liable to pay an amount, by way of financial disincentive, not exceeding rupees ten lakh per parameter for which such false report has been furnished, as the Authority may, by order, direct:

Provided that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the cellular mobile telephone service provider has been given a reasonable opportunity of representing against the contravention of the regulation observed by the Authority.

(4) The amount payable by way of financial disincentive under these regulations shall be remitted to such head of account as may be specified by the Authority."

4. After regulation 9 of the principal regulations, the following regulation shall be inserted, namely:-

"9A. Consequences for failure of the service providers to submit compliance report.-(1) If a service provider contravenes the provisions of regulation 9, it shall, without prejudice to the terms and conditions of its licence, or the provisions of the Act or rules or regulations or orders made, or, directions issued, thereunder, be liable to pay an amount, by way of financial disincentive, not exceeding rupees five thousand for every day during which the default continues, as the Authority may, by order, direct:

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Provided that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the service provider has been given a reasonable opportunity of representing against the contravention of the regulation observed by the Authority.

(2) The amount payable by way of financial disincentive under these regulations shall be remitted to such head of account as may be specified by the Authority."

(Rajeev Agrawal)

Secretary

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Note.1.--- The principal regulations were published in the Gazette of India, Extraordinary, Part III, Section 4 dated the 20th March, 2009 vide notification number No. 305-25/2008-QoS dated the 20th March, 2009.

Note.2.--- The principal regulations were amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone service (Amendment) Regulations, 2012 (10 of 2012) dated the 7th May, 2012.

Note.3.--- The Explanatory Memorandum explains the objects and reasons of the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Second Amendment) Regulations, 2012 (24 of 2012).

Explanatory Memorandum

TRAI has laid down the Quality of Service standards for Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service through the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) dated the 20th March 2009. These regulations were amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone service (Amendment) Regulations, 2012 (10 of 2012) dated the 7th May, 2012. As part of compliance to these regulations the Monthly/Quarterly Performance Monitoring Reports are received from service providers. TRAI also conducts periodic survey through independent agencies across the country, to monitor the compliance of prescribed standards/benchmarks. Analysis of these reports of several past quarters reveals that some of the service providers are repeatedly not meeting the quality of service benchmarks for some of the prescribed parameters and no consistent improvement is noticed in spite of the measures taken by TRAI. Therefore, there is a need to provide for financial disincentives for failure to meet the Quality of Service benchmarks.

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2. TRAI had earlier considered the issue of imposing financial disincentives for ensuring Quality of Service, in pursuance of the Consultation Paper issued on 18th December, 2008. It was decided that the Authority may consider issuing regulation, separately, similar to the Telecom Unsolicited Commercial Communication Regulations, 2007 (4 of 2007), for imposing financial disincentives to ensure the compliance of quality of service regulations, after detailed analysis of the performance of service providers once the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 are implemented.

3. Keeping in view the above provisions in para 9.4 of the Explanatory Memorandum to the above Quality of Service Regulations, the need to ensure the quality of service provided by the service providers and to protect the interests of the consumers by making these regulations more effective, it is felt

that there is a need to amend the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) dated the 20th March, 2009 to introduce financial disincentive in relation to the performance of service providers with regard to the Quality of Service benchmarks so as to strengthen the effectiveness and compliance of the said regulations.

4. The draft second amendments to the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) on financial disincentives were released on 27.08.2012, seeking the comments of the stakeholders. Some of the stakeholders have stated that Telecom Regulatory Authority of India Act, 1997 does not confer upon the Authority power to impose penalty in the form of financial disincentives. In this context, it is stated that the TRAI Act confers power on the Authority not only to regulate but also to ensure the compliance of the provisions of the regulations. The word "ensure" has mandatory connotation, it means "make certain". Furthermore, the Hon'ble Supreme Court, in its judgment dated the 17, Aug, 2007, in Civil Appeal No. 2104/2006 (Central Power Distribution Co. & Ors Vs. CERC & Anr), inter-alia, held that "it is well settled that a power to regulate includes within it power to enforce". It will not be out of place to mention that there are a catena of judgments by the Supreme Court wherein the Hon'ble Court has repeatedly re-stated the proposition that legislation should be read and interpreted so as to further the purpose of its enactment and not in a manner that derogates from its main objectives. The Hon'ble Supreme Court in its judgment in the case of State of Karnataka Vs. Vishwabharthi House Building Co-operative Societies and Ors. [(2004) 5 SCC 430], quoted with approval the judgment of Hon'ble Guwahati High Court in the case of Arbind Das Vs. State of Assam & Ors. [AIR 1981 Gau 18 (FB)] wherein it was inter-alia, held that where a statute gives a power, such power implies that legitimate steps may be taken to exercise that power even though these steps may not be clearly spelt out in the statute. The Hon'ble

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Court further held that in determining whether a power claimed by a statutory authority can be held to be incidental or ancillary to the powers specially conferred by the statute, the court must not only see whether the power may be derived by reasonable implication from the provisions of the statute, but also whether such powers are necessary for carrying out the purposes of the provision of the statute which confers power on the Authority in exercise of such powers. The relevant part of the said judgment reads as under:-

"We are of firm opinion that where a statute gives a power, such power implies that all legitimate steps may be taken to exercise that power even though these steps may not be clearly spelt in the statute. Where the rule-making authority gives power to certain authority to do anything of public character, such authority should get the power to take intermediate steps in order to give effect to the exercise of the power in its final step, otherwise the ultimate power would become illusory, ridiculous and inoperative which could not be the intention of the rule-making authority.

In determining whether a power claimed by the statutory authority can be held to be incidental or ancillary to the powers expressly conferred by the statute, the court must not only see whether the power may be derived by reasonable implication from the provisions of the statute, but also whether such powers are necessary for carrying out the purpose of the provisions of the statute which confers power on the authority in its exercise of such power."

In view of the above, the Authority has power to impose financial disincentives on the service providers for non-compliance of the provisions of the Regulations. Keeping in view the comments received from the stakeholders, the meeting held with the service providers on their request and the need to ensure compliance with the Quality of Service regulations, these regulations have been formulated.

5. The Authority will monitor the Quality of Service reported by service providers subsequent to the coming into force of these regulations from the

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point of view of non-compliance with the benchmarks and accordingly impose financial disincentive. In case the benchmark for any of the network quality of service parameter for Cellular Mobile Telephone Service e.g. call drop rate benchmark ≤2%, is not met by an operator in the first quarter after coming into force of these regulations financial disincentive not exceeding Rs.50000/- shall be imposed. In case in any of the subsequent quarters the benchmark for the same parameter i.e. call drop rate benchmark ≤2% is not met, financial disincentive not exceeding Rs.1 lakh will be imposed by the Authority.

6. Similarly, in case the benchmark for any of the Basic Telephone Service (Wireline) or customer service quality parameter for Cellular Mobile Telephone Service e.g. termination/closure of service benchmark ≤7 days, is not met by an operator in any quarter after coming into force of these regulations financial disincentive not exceeding Rs.50000/- shall be imposed on each instance of non-compliance with the benchmark.

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7. In order to deter service providers from giving deliberate false reports to TRAI, financial disincentive, not exceeding rupees ten lakh per parameter for such false report has been provided in the regulations. Also, to ensure that the service providers submit the report in time, financial disincentive has been prescribed.

TO BE PUBLISHED IN THE GAZETTE OF INDIA, EXTRAORDINARY, PART III, SECTION 4

TELECOM REGULATORY AUTHORITY OF INDIA

NOTIFICATION

New Delhi, the 21 August, 2014

F. No. 305-01/2014-QoS.----- In exercise of the powers conferred upon it under section 36, read with sub-clauses (i) and (v) of clause (b), of sub-section (1) of section 11 of the Telecom Regulatory Authority of India Act, 1997 (24 of 1997), the Telecom Regulatory Authority of India hereby makes the following regulations further to amend the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009), namely: -

THE STANDARDS OF QUALITY OF SERVICE OF BASIC TELEPHONE SERVICE (WIRELINE) AND CELLULAR MOBILE TELEPHONE SERVICE (THIRD AMENDMENT) REGULATIONS, 2014 (12 OF 2014)

1. (1) These regulations may be called the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Third Amendment) Regulations, 2014.

(2) They shall come into force from the date of their publication in the Official Gazette.

2. In regulation 3 of the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) (hereinafter referred to as the principal regulations), in sub-regulation (1), in the table, -

(a) under the column 'Benchmark', ---

(i) against serial number (i), for the character and figure " ≤ 5 ", the character and figure " ≤ 7 ", shall be substituted;

(ii) against serial number (ii), ---

(A) under the heading "For urban areas", for the words, character and figures "By next working day: ≥ 90% and within 3 days: 100%", the character, figures and words "By next working day: ≥ 85% and within five days: 100%" shall be substituted;

(B) under the heading "For rural and hilly areas", for the words, character and figures "By next working day: ≥ 90% and within 5 days: 100%', the characters, figures and words "By next working day: ≥ 75% and within 7 days: 100%" shall be substituted;

(iii) against serial number (iii), for the character, figure and letters " ≤ 8 Hrs", the character, figure and letters " ≤ 10 hours" shall be substituted;

(iv) (a) against serial number (viii), for the figures, character and words "100% within 4 weeks", the figures, character and words " ≥ 98% within four weeks and 100% within six weeks" shall be substituted;

(b) against serial number (iv), the entries appearing under the columns 'Name of Parameter', 'Benchmark', and 'Averaged over a period' shall be deleted;

(c) against serial number (x), ---

(i) under the column 'Name of Parameter', in parameter (b), for the figure and word "60 seconds", the words "ninety seconds" shall be substituted;

(ii) against parameter (b), under the column 'Benchmark', for the character and figures " ≥ 90%", the character and figures " ≥ 95% " shall be substituted;

3. In regulation 5 of the principal regulations, in sub-regulation (1), in the table, ---

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IndiaCode

(a) against serial number (vii), under the column 'Benchmark', for the figure, character and words "100% within 4 weeks", the figure, character and words " ≥ 98% within four weeks and 100% within six weeks" shall be substituted;

(b) against serial number (viii), ---

(i) under the column 'Name of Parameter', in parameter (b), for the figure and words "60 seconds", the words "ninety seconds" shall be substituted;

(ii) under the column 'Benchmark', against parameter (b), for the characters and figure " ≥ 90%", the characters and figure " ≥ 95%" shall be substituted;

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Note.1. —The principal regulations were published in the Gazette of India, Extraordinary, Part III, Section 4 dated the 20th March, 2009 vide notification number No. 305-25/2008-QoS dated the 20th March, 2009.

Note.2. —The principal regulations were amended by issuing The Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Amendment) Regulations, 2012 (10 of 2012) dated 7th May, 2012.

Note.3. —The principal regulations were further amended by issuing The Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Second Amendment) Regulations, 2012 (24 of 2012) dated 8th November, 2012.

Note.4. —The Explanatory Memorandum explains the objects and reasons of the "Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Third Amendment) Regulations, 2014.

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Explanatory Memorandum

1. TRAI has issued benchmarks for various parameters pertaining to wire line services being provided to telecom customers by telecom service providers(TSPs) under the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009). These parameters have been decided through a consultation process, taking various factors into the consideration. These regulations were further amended by "The Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Amendment) Regulations, 2012" on 7th May 2012 to address the Quality of Service requirements for 3G mobile services. The Authority, through the second amendment to these regulations issued on 8th November, 2012 has prescribed the financial disincentives to be imposed on TSPs for not meeting the benchmarks specified, delay or failure in submission of reports and in case of false reporting.

2. The Authority is monitoring the compliance to these benchmarks by various TSPs on periodic basis and has been imposing financial disincentives wherever there had been failure to comply with the benchmarks by various TSPs. From the monitoring of performance of basic TSPs, TRAI has observed that compliance with the benchmarks for the parameters relating to fault incidences, fault repair and response time to the customer for assistance have been a problem area for these operators. Though TRAI has been pursuing with these TSPs to improve their performances, there have been representations from these TSPs to the Authority expressing their inability and practical difficulties in achieving the prescribed benchmarks and requesting the Authority to review the benchmark for some of the parameters.

3. Some of the practical difficulties mentioned by these TSPs include frequent damage to the underground cables due to large scale developmental activities by various civic agencies throughout the country; theft of cables, Pillars and Distribution Points by anti-social elements; delay in restoration of these cable faults due to delay in Right of way (ROW) permission from the civic agencies; old cables like paper core, low insulation problem in jelly filled cables, with multiple joints resulting in service deterioration ; corrosion of cables in coastal areas; law and order problems in some of the areas; and frequent landslides in hilly areas. Other difficulties mentioned by them includes faults due to natural calamities, floods, denial of permission for digging the roads during monsoon season; in some cases due to non-availability of customers in the premises during office hours, the indoor faults persists; in the event of major cable breakdowns, the complaint center is flooded with calls resulting in delayed response.

4. With this background, the Authority is of the opinion that the Quality of services parameters require rationalization, striking a balance with the problems faced by TSPs to ensure better compliance from them and the need to ensure quality of service to wireline customers. After discussing the issue with the service providers, the Authority issued a consultation paper on 21st May 2014 seeking comments from various stakeholders. The stakeholders were requested to send their comments on the consultation paper. The consultation paper and comments received from stake holders were published on website of TRAI.

5. After careful examination of the comments received from various stakeholders on the consultation paper, the Authority observed that the benchmarks for some of the Quality of service parameters are under the control of TSPs and with concerted efforts, the prescribed benchmark can be achieved. However, for some of the parameters, there could be practical and genuine difficulties in achieving the benchmarks as discussed below:

6. **Quality of Service (QoS) Parameters for Basic Telephone Service (Wireline)**

6.1 **Fault incidences (No. of faults/100 subscribers/ month):**

The existing benchmark is ≤ 5%. Some service providers have sought to relax it to ≤ 8% and some of them have sought to relax it to ≤ 10%. The Authority examined this and felt that the difficulties being faced by the TSPs as mentioned in para 3 especially frequent

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cable faults due to various development works, cable thefts, pillar thefts and DP thefts are beyond the control of the TSPs. The Authority, after considering the practical difficulties in achieving the benchmarks and the performance of service providers, has decided to rationalise the benchmark to ≤ 7 %.

6.2 **Fault Repair by next working day:**

The existing Benchmarks are--

For urban areas: By next working day: ≥ 90% and within 3 days: 100%; and **for rural and hilly areas:** By next working day: ≥ 90% and within 5 days: 100%;

In addition to the issues mentioned in para.3, most of the service providers have expressed that working hours for field staff are limited to 5 O'clock in the evening and the work for next day resumes at 10 O'clock in the morning and therefore faults booked during this period are difficult to be attended within the next working day. This will also accumulate the number of faults for further rectification. In some of the cases, the TSPs have stated that for attending indoor faults (within the premises), the non-availability of customers in the premises during office hours pose a challenge. The TSPs have also represented that in some cases the rectification of fault within the prescribed time limit is beyond their control. Most of the service providers have requested to relax the benchmarks as:

For urban areas: By next working day: ≥ 70%; within 3 days: 90%; and within 7 days: 100%;

For rural and hilly areas: By next working day: ≥ 70%; within 3 days: 80%; within 5 days: 90%; and within 15 days: 100%;

The Authority after considering the submissions of the TSPs, practical difficulties in achieving the benchmarks, the performance of TSPs and keeping in view the interests of consumers, has decided to rationalize the benchmarks as below:

For urban areas: By next working day: ≥ 85 %; and 100% within 5 days.

For rural and hilly areas: By next working day: ≥ 75%; and within 7 days: 100%;

Keeping in mind the interest of consumers, while rationalising these benchmarks, TRAI has not made any change to the rent rebate allowed to consumers under these regulations.

6.3 **Mean Time to Repair (MTTR):**

The existing benchmark for mean time to repair is ≤ 8 Hrs. Most of the TSPs have requested relaxing the benchmark to ≤ 12 Hrs. Considering the difficulties being faced by the service provider in rectifying cable fault due to various development civil works, cable thefts, delay in obtaining permission to work at site by civic agencies, non-availability of customers in their premises (for attending indoor faults) and delay in procurement of material etc. and in view of the revised benchmarks for fault repair, the Authority has decided to rationalise the benchmark to ≤ 10 Hrs.

6.4 **(a) Call Completion Rate within a local network shall be better than ≥ 55% or (b) Answer to Seizure Ratio (ASR) should be ≥ 75 %:**

It is noted that most of the wireline exchanges of various TSPs have sufficient capacity because of the exponential rise in the mobile subscription. During the monitoring of quarterly Performance Monitoring Reports it has been observed that there has been no default by any TSPs. Therefore, the Authority has decided that that these parameters shall be monitored by TSPs, but not be mandated for reporting to TRAI.

7. **Quality of Service (QoS) Parameters for both, Basic services (wireline) and cellular mobile telephone services:**

7.1 **Resolution of billing/charging complaints:**

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The existing benchmark for this parameter is 100% of the complaints to be resolved within 4 weeks. During consultation process, TSPs had suggested that this parameter may be revised to 95% within 4 weeks and 100% within 8 weeks. They have emphasized that there might be some stray cases where due to unforeseen reasons there might be delay in resolution of complaints beyond 4 weeks and hence the benchmark of 100% could not be achieved in some instances. The Authority after considering the views of service providers has decided to rationalize the benchmark to ≥ 98% within 4 weeks and 100% within 6 weeks, providing leverage for unforeseen cases.

7.2 **Response time to the customer for assistance, (b) Percentage of calls answered by the operators (voice to voice) within 60 seconds:**

The existing benchmark for this parameter is ≥ 90%. Some of the TSPs had suggested reducing the benchmark to ≥ 60%, on the lines of broadband benchmarks; whereas some TSPs requested for relaxing it to ≥ 80%. There was also a suggestion to revise the parameter as "Percentage of calls answered by the operators (voice to voice) within **90** seconds". The major reason attributed by the TSPs for revising the benchmark for this parameter is because of the many fold increase in call volumes because of increase in customer base. Hence, the TSPs are finding it difficult to respond to the customer for assistance by answering within 60 seconds.

The Authority, after considering the views of stakeholders, has felt that this parameter is very critical for consumer satisfaction and it is largely within the control of the TSPs to achieve the benchmark by augmenting the customer care resources. Considering the level of customer satisfaction with the help services, the Authority has decided to revise the parameter as "Percentage of calls answered by the operators (voice to voice) within 90 seconds" with a more stringent benchmark ≥ 95%. The Authority feels that this will ensure that both the interests of TSPs and consumers are met.

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TELECOM REGULATORY AUTHORITY OF INDIA

NOTIFICATION

NEW DELHI, THE 15th OCTOBER, 2015

THE STANDARDS OF QUALITY OF SERVICE OF BASIC TELEPHONE SERVICE (WIRELINE) AND CELLULAR MOBILE TELEPHONE SERVICE (FOURTH AMENDMENT) REGULATIONS, 2015 (8 OF 2015)

F. NO. 305-25/2014-QoS.----- In exercise of the powers conferred upon it under section 36, read with sub–clauses (i) and (v) of clause (b) of sub-section (1) of section 11, of the Telecom Regulatory Authority of India Act, 1997 (24 of 1997), the Telecom Regulatory Authority of India hereby makes the following regulations further to amend the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009), namely:-

1. (1) These regulations may be called the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Fourth Amendment) Regulations, 2015.

(2) They shall come into force from the date of their publication in the Official Gazette.

2. In regulation 5A of the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009),----

(a) for sub-regulation (1), the following sub-regulation shall be substituted, namely:-

"(1) If a cellular mobile telephone service provider fails to meet the benchmark of parameter specified under sub-regulation (1) of regulation (5), it shall, without prejudice to the terms and conditions of its licence, or the Act or rules or regulations or orders made, or directions issued, thereunder, be liable to pay an amount, by way of financial disincentive, not exceeding rupees one lakh per parameter for the first contravention reported by the service provider in its quarterly report:

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Provided that if the service provider fails to meet the benchmark of the same parameter consecutively in two or more subsequent quarters, he shall be liable to pay, by way of financial disincentives, an amount not exceeding rupees one lakh fifty thousand for the second consecutive contravention and not exceeding rupees two lakhs for each consecutive contravention occurring thereafter;

Provided further that for any failure to meet the benchmark of a parameter, after the service provider has reported compliance of the said parameter in the previous quarter, he shall be liable to pay the financial disincentive for such failure as applicable for the first contravention:

Provided also that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the cellular mobile telephone service provider has been given a reasonable opportunity of representing against the contravention of the regulation observed by the Authority."

(b) sub-regulation (2) shall be deleted.

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Note.1. — The principal regulations were published in the Gazette of India, Extraordinary, Part III, Section 4 dated the 20th March, 2009 vide notification No. 305-25/2008-QoS dated the 20th March, 2009.

Note.2. — The principal regulations were amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Amendment) Regulations, 2012 (10 of 2012) dated the 7th May, 2012.

Note.3. — The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Second Amendment) Regulations, 2012 (24 of 2012) dated the 8th November, 2012.

Note.4. — The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Third Amendment) Regulations, 2014 (12 of 2014) dated the 21st August, 2014.

Note.5. — The Explanatory Memorandum explains the objects and reasons of the "Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Fourth Amendment) Regulations, 2015 (8 of 2015).

Explanatory Memorandum

TRAI has laid down the Quality of Service Standards for Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service through the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) dated the 20th March 2009. To include the QoS benchmarks for 3G services, the regulations were amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone service (Amendment) Regulations, 2012 (10 of 2012) dated the 7th May, 2012.

2. In order to ensure better and effective compliance with the Quality of Service regulations and to protect the interests of consumers, the Authority through the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Second Amendment) Regulations, 2012 (24 of 2012) dated the 8th November, 2012 prescribed financial disincentive on service providers for non-compliance with the quality of service benchmarks, delay in submission of compliance reports and wrong reporting of performance.

3. The regulations provide for financial disincentive on Basic Telephone Service (Wireline) operators for non-compliance with the benchmark for the specified parameters at a rate not exceeding Rs 50,000 per parameter. The regulations prescribed financial disincentive on Cellular Mobile Telephone Service operators for non-compliance with the benchmark for the Network Service Quality Parameters at a rate not exceeding Rs 50,000 per parameter for the first non-compliance and Rs 1,00,000 per parameter for subsequent non-compliance of the benchmarks. The regulations also prescribed financial disincentive on Cellular Mobile Telephone Service operators for non-compliance with the benchmark for the Customer Service Quality Parameters at a rate not exceeding Rs 50,000 per parameter for the non-compliance of the benchmarks. The regulations further provide for a deterrent against false or delayed reporting of the Quality of Service benchmarks.

4. TRAI has been monitoring compliance to these regulations through monthly/ quarterly performance reports submitted by service providers. Wherever non-compliance with the benchmark is observed the service provider is given an opportunity to explain the matter and after considering the reply submitted by the service provider, financial disincentives are imposed on the defaulting service providers. TRAI has analysed the compliance reports of cellular mobile telephone service providers for past several quarters and it is observed that in many cases, the present amount of financial disincentives has not acted as a sufficient deterrent against non-compliance as there have been repeated cases of non-compliance with the benchmarks.

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5. Considering the above and the responses to the draft regulation, the Authority is of the view that there is a need for further strengthening the framework for financial disincentives especially for cases of repeated consecutive non-compliance so as to ensure better compliance with the regulations by cellular mobile telephone service providers. Accordingly, these amendment regulations prescribe increasing financial disincentives for consecutive repeat violations. Also the % of non-compliance in case of customer related parameters are more than that of network related parameters. Hence the Authority has decided to impose identical structure of financial disincentives in both cases. The Authority feels that these measures will act as a sufficient deterrent against prolonged non-compliance and will further improve the quality of service in a time bound manner.

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EXTRAORDINARY, PART III, SECTION 4

TELECOM REGULATORY AUTHORITY OF INDIA

NOTIFICATION

NEW DELHI, 18th AUGUST, 2017

THE STANDARDS OF QUALITY OF SERVICE OF BASIC TELEPHONE SERVICE (WIRELINE) AND CELLULAR MOBILE TELEPHONE SERVICE (FIFTH AMENDMENT) REGULATIONS, 2017 (4 of 2017)

F. No. 304-2/2016-QoS.....In exercise of the powers conferred upon it under section 36, read with sub-clauses (i) and (v) of clause (b) of sub-section (1) of section 11, of the Telecom Regulatory Authority of India Act 1997 (24 of 1997), the Telecom Regulatory Authority of India hereby makes the following regulations further to amend the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009), namely: -

1. (1) These regulations may be called the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Fifth Amendment) Regulations, 2017 (4 of 2017);

   (2) They shall come into force with effect from the 1st day of October 2017.

2. In sub-regulation (3) of regulation 1 of the Standards of Quality of Service Basic Telephone Service (wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) (hereinafter referred to as the principal regulations), after clause (iii), the following clause shall be inserted:-

   "(iv) Access Services authorized under Unified License (UL)";

3. In sub-regulation (1) of regulation 2 of the principal regulations,

   (a) after clause (a), the following clause shall be inserted:-

   "(aa) Access Services Authorization under Unified License (UL)

   (i) means collection, carriage, transmission and delivery of voice and/or non-voice messages over Licensee's network in the designated Service Area.

   (ii) The Licensee can also provide Internet Telephony, Internet Services including IPTV, Broadband Services and triple play i.e. voice, video and data.

   (iii) While providing Internet Telephony service, the Licensee may interconnect Internet Telephony network with PSTN/PLMN/GMPCS network. The Licensee may provide access service, which could be on wireline and / or wireless media with full mobility, limited mobility and fixed wireless access";

   (b) after clause (b), the following clause shall be inserted:-

   "(ba)**"Base Station" or "BS"** means a network element in a radio access network that is responsible for radio transmission and reception in one or more Cells to or from the user equipment and it includes BTS, Node B and eNode B;

   (bb) **"Base Transceiver Station" or "BTS"** means a Base Station in a GSM or CDMA based radio access network technology";

   (c) for clause (d), the following shall be substituted:-

   "(d) **"Cell"** means an area of radio coverage identified by a Cell Global Identity or CGI";

   (d) after clause (e), the following clauses shall be inserted:-

   "(ea) **"Cell Identity" or "CI"** means identity of a cell which is unique within a Location Area(LA) or a Tracking Area (TA)";

   (eb) **"Cell Global Identity" or "CGI"** means the Globally Unique Identification of a cell and is the concatenation of the Mobile Country Code (MCC), Mobile Network Code (MNC), Location Area Code(LAC) or Tracking Area Code (TAC) and the Cell Identity (CI)";

   (ec) **"Cell_Q(t)" or "Cell Quality of Service Performance Measure for DCR Parameter"** means the tth

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IndiaCode

percentile value in the set of DCR values corresponding to a Cell observed during the assessment period";

(ed) **"Cell_Q(90)"** means Cell_Q(t) with t=90 and indicates the 90th percentile DCR value in the set of DCR values observed for a Cell in the assessment period;

Explanation: If a Cell was operating for ninety days during an assessment period and computed DCR values were available for all these ninety days then arranging these ninety DCR values in ascending order and finding 90th percentile DCR value for that Cell would point to 81st DCR value (counted from lowest to highest DCR value). This Cell_Q(90) DCR value will be the representative DCR value for calculation of Spatial Distribution Measure of that Cell during that assessment period";

(e) sub-clause (iv) of clause (f) shall be substituted by the following:-

"(iv) includes any service provided through Global System for Mobile Communications (GSM), Code Division Multiple Access (CDMA), Wideband CDMA based Universal Terrestrial Radio Access Network (UTRAN), Evolved Universal Terrestrial Radio Access Network (E-UTRAN) based on Long Term Evolution (LTE) technologies and any other technologies permitted under the CMTS or UASL or UL";

(f) after clause (h), the following clauses shall be inserted:-

"(ha)**"Day_Q(s)" or "Network Quality of Service Performance Measure on a Day for DCR Parameter"** means the sth percentile DCR value in the set of DCR values of all cells of the network on a particular day;

(hb) **"Day_Q(97)"** means Day_Q(s) with s=97 and indicates the 97th percentile DCR value in the set of DCR values of all Cells of the network on a particular day;

Explanation: If ten thousand cells were operating in a network on a particular day and computed DCR values were available for all these ten thousand cells then arranging these ten thousand DCR values in ascending order and finding the 97th percentile DCR value would point to the 9700th DCR value (counted from lowest to highest). This Day_Q(97) value will be the representative DCR value for calculation of Temporal Distribution Measure of the network on that day;

(hc) **"Drop Call Rate" or "DCR"** means the percentage of voice calls which once having been established are interrupted prior to their normal completion;

(hd) **"eNode B" or "evolved Node B" or "eNB"** means a Base Station that acts as a logical node in Evolved Universal Terrestrial Radio Access Network (E-UTRAN) based on Long Term Evolution (LTE) technology";

(g) after clause (j), the following clause shall be inserted:-

"(ja) **"Location Area" or "LA"** means an area in which a mobile station may move freely without updating the Visitor Location Register (VLR) and includes one or several cells in GSM or CDMA or UTRAN Network;

(jb) **"Location Area Code" or "LAC"** means a number of fixed length identification number (of 2 octets) used for identifying a Location Area (LA) within a Public Land Mobile Network (PLMN)";

(h) clause (la) shall be substituted by the following:-

""**Node B"** means a Base Station that acts as a logical node in a Universal Terrestrial Access Network (UTRAN) based on Wideband CDMA (WCDMA) technology";

(i) after clause (la), the following clause shall be inserted:-

"(lb) **"Network_Q_{SD}(s,t)" or "Network Quality of Service (QoS) DCR Spatial Distribution Measure"** means the sth percentile value in the set of Cell_Q(t) values for all cells in a network during the assessment period;

Explanation: Network_Q_{SD}(s,t) is a representative DCR spatial distribution value for the entire network during the assessment period and indicates that Cell_Q(t) value of at-least s% of the cells were equal to or lower than the Network_Q_{SD}(s,t) value;

(lc)**"Network_Q_{SD}(90,90)"** means Network_Q_{SD}(s,t) with s=90 and t=90, and indicates 90th percentile value of Cell_Q(90) values of all cells in the network;

Explanation: Network_Q_{SD}(90,90) value is a representative DCR spatial distribution value for the entire network during the assessment period indicating that Cell_Q(90) value for at-least 90% of the Cells were equal

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नई दिल्ली-110002/New Delhi-110002

to or lower than the Network_Q_{SD}(90,90) value. For example, if a network was operating with ten thousand cells on ninety days during the assessment period then Network_Q_{SD}(90,90) value will be the 90th percentile Cell_Q(90) value out of the available ten thousand Cell_Q(90) values;

(ld) **"Network_Q_{TD}(s,t)" or "Network Quality of Service(QoS) DCR Temporal Distribution Measure"** means the t^{th} percentile value in the set of Day_Q(s) values for a network on all days in the assessment period;

Explanation: Network_Q_{TD}(s,t) is a representative DCR temporal distribution value for the entire network during the assessment period which indicates that the Day_Q(s) value for at-least t% of the days during the assessment period were equal to or lower than the Network_Q_{TD}(s,t) value;

(le) **"Network_Q_{TD}(97,90)"** means Network_Q_{TD}(s,t) with s=97 and t=90, it indicates 90th percentile value of Day_Q(97) values of network on all days in the assessment period;

Explanation: Network_Q_{TD}(97,90) is a representative DCR temporal distribution value for the entire network during the assessment period indicating that the Day_Q(97) values of the network for at-least 90% of the days of the assessment periodwere equal to or lower than the Network_Q_{TD}(97,90) value. For example, if a network was operating with ten thousand cells for ninety days during the assessment period, then the Network_Q_{TD}(97,90) value will be the 90th percentile Day_Q(97) value out of available ninety Day_Q(97) values;

"(lf)" **n^{th} Percentile" or "n^{th} Percentile Value"** means the smallest data value in a given data set with the property that n% of the data values in that data set are less than or equal to it.

Explanation: Percentile is a measure of relative standing of an observation within the data set, for example, if 90th percentile value is to be calculated in a data set of 200 DCR values each falling in the interval from 0 to 100 (in percent), then it would point to DCR value at 180th position (90% of 200), when all 200 DCR values are arranged in ascending order and say it is 3.45% (DCR value) in this example. The 3.45% DCR value will be the smallest DCR value in the given set of 200 DCR values with the property that 90% of the DCR values in this set i.e. DCR values from position 1 to 179 in set of values arranged in ascending order, are less than or equal to it. If the data set has many data values in the given data set with 3.45% DCR value, then 90th percentile would point to all such DCR values. In case, n% of the data values comes out to be a number with fraction then rounded up number shall be used."

(j) after clause (m), the following clause shall be inserted:-

"(ma) **"Evolved-Universal Terrestrial Radio Access Network (E-UTRAN) Radio Access Bearer" or "E-RAB"** means a user plane connection between User Equipment (UE) and Serving Gateway (SGW) in the LTE based technology;"

(k) after sub-clause (rb), the following clause shall be inserted:-

"(rba)**"Radio Link Timeout" or "RLT"** means the Radio Link Timeout value broadcast by the GSM based radio access networks to initialize 'S' counter";

(l) after clause (u), the following clause shall be inserted:-

"(ua) **"Tracking Area" or "TA"** means an area in which a mobile station may move freely without updating the Mobile Management Entity (MME) and includes one or several cells of Evolved Universal Terrestrial Radio Access Network (E-UTRAN);

(ub) **"Tracking Area Code" or "TAC"** means a fixed length identification number (of 2 octets) used for identifying a Tracking Area within a Public Land Mobile Network (PLMN)";

(m) after clause (y), the following clause shall be inserted:-

(z) **"Voice over LTE" or "VoLTE"** means voice call established, maintained and released using IP (Internet Protocol) Multi-Media Sub-System (IMS)."

4. In sub-regulation (1) of regulation 5 of the principal regulations, in the table, the column headings and entries in Serial Number A, Network Service Quality Parameters shall be substituted by the following column headings and entries:-

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महानगर दूरसंचार भवन (पुराना मिंटो रोड)
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Serial Number	Name of Parameter	Benchmark	Method and Assessment period
A	**Network Service Quality Parameters:**		
(i)	Network Availability		
	(a) Base Station Accumulated downtime (not available for service)	≤ 2%	On average basis over a period of one quarter
	(b) Worst affected Base Station due to downtime	≤ 2%	On average basis over a period of one quarter
(ii)	Connection Establishment (Accessibility)		
	(a) Call Set-up Success Rate and Session Establishment Success Rate for Circuit Switched Voice or VoLTE as applicable (within licensee's own network)	≥ 95%	On average basis over a period of one quarter
	(b) SDCCH/ Paging Channel Congestion / RRC Congestion	≤ 1%	On average basis over a period of one quarter
	(c) TCH, RAB and E-RAB Congestion	≤ 2%	On average basis over a period of one quarter
(iii)	Connection Maintenance (Retainability)		
	(a) Network QoS DCR Spatial Distribution Measure [Network_Q_{SD}(90,90)]	≤ 2%	On percentile basis over a period of one quarter
	(b) Network QoS DCR Temporal Distribution Measure [Network_Q_{TD}(97,90)]	≤ 3%	On percentile basis over a period of one quarter
	(c) connections with good voice quality, Circuit Switched Voice Quality and Voice over LTE (VoLTE) quality	≥ 95%	On average basis over a period of one quarter
(iv)	Point of Interconnection (POI) Congestion (on individual POI)	≤ 0.5%	On average basis over a period of one quarter

5. In sub-regulation (1) of regulation 5 of the principal regulations, below the table, the following shall be inserted-

NOTE-1: The performance against benchmarks for the parameters listed under (i), (ii) and (iii) in the table shall be computed for all the cells, which are being used to provide Circuit Switched Voice or VoLTE service, in the License Service Area (LSA) in which a service provider is operating;

Explanation: In case, VoLTE service is provided by the service provider then DCR values for the cells of the eNodeBs will be included for the parameters listed under (iii) in the table and if only Circuit Switch based voice calls are provided then cells in the eNode Bs will not be included for the assessment purposes of parameter under (iii) in the table;

NOTE-2: All DCR values for the assessment period shall be considered for Percentile value computation for the parameter listed under (iii) (a) and (iii) (b) in the table except the cases enumerated in the table for list of 'DCR Codes (DC)' given in Note 5;

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नई दिल्ली-110002/New Delhi-110002

NOTE-3: DCR values of each cells for the computation of parameter listed under (iii) (a) and (iii) (b) of the table shall be computed, up to two decimal places, during Cell Bouncing Busy Hour;

NOTE-4: Blank DCR entries or entries filled with any value other than computed DCR value or entries filled with any code or text other than DCR codes specified in Note 5, shall be considered as non-submission of compliance report;

NOTE-5: DCR codes as given below in the table shall be used for the reasons and circumstances corresponding to the codes:

DCR Code	Stands for	Reason or circumstances
DNE	Does Not Exist	The cell was either not commissioned or de-commissioned in the middle of the assessment period and was not part of the network to serve the users in the network.
NOP	Not Operational	The cell was not in operation either due to planned shut down or force majeure condition or technical problem and thus not able to serve the users in the network.
NAV	counter values Not Available	If the requisite counter values for computation of DCR for a Cell on a particular day could not be captured due to technical glitch although the cell was operational.
NDM	computation of DCR Not Determinable or irrelevant	In case, DCR values are indeterminate or computed value is irrelevant for the purpose of assessment

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NOTE-6: Authority may further add, modify or delete the list of DCR Codes, through directions issued from time to time;

NOTE-7: Usage of DCR codes for reasons and circumstances other than that as specified in Note 5 shall be treated as violation in terms of sub-regulation (3) of Regulation 5 of the principal regulations.

6. In regulation 5A of the principal regulations,-----

(a) in sub regulation (1), after the words, characters and number "regulation (5)", the following shall be inserted:-

(i) ", other than the DCR related parameters i.e. Network_Q_{SD}(90,90) and Network_Q_{TD}(97,90);"

(b) after sub regulation (1), the following sub regulations shall be inserted:-

"(1a) If a cellular mobile telephone service provider fails to meet the benchmark for the parameter 'Network_Q_{SD}(90,90)', specified under sub-regulation (1) of regulation (5), it shall without prejudice to the terms and conditions of its license, or the Act or rules or regulations or orders made, or directions issued thereunder, be liable to pay an amount, by way of financial disincentive, as given in the table below, for the contravention, reported by the service provider in its quarterly report:

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महानगर दूरसंचार भवन (पुराना मिंटो रोड)
नई दिल्ली-110002/New Delhi-110002

Value of Network_Q_{SD} (90,90) in quarterly report	Amount of Financial Disincentives in rupees
More than 2% but not exceeding 4%	not exceeding One lakh
More than 4% but not exceeding 6%	not exceeding Two lakhs
More than 6% but not exceeding 8%	not exceeding Three lakhs
More than 8% but not exceeding 10%	not exceeding Four lakhs
More than 10%	not exceeding Five lakhs

Provided that if the service provider fails to meet the benchmark consecutively in two or more subsequent quarters, he shall be liable to pay, by way of financial disincentive, an amount not exceeding one and half times of financial disincentive payable, for the consecutive contravention and not exceeding twice the financial disincentive liable to be paid as specified in the table above for each consecutive contravention occurring thereafter:

Provided also that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the cellular mobile telephone service provider has been given a reasonable opportunity by representing against the contravention of the regulation observed by the Authority.

(1b) If a cellular mobile telephone service provider fails to meet the benchmark for the parameter 'Network_Q_{TD}(97,90)', specified under sub-regulation (1) of regulation (5), it shall without prejudice to the terms and conditions of its license, or the Act or rules or regulations or orders made, or directions issued there under, be liable to pay an amount, by way of financial disincentive, as given in the table below, for the first contravention, reported by the service provider in its quarterly report:

Value of Network_Q_{TD} (97,90) in quarterly report	Amount of Financial Disincentives in rupees
More than 3% but not exceeding 5%	not exceeding One lakh
More than 5% but not exceeding 7%	not exceeding Two lakhs
More than 7% but not exceeding 9%	not exceeding Three lakhs
More than 9% but not exceeding 11%	not exceeding Four lakhs
More than 11%	not exceeding Five lakhs

Provided that if the service provider fails to meet the benchmark consecutively in two or more subsequent quarters, he shall be liable to pay, by way of financial disincentive, an amount not exceeding one and half times of financial disincentive payable, for the consecutive contravention and not exceeding twice the financial disincentive, liable to be paid as specified in the table above, for each consecutive contravention occurring thereafter:

Provided also that no order for payment of any amount by way of financial disincentive shall be made by the Authority unless the cellular mobile telephone service provider has been given a reasonable opportunity by representing against the contravention of the regulation observed by the Authority.

(1c) The total amount payable as financial disincentives, under sub-regulation (1a) and (1b), shall not exceed rupees ten lakhs, in a quarter.

(1d) The Authority may, impose a lower amount of financial disincentive than the amount of financial disincentive payable as per the provisions in sub-regulation (1a) or (1b) or (1c), as the case may be; where it finds merit in the

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महानगर दूरसंचार भवन (पुराना मिंटो रोड)
नई दिल्ली-110002/New Delhi-110002

reasons furnished by the service providers:

Provided that the decision of the Authority in such circumstances shall be final and binding on the service providers."

7. In sub-regulation (1) of regulation 6 of the principal regulations, -----

in the table, the following numbers, words, characters shall be inserted:-

Serial Number	Name of Parameter	Benchmark
2	Radio Link Timeout (RLT)	4 to 64

(a) after sub-regulation (6), the following sub-regulation shall be inserted:-

"(6a) The service provider shall keep records of those BTS with their locations, which were configured with Radio Link Timeout (RLT) values equal to or higher than 48 for a period of more than 3 consecutive days. Service provider shall maintain the records of valid reasons or justification for keeping RLT equal to or more than 48 for each Cell of BTS and provide it to the Authority or its authorized agency or representative, on demand, for verifications".

18/8/2017

(Sunil Kumar Gupta)

Secretary (In-charge)

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नई दिल्ली-110002/New Delhi-110002

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Note.1. —The principal regulations were published in the Gazette of India, Extraordinary, Part III, Section 4, dated the 20th March, 2009 vide notification No. 305-25/2008-QoS dated the 20th March, 2009.

Note.2. —The principal regulations were amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Amendment) Regulations, 2012 (10 of 2012) dated the 7th May, 2012.

Note.3. —The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Second Amendment) Regulations, 2012 (24 of 2012) dated the 8th November, 2012.

Note.4. —The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Third Amendment) Regulations, 2014 (12 of 2014) dated the 21st August, 2014.

Note.5. —The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Fourth Amendment) Regulations, 2015 (8 of 2015) dated the 15th October, 2015.

Note.6. —The Explanatory Memorandum explains the objects and reasons of the "Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Fifth Amendment) Regulations, 2017 (4 of 2017).

Explanatory Memorandum

1 Background

The rationale for regulations in the telecommunication sector is closely linked to the objectives of protecting the interests of telecom service providers, telecom consumers and maintaining an environment of orderly growth in the sector. One of the key responsibilities assigned to TRAI is to lay down the standards of quality of service to be provided by the service providers so that telecom subscribers should get a fair and satisfactory quality of service (QoS). The International Telecommunications Union (ITU) defines QoS to mean "*Totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service*".

1.1 In general, markets are expected to function in a manner that consumers would gravitate towards providers that offer them the best service experience at the most competitive prices. But, in fact, subscribers come to know the quality of service provided by the service provider only after subscribing and using the services. And subscribers do not have the information to assess whether the services of a competing TSP are likely to be more or less satisfactory than those offered by their current provider.

1.2 Telecom Regulatory Authority of India (TRAI) has been given the mandate under the TRAI Act, 1997 to lay down the Quality of Service (QoS), to ensure the QoS and to conduct the periodical survey of such service provided by the service providers so as to protect the interests of the consumers.

1.3 In exercise of its functions under the above provisions in the TRAI Act, the Authority had notified the "Regulation on Quality of Services (QoS) of Basic and Cellular Mobile Telephone Services, 2000" vide Notification dated 5th of July, 2000. The objectives of these regulations were to

a. create conditions for customer satisfaction by making known the quality of service which the service provider is required to provide and the user has a right to expect;

b. measure the Quality of Service provided by the Service Providers from time to time and to compare them with the benchmarks so as to assess the level of performance; and

c. to generally protect the interests of consumers of telecommunication services.

1.4 These regulations were subsequently reviewed and TRAI issued the revised QoS standards for these services in July 2005. The regulations issued in 2005 were further reviewed in 2008-09 and TRAI issued "The Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009" in March, 2009.

1.5 The QoS regulations of 2009 were first amended in May, 2012 to provide for parameters for 3G services. In November, 2012 TRAI amended the regulations to include financial disincentives for delay in submission of compliance reports, non-compliance with the benchmarks for QoS parameters, and for wrong reporting of QoS performance. The introduction of these financial disincentives was based on the information collected by TRAI through various QoS audit analysis reports which revealed that some of the service providers were "*repeatedly not meeting the QoS benchmarks for some prescribed parameters and no consistent improvement is noticed in spite of the measures taken by TRAI. Therefore, there is a need to provide for financial disincentives for failure to meet the Quality of Service benchmarks*".[1] Accordingly, the Authority decided that there was a need to introduce financial disincentives in relation to the performance of service providers under the QoS benchmarks so as to strengthen the effectiveness and compliance of the said regulations.

1.6 Subsequently, a third amendment to the regulations was issued in August 2014, to address the practical difficulties expressed by the service providers in meeting the benchmarks. To create further deterrent against consecutive non-compliance with the benchmarks, TRAI again amended the regulations on 15th October 2015, providing for increased financial disincentives in cases of repetitive non-compliance.

1.7 Even with the regular monitoring of QoS parameters and financial disincentives in cases of non-compliance,

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1 Explanatory Memorandum to the Standards of Quality of Service of Basic Telephone Service (wireline) and Cellular Mobile Telephone Service (Second Amendment) Regulations, 2012.

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नई दिल्ली-110002/New Delhi-110002

there have been growing concerns by consumers regarding poor QoS and increasing call drops, with a large number of consumers complaining about poor quality of experience (QoE), i.e. the level of quality that customers believe they have experienced. This was in contrast to observed QOS parameters where service providers were generally meeting the existing benchmarks for most of the QoS parameters.

1.8 In this background, with a view to compensate the customers for poor quality, the Authority undertook public consultation and issued the "Telecom Consumers Protection (Ninth Amendment) Regulations, 2015 (9 of 2015)" on October 16th, 2015. Through these regulations, TSPs were mandated to provide compensation of one Rupee for each dropped call to the calling consumers, limited to three dropped calls in a day. However, these regulations were struck down by the Hon'ble Supreme Court.

1.9 As it was being observed that there is a significant divide between the performance of TSPs against the current QoS benchmarks and the actual network performance as experienced by subscribers. This called for a need to reassess the current benchmarks and move towards adopting revised QoS norms and parameters that may be better equipped for achieving the desired goals. This is in line with the Authority's duty to lay down the QoS standards and ensure that such standards are met "*so as to protect interest of the consumers of telecommunication service*". Accordingly, the Authority decided to relook into the various other options for ensuring QoS, including redefining the various QoS parameters and benchmarks, measurement methodology etc. so as to improve the QoE of customers.

1.10 QoS network parameters, at present, are being evaluated for the service area as a whole and daily performances are averaged over a month for assessment of the performance of service providers at the level of the Licensed Service Area (LSA). But there could be many areas/ localities within the network where the performance on existing QoS parameters could be poorer in comparison to other parts of the LSA.

1.11 When the dropped call rate (DCR) is measured by averaging across the country, as mentioned in the consultation paper, more than 12% of the individual base transceiver stations (BTS) report a call drop rate of more than 2% and approximately 1% of the individual BTS report a call drop rate of more than 10%. In contrast, the overall call drop rate in the country - using the existing measure - was around 0.7%, which is well below the benchmark. TRAI has issued a Direction on 29th July, 2015 to the TSPs to provide the call drop rate in 63 cities across the country. It should be noted that in most of the cities, the TSPs are generally meeting the call drop rate of 2%, once again signaling a gap between the benchmark performance and end user experience.

1.12 The problems created as a result of this gap can be better explained by taking a closer look at the design and implementation of cellular networks. A cellular network consists of a large number of BTS, which is the infrastructure through which communication signals are transmitted between the subscriber's equipment (i.e. mobile phone) and the TSP's network. In general, each BTS consists of three cells each of which covers a certain number of subscribers within its coverage area. As the users of cellular networks move across several locations, the voice calls being made by them are handed over from one cell to another. This may lead one to assume that a subscriber's QoE is dependent on the performance of its TSP's network across the broad geographic area within which a subscriber would typically use its services. However, in reality, a large number of users typically use their mobile phones for making calls from one or two specific locations where they spend most of their time, in addition to a part of the time that may be spent in transit. For instance, subscribers who predominantly use their mobile phones at home or at their place of work would be most directly impacted by the performance of the TSP's cells that cover these specific areas. From the perspective of those users, degraded performance of these cells cannot be offset by better performance of the TSP's cells in some other location.

1.13 In view of this, the Authority undertook a public consultation in the matter by releasing a consultation paper on "*Review of network related Quality of Service standards for Cellular Mobile Telephone Service*" on 5th August, 2016 seeking comments of stakeholders by 16th September, 2016. In response to the Consultation Paper, the Authority received comments from 13 stakeholders. An Open House Discussion was also held with the stakeholders at Chennai on 21st December, 2016. All comments received from stakeholders during the consultation process have been considered by the Authority while finalizing these regulations.

1.14 Key issues in the Consultation Paper (CP) raised to review network related QoS standards for Cellular Mobile Telephone Service (CMTS) were:

a. Redefining existing network related QoS parameters

i. options to measure and benchmark QoS at Sub-service area level i.e. at LDCA (Long Distance Charging Area)/DHQ (District Headquarter)/City/Town/ BTS level

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नई दिल्ली-110002/New Delhi-110002

ii. *options to benchmark call drop rate by calculating it at License Service Area (LSA) level during Time Consistent Busy Hour (TCBH) or by calculating it during Cell Busy Bouncing Hour (CBBH) at BTS level*

iii. *options to define parameters and benchmarks to make them technology agnostic*

b. Introducing additional Parameters to measure network related QoS parameters

i. *Criteria to set the RLT (Radio Link Timeout) parameters and values that need to be set*

ii. *Options to calculate call drop rate through CDR data analysis and benchmark for this purpose*

c. Defining Consumer satisfaction index for Quality of Experience (QoE) purpose and methodology of calculating such index. Also identifying latent variable and ways to calculate them.

d. Introducing a Graded Financial Disincentive based on performance and quantum of financial disincentives for various parameters.

1.15 Four issues raised in above sub-para 1.14 (a) namely, Sub-Service Area, TCBH vs. CBBH, options to define new parameters (including defining technology agnostic parameters) & setting new benchmarks are related with assessment methodology of Drop Call Rate (DCR) parameters. For the analysis of all these four issues and re-defining framework for DCR assessment methodology requires re-look into assessment area, assessment period, statistical measures to be used for the assessment, defining new parameter(s) and benchmark(s), if need. All these issues need to be deliberated together and therefore, this set of four issues have been deliberated in a combined manner in Para 2 to Para 7.

1.16 Rest of the four issue mentioned in sub-para 1.14 (b) and 1.14(c) namely, Graded Financial Disincentives, criteria to set RLT parameter, CDR data analysis for Call Drop Rate assessment and Customer Satisfaction Index have been deliberated subsequently in the Para 8 to Para 11 respectively.

2 Present Methodology of Drop Call Rate (DCR) Assessment and related issues

2.1 One of the main issues highlighted in the consultation paper was regarding the present methodology of assessment of the performance of service providers by averaging QoS parameter over the service provider network. CP emphasized the adverse impact of averaging out the 'Call Drop Rate 'parameter over a service area as a whole and also averaging out over a month. The averaging method for assessment of 'call drop rate' parameter could not identify local variations in many areas/ localities within the network where the performance on these QoS parameters could be poor.

2.2 One of the options to address the issues related to averaging may be to apply averaging on a smaller geographical area or for a shorter time period. For example, averaging on sub-service area instead of complete service area may contain the averaging effect within that sub-service area. Monitoring of benchmarks for various parameters on a sub-service area level may help in identifying the problem areas, taking measures to address the problem, and consequently ensuring better QoS. Other options to address the averaging effect may be to explore and define new parameters for the QoS standards.

2.3 The main issues raised in the consultation paper related to DCR assessment methodology were

a. Whether Measurement of QoS should be at sub service area level (LDCA/ DHQ/ City/ Town / BTS Wise) or a combination?

b. Whether call drop should be measured at TCBH or at CBBH?

c. How should the benchmark for the parameters be revised? What should be the benchmarks and how should they be measured?

2.4 TSPs' views

a. During the consultation process, service providers and industry associations had supported the present system of QoS measurement at LSA level.

b. The reasons advocated by them in support of their suggestions are that

i. *maintaining uniform QoS in all parts of the LSA is not possible due to various factors which are beyond their control,*

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ii. *no international reference of sub-service area level benchmarking in geography comparable to India is found,*

iii. *the problem areas are well identified through the raw data network counters submitted to the Authority and also through regular drive tests,*

iv. *the networks are architected for a Service Area and not designed and built on LDCA or District basis, lack of availability of digital maps with clearly defined towns, varying size of sub-service area and quantum of BTSs etc.*

c. There was a suggestion from one service provider that the benchmarking of QoS parameters should be at a combination of LSA and BTS level.

d. The service providers have also suggested to change the measurement methodology for the parameter "Worst affected cells having more than 3% call drop rate".

e. With respect to measurement of call drops, the service providers and industry associations have supported measurement of QoS parameters at Time Consistent Busy Hour (TCBH) only at service area level as Cell Bouncing Busy Hour (CBBH) may vary drastically with various factors like sudden movement of subscribers, any outage etc. whereas, TCBH accounts for the network performance as a whole and not just for a particular cell.

f. The overall view of the service providers is that the existing regulation of measuring QoS of telecom networks at LSA level should continue.

2.5 Suggestions from stakeholders other than TSPs

a. Suggestions from other stakeholders included monitoring QoS at BTS level as this would eliminate "averaging-out", measurement of QoS across all of India, and focusing on 'hot spots' or poor service areas.

b. One consumer organization registered with TRAI suggested tightening the benchmark for the call drop parameters and the parameters relating to voice quality and POI congestion.

2.6 Suggestions were also made in favour of continuous measurement so that seasonal changes, metro, urban and suburban development can be factored into. The consumer organization referred to above also suggested that QoS measurement should take place at the BTS level during Cell Bouncing Busy Hour (CBBH).

2.7 Before proceeding further, it would be useful to gain a deeper insight into the DCR data and have a better understanding of the character, shapes and patterns of the typical distribution of DCR data. This is followed by an evaluation of the options of redefining the DCR parameters; the revisiting the measurement methodology; or tightening of the current benchmarks. Accordingly, the following section provides some illustrations to explain:

a. the typical distribution pattern of DCR values at the BTS level and the consequences of (i) averaging the DCR values of all the cells in a BTS; and (ii) further averaging the DCR values of a BTS over a period of time; and

b. the extent to which the poor performance of some BTS can be compensated by the better performance of others while averaging the performance of a provider's BTS at a LSA level.

2.8 Typical Distribution Pattern of Count of BTS vs. DCR

a. Distribution pattern of the number (count) of BTS with DCR meeting current benchmarks is illustrated in the graph below. DCR for a BTS is an average of three DCR values belonging to each sector or cell of this BTS. Consequently, very few BTS may report DCR value close to zero as it is highly unlikely for all three cells to have zero DCR values and average DCR value of zero for all days in the assessment period.

b. Similarly, very few BTS may be seen to have higher DCR values, which may be due to the effect of averaging DCRs for a BTS over a period of time. If a BTS had high DCR values on a few days, then it likely that it may also have had relatively lower (i.e. better) DCR values on some other days. Accordingly, for a network that meets the current benchmark of 2% DCR, the peak of the distribution of the number of BTS will most likely fall between DCR values of 0 to 2.

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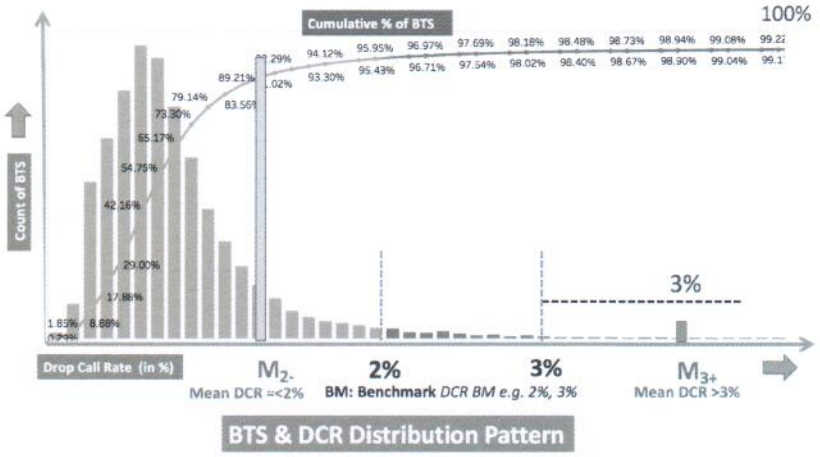


Figure 1: Illustration of distribution pattern of count of BTS vs. DCR

c. The range of continuous DCR values, along with the count of the BTS, may also be presented in a point-mass form. For instance, all BTS having DCR values less than or equal to 2% can be clubbed together and represented at their mean DCR value M_{2-} with height of the bar being equivalent to % of total count of BTS in the 0-2 DCR value region. Similarly, M_{3+} may represent mean DCR value of BTS having DCR value beyond 3%. Percentage of BTS counts exceeding 3% DCR value is represented as a point-mass value at M_{3+} with % of BTS counts shown at a bar height of 3%.

2.9 Impact on Network Performance Assessment due to DCR averaging

a. Presently, the QoS for network parameters is measured for the service area as whole. Because of averaging, bad performance in some of the areas within the LSA is compensated by good performance in other areas, allowing the service provider to meet the benchmark. However, this method of computation of QoS performance does not give a true picture about the extent of non-compliance in specific pockets and the problem areas. For example, the figure below illustrates the DCR performance of all the BTS of a provider in a particular LSA:

- M_{2-} indicates the mean DCR value of all DCR values lying between zero and 2%;
- M_{2-3} indicates the mean DCR value of DCR values lying between 2% and 3%; and
- M_{3+} indicates the DCR values lying beyond 3% and M_{ALL} is overall average value.

b. From the illustration, it can be seen that average DCR value meets the 2% benchmark even though there are a good number of BTS lying between 2% and 3% DCR and a few BTS also have DCRs greater than 3%.

c. The following is a hypothetical example that illustrates the extent to which the DCR values of badly

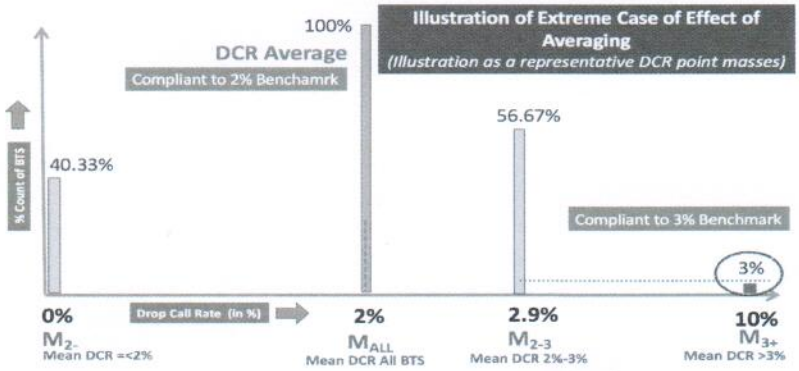


Figure 2: Illustration of effect of averaging in extreme case

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performing BTS could potentially be offset by the DCR values of value of well performing BTS. If we assume that 40.33% of the total BTS of a provider in a LSA are performing ideally with zero percent DCR value, that would be sufficient to compensate for 56.67% of its total BTS with DCR value at 2.9% (almost 3%) and 3% of BTS with DCRs values as high as 10%.

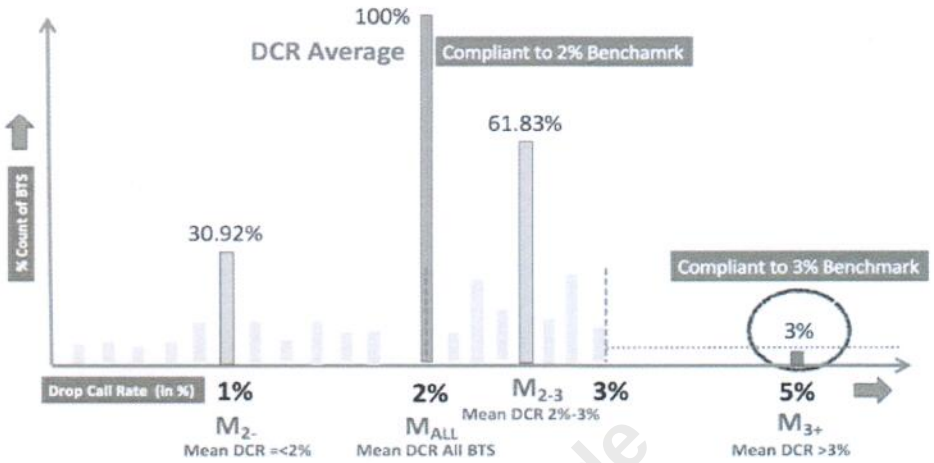


Figure 3: Illustration of effect of averaging

d. The effect of averaging may be better visualized by comparing the averaging process with a see-saw (as illustrated in the diagram below) having planks of unequal lengths. The benchmark point i.e. 2% DCR can be considered to be the fulcrum point of the see-saw with the left-side plank of the fulcrum being a length of 2mm (0 to 2% DCR) and the right-side plank going up-to the length of 98mm (2% to 100% DCR) to be the of the see-saw. The circles on either side represent the point mass for DCR value ranges while the size of the circles represents their weight, equivalent to the % count of BTS in that range. The position of the circles represents mean DCR values within the DCR sub-range which the circle represents. Typically, as seen in the BTS & DCR distribution patterns discussed earlier, weights on the left-side plank are likely to be heavier than weights on right-side plank. Further, on the right-side plank, the distances of circles from the fulcrum are relatively much larger than the distances of circles on the left-side of the plank. If the see-saw is balanced or inclined towards the left, then performance of the network would be considered to be compliant with the existing benchmark. As is obvious from the illustration, that averaging may easily balance out the far placed smaller size circles on the right part of plank using the weight of the bigger sized circles on the left part of the plank.

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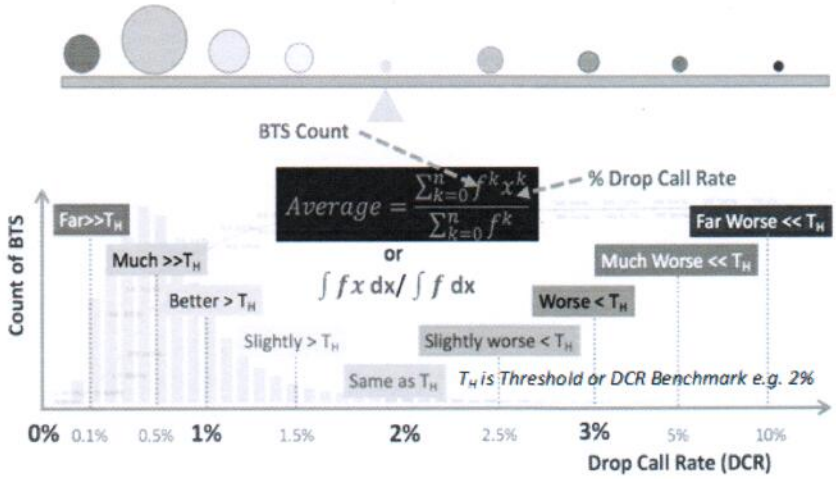


Figure 4: Illustration of effect of averaging (See-Saw)

2.10 In view of above, the Authority felt the need to devise a QoS framework for DCR assessment that measures and reflects a more realistic and granular picture of the network's performance while addressing the concerns of customers; and keeping in mind the practical constraints faced by TSPs, along with factors beyond their control.

2.11 The Authority accordingly decided to carry out a detailed study of the DCR data of some of the service areas submitted to TRAI by telecom service providers in order to gain a deeper insight and characterize the distribution behavior which would help to define new DCR parameters, revisit the existing methodology; or tighten the existing benchmarks. In summary, the framework is to be revised in such a manner that it identifies problem areas and represents a more realistic picture of the performance of the network.

3 Organizing the DCR data

3.1 Arranging the DCR Data (DCR-Matrix-Spatial-Distribution)

a. The first step is to organize the DCR data in matrix form where each row represents the DCR values for individual cells over the days in chronological order as columns i.e. the daily DCR values for the assessment period. DCR data points with values greater than the set benchmark for each individual cell are highlighted as illustrated in figure 5. e.g. 2% DCR are shown in light grey and DCR data points breaching the benchmark are in dark grey.

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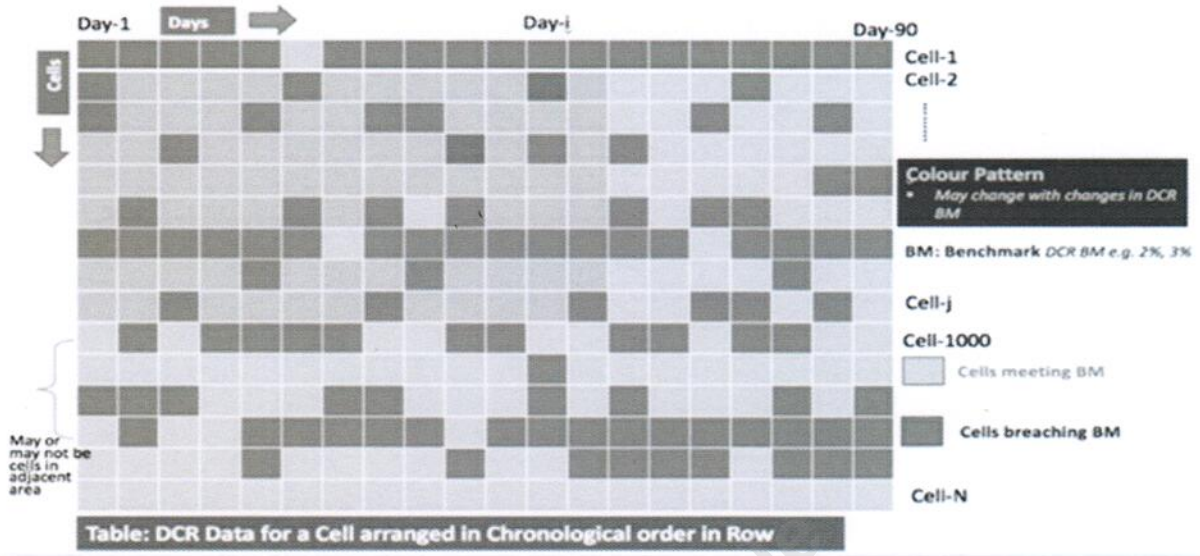


Figure 5: illustration of DCR data for different cells on different days

(grid size shown in the illustration is not to scale)

b. Suppose if DCR values for each individual cell be arranged in ascending order for all days in the assessment period, then the worst DCR values of a cell irrespective of date will slide to the rightmost part as illustrated in figure(6).

c. Certain days for a cell - let's say 10% of total days - may exhibit poor performance due to uncertainty and factors beyond the control of the TSP, for e.g. uncertainties in the behavior of mobile traffic and Radio Frequency (RF) signal propagation. Given this backdrop, 90 percentile (say) DCR value of the daily time-series of DCR values of each cell, may be considered as representative DCR for that cell during the period of assessment. This representative DCR value of each cell may be called Cell-Q factor, and in the context of spatial distribution matrix, the corresponding value for a cell may be called Cell_Q(90).

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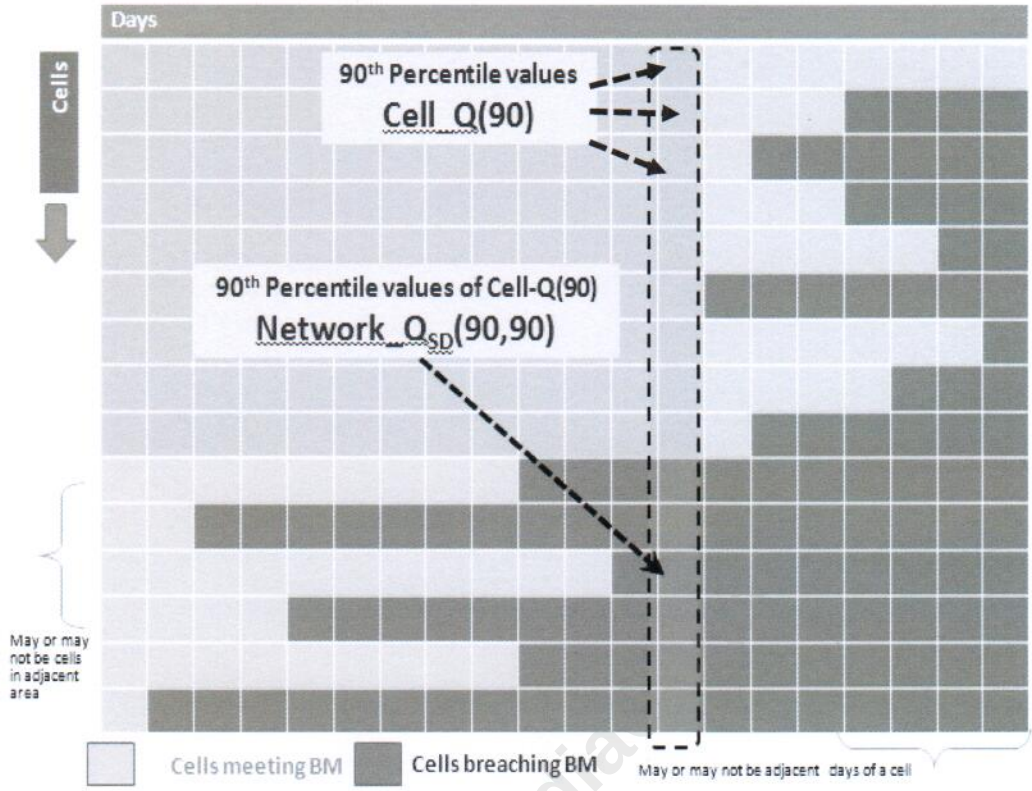


Figure 6: Illustration of DCR data after sorting of DCR values within a row and then sorting rows on the basis of 90th percentile DCR value of row
(grid size and column indicating Cell_Q(90) shown in the illustration is not to scale)

d. The rows, previously ordered over time, are next sorted in ascending order of their representative 90th percentile DCR values identified in the previous step. The 90th percentile DCR value is extracted from the resulting vector of ordered, representative 90 percentile values of each cell. Unlike the previous step, we obtain a single value for the cross-sectional 90th percentile cut which we refer to as Cell_Q(90).

e. Bottom region of the matrix after arranging of rows, will have all cells (complete row with DCR data belonging to that cell) with Cell_Q(90) relatively higher (i.e. poorer performance) in comparison to Cell_Q(90) of cells in upper part of the matrix.

f. The complete DCR value dataset arranged in a row and columns may be called the DCR-Matrix-Spatial-Distribution (DCR-Matrix-SD).

3.2 Partitioning of DCR Matrix Spatial Distribution

a. The Cell_Q(90) for each cell represents the worst performance (highest DCR) attained by the cell after removing 10% of its worst performing days. Next, in order to account for cells which might exhibit consistently poor performance e.g. border cells, we extract the 90th percentile DCR value from the vector of Cell_Q(90) for each cell. We obtain a single value for the cross-sectional 90th percentile cut which represents the DCR value achieved by a network 90% of the time, in 90% of geographic locations (cells). This value is the representative value for the performance of a network as a whole, across time and location and we term this value as Network_Q_{SD}(90,90). Essentially Network_Q_{SD}(90,90) is the 90th percentile of Cell_Q(90) of all cells in a network.

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b. Considering that data for all cells, for all days in the period of assessment is available, Network_Q_{SD}(90,90) will be a cross-point of a column having Cell_Q(90) values and a row having DCR values corresponding to a cell having Cell_Q(90) and represents 90th percentiles value among all Cell_Q(90) values.

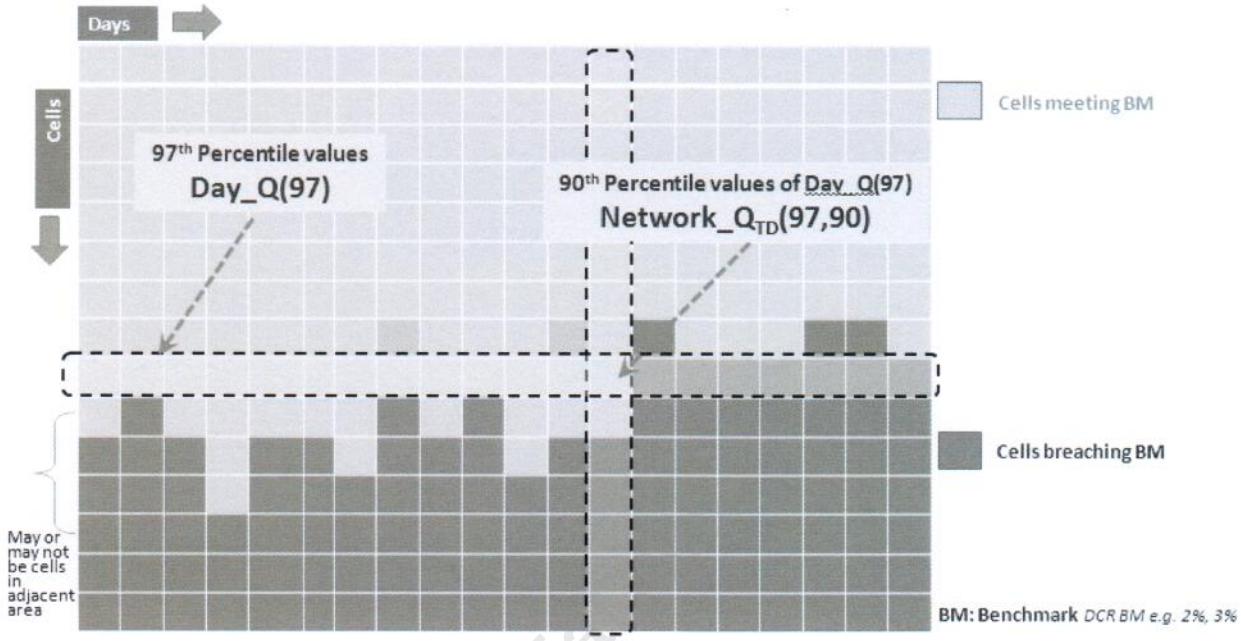


Figure 7: Illustration of DCR data to show Network_Q_{TD}(97,90) as 90th percentile DCR value Day_Q(97)

3.3 Arranging the DCR Data (DCR-Matrix-Temporal-Distribution)

a. Similarly, DCR Data can be arranged in ascending order in each column first for performances of various cells on a particular day.

b. 97th percentile DCR value in a column may be representative DCR value for that day with 97% of cells having better DCR values than this. This may be called as Day_Q(97).

c. Similar to Spatial Distribution Performance DCR Matrix, all columns can be rearranged in a ascending order of Day_Q(97) values and 90th Percentile of the Day_Q(97) will be Network_Q_{TD}(97,90).

d. The complete DCR value dataset arranged first spatially, and then temporally may be called DCR-Matrix-Temporal-Distribution (DCR-Matrix-TD).

3.4 Regions of DCR Matrix

a. The column and row associated with any Data-point in the DCR Matrix (apart from matrix borders) divide the matrix into four regions. From benchmark perspective, concern will be specific to some key points in the matrix such as Network_Q_{SD}(90,90) in the spatial distribution and Network_Q_{TD}(97,90) in the temporal distribution. This single Q-point may give good insight into thenetwork performance and may be a key data-point for defining benchmark.

b. Column and rows containing Network-Q_{SD}(90,90) in a completely filled array of DCR values matrix i.e. DCR-Matrix for Spatial or Network-Q_{TD}(97,90) for Temporal Distribution partitions the data in four regions namely, Top-Left Region (TLR) , Top-Right Region (TRR), Bottom-Left Region(BLR), Bottom-Right Region(BRR).

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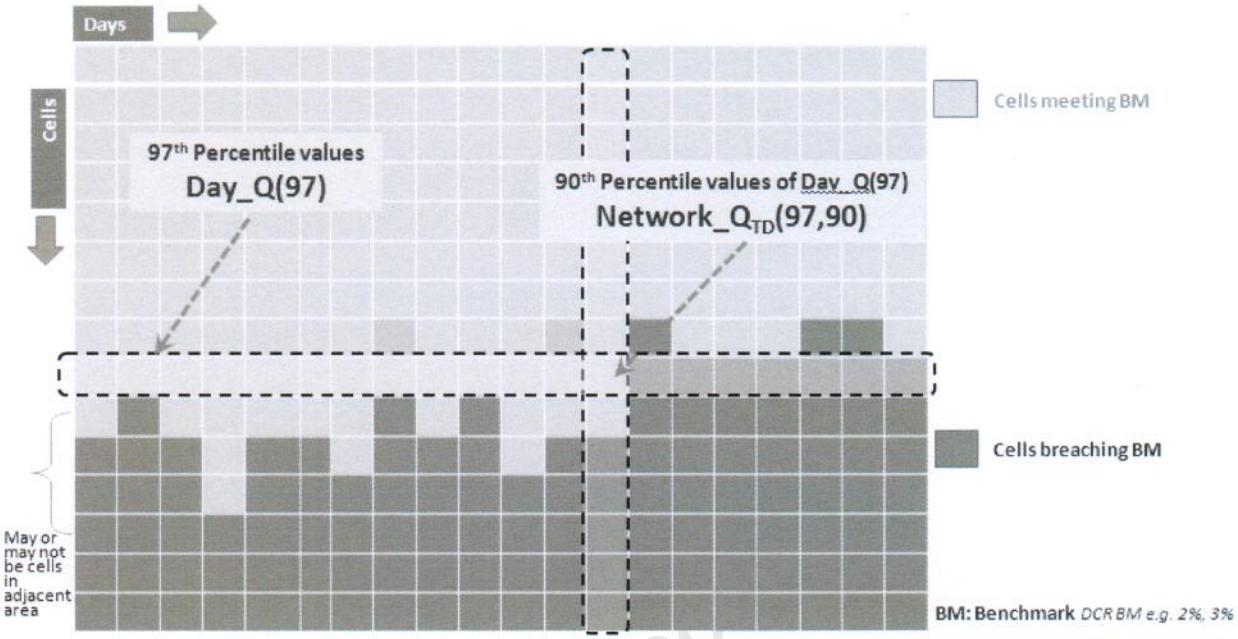


Figure 8: Illustration of DCR data to show Network_Q_{TD}(97,90) as 90th percentile DCR value Day_Q(97)

4 Characteristics of the data in different partition

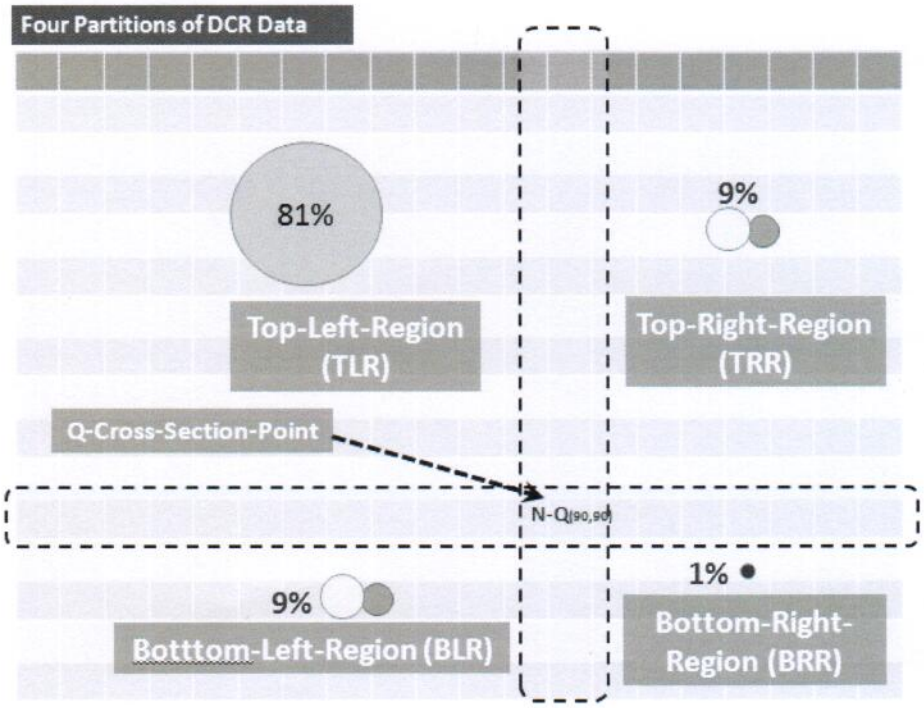


Figure 9: Illustration for partitioning of DCR Data

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4.1 Characteristics of the data in Top-Left Region (TLR) in DCR-Matrix-SD

a. Column containing Network_Q_{SD}(90,90) has representative DCR values for all cells and every DCR value of this column is a upper bound value for all DCR values in the left part of the same row. This DCR value is also a lower bound value for all DCR values in right part of the same row.

b. TLR part contains DCR values which are smaller than Network_Q_{SD}(90,90) i.e. Network_Q_{SD}(90,90)) is an upper bound value for complete Top-Left Region (TLR).

c. If the network performance of a TSP computed as per the Network_Q_{SD}(90,90) methodology meets the DCR

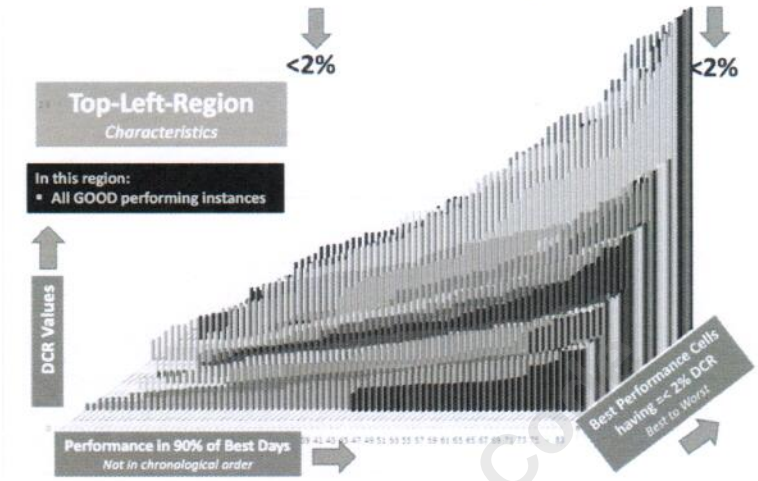


Figure 10: Top Left Region

benchmark specified by the Authority (say, 2%) then all data points in the TLR are better than benchmark value.

d. TLR contains 81% of the total data-points in the DCR-Matrix and Network_Q_{SD}(90,90) value meeting the DCR benchmark indicates that at least 81% data-points are better than the benchmark value.

e. If DCR values in TLR are not meeting the DCR benchmark value set for an individual cell, then there is a cell which has performed worse than the set DCR benchmark for more number of days than the set benchmark of 10% of total days (say).

4.2 Characteristics of the data in Top-Right Region (TRR) in DCR-Matrix-SD

a. This region of the Network_Q_{SD}(90,90) partition represents 9% data-points. It has row-wise DCR values which are greater than Cell_Q(90) values for the cell representing that row.

b. In this region, Cell_Q(90) values are smaller than the Network_Q_{SD}(90,90) values and there may be a wide range of DCR values in this region, some of which meet the specified benchmark value while others do not.

c. In this region, if two rows are considered then it may happen that DCR values in a row which is on downside

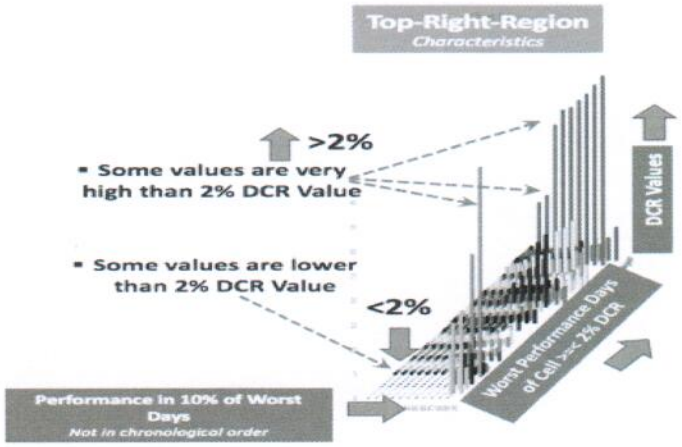


Figure 11: Top Right Region

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may be having DCR values smaller than DCR values in the row on the upper side. It may depend upon DCR value rising pattern of row beyond a Cell_Q(90) point. Different rows having different Cell_Q(90) starting point may have rising curves competing with each other and one curve may be rising at a slower pace while other curve may be rising at a faster pace and cross each-other.

4.3 Characteristics of the data in Bottom-Left Region (BLR) in DCR-Matrix-SD

a. This region of the Network_Q_{SD}(90,90) partition symmetrically represents 9% data-points of DCR-Matrix.The DCR values in a row in BLR are smaller than Cell_Q(90) values for that cell.

b. In this region, if two rows are considered then DCR values of a row will be rising from left to right side and reaching to their respective Cell_Q(90) values. Cell_Q(90) of a row on downside may be equal or higher than Cell_Q(90) value of a row on upper side. But it may happen that DCR values in a row on downside may be having DCR values smaller than DCR values in the row on the upper side. It may depend upon DCR value rising pattern of row before reaching to a Cell_Q(90) point. Different rows having different Cell_Q(90) final points and DCR rising curve may compete with each other and one curve may be rising at a slower pace while other may be rising at a faster pace and cross each-other.

c. If one DCR value in a row in this region is not meeting the benchmark, then all right DCR points will not be meeting the benchmark value as they are arranged in non-decreasing order.

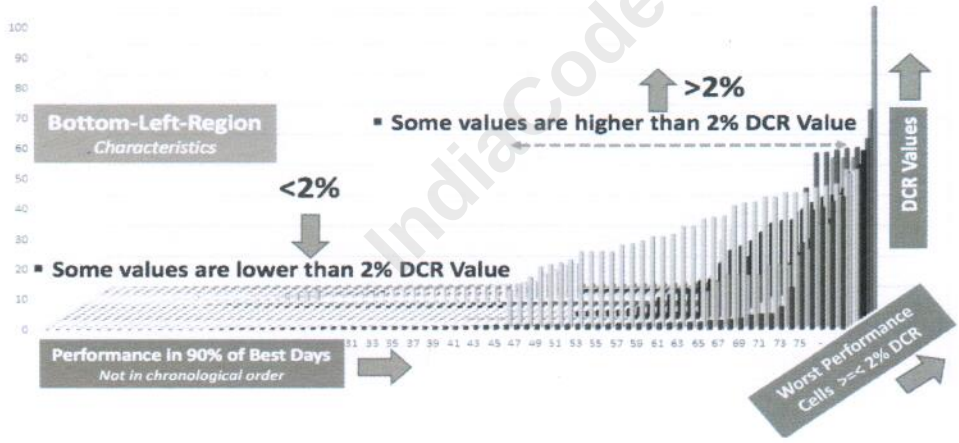


Figure 12: Bottom Left Region

4.4 Characteristics of the data in Bottom-Right Region (BRR) in DCR-Matrix-SD

a. This region of the Network_Q_{SD}(90,90) partition represents 1% data-points of DCR-Matrix.

b. This region represents all DCR values worse than benchmark values.

c. However, all DCR values may or may not be as bad as observed in TRR. This means that worst DCR values may either be in TRR or BRR.

d. Cell_Q(90) of a row is a lower bound value for all DCR values in the BRR.

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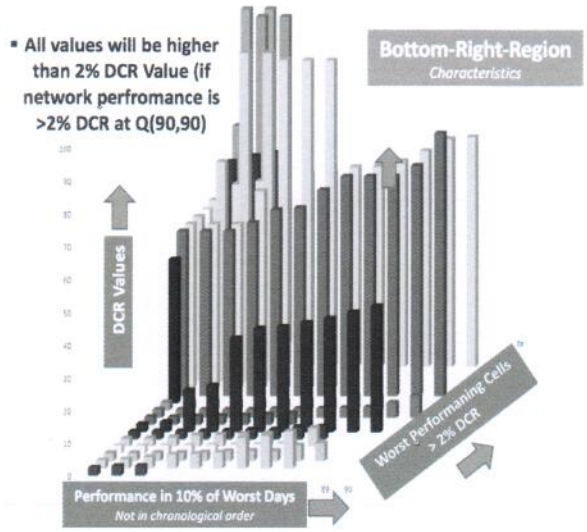


Figure 13: Bottom Right Region

4.5 Characteristics of the data in DCR-Matrix-TD

a. The DCR-matrix for Temporal Distribution similarly, has four regions divided by the point Network_Q_{TD}(97,90) with similar characteristics.

b. The key difference to be noted between the spatial and temporal matrices is that the former focuses on cells which are consistently performing poorly, for many days, while the latter addresses the days on which the performance of cells is relatively poorer than other days.

5 Main objectives for redefining existing network related quality of service parameters for cellular mobile telephone service.

5.1 DCR data organized in Spatial distribution and Temporal distribution will provide insight into area-to-area variations of DCR and day-to-day variations of DCR. Appropriate points in this distributions which may be representatives of performance of network on most of the days and for most of the cells in the network and may be used as new parameters for measure of DCR assessment and accordingly new benchmarks may be set for these parameters.

5.2 Before finalizing the new parameters for DCR assessment in context of DCR Spatial and Temporal Distribution, there is need to consider the main objectives which should be met by the new parameters and benchmarks. And also to consider the assessment area, radio access technologies and assessment period for which DCR matrix need to be populated. New parameters and benchmarks also take into account the factors which are beyond control of TSP and practical challenges faced by them. Some of these points like objectives and stakeholders' views related to DCR assessment are deliberated under this Para while other points are dealt in Para 6 and Para 7.

5.3 The benchmarks for QoS should be designed in a way that makes them meaningful to consumers - enabling them to make an informed choice between TSPs based on the level of quality of service they can expect, irrespective of the technology provided by the TSPs. Accordingly, it is important to adopt measures that are objective, measurable, and verifiable so as to ascertain the QoS being maintained by the service providers.

5.4 While designing the benchmarks, it was kept in mind that the benchmark parameters should be achievable - while at the same they should force a service provider to invest resources in improving QoS. Also the QoS parameters and benchmark should be technology agnostic (2G/ 3G/ 4G/ BWA) and should be capable of being measured and reported irrespective of the technology deployed.

5.5 For exploring the options of new parameters and benchmarks, or revising the measurement methodology - key objectives should be set ex-ante, which can be used to ascertain the appropriateness of the new approach and

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ensuring that the concerns with the present methodology or parameters are addressed.

5.6 After analyzing the issues raised earlier with the averaging process, following key objectives were set out for devising a new framework or approach for DCR assessment:

a. Main goal of the new framework should be to highlight the problem areas so that coordinated actions may be taken to ensure effective QoS.

b. New approach should consider DCR of individual cells of a Base Station (BS) for each day without involving any averaging process for the assessment of a cell during the period of assessment.

c. The new approach should also consider representative DCR value of all individual cells without involving any averaging process for assessment of the representative DCR value of the network.

d. The new methodology should be able to identify the cells which have performed worse than the set benchmark beyond a certain % of days in the period of assessment. Such identified cells with poor performance for many days should be appropriately considered in the performance assessment of the network.

e. The new methodology should also identify the days on which a significant number of cells (e.g. certain % of the total cells in the network) of the network observed relatively poorer performance. Such identified days should be considered while assessing the network performance.

5.7 After analyzing the stakeholders' views, the Authority felt that the following key points should be given due consideration while devising a new framework or approach for assessment:

a. Licenses are issued on service area basis and infrastructure is created to provide the service at a service area level.

b. Operators are facing problems in establishing infrastructure because of false EMF radiation rumours, scarcity of spectrum, Right of Way (RoW), infrastructure related issues, administrative issues, natural calamities etc.

c. TSPs face practical challenges in meeting the benchmarks at each individual cell level for every day, which are beyond their control e.g. various factors like sudden movement of subscribers, any outage etc.

d. Radio Frequency (RF) propagation characteristics introducing uncertainties in the coverage to any user with variations in location and time.

e. Performance assessment of a network should be done after excluding certain cells or certain days but assessment should be representative of most of the part of the network for most of the days.

5.8 New benchmark or methodology which achieves the above objectives and addresses the gaps in the existing benchmarks is deliberated in following Para(s).

6 Redefining framework for new benchmarks, parameters and methodology for DCR assessment

6.1 As noted earlier, the main goal of redefining the QoS parameter is to highlight the problem areas so that coordinated actions may be taken to ensure effective QoS. From the characterization of DCR Data in Spatial and Temporal Distribution, it is clear that the problem areas, if any, are easily identifiable using the methodology described above.

6.2 One of the options brought up in the consultation was to tighten the benchmark for the parameters so that the effect of averaging a TSP's performance over the LSA may be lessened. However, based on a detailed analysis of averaging process, it is obvious that mere tightening of benchmarks while retaining the process of averaging will not address the concerns of identifying the problem area. Any average DCR value arrived at through this process may not be representative of most of the parts of the networks and most of the days.

6.3 These concerns are being addressed by the being new methodology of carrying out the DCR-Matrix analysis using the Q-factor cross-section, as described in the previous sections.

6.4 The Spatial and Temporal Distribution methods portray the performance of the network in different parts of the service area and on different days. However, this is being achieved without involving any averaging process for the purpose of assessment of a cell or the assessment of a network as a whole.

6.5 DCR-Matrix arrangements with Spatial Distribution identifies the cells which have performed worse than the set benchmark beyond a certain % of days in the period of assessment. Some of these identified cells with poor

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नई दिल्ली-110002/New Delhi-110002

performance for up-to a certain number of days may be excluded from the overall assessment in view of practical difficulties and factors which may be beyond control of TSPs. But beyond these exclusions, which are clearly identified, every cell is considered for assessment of the overall network performance.

6.6 DCR-Matrix arrangements with Temporal Distribution identifies the days on which a significant number of cells of the network observed relatively poorer performance allowing them to be excluded while assessing the network's overall performance. Beyond these exclusions, which are clearly identified, each day during the assessment period is considered for assessment of the overall network performance.

6.7 Q-cross-points partitions of DCR-Matrix arrangements with Temporal and Spatial Distribution are very meaningful for the purpose of enabling consumers to make an informed choice. These distributions set out a clear assessment of what percentage of the total service area and for what percentage of days can a particular network be assumed to be performing better than the benchmarks set by the Authority. By knowing the position of Q-cross-point, subscribers will be in a position to assess the minimum confidence level with which they can be assured of a certain level of QoS.

6.8 To meet the objective of assessment of network irrespective of the technology provided by the TSPs, the DCR Data matrix may be a single data matrix for all technologies being used for providing voice services. In case of a voice call, a user may not be concerned about the specific technology being used to serve him/her. Therefore, aggregating data of all cells of a TSP, irrespective of technology, will be appropriate. Accordingly, the Authority has decided that QoS parameter like DCR should be technology agnostic (2G/ 3G/ 4G/ BWA) as these can be measured and reported irrespective of the technology being deployed.

6.9 The Q-value cross-points in the DCR Matrix, both in case of Spatial Distribution and Temporal Distribution, are based on percentile values, and can therefore be defined in an objective, measurable and verifiable manner. Accordingly, the Authority has come to the conclusion that the Q-values cross-points methodology shall be used for ascertaining the level of QoS being offered by a service provider in relation to call drops.

7 Setting the Benchmarks (BMs) for DCR Assessment

7.1 One of the objectives to be kept in mind while setting the benchmark value is to arrive at Q-values which are achievable and also force a service provider to invest in infrastructure and improve its services. At the same time, the benchmarks should be such that they satisfy the overarching concerns of user experience of QoS.

7.2 With these objectives in mind, the Authority has decided to introduce the following benchmarks and criteria related terminologies for the redefined DCR framework:

a. Percentile-t value of DCR out of DCR data for a particular cell which will be considered as representative DCR value for the performance of that particular cell for the entire period of assessment i.e. Cell_Q(t).

b. Percentile-s value of Cell_Q(t) values which is to be considered for representative DCR value for network DCR Spatial Distribution performance in the assessment period .i.e. Network_Q_{SD}(s, t).

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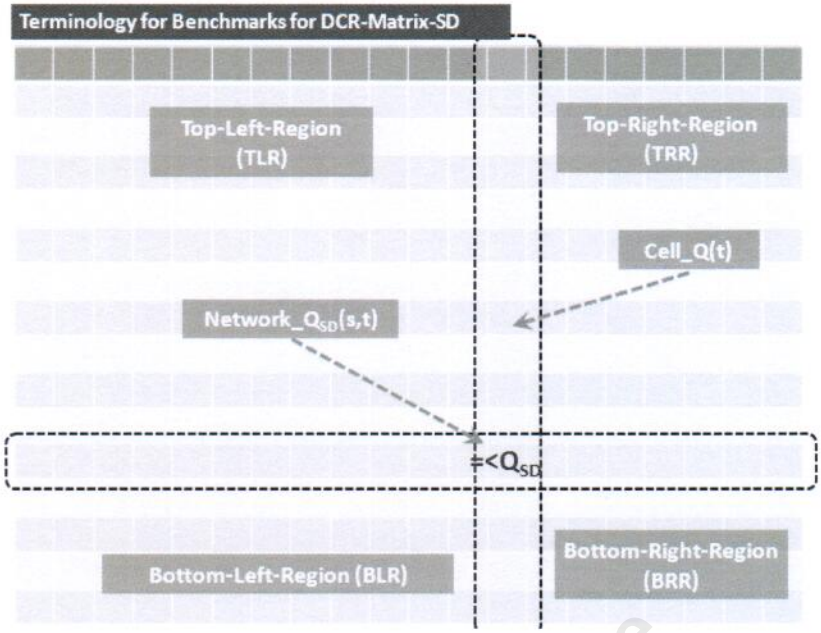


Figure 14: Terminology for DCR-Matrix-SD related

c. DCR benchmark value, QSD which is to be set as a maximum DCR for Network_QSD(s, t) i.e. for network DCR Spatial Distribution performance in a LSA and will be considered as meeting the benchmark when value at Network_QSD(s,t) ≤Benchmark QSD.

d. Percentile-s value of DCR out of DCR data for all cells operating in a network on a day which will be considered as representative DCR value for the performance of the network on that day i.e. Day_Q(s).

e. Percentile-t value of Day_Q(s) which is to be considered for representative DCR value for network DCR Temporal Distribution performance in the assessment period i.e. Network_QTD(s, t)

f. DCR benchmark value, QTD which is to be set as a maximum DCR for Network_QTD(s, t) i.e. for network DCR Temporal Distribution performance in a LSA and will be considered as meeting the benchmark when value at Network_Q_{TD}(s,t) ≤Benchmark Q_{TD}.

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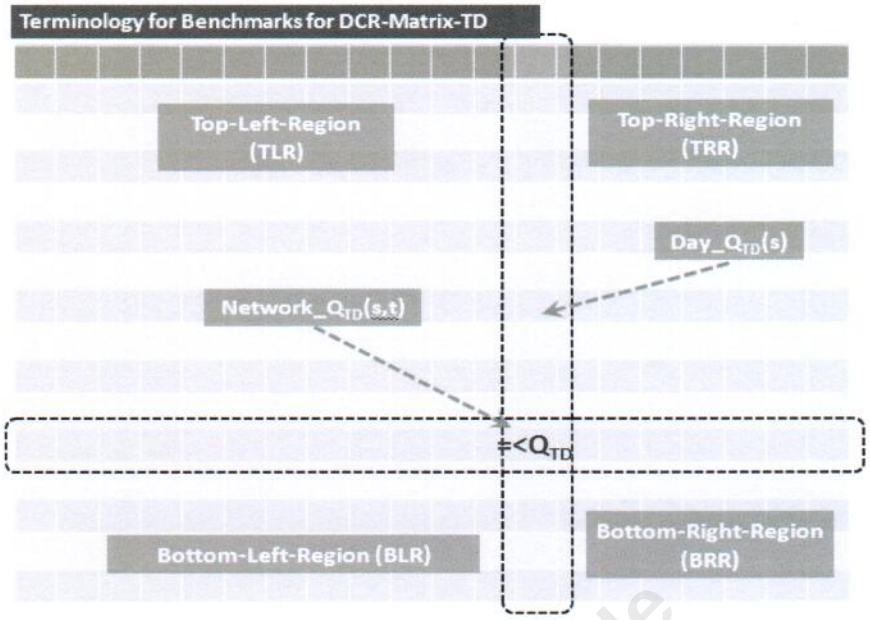


Figure 15: Terminology for DCR-Matrix-TD related

7.3 One of the main issues in the consultation paper was that averaging of DCR over the entire service area and over a period of three months was not reflective of a large number of local variations in the DCR value. The 2% DCR benchmark, as such, was not an issue although tightening of DCR benchmark was considered as an option for the specific purpose of lessening the impact of averaging. In the DCR-Matrix, DCR data is not averaged with DCR values of any other cells, not even with the values of other cells belonging to same BTS. In present assessment methodology of worst affected BTS, counts of good performing days of one BTS was compensating counts of bad performing days of other BTS which is not the case in revised approach. So, if averaging effect is nullified then, it will be a relatively stringent requirement. However, considering practical difficulties faced by the TSPs and the many factors that may be beyond the control of a TSP, certain percentage of days are allowed to be excluded for each cell and also certain percentage of cells are allowed to be excluded from the assessment of the network performance by appropriately choosing values of Percentile s and t values. Once that is done, if network is meeting the Q-Cross-point benchmark then DCR value for each cell on all days lying in the TLR would be better than 2% in case of spatial distribution and better than 3% for temporal distribution.

7.4 Sample analysis was carried out for a few LSAs using the current DCR data for 2G networks to have an idea about the network performance of different service providers with reference to Q-cross points Network_Q_{SD}(90,90) and Network_Q_{TD}(97,90) in case of metro type LSA e.g. Delhi, in case of Cat-A LSA e.g. Tamil Nadu, incase of cat-B LSA e.g. Punjab and in case of Cat-C LSA e.g. Himachal Pradesh.

7.5 Network_Q_{SD}(90,90)-values for Spatial Distribution were observed as

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TSP	Metro One LSA	Cat-A One LSA	Cat-C One LSA	Cat-B One LSA
TSP-1	3.12%	3.12%	4.84%	2.17%
TSP-2	1.58%	2.24%	0.92%	1.28%
TSP-3	2.46%	1.62%	2.78%	1.18%
TSP-4	2.05%	.....	.....	.....
TSP-5	0.67%	0.91%	1.39%	0.63%
TSP-6	1.47%	0.91%	0.00%	1.69%
TSP-7	3.25%	2.44%	2.65%	3.10%
TSP-8	.....	2.87%	10.97%	.....

7.6 Network_Q_{TD}(97,90) values for Temporal Distribution were observed as

TSP	Metro One LSA	Cat-A One LSA	Cat-C One LSA	Cat-B One LSA
TSP-1	3.70%	3.71%	5.92%	2.74%
TSP-2	1.97%	2.75%	1.21%	1.62%
TSP-3	2.99%	1.92%	2.94%	1.51%
TSP-4	3.11%	.....	.....	.....
TSP-5	0.96%	1.14%	2.50%	0.95%
TSP-6	2.17%	1.96%	0.00%	2.16%
TSP-7	3.65%	3.00%	2.90%	11.36%
TSP-8	.....	3.15%	14.49%	.....

7.7 LSA average DCR values for 2% benchmark, calculated as per the existing methodology are

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नई दिल्ली-110002/New Delhi-110002

TSP	Metro One LSA	Cat-A One LSA	Cat-C One LSA	Cat-B One LSA
TSP-1	0.72%	0.79%	0.97%	0.62%
TSP-2	0.69%	0.69%	0.48%	0.45%
TSP-3	0.77%	0.24%	1.28%	0.30%
TSP-4	0.29%	.....	.....	.....
TSP-5	0.17%	0.14%	0.41%	0.08%
TSP-6	0.25%	0.27%	0.09%	0.36%
TSP-7	1.13%	0.61%	0.70%	0.64%
TSP-8	.....	0.86%	1.98%	0.76%

7.8 LSA average DCR values for 3% benchmark, calculated as per the existing methodology are

TSP	Metro One LSA	Cat-A One LSA	Cat-C One LSA	Cat-B One LSA
TSP-1	4.13%	4.05%	8.58%	2.01%
TSP-2	1.12%	2.05%	0.33%	0.89%
TSP-3	2.65%	1.25%	2.21%	0.47%
TSP-4	1.51%	.....	.....	.....
TSP-5	0.35%	0.34%	1.76%	0.41%
TSP-6	1.24%	1.27%	0.53%	1.37%
TSP-7	2.61%	2.48%	2.27%	2.80%
TSP-8	.....	1.77%	2.60%	1.15%

7.9 These values clearly indicate that while the average DCR value of each TSP was substantially lower than the current DCR benchmark of 2% but Network_Q_{SD}(90,90) was greater than 2%. In case of Network_Q_{SD}(90,90) approach at-least 81% data-points are equal to or lower than the Q-value i.e. Q-value is a better representative of the network performance. Additionally, it can be seen from these tables that Q_{SD}= 2% is practically achievable if service provider makes appropriate efforts to address the issues of poor performing cells or days.The Q-cross-section view portrays a truer picture of the network performance.

7.10 From above DCR Data analysis, it is quite clear that Network_Q_{SD}(90,90) in spatial distribution presents a more real picture of the performance of the network and if network meets the benchmark then it indicates that

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नई दिल्ली-110002/New Delhi-110002

DCR≤2% is achieved on at-least 90% of days, by at-least 90% of cells and similarly Network_Q_{TD}(97,90) in temporal distribution meets the benchmark then it indicates that DCR≤3% is achieved on at-least 90% of days by at-least 97% of cells.

7.11 In view of above, the Authority has decided to set Network_Q_{SD}(90,90) =2% as the benchmark for the spatial distribution of the DCR Matrix. As the DCR value is to be measured at the cell level, therefore, it has been decided that all DCR values need to be reported by TSPs during the CBBH.

7.12 Day_Q(97) parameter of DCR-Matrix-Temporal Distribution may be compared with the present "Worst Affected BTS Call Drop Parameter" and Benchmark in the existing QoS regulations. "Worst Affected BTS Call Drop Parameter" specifies that a TSP should not have more than 3% BTS with more than 3% Call Drop Rate. This parameter may also be interpreted as the requirement that 'at-least 97% of the BTS' should have a DCR of less than 3%. It may be noted that computation of the 3% DCR for this parameter is based on the averaging of data across cells of same Base Station. Accordingly, there may be instances where the DCR of a cell is much higher than 3% but after averaging, it's value comes down to below DCR 3% at the BTS level. But same time, it does not consider the situations or difficulties faced by service providers and factors which may be beyond the control of service provider. To take that into account, certain percentage of cells and certain percentage of days may be required to be considered.

7.13 In the redefined framework of QoS, which is percentile based, worst affected 3% cells will be identified using the DCR-Matrix-TD. Rest of the approach remains similar to the Spatial Distribution except that the value of percentile-s which assess day-wise performance of cells would be considered at 97% instead of 90%. This will reflect that on at-least 90% of the days for at-least 97% of cells in a network, the performance will be better than 3% DCR if network is meeting the benchmark. Value of percentile-t which assess % of days when more than 97% of cells observed DCR higher than benchmark may be considered same as in case of Spatial Distribution i.e. 90%. DCR Benchmark for Temporal Distribution may be set as 3%, same as mentioned in the present regulation for worst affected BTS.

7.14 Therefore, the Authority has decided to set the benchmark for TD i.e. .Network_Q_{TD}(97,90) as 3%. Networks meeting this benchmark will indicate that DCR≤3% is achieved on at-least 90% of days by at-least 97% of cells.

7.15 It may be noted that due to high mountainous terrain, remote areas and other factors, certain service areas may face difficulties and challenges in maintaining QoS on implementation & operational fronts. Network coverage in many parts of these areas, may be in the form of island of coverage and may not be contiguous which is likely to lead to more drop call instances for traffic moving in or out of these islands of coverage. In the stages of evolving from islands of coverage to carpet or contiguous coverage, these services areas are likely to observe higher DCR values. Such situation for difficult service areas may require special consideration to encourage Service Providers to provide coverage in remote and challenging areas without fear of high financial disincentive on account of relatively more number of instances of Drop Call Rate higher than 2% or 3%. Such special circumstances can always be addressed on case to case basis and it cannot be the basis for any blanket relaxation. The Authority is aware of these concerns and it shall be looked into on need basis.

7.16 In summary, revised DCR assessment methodology will remove averaging effect. This methodology also improves confidence level by making it more representative of the actual network performance (e.g. at-least 90% of cells, at-least 90% of days have to achieve DCRs equal to or better than 2% DCR value); and as DCR is to be measured for individual cell, busy hour for that cell need to be taken, it means that DCR to be measured during CBBH. Similarly, worst-affected BTS parameter has been revised to adopt a cell-level parameter and ensure that on at-least 90% of days, at-least 97% of the cells, have to achieve DCR equal to or better than 3% DCR value. DCR is to be measured during CBBH.

7.17 Further, the Authority has decided the assessment of the performance of the network for QoS parameters to be continued at LSA level and on quarterly basis. QoS parameters with consolidate values for corresponding parameters for all cells (inclusive of all technologies) will be assessed as a whole. Benchmarks for network quality and customer service quality will continue to be applicable in the same manner as in the present regulation, except DCR benchmarks which will be 2% for DCR Spatial Distribution Measure and 3% for DCR Temporal Distribution Measure, and assessment period for all cases will be on quarterly basis.

7.18 In case 90% of total number of days or 97% of total number of cells is not an integer and includes fractional value then the DCR value corresponding to its rounded nearest integer value is to be considered for computation

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नई दिल्ली-110002/New Delhi-110002

of the network's performance assessment.

7.19 The Authority has also decided that DCR benchmark should be technology agnostic. Accordingly, from a DCR benchmark and measurement perspective, a network's performance on all technologies (e.g. 2G, 3G or 4G) deployed by the TSP in a LSA and used for providing voice services will be treated equally. Therefore, the consolidated data of all the cells of the TSP will be assessed as part of a single network, irrespective of the technology being used.

7.20 The performance against benchmarks for the parameters namely availability, accessibility and retainability in the Network Service Quality table, to be computed for all the cells in the License Service Area (LSA) in which a service provider is operating and which are being used to provide Circuit Switched Voice or VoLTE service. For example, In case, VoLTE service is being provided by the service provider then DCR values for the cells of the eNodeBs will also be included for the parameters and if only Circuit Switch based voice calls are being provided then cells in the eNodeBs will not be included for the assessment purposes of parameter;

7.21 Data pertaining to all other QoS parameters should continue to be reported technology-wise although the Authority may consider revisiting the question of their assessment as a single network at a later stage.

DCR Code	Stands for	Reason or purpose
DNE	Does Not Exist	The cell was either not commissioned or de-commissioned in the middle of the quarter and was not part of the network to serve the users in the network.
NOP	Not Operational	The cell was not operational because of planned shutdown or taken out of operation due to technical problem and thus not able to serve the users in the network. It includes force majeure conditions.
NAV	counter values Not Available	If the requisite counter values for computation of DCR for a Cell on a particular day could not be captured due to technical glitch although the cell was operational.
NDM	computation of DCR Not Determinable or irrelevant	In case, computation of DCR observes that mathematically DCR values could not be computed being not in a determinate form or computed value is irrelevant for the purpose of assessment.

7.22 There may, however, be situations when DCR data for a few cells may not be available for all the days of a quarter. For example, this could happen in a case when the BS was installed and commissioned in the middle of that quarter; or if a particular BS went an operational shutdown for certain legitimate reasons; or if there was a genuine technical difficulty in acquiring data for a few days. There may also be cases where the net voice traffic handled by a cell on a particular day was zero or a value which makes DCR value on that day non-determinable or irrelevant.

a. For the treatment of special cases, 'DCR Codes' shall be used when a special observation is made corresponding to a Cell on a particular day as listed in the table below:

b. Authority may add, modify or delete the list of DCR Codes, through directions issued from time to time;

c. If it is found that DCR codes detailed in Note 5 are used not consistent with the reasons and circumstances for which it has been specified mentioned, then it may be treated as per sub-regulation (3) of Regulation 5A of the principal regulation;

d. Blank DCR entries or entries filled with any value other than computed DCR value or entries filled with any code or text other than DCR codes specified in Note 5, shall be considered as non-submission of the compliance report;

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e. All DCR values for the assessment period shall be considered for Percentile value computation for the parameter DCR spatial measurement and DCR temporal measurement excluding the cases enumerated in above the table.

f. DCR values of individual Cells for the computation of parameter DCR spatial measurement and DCR temporal measurement shall be computed during Cell Bouncing Busy Hour and only up to two decimal places;

7.23 TSPs need to start re-assessing their systems and processes to ensure that complete and verifiable data is available. In view of this, the Authority has decided that the revised framework for network service quality and methodology will come into effect only after 1st October, 2017, allowing TSPs sufficient time to adapt to the new framework.

8 Graded Financial Disincentives for non-compliance with the benchmarks

8.1 The present structure of DCR financial disincentives is based on a determination of whether or not a TSP meets the specified DCR benchmarks. However, no consideration is given to the extent of poor performance by the TSP. In this context, the consultation paper sought to explore the possibility of a scheme of graded financial disincentives which would allow the Authority to take actions commensurate with the extent of poor performance.

8.2 Service providers and their associations were broadly not in favour of amending the financial disincentives structure. There were also suggestions that there should be no financial disincentives on marginal violations of key performance indicators (say less than 10 to 15%). In contrast, others have suggested that a policy of "financial incentives" would be in the best interest of the consumers and serve the purpose of motivating the TSPs for provisioning better services. With respect to graded financial disincentives, it was suggested that it should not be done due to various reasons such as new site restrictions, EMF issues, Fibre cut, theft cases, boundary and fringe cells, GSM spectrum non-availability, interference etc. They also suggested that financial disincentives for QoS should be removed as there is heightened competition in the market with comparable price structures, and quality of service has emerged as a major differentiator. The TSPs were also not in favour of imposing additional penalties for 2nd and 3rd consecutive default if improvement in performance over previous quarters is observed. They were in favour of imposing penalties if a TSP refuses to collaborate in a joint action plan. They were also of the opinion that there should not be any financial disincentives for the TSPs if the QoS benchmarks are breached as choices are available to consumer and market forces will ensure improved QoS. In general, they believe that financial disincentives have not contributed in either increasing investments or to improve QoS. However, others have suggestions supporting graded financial disincentives.

8.3 The suggestions of stakeholders were taken into account by the Authority. At the same time, the Authority also considered the improvements in QoS standards that have taken place in the recent months. These positive developments are attributable in part to the increase in awareness and transparency about the performance of networks and the existence of the financial disincentives framework in the QoS regulations. In light of this, the Authority has decided to continue with the existing framework on consequences for non-compliance with the benchmarks for the network related QoS parameters, except for the parameter on call drop.

8.4 Being an issue of grave public concern, and to improve the quality of experience of telecom consumers, the Authority has decided to prescribe a graded financial disincentive structure for the call drop parameter. The graded financial disincentive (FD) will be imposed on the basis of extent of deviation of a network's performance from the specified DCR benchmarks. For this purpose, the Authority has decided to continue the existing periodicity of assessment of Performance Monitoring Report (PMR) i.e. on quarterly basis. The imposition of FD will take place at the LSA level taking into account the data for all cells (2G, 3G and 4G) which are being used for voice calls.

8.5 The revised graded FD structure being adopted by the Authority is with due regard to the specific functions conferred upon the Authority under the TRAI Act. The TRAI Act gives the Authority the power to not only regulate QoS but also ensure the compliance of the provisions of the regulations. The Authority has accordingly adopted a number of measures in the past to ensure such compliance by TSPs. Firstly, information relating to the QoS performance of service providers is being disclosed regularly to the public in the form of the TRAI's performance reports, QoS audit reports and the TRAI Analytics Portal. Secondly, FDs are being imposed on service providers that fail to meet the specified QoS benchmarks and information relating to the imposition of such FDs is also shared publicly by the Authority. The Authority intends to continue following both these paths

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in respect of the new DCR benchmarks also. Authority decided to keep the minimum amount of FD in case of DCR benchmark same as present value of Rs. 1 lakh for each instance of non-compliance. This is being accompanied by a graded mechanism for determining the FD based on the extent to which a TSP's performance deviates from the specified DCR benchmark. If network doesn't meet benchmark then for every 2% deviation from DCR Benchmark, financial disincentives may also be increased by rupees one lakh. However, there may be a capping of rupees five lakh for FD against one DCR parameter if it is a first contravention of benchmark in the consecutive quarters. If there is a case of contravention of benchmark in consecutive quarters, then the amount of FD may be increased by a factor of 1.5 while by a factor of 2 if it is in more than two consecutive quarters.

8.6 To illustrate the computation of FD, for instance if the performance of a service provider in the first quarter with respect to the parameter Network_Q_{SD} (90,90) is 3.5 percent, then the FD payable would be rupees one lakh.In case the performance in the second quarter is 5.5 percent then the FD payable would be 1.5 times of rupees 2 lakhs i.e. rupees 3 lakhs. Similarly, in case the performance in the third quarter is 7 percent then the FD payable would be twice the amount payable as per the table in the regulations i.e. rupees 6 lakhs. Further, if the performance of the same service provider in the first quarter with respect to the parameter Network_Q_{TD} (97,90) is 4.7 percent, then the FD payable would be rupees one lakh. In case the performance in the second quarter is 6 percent then the FD payable would be 1.5 times of rupees 2 lakhs i.e. rupees 3 lakhs. Similarly, in case the performance in the third quarter is 8 percent then the FD payable would be twice the amount payable as per the table in the regulations i.e. rupees 6 lakhs. However, since there is a capping of rupees 10 lakhs in a quarter for combined violation of both the parameters, the FD payable for the third quarter violation, combined for both the parameters will be capped at rupees 10 lakhs.

8.7 It was proposed in the consultation paper that QoS parameters and benchmarks should be technology agnostic (2G/ 3G/ 4G/ BWA) and could be measured and reported irrespective of the technology deployed. During public consultations, most of the service providers and their associations had suggested that parameters for Network Availability, Accessibility (CSSR), Retainability (Call Drop Rate) should be technology agnostic as long as they provide voice services in the country. Presently, the 3G networks have similar network related parameters and benchmarks as 2G, although nomenclature of the parameters may differ. ITU-T Recommendation G.1028 defines end-to-end quality of service for voice over 4G mobile networks. For voice over 4G, parameters similar to 2G and 3G have been discussed with the service providers and consequently, TRAI had proposed similar parameters for 4G services. Almost all service providers have agreed with these parameters and benchmarks. Accordingly, TRAI has prescribed the parameters and benchmarks for 4G services in these regulations.

8.8 Network and Customer Service Quality parameters, other than DCR, will remain same as in the previous regulation and existing FD will continue.

9 Radio Link Timeout (RLT)

9.1 Call Drop Rate at network level is assessed on the basis of information captured by the network. Call drop is forced release when quality of voice call degrades below a pre-specified level. There may be scenarios in real environment when degradation of voice quality may be for very short duration and cause of degradation is likely to be temporary in nature e.g. user moving in and out of elevator (lift), passing through tunnel etc. In such scenarios, users may experience degradation of quality but for a very short duration. Degradation of voice quality for very short duration may also happen during the handover process between cells. The duration of degradation may also be dependent upon radio network deployment scenarios e.g. wide area cells and micro-cells may observe variations of different levels in the network signal. Similarly, there may be variations in the duration for which degraded network signal quality is observed.

9.2 Mobile networks are designed to take care of such scenarios and provide flexibility in the system through configurable parameters to handle situations in different network deployment scenarios and traffic patterns in different pockets of the network. In GSM system, RADIO_LINK_TIMEOUT value can be maintained and broadcast by the network to the devices for initializing or re-initializing Counter 'S', as defined by GSM specifications. The counter 'S' is incremented or decremented according to good and poor quality on the Slow Associated Control Channel (SACCH) associated with a connection. When Counter 'S' value becomes zero, radio resources are released.

9.3 In a GSM system, a mobile station (MS) making a voice call tracks a radio link counter, which is used to ensure the quality of the radio link. The radio link counter is used to measure the quality on the Slow Associated Control Channel (SACCH) associated with a connection (which may be used to carry a voice call). At the start

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of a call, after handover, and after re-assignment, the radio link counter "S" is initialized to a network-defined Radio Link Timeout (RLT) value. After every bad SACCH block, S is decreased by 1. After every good SACCH block, S is increased by 2 (to a maximum value of RLT). If the radio channel conditions are bad, many radio blocks will be lost, and eventually the radio link counter will expire when the value of S equals the expiry value (zero). This event is termed Radio Link Failure (RLF), and at that point the device stops using the traffic channel. The commonly-seen problems leading to radio link failure are (a) rapid radio channel degradation (e.g., due to sudden co-channel interference), (b) the network not sending a handover message in time to avoid RLF and uplink interference and/or limit-of-sensitivity (due to limited transmit power) issues.

9.4 For cells with obvious coverage holes or in areas where call drops occur during movement, a TSP can increase this parameter appropriately in order to increase the possibility to resume the conversation. This parameter is normally set depending upon the region – urban, semi-urban, rural areas. Though the RLT value is normally set up as per the network, setting up high values for the same could lead to customer dissatisfaction. Considering this, the views of stakeholders were sought as to whether RLT parameter should be mandated or not and what should be the RLT values.

9.5 During public consultations, most of the stakeholders had suggested that RLT is just a configuration parameter amongst thousands of other configuration parameters to counter various dynamic adverse conditions and thus in the best interest of the TSPs being able to optimize their networks for delivering good quality services, it should be kept out of the ambit of any regulatory framework. However, there were suggestions to mandate optimal value for RLT.

9.6 Normally the RLT value is defined, to be between 36 to 48 for areas of light traffic and large coverage (rural areas); between 20 to 32 for areas of heavy traffic (urban areas); and between 4 to 16 for semi-urban areas and in areas with heavy traffic (with microcells). TRAI had obtained the details of cells with RLT values in the range of 0 to 16, 16 to 32, 32 to 48 and 48 to 64 from the service providers. On analysis of this data it was seen that in most of the cases the RLT value is within the range of 32 to 48. However, there were few cases where the RLT value was in the range of 48 to 64.

9.7 Inappropriately high RLT value configuration in the network may lead to a call not getting dropped even in case of prolonged degraded quality of voice call. In such cases, users are likely to disconnect the call because of poor quality of voice call and it may not be registered as call drop, though in real sense it was a call drop. Hypothetically, RLT parameter can be misused to moderate call drop rate in the network but no service provider is likely to adopt such practice as it will also deteriorate network performance. In view of this, the Authority feels that there is no need for mandating any specific value of RLT as such but there is a need to have mechanism to check inappropriate high RLT value configuration in the network. Since such high values could lead to poor customer experience the Authority has decided to monitor such cells through reporting by service providers for RLT values equal to or higher than 48 for more than three consecutive days.

10 Use of Call Detail Records (CDR) meta data for call drop rate calculation

10.1 CDRs (Call Detail Records) which provide usage related information for a particular customer, may be an additional source of information for the assessment of call drop rates. CDR captures cell id and duration of the call. The analysis of CDRs with small duration and repetitive calls to same called party within stipulated duration may give indication that the calls were probably getting dropped by the network. Through data analytics of the CDR, it may be possible to identify probable call drop instances.

10.2 Stakeholders' views

a. During the consultation process all the service providers had opined that identification or segregation of the Cause Codes whether they are due to network behavior or consumer behavior or device behavior is not possible with present information in the CDR. Hence, call drop rate using CDR meta data cannot be calculated.

b. One of the registered consumer organizations had suggested that CDR data method can be the secondary source for calculating call drops and worst of the two results should be counted for performance measurement.

10.3 The Authority, after considering the views of stakeholders and examining the issue found that cause codes captured as a part of CDRs are not detailing the specific reasons related to radio network conditions and mapping of radio network related events to the codes captured in CDR is many to one and this mapping has non-

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uniform implementation among different telecom equipment vendors. It is also noted that analytics of CDR indicates the probability of call drop but it may not be concluded only on the basis of the CDR. This information may be helpful to identify likely problematic area and investigate further, if required. Further, as the CDR also reflects details of the source and destination numbers, any analysis of this data would also have to take into account the privacy of telecom subscribers. In view of these factors, the Authority has decided to undertake further analysis of this issue through engagements with expert agencies/organizations to consider the usefulness of CDR meta data analysis and feasibility of implementation.

11 Customer Satisfaction Index:

11.1 Measuring the QoE of consumers

a. One of the options for measuring the QoE of the consumer could be to calculate the QoE as perceived by the consumer. Perceived QoS could be assessed by customer surveys and from the service provider's network. Using the various network related parameters one can calculate the Network Service Quality Index (NSQI). Similarly, the Customer Service Quality Index (CSQI) could be calculated by focusing on the Customer Centric parameters like metering and billing credibility, for post-paid and pre-paid; resolution of billing/ charging complaints, etc. Similarly, the Customer Satisfaction Survey Quality Index (CSSQI) is calculated through consumer surveys.

b. These different indexes for could then be used to evaluate the performance of the cellular mobile service providers on each parameter based on a 10-point score and by giving equal weightage to each parameter. (Whenever a benchmark is achieved, a score of 10 points will be assigned to that parameter. In case the performance of parameter is below benchmark, the score will be reduced depending on level of performance). Accordingly, the total score for all parameters will be added. Using these the 'Customer Satisfaction Index' (CSI) could be calculated.

c. The CSI combines the user behavior and the actual performance of the network, Technical Quality perception and Service Quality Perception are included to distinguish network technologies and service quality from customer's perspective. While Technical specifications are also added for evaluating the real performance of the network. To calculate this, a number of latent variable needs to be defined - Customer Expectation; Value perception; Technical quality perception; Customer Satisfaction; Service quality perception; Customer Loyalty; and Technical Specifications.

d. The views of stakeholders were sought on the utility of customer satisfaction index, the methodology of calculation, the latent variables that need to be defined and how they are to be calculated.

11.2 Stakeholders' views

a. During consultation process the service providers and their associations had suggested that Quality of Experience(QoE) is subjective and varies with the expectation of the consumers and affected by various factors such as awareness, experience, media, perception etc. and hence, it should not be measured.

b. One of the consumer organization registered with TRAI suggested that the QoE can be calculated by giving weightage of 30% for NSQI, 40% to CSQI and 30% to CSSQI and CSSQI need to be refined based on experience of at least 2 years. There was also a suggestion that a SIM may be used by the TSPs to measure the QoE of customers as it will help the TSPs to invest wisely. Direct engagement with the customer to measure QoE is not suggested as their input to key performance indicator (KPI) is subjective.

c. The Authority considered the views of the stakeholders and has felt the need for using technological platforms, involving customers, to collect and assess feedback of QoE by the customers. In this regard, TRAI has recently launched the "TRAI MyCall App" through which the customers can rate their call quality experience. Also the App can capture the call quality and report to TRAI. The analytics of the data collected via App can be presented in a manner which enables consumers to understand the perceived quality of different service providers' network.

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TELECOM REGULATORY AUTHORITY OF INDIA

NOTIFICATION

New Delhi, the 31st July, 2018

F. No. 305-03/2018-QoS.....In exercise of the powers conferred upon it under section 36, read with sub-clauses (i) and (v) of clause (b) of sub-section (1) of section 11, of the Telecom Regulatory Authority of India Act 1997 (24 of 1997), the Telecom Regulatory Authority of India hereby makes the following regulations further to amend the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009), namely: -

THE STANDARDS OF QUALITY OF SERVICE OF BASIC TELEPHONE SERVICE (WIRELINE) AND CELLULAR MOBILE TELEPHONE SERVICE (SIXTH AMENDMENT) REGULATIONS, 2018
(7 of 2018)

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1. (1) These regulations may be called the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Sixth Amendment) Regulations, 2018 (7 of 2018);

(2) They shall come into force from the 1st day of October 2018.

2. In sub-regulation (1) of regulation 2 of the Standards of Quality of Service Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) (hereinafter referred to as the principal regulations),

(a) after clause (hb), the following clauses shall be inserted, namely: -

"(hba) "**Down Link (DL) Packet Drop Rate or DL-PDR"** means fraction of Packet Data Convergence Protocol (PDCP) Service Data Units (SDUs), in percentages, which are dropped by the network or lost in the network while transferring data on the downlink for Quality of Service (QoS) Class Identifier (QCI)=1 in LTE based radio access networks;"

(b) after clause (y), the following clause shall be inserted, namely: -

"(ya) "**Up Link (UL) Packet Drop Rate or UL-PDR"** means fraction of Packet Data Convergence Protocol (PDCP) Service Data Units (SDUs), in percentages, which are lost in the network while transferring data on the uplink for Quality of Service (QoS) Class Identifier (QCI)=1 in LTE based radio access networks;"

3. In sub-regulation (1) of regulation 5 of the principal regulations, in the table, and,

(a) under the column "Name of Parameter",

(i) in serial number (iii) after entry (c), the entry '(d) DL Packet Drop Rate' shall be inserted;

(ii) in serial number (iii) after entry (d), the entry '(e) UL Packet Drop Rate' shall be inserted;

(b) under the column "Benchmark",

(i) in serial number (iii) item (d), the entry '≤ 2%' shall be inserted;

(ii) in serial number (iii) item (e), the entry '≤ 2%' shall be inserted;

(c) under the column "Method and Assessment period",

(i) in serial number (iii) item (d), the entry 'On average basis over a period of one quarter' shall be inserted;

(ii) in serial number (iii) item (e), the entry 'On average basis over a period of one quarter' shall be inserted.

(Sunil Kumar Gupta)
Secretary

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Note.1. —The principal regulations were published in the Gazette of India, Extraordinary, Part III, Section 4 dated the 20th March 2009 vide notification No. 305-25/2008-QoS dated the 20th March 2009.

Note.2. —The principal regulations were amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Amendment) Regulations, 2012 (10 of 2012) dated the 7th May 2012.

Note.3. —The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Second Amendment) Regulations, 2012 (24 of 2012) dated the 8th November 2012.

Note.4. —The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Third Amendment) Regulations, 2014 (12 of 2014) dated the 21stAugust 2014.

Note.5. —The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Fourth Amendment) Regulations, 2015 (8 of 2015) dated the 15thOctober 2015.

Note.6. —The principal regulations were further amended by issuing the Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Fifth Amendment) Regulations, 2017 (4 of 2017) dated the 18thAugust, 2017.

Note.7. —The Explanatory Memorandum explains the objects and reasons of the "Standards of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service (Sixth Amendment) Regulations, 2018 (7 of 2018).

Explanatory Memorandum

1. Background

1.1. Telecom Regulatory Authority of India (TRAI) has been given the mandate under the TRAI Act, 1997 to lay down the Quality of Service (QoS), to ensure the QoS and to conduct the periodical survey of such service provided by the service providers so as to protect the interests of the consumers. In exercise of aforementioned functions under the TRAI Act, the Authority had notified the Regulation on Quality of Services (QoS) of Basic and Cellular Mobile Telephone Services, 2000 vide Notification dated 5th of July 2000. The objectives of these regulations were to create conditions for customer satisfaction by making known the Quality of Service which the service provider is required to provide, and the user has a right to expect; measure the Quality of Service provided by the service providers from time to time and to compare them with the benchmarks so as to assess the level of performance; and to generally protect the interests of consumers of telecommunication services.

1.2. These regulations were subsequently reviewed and TRAI issued the revised QoS standards for these services in the year 2009 as The Standards of Quality of Service of Basic Telephone Service (Wireline) And Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009). First four amendments to the main regulations were made keeping in view the 2G networks and 3G networks deployed by the service providers. Subsequently, due to growing concerns by consumers regarding poor QoS and increasing call drops and introduction of 4G network deployment by service providers, last amendment i.e. the fifth amendment to the regulations was issued on 18th August 2017 which redefined QoS framework for Drop Call Rate (DCR) assessment. After this amendment, the consolidated data of all the cells of the TSP is to be assessed as part of a single network, irrespective of the technology being used i.e. whether cells belong to GSM, CDMA, WCDMA or LTE.

1.3. Similarly, parameters other than DCR like Accessibility (Call Setup Success Rate and Session Establishment Success Rate, Channel/ Bearer Congestion), Retainability parameter of Connection with good voice quality are also computed in a technology agnostic manner and these parameters includes LTE radio access bearers, Voice over LTE (VoLTE) in addition to voice and network performance for 2G and 3G networks. While computation of QoS parameters for all RATs may be consolidated as a single data set, there may be technology specific terms and thresholds for considering samples as good or bad. Corresponding values of parameters for different technologies may be computed in a technology specific manner but once computed they may become part of single data set. For DCR assessment, VoLTE was also included in the revised QoS regulations and Explanatory Memorandum (EM) to fifth amendment referred to ITU-T Recommendation G.1028 which defines end-to-end quality of service for voice over 4G mobile network. However, detailed deliberations on various issues of QoS specific to voice services for LTE users were not done during earlier consultation.

1.4. LTE networks are IP based and it is common protocol for delivering voice and data. Voice and data have quite different characteristics, data in nature is asymmetric and comes in bursts while voice is symmetric and almost regular in periods. Therefore, providing voice services through LTE network may be a bit challenging as compared to the 2G and 3G networks. 2G and 3G based radio technologies and devices came in market with voice capabilities from day one and voice services to users are provided by the same network on which they were camped on. For purpose of voice calls, if LTE network is not supporting voice i.e. VoLTE then user may be required to be pushed to other radio access technologies i.e. fall back to Circuit Switched technologies (CSFB) which may affect QoS experience of user. LTE network penetration in India

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has increased significantly in last one year. Many operators providing LTE coverage have yet to offer VoLTE. VoLTE may be launched in a phased manner across the country. Almost all other operators having LTE networks in India have plans to launch VoLTE services soon. In such scenarios, there may be many 4G users who are suffering due to long time required to set up the voice calls.

1.5. In view of this, the Authority undertook a public consultation in the matter by releasing a consultation paper on "Voice Services to LTE users (including VoLTE and CS Fallback)" on 26th February 2018 seeking comments of stakeholders by 16th March 2018. In response to the Consultation Paper, the Authority received comments from 12 stakeholders. An Open House Discussion (OHD) was also held with the stakeholders at New Delhi on 23rd April 2018. This consultation was focused and limited to QoS issues related to voice services to LTE users e.g. silence or voice mute for VoLTE users and voice call related issues experienced by users served via CSFB and capture them appropriately in the DCR statistics available from the networks or during drive tests. All comments received from stakeholders during the consultation process have been considered by the Authority while finalizing these regulations.

2. Key issues raised in the Consultation Paper (CP) were:

2.1. **Issue of silence/voice mute and requirement of new Quality of Service parameters specific to voice services for LTE users:** It is noticed that requirements of Quality of Service (QoS) specific to voice services for LTE users may be different from 2G and 3G users. Therefore, there are possibilities that network parameters and benchmarks as per existing regulations are not sufficient for effectively monitoring QoS for VoLTE/CSFB calls. Various situations were discussed in consultation paper which could result in poor QoS experience for VoLTE users.It is observed that, in LTE, some of the constants and timers are used whose values may impact QoS but improve DCR statistics or call set up success rate etc. Inappropriate value configuration of such timers and constants in the network may lead to situations like; frequent call drops, longer call set up delay, silence periods or voice muting. Such instances may result into silence period or voice mute observed by the users. In order to resolve such issues, it is important to define instance of silence/voice mute and how many such instances may be accepted during voice call. It was sought from stakeholders to identify the KPI which could be used to measure report and evaluate network or service from perspective of silence/voice mute problem.

2.2. **Parameters to measure performance of users being served voice via CSFB**: What parameters like Post Dialing Delay (PDD) may be introduced to measure performance of users being served voice via CSFB. For CSFB scenarios, measurements for time taken to set up the call and report the measured values may be required to be specified.

3. Comments of Stakeholders

3.1. **Issue of silence/voice mute and requirement of new Quality of Service parameters specific to voice services for LTE users:**

(a) Majority of stakeholders suggested that measurement of Mean Opinion Score (MOS) score provides an easy way to measure and quantify the device speech quality. However, few stakeholders mentioned that they cannot identify the source of the problem i.e. if the Mute or silence is due to device or network. Apart, these equipment's being expensive, do not scaleout for a mass testing in live Service provider network. However, few stakeholders including service provider suggested that quality of VoLTE calls needs additional support from factors like IP Packet Loss (uplink and downlink), Block Error Rate (uplink & downlink), Garbled Voice Packets, Jitter, Mute calls,Mean Opinion Score (MOS),Dropped call, Call setup success rate, Call setup time, Post dial delay, Registration success rate, Registration

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delay, S-CSCF identification success rate, S-CSCF identification delay etc.

(b) Some stakeholders suggested that the existing parameters like packet loss, jitter, latency, end-to-end delay are sufficient to identify or measure silence/voice mute while others suggested some additional parameters may be used for measurement. One more suggestion received from stakeholders, which was related to tapping data with probes from VoLTE forwarding plane for the measurement of silence/voice mute instances and duration of silence impacting customer experience as it has a lot of subjectivity in it. These kinds of measurements and KPIs/ KQIs (Key Quality Index) are derived based on customized algorithms devised by individual "probe vendors". Also, these KQI measurements are done on dip stick basis to evaluate customer experience trends and detect issues in the network/devices. These are non-standard/customized algorithms that are subjected to continuous tuning based on customer research surveys of experience and show variance of measurement output across probes from different vendors. Thus, introducing such KPIs/KQIs as part of the regulation will not be advisable. Other stakeholder suggested that a mechanism of measuring mute calls can be through conducting drive tests on sample basis during TRAI IDTs.

(c) One service provider suggested that the measurement of PDCP SDU Loss Rate for VoLTE provides the fraction of IP packets (PDCP SDUs) which are lost (not successfully received) on the uplink and downlink. Packets lost in any of the lower layers such as Physical, MAC and RLC layers can be recovered through retransmission, however, Packets lost in PDCP SDU Layer cannot be recovered and hence can be considered for muting. The Benchmark for VoLTE Voice Quality KPI (100-PDCP SDU Loss Rate) is suggested to be of 95%. One consumer protection association furnished suggestions related to the average and the ideal quality values of the Packet Loss rate during Voice over LTE sessions and suggested values were <2% and <1% respectively.

(d) Some stakeholders submitted that optimization of timers and constants, mentioned in 3GPP TS 36.331, is very essential from the users experience perspective. One stakeholder suggested that The Media Inactivity Timer (MIT) is the critical timer that influences the dropped call rate in VoLTE. One of the stakeholder suggested that PDCP discard timer could be used for optimization. However, majority of stakeholders suggested that the prescribed QoS parameters will be sufficient to take care of such constants/timers. While the ranges of timers/constants are as per the 3GPP standards, the actual values set are dependent on vendor implementations which may be different across all mobile operators (depending on which operator has deployed which vendor's equipment in its network). Each OEM works on a certain range of values for the timers and constants as per the internal systems and network designs pertaining to applicable terrain, clutters etc. and uses them for the purpose of optimization.

3.2. **Parameters to measure performance of users being served voice via CSFB:** Few stakeholders suggested that ITU-T Recommendation G.1028 & GSMA recommendation IR.42 has defined parameters to measure performance of voice via CSFB such as Registration success rate (KPI related to IMS), Post-Dialing Delay (PDD), voice quality (MOS-LQ) and call drop rate, CSFB Return to LTE Success Ratio, Speech Quality on Call Basis (SpQ), Call Completion Ratio Circuit Switched Telephony etc. which may reflect the customer experience for voice service.

4. Analysis of inputs and conclusion

4.1. **Issue of silence/voice mute and requirement of new Quality of Service parameters specific to voice services for LTE users:** From the discussions and deliberations on the issues related to VoLTE, muting of

voice or silence during conversation seems to be a major concern. Any of the current parameters specified in the QoS regulations do not reflect poor quality of service on this part. Voice call over LTE might not be dropped while there may be a long pause of voice.

(a) To capture instances of such pauses, percentage of Internet packet drops may be a network parameter which may reflect quality of service. To measure and assess high percentage of drops, there may be options to capture it while conducting drive tests but these tests in a particular area may not be very frequent. Other option may be to define a network level parameter which may be measured and reported periodically.

(b) Mean Opinion Score (MOS) for measuring mute or silence during VoLTE calls at network level would require implementation of probes across the network. This may not be practical from regulatory perspective as probes are to be physically deployed across the networks and number of probes and locations are to be expanded along with the growth and expansion of the networks. MOS based methods or alternative ways to assess the quality of voice calls during conversations may be carried out by making sample test calls during drive tests. However, such tests would be limited to the period and locations of drive tests.

(c) Network level parameter for measuring and assessing mute or silence period during VoLTE calls may be directly related to drop and loss rate of Internet packets (IP Packets). In LTE networks, to measure drop rate of packets, it may be appropriate to capture drop rate of Service Data Units (SDUs) at Packet Data Convergence Protocols (PDCP) layer as loss of packets at this layer cannot be recovered while loss of packets at lower layers than PDCP layer such as Physical, MAC and RLC layers have mechanism to recover packet loss through re-transmissions.

(d) In view of this, **the Authority decided that new QoS network parameter for assessment of VoLTE mute may be assessed by packet drop rate in downlink and uplink. Such measurements may be made on average basis for entire network in the license service area and reported to TRAI on quarterly basis.** In general, Packet loss rate is defined as the ratio of lost packets to all packets sent from the Source to Destination in percents (measured over a given period of time) [GSMA document IR.34]. In LTE, following three scenarios for PDCP SDUs (Internet Protocol packets) drop and loss are possible which may be defined in accordance to the International Specifications 3GPP TS 36.314 and 3GPP TS 32.425: -

(i) PDCP SDUs (Internet Protocol packets) may be dropped or discarded on the downlink. Where, a dropped packet is one whose context is removed from the eNodeB without any part of it having been transmitted on the air interface while packets discarded during handover are excluded from the count. For such measurement, only user plane traffic (Dedicated Traffic Channel DTCH) is to be considered.

(ii) PDCP SDUs (Internet Protocol packets) may be lost (not successfully transmitted) on the downlink. Where, a lost packet is one whose context is removed from the eNodeB/ RN after an attempt has been made to transmit part or all of the packet on the air interface but the whole packet has not been successfully transmitted (not positively acknowledge). For such measurement, only user plane traffic (Dedicated Traffic Channel DTCH) is to be considered.

(iii) PDCP SDUs (Internet Protocol packets) may be lost (not successfully received) on the uplink. Where, a lost packet is a missing UL PDCP sequence number, representing packet that is not

delivered to higher layers, of a data radio bearer. For such measurement, only user plane traffic (Dedicated Traffic Channel DTCH) and only PDCP SDUs that have entered PDCP (and given a PDCP sequence number) are to be considered.

(e) For the purpose of VoLTE, QCI will be equal to 1. In view of above, it is observed that new network parameters may be included, for QoS assessment, which will cover all the above mentioned three scenarios. Therefore, **Authority considered the views of stakeholders and decided to introduce two new network parameters for QoS regulations "Down Link (DL) Packet Drop Rate or DL-PDR" and "Up Link (UL) Packet Drop Rate or UL-PDR", to measure overall packet loss or drop in both downlink and uplink at PDCP layer.** Here, DL-PDR will include both the packets dropped due to congestion, traffic management etc, and packets lost in the downlink transmission between the eNodeB and UE and between the eNodeB and Relay Nodes (RNs), as defined in sub-para(d) (i) and (d) (ii) respectively. However, UL-PDR will only include packets lost in the uplink transmission between the eNodeB and UE and between the eNodeB and RNs, as defined in sub-para(d) (iii) above. Regarding benchmark, one service provider suggested 5% benchmark for PDCP packet loss rate, however, one consumers' association suggested that packet loss rate in case of voice over LTE session i.e. in ideal <1% and in average <2%. According to the ITU-R M.2135-1 report on 'Guidelines for evaluation of radio interface technologies for IMT Advance', *a user is defined to have experienced a voice outage if less than 98% of the packets have been delivered successfully*. In view of above, **Authority decided to prescribe benchmarks as less than or equal to 2% for both the parameters.**

(f) The measurement can be made via an automatic data collection system, based on the network counters which register the real traffic of the network. The counter is available on the eNodeB and is recorded 24 hours a day, every day of the years. However, for reporting the performance the measurements have to be taken during TCBH. The formula for calculating the percentage of DL Packet Drop Rate and UL Packet Drop Rate are:

$\frac{(A * 100)}{B}$ where:

For DL Packet Drop Rate:

A =Total number of PDCP SDUs (packets) dropped or lost (not successfully transmitted) in the downlink, for QCI=1.

B = Total number of PDCP SDUs (packets)of bearer entered for transmission, for QCI=1.

The formula includes the packets dropped due to congestion, traffic management etc, and packets lost in the downlink transmission between the eNodeB and UE and between the eNodeB and RNs.

For UL Packet Drop Rate:

A = Total Number of missing UL PDCP sequence numbers, representing packets that are not delivered to higher layers (packets lost), of a data radio bearer with QCI = 1.

B = Total number of UL PDCP sequence number of a bearer, representing packets that are to be delivered to higher layers with QCI=1.

The formula includes the packets lost in the uplink transmission between the eNodeB and UE and between the eNodeB and RNs.

4.2. **Voice Services for LTE Users via CS Fall Back:** Circuit Switch (CS) Fall Back (CSFB) scenarios lead to long call set up time and user may not be aware about the requirements of the network for such longer times to set up the voice calls as network is not in a position to announce or send a tone because of non-availability of radio resources between user and network for the interim period. To address the concerns related to longer call set up time in cases of Circuit Switch (CS) Fall Back (CSFB) scenarios, the Authority acknowledged the technical reasons which may be beyond control of service providers to reduce the time gap when user initiates the call in LTE networks and calls are established over other types of access networks. In this regard, the Authority decided that field measurements are required to be collected on periodic basis from different locations before setting any particular parameter and benchmarks in this regard. In view of this, **the Authority decided to issue directions to service providers to conduct such field measurements and submit report to TRAI on quarterly basis**.

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