

Consultation Paper No. 02/2018



Telecom Regulatory Authority of India



Consultation Paper

on

**‘Method of allocation of spectrum for Public Mobile
Radio Trunking Service (PMRTS), including auction, as
a transparent mechanism’**

8th February, 2018

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Written Comments on the Consultation Paper are invited from the stakeholders by 22nd March, 2018 and counter-comments by 5th April, 2018. Comments and counter-comments will be posted on TRAI's website www.trai.gov.in. The comments and counter-comments may be sent, preferably in electronic form, to Shri Syed Tausif Abbas, Advisor (Networks, Spectrum and Licensing), TRAI on the email ID advmn@trai.gov.in with subject titled as "Comments/counter-comments to Consultation Paper on "Method of allocation of spectrum for Public Mobile Radio Trunking Service (PMRTS), including auction, as a transparent mechanism".

For any clarification/ information, Shri Syed Tausif Abbas, Advisor (Networks, Spectrum and Licensing), TRAI, may be contacted at

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CHAPTER I: INTRODUCTION

- 1.1 Trunking systems, using frequency-trunked technology, were developed to offer companies a more sophisticated, private and efficient way of communicating with their mobile workforce.
- 1.2 The market for Trunked Radio is relatively small with no direct competition from other services. Unlike cellular services, it is not intended for general public, but is mainly engineered to provide communications among a group/organization. Limited customer base is due to specific scope of service meant for person-to-person and person-to-group radio communication. It has wide-spread application in sectors such as Public Safety (Ambulance, Fire Service, Police, Forest, Defense), Manufacturing (Logistics, Oil & Gas, Mining), Construction (new projects), Courier (picking and delivery of packages), Emergency Services (for logistics and fighting natural calamities), Utilities (like Municipal services, electricity, water etc.), Transportation (Road, Airports, Harbors), Energy & Communication (for efficient service & maintenance), and Service Industry (repair, delivery, financial services).
- 1.3 Many trunked radio systems today still operate in analog mode; however the demand for better performance and reliable system has shifted the strategic direction of service providers and users worldwide towards migration to digital mode. The technological obsolescence in Analog Trunked Radio Systems have raised several issues like cost of Operations & Maintenance, unavailability of equipment and inefficient use of spectrum as compared to new Digital Systems. The Digital Trunked Radio Systems offer enhanced signaling options, more consistent audio quality, higher radio spectrum efficiency, wider range of encryption features, narrow band data connection enabling the support to applications such as internet, GPS etc.

1.4 There are several international standards developed for trunked radios worldwide, however there is no universal standard with global appeal. The industry has deployed a mixture of standards by manufacturers in collaboration with associations and agencies. The report¹ ITU-R M.2014-3 on “Digital Land Mobile Systems for Dispatch Traffic” provides the technical and operational characteristics for spectrum efficient digital dispatch systems and also provides details of systems being introduced throughout the world. Comparison between some of the prominently used digital trunked radio standards is given in **Annexure I**.

A. Prevailing Mobile Digital Radio Trunking Technologies²

i. TETRA

1.5 It is an open standard for a trunked radio system whose technical requirements specification aims to satisfy the needs of a wide range of professional users, ranging from emergency services to commercial and industrial organizations. The development of the standards for TETRA system has been carried out in the European Telecommunications Standards Institute (ETSI). The TETRA suite of mobile radio specifications provide a comprehensive radio capability encompassing trunked, non-trunked and direct mobile-to-mobile communication with a range of facilities including voice, circuit mode data, short data messages and packet mode services. It uses Time Division Multiple Access (TDMA) with 4 user channels on one radio carrier and 25 KHz spacing between carriers. TDMA provides 6.25 KHz channel efficiency (4 timeslots in 25 KHz channel). For its modulation TETRA, uses $\pi/4$ differential quadrature phase-shift keying. The symbol (baud) rate is 18,000 symbols per second, and each symbol maps to 2 bits, thus resulting in 36,000 bit/s gross. It operates in 380-390/390-400, 410-420/420-430, 450-460/460-

¹ https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2014-3-2016-PDF-E.pdf

² https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2014-3-2016-PDF-E.pdf,

<http://forum.ameradio.com/usr/doc/Tait White Paper Digital Radio Adv and Disad 20130130.pdf>

470, 870-888/915-933 MHz frequency bands. It has higher data throughput than other standards such as DMR, Project 25. However, it has poorer coverage. It covers roughly half that of DMR for same frequency and transmit power, thus need 4 times amount of sites. Moreover, it is not designed for backwards compatibility or migration from legacy analog networks.

ii. PROJECT 25 (P25)

1.6 Project 25 is a user-defined open standard. The development of the standards for Project 25 system (Phase I and II) has been carried out by Project 25, a cooperative effort between US local (Association of Public-Safety Communications Officials international- APCO), state (Technology Professionals Serving State Government- NASTD) and federal government users; in collaboration with the Telecommunications Industry Association (TIA), an ANSI-accredited and ITU-R recognized standards development organization. A key element of the Project 25 technology is its ability to coexist with operational analogue systems, enabling a graceful migration from analog to digital, while maintaining an emphasis on interoperability and compatibility among conventional and trunked system implementations. It operates in 136-200, 360-520, 746-870 MHz frequency bands. It has channel efficiency of only 12.5 KHz (FDMA). However, Phase 2 of the P25 standard provides an upgrade path to 6.25 KHz channel equivalence, but only for voice. Some technical details about P25 Phase I & Phase II are given below-

Phase 1: P25 phase 1 radio systems operate in 12.5 KHz digital mode using FDMA access method. Phase 1 radios use Continuous 4 level FM (C4FM) modulation for digital transmissions at 4,800 baud and 2 bits per symbol, yielding 9,600 bits per second total channel throughput.

Phase 2: P25 phase 2 products require the more advanced AMBE vocoder, which allows audio to pass through a more compressed bit stream and provides 2 TDMA voice channels in the same channel

spacing (12.5 KHz) in which phase 1 provides one voice channel. Voice traffic on a Phase 2 system is transmitted at a faster data rate of 12 kbit/s.

iii. TETRAPOL

1.7 TETRAPOL is providing a spectrum efficient, digital narrow-band FDMA, voice and data system for dispatch traffic, which has been developed and validated, and which is operational since 1992. The TETRAPOL land mobile radio specification was defined by the TETRAPOL Forum to provide specifications to the most demanding PMR segment: the public safety and then extended to professional users. The TETRAPOL applicable band is 70-520, 746-870, 870-888/915-933, with a channel spacing of 10-12.5 KHz. Future generation TETRAPOL is expected to make provision for two 6.25 KHz channels in a single 12.5 KHz channel. The access mode is FDMA, with a fully digital constant amplitude modulation GMSK. The data rate is 8 kbit/s per channel. The TETRAPOL specifications apply to three different modes:

- network mode where the mobile is under the coverage and the control of the infrastructure; trunking mode and open channel mode are included;
- direct mode where the mobile directly communicates with the other terminal;
- repeater mode where the mobile communicates with the other terminal through a repeater.

iv. DMR (Digital Mobile Radio)³

1.8 Digital mobile radio (DMR) is an open digital mobile radio standard developed by ETSI. In practice, DMR manufacturers have focused on building products for the professional and commercial markets for both

³ <http://www.etsi.org/website/document/technologies/leaflets/digitalmobilradio.pdf>

licensed conventional mode operation (known as DMR Tier II) and licensed trunked mode operation (known as DMR Tier III). The DMR standard operates within the 12.5 KHz channel spacing. It achieves two voice channels through two-slot TDMA technology. The TDMA implementation in DMR offers a spectrum-efficiency of 6.25 KHz per channel. The modulation is 4-state FSK, which creates four possible symbols over the air at a rate of 4,800 symbols/s, corresponding to 9,600 bit/s. It has lower data throughput than TETRA.

v. NXDN

- 1.9 NXDN is an open standard Common Air Interface (CAI) technical protocol that supports a comprehensive radio system including trunked, non-trunked and direct mobile-to-mobile communication. It was developed jointly by Icom Incorporated and Kenwood Corporation. It was accepted at the Study Group 5 (SG5) meeting of the ITU-R held in November 2016 and in report M.2014-3 published in February 2017 as an international digital land mobile system. It is an open standard narrowband digital protocol employing 6.25 KHz and 12.5 KHz FDMA technology. NXDN physical layer employs a FDMA technique with a four-level FSK modulation and includes two transmission rates- (a) 4.8 kbit/s for 6.25 KHz bandwidth and (b) 9.6 kb/s for 12.5 KHz bandwidth. It operates in 136-174 MHz, 380-512 MHz, 806-821/851-866 MHz, 896-901/935-940 MHz frequency bands.

B. Brief background to this consultation paper:

- 1.10 The Department of Telecommunications (DoT) opened up Public Mobile Radio Trunking Service (PMRTS) as value-added service in the year 1995. Initial PMRTS license were issued in the country in 1995 and 1996. These first set of licenses were granted for 5 years period. A total 77 companies bid for 802 service areas in 153 cities in India. A total of 279 licenses were issued by DoT to 41 companies for operations in 91 cities.

There was no limitation on the number of service areas in the country. The service area was defined as the geographical area covered within the 30 Km Radius from the base station site or city limit whichever is larger.

i. TRAI recommendations, 2000

1.11 Subsequent to the introduction of New Telecom Policy (NTP) 1999, the Authority on the basis of a reference from DoT, issued its recommendations on 18th December, 2000 for issue of fresh PMRTS licences (**Annexure- II**).

ii. DoT Guidelines on PMRTS, 2001

1.12 Pursuant to the TRAI recommendations, the DoT on 1st November, 2001, issued detailed guidelines⁴ for migration of existing PMRTS licenses to digital technology and issue of fresh licenses. The salient features of these guidelines are:-

- The licensees willing to migrate shall be required to sign a fresh license agreement in terms of new policy.
- The licence of existing operators, who are not willing to migrate to the new licensing regime, shall be extended, if requested, upto another ten years, so as to make the total licence period upto 15 years for continuing with analog systems, during which period the operators may change over to digital technology.
- Those operators willing to migrate to Digital Technology shall be allocated upto 1 MHz additional spectrum for Digital Technology and shall be directed to transfer their network positively within two years from the date of letter of confirmation. The license agreement for these operators shall be extended, so as to make the total license period of 20 years.

⁴ http://www.dot.gov.in/sites/default/files/guide_pmrts_0.doc?download=1

- A minimum of 10 channels (25 KHz each) shall be reserved for the expansion of the analog systems during the period of migration from Analog to digital technology.
- New licenses for operation of PMRTS shall be granted on non-exclusive “first-come-first-served” basis. One MHz frequency spectrum shall be allotted at the time of grant of license. Fresh PMRTS licensees shall be bound to use only digital technology.
- Other than Metro service areas and other city service areas, a new type of service area along the High Ways has been defined. The service area for High Ways shall cover National High Ways/State High Ways /Other District Roads contiguous with the boundary of the State.
- There shall be no entry fee. All PMRTS licensees including those using Captive Mobile Radio Trunked Service shall pay license fee except for agencies working for public service such as Police, Fire and Government Security etc.
- There shall be separate charges (Royalty and License fee) for use of Radio Spectrum; the present arrangement of Spectrum Charging from PMRTS licenses for commercial as well as captive system shall continue.
- The license fee for commercial PMRTS system shall be 5% of the ‘Adjusted Gross Revenue’ (AGR). Spectrum beyond one MHz may be considered depending on availability for allotment only after complete service area has been covered with the service and customer base of 10,000 has been reached.
- Public Switched Telephone Network (PSTN) connectivity shall be given as one PSTN line for 5 RF Channels (of 25 KHz each) to start with for analog systems and one E1 link for new licenses for digital system.
- Inter-site connectivity shall be permitted to PMRTS Providers between their own sites within the licensed area.

iii. TRAI recommendations 2003 on PMRTS

1.13 On 1st November, 2002, DoT requested TRAI for recommendations on issues concerning PMRTS raised by Mobile Trunked Radio Operators Association (MTROA). These issues were:

- a. Increase in Quantum of PSTN connectivity
- b. Separate numbering scheme for PMRTS
- c. Extension of service area to cover Local Charging Area.
- d. Licence Fee
 - Total Licence fee including WPC charges
 - Fee for captive users
 - Definition of AGR (Sale of Handset)
- e. Choice of Technology for new Licences
- f. Service Area
 - Circle-wise licensing
 - New Licence areas e.g. Highways

1.14 The Authority *inter-alia* recommended the following:-

- On the issue of PSTN Connectivity, the Authority reiterated that the total permitted usage of such interconnection in a month should not exceed 15% of total airtime usage of the network during the previous month.
- On the issue of separate numbering scheme for PMRTS, the Authority recommended that to retain the CUG characteristic of the PMRT services it is felt that only one-way PSTN connectivity should be allowed. This negates the requirement for a separate numbering scheme.
- On the issue of total Licence fee, the Authority reiterated that the licence fee (to be paid to DoT as well as WPC) and the Royalty for spectrum together should work out to not more than 5% of the AGR.

- On the issue of fee on captive licensees, the Authority recommend that the same fee as paid by PMRT service providers should be payable by the Captive licencees of Mobile Radio Trunking Service as well. Since the commercial trunking service providers have migrated to revenue sharing regime it recommended that captive licencees pay a licence fee of Rs. 300 per annum per terminal with a minimum of Rs. 25,000/- per annum as recommended by TRAI earlier. It is also recommended that the licensor must ensure that the captive licencees pay their licence fee like commercial PMRTS operators.
- On the issue of definition of AGR for PMRTS, the Authority recommended that DoT should exclude the sale proceeds of instruments in the definition of the “Adjusted Gross Revenue” especially in case of PMRTS services.
- On the issue of choice of technology for PMRTS, the Authority keeping in view the high investment cost involved in deployment of digital technology and the health of the industry in last 2-3 years, the Authority had the view that with the new Licence agreement mandating digital technology the investment in subscriber terminals and other analog equipment would go waste if analog networks were replaced by digital networks. Therefore, it recommended that the choice of the technology should be left to the service providers.

1.15 DoT on 19th May, 2006 issued an amendment to the clause B(ii) and clause B(iii) of the guidelines dated 1st November, 2001 as under:

Exiting	Amended
Clause B(ii) New licenses for operation of PMRTS shall be granted on non-exclusive “first-come-first served” basis. One MHz frequency spectrum shall be allotted at the time of grant of license.	New licenses for operation of PMRTS shall be granted on non-exclusive “first-come-first served” basis.

<p>Clause B(iii) Fresh PMRTS licensees shall be bound to use only digital technology.</p>	<p>Frequency spectrum shall be allotted depending upon the justified requirements and the availability of the same.</p>
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- 1.16 Vide circular No.311-80/2001-VAS (Vol.II) dated 14th July, 2006, DoT issued amendment to the licence agreements for PMRTS consequent to migration to new licencing regime under NTP-99 superseding earlier amendments to the PMRTS licence agreement issued vide letter No.311-80/2002-VAS dated 30th October, 2002 to all PMRTS licensees.
- 1.17 The DoT in the year 2014 had informed the Authority that spectrum allotment was being made administratively at administrative spectrum charges on formula basis to certain category of public / commercial service providers such as Internet Service Providers (ISPs) and PMRTS for providing public/ commercial service, and had, inter-alia, sought the recommendations of TRAI on the methodology of allotment of spectrum and spectrum pricing to such public / commercial service providers. In reference to this, the Authority vide letter No. 102-6/2014/NSL-II dated 8th July, 2015 requested DoT to take a policy decision as to whether it is legally tenable to allocate spectrum by any other mechanism (viz. administratively) than auction in consultation with Ministry of Law. The Authority therefore returned the references to DoT to take appropriate decision in the matter and then seek fresh recommendations.
- 1.18 In the present reference DoT through its letter L-14027/08/2016-NTG dated 13th July, 2017 (**Annexure-III**), has sought the recommendations of TRAI on:-
- a) Method of allocation of spectrum for PMRT service
 - b) Appropriate bands for PMRT services
 - c) Block size for PMRT service
 - d) Duration/Validity period of spectrum for PMRT service
 - e) Area of service

- f) Reserve price and applicable SUC for PMRT service in different bands
- g) Applicable spectrum cap for PMRT service

1.19 For drafting this consultation paper, various documents available in the public domain, published by government agencies/departments, telecom regulators of many countries, research agencies/institutions, academic institutions, telecom vendors, operators and international agencies/forums etc. were referred with the purpose to make the consultation paper balanced and comprehensive. Excerpts from certain documents, which had domain relevance, are also included in this CP.

1.20 In this consultation paper, Chapter-II deals with the licensing criteria for PMRTS license and Chapter-III deals with the methodology of allocation of spectrum, candidate bands for PMRTS and valuation & reserve price of the spectrum as well as spectrum cap. In chapter-IV international practices in regulating the PMRT services are covered and the Chapter-V provides the summary of issues for consultation.

CHAPTER-II: LICENSING CRITERIA FOR PMRTS LICENSE

A. Present License Service Area (LSA) based Authorisation of PMRTS in Unified License (UL) regime

- 2.1 In the present DoT reference it is stated that, prior to UL regime, RF spectrum was allotted administratively city wise to the PMRTS licensees, having valid license agreement for providing PMRT Services in a particular city. Under the Unified License regime, license is granted for providing PMRT Services on service area basis instead of earlier practice of city wise.
- 2.2 Despite the LSA based license agreement under UL, spectrum is still allotted administratively for PMRT services on city basis. Demarcation of LSA for PMRT service is also the same as in the case of cellular mobile service. With such allotment of spectrum, service provider can provides services only in the cities of the LSA for which spectrum has been assigned.
- 2.3 UL agreement authorizes service providers for providing services in entire service area; however, PMRT services are unlikely to be deployed over the entire service area since the service providers have no scope of business to provide services beyond the city areas. Since there is no business proposition for pan-LSA deployment, efficient utilization of spectrum beyond the city areas remains a concern for licensee as well as licensor.
- 2.4 DoT in its present reference has mentioned that Mobile Radio Trunking Service has been growing steadily since its introduction in India over two decades ago. As a result, commercial Mobile Trunking Radio Service Providers has been asking for more spectrum to cater to their growing subscriber base. In addition, they are also asking spectrum for new cities/locations (mining area, power plant and refinery etc.). The growth pattern of Captive (non-commercial) Mobile Radio Trunking Services

(CMRTS) as used by Police Organization and public Sector Units (PSUs) etc. is also following the same trend.

- 2.5 As per the details provided by DoT through the reference, presently, 8 service providers are providing PMRT service in 34 cities which fall in 11 LSAs. DoT has also provided the summary of the existing assignments made to PMRT service networks in various cities as part of their reference.
- 2.6 DoT has also mentioned that requests has been received from existing service providers for assignment of initial spectrum in 28 new cities as well as for allotment of additional spectrum for expansion of existing PMRT service networks. Spectrum for these new requests has not yet been allotted. Taking together the existing network/spectrum assignments and the proposed network in various cities, as sought by service providers, the number of such cities will become 62 falling in 16 LSAs. Consolidated LSA wise breakup for the demand of RF channels for existing cities and new cities have been given in the **Annexure IV**.
- 2.7 The details of city wise demand for RF Channels raised by service providers, as provided by DoT indicate that maximum demand have been arising from the Metro cities. Demands in other cities are most likely due to development of greenfield infrastructure or expansion of existing infrastructure. The examples such as Sea Ports, Mines, Large Manufacturing units in Steel, Refineries, Power Plants, Airports, Mines, Tea gardens and factories, Smart Cities etc. are fueling the demand for additional or fresh allocation of RF channels.
- 2.8 As per existing condition under UL, the Service Area of PMRTS shall be the Telecom Circle/Metro area similar to as defined for Access Service authorization with duration of authorization for 20 years. Entry fee of Rupees Fifty thousand, Performance Bank Guarantee (PBG) and Financial Bank Guarantee (FBG) of Rupees One lakh each have been

prescribed in the UL. Currently assignment of electromagnetic spectrum for PMRTS license is done administratively and solely dependent on the availability of spectrum in a particular service area. Existing assignments of frequencies to PMRT service providers are on conditional basis as mentioned in para 3.2. Spectrum charges for PMRT service are levied on formula basis which include the number of assigned RF channels (f), the number of radio stations (n) (base and mobile stations) and coverage radius in kilometers (Kms) for the purpose of calculations. Royalty and license fee for the grant of license to establish, maintain and work PMRTS stations are governed through the Office Memorandum No. L-14027/01/98-NTG issued by DoT dated 18th September, 2000. The calculation of total annual fee payable is as below:

A table indicating various charges/fees payable by PMRT service provider is given below:

Table: 2.1

Entry Fee (One time) per license service area (Rs.)	PBG (Rs.) per annum	FBG (Rs.) per annum	License Fee (per annum)	PMRT Station fee and Royalty charges per year	Value of L& R for maximum radio link distance between 5 and 60 Kms.	Value of L& R for maximum radio link distance below 5 Kms.
50 thousand	1 Lakh	1 Lakh	8% of AGR	L+R	L= 100 X n R=4800 X f	L=100 X n R= 1200 X f

(where L = License Fee per PMRT station, R= Royalty)

- 2.9 Through the reference, DoT has mentioned that TRAI may consider exploring the feasibility for allotment of spectrum for PMRTS on city basis unlike service area basis as for cellular mobile services and give recommendation accordingly.

2.10 Factually, PMRT services cannot be equated or compared with commercial cellular mobile services provided by licensees under the licensing framework of CMTS, UAS and UL in terms of business potential, subscriber base and revenue. In fact PMRT services are intent to serve niche market, mostly industrial establishments, in a limited geographical area. The statistics also implies that PMRT services have witnessed almost stagnant growth in comparison to cellular mobile services in the country. The growth chart of PMRT⁵ and cellular services for the last five years has been depicted below:

Chart: 2.1

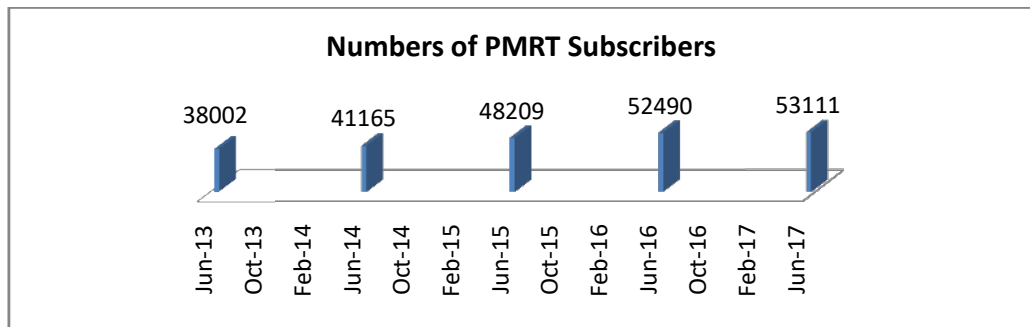
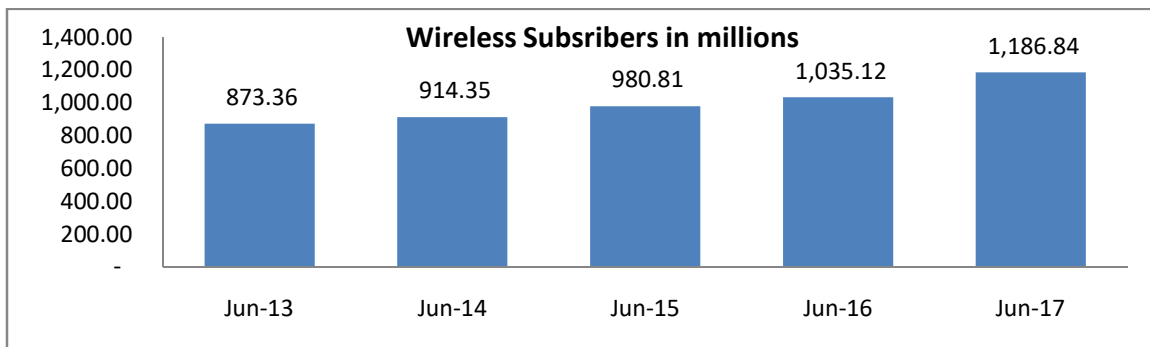


Chart: 2.2



2.11 Due to niche nature of PMRT services with limited but steady market proposition, the commercial trunking services business has the potential

⁵ The number of subscribers indicated for PMRTS is the actual number of base/mobile stations in operation.

to grow in future. Service providers can provide quality services to its customers and also venture into new areas/geography for operations.

2.12 Accordingly, following issues are raised for the comments of the stakeholders:-

- Q1. Do you agree that existing License Service Area (LSA) based authorization criteria for PMRT service license is appropriate? If not, should there be a city/district based authorization aligned with spectrum assignments?**
- Q2. Do you suggest any other criteria/change in license/ area of authorization for PMRT service? Elaborate your suggestions with supporting facts.**
- Q3. Do you suggest any change in the duration of license from the present duration of 20 years? Please provide supporting justification.**

CHAPTER -III: METHODOLOGY OF ALLOCATION OF SPECTRUM, CANDIDATE BANDS FOR PMRTS, VALUATION AND RESERVE PRICE OF THE SPECTRUM

A. Methodology of allocation of spectrum

- 3.1 As mentioned in Chapter I, DoT in the year 2014 had informed the Authority that spectrum assignments were being made administratively at administrative spectrum charges on formula basis to certain category of public / commercial service providers such as Internet Service Providers (ISPs) and PMRTS for providing public/ commercial service, and had, inter-alia, sought the recommendations of TRAI on the methodology of allotment of spectrum and spectrum pricing to such public / commercial service providers. In view of the DoT reference, the Authority requested DoT to take a policy decision as to whether it is legally tenable to allocate spectrum by any other mechanism (viz. administratively) than auction in consultation with Ministry of Law. The Authority therefore returned the references to DoT to take appropriate decision in the matter and seek fresh recommendations.
- 3.2 DoT vide its Office Memorandum (OM) No. R-11014/15/2012-NT Pt.0 dated 09th January 2014, as an interim measure for a period of six months allowed to continue spectrum allotment on administrative basis at administrative prices to the Government, PSU and Private users for captive usages, satellite networks of broadcasting and captive VSATs, commercial satellite usages (DSNG/Commercial VSATs/PMRTS/teleport/ DTH/ NLD/ ILD/ HITS/INMARSAT) etc. However DoT in a subsequent OM dated 8th June 2015 left out PMRTS from provisional assignment of spectrum while authorizing all other services mentioned above for such interim assignment of spectrum. It is

pertinent to mention here no new spectrum is assigned to PMRTS since June 2014.

- 3.3 Upon escalation of the concerns of PMRT service providers through various channels regarding allotment of fresh spectrum and continuation of services since their licenses were set to expire in October, 2015 and May, 2016, the Authority requested DoT to resolve the issues. Accordingly, DoT vide OM dated 12th May, 2016 allowed as an interim measure, for a period of six month from the date of issue of OM to continue the allotment of spectrum administratively at administrative pricing to PMRTS wireless users on conditional basis. DoT issued a conditional basis continuation as per the para 2 and para 3 of aforementioned OM as mentioned below:

Para 2

- i. Annual Royalty and License Fee may be levied as per the OM No. L-14027/01/98-NTG issued by DoT dated 18th September, 2000;*
- ii. The allotment of spectrum is provisional and subject to Government's decision on allotment and pricing of spectrum;*
- iii. In the event of final decision to allot spectrum through auction process, the provisional allotment of spectrum shall be withdrawn;*
- iv. In case the provisional allotment of spectrum is withdrawn, payment made towards spectrum charges or part thereof shall not be refunded;*
- v. In case the provisional allotment of spectrum is withdrawn, respective wireless users would obtain Non Dealer Possession License (NDPL) for possessing the wireless equipment or return the equipment to a Dealer Possession License (DPL) holder or shall be disposed off as per procedure;*
- vi. The respective wireless users would be required to give an undertaking to pay the revised spectrum charges, as finally determined through market related mechanism or otherwise as may*

be applicable, from the date of Letter of Intent (LoI) for provisional allotment of spectrum.

Para 3

Upon shift/change in policy from administrative allotment, due notice of 3 months of such change will be given and the same has to be complied with the PMRTS licensees.

3.4 DoT also mentioned that spectrum allotted to PMRT service providers is provisional and can be taken back before the assignment of spectrum through auction. Further, as per the title of the letter under reference, DoT has sought TRAI recommendations on method of allocation of spectrum for PMRTS including auction, as a transparent mechanism. This implies that other methods of allocation of spectrum such as administrative allocations etc. apart from the auction mechanism are also open for consideration.

3.5 Continuation of administrative allocation of the spectrum to the PMRT service licensees could also be an option. Operator wise gross connections vis-à-vis spectrum assigned revenue figures as on September, 2017 has been tabulated in the Table 3.1 below.

Table 3.1: Service provider wide market share and spectrum allocations

Sr. No.	Name of the Service Provider	Subscriber Base as on September, 2017	%age in Market Share	Total no. of RF carrier assigned	%age Share of existing spectrum assignments in all bands
1	Arya Omnitalk Radio Trunking Services Pvt.Ltd.	44039	83.39	305	61.50
2	Procall Ltd.	3005	5.69	65	13.10
3	Smartalk Pvt Ltd.	986	1.87	20	4.03
4	QuickCall	1490	2.82	25	5.04
5	Bhilwara Telenet Services Pvt.Ltd.	811	1.54	10	2.02

6	Inative Networks Pvt. Ltd.	1820	3.45	21	4.23
7	Wiwanet Solutions Pvt. Ltd.	345	0.65	45	9.07
8	Airtalk Solutions & Services Pvt. Ltd.	314	0.59	5	1.01
	Total	52810	100.00	496	

3.6 According to the figures mentioned in Table 3.1, M/s Arya Omnitalk Radio Trunking Services Pvt. Ltd. continues to be the market leader with a subscriber base of 44039 which translates into market share of 83.39%. M/s Procall Ltd. is at 2nd position with a total subscriber base of 3005 and market share of 5.69%. In terms of percentage of spectrum assigned, share of M/s Arya Omnitalk stands at 61.50% of spectrum followed by M/s Procall Ltd. at 13.10 percent. In totality there are only four service providers who have been assigned spectrum more than 5% of total assignments and only two service providers are having market share of more than 5% of total subscriptions. Figures mentioned above imply that M/s Arya Omnitalk has been market leader in terms of market share as well as share of spectrum assigned.

3.7 The market for the trunking services is growing slowly but steadily in the country and has been particularly driven by the development and deployment of infrastructure such as sea ports, airports, metro rail projects, industrial plants and hubs etc. However, a large portion of the need for mobile radio trunking is being catered by the organizations themselves. DoT assigns the Captive Mobile Radio Trunking (CMRT) service license to such organizations for their internal use and consumption. Details of the CMRT subscriptions are not available; however, taking together the subscriptions of CMRT services, the number would be substantial for trunking services in India. The total revenue of

the PMRTS operators in the last 5 years has been given in the Table 3.6 in para 3.44.

- 3.8 The deliberation made above is significant while we consider appropriate methodology of spectrum assignment. First of all, it is important to deliberate on the feasibility of administrative assignment of spectrum to PMRT licensees as being assigned presently.
- 3.9 Currently, spectrum assignment is being made administratively for captive or commercial purposes in many cases. Some examples of captive allocations are CMRT, Single Channel Operations for Fixed/ Land/ Land Mobile Stations/ terrestrial Broadcasting, Captive VSAT Hubs and terminals frequency etc. Allocations of the carriers for commercial purposes in various capacities are also made on administrative price and formula basis to TSPs. For example - allotment of Microwave Access and Microwave Backhaul links, similarly allotment of carriers to Internet Service Provider (ISP), National Long Distance (NLD) service operators are also made on administrative prices. In Satellite segment, frequencies for commercial VSAT operations are also being made available at administrative prices.
- 3.10 Trunking service licensees (PMRTS and CMRTS) in India are assigned 814-819 MHz/859-864 MHz band for Analog and 811-814/856-859 MHz band for Digital networks. License conditions for PMRTS/CMRTS provides that initially, not more than five channels (frequency pairs) are being assigned for Analog system and for Digital systems upto 30 frequency channels (25KHz each) depending on the availability, justification and the actual usage of the same. Further, additional channels are considered subject to availability of frequency spectrum in the designated frequency bands in the particular service area and after

taking into account growth of service. This includes the control channels also.

- 3.11 From the above deliberations, one view is that the PMRT being a miniscule industry serving niche market have certain limitations to grow substantially. Moreover, being a unique service it cannot be compared with wireless access services neither in technological nor on aspects of the scale of business. Hence, it will be prudent that the methodology of assignment of spectrum is discussed keeping all options open.
- 3.12 DoT reference has emphasized on auction as one of the methods of assignment of spectrum for PMRTS, as a transparent mechanism. Hence keeping auction as one of the methodology for assignment of spectrum for PMRTS, a number of other connected aspects such as quantum of spectrum and bands for auction, reserve (floor) price, methodology of auction, Spectrum Usage Charges (SUC), License Fee (LF), spectrum cap, duration of right to use the spectrum etc. also arises. These issues also need to be deliberated before finalization of auction process.
- 3.13 Licensing framework and spectrum assignment mechanism has undergone major changes post introduction of Unified License (UL) regime. In the case of Access Service, the service providers are required to acquire spectrum through auction process. The spectrum acquired through auction is treated as liberalized spectrum i.e. technology agnostic spectrum. In the year 2010, spectrum assignment was de-linked from the license, i.e. grant of license no longer ensures availability of spectrum. Since the year 2010, right to use of spectrum to wireless access providers have been granted through auction process only and till date spectrum in the bands 800/900/1800/2110/2300/2500 MHz have been put to auction. In the recent auction 2x35 MHz spectrum (per LSA) in 700 MHz band also was put to auction.

3.14 The basic features of UL inter-alia provides that:-

The allocation of spectrum is delinked from the licenses and has to be obtained separately as per prescribed procedure. At present, spectrum in 800/900/1800/2100/2300/2500 MHz band is allocated through bidding process. For all other services and usages like Public Mobile Radio Trunking Service (PMRTS), the allocation of spectrum and charges thereof shall be as prescribed by Wireless and Planning and Co-ordination wing of Department of Telecommunications from time to time.

3.15 Considering auction as a method for assignment of spectrum for PMRT services, the Authority has identified certain issues to be put forth for the consultation of stakeholders. Through the reference it has not been made clear by the DoT whether spectrum assignment for CMRT service licensee will continue administratively or through any other mechanism such as auction. Clarifications were sought from DoT on the methodology of allocation of spectrum vide TRAI letter dated 8th August, 2017 (**Annexure V**). In case CMRTS licensee will be continued administrative assignment of spectrum by DoT, the issue arises to clearly identify the bands to be put for auction. The detailed deliberation on the issue has been made in the relevant section in this CP. Amount of the spectrum to be put for auction vis-à-vis existing assignments and pending demand should also be deliberated carefully.

3.16 It has already been deliberated that market size and business prospects for PMRT licensee are not comparable with the access services and administrative assignment of the spectrum is city based in existing process. As per the information provided by the DoT through reference, it is clear that, even after considering the new requests for assignment of spectrum, demand for PMRTS exists only in 16 LSAs out of a total of 22 LSAs. In 6 LSAs, still there is no demand for PMRTS. This implies that the scope and opportunities for the business are fragmented across the

country. In such a scenario it is important to deliberate on the necessity of auction of spectrum.

3.17 The provisions of roll out obligations and penalties associated (on non conforming the roll out obligations) applicable to PMRT licensee under UL are as below:

4.1 The Licensee shall roll out the network by installing and commissioning at least one Base Station (BTS) in the city/town for which frequency has been allotted by WPC.

4.2 Applicable system for provision of PMRTS Service must be commissioned within 12 months from the date of frequency allotment by WPC.

4.7 In case the Licensee fails to rollout the network, within the period prescribed, the Licensor shall be entitled to recover LD charges @ Rs. 10,000/- (Rupees Ten thousand only) per month subject to a maximum amount of Rs. 2.4 lakh. For delay of more than 24 months, in addition to imposition of maximum amount of LD as mentioned above, the frequency allotment may be withdrawn and the Service authorization may also be terminated. The PBG shall be encashed to the extent of LD amount, if the same is not paid within the time period specified in the notice for recovery of LD.

If the spectrum for the PMRT services is assigned through auction, the issue of roll out obligation as well as penalties also will have to be revisited.

3.18 Accordingly, the following questions are raised for the comments of stakeholder:-

Q4. Keeping in view the existing PMRT services market size and growth potential, which methodology of allocation of spectrum will be most suitable for PMRT services?

(a) Auction (or)

(b) Administrative allocation

Kindly provide supporting arguments for your choice.

- Q5. Do you propose any other methodology other than the options provided in Q4. above for allocation of spectrum for PMRTS? Please provide detailed justifications.**
- Q6. If you have opted for auction as the methodology for allocation of spectrum for PMRTS,**
- (a) What criteria/norms should be there for auction of spectrum so that efficient utilization of the spectrum is ensured? Should there be preference for Digital PMRTS networks?**
 - (b) Should the spectrum auction be held on LSA basis or city basis?**
 - (c) What should be the effective date of allocation of spectrum (if won through the process of auction)?**
 - (d) What should be the rollout obligations for PMRT service providers? What should be the penalty to be imposed in case of non-compliance of roll out obligation? Please provide detailed justifications?**
- Q7. If you feel administrative allocation is the best methodology, then**
- (a) Are the existing criteria of assignment of RF carriers sufficient or should there be different criteria/norms for assignment of spectrum? If existing criteria is not sufficient, what are the proposed criteria for such assignments so that efficient utilization of the spectrum is ensured?**
 - (b) Should administrative price of spectrum be calculated LSA wise? If yes, what should be the basis and formula for determination of administrative price? Suggest alternate calculations, if any.**

B. Preferable frequency bands for PMRT services and emerging ecosystem

3.19 For Region 3, the 806-824 MHz band paired with 851-869 MHz has been retained as harmonized band for deployment of PMR/LMR trunking network. Trunking service licensees (PMRTS and CMRTS) in India are assigned 814-819 MHz/859-864 MHz band for Analog and 811-814/856-859 MHz band for Digital networks. License conditions for PMRTS/CMRTS provides that initially, not more than five channels (frequency pairs) will be assigned for Analog system and for Digital systems upto 30 frequency channels (25KHz each) depending on the availability, justification and the actual usage of the same. Further, additional channels will be considered subject to availability of frequency spectrum in the designated frequency bands in the particular service area and after taking into account growth of service. This includes the control channels also.

3.20 In the reference under deliberation, DoT has mentioned that distinct sub-bands have been identified for Radio Trunking Services in National Frequency Allocation Plan - 2011, and there is no strict demarcation in those sub-bands between the usage by commercial and non-commercial radio trunking services. As provided by DoT, the existing sub-bands for Mobile Radio Trunking Service and their usage pattern is given in table 3.2 below:

Table 3.2: Allocation of frequencies as per National Frequency Allocation Plan (NFAP)-2011

Frequency band: 300 MHz and 400 MHz				
Frequency band (MHz)	Total Bandwidth	Uses	India remark in NFAP	
336-338, 346-348	2x2 MHz	For both PMRTS and CMRTS	IND 27	
338-340, 348-350	2x2 MHz			
351-356, 361-366	2x5 MHz	Digital CMRTS	IND 28	

356-358, 366-368	2x2 MHz		
380-389.9, 390-399.9	2x9.9 MHz	Digital PMRTS and CMRTS	IND 29
Frequency band: 800 MHz			
Frequency band (MHz)	Total bandwidth	Uses	India remark in NFAP
806-811, 851-856	2x5 MHz	Predominantly for CMRTS	IND 40
811-814, 856-859	2x3 MHz	For spectrum efficient digital PMRTS and CMRTS	IND 41
814-819, 859-864	2x5 MHz	Predominantly for CMRTS	IND 42
819-824, 864-869	2x5 MHz	For both PMRTS and CMRTS	IND 43

3.21 Further DoT has stated that it would be preferable to consider the bands for PMRT services in the following order of priority:

Table 3.3: Preferable frequency bands

Sl. No.	Frequency Band Total (in MHz)	Total Bandwidth
1.	816 - 819 / 861- 864	3.0 MHz
2.	819 - 824 / 864 - 869	5.0 MHz
3.	336 - 340 / 346 - 350	4.0 MHz

3.22 Further according to the provisions of ‘IND43’ in NFAP 2011-
“Requirement of public mobile radio trunked systems (PMRTS) and captive mobile radio trunked systems may also be considered, as appropriate, in the frequency bands 819-824 MHz paired with 864-869 MHz”.

3.23 International Telecommunication Union’s Radio communication sector (ITU-R) has *reserved* several frequency bands for Industrial, Scientific and Medical (ISM) applications. These ISM bands are unlicensed, and vary slightly from country to country. Popular ISM bands are 433 MHz, 868 MHz, 915 MHz and 2.4 GHz, which are used by wireless communication systems such as remote controls, cordless phones and Wi-Fi etc.

- 3.24 In India, one chunk of 2 MHz in Sub-GHz band range 865-867 MHz has been made license exempt for indoor applications with Maximum Transmitted power of 1W, Maximum Effective Radiated Power of 4W and Maximum Channel Bandwidth of 200 KHz. Globally, in Machine-to-Machine (M2M) communication the sub-GHz band range 865-867 MHz is having substantial ecosystem for low power devices and lot of technological development is taking place in several countries. Considering the fact that global ecosystem for M2M communication has developed robustly in this band, the Authority in its recommendations on “Spectrum, Roaming and QoS related requirements in Machine-to-Machine (M2M) Communications” dated 5th September, 2017 has recommended that 1 MHz of spectrum from 867-868 MHz can be delicensed to de-clutter this delicensed band.
- 3.25 It is also worth emphasizing that based on the information made available by the DoT, neither there is any allocation in the band 819-824 MHz/ 864-869 MHz to PMRTS and CMRTS operators nor there is a demand or pending request in this band range.
- 3.26 Public Protection and Disaster Relief (PPDR) agencies in India are issued license by DoT under CMRTS category. Accordingly, spectrum is allocated by WPC Wing of DoT in the 300 MHz or 400 MHz or 800 MHz bands as mentioned in the Table 3.2 above. The advancement of the technology has provided PPDR networks with latest and enhanced features in terms of capability, capacity and interoperability. Broadband PPDR supports wide range of applications such as sending live images, videos and texts apart from narrowband voice and data communications. In the regard, the Authority has issued a Consultation Paper on “Next Generation Public Protection and Disaster Relief (PPDR) communication networks” on 9th October, 2017 for the comments of the stakeholders. The consultation paper has provided a summary of recommendations

given by ITU so far for Region 3 for PPDR that also includes the band range 806-824/851-869 MHz as per the table 3.4 below:

Table 3.4: Harmonized band for PPDR recommended by ITU for Region 3

Source	Harmonized band for PPDR	Technology
Resolution 646 WRC 03 , rev.WRC 12	406.1-430 MHz 440-470 MHz 806-824/851-869 MHz 4940-4990 MHz 5850-5925 MHz For Region 3	Narrowband
ITU-R recommendation M.1826	4940-4990 MHz For Region3	Broadband
Resolution 646 rev. WRC 15	694-894 MHz Globally	Broadband

3.27 The consultation paper issued on PPDR related issues also emphasizes on Asia-Pacific Telecommunity (APT) report⁶ issued in April 2017 on “Harmonization of frequency ranges for use by wireless PPDR applications in Asia-Pacific region” suggesting APT administrations to consider using parts of the 694-894 MHz, 406.1-430 MHz and 440-470 MHz, 4940-4990 MHz frequency ranges for PPDR when undertaking their national planning for PPDR operations. The APT report referred above provides frequency arrangements and usage type in the parts of frequency range 694-894 MHz.

3.28 Out of the three bands proposed by DoT for PMRTS as given in Table 3.3, in the band 864-869 MHz, 2 MHz is already delicensed for the use of low power equipment/ devices with maximum Transmitted power of 1W, maximum Effective Radiated Power 4W and maximum Channel Bandwidth 200 KHz. This entails that this band of 5MHz will not be

⁶ http://www.aptsec.org/sites/default/files/Upload-files/AWG/APT-AWG-REP-73_APT_Report_PPDR_Spectrum_Harmonization.docx

available for PMRTS. The Authority in its recommendations dated 5th September 2017 recommended 1 MHz to be further delicensed in the band to cater for M2M/IoT deployments. Hence it is likely that this band may not be available for PMRTS. In view of this, the availability of spectrum of 12 MHz as mentioned in table 3.3 above will get reduced to 7 MHz. It will have to be deliberated whether 7 MHz will be adequate to meet the PMRTS requirements in the country.

3.29 The Authority is of the opinion that assignment of spectrum through auction can only be considered if there is a clear cut demarcation of spectrum for public and captive trunking bands. Therefore, the issue requires thorough deliberations so that there is a balance between the demand and supply of spectrum as well as other developments are also taken into consideration. Accordingly, following issues are raised for the comments of stakeholders.

Q8. Out of the bands discussed in Table 3.2 above, which are the preferable bands for the PMRT services in India? List out in the order of priority. Are the bands suggested by DoT as mentioned in the Table 3.3 will be adequate to cater for the spectrum requirements of PMRTS?

Q9. Taking into consideration the existing allocation by DoT and Authority's latest recommendation for delicensing spectrum for M2M, would it be feasible to consider the band 819-824 MHz/ 864-869 MHz for allocation to PMRTS licensees?

Q10. Which other candidate band will be most suitable for PMRTS if the band 819-824 MHz/ 864-869 MHz (5 MHz) is not to be considered for allocation to PMRT services? Please support your answer with facts.

C. Block Size/Channeling plan

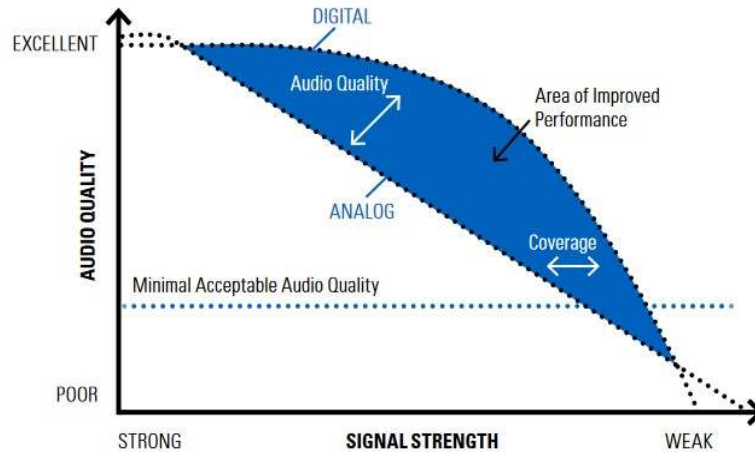
- 3.30 Currently analog trunking technologies are also used by some PMRTS operators and captive users. However, there is a shift towards adoption of digital technologies worldwide. Typically the digital technologies used are TETRA (Terrestrial Trunked Radio), APC025 (Association of Public safety Communications Officials International Inc.), iDEN (Integrated Digital Enhanced Network), DPMR (Digital PMR) and GoTa COMA (Global open Trunking Architecture COMA), etc. Some standards such as TETRA (ETSI EN 300 392-2), APCO P25 (TIA 102) or DIMRS (ITU-R M.2014-1) are prominently in use. Advanced digital technologies provide spectrum efficient and reliable communication by offering and managing a pool of radio channels for use by radio subscribers automatically. These technologies demand varying emission bandwidths of 25 KHz, 12.5 KHz and 6.25 KHz, thus, allowing larger number of subscriber to be loaded on the system.
- 3.31 License conditions for PMRTS provides that initially, not more than five channels (frequency pairs) will be assigned for PMRTS Analog system and for Digital system upto 30 frequency channels (25KHz each) depending on the availability, justification and the actual usage of the same. Further request for additional channels are considered subject to availability of frequency spectrum in the designated frequency bands in the particular service area and after taking into account growth of service.
- 3.32 In past few years, different technologies have evolved and are available in the market. In order to have flexibility with allotment of spectrum, it would be preferable to consider block size of 6.25 KHz. With this block size future growth plan for PMR services can also be met easily. It may also be ensured that user may bid for even number of blocks.

Table 3.5: Technologies/Standards for PMRTS

Technology / Standard	Permissible Channeling Plan	Modulation
Analog	25 KHz (Single traffic channel)	Changing the frequency, amplitude or phase of the radio signal
TETRA	25KHz, 50 KHz, 100 KHz and 150 KHz (Within 25 KHz wideband, 6.25 KHz channel equivalence is achieved through the use of 4-slot TDMA).	TETRA uses $\pi/4$ DQPSK modulation with an associated symbol rate of 18000 symbols/sec (36000bits/sec)
Digital Mobile Radio (DMR)	2 TDMA slots (1 control and 1 traffic) within 12.5 KHz	DMR uses 4FSK modulation with a symbol rate of 4800 symbols/sec (9600bits/ sec),
Digital Private Mobile Radio (DPMR)	FDMA slot (no dedicated control channel) within 6.25 KHz	Modulation @ 4FSK with Transmission Rate: 4800 bps
APCO25	Phase 1 P25 radios can operate in 12.5 KHz analogue, digital, or a mixed mode format. P25 Phase 2 uses FDMA - frequency division multiple access	Phase 1 modulation format is Continuous 4 level FM (C4FM). Phase 2 modulation format is CQPSK.

3.33 Above deliberations indicate that more efficient usage of the existing spectrums could be achieved with the systematic utilization of 12.5 KHz and 6.25 KHz channel spacing together with digital modulation. The use of 12.5 or 6.25 KHz channels with digital technologies can provide up to 4 times the capacity compared with traditional 25 KHz system. With the same infrastructure, digital PMRTS systems can work as robustly and stable as analog systems and also provide additional useful features as well as better communication quality. Figure 3.1 indicates the comparison of performance of analog and digital systems in terms of audio quality and coverage.

Figure 3.1: Conceptual diagram showing improvements in audio quality with digital PLMR⁷



- 3.34 Advanced digital technologies evolved under various standards paves way for better and efficient utilization of the spectrum. For example efficiencies may be realized by splitting existing 12.5/25 KHz channels. Using 6.25 KHz channels offset from the carrier frequency of a 12.5 KHz channel, it is possible to fit two 6.25 KHz channels into the 12.5 KHz bandwidth, and similarly it is possible to fit four 6.25 KHz channels into the bandwidth of 25 KHz. Therefore permitting splitting of channels brings in more efficiency in utilization.
- 3.35 Availability of contiguous spectrum is an important aspect. Limited spectrum allocations and non-contiguous spectrum blocks continue to pose challenges for service providers across their network.
- 3.36 Deciding on the minimum block size of spectrum is vital for assignment of the spectrum through auction process. For example- in order to make informed decision and planning; a minimum block of 5 MHz has been specified for auction of access spectrum in 700 MHz band. Similarly, the Authority at various occasions have recommended band wise minimum

⁷ Source: ITU

block size for auction in 800/900/1800/2100/2300/2500 MHz bands. In this case of auction of spectrum for PMRT services, the Authority is of the opinion that there should be clarity on minimum block size and contiguity of spectrum before heading for auction process.

3.37 Accordingly, following issues are raised for the comments of stakeholders.

Q11. What should be the minimum block size of spectrum to be put for auction? How contiguity of spectrum can be ensured?

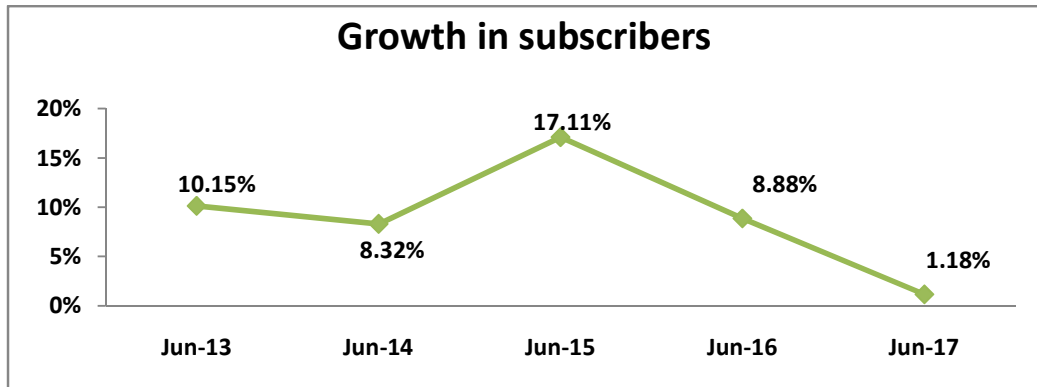
D. Valuation of Spectrum for Public Mobile Radio Trunking Service (PMRTS) and levy of Spectrum Usage Charges (SUC)

3.38 PMRTS works in closed user group coordination. PMRTS service is required for public safety, disaster management and emergency relief operations, as well as for health department, public utility services, metro services, etc. PMRTS is one of the key sources to set up communication links in the shortest possible time. In order to provide this service, the PMRTS operators require spectrum which is allocated on administrative pricing by WPC wing of DoT.

3.39 Over the past five years, the subscribers of Public Mobile Radio Trunking Service (PMRTS) have increased from 34,500 in June 2012 to 53,111 in June 2017, showing the Compound Annual Growth Rate (CAGR) of 9.01%. The total number of PMRTS subscribers since June 2013 to June 2017, have been depicted Chart 2.1 in para 2.10 above.

3.40 The year-on-year (YoY) % growth of subscribers over the last five years, starting from June 2013 to June 2017, is shown in the chart below: -

Chart 3.1



3.41 The detailed information on the % market share in terms of subscribers and % spectrum allocations to PMRTS Operators as on 30th September, 2017, have been given in the Table 3.1 in para 3.5 above.

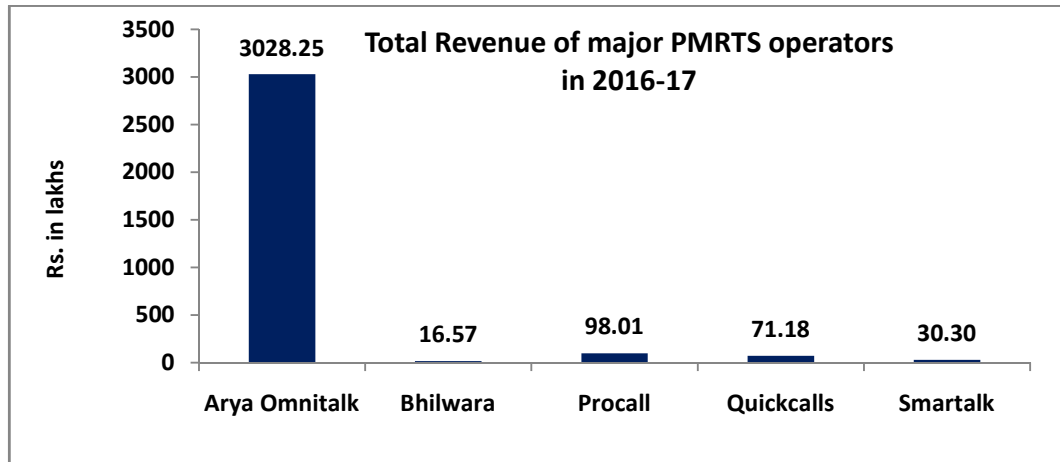
3.42 There are only 9 PMRTS operators and out of which 4 PMRTS operators are holding more than 95% subscriber base and about 84% of market share of existing spectrum assignments in all bands. Further one the operator is holding about 84% of market share of subscriber base and more that 61% of market share of existing spectrum assignments in all bands.

3.43 Further at present the revenue generated by the operators is also about only Rs. 30 to 35 Crore. Total Revenue of major PMRTS operators in last 5 years has been in the table below:

Table 3.6: Statement of Revenue of 5 major PMRTS Operators					
(Rs. in Lakh)	2012-13	2013-14	2014-15	2015-16	2016-17
Smartalk	58.74	24.85	19.99	11.38	30.30
Quickcalls	307.55	152.39	116.98	67.72	71.18
Bhilwara	39.06	25.55	11.32	7.94	16.57
Procall	661.40	398.14	243.62	82.09	98.01
Arya Omnitalk	1535.24	2001.24	2284.50	2754.88	3028.25

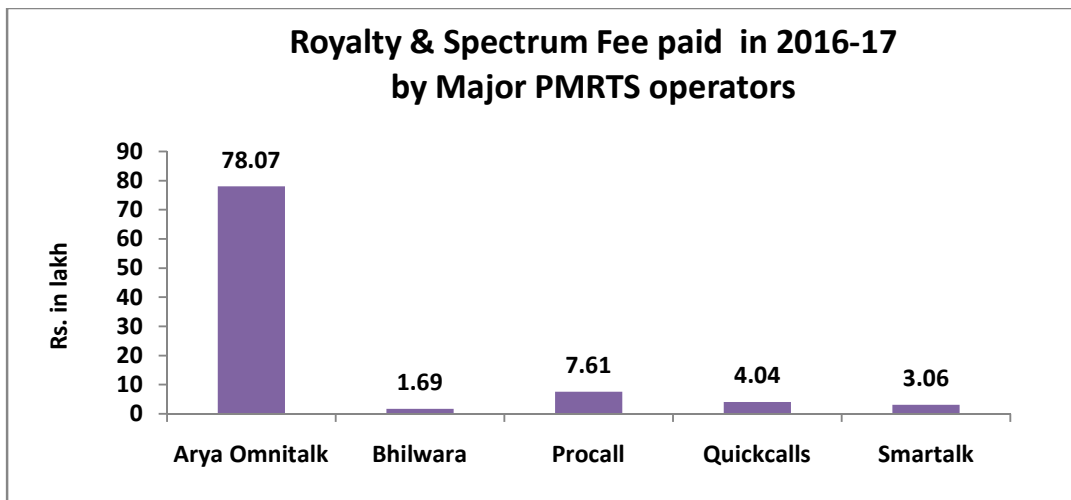
3.44 Total Revenue of major PMRTS operators in 2016-17 is given in the table below which clearly indicates that this service is not so revenue yielding:

Chart: 3.2



3.45 The Royalty and Spectrum fee charges at paid by the PMRTS operators are less than Rs. 1 Crore in 2016-17. The details Royalty and Spectrum fee charges at paid by major PMRTS operators in 2016-17 is given in the table below:

Chart: 3.3



3.46 As on 31st July 2017, total nine (9) licenses of PMRTS are operational, providing the PMRTS services in the following service areas⁸:

⁸ As available on DOT's website under the link: http://dot.gov.in/sites/default/files/PMRTS_31.07.2017.pdf?download=1

Table 3.7

Sl.No.	Name of Company	Service Area
1	M/s Arya Omnitalk Radio Trunking Services Ltd.	Delhi, Mumbai, Kolkata, Gujarat, Karnataka, Tamil Nadu , Pune, Andhra Pradesh, Madhya Pradesh, Kerala & Rajasthan
2	M/s Procall Private Limited	Delhi, Rajasthan
3	M/s Bhilwara Telenet Services Private Limited	Mumbai
4	M/s Smart Talk Private Limited	Mumbai, Maharashtra
5	M/s Inative Networks Private Limited	Gujarat, Rajasthan, Bihar, Andhra Pradesh, Madhya Pradesh, Tamil Nadu, Karnataka, Haryana, Delhi, West Bengal, Orissa & Maharashtra
6	M/s Quickcalls Private Limited.	Andhra Pradesh, , Karnataka, Tamil Nadu
7	M/s WiWaNet Private Limited	Kerala, Andhra Pradesh, Tamil Nadu, Gujarat and Maharashtra.
8	M/s Airtalk Solutions and Services Private Limited	Mumbai, Maharashtra, Gujarat
9	M/s Surya Telecom Private Limited	Delhi

3.47 Accordingly, the following question is raised for the comments of stakeholder:-

Q12. In case spectrum is to be auctioned, which methodology / approach(s) should be adopted for valuation and associated reserve price of Spectrum for PMRTS and why? Please justify your answer.

3.48 In the present regime of administrative assignment of spectrum for PMRTS, the rates of annual Royalty and Licence Fee charges are levied

for the grant of the license to establish, maintain and work fixed/vehicle Mobile/Handheld mobile wireless telegraph stations in the PMRTS. These charges are being levied as per order no. L-14027/01/98-NTG dated 18th September 2000, which inter alia states that: -

“2. The formula for calculation of royalty and licence fee is given below:-

$$\text{Total fee per year} = L + R$$

(Where, L = License Fee per PMRT station and R = Royalty)

2.1 Total fee per year is payable in advance for the whole year (year may start in any month in the first year and January, in the subsequent year. For the first year the royalty on pro-rata quarterly year basis is to be paid and license fee is to be paid on annual basis)

2.2 Royalty and license fee will have to be paid annually in advance by 15th January. The number of stations as on 1st January and 1st July shall be certified by the licensee by way of an affidavit. Balance of licence fee for additional number of stations based on 1st July and 1st January of the following year should be paid by 15th July and 15th January respectively.

i) L & R for maximum radio link distance between 5 & 60 Kms are to be calculated as follows:

$$L = 100X n,$$

$$R = 4800 X f$$

ii) L & R for maximum link distance below 5 Kms, R & L will be expressed as:-

$$L = 100X n, \quad R = 1200 X f$$

where,

n = No. of stations (station includes fixed base station, Vehicle mounted mobile or hand held mobile stations)

f = No. of frequency spots used. (This corresponds to f/2 frequency pairs).”

3.49 As per license condition, PMRTS operators are paying licence fee as percentage (at 8%) of AGR and PMRT Station fee and Royalty charges per year (Spectrum Usage Charges) on the formula basis as mentioned in the para above. Since the assignment of spectrum is done on administrative basis, no upfront payment is being charged. In the case of access service authorization, the licensee is charged SUC in % of AGR. Accordingly, in the event of auction of spectrum, the issue arises whether the SUC to

PMRTS licensee should be continued to be charged on formula basis as indicated in para above or should there be the provision of SUC in line with the provision for access service authorization.

3.50 Accordingly, the following issue is raised for the comments of the stakeholders:-

Q13. In case spectrum is to be auctioned, which methodology/ approach(s) should be adopted for calculation of spectrum usage charge? Please justify your answer.

E. Spectrum Cap

3.51 Spectrum caps in mobile access services have been introduced in several countries at various times and seen as a measure to ensure competition in mobile communications markets. The relevance of spectrum cap has been to ensure that no single mobile operator, or a very small number of operators, can acquire all or almost all spectrum on offer either at the time of initial spectrum awards or in subsequent mergers of, or deals between operators. The philosophy of spectrum cap is mainly to prevent operators from gaining monopolistic positions through large holdings of a scarce resource, i.e. spectrum, which they might then exploit anti-competitively so as to cause market failures with deleterious effects for customers and overall economic welfare. Other advantages of spectrum cap are to create opportunities and business avenues for other parties in a transparent manner and providing level playing field.

3.52 In a large market like India, the role of spectrum cap in wireless access is very relevant so that an operator cannot hold a position to behave in an anti-competitive manner. As per existing spectrum holding rules there is cap of 50% for intra-band spectrum assignments and cap of 25% for overall assignments in all access bands in a licensed area. It is pertinent

to mention that spectrum caps are not applicable in the assignments other than access spectrum.

3.53 On the other hand in the case of PMRT services in the country, there is substantial difference in spectrum holdings between the service providers of PMRTS. As mentioned earlier in para 3.5 above, the market leader M/s Arya Omnitalk Radio Trunking Services Pvt. Ltd holds 61.50% of spectrum assignment followed by M/s Procall Ltd. at 13.10%. Similarly in terms of share of spectrum assigned M/s Arya Omnitalk enjoys the market share of 83.58% followed at huge gap by M/s Procall Ltd. at 2nd position with a market share of 5.69%. Operator wise and band wise spectrum assignments are given in the Table 3.8 below.

Table 3.8: Operator wise and band wise existing assignments

Sr. No.	Name of the Service Provider	Total no. of RF carrier assigned	%age Share of existing spectrum assignments in all bands	No of RF carriers assigned in		
				338-340 MHZ/ 348-350MHz band	811-814 MHZ/ 856-859 MHz band	814-819 MHZ/ 859-864 MHz band
1	Arya Omnitalk Radio Trunking Services Pvt.Ltd.	305	61.50	Nil	5	300
2	Procall Ltd.	65	13.10	Nil	Nil	65
3	Smartalk Pvt Ltd.	20	4.03	Nil	Nil	20
4	QuickCall	25	5.04	Nil	Nil	25
5	Bhilwara Telenet Services Pvt.Ltd.	10	2.02	Nil	Nil	10
6	Inative Networks Pvt. Ltd.	21	4.23	Nil	21	Nil
7	Wiwonet Solutions Pvt. Ltd.	45	9.07	45	Nil	Nil
8	Airtalk Solutions & Services Pvt. Ltd.	5	1.01	Nil	Nil	5
	Total	496		45	26	425

- 3.54 From the table above it is clear that 85.76 % of RF assignments are in the band 814-819 MHz/ 859-864 MHz band followed by 9% and 5.24% in the band 338-340 MHz/ 348-350 MHz and 811-814 MHz/ 856-859 MHz band respectively. As per the information made available by DoT, there are 400 no. of RF carriers of (25 KHz each) in total (considering all the allocated bands) available in each city for assignment to the service providers. The maximum demand of RF carriers (including existing assignments) is 117 in Delhi service area. Keeping in view the existing assignments vis-à-vis no. of RF channels available it can be concluded that there are enough spectrum available for assignments.
- 3.55 As most of the existing assignments are in 814-819 MHz/ 859-864 MHz band, service provider offering the services as on date, would prefer to continue the services on the same band and same frequency channels. However, the entire plan would be dependent on the outcome of the auction.
- 3.56 The Authority understands that PMRT service is basically a niche segment where market opportunities are not omnipresent. Further, growth pattern of the industry does not indicate disruptive changes in near future on the demand side. If at all required, in order to prevent the anti-competiveness of the market, the option of intra-band cap and overall cap should be evaluated carefully and a considered decision is required to be taken.
- 3.57 Accordingly, following issues are raised for the comments of stakeholders.

Q14. Whether the concept of spectrum cap shall be applicable on assignment of spectrum to the licensees for PMRTS? Justify your answer.

Q15. In case you are of the view that provision of spectrum cap should be there, what should be the mechanism for applicable spectrum cap?

(a) Whether any one of the spectrum cap i.e. intra-band or overall shall suffice the requirement as of now? or

(b) both caps should be made applicable simultaneously?

(c) What should be the appropriate criteria for spectrum cap?

F. Duration/validity period of spectrum assigned

3.58 DoT in its reference has mentioned that since the PMRT services cannot be matched with access services in terms of scale of services and revenue generation and these services are expected to be limited to few cities only, hence, TRAI may consider whether validity period for PMRT can be kept less than 20 years such as 5 years, 10 years, notwithstanding that Unified License for PMRT services is issued for 20 years period.

3.59 In the case of spectrum assignments for access services, the licensee has 'right-to-use' of the spectrum for 20 years. Accordingly, the reserve price or auction prices are amortized over the entire period. Being a capital sensitive segment, the assignment of spectrum for longer period provides greater confidence in the industry and better avenues for growth and evolution. The Authority also feels that duration of assignment of spectrum should be such that a service provider is able to recover the costs and able to sustain for long in the market. Accordingly, following issues are raised for the comments of stakeholders: -

Q16. What should be the duration/validity of assignment of spectrum to PMRT service provider? Should it be with the same duration as that of the license (20 Years)? Please support your answer with facts.

Q17. If the duration of validity of spectrum is to be made lesser than the validity of license, should there be an option with the licensee to renew? What should be the specific conditions for such renewal?

CHAPTER IV: INTERNATIONAL PRACTICE

Singapore

- 4.1 According to the Spectrum Management Handbook⁹ issued by IMDA (Infocomm Media Development Authority) in July 2017, for providing Public Trunk Radio Service (PTRS), the operators are required to take FBO (Facilities-Based Operations) license¹⁰. The duration of the license is 10 years and renewable for a further period, if required. The license fee is an Annual Fee¹¹ of S\$80,000 for the first S\$50 million in AGTO (Annual Gross Turnover)¹², 0.8% of AGTO for the Next S\$50-S\$100 million in AGTO and 1% of AGTO for the above S\$100 million in AGTO.
- 4.2 IMDA was of the view that the trunked radio features have not been replaced by cellular services. The ability to make one-to-many group calls using trunked radio is a feature in which cellular networks have yet to offer. One-to-many group calls are crucial for operations that require information to be verbally communicated to all field staff in different locations simultaneously.
- 4.3 IMDA's policy is to assign the spectrum allocated for public mobile services to FBOs only. Administrative-based approach is being used for spectrum allocation for PTRS. IMDA is of the view that it will continue to use administrative-based approach for services such as paging, trunked radio, fixed links, etc, till such time when there are competing demands for the spectrum.

⁹ <https://www.imda.gov.sg/~media/imda/files/regulation%20licensing%20and%20consultations/frameworks%20and%20policies/spectrum%20management%20and%20coordination/spectrummgthb.pdf>

¹⁰ <https://www.imda.gov.sg/~media/imda/files/regulation%20licensing%20and%20consultations/licensing/license%20s/fboguidelines.pdf>

¹¹ The licence fee for FBOs is an annual recurrent fee based on Annual Gross Turnover (AGTO) of the FBOs, subject to a minimum amount of \$80,000 or \$200,000. There is no initial one-time licence fee payable.

¹² Annual Gross Turnover (AGTO) is the annual fair value of the consideration received or receivable for licensable activities taking into account the amount of any trade discounts and volume rebates allowed by the FBO licensee.

4.4 Currently, GRID Communications and CitiCall Communications are the two operators offering the public trunked radio services in Singapore. The spectrum allocation and band plan for PRTS is shown in table 4.1 below.

Table 4.1: Spectrum allocation and band plan for PRTS in Singapore

Frequency Range	Existing/Planned system	Main User	Technology used
410-430 MHz/ 440-450 MHz	Trunked Radio	CitiCall Communications	NXDN ¹³¹⁴
806-821 MHz/ 851-866 MHz	Trunked Radio	GRID Communications	iDEN ¹⁵

4.5 For spectrum to be administratively allocated, IMDA requires the applicant to furnish the following information:

- (i) Network Facilities: The planned locations and technical details of radio base station sites and other equipment to be installed and frequency spectrum to be used.
- (ii) Network Coverage, Capacity and Improvement: The planned geographical coverage of the network upon launch of services and the network capacity expansion plans for the first 5 years of operation; and commitments for improvements to infrastructure facilities for the next 5 years.

¹³ <http://www.citicall.net/>

¹⁴ NXDN is an open standard Common Air Interface (CAI) technical protocol that supports a comprehensive radio system including trunked, non-trunked and direct mobile-to-mobile communication. It was developed jointly by Icom Incorporated and Kenwood Corporation. It was accepted at the Study Group 5 (SG5) meeting of the ITU-R held in November 2016 and in report M.2014-3 published in February 2017 as an international digital land mobile system. It is an open standard narrowband digital protocol employing 6.25 KHz and 12.5 KHz FDMA technology. NXDN physical layer employs a FDMA technique with a four-level FSK modulation and includes two transmission rates; one is 4.8 kbit/s for 6.25 KHz bandwidth and the other is 9.6 kbit/s for 12.5 KHz bandwidth used for current analogue FM. It operates in 136-174 MHz, 380-512 MHz, 806-821/851-866 MHz, 896-901/935-940 MHz frequency bands.

¹⁵ https://www.imda.gov.sg/~media/imda/files/inner/pcdg/consultations/20150707_secondpublicconsultation/gri%20communications%20pte%20ltd.pdf

(iii) Technology and System Parameters: Technologies employed and the rationale for the choice of technology selected and the system parameters for the technology chosen.

4.6 In October 2016, IMDA issued a document on “Technical Specification¹⁶ of Land Mobile Radio Equipment”. Table 4.2 shows some of the technical requirements for Radio Equipment to be used in Land Mobile Radio Services (specifically Digital Radio Trunking Service).

Table 4.2: Technical requirements for Radio Equipment to be used in Radio Trunking Service

Technology	Operating frequencies	Channel spacing	ERP (Effective Radiating Power) limit
iDEN	Tx: 806 – 825 MHz Rx: 851 – 870 MHz	25 KHz	25W
DMR	136 – 174 MHz 400 – 410 MHz 430 – 450 MHz	6.25 KHz or equivalent/ 12.5 KHz	25W
TETRA	380 – 400 MHz	25 KHz	25W

France

4.7 In France, Professional Mobile Radio (PMR)¹⁷ networks are systems that are independent from the cellular mobile service, generally local or regional in scale and used for professional purposes. These professional radio networks are used by companies of all sizes (ranging from freelance workers to large conglomerates) and different sectors, such as transport (road transport companies, bus companies, taxis, airport services, motorway companies, ambulance, etc.); security and guarding; construction and public works; energy (electricity utilities); industry;

¹⁶ https://www.imda.gov.sg/~media/imda/files/regulation%20licensing%20and%20consultations/ict%20standards/telecommunication%20standards/radio-comms/imda_ts_lmr.pdf

¹⁷ <https://www.arcep.fr/index.php?id=11723&L=1>

sport and leisure associations. PMR networks are also used by certain State agencies and services, hospitals, local authorities and some public institutions.

- 4.8 As other use of spectrum for electronic communication services, PMR networks require an authorisation issued by Arcep. A very large number of installations employ PMR networks. As of January 2012, there were 25,840 individual PMR authorisation issued by Arcep. Added to this are the many uses made of "open spectrum", that do not require an individual authorisation to use the frequencies.

Authorisation Framework Set By Arcep

- 4.9 As with all radiocommunications services, PMR networks can be issued an authorisation under one of several regimes. In the 50 MHz, 60 MHz, 80 MHz, 160 MHz and 400 MHz bands, whose allocation is under the Arcep responsibility, users must be granted an authorisation by Arcep. Under this individual licensing system, Arcep applies three distinct schemes for spectrum use, adapted to PMR networks' different needs.
- (i) Individual authorisation by allotment: An authorisation is granted for the use of a block of frequencies in a given geographical area, without specifying the location of the user base stations. The authorisation carries a protection guarantee against harmful interference. This type of authorisation does not specify in any detail how the authorised network is engineered, which the user is free to alter within the limits set by the authorisation provisions.
 - (ii) Individual authorisation by assignment: An authorisation is granted for the use of a frequency in a given location and under technical terms and conditions that are detailed specifically in the authorisation, which implies prior frequency coordination, site by site. . The authorisation carries a protection guarantee against harmful interference. If the user wants to modify the location of the sites or the technical terms and

conditions attached to its licence, the user must request permission from Arcep to make these changes.

(iii) Individual licences for shared use, with no guarantee of protection: The licence is issued for the use of frequencies on an individual, but non-exclusive basis, with no guarantee of protection from other users.

4.10 In some channels of the identified frequency bands, whose allocation is under the Arcep’s responsibility, a PMR network does not require a prior authorisation from Arcep to operate: these sub-bands are subject to a system of general authorisation. Users can therefore employ these frequencies for free, provided they comply with the technical terms and conditions set out in the Arcep decision, which may include restrictions on the type of equipment, network or technology that can be employed in the frequency band.

Malaysia

4.11 In November 2013, the Malaysian Communications and Multimedia Commission (MCMC) issued Standard Radio System Plan (SRSP) namely “Requirements for digital trunk radio systems (DTRS)¹⁸ -operating in the frequency band 380 MHz to 399.9 MHz” and “Requirements for digital trunk radio systems (DTRS)¹⁹ -operating in the frequency band 410 MHz to 430 MHz”. The channeling plans for the same in given as per the table below:-

Table 4.2: Channeling plan for digital trunk radio systems

	Frequency bands	Channels
frequency band 380 MHz to 399.9 MHz		
Block A	380-382.50 MHz / 390-392.50 MHz	99 (of 25khz each)
Block B	382.50-385 MHz / 392.50-395 MHz	99 (of 25khz each)
Block C	385-387.50 MHz / 395-397.50 MHz	99 (of 25khz each)

¹⁸ https://www.mcmc.gov.my/skmmgovmy/files/attachments/SRSP519_DTRS.pdf

¹⁹ https://www.mcmc.gov.my/skmmgovmy/files/attachments/SRSP537_DTRS.pdf

Block D	387.50-390 MHz / 397.50-399.9 MHz	98 (of 25kHz each)
TOTAL	19.9 MHz	395
frequency band 410 MHz to 430 MHz		
Block A	410-412.5 MHz / 420-422.5 MHz	200 (of 12.5kHz each)
Block B	412.5-415 MHz / 422.5-425 MHz	200 (of 12.5kHz each)
Block C	415-417.5 MHz / 425-427.5 MHz	200 (of 12.5kHz each)
Block D	417.5-420 MHz / 427.5-430 MHz	196 (of 12.5kHz each)
TOTAL	20 MHz	796

Principles of Assignment for frequency band 380 MHz to 399.9 MHz

4.12 Authorisations to use the said band for the DTRS base station apparatus and the trunked radio access device were as follows:

- Apparatus Assignment ('AA') for DTRS base station apparatus; and
- Class Assignment ('CA') for trunked radio access device.

4.13 Eligible persons who may apply for the AA are private network facility (Government and private corporations/companies) for own and private use only. The Applicants were required to submit AA application for the apparatus on the prescribed AA form. The duration of AA for the said band was a period of five (5) years or such lesser period as specified in the AA.

4.14 The AA was decided to be assigned on a first come first served basis. In the event of unavailability of spectrum, applicants were placed in the queue that will be reviewed periodically.

Principles of Assignment for frequency band 410 MHz to 430 MHz

4.15 Authorisations to use the said band for the DTRS base station apparatus and the trunked radio access device were as follows:

- Apparatus Assignment ('AA') for DTRS base station apparatus; and
- Class Assignment ('CA') for trunked radio access device

4.16 The eligibility criteria and information for the AA application were as follows:

For Spectrum blocks A, B and C

- The applicant shall have Network Facilities Provider Individual (NFP (I)) licence.
- The applicant shall submit a Detailed Business Plan (DBP) based on wholesale model and defined geographic area including details of the roll out and digital migration plan acceptable by the Commission.
- Upon the approval of the DBP by the Commission, the applicant shall submit application for an AA in accordance with the geographical region(s) specified in the DBP; and prior to the issuance of the AA, provide to the Commission an Irrevocable Bank Guarantee (IBG) to guarantee performance and compliance with the conditions of the AA and the DBP, payable on demand, either in part or in full, for the amount of RM 50,000 (Ringgit Malaysia Fifty Thousand) for Area 1 (Peninsular Malaysia), RM 30,000 (Ringgit Malaysia Thirty Thousand) for Area 2 (Sabah and Wilayah Persekutuan Labuan) and/or RM 30,000 (Ringgit Malaysia Thirty Thousand) for Area 3 (Sarawak), from a licensed financial institution in Malaysia in the form and substance agreed by the Commission.
- The IBG shall start on the 1 January of every year, shall be valid for the period of 15 months and shall be provided until the final year of the roll out in accordance to the DBP.
- The finalised size of spectrum made available on geographic region basis to the applicant shall be based on the principle of:
 - the percentage of analogue Trunked Radio System (TRS) AA held
 - the need of the technology of choice; and
 - spectrum allocation efficiency.
- The application for an AA shall be based on the committed roll out plan as specified in the DBP. For spectrum which are not utilised or

under-utilised or not covered by the roll out plan, the Commission may allow other NFP (I) licensees to apply for an AA.

For Spectrum Block D:

- This block was set aside for migration of existing private networks and government users in the 800 MHz as well as for new users.
- The Applicants were required to submit AA application for the apparatus on the prescribed AA form.
- The AA for the said band shall be valid for a period of five (5) years or such lesser period as specified in the AA. AA holders may re-apply for a new assignment at least sixty (60) days before the expiry date.
- Other than the spectrum blocks/sub-blocks reserved for migration, the AA shall be assigned on a first come first served basis. In the event of unavailability of spectrum, applicants will be placed in the queue that will be reviewed periodically.

CHAPTER V: ISSUES FOR CONSULTATION

- Q1. Do you agree that existing License Service Area (LSA) based authorization criteria for PMRT service license is appropriate? If not, should there be a city/district based authorization aligned with spectrum allocations?**
- Q2. Do you suggest any other criteria/change in license/ area of authorization for PMRT service? Elaborate your suggestions with supporting facts.**
- Q3. Do you suggest any change in the duration of license from the present duration of 20 years? Please provide supporting justification.**
- Q4. Keeping in view the existing PMRT services market size and growth potential, which methodology of allocation of spectrum will be most suitable for PMRT services?**
- (a) Auction (or)**
 - (b) Administrative allocation**
- Kindly provide supporting arguments for your choice.**
- Q5. Do you propose any other methodology other than the options provided in Q4. above for allocation of spectrum for PMRTS? Please provide detailed justifications.**
- Q6. If you have opted for auction as the methodology for allocation of spectrum for PMRTS,**
- (a) What criteria/norms should be there for auction of spectrum so that efficient utilization of the spectrum is ensured? Should there be preference for Digital PMRTS networks?**
 - (b) Should the spectrum auction be held on LSA basis or city basis?**
 - (c) What should be the effective date of allocation of spectrum (if won through the process of auction)?**

(d) What should be the rollout obligations for PMRT service providers? What should be the penalty to be imposed in case of non-compliance of roll out obligation? Please provide detailed justifications?

Q7. If you feel administrative allocation is the best methodology, then

(a) Are the existing criteria of assignment of RF carriers sufficient or should there be different criteria/norms for assignment of spectrum? If existing criteria is not sufficient, what are the proposed criteria for such assignments so that efficient utilization of the spectrum is ensured?

(b) Should administrative price of spectrum be calculated LSA wise? If yes, what should be the basis and formula for determination of administrative price? Suggest alternate calculations, if any.

Q8. Out of the bands discussed in Table 3.2 above, which are the preferable bands for the PMRT services in India? List out in the order of priority. Are the bands suggested by DoT as mentioned in the Table 3.3 will be adequate to cater for the spectrum requirements of PMRTS?

Q9. Taking into consideration the existing allocation by DoT and Authority's latest recommendation for delicensing spectrum for M2M, would it be feasible to consider the band 819-824 MHz/ 864-869 MHz for allocation to PMRTS licensees?

Q10. Which other candidate band will be most suitable for PMRTS if the band 819-824 MHz/ 864-869 MHz (5 MHz) is not to be considered for allocation to PMRT services? Please support your answer with facts.

- Q11. What should be the minimum block size of spectrum to be put for auction? How contiguity of spectrum can be ensured.**
- Q12. In case spectrum is to be auctioned, which methodology / approach(s) should be adopted for valuation and associated reserve price of Spectrum for PMRTS and why? Please justify your answer.**
- Q13. In case spectrum is to be auctioned, which methodology/ approach(s) should be adopted for calculation of spectrum usage charge? Please justify your answer.**
- Q14. Whether the concept of spectrum cap shall be applicable on assignment of spectrum to the licensees for PMRTS? Justify your answer.**
- Q15. In case you are of the view that provision of spectrum cap should be there, what should be the mechanism for applicable spectrum cap?**
- (a) Whether any one of the spectrum cap i.e. intra-band or overall shall suffice the requirement as of now or**
- (b) both caps should be made applicable simultaneously?**
- (c) What should be the appropriate criteria for spectrum cap?**
- Q16. What should be the duration/validity of assignment of spectrum to PMRT service provider? Should it be with the same duration as that of the license (20 Years)? Please support your answer with facts.**
- Q17. If the duration of validity of spectrum is to be made lesser than the validity of license, should there be an option with the licensee to renew? What should be the specific conditions for such renewal?**

LIST OF ACRONYMS	
AGR	ADJUSTED GROSS REVENUE
AGTO	ANNUAL GROSS TURNOVER
APCO	ASSOCIATION OF PUBLIC SAFETY COMMUNICATIONS OFFICIALS
APT	ASIA-PACIFIC TELECOMMUNITY
C4FM	CONTINUOUS 4 LEVEL FM
CMRTS	CAPTIVE MOBILE RADIO TRUNKING SERVICE
CMTS	CELLULAR MOBILE TELEPHONE SERVICE
CP	CONSULTATION PAPER
CUG	CLOSED USER GROUP
DIMRS	DIGITAL INTEGRATED MOBILE RADIO SYSTEM
DMR	DIGITAL MOBILE RADIO
DoT	DEPARTMENT OF TELECOMMUNICATIONS
DPL	DEALER POSSESSION LICENSE
DPMR	DIGITAL PRIVATE MOBILE RADIO
ETSI	EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE
FBG	FINANCIAL BANK GUARANTEE
FBO	FACILITIES-BASED OPERATIONS
FDMA	FREQUENCY DIVISION MULTIPLE ACCESS
FM	FREQUENCY MODULATION
FSK	FREQUENCY SHIFT KEYING
GMSK	GAUSSIAN MINIMUM SHIFT KEYING
GoTa COMA	GLOBAL OPEN TRUNKING ARCHITECTURE COMA
GPS	GLOBAL POSITIONING SYSTEM
iDEN	INTEGRATED DIGITAL ENHANCED NETWORK
IMDA	INFOCOMM MEDIA DEVELOPMENT AUTHORITY
ISM	INDUSTRIAL, SCIENTIFIC AND MEDICAL
ISP	INTERNET SERVICE PROVIDER
ITU	INTERNATIONAL TELECOMMUNICATION
ITU-R	INTERNATIONAL TELECOMMUNICATION UNION'S RADIO COMMUNICATION SECTOR
LF	LICENSE FEE
LMR	LAND MOBILE RADIO
LoI	LETTER OF INTENT
LSA	LICENSE SERVICE AREA
M2M	MACHINE-TO-MACHINE
MCMC	MALAYSIAN COMMUNICATIONS AND MULTIMEDIA COMMISSION
MTROA	MOBILE TRUNKED RADIO OPERATORS ASSOCIATION
NDPL	NON DEALER POSSESSION LICENSE
NFAP	NATIONAL FREQUENCY ALLOCATION PLAN

NLD	NATIONAL LONG DISTANCE
NTP	NATIONAL TELECOM POLICY
P25	PROJECT 25
PBG	PERFORMANCE BANK GUARANTEE
PLMR	PUBLIC LAND MOBILE RADIO
PMR	PROFESSIONAL MOBILE RADIO
PMRTS	PUBLIC MOBILE RADIO TRUNKING SERVICE
PPDR	PUBLIC PROTECTION AND DISASTER RESPONSE
PSTN	PUBLIC SWITCHED TELEPHONE NETWORK
PSU	PUBLIC SECTOR UNITS
PTRS	PUBLIC TRUNK RADIO SERVICE
RF	RADIO FREQUENCY
SG5	STUDY GROUP 5
SRSP	STANDARD RADIO SYSTEM PLAN
SUC	SPECTRUM USAGE CHARGE
TDMA	TIME DIVISION MULTIPLE ACCESS
TETRA	TERRESTRIAL TRUNKED RADIO
TRAI	TELECOM REGULATORY AUTHORITY OF INDIA
TRS	TRUNK RADIO SYSTEM
UAS	UNIFIED ACCESS SERVICE
UL	UNIFIED LICENSE
VSAT	VERY SMALL APERTURE TERMINAL
WPC	WIRELESS PLANNING & COORDINATION

ANNEXURE I

Comparison between different digital trunked radio standards

	Project 25	TETRA	DIMRS	TETRAPOL	TETRA enhanced data service (TEDS)	GoTa	NXDN
Frequency bands (MHz)	136-200 360-520 746-870	380-390/ 390-400 or 410-420/ 420-430 or 450-460/ 460-470 or 870-888/ 915-933	806-821/ 851-866	70-520 746-870 870-888/ 915-933	As in TETRA TEDS is integrated with TETRA	410-415/420-425 452-457.5/ 462-467.5 806-821/851-866 824-849/869-894 1850-1910/1930-1990 1920-1980/2110-2170	136-174 380-512 806-821/ 851-866 896-901/ 935-940
Duplex separation	Varies or none (150 MHz band) 3 MHz and 5 MHz (400 MHz band) 39MHz & 45MHz (800 MHz band)	5-10 MHz (400 MHz band) 10-45 MHz (800/900 MHz band) dependent on system design	45 MHz (800 MHz band)	As necessary (80/160 MHz bands) 5 MHz or 10 MHz (400 MHz band) 45 MHz (900 MHz band)	As in TETRA	10 MHz (400 MHz, 450 MHz bands) 45 MHz (Secondary 800 MHz, 800 MHz bands) 80 MHz (1.9 GHz band) 190 MHz (2.1 GHz band)	Varies (150 MHz band) Varies (400 MHz band) 45 MHz (800 MHz band) 39 MHz (900 MHz band)
RF carrier spacing (KHz)	12.5 for 8K10F1E (C4FM) 6.25 for 5K76G1E (CQPSK)	25	25	12.5-10 6.25 evolution	25, minimum	1230 (800 MHz) 1250 (else)	12.5/6.25
Cell Radius (km): -handheld - suburban - mobile/rural	7.6-35 7.6 35	3.8-17.5 3.8 17.5	5-40 (design dependent) 5 40	8-28 8 28	Maximum cell radius as TETRA	Design and deployment dependent Typically: 1.5, Maximum: 100	Design dependent

	Project 25	TETRA	DIMRS	TETRAPOL	TETRA enhanced data service (TEDS)	GoTa	NXDN
Access method	FDMA TDMA in development	TDMA	TDMA	FDMA	Multi-carrier modulation (MCM) TDMA	CDMA	FDMA
Traffic channels /RF carrier	Integrated voice and data modes FDMA: 1 TDMA: 2 @ 12.5 KHz TDMA: 4 @ 25 KHz	4	6, 4, 3, 8, 12, etc.	1	As in TETRA	-	1
Transmission rate (kbit/s)	Integrated voice and data modes FDMA: 9.6 TDMA 2-slot: TBD, ranging from 9.6-12 TDMA 4-slot: TBD, ranging from 22-24 700 MHz data only modes 50 KHz: 76.8-230.4 kbit/s 100 KHz: 153.6-460.8 kbit/s 150 KHz: 230.4-691.2 kbit/s	36	64	8	690 Maximum	9.6~153.6 Support up to 1.8 Mbit/s on the reverse link and up to 4.9 Mbit/s on the forward link	9.6 for 12.5 KHz 4.8 for 6.25 KHz

	Project 25	TETRA	DIMRS	TETRAPOL	TETRA enhanced data service (TEDS)	GoTa	NXDN
Modulation	FDMA integrated voice and data modes: QPSK-c family includes C4FM and CQPSK TDMA voice modes: 2-slot: TBD; QPSK-c family (includes C4FM and CQPSK) and CPM under consideration 4-slot: TBD; CPM under consideration 700 MHz data-only modes 50 KHz: QPSK 100 KHz: 16-QAM 150 KHz: 64-QAM	$\pi/4$ -DQPSK	M16-QAM (M = 4)	GMSK	$\pi/4$ -DQPSK, $\pi/8$ -D8PSK, 4-QAM, 16-QAM, 64-QAM	QPSK 8-PSK 16-QAM	4-level FSK
Intersystem roaming capability	Yes	Yes	Yes	Yes	Yes	Yes	Yes

ANNEXURE II

Telecom Regulatory Authority of India

Subject: Recommendations of TRAI on licencing issues relating to Public Mobile Radio Trunking Service Providers (PMRTSPs)

A. CONTEXT OF RECOMMENDATIONS:

The Department of Telecommunications made a reference to TRAI in April, 1999 seeking recommendations from the Telecom Regulatory Authority of India regarding the entry of additional Public Mobile Radio Trunking service providers (PMRTSPs) in the country and for the extended period of licence in respect of the existing licencees. The recommendations have been sought on the following specific issues:

- a) The basis of selection of additional operators.
- b) The basis for determining the entry fee.
- c) Percentage of Revenue to be shared with the licensor and defining revenue for the purpose.
- d) The appropriate level of Licence Fee for the extended period of the licence in respect of existing licencees.
- e) Any other issue considered relevant.

2. While processing the case for making recommendations, TRAI noted that the present customer base is much below the requirements of financial viability for most of the PMRTS operating networks. It was also observed that a large number of licencees have not commenced services at all and the operations of most PMRTSPs who have commenced services do not seem to be commercially viable. This naturally raises serious questions regarding the present content and mode of delivery of this service. In a diverse and growing economy like ours, this service which has established a niche market globally, should normally, be able to do the same in our country also. There is obviously a deeper reason for its failure to attract customers apart from the failure of the existing service providers to effectively market this service. This background has been kept in view while framing these recommendations.

3. A study of the operations of the PMRT service providers and the discussions at the open houses conducted for eliciting public opinion on this service have revealed some problems related to it. Briefly stated these are the following:-

1. The service falls short of customer's expectations in scope. This is largely because

interconnection between different operators and with the PSTN is not permitted, as per existing terms and conditions of license.

2. High price of subscriber units, as well as bulky handsets.
3. Too restrictive a definition of service areas. Service areas of PMRT service operators are not even co-terminus with that of local call charge area of PSTN, whereas for CMTS, which is an analogous service, it is much wider.
4. The existing PMRT networks employ analogue technology, offering lesser features and facilities to the customers especially in regard to tele-services relating to data communication.

B. Recommendations:

B.1 Service area and its categories:

The present service area of the PMRT service operators in all metros as well as the cities has been found to be rather small and, therefore, too restrictive to meet the needs of customers subscribing to the PMRTS. The licenced service areas of the PMRT operators do not even cover the local charging area i.e. upto 50 km. of PSTN. Such a restrictive definition is one of the most important reasons put forth for the service not proving attractive to the target customer group. We would therefore like to examine this issue i.e., area of coverage of PMRTS in some depth in the following paragraphs:

Considering that it is natural for the satellite towns of a metro city to have community of interest amongst themselves as well as with the Central Business Districts of the metro cities, we would like to enlarge the scope of this service to cover the metro and its satellite towns. A Closed Users Group (CUG) would have a strong community of interest in this entire area. On similar basis the service area of CMTS for metro cities have the satellite towns included as part of a homogenous area. Therefore, we find no reason to adopt a different basis for PMRTS which provides similar service as CMTS to a Closed User Group. TRAI is, therefore, of the opinion that redefinition and some enlargement of the service area of the PMRT Service providers will render the service more useful to customers and thereby promote its growth in the country. Accordingly, it is recommended that the service areas for PMRT service providers be redefined as under:-

- i) **Metropolitan Cities:** The service areas in the Metropolitan cities namely Delhi, Mumbai, Calcutta and Chennai should be enlarged to include urban agglomeration of these cities or 50 Kms. radius from the main base station site, whichever is greater. The respective licenses may specify the area suitably on the basis of the principle enunciated above.

- ii) **Other areas:** For all other cities the service area of PMRT service providers should extend to the municipal limits of the city plus a distance of 10 Kms. beyond the municipal limits.

A definition as above would keep the delineation of the service areas simple and make these broadly co-terminus with the areas covered in metros by a CMTS. We believe that by enlarging the service area, more customers would be attracted to the PMRTS market, which in turn will improve its financial viability.

B.2 Entry of additional operators:

B.2.1 Basis of selection:

Going by the principle that competition is in the best interests of the consumer, the TRAI would prefer to let the market forces determine the number of PMRT service providers in any service area subject to the limitation imposed by the quantum of frequency spectrum available for this service. The TRAI is also of the view that the market is self-limiting and will determine the number of players. As such, it would not like to limit competition artificially.

B.2.2 Exclusion of non-serious players from the Market:

Although, in the interest of promoting competition, the TRAI would not like to prescribe any entry fee in this area, it strongly believes that steps are required to be taken to eliminate non-serious players. This can be done by stipulating suitable Roll Out Obligations for the service providers and ensuring that failure to meet these Obligations leads to penalties ending in the cancellation of the licence and withdrawal of permission to use frequency spectrum. Therefore, to eliminate non-serious players, the TRAI recommends that the licence should contain strict conditions obliging the service provider to cover the entire service area within one year of the issue of licence. The performance of the Roll Out Obligation will have to be backed by a Bank guarantee of Rs. 10 lakh for licences covering Metros and Rs. 5 lakhs covering Other Areas, which will be invoked in the event of the service provider failing to fulfil his obligations. Non-fulfilment of the Roll Out Obligation will initially result in a penalty of Rs. 1,000/- per week of delay or part thereof upto a maximum of Rs. 25,000. Non-fulfilment of Roll Out Obligation after 25 weeks of delay will lead to cancellation of the licence and forfeiture of the Bank guarantee.

B.3 Entry Fee:

In terms of the existing licence conditions, there is at present, no requirement of Entry Fee. Having made a provision in these recommendations for a Bank guarantee to eliminate non-serious players, TRAI is of the view that no separate Entry Fee need be stipulated for the new entrants.

B.4 Rollout obligation and release of Bank Guarantee:

The Bank guarantee for fulfilment of the Roll Out Obligation provided by a PMRT Service provider will be released on successful completion of the Roll Out in accordance with the terms of the licence. As stated earlier, for delays in commissioning of service penalty is to be prescribed. Non-fulfilment of Roll Out Obligation even after the maximum margin of delay permissible i.e. 25 weeks, will lead to forfeiture of the entire bank guarantee and may result in cancellation of the licence. The already existing PMRT service providers also will be subject to similar Roll Out Obligations, which they will be required to fulfil. The Obligation of the existing service providers in respect of Roll Out will cover the extended part of the service area resulting from its redefinition as per these recommendations. It is clarified in this context that for the existing operators acceptance of the enlarged service area will be optional. However, once they exercise the option in favour of the enlarged service area their obligations for Roll Out in the entire area will be the same as that of a new service provider whose licence itself would entitle him to operate in the enlarged service area.

B.5 Licence fee and the Basis for its determination:

At present the licence fee for the PMRT service is as under:

- An annual licence fee @ Rs. 600/- per mobile/fixed terminal subject to a minimum of Rs. 50,000/-
- A separate Royalty is required to be paid to the Wireless Planning and Coordination Wing of the Ministry of Communications for utilization of appropriate Radio frequencies at prescribed rates as revised from time to time.

The current licence fee has been found to be heavy and in the opinion of the service providers as well as the users, is impeding the growth of the service. We, therefore, would like to recommend a reduction in this fee to facilitate the growth of this service.

Considering the present rather weak economic viability of this service, the TRAI recommends that the licence fee has to be very low so that it does not add in any significant manner to the cost of the service and thereby impedes its growth. A revised licence fee is, therefore, to be prescribed for both the handsets as well as for the radio channels. The licence fee payable is proposed to be not more than 5% of the gross revenue from the service, which will be utilised for contributions towards USO. It is also recommended that the level of licence fee now being recommended may be left unchanged for the next five years even if within this period the estimate of USO requirements is revised upwards. The position may, however, be reviewed after five years by when it is expected that the viability of the PMRT Service would improve substantially with the proposed changes in the licence conditions.

While, it would be simpler to prescribe the licence fee for PMRT service as a percentage of revenue, TRAI is of the view that administration of such a licence fee regime, may pose problems to the licensor. Licence fee on per subscriber basis is likely to make it easier for the licensor to levy the fee due from the licensee. It would also make realisation of the fee from users of captive licences easier. It is, therefore, recommended that the present licence fee structure which is on per subscriber basis be continued subject to the following modifications:

- Rs. 300 per annum per terminal with a minimum of Rs. 25,000- per annum.
- The Royalty payable for the radio spectrum should also be substantially reduced. It is understood that the Government is already considering reduction in the financial burden on the PMRTS operators caused by the Royalty for the spectrum, TRAI would recommend that the revision be expedited so that the problem is addressed urgently. (The licence fee and the Royalty for spectrum together should work out to not more than 5% of the revenue assuming a loading of about 90 subscribers per radio channel and a monthly average airtime revenue of Rs. 800/--900/-.
- The definition of revenue will be the same as already given in TRAI's recent recommendations in respect of other service providers viz. N.L.D operators, fixed service providers and VSAT service providers. TRAI considers that to be a common definition for all service providers unless it states otherwise in any specific case.
- While the new service providers will pay this licence fee during the entire period of their licence, for the existing service providers this will be for the extended period of the licence.

B.6 Other issues considered relevant:

B.6.1 Technology: The TRAI has observed that all present licencees are using analogue technologies which are not spectrum-efficient and do not provide for tele-services relating to data communication. Efforts, therefore, need to be made to ensure transition of the current licensees to spectrally efficient digital technologies based on open protocol. Such state of the art technologies will enable the service providers to offer a large number of tele and supplementary services to the customers to improve their financial viability. It will also permit standardisation of the handsets resulting in cost reduction. Therefore, the new licencees should be asked to deploy technologies with open protocol.

B.6.2 Incentives to the existing service providers for transiting to new technology : TRAI is of the view that use of analogue technology is coming in the way of the growth of the service. It would, therefore, like to recommend that effective steps be taken to facilitate and incentivise transition of the services offered by the existing service providers from their analogue technology to standard digital technologies. Accordingly, it recommends that for the existing PMRT service providers who have already rolled out their networks using analogue technologies, incentives should be provided in the form of reservation of a minimum number of additional radio channels, say 20 for each licencee so that they transit to standard digital technologies within a period not exceeding two years from their acceptance of new licence conditions.

B.6.3 Interconnectivity

Lack of interconnectivity with PSTN and inter-site connectivity is yet another reason which has limited the value of the service for the users and has been a restricting factor in its growth. TRAI, therefore, considers it desirable to remove these restrictions to improve the utility and acceptability of this service. NTP 99 also provides that direct interconnectivity between the licenced PMRT service providers and other types of service providers in their area of operation may be permitted after examining the legal implications. At that time exclusivity contained in the licence conditions of the mobile services operators needed to be kept in view in taking any such decision. Since then however, CMSPs have migrated to revenue sharing regime and therefore a review of this policy is called for.

However, considering the nature of the PMRT services such an interconnectivity can neither be unlimited nor unconditional. This is so mainly because PMRT service is primarily a Closed User Group (CUG) service and is meant primarily for exclusive intra-network communication. Quality considerations are also important and one has to keep in view that unrestricted interconnectivity with PSTN will seriously degrade the service within the Closed User Group. TRAI, therefore, recommends that interconnectivity may be permitted to the PSTN subject to the following restrictions:

Interconnectivity with PSTN :

- PMRT service providers both existing and new should be allowed interconnection with PSTN mainly to meet the requirements in situations of emergency faced by the subscribers.
- Such interconnection will be optional for the PMRT service providers.
- Total permitted usage of such interconnection in a month should not exceed 15% of total airtime usage of the network during the previous month. The technical details of the mechanism to implement this and the mechanism for checking the same should be examined and standardised by the Telecom Engineering Centre and stipulated in the Licence Agreement.
- It will be the responsibility of the PMRT service providers to ensure the quality of service within the PMRT network for intra-network calls. Failure in this regard including that on account of connectivity with the PSTN will make them subject to penal provisions including cancellation of the licence. Such a provision should be incorporated in the Licence Agreement.

Inter-site connectivity:

Inter-site connectivity will make the entire service area a single system and provide increased coverage and thus an enhanced market. In case of digital technology for PMRT Service, which is more spectrally efficient and provides greater range of tele and supplementary services, inter-site connectivity is an inherent requirement for optimal engineering of the network. TRAI, therefore, recommends that inter-site connectivity should be permitted to PMRT service providers between their own sites within the licensed area.

B.6.4 Redefinition of service area: As has been recommended in earlier sections, redefinition of service area and its enlargement both in metros as well as in other cities is considered very desirable in the interest of increased utility and acceptability of this service. In this context yet another area in which this service can prove its worth is the area of highway communications. Radio Trunking is ideally suited for transport companies and those who own or operate fleet of transport vehicles and depend upon the use of highways. The existing system is, however, of limited usage for this segment without highway connectivity as the present method of defining this service area is based on Base Station Location and city limits. In its present form, therefore, PMRT services cannot serve this potentially lucrative segment of customers effectively and thereby are forced to lose it. As a result an important market need for communication in a crucial commercial sector remains unfulfilled. In view of this, TRAI is of the view that in addition to redefining the existing service areas as per para B.1 above, new types of service areas may also be defined for PMRT services along

the highways.

B.6.5 Captive Licences: Users of Captive Licences are at present not paying any licence fee. In order to encourage efficient spectrum utilization, TRAI is of the view that all PMRT licencees including those using Captive Mobile Radio Trunking Service should pay a licence fee. Such licence fee would need to be based on spectrum allocations and area served. TRAI is of the view that the same fee as paid by PMRT service providers should be payable by the Captive licencees of Mobile Radio Trunking Service as well. This condition, however, should not be applicable to captive licencees where such captive service is considered necessary in public interest such as Police and Government security. TRAI is of the view that licencees without licence fee not only have a negative effect on the economic viability of service provider's operations but also result in inefficient utilization of the available radio spectrum.

B.6.6. Frequency Spectrum Requirement:

As per the present licence conditions, frequency allotment is done keeping in view the analogue network wherein five frequency pairs (including the control channel) of 25 KHz each are allotted to each operator initially and additional channels are considered for allotment in case per channel usage reaches 90% of the stipulated capacity of 90 mobiles per radio channel. This procedure of frequency allocation permits availability of a total of 240 frequency pairs in 800 MHz and 160 more in a 300 MHz band, a capacity to serve about 36,000 mobile subscribers in a given service area.

There is a global trend towards shift to spectrum-efficient digital system operating in 800 MHz band for PMRTS, which also provides more value added features in addition to a substantial reduction in the weight and cost of the subscriber unit. The shift to digital technology will require larger number of channels per operator. For an initial network rollout, about 40 channels are required to make the investment in digital technology attractive. For this purpose, as per NFAP 2000, additional 3 MHz spectrum has been allocated for digital PMRTS systems in 811-814 MHz band, which can initially permit 3 new operators to enter with digital technology. In addition, at least some of the existing operators using analogue technology in 800 MHz band will also be able to migrate to the digital technology and require extra channels for the migration, out of a total of 6 MHz available for analogue PMRTS.

In the above scenario, it would be possible initially to add 3 new operators with digital technology

and permit migration of 4-5 of the existing service providers with analogue technology to digital technology. With the increased spectrum efficiency of digital systems, it would be possible for each operator to service around 11,000-12,000 subscribers each given an initial allotment of 40 channels. These service providers amongst themselves should be able to service up to about 1,00,000 subscribers using digital technology in a single service area.

The allocation of bands between the PMRT service providers and the captive licencees will also have to be monitored and where necessary coordinated carefully so that most efficient utilization of the available spectrum is ensured in all service areas

Government of India
Ministry of Communications & Information Technology
Department of Telecommunications
Wireless Planning & Coordination Wing

6th floor, Sanchar Bhawan,
20, Ashoka Road, New Delhi-110001.

No.: L-14027/08/2016-NTG

Date: 13.07.2017

To,

The Secretary
Telecom Regulatory Authority of India
Mahanagar Doorsanchar Bhawan, Jawahar Lal Nehru Marg (Old Minto Road)
New Delhi-110002.

Subject: TRAI recommendations on method of allocation of spectrum for Public Mobile Radio Trunking Service (PMRTS), including auction, as a transparent mechanism.

Sir,

Mobile Radio Trunking Service has been growing steadily since its introduction in India over two decades ago. As a result, Commercial Mobile Trunking Radio Service Providers has been asking for more spectrum to cater to their growing subscriber base. In addition, they are also asking spectrum for new cities/locations (mining area, power plant and refinery etc.). The growth pattern of Captive (non-commercial) Mobile Radio Trunking Services (CMRTS) as used by Police Organization and public Sector Units (PSUs) etc. is also following the same trend.

2. Distinct sub-bands have been identified for Radio Trunking Services in National Frequency Allocation Plan - 2011, and there is no strict demarcation in those sub-bands between the usage by commercial and non-commercial radio trunking services. As of now, the sub-bands for Mobile Radio Trunking Service and their usage pattern is given in table 1 below:

Table 1				
S. No.	Frequency Band (in MHz)	Total Bandwidth	India remark in NFAP-2011	Applicability
1	336 - 338 / 346 - 348	2.0 MHz	IND27	For both PMRTS and CMRTS
2	338 - 340 / 348 - 350	2.0 MHz		
3	351 - 356 / 361 - 366	5.0 MHz	IND28	Digital CMRTS
4	356 - 358 / 366 - 368	2.0 MHz		
5	380 - 389.9 / 390 - 399.9	9.9 MHz	IND29	Digital PMRTS and CMRTS
6	806 - 811 / 851 - 856	5.0 MHz	IND40	Predominantly for CMRTS
7	811 - 814 / 856 - 859	3.0 MHz	IND41	For spectrum efficient digital PMRTS and CMRTS
8	814 - 819 / 859 - 864	5.0 MHz	IND42	Predominantly for PMRTS
9	819 - 824 / 864 - 869	5.0 MHz	IND43	For both PMRTS and CMRTS

Relevant India remarks in NFAP-2011, as mentioned above, are at Annexure-I.

3. Prior to Unified License (UL) regime, RF spectrum was allotted administratively city wise to the PMRTS licensees, having valid license agreement for providing PMRT Services in a that particular city. Under the Unified License regime, UL agreement is granted with authorization for providing PMRT Services on service area basis instead of earlier practice of city wise. However, spectrum is still allotted administratively for PMRT services on city basis. With such allotment of spectrum, service provider shall provide services only in the cities of the service area for which spectrum has been assigned.

4. Presently, a total of 8 service providers are providing PMRT service in 34 cities which fall in 11 Licensed Service Areas (the LSAs being the same as in cellular mobile service). A summary of the existing assignments made to PMRTS networks in various cities is enclosed as per Annexure II. Further, requests from these service providers for allotment of initial spectrum in 28 new cities as well as for allotment of additional spectrum for expansion of existing PMRTS networks have also been received. Spectrum for these new requests has not yet been allotted. If the existing network and the proposed new network in different cities are taken together, the number of such cities will become 62 which fall in 16 LSAs. Service area and city wise detailed information for demand of spectrum for PMRT services is at Annexure III.

5. All RF assignments made to existing PMRTS networks are conditional and made under the provisions of the Office Memorandums (O.M.s) issued from time to time in this regard with the following undertaking from the service providers:

- i. The allotment of spectrum is provisional and subject to Government's decision on allotment and pricing of spectrum;
- ii. In the event of final decision to allot spectrum through auction process, the provisional allotment of spectrum shall be withdrawn;
- iii. In case the provisional allotment of spectrum is withdrawn, payment made towards spectrum charges or part thereof shall not be refunded;
- iv. In case the provisional allotment of spectrum is withdrawn, respective wireless users would obtain Non Dealer Possession License (NDPL) for possessing the wireless equipment or return the equipment to a Dealer Possession License (DPL) holder or shall be disposed off as per procedure.
- v. Licensees would pay the revised spectrum charges, as finally determined through market related mechanism or otherwise, as may be applicable, from the date of Lol for provisional allotment of spectrum.

5.2 In this context, it may be mentioned that spectrum allotted to PMRT service providers is provisional and can be taken back before the assignment of spectrum through auction.

6. At present, spectrum charges for PMRT service are levied on formula basis which include the number of assigned RF channels, the number of radio stations (base and mobile stations) and coverage radius in kilometers (kms) for the purpose of calculation. The latest spectrum charging order applicable for PMRT services is at Annexure-IV.

7. Issues to be addressed:

7.1 Preferable frequency bands for PMRT services:

7.1.1 Radio trunking service on technological and regulatory landscape has undergone considerably changes since the publication of NFAP – 2011, it is therefore, important to take note of these changes. Further, steady efforts at the international fora to harmonise the spectrum bands for radio trunking service has necessitated that a holistic view of PMRTS and CMRTS should be taken in respect of their spectrum requirements.

7.1.2 In view of the preceding paras, it would be preferable to consider the bands for PMRT services in the following order of priority:

S. No.	Frequency Band (in MHz)	Total Bandwidth
1	816 - 819 / 861 - 864	3.0 MHz
2	819 - 824 / 864 - 869	5.0 MHz
3	336 - 340 / 346 - 350	4.0 MHz
	Total	12.0 MHz

7.1.3 TRAI may consider and give recommendation on appropriate frequency bands for PMRT services.

7.2 Block Size:

7.2.1 In past few years, different technologies have evolved and are available in market such as TETRA (Terrestrial Trunked Radio), APCO25 (Association of Public safety Communications Officials International Inc.), iDEN (Integrated Digital Enhanced Network), dPMR (Digital PMR and Go Ta CDMA (Global open Trunking Architecture CDMA), etc. These technologies demand varying emission bandwidths of 25 kHz, 12.5 kHz and 6.25 kHz.

7.2.2 In order to have flexibility with allotment of spectrum, it would be preferable to consider block size of 6.25 KHz. With this block size future growth plan for PMR services can also be met easily. It may also be ensured that user may bid for even number of blocks.

7.2.3 TRAI may consider and give recommendation on block size for PMRT service.

7.3 Duration/Validity Period:

7.3.1 Presently, spectrum for access services is auctioned for a validity period of 20 years. PMRT services cannot be matched with access services in terms of scale of services and revenue generation. Moreover, PMRT services are expected to be limited to few cities only.

7.3.2 TRAI may consider whether validity period for PMRT can be kept less than 20 years such as 5 years, 10 years, notwithstanding that Unified License for PMRT services is issued for 20 years period, and give recommendation accordingly.

7.4 Area of service:

7.4.1 At present, PMRT services are being provided over a city, even though UL agreement authorizes service providers for providing services in entire service area. Auctioning spectrum on service area basis may not be financially viable considering the scale of PMRT services and it

would also not lead to efficient spectrum utilization as PMRT services are unlikely to be deployed over the entire service area.

7.4.2 TRAI may consider exploring the feasibility for allotment of spectrum for PMRTS on city basis unlike service area basis as for cellular mobile services and give recommendation accordingly.

7.5 Reserve Price and Spectrum Usage Charges (SUC):

7.5.1 At present, assignment of spectrum for PMRTS is done on administrative basis and no upfront payment is charged. PMRT service providers are paying License Fee on percentage of AGR basis and spectrum usage charges on formula basis which include the number of assigned RF channels, the number of radio stations (base and mobile stations) and coverage radius in kilometers (kms) for the purpose of calculation. The latest spectrum charging order applicable for PMRT services is at Annexure-IV.

7.5.2 It may be noted that there is no strict distinction between CMRT and PMRT services except that the latter is a commercial service whereas CMRT services are non commercial and its area of operation is normally limited to mining area or factory premises.

7.5.3 TRAI may consider and give recommendation on reserve price and applicable SUC for PMRT services in different bands.

7.6 Spectrum Cap:

7.6.1 At present, allotment to spectrum for providing PMRT Services is done on administrative basis and there is no provision for spectrum cap. However, spectrum cap may be fixed so as to prevent market dominance by one operator.

7.6.2 TRAI may consider and give recommendation on applicable spectrum cap for PMRT services.

8. Besides above issues, any other issue which TRAI may think appropriate in respect of auction of spectrum for PMRT services may be included.

9. TRAI is, therefore, requested to:

9.1 Provide recommendations on applicable reserve price, and other associated conditions for auction of spectrum for PMRT services under the terms of clause 11 (1)(a) of TRAI Act, 1997 as amended by TRAI Amendment Act 2000.

9.2 Any other recommendations deemed fit for the purpose of auction of spectrum for PMRT services.

This issues with the approval of the competent authority.



(R. B. Prasad)
Joint Wireless Adviser

India Remarks in the National Frequency Allocation Table

- 10.1.2007 and GSR 532 (E) dated 12.8.2005
- IND20 The requirement of onsite radio paging systems and talkback facility will be considered in the frequency band 150.05-151.5 MHz. The frequency spots 150.3, 150.9 and 151.07 MHz are earmarked for onsite paging and 151.15, 151.55 and 150.6 MHz for talkback facility for such systems.
- IND21 The frequency spots 150.525, 151.250 and 166.950 MHz are earmarked for purposes such as O.B. Vans & film shooting.
- IND22 Requirement of fixed and mobile services including those of wireless telemetry seismic systems will be considered in the frequency band 174-230 MHz on a case-by-case basis. Specific requirement of wind profiler radars in the frequency band 200-220 MHz may also be coordinated on a case-by-case basis.
- IND23 Digital Audio Broadcasting (DAB) may be considered in the frequency band 174-230 MHz initially in the four Metro cities and further introduction of DAB could be considered on a case-by-case basis taking into account interference potentiality aspects.
- IND24 Protection requirements of radio astronomy service in the frequency band 230-235 MHz within the appropriate coordination zone around GMRT, Pune may be borne in mind while considering spot frequencies for other services.
- IND25 The requirement for wide area Radio Paging systems, two way radio systems including voice paging systems may be considered in the frequency band 276-280 MHz with talk back in the frequency band 917-921 MHz up to a maximum of 1 MHz in each band.
- IND26 The requirement of short-range radio may be considered in the frequency band 350-351 MHz.
The frequency spots 350.1625, 350.1750, 350.1875, 350.2000, 350.2125, 350.2250, 350.2375, 350.2500, 350.2625, 350.2750, 350.2875, 350.3000, 350.3125, 350.3250, 350.3375, 350.3500, 350.3625, 350.3750, 350.3875, 350.4000, 350.4125, 350.4250, 350.4375, 350.45, 350.4625, 350.4750, 350.4875, 350.5000, 350.5125, 350.5250 and 350.5375 MHz are earmarked for this purpose
- IND27 Requirements of public mobile radio trunked systems (PMRTS) and Captive mobile radio trunked systems will be considered in the frequency band 338-340 MHz paired with 348-350 MHz and its additional requirements may be considered in the frequency bands 336-338 MHz paired with 346-348 MHz on a case-by-case basis.
- IND28 The requirement of digital radio trunked service for captive networks will also be considered in the frequency band 351-356 MHz paired with 361-366 MHz and 356-358 MHz paired with 366-368 MHz on case-by-case basis.
- IND29 Requirements for digital radio trunked systems may be considered in the frequency bands 380-389.9 MHz paired with 390-399.9 MHz as also in 410-430

India Remarks in the National Frequency Allocation Table

- MHz on a case-by-case basis.
- IND30 Requirement of rural communications may be considered for coordination in the frequency band 368-380 MHz on case-by-case basis.
- IND31 Use of very low power remote cardiac monitoring RF wireless medical devices, medical implant communication/ telemetry systems and other such medical RF wireless devices in frequency band 402-405 MHz using a maximum radiated power of 25 micro watt or less with channel emission band width with in 300 kHz has been exempted from licensing requirement. (See also GSR no 673 (E) dated 23.9.2008)
- IND32 Requirements of digital seismic telemetry upto 1.5 MHz bandwidth may be met in the frequency band 406.1-450 MHz on case-by-case basis.
- IND33 Low power short range devices may be considered in the frequency band 433-434 MHz with a power output of 10 mW with a channel bandwidth of 10 kHz on non-interference, non protection and non- exclusive basis.
- IND34 The frequency spots 441.6 and 466.8 MHz may be considered for Anti Collision Device (ACD) applications on case-by-case basis.
- IND35 The requirement of IMT applications in the frequency band 450.5-457.5 MHz paired with 460.5-467.5 MHz may be considered for coordination on a case-by-case basis subject to its availability.
- IND36 Requirements of fixed and mobile services will be considered in the frequency band 470-520 MHz and 520-585 MHz on case-by-case basis.
- IND37 The requirement of Digital Broadcasting Services including Mobile TV may be considered in the frequency band 585-698 MHz subject to coordination on case-by-case basis.
- IND38 The requirement for IMT and Broadband Wireless Access may be considered in the frequency band 698-806 MHz subject to coordination on a case-by-case basis.
- IND39 Requirements of broadcasting and mobile satellite services except aeronautical mobile satellite(R) service in the frequency band 806-890 MHz may be considered for co-ordination on case-by-case basis.
- IND40 Frequency band 806-811 MHz paired with 851-856 MHz has been earmarked for mobile trunked radio system to be used predominantly for captive networks. The requirements for public mobile radio trunked systems (PMRTS), which cannot be met in other bands, may also be considered in this band.
- IND41 Frequency bands 811-814 MHz paired with 856-859 MHz has been earmarked for spectrum efficient digital public mobile radio trunked systems (PMRTS) and captive mobile radio trunked systems.
- IND42 Frequency band 814-819 MHz paired with 859-864 MHz has been earmarked

India Remarks in the National Frequency Allocation Table

- for mobile radio trunked systems to be used predominantly for public mobile radio trunked systems (PMRTS).
- IND43 Requirement of public mobile radio trunked systems (PMRTS) and captive mobile radio trunked systems may also be considered, as appropriate, in the frequency bands 819-824 MHz paired with 864-869 MHz.
- IND44 Use of low power RFID equipments or any other low power wireless devices or equipments in the frequency band 865-867 MHz with a maximum transmitter power of 1 Watt (4 Watts Effective Radiated Power) with 200 kHz carrier band width has been exempted from licensing requirement. (see also GSR 564 (E) dated 30 July 2008)
- IND45 Frequency spots 849.0125/933.0125, 849.0250/933.0250, 849.0375/933.0375, 849.0500/933.0500, 849.0625/933.0625, 849.0750/933.0750, 849.0875/933.0875, 849.1000/933.1000, 849.1125/933.1125, 849.1250/933.1250 MHz have been earmarked for supervisory control and data acquisition system (SCADA) except in a few specific locations.
- IND46 Frequency band 824-844 MHz paired with 869-889 MHz has been earmarked for cellular telecommunication systems, including WLL
- IND47 Frequency band 890-902.5MHz paired with 935-947.5MHz has been earmarked for cellular telecom systems.
- IND48 Additional requirements for cellular telecom systems in the frequency band 902.5-915 MHz paired with 947.5-960 MHz may be coordinated on case-by-case basis.
- IND49 Certain frequency spots in the frequency bands 902.5-915 MHz and 947.5-960 MHz may be considered for train control & mobile train radio systems for specific locations on a case-by-case basis.
- IND 50 Requirements for Micro cellular low powered, telecommunication systems with maximum EIRP up to 4 Watts, FDD access techniques may be considered at specific locations for indigenously developed systems and technology, in a small chunk, in the frequency band 900 MHz presently used by existing wireless users of captive systems subject to co-ordination on case-by-case basis.
- IND51 In relation to specific problem of harmful interference from wireless access systems (fixed/mobile) for telecommunication services into cellular based networks, appropriate measures of incorporating filters in the wireless access systems (fixed/mobile) for telecommunication services shall be taken. Appropriate measures of incorporating filters in cellular based networks for blocking signals leaking through the extended cellular frequency bands shall also be taken.

ANNEXURE - II

City-wise Allotment of RF Spectrum for PMRTS to TSPs

Service Area	Location (City/Town)	Service Provider	No. of RF Channels Allotted at present			
			338 - 340 MHz / 348 - 350 MHz	814 - 819 MHz / 859 - 864 MHz	811 - 814 MHz / 856 - 859 MHz	Total
Andhra Pradesh	Hyderabad	Arya Omnitalk Radio Trunking Services Private Limited		5		5
		Quickcalls Private Limited		15		15
	Visakhapatnam	Arya Omnitalk Radio Trunking Services Private Limited		30		30
Delhi	Delhi	Arya Omnitalk Radio Trunking Services Private Limited		30		30
		Procall Private Limited		40		40
	Faridabad	Procall Private Limited		5		5
	Gurgaon	Procall Private Limited		15		15
Gujarat	Ahmedabad	Arya Omnitalk Radio Trunking Services Private Limited		10		10
		Inative Networks Private Limited			5	5
	Amreli	Inative Networks Private Limited			1	1
	Bharuch	Arya Omnitalk Radio Trunking Services Private Limited		5		5
		Inative Networks Private Limited			1	1
	Dahej	Arya Omnitalk Radio Trunking Services Private Limited		5		5
	Jamnagar	Inative Networks Private Limited			2	2
	Kutch	Inative Networks Private Limited			5	5
	Surat	Arya Omnitalk Radio Trunking Services Private Limited		15		15
		Inative Networks Private Limited			5	5
Vadodra	Arya Omnitalk Radio Trunking Services Private Limited		10		10	

City-wise Allotment of RF Spectrum for PMRTS to TSPs

Service Area	Location (City/Town)	Service Provider	No. of RF Channels Allotted at present			
			338 - 340 MHz / 348 - 350 MHz	814 - 819 MHz / 859 - 864 MHz	811 - 814 MHz / 856 - 859 MHz	Total
	Vaduvuara	Inative Networks Private Limited			2	2
Karnataka	Bangalore	Arya Omnitalk Radio Trunking Services Private Limited		40		40
		Quickcalls Private Limited		5		5
Kerala	Alappuzha	WiWaNet Private Limited	5			5
	Cochin	Arya Omnitalk Radio Trunking Services Private Limited			5	5
	Ernakulam	WiWaNet Private Limited	5			5
	Kollam	WiWaNet Private Limited	5			5
	Munnar	WiWaNet Private Limited	5			5
	Panniankara	WiWaNet Private Limited	5			5
	Payyanur	WiWaNet Private Limited	5			5
	Tirur	WiWaNet Private Limited	5			5
	Trichur	WiWaNet Private Limited	5			5
	Trivandrum	WiWaNet Private Limited	5			5
Kolkata	Kolkata	Arya Omnitalk Radio Trunking Services Private Limited		20		20
Madhya Pradesh	Indore	Arya Omnitalk Radio Trunking Services Private Limited		10		10
	Khandala	Arya Omnitalk Radio Trunking Services Private Limited		5		5
	Bhopal	Arya Omnitalk Radio Trunking Services Private Limited		15		15

City-wise Allotment of RF Spectrum for PMRTS to TSPs

Service Area	Location (City/Town)	Service Provider	No. of RF Channels Allotted at present			
			338 - 340 MHz / 348 - 350 MHz	814 - 819 MHz / 859 - 864 MHz	811 - 814 MHz / 856 - 859 MHz	Total
	Pune	Smart Talk Private Limited		10		10
Mumbai	Belapur	Arya Omnitalk Radio Trunking Services Private Limited		5		5
	Mumbai	Arya Omnitalk Radio Trunking Services Private Limited		40		40
		Bhilwara Telenet Services Private Limited		10		10
		Smart Talk Private Limited		10		10
	Navi Mumbai	Airtalk Solutions & Services Private Limited		5		5
Vashi	Arya Omnitalk Radio Trunking Services Private Limited		10		10	
	Jaipur	Arya Omnitalk Radio Trunking Services Private Limited		5		5
		Procall Private Limited		5		5
Tamilnadu	Chennai	Arya Omnitalk Radio Trunking Services Private Limited		40		40
		Quickcalls Private Limited		5		5
Total			45	425	26	496

Data i.r.o. demand of RF Channels for PMRTS in various cities

Service Area	Location (City/Town)	338 - 340 MHz / 348 - 350 MHz				811 - 814 MHz / 856 - 859 MHz				814 - 819 MHz / 859 - 864 MHz				Total demand of RF Channels for PMRTS in all the bands
		No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	
Andhra Pradesh	Hyderabad	80			0	120		5	5	200	20		20	25
	Nellore	80			0	120		1	1	200			0	1
	Visakhapatnam	80			0	120		6	6	200	30	5	35	41
Bihar	Jamshedpur	80			0	120		1	1	200			0	1
Delhi	Delhi	80			0	120		27	27	200	70	20	90	117
	Faridabad	80			0	120			0	200	5		5	5
	Gurgaon	80			0	120			0	200	15		15	15
Gujarat	Ahmedabad	80			0	120	5		5	200	10	5	15	20
	Amreli	80			0	120	1		1	200			0	1
	Anand	80			0	120		1	1	200			0	1
	Bharuch	80			0	120	1	5	6	200	5	5	10	16
	Bhavnagar	80			0	120		1	1	200			0	1
	Chhota Udaipur	80			0	120		1	1	200			0	1
	Dahaj	80			0	120		5	5	200	5		5	10
	Gandhinagar	80			0	120		1	1	200			0	1
	Halol	80			0	120		5	5	200			0	5
	Jamnagar	80			0	120	2		2	200			0	2
Junagarh	80			0	120		1	1	200			0	1	

Data i.r.o. demand of RF Channels for PMRTS in various cities

Service Area	Location (City/Town)	338 - 340 MHz / 348 - 350 MHz				811 - 814 MHz / 856 - 859 MHz				814 - 819 MHz / 859 - 864 MHz				Total demand of RF Channels for PMRTS in all the bands
		No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	
	Kheda	80			0	120		1	1	200			0	1
	Kutch	80			0	120	5		5	200			0	5
	Navsari	80			0	120		1	1	200			0	1
	Porbandar	80			0	120		1	1	200			0	1
	Rajkot	80			0	120		1	1	200			0	1
	Sabarkatha	80			0	120		1	1	200			0	1
	Shidpur	80			0	120		1	1	200			0	1
	Sitapur	80			0	120		5	5	200			0	5
	Surat	80			0	120	5	5	10	200	15		15	25
	Surendranagar	80			0	120		1	1	200			0	1
	Vadodara	80			0	120	2		2	200	10	5	15	17
Valsad	80			0	120		1	1	200			0	1	
Haryana	Rohtak	80			0	120		1	1	200			0	1
Karnataka	Bangalore	80			0	120		15	15	200	45	25	70	85
	Bellari	80			0	120		2	2	200			0	2
	Mangalore	80			0	120		5	5	200			0	5
Kerala	Alappuzha	80	5		5	120			0	200			0	5
	Cochin	80			0	120	5	5	10	200			0	10

Data i.r.o. demand of RF Channels for PMRTS in various cities

Service Area	Location (City/Town)	338 - 340 MHz / 348 - 350 MHz				811 - 814 MHz / 856 - 859 MHz				814 - 819 MHz / 859 - 864 MHz				Total demand of RF Channels for PMRTS in all the bands	
		No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand		
Kolkata	Ernakulam	80	5		5	120			0	200			0	5	
	Kollam	80	5		5	120			0	200			0	5	
	Munnar	80	5		5	120			0	200			0	5	
	Panniankara	80	5		5	120			0	200			0	5	
	Payanur	80	5		5	120			0	200			0	5	
	Tirur	80	5		5	120			0	200			0	5	
	Trichur	80	5		5	120			0	200			0	5	
	Trivandrum	80	5		5	120			0	200			0	5	
	Kolkata	Kolkata	80			0	120	5	5	5	200	20	5	20	25
	Madhya Pradesh	Indore	80			0	120		0	200	10		15	15	
Maharashtra	Chandrapur	80			0	120	1	1	200			0	1		
	Khandala	80			0	120		0	200	5		5	5		
	Pune	80			0	120		0	200	25		25	25		
	South Goa	80			0	120	1	1	200			0	1		
Mumbai	Belapur	80			0	120	10	10	200	5	25	30	40		
	Mumbai	80			0	120	10	10	200	60	25	85	95		
	Navi Mumbai	80			0	120		0	200	5		5	5		

Data i.r.o. demand of RF Channels for PMRTS in various cities

Service Area	Location (City/Town)	338 - 340 MHz / 348 - 350 MHz			811 - 814 MHz / 856 - 859 MHz			814 - 819 MHz / 859 - 864 MHz			Total demand of RF Channels for PMRTS in all the bands		
		No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment	No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment	Total demand	No. of RF Channels available (@ Channel Spacing of 25 kHz) for assignment		No. of RF Channels, assigned to existing networks	No. of RF Channels, requested for assignment
Orissa	Vashi	80			0	120	10	10	200	10	25	35	45
	Angul	80			0	120	5	5	200			0	5
	Jagatsinghpur	80			0	120	1	1	200			0	1
Rajasthan	Jaiपुर	80			0	120	1	1	200			0	1
	Barmer	80			0	120	1	1	200			0	1
	Jaiपुर	80			0	120	5	5	200	10		10	15
Tamilnadu	Chennai	80			0	120	21	21	200	45	15	60	81
	Coimbatore	80			0	120	5	5	200			0	5
	Haldia	80			0	120	1	1	200			0	1
West Bengal													

(3)

Government of India
Ministry of Communications
(WPC Wing)

Parliament Street, Dak Bhavan
New Delhi - 110 001

No. L-14027/01/98-NTG

Dated: Sep 18, 2000

ORDER

Subject: Royalty and licence fee charges for the grant of licence to establish, maintain and work Public Mobile Radio Trunked Service (PMRTS) stations under the provisions of the Indian Telegraph Act, 1885.

In pursuance of powers conferred by section 4 of the Indian Telegraph Act, 1885 (13 of 1885), the Central Government hereby prescribes the following rates of royalty and licence fee charges for the grant of the licence to establish, maintain and work fixed/vehicle mobile/handheld mobile wireless telegraph stations in the Public Mobile Radio Trunked service (PMRTS):-

2. The formula for calculation of royalty and licence fee is given below:-

Total fee per year = L + R

where,

L = Licence fee

R = Royalty

- 2.1 Total fee per year is payable in advance for the whole year (year may start in any month in the first year and January, in the subsequent year. For the first year the royalty on pro-rata quarterly year basis is to be paid and licence fee is to be paid on annual basis)
- 2.2 Royalty and licence fee will have to be paid annually in advance by 15th January. The number of stations as on 1st January and 1st July shall be certified by the licensee by way of an affidavit. Balance of licence fee for additional number of stations based on 1st July and 1st January of the following year should be paid by 15th July and 15th January respectively.

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- i) L & R for maximum radio link distance between 5 & 60 kms are to be calculated as follows :

$$L = 100 \times n$$
$$R = 4800 \times f$$

- ii) L & R for maximum link distance below 5 kms, R & L will be expressed as :-

$$L = 100 \times n$$
$$R = 1200 \times f$$

where,

n = No. of stations (station includes fixed base station,
Vehicle mounted mobile or hand held mobile stations)

f = No. of frequency spots used. (This corresponds to
f/2 frequency pairs).

3. The order shall come into force from July 20, 1995.
4. This issues with the concurrence of Finance Advice IV Branch, DoT vide their UO No.616/DFIV/2000 dated 14.09.2000.



(Dr. Ashok Chandra)

Deputy Wireless Adviser to the Government of India

Copy to :-

1. All concerned
2. Wireless Monitoring Organisation
3. Department of Telecommunications (Finance Advice IV Branch),
New Delhi.

ANNEXURE IV

Consolidated LSA wise breakup for the demand of RF channels for existing cities and new cities

LSA	Existing networks			Upcoming networks		
	Name of cities for additional RF Channels assignments	Number of service providers	Total number of RF Channels assigned	Name of cities seeking fresh RF Channels assignments	Total number of RF Channels requested	Total number of channel
Andhra Pradesh	Hyderabad	1	5+15	Hyderabad	5+1+6	12
	Vishakahapatnam	1	30	Vishakahapatnam Nellore		
Bihar				Jamshedpur	1	1
Delhi	Delhi,	2	30+40	Delhi,	27+20	27
	Faridabad,	1	5	Faridabad,	0	
	Gurgaon	1	15	Gurgaon	0	
Gujarat		2			5	38
	Ahmedabad		10+5	Ahmedabad		
	Amreli	1	1	Amreli	0	
	Bharuch	2	5+1	Bharuch	5+5	
	Dahej	1	5	Dahej	5	
	Jamnagar	1	2	Jamnagar	0	
	Kutch	1	5	Kutch	0	
	Surat	2	15+5	Surat	5	
	Vadodara	2	10+2	Vadodara	5	
				Anand	1	
				Bhavnagar	1	
				Chhota Udaipur	1	
				Gandhinagar	1	
				Halol	5	
				Junagarh	1	
				Kheda	1	
				Navsari	1	
				Probandar	1	
				Rajkot	1	
				Sabarkatha	1	
			Shidpur	1		
			Sitapur	5		
			Surendernagar	1		
			Valsad	1		
Haryana				Rohtak	1	1
Karnataka	Bangalore	2	40+5	Bangalore	15	22
				Bellari	2	
				Mangalore	5	

LSA	Existing networks			Upcoming networks		
	Name of cities for additional RF Channels assignments	Number of service providers	Total number of RF Channels assigned	Name of cities seeking fresh RF Channels assignments	Total number of RF Channels requested	Total number of channel
Kerala	Alappuzha	1	5	Alappuzha	0	5
	Cochin	1	5	Cochin	5	
	Ernakulam	1	5	Ernakulam	0	
	Kollam	1	5	Kollam	0	
	Munnar	1	5	Munnar	0	
	Panniankara	1	5	Panniankara	0	
	Payyanur	1	5	Payyanur	0	
	Tirur,	1	5	Tirur,	0	
	Trichur	1	5	Trichur	0	
Trivandrum	1	5	Trivandrum	0		
Kolkata	Kolkata	1	20	Kolkata	5	5
Madhya Pradesh	Indore	1	10	1	5	5
Maharashtra	Khandala	1	5	Khandala	0	2
	Pune	2	15+10	Pune	0	
		Chanderpur		1		
		South Goa		1		
Mumbai	Belapur	1	5	Belapur	10+25	105
	Mumbai	3	40+10+10	Mumbai	10+25	
	Navi Mumbai	1	5	Navi Mumbai	0	
	Vashi	1	10	Vashi	10+25	
Orissa				Angul	5	7
				Jgatsinghpur	1	
				Jaipur	1	
Rajasthan	Jaipur	2	5+5	Jaipur	5	6
				Barmer	1	
Tamil nadu (including Chennai)	Chennai	2	40+5	Chennai	21	26
				Coimbatore	5	
West Bengal				Haldia	1	



सत्यमेव जयते

भारतीय दूरसंचार विनियामक प्राधिकरण
TELECOM REGULATORY AUTHORITY OF INDIA
भारत सरकार / Government of India



No. 102-6/2014-NSL-II

Dated: 8th August, 2017

To,
The Secretary,
Department of Telecommunications,
Ministry of Communications,
Sanchar Bhawan,
20, Ashoka Road,
New Delhi - 110001

[Kind attention: Wireless Adviser]

Subject: Department of Telecommunications (DoT) reference seeking TRAI recommendations on method of allocation of spectrum for Public Mobile Radio Trunking Service (PMRTS) including auction, as a transparent mechanism -reg.

Reference is made to the Department of Telecommunications (DoT) letter no. L-14027/08/2016-NTG dated 13th July, 2017 wherein TRAI has been requested to provide its recommendations under section 11(1) (a) of TRAI Act, 1997 as amended.

2. As regard to the aforementioned letter, DoT has stressed on following issues to be addressed in the recommendations: -

- a) Preferable frequency bands for PMRT services
- b) Block Size
- c) Duration/Validity Period
- d) Area of service
- e) Reserve Price and Spectrum Usage Charges (SUC)
- f) Spectrum Cap

3. Whereas, upon examining the reference, as per the title of the letter under reference, DoT has sought TRAI recommendations on method of allocation of spectrum for Public Mobile Radio Trunking Service (PMRTS) including auction, as a transparent mechanism. This implies that other methods of allocation of spectrum such as administrative allocations etc. apart from the auction mechanism are also open for consideration. In case methods other than auction are to be considered then kind attention is invited to TRAI's letter of even no. dated 8th July 2015 (**Copy enclosed**) wherein inter-alia, informed DoT to take a policy decision as to whether it is legally tenable to allocate spectrum by any mechanism (viz. administrative) other than auction in consultation with the Ministry of Law.

(Cont...2/-)

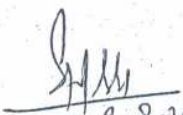
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4. In addition to above, there are certain other issues that require clarifications as mentioned below:-

- a) Frequency band 819-824/864-869 MHz has been mentioned as preferable band for PMRTS services, whereas; a portion 865-867 MHz of the frequency band has already been delicensed for the use of Low Power Equipment in the Frequency Band 865-867 MHz and same is supposed to be predominantly used for Machine-to-Machine (M2M) communications.
- b) Annexure -II of the letter provides frequency assignments of 3 bands only, whereas, Table 1 of the letter lists out total 9 sub-bands for Mobile Radio Trunking Services. Hence, details of frequency assignments, if any, in the 6 leftover bands to be provided.
- c) Whether CMRTS is part of the reference?

5. In view of foregoing, it is requested that clarification on the issues as referred in Para 3 & 4 above may be provided for enabling TRAI to initiate the consultation process at earliest.

6. This issues with the approval of the competent authority.


8.8.2017

(S. T. Abbas)
Advisor

(Networks, Spectrum & Licensing)

Encl: a/a