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To

Director General
Posts and Telecommunications Department
Ministry of Transport and Communications
Nay Pyi Taw
The Republic Union of Myanmar

Cc

Deputy Director General
Posts and Telecommunications Department

Our date	Our reference
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Your date	Your reference

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Subject: **Providing comments on the Spectrum Roadmap (2020): Facilitate the Sustainable Growth of Industry (Draft)**

Reference: PTD ref. 700 – SaNya/Kwe(7)Resource/8544 dated November 9, 2020

Dear Sir,

Telenor Myanmar Limited (TML) commends the Posts and Telecommunications Department's (PTD's) consultative approach to building a roadmap for spectrum release to support Myanmar's broadband goals and digital economy ambitions. Predictability of spectrum release is crucial for industry players and to benefit for the society. Below we provide our comments on the release of various spectrum bands, on specific proposals for the 2.6GHz and 3.5GHz bands, as well as spectrum for PPDR and government organisations. We look forward to discussing these topics further with PTD and would be happy to share international developments and practices from Telenor Group's experience in Asia and the Nordics.

Executive Summary

This consultation paper will mainly highlight that PTD should target efficient spectrum assignments at reasonable prices in releasing more IMT spectrum in order to ensure sustainable growth in telecommunication sector while trying to achieve the objectives of national policy in that sector.

Main points discussed:

- ***Release of more IMT spectrum –***

  - No urgency for release of capacity bands - At present, there is still spare capacity in the mobile networks in Myanmar and users enjoy a high quality of service. Capacity band spectrum should be released only when networks are more constrained.
  - Allow market to mature to support 5G - Myanmar would benefit from allowing the 5G infrastructure device ecosystem to develop further, and for cost of devices to fall to more economical levels. Furthermore, viable business or industrial use cases for 5G in Myanmar will take some time to develop.
  - 700MHz important for improving coverage
  - Release the capacity band together as nationwide licences - The capacity bands should be released based on market demand. It is important to award these capacity bands together because of the need for large, contiguous spectrum blocks that offer greater spectral efficiency. Therefore, spectrum in these capacity bands should be released on a nationally basis.
  - Millimetre wave spectrum - Millimetre wave (mmWave) spectrum should only be released when the market is ready for 5G.

- ***2.6GHz band plan –***
    - Nationwide acquisition of spectrum - Mobile operators who deploy nationwide networks should be allowed to acquire spectrum on a national basis. Regional licences create risk for operators of not being able to acquire spectrum nationally as well as rollout nationally, which would impact operators' value for spectrum. Synchronisation important for interference management given TDD band plan. Fair and equal access. All operators, including both mobile operators and ISPs should be able to acquire spectrum in the band in a fair and transparent manner.

    - Sound use of auctions and setting of reserve prices - Auction design and implementation should be consistent with international best practice that ensure efficient spectrum assignments and reserve prices should be reasonable and rational.

- ***3.5GHz guard band –***
    - TML proposes that PTD consults on the release of the C band in more detail in a separate process.

- ***Spectrum for PPDR and government organisations –***
    - PPDR and government organisations' connectivity needs would be best served on top of existing mobile networks, utilising spectrum also used for public services but providing priority access to these services.

[TML suggests that spectrum allocation roadmap should reflect current market demand and developments. According to draft roadmap, the release of capacity bands (2.3G/2.6G/3.5G) is a few years early since growth in market demand does not call for the release of capacity band spectrum yet, although timeline of releasing 700MHz in 2022 is pertinent to extension and development of 4G network coverage as well as transition to 5G. The reason for this is that viable business and/or industrial use cases for 5G in Myanmar will take some time to develop. For the same reason, it would be more logical to release mmWave spectrum which is only suited for highly localised deployment once there is market demand for 5G services. In addition, TML would like to point out that it will be important that nationwide mobile operators who deploy nationwide networks are allowed to acquire spectrum on a national basis and to utilise large, contiguous blocks of capacity spectrum for greater spectral efficiency.

In regard to allocating regional 2.6GHz spectrum in 2021 ahead of national 2.6GHz spectrum in 2023, TML cannot find any rational explanation for this to happen. TML would also like to remind that there will be potential interference created by proposed regional lots of 2.6GHz with existing licensees within the band; it could be better managed by shifting existing licensees either to the top or the bottom of the band.

The inference is made that the establishment of a well-functioning synchronization regime for TDD band plan should be mandated by PTD so as to control interference and to avoid large guard bands between operators.

TML would also like to urge PTD to ensure a fair and open award process for all spectrum bands as a general principle, including in particular the 2.6GHz band. TML would like to recommend that PTD hires competent external consultants to guide and assist PTD in holding sound auction processes and wishes it to be consistent with international best practice that ensure efficient spectrum assignments and reserve prices should be reasonable and rational.

We would encourage the Government to consider changes to policy and Competition Rules pertaining to number of operators for the national benefits outlined below.

TML would also like to propose that PTD consults on the release of the C band in more detail in a separate process, including the detailed band plan, managing interference with satellite users and the migration of satellite users.

Lastly, TML suggests that an existing mobile operator will be able to build the PPDR functionality on top of its existing infrastructure much more cost efficiently than a stand-alone network.]

1 - Background

The Union Government policy from 2012/13 pertaining to ensuring the development of the country's telecommunications sector, and the overall ICT sector, by facilitating competition.

The main goals of that policy were to;

- to increase the overall tele density;
- to make telecommunications services available to the public at affordable prices in both urban and rural areas;
- and to give citizens and enterprises the ability to choose their telecommunications services and providers.

The astonishing establishment of competing networks over the past 6 years and the massive consumer growth and benefits during the same period demonstrate that the Union Government's enabling framework both in relation to overall policies, regulations and spectrum, has achieved the set objectives.

Telenor Myanmar would like to take the opportunity to expand our response somewhat and also address the issue of "Sustainable Growth" in addition to the spectrum release aspects, as this should be seen in context of the Union Government's overall policies for the next 5-7 years.

Myanmar is unique in relation to the astonishing development of the sector over the past years, and we would encourage the Government through PTD and Ministry of Transport and Communications (MoTC) to review the overall industry structure as part of this consultation. In this regard, Myanmar is one of the few markets with four Nationwide Mobile Operators in addition to regional licensees as outlined in Section 3. (B)(C) below. Finding the balance between the number of Licensees and national benefits are critical both in regard to competition and allocation of spectrum resources for the upcoming 5G networks. Telenor Myanmar would accordingly encourage PTD and the Ministry to consider above points when assessing the industry response to this Consultation.

2 - Release of more IMT spectrum

PTD has proposed to release at least 400MHz to the market by 2022, prioritising spectrum capable of supporting 5G technology, including:

- Part of 2.6 GHz is considered to release in 2021
- 2x45MHz of 700MHz spectrum, 90MHz 2.3GHz and 120MHz of 3.5GHz in 2022; and
- 200-400MHz of mmWave spectrum in the 28GHz band if in demand.

Further, release of 1500MHz, further 2.6GHz, 3.5GHz, 4.8GHz, 600MHz and the re-planning of 850MHz and EGSM900MHz between 2022-2025 and beyond may be considered based on market demand and market developments (such as the expiry of existing licences and progress of analogue to digital television switchover).

PTD has made several good points in the consultation document and it is appropriate that PTD intends to release spectrum based on market demand. This ensures that spectrum that is released will be utilised to serve the connectivity needs of end users in Myanmar and that competitive market forces built on viable business cases will drive consumer outcomes. To this end, we would like to provide the following input on current market demand and developments.

- **No urgency for release of capacity bands**

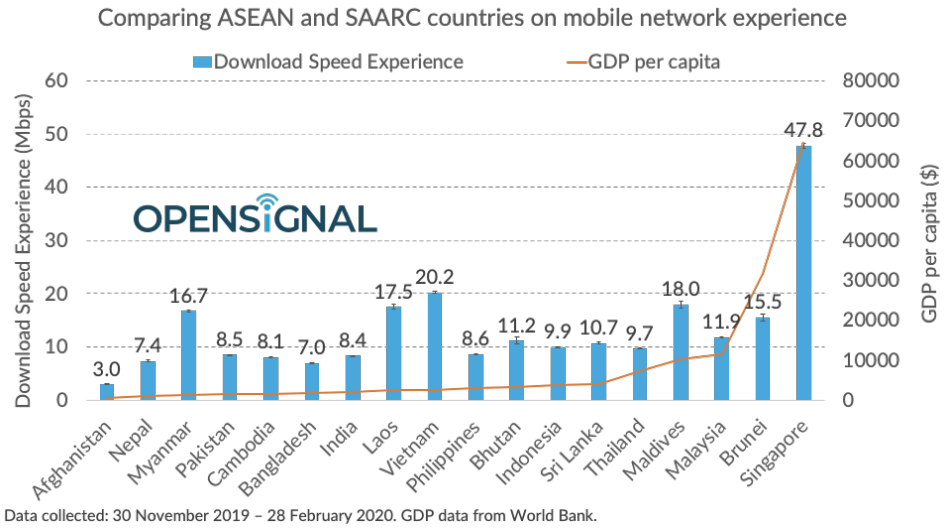
At present, there is still spare capacity in the mobile networks in Myanmar and users enjoy a high quality of service. Recent speed test results in the figure below show that average mobile broadband speed in Myanmar is comparable to the ASEAN average.[1] In our previous responses to the 2.6GHz band consultation in February 2020 and the spectrum roadmap consultations (March and July 2019), we have also provided comparable information on the (high) quality

[1] Open signal speed test results indicate that Myanmar download speed experience is above average with 16.7 Mbps compared with ASEAN and SAARC countries. However, Singapore is an outlier with mobile download speeds.

performance of mobile networks in Myanmar with the existing spectrum portfolios. As such, there is no immediate need for more capacity band spectrum.

The speed and coverage enjoyed by users are improving even without the release of more spectrum – notably, TML is currently upgrading its 4G network to 4.5G, which is expected to deliver twice the speeds and the wider voice and data coverage. Capacity band spectrum should be released only when networks are more constrained. This would also ensure that investment to upgrade and extend existing networks is not distracted by the acquisition of capacity band spectrum. We propose to keep in close loop with PTD on when growth in market demands calls for the release of capacity band spectrum – we expect this to be a few years away.

Figure 1: Comparing ASEAN and SAARC countries on mobile network experience (Reference from Open Signal)



- **Allow market to mature to support 5G**

5G rollout is in its very infancy even in mature markets in Europe where the willingness to pay for a 5G premium remains weak. The business case for 5G remains uncertain as industrial use cases utilising the technical capability that 5G offers are still under development.

5G handsets remain costly, especially relative to average income levels in Myanmar. The basic iPhone 12 model for instance retails at over MMK 2,000,000 (~US$1,500), which is higher than the average annual income of the population in Myanmar[2]. While the cost of 5G devices may fall in the coming years to around US$300-500, this will still be out of reach of many in Myanmar.

Myanmar would benefit from allowing the 5G infrastructure device ecosystem to develop further, and for cost of devices to fall to more economical levels. Furthermore, viable business or industrial use cases for 5G in Myanmar will take some time to develop. Meanwhile, 4G remains relevant to and capable of serving the broadband needs in Myanmar. It would be in line with Myanmar's broadband and digital economy goals therefore, to continue to support strengthening of 4G networks in the near term, building a good foundation and bridge to 5G in the longer term.

- **700MHz important for improving coverage**

700MHz spectrum will be important to extending and developing 4G network coverage in Myanmar and to support the transition to 5G subsequently. During 2020, 4G population coverage for Telenor Myanmar 76%[3] and given the scope for improving 4G coverage, the release of 700MHz band is more urgent and important than the capacity bands. The proposed timeline of releasing 700MHz in 2022 is appropriate.

[2] GDP per capita in 2019 in Myanmar was around US$1,400 – World Bank.
[3] Telenor network data.

- **Release the capacity band together as nationwide licences**

The capacity bands should be released based on market demand. Spectrum in the 2.3GHz, 2.6GHz and 3.5GHz bands are substitutable to a large extent, especially for 5G, and should be simultaneously released in a multiband award process where operators can pick and choose between these bands based on market and technological evolution. This would provide greater predictability and certainty to operators necessary for making long-term investments.

It is also important to award these capacity bands together because of the need for large, contiguous spectrum blocks that offer greater spectral efficiency, rather than for operators to acquire smaller amounts of spectrum across multiple bands. Allocating these bands in a single award process will mean that there will be sufficient chunks of large contiguous block for each operator to obtain 80-100MHz of contiguous spectrum necessary to support 5G. Here the award format and rules should also support the acquisition such of large, contiguous spectrum by operators.

Therefore, spectrum in these capacity bands should be released on a nationally basis. The award format and rules should support the acquisition of nationwide spectrum by mobile operators. Regional licensing creates risks for operators with national ambitions and would mean that the full value of spectrum to the public may not be realised. We discuss PTD's proposals for the 2.6GHz band below but note that in general, all IMT spectrum bands should be assigned nationally.

- **Millimetre wave spectrum**

Millimetre wave (mmWave) spectrum is relevant to support the deployment of 5G and should only be released when the market is ready for 5G as discussed above. This may be at the same time as the capacity bands or potentially even later as capacity bands may be used to strengthen 4G as a pathway towards 5G eventually. Further, the technical characteristics of mmWave spectrum means that it is only suited for highly localised deployment and would be complementary to but not substitutable for capacity band spectrum.

3 - 2.6GHz band plan

We are pleased to see that PTD has taken industry's feedback on using Band 41. There remain a number of key considerations that we believe are important to ensure spectrum in the band, may best be used to deliver good connectivity to consumers.

- **Nationwide acquisition of spectrum**

As noted above, it is important for mobile operators who deploy nationwide networks to be allowed to acquire spectrum on a national basis. Regional licences create risk for operators of not being able to acquire spectrum nationally as well as rollout nationally. This in turns would impact operators' value for spectrum. We also do not see any strong justification for allocating regional 2.6GHz spectrum (in 2021) ahead of national 2.6GHz spectrum (in 2023) and would welcome a discussion with PTD on this.

In this particular draft roadmap, it is also unclear which bandwidth is supposed to be allocated to regional licenses in 2021 and the reason of why issuing regional licenses earlier than national. For mobile operators, access to mid-band TDD spectrum for 5G is one common, big task, underlining the interdependencies between 2300, 2600 and 3500 MHz bands. Hence, these bands should be seen in context and be released simultaneously.

In our previous response to the PTD's consultation on the 2.6GHz band, we noted that in general, regional licenses create auction risks and post-auction transaction costs, but do not empirically result in regional service provision. Globally there has also been a shift away from regional towards national spectrum allocation. For example, in Norway, 3500 MHz spectrum was auctioned in 2004 in regional lots but after auction, the operators traded spectrum to obtain nationwide holdings. All subsequent auctions in Norway have allocated spectrum nationally. Separately in Malaysia, Malaysian Communications and Multimedia Commission, MCMC's current proposal to reform the 2300 MHz band involves a move away from regional spectrum towards national allocation of spectrum.

In addition, regional lots would create additional interference challenges in border areas between regions. To this end, it would make sense to maximise spectral efficiency by allocating all lots in the band outside of those already assigned

to ISPs on a nationwide basis. Minimally, the award format and rules should ensure that operators can acquire spectrum on a national basis and do not face risk in ending up with a sub-national spectrum footprint.

Potential interference with existing licensees within the band could be better managed by shifting existing licensees either to the top or the bottom of the band. This would mean that there would only be one spectral interface between existing and new licensees to manage. It would also increase flexibility in the award of the rest of the band.

- **Synchronisation important for interference management given TDD band plan**

Even if spectrum is assigned as national lots, the TDD band plan will require synchronisation between new and existing licensees to control interference. This would avoid large guard bands between operators. On the other hand, failing to establish a well-functioning synchronization regime would be disastrous for the quality of the networks.

It should therefore be mandated by PTD that all operators (including the ISPs) in the band would use:

- A common time frame structure (i.e. the same amount of time allocated for base station transmitting (downlink) and base station receiving (uplink)).
- A common clock, e.g. by using GPS.

- **Fair and equal access**

All operators, including both mobile operators and ISPs should be able to acquire spectrum in the band in a fair and transparent manner. Spectrum should not be set aside or reserved for ISPs (or any other party unless on strong public value grounds) and all winners of lots in the band should pay a comparable price for comparable spectrum. This would ensure that different operators can compete on equal footing for spectrum. An efficient award process should then see operators who will deliver the best consumer outcomes winning spectrum. Such an efficient award process requires that winners are determined in an objective manner.

It is noteworthy that out of the ISPs who won spectrum in the 2.6GHz band from the 2016 auction, only Amara Communications has launched a fixed-wireless network. In Q3 2020, Ananda (Amara) has just over 300k subscribers or less than 0.5% of mobile broadband subscribers in Myanmar.[4] The impact that the existing 2.6GHz licensees have had on improving mobile broadband quality or reach in Myanmar appears limited.

Furthermore, we noted in our previous response to the 2.6GHz band consultation that many countries that have experimented with local or regional licenses for wireless services, but most have not resulted in outcomes with strong and innovative local players. Markets such as US, Canada, Brazil, Russia, Australia and India have consolidated into the typical 3-4 player market structure. China is arguably moving towards what is effectively a two-player market. In those countries where regional licenses have not been consolidated into the asset base of the major players or leased to major players for use, the spectrum remains largely unused or under-utilized. Increasing number of Licensees results in diminishing National returns and unsustainable development. In this regard, and as outlined above, most markets achieve the required competitive landscape with three operators. The main reasons for this are:

- Avoidance of fragmentation of spectrum,
- Ensure contiguous spectrum blocks required for 5G,
- Avoidance of national over investments in networks, and lower equipment imports,
- Scale and resulting lower operating costs resulting in benefits passed on to consumers.

We would accordingly encourage PTD and MoTC to carefully evaluate the option of policy amendments which would encompass the possibility of in-market consolidation for the next policy period as the current Policy and Competition Rules 2013 provides Government and the sector with limited options in this regard.

This suggests that mobile operators should also be allowed to take part in the award process fairly for key IMT bands including the 2.6GHz, the spectrum may be under-utilized, to the ultimate loss of consumers. Therefore, we urged PTD

[4] GSMA Intelligence Q3 2020 data.

to ensure a fair and open award process for all spectrum bands as a general principle, including in particular the 2.6GHz band.

- **Sound use of auctions and setting of reserve prices**

We have noted the importance of assigning spectrum in an objective manner above. One way of doing this would be via the use of auctions to assign spectrum. It is important that the auction format and rules are conducive to operators participating, bidding and winning desired spectrum portfolios. Auction design and implementation should be consistent with international best practice that ensure efficient spectrum assignments and reserve prices should be reasonable and rational.

Internationally, regulators, even in mature markets such as the UK and the Nordics would typically hire external consultants to guide and assist in auction design and implementation. External advice is recommended as this is a technical topic and there are significant benefits in learning and adapting from international experience in other jurisdictions. We recommend that PTD hires competent external consultants to guide and assist PTD in holding sound auction processes.

4 - 3.5GHz guard band

In the context of the spectrum roadmap, we note that PTD has indicated the guard band between IMT use at the bottom of the C band and satellite users (Intelsat and others) in the Satellite Extension C Band may be 25MHz[5] or 105MHz. The current proposal of 105MHz for the guard band would fall towards the upper end of what other countries are putting in place (see table below). Specifically, the use of filters for satellite receivers and the use of regional exclusion zones to protect receivers will help with interference management and could allow for a narrower guard band.

Country	Guard band
Brazil	25 MHz
Hong Kong	100 MHz
Singapore	50 MHz
Taiwan	44 MHz
US	20 MHz

GSMA, Roadmap for C-band spectrum in ASEAN, August 2019[6]

As mentioned above, it is important for mobile operators to be able to utilise large, contiguous blocks of capacity spectrum. A slimmer guard band would make more spectrum available for IMT use. A holistic approach to ensuring availability of large, contiguous spectrum should also include a plan for migrating satellite users.

We propose that PTD consults on the release of the C band in more detail in a separate process, including the detailed band plan, managing interference with satellite users and the migration of satellite users. This would allow for a more in-depth discussion on these topics, including when to release, how much of the C band, and would ensure that the release of the C band in Myanmar would be in line with international best practice.

5 - Spectrum for PPDR and government organisations

We believe that PPDR and government organisations' connectivity needs would be best served on top of existing mobile networks, utilising spectrum also used for public services but providing priority access to these services. An existing mobile operator will be able to build the PPDR functionality on top of its existing infrastructure much more

[5] Seint Seint Aye for PTD at the 6th Asia Pacific Spectrum Management Conference (6th Aug 2020)

[6] https://www.gsma.com/spectrum/wp-content/uploads/2019/08/GSMA_Roadmap-for-C-band-spectrum-in-ASEAN_WEB.pdf

cost efficiently than a stand-alone network. They can also allow PPDR and government users to use all their spectrum bands, not only an earmarked small amount. This would also mean that the network technology that PPDR and government users have access to will be on par with market developments. At the same time, priority access on public mobile networks which both 4G and future 5G technology are suited to provide, will ensure that PPDR and government users get the necessary technical and security capabilities required.

Such an arrangement would make available more spectrum for public mobile networks, to the benefit of the general public at large. On the contrary, the benefit of reserving spectrum for very specific purposes may be quite narrow. Furthermore, spectrum withheld for PPDR and government users would represent a direct loss in spectrum value for the government.

The approach of establishing PPDR and government uses on top of public mobile networks has successfully been implemented by a number of countries, including the UK and Belgium.

6 - Conclusion

TML appreciates the opportunity to provide comments related to efficient spectrum assignments at reasonable prices with the basis of current market demand and developments, and allocation of the release of capacity bands and mmWave spectrum. For nationwide mobile operators who deploy nationwide networks, it is recommended to be allowed to acquire spectrum on a national basis and to utilise large, contiguous blocks of capacity spectrum for greater spectral efficiency. It is reminded that potential interference could be created by proposed regional lots of 2.6GHz. In addition, TML also proposed PTD to bring about a fair and open award process for all spectrum bands. TML looks forward to discussing the above-mentioned contents and will be glad to share with PTD international best practices.

Should you have any further questions regarding comments, please do not hesitate to contact us.

Yours sincerely,

Mya Thwin, SVP, Head of Regulatory,
Signing on behalf of Jon Omund Revhaug,
Chief Executive Officer, Telenor Myanmar Limited