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            INTERNATIONAL TELECOMMUNICATION UNION
      ITU REGIONAL SEMINAR FOR EUROPE AND CIS ON SPECTRUM
                 MANAGEMENT AND BROADCASTING
                       1 JULY 2020
                        13:00 CET
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>> JAROSLAW PONDER: The two options for entering this room. So that's why you will see that the number of the participants are going up. In the morning we had over 200 people connected, but now we have all of you in the one room that we can use, all functionalities of the platform, including the chat, which is very important. Very important compliment of this exercise, where we are encouraging you also to use the chatroom to ask the questions directly to the experts and the presenters and using the opportunity to clarify certain things.

Dear ladies and gentlemen, this is 1304, even though the numbers are going up, people are just accessing the portal now, we have to go ahead because we have also the interpreters and services and we would like to start with session 3, exciting topic, 5G, and it's my great pleasure to hand over the moderation to Joaquin Restrepo, who is our colleague representing Radiocommunications Bureau. So Joaquin, I'm handing over to you. Thank you.

>> JOAQUIN RESTREPO: Thank you, Jaroslaw. I wished to confirm. I received a question from Julian, maybe he could make his presentation before starting this session?

>> JAROSLAW PONDER: If you can just tell me the name, it will be -- it Dimitry.

>> JAROSLAW PONDER: Yes, he will be speaking in place of the GSMA speaker. I see that Dimitry already has his hand up and hopefully this time it will work.

>> JOAQUIN RESTREPO: Thank you very much. This session is devoted to 5G status, implementations and main decisions for this transition. This is panel includes Victor Strelets, Mr. Morten Friis-Moller, and Mr. Darko Ratkaj, senior project manager of EBU, and last but not least, Ms. Aarti Holla, with ESOA.

Could we start? I would like to give the floor to Mr. Victor Strelets. Victor, the floor is yours.

>> VICTOR STRELETS: Thank you very much, sir, dear colleagues, good afternoon. I would like to thank the organizers for the invitation to speak at this seminar.

This is a well-organized event and thank you to our interpreters, Alexander and Andrei, who are doing a great job!

So the future of 5G and the ways of the development of satellite communications within the framework of limitations of access. I tried to concentrate on that, and not to touch on any other issues. Please show next slide.

We see academic picture of a pie.

Next slide. Yes.

The academic picture of a pie which is how they are going to use 5G. We can see high bands, medium bands and low bands, which provide for the access to 5G. Next slide.

And the most important problem, it's the use of

the ranges, frequency ranges that you see in Europe. We plan to use 3.4 to 3.8. This is the band they man to use in Europe. Next slide, please.

We know that the band, the 3.6-3.8 header will be discussed at the next conference. And in Region 1, this band has been allocated for the IMT system. So the countries that issue licenses to use higher frequencies 6 and 7, 3.6, 3.7, this are not aware of the Radio Regulations. This is unsettling news.

The next slide. We can see that this particular band is going to be reviewed and discussed under 1.2, 1.3, of the agenda 23, the no, 6, 7, for the mobile services, but it's interesting to know that the issues in satellite issues are sort of delineated. They are in different parts of the agenda. So we can see the situation in the boxers. The two boxers are in different corners but they are both fighting for the same prize or here, for the same part of the spectrum. So many issues will be delegated to IMT, 1.2, 1.3 agenda points and 1.5. It's like -- it's a mixing up with the issue of operators.

Next slide.

There is also 1.1 of the agenda, which also relates to the active use of spectrum, the band 4,008, 4,009, because there are problems in some countries, problems in this arrangement, and some countries use -- tended to use as a basic or additional range for the development of 5G network.

This is problematic issues which is going to be discussed at the next conference, but during the previous successful conference in Sharm el-Sheikh, many countries spoke about that. Many countries talked to this point of agenda in using such range, Russia, Brazil, India, China, big countries like that and many others.

Next slide.

Operators interests and mobile interests are in the GSMA association represents these interests and this is a perfect example of interaction between the operators and the producers. It's a global mat form, Barcelona, Shanghai, and, indeed, these platforms will attract everyone else in the world and this is the hubs of the IT industries. And this is a good example also for the satellite operators and the industry where we have seen a lot of competition unlike earth

systems and operators of satellite systems, competitors in using and servicing the spectrum saw these had sort of associations are quite complicated and difficult in terms of developing a certain policy.

But coming back to 5G, and earth component, and land component of the system, next slide, please, future part of the population can be covered by these services, but a major part of the territory of the certain countries will be left outside this coverage.

On this slide, you can see that only 37% of the global earth territory will be covered by 5G, but, again, it's very important for development of satellite networks, which had require white coverage and stable communications, especially in remote areas and can solve some of the very important issues like emergency situations and because of the pandemic situation, the use of medical services and satellite channels.

I can stop now. I was waiting, preparing myself to present on my -- well, go ahead.

Next slide.

So the C range that is used in our countries for comparison purposes, I took United States, China and Hong Kong, by 2023 in the United States, I want to launch 5G in C range. A huge investment, one operator gets 5 billion, the second one 4 billion. Of course, not every country can afford it, but the confederation of satellite systems will be changed.

And in China and Hong Kong, they opted for another way many. They started thinking about during the use of the filters which protects from the neighboring bands and for Hong Kong, it's a huge hub about many 1 million points of accepting satellite communications and they will be equipped all by the innovation technologies. They launched production of filters and as such, started to start this -- to install the filters in C range.

In Russia, the situation is somewhat different. On this slide, you can see two capitals in Russia, Moscow and St. Petersburg, the northern capital of Russia. And the next slide, please. Right away, the next slide. So they show that it is almost impossible, the merger of these two.

So these are all the difficulties for the administration, the search for eight or nine, or new

technological innovations like photos mentioned above, et cetera.

Next slide. Satellite communications is developing its high technology area. We see the appearance of new technologies and introduction of new technologies. Many networks on lower satellite orbits -- I can hear you -- so the involvement of the satellite system is very important.

Next slide. And the agenda of the next conference.

Next slide.

Oh. So this agenda includes many issues relating to the satellite systems, including the issues of 5G global levels, and also the development of technologies developing by satellite lines and broadband system of mobile satellite services, which is also part or component of the satellite component of 5G.

Next slide. Satellite operators and their associations try to prove -- I can see now myself. It's a huge pleasure to see myself participate in this session. And that's why satellite operators try to standardize services and be part of the system.

Next slide. Next slide shows the role and the place of satellite components in 5G systems.

Next slide, please.

And at the same time, if -- next slide, please. If we drop many services because of the loss of the range, we are going to lose very important elements, distance learning in some of the areas and multimedia services.

Some services will be left without communications.

So this is a possibility for all and that will contribute to the development of the satellite communications.

Next slide, please.

And in conclusion, I would like to say that in European countries, and the CIS countries, we have different geographical conditions, population, demand for the services and that's why the standard approach which is used in one country not only can be effective and efficient in another country.

So we see a breakthrough coming, breakthrough in satellite communications, and we have to remember

that. And this is the element of the 5G and we can --
we should secure the use of the services and
protection of the services, only the joint satellite
and land can provide for the sufficient development of
the system.

        And finally, the last slide. Thank you very much
to all of you for your attention. And thank you very
much to organizers for this invitation. Thank you.

        >> JOAQUIN RESTREPO: Thank you, Victor for your
presentation.

        Now I give the floor to Morten, but I think he's
not yet connected.

        Morten, are you there? It seems not. While we
solve this connection problem with Morten, I give the
floor then to Darko. Darko. Are you ready, please?

        >> I think Mrs. Holla is connected.

        >> DARKO RATKAJ: Can you see and hear me?

        >> Darko, I will ask you to disconnect so Joaquin
can reenter the session.

        Thank you.

        Sorry. Just a moment.

        >> JOAQUIN RESTREPO: I was asking -- because we
many -- in the list, the second one was Morten
Friis-Moller. Morten, are you reason?

        >> I think Joaquin, we can start with Mrs. Holla,
and then we will try and connect --

        >> JOAQUIN RESTREPO: Ms. Aarti Holla, thank you
for coming. The floor is yours.

        >> AARTI HOLLA: Thank you. Can you just check
that you can hear me? I know you already heard from
my colleague a little bit earlier on. I will focus on
the satellite 5G and the roll of spectrum. Next
slide.

        So it's -- it is very much an important time for
satellite in 5G right now. I mean, I know we are
already halfway through the year, but at the beginning
of this year, we had just come out of WRC-19, which
took some important decisions which provide the basis
for future growth across many different bands for our
industry, but there was also the plenary meeting of
3GPP, which took some very important decisions on
normative work items and new study items, both on 5G
new radio and NBIOT, to support satellite. At the
same time, we had multiple trials, demonstrations
going on with our 5G operators to validate the key use

case.

Right now the satellites can provide 5G for IoT, for on-the-move and satellite can provide direct broadband connectivity as well.

Next slide.

I wanted to just say a word about our vision or the 5G world. I think it's very important to emphasize why is 5G different from previous Gs. We always hear regulators saying why should we invest in this? Why should anyone invest in this? What is different? Well, it's meant to be a paradigm shift in connectivity because it's supposed to pool the strengths of different technologies. This is the EU's view and they said satellite is an inherent part of it.

It's being endorsed by the CPT, by the ITU, and also NGMN which is the Next Generation mobile network operators group. Of course, I'm sure you are familiar with the CPT, and the ECC report 280 and also the ITU's M.2460 report, on key elements for integration of satellite systems in Next Generation access technologies. We signed a paper with NGMN, and they wrote their own position paper on nonterrestrial networks which was instrumental in supporting the work items that came into release 17.

We are vital. Satellite is vital to 5G. For a start, we need to present a 5G divide and we need to enable key use cases which will only work if there is uninterrupted connectivity.

Next slide, please.

Now, I realize I'm talking to an already very educated audience in the field of satellite systems, but I think it's worth remembering the very broad range of capabilities that is coming from the satellite sector and all of them are relevant to 5G deployment needs whether it's the broadcast and the multicast of the geo-satellites and whether it is the low latency is and so on of NGSO systems are emerging.

I mean, you know how much capacity is being invested in and how much is in orbit and how much is coming into orbit, and all of this just serves to increase the diversity of the offering from the satellite sector to the 5G ecosystem.

Next slide, please.

I mentioned about technology validation of the

satellite 4/5G. You can see the logos of various projects and demonstrations that have gone on, and you can see in the box all of the different types of applications that have been tested. So whether it's live over the air streaming, chat, browsing for 5G test beds, whether it's direct access on the IoT, there is full integration of 5G RAN with CPE, and direct and indirect access. I mean, there's so many different things which have been tested and as I mentioned, mobile operators have been involved in some of these programs as well.

So what we are trying to establish as the next step is looking for opportunities, trying to convince the mobile operators to get their hands on our technology themselves so they can try and test it in a real end user environment or controlled setting, in order to be satisfied that, yes, the technology meets our requirements and start having the confidence of really adopting satellite as part of their solution set. I think that's a very important next step based on all the decisions that have been taken and based on all the technology work that's gone on so far.

Next slide.

I just -- I thought it was useful to give you a few examples of what is actually going on. So some of our larger members have already been working with IBM, with Microsoft on cloud services, cloud-based services. At the same time, you don't often hear too much about satellites and connective cars and this kind of thing, but it's absolutely there, as a project going on with HISPASAT and 02, innovation of Glasgow, innovation hundreds in the UK, which are testing satellite integrated solutions to support connected and autonomous industrial vehicles that is underway as well.

Next slide. I want to make this point quite strongly. I think being in Europe, we often hear mobile operators being bashed by the policymakers, you need to invest. When will you invest? Why don't you invest? I think it's important not to ignore the elephant in the room. The lead mass market application is enhanced mobile broadband. That means social media, OTT, gaming, all of these things which involve a huge transmission of data and much of that data is video traffic.

You know, I think to European 5G events where the comparisons are constantly being made with Korea, China, where the 5G investment is serving only an insatiable demand for mobile broadband. It's not about all the verticals that the policymakers talk about which are needed to drive efficiencies and produce growth and a greener economy. It's really -- I mean, when push comes to shove, when you look at it, it is about satisfying demand for mobile/broadband. Of course, we very much hope that verticals will latch on to this, that we will see downstream benefits in the healthcare connector, in energy, in education, and so on. Of course, that's very -- very beneficial if it comes. I'm sure they will benefit from efficiencies and cost savings and so on, but those are the challenges right now.

So I think when you come back and you consider enhanced mobile broadband and you consider the relevance of video, then you have to conclude that more efficient ways need to be found to deliver content to the edge. This is where satellite can pay a very, very key role. A satellite overlay can be used to preposition content for local storage. That will reduce the data transmission needs, and the burden on the network. So in the past, we have often talked about WiFi off-loading terrestrial and that's still very relevant, but in the 5G context, where you will see so much data being transmitted, whether it's for gaming or whether it's for OTT, when a new game comes out, like before Christmas, more and more games are coming out and they are more, and more sophisticated and they are full of CGI imagery and at the same time, OTT and so on, being consumed all the time and look at what we just seen with the COVID pandemic, huge consumption of all of this.

So I think the satellite role in this respect should not be neglected at all. Next slide.
        >> JOAQUIN RESTREPO: Aarti, we are a little short of time.
        >> AARTI HOLLA: Wrapping up them. What are the opportunities for satellite. Coming out of 2019, we really see plenty of opportunities in the short, medium and long term. Of course, right now the mobility market is down but the projections or that it will come back and it will come back strong. We are

actively engaging to enhance existing satellite
applications to utilize most of the new
applications -- you can see more of the items there
that are available for future growth or increase the
flexibility in the use of existing spectrum and Europe
has already proven itself to be a leader in delivering
some of these tombs at ECC level.

Next slide.

There are challenges as well. I think we are
well aware of them, they are considering C band,
whether it's IMT coming in or upgrading from secondary
status to primary status and threats on other bands
from 9.1C. It might not be an immediate threat, but,
you know, if IMT manages to secure identifications for
FWA or recommendations in that direction, that could
be a slippery slope in the long haul.

So many services -- many countries rely heavily
on Saturday services and it is really up to us to find
ways to make sure that the regulators understand that
and that existing services and spectrum is protected
for existing and future use.

Last slide, conclusion slide.

So in conclusion, and coming back to the subject
of 5G, I would say MNOs are prioritizing rolling out
5G. Existing and future satellite systems are both
highly relevant to this. It is imperative that 5G
networks should be forward compatible with satellites.
So we're talking about embedding satellite into
critical parts of 5G infrastructure now. If they
think about this as an afterthought, that will be
inefficient and expensive. Satellite integration into
5G is going to enable more subscribers. Business
cases can be closed for verticals that need
uninterrupted coverage and of course network
efficiencies and reduced costs. Spectrum Management
has to match the role that satellite will play.
WRC-19 has already acknowledged that and taken good
steps in that direction, but we need the spectrum
policy management going forward to be very conscious
of the satellite role, whether it's in content
prepositioning, and multicast broadcasts and backhaul
of all of this data that will be generated under 5G
and whether it's for coms on the move, whether it's
direct or connectivity to users, homes, business,
schools, and so on and whether it's for direct

connectivity to devices in the future. Thank you.

>> JOAQUIN RESTREPO: Thank you, Aarti. And now I will give the floor to Moller. Morten? Sorry. Morten, the floor is yours.

Please go ahead.

>> MORTEN FRIIS-MOLLER: Sorry for not being present before. I think this time of corona, we are testing so many different meeting platforms, and I should be expert, but unfortunately not yet.

Thank you once again for inviting me to give a speech on this event and I thank you for organizing such interesting web streaming conference.

Just briefly, yeah, I'm coming from the Nordic Council Ministers. This is an official organization or forum for the Nordic collaboration between the Nordic governments.

So I'm not representing -- I'm representing the governments here and the governmental voice and the interpretation of 5G. And up here we have regional cooperation on digitalization and, of course, 5G will be really huge driver for digital innovation and also an enabler for reaching political goals in the future. So this is the perspective in my presentation today, and many -- well, looking into the future of 5G network, I would like to present some of the driving forces up here because we are now in a very -- still in the very early stage of 5G implementation, but we do see some stakeholders, some businesses and industries moving ahead, and who is actually driving this development further. It's interesting to take a look at that.

Well, next slide, please.

Thank you. Well, up here, we really like to perceive ourselves as digital front-runners. That is also somehow true, looking into international index rankings. We are doing very well. We are pretty high on the PC government and the OCB going digital tool for digital transformation. It's more or less if you go deeper into it, it's also built on a very digital matrix -- a major digital infrastructure, with high levels of connectivity, not 5G yet, but hopefully soon to come, and high periods of trust between our citizens and businesses.

I could go through many of these measures but actually, my point is right here, is that we have a

very good foundation to build on, and to move ahead
and building up new infrastructure around 5G
network -- with 5G network.

And also important to mention here, is that we
have also some of the big teleproviders, Nokia and
Ericsson, they are big drivers, of course and they are
pushing the implementation of 5G network up here.
It's important to have these operators pushing the
agenda, because it is a costly infrastructure that
also needs to be promoted by the governments and it's
important to have these strong voices.

Next slide, please.

Yeah. However, as I said before, the 5G
deployment is still in the very early stage and we
have seen the first options up here on 5G networks and
it's now also available -- first 5G network is already
available in a few cities and also in a few test
centers. I would like to come back more to that
later, but it is -- it's a growing area, but it's
still in a very early stage. I think that's important
to stress here. I think the 5G observatory also gives
a very good picture of the various stages, and the
options and the assignments. So I don't want to go
too much into that now, but next slide, please.

Even though we consider ourselves as digital
front-runners, we do also have that, to be honest,
some serious challenges to overcome. And unlike the
first generations of mobile networks, where the Nordic
countries was very front-runners and very early on the
development of the 5G technologies and the
infrastructure, we don't consider ourselves as really
front-runners here. The US, South Korea, China, are
way ahead of us, but what we actually would like to --
to see now is also how it can be used and applied in
different industries. So this is more where we have
our strategic focus up among the Nordic countries and
how we can bring that into use in different verticals.

But having said that, we still see that there's
some areas of sectors or verticals that are not really
long in the development of this technologies or
testing it even. So it's very premature and it's only
a few industries where we see some high activity.

We also see very little, cross-regional
collaboration, official Nordic collaboration. I must
admit that it's still something focused on very

specific cities, selected cities, small areas, and
there is no way to coordinate too much in this
development. I think that's there's also some
competition to consider here, of course, who will be
first and who will take the market. So that's also a
point of view to consider here.

We also see that the very low terminal
availability, it's also hampering the test activities,
but even though the test activities are up and
running, we see a very limited number of industries
active. We also see a lack of applications which
could be a driving force and also make other
businesses to adapt to this -- to this new
infrastructure are.

So we are still in a wait-and-see position and,
of course, supporting and promoting this as best as we
can. Next slide, please.

>> JOAQUIN RESTREPO: Morten, we are a little
short of time, please.

>> MORTEN FRIIS-MOLLER: I will go through this
quickly. Yeah, what we actually have to build on here
is actually some very strong commitment from our Prime
Ministers. You can see on the picture here, that we
have 5G declaration promoting the 5G deployment and
application. Next slide, please.

In this declaration, they are outlining the goals
for the regional collaboration on 5G.

That is encouraging development of new testing
facilities and expanding the 5G network, in particular
deployment of base stations and antennas and it's
encourage and monitor the development of 5G and that's
really an important area for the Nordic Corporation to
monitor this development and promote the test
facilities and the cooperation. And I will go more
into this now.

Next slide, please.

Because are 5G is becoming an innovation
platform, stimulating new products and sustainable
solutions, the major impact will be found in almost
all sectors of society, from industries to harbors,
Air Force, media, et cetera, nearly every sector of
the economy relies on the opportunity to effectively
utilize the radio spectrum 5G, but you can -- looking
at these verticals provides insight into the region's
weaknesses and strongholds and that's what we have

done lately. We have looked more into where are the test facilities linked to, would are really willing to invest in this infrastructure, and how it's important to also promote this cost collaboration, also to promote an economy of scale in the region.

So this is -- this is truly this work with test cases and cross-border collaboration on testing facilities is high on the agenda.

These test cases indicate the driving forces. It takes the driving and the testbeds in various verticals. And there's 5G test facilities, at least -- there's 50 testbeds with 5G have been detected. We have a plethora of 5G initiatives from cities to municipalities, universities and industries, but many very active and strong test beds had is really giving hope for leading this change.

Next slide, please.

This cross-border infrastructure is important to look more into, because as you see on the map now, we are a region with close connected region. Also when it comes to businesses collaborating across borders, but going into this new infrastructure with autonomous costs, and drones and much of the transport sector is based on this wireless communication, I think we, of course, need to coordinate standards and the test facilities.

>> JOAQUIN RESTREPO: Morten, sorry, please. We are late on time.

>> MORTEN FRIIS-MOLLER: Yes, sorry. Next slide, please.

Take the next slide again. Yes, the next one. That will be my last one. Because I also mentioned all the possibilities and the industrial -- sorry. If you go one back. Yeah. The pitfalls, I think we -- looking into this driving forces, we also see that we need to be aware of -- from the first option the benefits from the economy, and prevent monopolies is very important initiative and we need to be aware of that.

To promote diversity and resource spectrum to third parties in general is a high priority. We also need to avoid short-term and promote investment in infrastructure.

That is the commitment to invest in this infrastructure and we see that there's some challenges

here to really develop this infrastructure. I think that the option needs to be -- it needs to be a commitment, a test to these options to develop and invest in this infrastructure.

Avoid distortion in competition, that's another important aspect. Harmonizing the licensing conditions and duration of the licenses, price and spectrum packaging and availability and regulatory conditions in general. It's important to harmonize, and also ensuring that there's no distortion in the competition.

And least but not last, is very important is also to ensure that this 5G network will be deployed and covered also in rural areas and less dense populated areas in order to even push forward to this digital divide to see also in the -- considering the -- the digital station as such. It's important to also remember all parts of society here, and it's also a strong political voice in that has to benefit from this 5G network.

So a more automated and connected world based on 5G technology could be an important driver for sustainable development and green solutions in the future, at not only a business asset but come through the -- it will be beneficial for the society as such.

This is a strong political wish up here. So I think that was my presentation. Thank you.

>> JOAQUIN RESTREPO: Thank you, Morten. I give the floor to Darko. Darko, please. The floor is yours.

Darko, are you there?

>> DARKO RATKAJ: Just confirming you can hear me.

Can anybody say that the audio is coming through?

>> JOAQUIN RESTREPO: I can hear you. Please, go ahead.

>> DARKO RATKAJ: So may I then get my slides on the screen, please.

So I come from the European Broadcasting Union. For those who attended the previous session this morning, you already heard me say a few words about the organization. So I will not repeat that.

Next slide, please.

What I will talk about is how do we see 5G, and the opportunities that come with that technology, and learn a little bit more about the opportunities in the

production of content and in the distribution of
content.

Next slide. Okay. So perhaps we skip this one
and the next one and the one after that in the
interest of time.

Okay. So next one, please.

So from the point of view of media company, we
have actually looked at 5G, and we are involved in a
number of a different activities starting from R&D and
the European projects and the international projects
and we are involved in 3GPP activities for years and
tests and trials.

What did we learn about 5G? 5G from our first
and foremost is a communications technology. It's an
enabler. It's designed to serve many different
sectors and it does have the option to benefit about
media organizations. However, the current deployments
are almost all focused open mobile broadband, and on
the teleco and so on the consumers and the
subscription basis business model.

As such, it will make the mobile broadband
better, but it won't make a big difference, compared
to are the media companies, compared to the current
technologies and the current networks. So it will be
an incremental improvement, but we believe that 5G has
the potential to do much more for the media.

And in order to do that, to achieve that, it
would have to adopt. It would have to expand some of
the capabilities and the other aspect is that it's not
only about the technical performance. We also need to
look at how the networks are deployed, how one can
access those networks, and how they are realized and
so on.

The good thing is that 5G is still being
developed, and we are engaged. We are trying to
influence its development. So next slide, please.

In the media sector, we looked at in which part
of the value chain 5G could play a role and we have
identified the content contribution is a large area.
The requirements in those areas are substantially
different from each other and we can't assume that any
network, in the 5G network would be able to meet all
of this. Next slide, please.

When I hear that people say, yeah, 5G will enable
content production. That is true. But it is only

true up to a point. Next slide, please.

     There are many production use cases and in the use gathering, mobile networks are already used substantially, but there are many, many production use cases where the current mobile networks are actually not able to meet the requirements. So this is just an example in our sample of different use cases. We have brought the technical requirements of PGT to expand the specifications. It will take a number of years before the functionality becomes available on the markets and in the networks.

     Are so next slide, please. Those are just a couple of situations where you can see the current production of wireless cameras and microphones in act. The point for the media company here, is we need higher availability. Some events are once in a lifetime. They cannot repeat it. So if the connectivity fails, it cannot be recovered. Some content is of very high value and so they implement this. We will see to what extent 5G can serve those requirements. Next slide.

     And maybe for the technically minded, one example of state of the art camera, television camera, that currently carries about -- up to 11 different radio links on a single camera, in a range of spectrum of bands. So the question one can pose, can all of these be transferred to 5G? What would it take? Which network, and what operator will develop a network and deploy all of these requirements.

     So our conclusion is that for a number of different use cases, in the content production, we actually need to use both, the public networks, and they are specifically designed for that purpose. And we call on the regulators and the policymakers to take that into effect. Some of the technical requirements may be specific, but having access to spectrum and the licensing model for nonpublic networks, I think it is a requirement that comes from a number of different political sectors.

     Next slide, please.

     This is a summary of the conclusions.

     Can I see one more?

     And so with a little bit of focus on the content contribution, could you please -- next slide. So first question is. What is to be distributed? And

what is to be distributed is not just video in an
undifferentiated sense, it's actually a service and
there a number of different services. We would like
all of these services to be distributed to all the
devices. This is just, again, a sample of different
devices and you see the systems on the left, all the
way to personalized devices and your devices, the
speakers and the augmented reality sets.

     Next slide.

     And no to state further the complexity of the
task. Universal access to services, the content is
being consumed in a number of different environments,
a number of different settings. So how can we serve
all of this audience with all of these services? So
this is the challenge.

     Next slide.

     Currently we are using a range of distribution
technologies and networks. A group that broadly leads
to broadcast and broadband networks. On broadcast
networks, we have a lot of -- a lot of safeguards,
both technical and regulatory ones but broadcast
networks alone cannot serve all the demand because
there's a lot of -- there's a lot of nonlinear
services that can be delivered by broadband. On the
other hand, broadband cannot currently carry all the
linear services and we have to use both and that leads
to increased complexity and costs. Next slide.

     The question one can pose is what role would 5G
play, and where can you help us? And so with 5G being
implemented in mobile networks, mobile broad band will
become much better. Next slide.

     But we believe that 5G, the previous one, please.

     We believe that 5G has also a potential to be
implemented on satellite networks for the purpose of
media delivery and I don't need to repeat all that was
said earlier that Aarti highlighted so well.

     So I think it requires attention from the
regulators. Next slide.

     Without going into the details, on the left-hand
side of the slide, you have some of the requirements
that you are looking for to be enabled through a
distribution platform, whatever it is, and on the
right-hand side, it's our take on what 5G can do.
Certainly, 5G is only deployed on several networks,
there will be issued with the network, because they

may not be adequately dimensioned or configured to meet all the requirements.

One aspect is many I point number four on the right-hand side. We do believe that there is a great potential for them to harmonize the way how the media content is distributed over different types of networks. It depends. We have different ways of delivering networks that are similar to the terrestrial and the satellite components or to fix the networks. We would like that to be always the best. So as a media company, I don't need to worry about what is the underlying distribution network infrastructure.

Next slide, please. So that effectively brings me to the conclusions I wanted to raise here.

I think the important thing to raise is that 5G will -- will deliver value. That value will largely come from the --

>> JOAQUIN RESTREPO: Darko, we are running short on time.

>> DARKO RATKAJ: I'm concluding right now. The second thing is in the individual media sector, 5G will need to be adopted to serve the requirements, otherwise the demand will be delivered. We are looking to enable not just public networks, which will happen because there are mobile operators in the rest of the mobile industry but also to no public networks and in addition to that, we would like harmonization of the way the content is being distributed and also be part of this vision of the 5G ecosystem.

For the -- for these things, we recall the regulators to acknowledge that and lead the way in establishing the regulatory framework and ensure access to the other parts of the spectrum.

My last point is 5G will not replace in our view, of the existing technology in the media sector, because these technologies also continue to evolve so therefore we need to look at coexistence between 5G and conventional networks and that applies tore terrestrial and satellite broadcast networks and the PMSE, the production equipment that we currently use. With that, thank you very much for listening and giving me a chance to present.

>> JOAQUIN RESTREPO: Thank you, Darko. We have our last speaker, Mr. Dimitry.

Dimitry, are you there?
>> Mr. Dimitry, you have the floor.
>> Can you please connect Mr. Sergey Silich, because I think they will try to connect through him.
>> Okay.
I can now see Dimitry with Sergei connected. Put we cannot see the video or hear.
>> JOAQUIN RESTREPO: Is he connected?
>> Yes, Mr. Sergei is connected and he has the floor.
>> JOAQUIN RESTREPO: Okay, Dimitry, please take the floor for your presentation.
>> Let's check a few moments more, if Dimitry can connect.
>> My colleague is trying to fix the problem with Dimitry, and can we go to the next speaker?
>> JOAQUIN RESTREPO: He's the last speaker.
>> Yes.
>> I think at this point, if our colleagues are trying to fix the problem, we can go ahead with the next session, and maybe he will try to connect again, Dimitry at the end of the next session. Joaquin, what do you think?
>> JOAQUIN RESTREPO: Yes. Then seeing the limit of time on by the chat, I would like to thank all the speakers who in how we are at the convergence of the services and platforms. Thanks again.
So please go to the next session. Thank you very much.
>> Thank you very much, Joaquin for excellent work. We appreciate your moderation, and thank you all the speakers for their valuable intervention. I would not waste any time and call for Arseny Plossky, who will be the next speaker on "Economics of Spectrum in the Context of 5G, Tendering of 5G Frequencies." Arseny, if you can please raise your hand. Voila!
>> ARSENY PLOSSKY: Thank you, Julian for this possibility. Arseny Plossky, I represent the research institute of radio of the Russian Federation and one rapporteur, for group 1.
We have five presentations in our session Dr. Peter Vari will be the first one, the deputy director of the national agency for communications Hungary. He actually opened our meeting, our seminar.
Andrei Gavrisi then will be the second presenter,

representing the national agency for frequencies, Moldova. And then Justin Moore head of the unit for the strategy of using spectrum United Kingdom.

And then Stephen Pentland, Vodafone, Spectrum Management Russia.

And so we will have our presentations representing the national experience in terms of economics of the spectrum and 5G, and general presentations.

And now without further ado, I would like to give the floor to Peter Vari. And I would like to call on all the presenters to mind the time because we have only 53 minutes left. So Dr. Vari, the floor is yours.

As far as I can see, Dr. Vari has not been connected yet. Andrei, are you ready to speak? Are you ready to present your report?

I can see your hand -- yeah. The floor is yours.

Dr. Vari, now that you are connected, please the floor is yours, and after you, Andrei Gavrisi.

>> PETER VARI: Could you though my presentation, the first slide. Good afternoon. I'm very happy to share my experience, what has happened, in about the 5G auction in Hungary.

The next slide.

Maybe you listen to Lucius Seneca.

It's you don't know what you would like to reach in the future, and how we can go there. Next slides.

The road slide, we must create a national roadmap, because it will define how we can organize in the future and how we can use for the broadcasting and the mobile purposes and we created and initiative in 2017, when we published this roadmap, which conclude both sector in broadcasting, the mobile sector, how we can use the future and use the spectrum for both purposes. And after we published this roadmap, we organizes the public consultation, and identified the market providers and how we can manage this situation and how we can use, for example, something that's meant for the future for mobile purposes.

And we received a lot of ideas, remarks and we launched the tender, one the option, one was the broadcasting the tender, in this way, it was available for the broadcast for the future and it's according from this year, and in this way.

The next slide, and others. Yes.

What I mentioned was the option and the role, the last year we published our documentation, how we can go forward in the future, the next slide, what contained this documentation, let's say.

We know that we have three bands which belongs to the 5Gs, and the 700 megahertz, and the 2100 megahertz 2600, and 3600 megahertz bands. We realizes that the 2600 megahertz band had been used by the mobile operators and they are not entered at the moment that we use this band, the 5G the first time we had to define the new microwave band and move the links to there and the next steps could be that we offered to the 5G the 2600 megahertz band. And in this way, we have the 3600 megahertz band which is definitely the 5G purposes available in our country, but we had two other bands -- part of the band we don't need, this the 2,100 megahertz band. We had three times 5 megahertz and we had the 3,600 megahertz band, 15 megahertz bandwidth on the TD D. technology.

We offered this in box to operators and let's see what happens, how they accept it and how they tried to increase. I use the animation. I hope it's working also.

Please click on my presentation. It's the next slide, but if you click on the animation, it's working. Yes?

It was interesting because the 2,600 megahertz band was unsold because the operators used generally, usually, FDD blocks in this band and this was answered in this time also why one of operators used the TD D. block in this band, because they bought the former option. But as you see, it's not interesting for the mobile purposes and documented for our operators. So the 700 megahertz band was stored here. They could launch the large cell mobile 5G networks that are in this band and this way, we offered five times 10 megahertz. Someone asked me where is the 6 megahertz.

So we decided that we take one piece one 5 megahertz band and at the moment, we offered one of the five blocks in this band and all of them were stored in this option.

Let's see what happened the next two band. Please click my presentation. Yes, it wasn't a

surprise that it was called the C band, it was an interesting for the operators because they would like to use 100, a little bit more than 100 megahertz for the 5G in future, and they both list this band.

And I mentioned that we had 2,100 megahertz band where we -- where they were available three times 500 megahertz and it was interesting to the operators because they would like to launch this band, and that was in the future, and they changed the 3G technology and it will be interesting that they have the 20 megahertz bandwidth because they can offer this option in future.

In this way, I can say that it was a success auction, because they offered the four band and only one was sold.

Let's go to the next slide.

So we think that the major test of transport powers it's important to cover and we had the 5G auction program which remotes in major urban eras and the transport was also and the target of the transport bands having interrupts the 5G coverage by 2025.

This obligation was laid in our auction documentation.

Please, in ex slide. How we can define the obligation. We have defined the network development case group. And we asked the operators that they choose some part of the main high rail and they covered, for example, 90% of the length of each line, for example. And then the dead line is 2025 October and we know when we speak about the cover, the role, it comes from the role, and we calculated that when they are available on the market, the 5G station, the base station, can cover the main 5G. Please click my presentation.

Thank you.

The second group is the role -- the national -- the national main road in our country, and we asked to cover at least 170-kilometer of each line and the deadline is 2025 December, which is as I mentioned it used the 5G frequency.

Let's see the third group.

Please click my presentation. The first two, these are the main cities, the capital, some district from our capital, and some of the main cities, please cover, we asked from the operators side. And in this

way, the inhabitants are available to the 5G solution
in the future.

Let's see the fourth group.

>> Dr. Vari, I'm sorry to interrupt. I would
remind you to try to wrap up.

>> PETER VARI: Yes. The fourth belongs to
tourists. In this city, it's not a regular group, but
in the 2025, I hope we will use this group, because
it's important to the tourists that they can use the
5G. That's the last one, the last group, which is
interesting for us. The industry of marks and the
healthcare, we tried to have the different sectors
like industry and agricultural sectors to use the 5G
in the future.

Please, the next slide.

We asked in the four categories, the operator
built -- they have the courage, they can decrease
their spectrum usage fee if the fee, for the ten
years. And we tried to encourage the 5G -- the 5G
networks building in our country. Yes, next slide,
please.

Yes, they were all operators accepted these
things and we would like to cover the defined groups
in this -- in this time.

There are some other things that we offer the
same condition for the work, but they can't and we
haven't the market for it. And this is possible that
it's voluntary based, and agreement between the MN Os.

The next slide. Maybe I haven't mentioned this
spectrum will be available for 20 years for operators.

And as you can see, the former slide, because it
was interesting how we can organize the option. It
was an offline option. We met the operators and due
to the COVID situation, we tried to grant it -- not
only technical, but the healthcare solution that they
can participate in our auction and we can see that our
auction this time was very, very successful and we and
last one to Seneca. Yes, we have a very good plan,
but only when things are populated, this -- this
COVID-19, but I hope that operators can build the
network and we can use the 5G solution in our country.

So thank you very much.

>> ARSENY PLOSSKY: Thank you, Dr. Vari for a very
substantive presentation relative to the national
experience of Hungary.

We -- it's highly likely that we won't have any
session of questions and answers. I would like to
strongly advise you to actively participate in our
chat and answer all possible questions then.

     And now I would like to turn the floor to Andrei
Gavrisi, who will present the national experience of
Moldova. Andrei, the floor is yours.

     >> ANDREI GAVRISI: Just for clarification, that
we will only be able to extend for ten minutes and I
would already ask the interpreters and the captioners
to consider this as an option. But I will give the
floor to Mr. Gavrisi, who I see connected now.

     >> ANDREI GAVRISI: Good afternoon. I hope you
see and hear me well. With your permission, I shall
perform my presentation in the Russian. That's why I
move into Russian language then.

     Next slide, please.

     So my presentation is about the experience of the
government of the Republic of Moldova, experience in
terms of the developing multiyear national program to
ago radio spectrum and to create the necessary
conditions to introduce the Next Generation networks.
Here you can see the advantages of 5g networks. Next
slide, please.

     And at present, I would -- I would like to tell
you what we have at present. The ministry of economy
and infrastructure, the Republic of Moldova, in
partnership with the experts from the ITU, the ITU
regional office for European and the Korean
Information Society development institute. We are
developing the Spectrum Management program for
2021-25, which continues the Spectrum Management
program for the 2013-2020 years previously developed
by the ministry.

     At the same time, as we developed this program.
We will continue to take the necessary steps to make
sure that WRC decisions -- the WRC-19 decisions are
implemented in the national frequency allocation table
in order to ensure that the national legislation
factors in all the necessary aspects required to
develop the Next Generation 5G networks. Next slide,
please.

     At the time, we have three mobile operators which
are Orange Moldova, Moldcell and mole telecom. It
should be noted that are operating in 800, 900, 1800,

and 2100 and 2600 megahertz is where they operate.

They are using the technological neutrality principle which in turn creates a very good precondition of the developments of future technologies and facilitates the implementation of the Next Generation networks. Next slide, please.

The primary objective is to -- we are trying to describe and ensure that the following frequencies are used. Next slide, these are 700 megahertz, 3,600 megahertz, and 26 gigahertz and 1500 megahertz and 2,300 megahertz. The program will also cover the available spectrum resources in the following bands. 450 megahertz E900, 2100 megahertz and 2600 megahertz. Next slide, please.

What exactly is going to be the novelty of this program that we are launching? We are planning to divide it into two different stages. During first stage, we will try to implement various portions of this program and it will cover 2021 and 2022. We will revisit the current state and the use of existing networks and available radio spectrum resources so we can reform the band of 2100 megahertz and consolidate the use of spectrum in the 2600 megahertz band by national operators.

This will be done so that we can primarily provide the necessary resources in the radio spectrum which can be used by operators and a possibility of quickly transitioning from the 3G technology in the 2100 megahertz and 4G to 5G. Again, against the backdrop of technological neutrality to ensure greater flexibility and use of the radio spectrum.

In the subsequent stage, which will run between 2022 and 2025, we envisage that we will be able to prepare all other parts of the radio spectrum and I mean 800 megahertz through 3600 megahertz, et cetera.

So that we could use these frequency and auction them and these auctions will be held for operators. One of the new ideas that we are pondering at the moment, we're looking into creating reserved bands for operators as on option with reserve prices and we are thinking of auctioning other frequency bands so that we could in this eventuality have other mark participants, including those from abroad take part in these options and grain access to the Moldova market.

Ultimately this program is still at the

preparatory stage. We are planning to complete this work, literally this week, and starting from next week, we will initiate the public consultations so that by this autumn, we could approve the program by the government and then starting from next year, this program could come into full effect.

At the same time, the program will also cover such issues as the public protection from electromagnetic fields because the spectrum that we are using is becoming greater and higher and the density of base stations will become greater. So we have been discussing this issue and coordinating it with the central authorities responsible for these aspects.

At the same time, we are taking steps to stimulate the use of shared infrastructure by mobile operators in order to facilitate the implementation of new base stations and their deployments, as well as to ensure faster coverage of our population with 5G technologies.

At the same time, one of our objectives is to provide and cover the population with new services and to increase the coverage of national highways and roads with mobile Internet. These steps would also presuppose certain timelines, implementation timelines, at this stage we are consulting with the operators so that we could select the best strategy to achieve these objectives.

At this stage, I would like to draw my presentation to a close. If you have any questions, I would be happy to entertain them in the chat. Thank you very much.

>> ARSENY PLOSSKY: Thank you very much, Andrei for your presentation.

I hope there will be questions in our chatroom because the program, indeed is very interesting.

And perhaps it will pique the interest of the colleagues from other countries. At this stage, I would like to turn the floor over to Mr. Justin Moore, from the United Kingdom. Justin, the floor is yours. Please.

>> JUSTIN MOORE: Hello, can everybody hear me? Thank you for inviting me. I'm Justin Moore. I'm from the communications in the UK. I'm going to talk about Spectrum Management in the context of 5G and how

that might be different in how spectrum is managed in
the past and some of the lessons we can learn from
that.

So next slide, please.

So we'll start off with -- maybe it's an obvious
point, if we think about how we get them out of an
actual resource, particularly limited one, we might
think about how we think about extracting mineral from
country. And in that case the things that are
extracted are not being used by the people in that
country or only to -- or to a limited extent. They
can be exported, and the citizens benefit from the
value that the revenues from those minerals, not
directly from their use.

Spectrum is the opposite extreme. We can't
export it. The spectrum in your country stays in your
country, and so it's all about the use, and getting
the greatest value from that. And that really sets
the scene for how we think about it and how we
allocate the spectrum in the UK. In ex slide.

Next slide, please. Thank you.

So in the UK, we have a legal DT to ensure the
optimal use of the radio spectrum and that is set out
in communications act had, and our ultimate aim in
making optimal use is to further the interests of
citizens and consumers in the UK to enrich the
communications. And I will stress again, this is
about use of communications and not revenues from the
spectrum awards. So we go about our work very much
thinking about what is the likely use of the spectrum?
And that might take into account what is the
geographic use of it, whether it's localized, whether
it's national, whether it's indoor or outdoor and then
also the economic conditions of whether demand will
exceed supply, nationally or in particular locations.

And I would take that together to come up with a
licensing regime that's appropriate.

Next slide, please.

So what is interesting with 5G? As we have heard
from many previous speakers, 5G is a lot about our
mobile broadband, but it's a lot more in addition, and
we have had speakers talking about a range of
different applications and use cases and some of those
are outlined there. One new one that's not there,
which I haven't heard before, but it was discussed by

the EBU earlier on was in constant creation. I think
that a very interesting potential use case for 5G,
which has some particular requirements in terms of
both technical comments and its deployment
requirements.

Next slide, please.

And, again, I think this is something that people
have shown before, that 5G is a mixture of frequencies
for different applications. It's partly a case of
different bands being used for different applications,
but maybe that each application could be supported by
a range of bands. It's not a simple mechanism between
bands and applications, however, for each band, we
need to think about what could it be used for and what
might that mean for the licensing of a band and any
conditions that applies to the use of that band.

Next slide, please.

So this had outlines where we are on making
spectrum available for 5G and other wireless broadband
services in the UK. I won't go through every line on
this, but there are, of course, a number of bands that
have been awarded particularly in the lower
frequencies for mobile services. We have got some
other bands in preparation. 700 megahertz, and 3.6,
3.8 gigahertz. We have some bands that are for shared
access which are localized licenses and I will talk a
bit more about that in a moment.

And then also, we've got some high frequency
bands which are available for testing or on an exempt
basis, and the one addition to this slide is that 26
giga hertz, we also have shared access licenses, which
means you can get a low power indoor license on a
localize basis. I think that's all I want to say on
this. I think it reflects a lot of progress in last
few years and people have talked in detail about
specific awards, which I won't do today, but there's
two things I wanted to mention in relation to the
geographic scale of different licenses.

Next slide, please.

So one of the important things for mobile use is
that people want to be able to use their mobile
broadband wherever and whenever they want to use it,
and our previous spectrum options have attached the
coverable obligation requiring rollout to 98% of
premises in the UK, and that was the 4G auction in

2013. And that gives us good coverage of where people
live and work, but there are still a number of gaps,
particularly in places where people don't live but
they may travel.
     And the interesting difference in our next
auction is that the -- there is not a coverage
obligation. And the UK government has separately
agreed with the mobile networks on the deployment of
the shares rural network. And that network will mean
that each operator will deliver 90% coverage of the UK
geography by 2026. And this has now been implemented
by licensed conditions in the mobile network operating
licenses and OFCOM will be responsible for ensuring
those conditions are complied with.
     So that simplifies our option quite
significantly, and also will ensure we get excellent
coverage in the UK.
     Next slide, please.
     So going to the opposite extreme, we know there
are lots of new use cases for 5G, as I mentioned
earlier on and people have emphasized the new industry
verticals that could benefit from the use of 5G. So
with that in mind, we have got some more localized
products available. We now issue shared access
licenses. These give people the ability to deploy
mobile technology, but on a smaller basis. So we
offer some licenses that deploy multiple devices with
a 50-meter radius, and you can buy those whenever you
want and you can apply for a particular location.
There's a nominal fee of 100 or so pounds for each
50-meter circle you want to buy and then you are free
to deploy what you want in that radius. And if you
want to deploy a cross a large earth site, a bigger
warehouse or a factory, then you can buy a number of
licenses to cover that.
     And we offer that in a number of bands, as I
mentioned, including bands which have interest for 5G.
Can I just finish that slide, please?
     And we -- and the 26 gigahertz band as well. So
for the local spectrum, we have access to mobile
licenses and what users can do is to apply to us, for
access to a band that is owned by a mobile operator
and used in a particular location and used for a
limited period of three years or potentially longer.
     So that's all I wanted to say, to bring out the

contrasts between different use cases and the -- and national licensing conditions. Thank you.

>> ARSENY PLOSSKY: Thank you very much, Justin, for your presentation, for sharing the UK experience and the OFCOM's experience in terms of licensing.

There are a number of interesting solutions there, and I hope that this will provoke questions on this particular subject matter, and I would like to thank our proactive members of the discussion that is taking place in our chatroom.

Now, I would like to turn the floor over to Mr. Stephen Pentland from Vodafone. Stephen, please the floor is yours.

Unfortunately, Stephen, we cannot hear you. We cannot hear you. Perhaps your mic is muted.

>> STEPHEN PENTLAND: Okay. I'm off mute. Thank you for the reminder.

Good afternoon, everybody and thank you for the opportunity to speak with you. To the slide operator, there is just one slide, it's a numbered bullet point buildup. So once I call out the number, you can just go to slide one and then step through the bullets which will simply give headlines to the presentation I want to give. Maybe you can step back a little bit and just start with number one.

Or maybe come out of present and -- that's super. Thank you very much. Good. Thank you.

So my name is Stephen Pentland. I'm responsible -- (No audio) spectrum licensing matters across Vodafone in Europe and Africa.

I have been asked to provide an operator point of view on licensing and the impact of economics in our sector and licensing is a very key driver of the economics in our sector.

Let me start with the big picture point one you have on the slide already. The COVID-19 crisis has confirmed how critical digital networks tore achieving our societal goals and improving our resilience so the health operators can improve and the operators can continue to work remotely and the businesses will continue to trade and the students will continue their studies. We can't imagine what life would be like in this crisis without digital and strong digital networks.

Point two, please. These digital networks need

investment to make them future proof and for the last
30 years, it's principally been the private sector and
their investment that has driven that investment and
because it's been private investment, perhaps it's not
always obvious to policymakers what the challenge is
to make sure this investment happens. Vodafone in its
annual accounts and annual report, and results in May,
reported for the first time return on capital
employed, our ROCE is 4%. And that's lower than our
cost of financing. So in simple terms that means that
our investors and lenders would get a better deal with
liquidated our assets and gave the remaining cash back
to investors to invest elsewhere and what is true for
Vodafone, I would guess is broadly true for the other
mobile broadband operators today. If you get a secret
that gets you hired, I would love to speak you
afterwards.

David Pringle has the top telecos making money
and he testified that the ROCE for operators has
fallen from 10% to 5% in the last ten years.

Point three, please.

So while we all agree that digital networks are
critical to society, we created an investment
environment that will constrain rather than accelerate
the networks which is contrast to what we see in US
and parts of Asia and if our digital economies fall
further behind rest of our economy, as it becomes
increasingly digitized, it should follow, so there's a
lot at stake. And whether we succeed or fail is not
just of the interest to telecom ministers and finance
ministers, but also to the ministers of health,
education, transport, agricultural and industry who
are looking to us to get it right and benefit their
sectors for going digital.

How did we get into this position? For one thing
governments and regulators used spectrum awards as a
way to extract excessive license fees from the sector
and reduce the sector's remaining capacity to invest
in infrastructure. But option rules can be even more
harmful and let me explain. With the best of
intentions for the last 25 years, policymakers in
Europe have focused on getting mobile consumers the
lowest possible price through the maximum mobile
network competition, the more players, the better.

Now, competition should be a good thing, but the

question is always, is it sustainable? Point four on
the slides.

So where policymakers seek to intensify
competition artificially, particularly through
asymmetric, and reservation of spectrum, history shows
that these results are likely to be unsustainable and
will depart from efficient welfare enhancing outcomes
and sustainable in so much that the players who reply
on the artificial support tend to exit the market
anyway and we are beginning to see a new wave of
mergers in country across Europe.

And also, they are inefficient because the
artificial competition in spectrum options increases
licensed costs whether the reserve prices were
reasonable to begin with or not, because as capital
expenditure to be fragmented across more networks, the
networks are each smaller and it results in network
assets getting written off when players subsequently
merge. It becomes a cash cow rather than a strategic
investment sector.

With the situation in the US, where there is more
of a virtual circle of stronger investment and
stronger economics in the sector.

So it raises the question, how do we expect the
mobile sector in Europe to invest regularly in next
generation technologies and to deliver the step change
of quality that customers are looking for.

Point five. And I'm afraid to say that there are
at least five reasons why things are only going to get
worse in Europe before they get better. First of all,
the average price of equipment is going up, as
European operators are caught in this cross-fire of
the trade dispute between the US and China, and some
vendors become out of reach. Secondly, equipment
budge eliminates are going to be cannibalized to fund
equipment swap outs, to comply with these dispute
trade orders and that will reduce the amount of cap ex
remaining for network expansion and upgrade.

Thirdly, service revenues will be impacted as
COVID-19 causes the global dime turn to turn into a
global recession to a global depression.

Point four, there are regulatory barriers and
barriers we will hit like EMF restrictions that will
limit how far you can get on cost effective network
densification. And fifthly, meeting the ongoing

growth in tract will require more ongoing spectrum. It's priced open a per megahertz cost. How Doucet reserve prices? Like there's some kind of absolute truth.

The fact is they need to be -- the spectrum prices need to be an output, not an input and at a time when the industry needs more network capacity, and more spectrum for benchmarks to remain static is constantly increasing the spectrum cost burden for the sector at a time when revenues are not increasing.

Point six, so my observation working with governments and regulators across our European markets is that European policymakers are beginning to reflect are on the situation. They are beginning to understand the challenging economics of the mobile sector in how it's currently constructed, the poor health of the mobile sector makes it difficult to attract the new investment capital that is into Ed, and some policymakers are already designing measures to help square the circle. That's why we are seeing multi billion Euro state funding that the one we announced recently in Germany for passive mobile infrastructure and on economic areas to provide vouchers for small businesses and consumers to get connected, we are seeing that in some markets, money to digitize the healthcare sector, M.P. to facilitate the switch off of three G and move quicker to 5G. Even plans to compensate for the swap out of banned Chinese equipment.

So with all of these remedies coming in with state funding, ironically after 35 years of privatization and principally private sector funding the poor health of the mobile sector in Europe is leading to a return to state funding of the sector in part.

We are also seeing, among some governments and regulators enthusiasm to remove regulatory barriers. We are seeing them reduce the EMF limits to normalize with international standards and we have some markets put through a streamline pro err for exemption of building permits for mobile towers.

Point seven, please. We are beginning to see changes in spectrum awards just to mention of what OFCOM has done in the UK to replace onerous coverage obligations with a state-funded shared rural network,

but we are also seeing regulators think about life
after auctions. This he recognize after 30 years on,
the mobile market has stabilized. There's nothing
much to be gained through auctions in particular, and
the problems of high spectrum costs and inefficient
and unsustainable outcomes impoverish the sectors.
They realize that they have no choice but to continue
to renew and expand spectrum licenses. So we are sort
of sitting ducks in these award procedures not really
able to say no.

The governments and the regulators ensure that
there's commitments from the sector to accelerate
increased investment in critical infrastructure in
return for lower spectrum fees and we are seeing that
now in a couple of markets in -- in Europe.

If we think back over time, we did see in
Portugal and France some years ago, there were
procedures to renew expiring legacy spectrum with no
additional upfront fees. And, in fact, New Zealand
recently awarded its 5G spectrum in what is called a
management assigned procedure, very low prices, no
options and job done. So other policymakers across
European states, both large and small are looking at
the possibilities, including the possibility of beauty
contests, recognizing that auctions and the attempts
to change market structure do more harm than good and
at this time in particular, what we need is strong
investment.

Point eight, please.

We're also seeing something of a reversal on
market structure. Only a few weeks ago the European
court overturned DG competitions, rejection of the
Hutchison bid in 2016, the European court concluded
that the benefits of mark consolidations and the
approved economy of scale more than outweighed the
marginal impact on competition. So regulators and
competition authorities and the courts are beginning
to think afresh about whether every increasing, and
competition, in fact, harmful towards economy of scale
and investment.

Point nine, please. I will finish with this. So
rather than use this forum to discuss lots of
technical details of what spectrum bands are going to
be harmonized and cleared and brought to market
through awards, I have to say for me global events

seem to have rather overtaken us. The only thing that
really matters is whether or not our approach to
spectrum awards in Europe will encourage investment in
sustainable, competing digital networks and to ensure
that digital solutions deliver societal resilience.
If he with don't have the digital networks that
inclusion and digital society resilience will be
difficult to deliver.

   There's an industry, as an industry we work in
every opportunity to work together with poll sector
makers, collectively and country by country to work
out how we can take these required bold new steps to
achieve this common goal. Thank you.

   >> ARSENY PLOSSKY: Thank you, Stephen, for this
presentation, for this critical view on the markets
and it was very important to see it that we, not only
seeing positive elements and -- but --

   >> I ask the captioners and the interpreters so
we can continue for 15 minutes. Thank you very much.

   Vadim.

   >> INTERPRETER: Yes, of course, sir.

   >> VADIM POSKAKUKHIN: I would like to make my
presentation on 5G spectrum and its economic impact.

   I will speak in English. So next slide, please.

   My presentation, in many ways is very similar to
the previous speaker from Vodafone. Understand that
we basically need to look to the past. When you have
the voice treatment market, with very large revenues,
and possibilities to invest a lot, and to get those
return of investments in a short period. This mobile
broadband, even it gives us a lot of opportunities and
the economy, still they are expenses grows as the
traffic goes. And the margins are very different from
what we had 15, 20 years ago.

   So right now, we are coming to the stage when we
try to get with the very bright future, which
everybody is talking about, about this, the there's a
lot of vertical services and a lot of new revenue
streams. The past there is very unclear. It's
possible for every activator to solve and many
operators are going through this maze and not becoming
a data trap.

   So there's a need to maximize the possibilities
for operators to invest in these services and the
infrastructure. So next slide, please.

And look what it means from the cost and revenue expenses. And if you look at the revenues just from the services, excluding, for example, sales of SmartPhones, many operators are already at this point, when the costs are becoming larger than revenues of the margin, it's very small and the mobile business is not effective from the investor point of view.

So there are ways to have this situation, and -- (Garbled audio).

With very low IPU subscriber, for example in many countries in India. This there is a rise in prices for subscribers and even though it's not a popular measure, to are some markets it will be inevitable.

The most straightforward one is additional wide spectrum for a reasonable price. And this wider spectrum, with more networks, there's a possibility to reduce costs and the other one is from technology and the operators are looking for the so-called zero touch network when the operational costs will be reduced by automation.

All of these measures, in the future would be combined with new revenue streams from verticals, and probably the oldest measures that bring back the sustainability of the mobile industries when the revenue costs at the margin between them and the interest for investment.

Next slide.

So going back to spectrum, the most important part is the mid-band, at this current point of business models revolutions. Yes, there is a need to -- (Background noise).

There is a need for wide channels, preferably 80 to 100 megahertz. There is a screen shot of the options and a number of countries with the average resource characters from 3.5 and 3.7 gigahertz and in some cases one option was large chunks of spectrum, around 300 or 400 megahertz. As you can see it's achievable, especially if your option at least 300 or 400 megahertz of spectrum and this is actually the -- we have operators basically need to pursue the maximum spectrum of their options and each operator -- and create a possibility to reduce a degree of the pricing.

What about the spectrum? Next slide, please. It's very interesting study from a consulting company,

to evaluate the cost of spectrum. And one of them is
analyze the cost of spectrum, compared to the
revenues. You can see it on the left of the slide.
And the -- the studies suggest that countries or
operators -- operators and countries with the analyzed
costs is below 5%, and very favorable conditions for
investment and if it goes to close to 10 cents this
situation is getting worse and if you go beyond this
limited funds, then it's very difficult to invest into
mobile networks and you can see an example of India
was almost 20% and I assure that my colleague from
Vodafone could tell you a lot of stories about
Vodafone and the ventures in India.

　　　These examples could be seen from the comparison
of Finnish operator, and German operator. The small
operator, when compared by the novice from Finland
generates much more traffic than given large operators
from Germany, because of better networks, better
prices, better consumption.

　　　For Russia, we checked, what are the prices for
Russia. Fortunately for us, it was only 3.5%, which
is why we have actually a very good 4G coverage for
the networks and one of the best prices for
subscribers in regard to mobile data, but currently
they were a lot of concerns about future of spectrum
barrier for 5G. And it's not only the spectrum that
matters, but actually some initiatives which is now
created in Russia for information security, for social
measures. It creates additional costs for mobile
operators, which could mean that the ratio of one tax
payment or spectrum payments beyond the limit of 10%.
That's why they are reactive to negotiation the limit
for 5G spectrum and also they limit the impact. So
the nontax payment will be below 10%. Next slide,
please.

　　　So if we look at the experience of other
countries already optioned this spectrum, we see that
countries -- some countries have a very good practice
when the payment, even if it's function, the payment
is given in annual chunks. This provides an
opportunity to not increase the spectrum, due to the
cost of capital. And also we see that better practice
is actually provided this coverage obligation or the
infrastructure obligation, adapter than require
specific speed limits into the licenses.

And we see in Germany, the 800 megahertz licenses, they are too high for the coverage required, and I think there is a gap from the operators.

So basically, at the end, it's better to invest -- for you are purposes, it's to invest the different funds into the coverage, into the infrastructure, rather than to get just an option or a very high operator. And this is the proposal for countries to consider -- to shift it from this -- this use of high prices or high everything, from option, into more coverage and cite the number of obligations.

Next slide.

So this slide summarizes the presentation, but maybe only one new aim is the last bullet. The limit of time, I didn't consider the lower bands and coverage situation, but I could agree with my colleague from Vodafone. Basically with narrow spectrum which is in lower bands it becomes very difficult to create sustainable network -- sustainable investment to get from population coverage to geographic coverage and we will see more and more situations when there will be voluntary sharing or stimulus from governments to create share of network, one common network for the rural areas. And there will be governmental funding to create this coverage because the measures of single network probably won't be enough investment to get to this very high geographical coverage.

That's why it's better, even the option creates a lot of new additional budget-driven use. And then governments to create better networks and have to subsidize operators to get rural coverage.

And with that, I would like to finish my presentation. Thank you.

>> ARSENY PLOSSKY: Thank you very much, Vadim, as I follow your presentation. At this stage, our fourth session is drawing to a close. I hope all of us have the contact details of all of our colleagues who took the floor and if you have any additional questions, you can send them directly to our presenters.

And now I would like to turn the floor over to Julian, who will complete the meeting.

>> JULIAN: Thank you very much, Arseny and the speakers for the presentations. I think everybody has very much benefits from these insights. I see now

that we have Mr. Korzun connected. Can you hear us?
     >> DIMITRY: Yes, I can hear you. Can you hear
me?
     >> JULIAN: I will give you the floor for your
presentation.
     >> DIMITRY KORZUN: I will try to be very brief,
if I may. Could you show my presentation on the
screen?
     Thank you very much. I really appreciate this
wonderful seminar, and I would like to thank the
organizers. This is a great honor for me to speak
here today. The unique nature of this time is that we
are at the juncture of two great organizations, the
European Union and the Eurasian union and we see
ourselves as a bridge that would enable our great
organizations to improve the economic ties and by way
of using mobile technology.
     Next slide, as far as the coverage is concerned,
could I see the they slide, please. Thank you very
much. As far as coverage is concerned, we almost have
100 coverage of our territory and population with 3G.
We are slightly behind in LTE because 800 megahertz
were occupied and on the last year, we started selling
the abandoned. We are expecting in a couple of years
we will get 99.9% of the territory and the population
covered. That's the entire territory of our country
and now we can see very interesting processes. We can
see the subscriber base is migrating from 2G to 3G and
4G networks. We have a plan for 4G networks by 2022,
was approved by the ministry and is being implemented
as we speak. So we believe that will 4G still has
some potential to offer. It hasn't been exceeded.
     And by 2022, we'll have fourth generation network
conducting most traffic. Next slide, please.
     As far as 5G is concerned. Next slide, please,
if I could see the next slide on the screen. As far
as 5G is concerned, it's being examined, as we speak
at the top level of our governments. The Prime
Minister appointed a new top level group which is
headed up by the first Deputy Prime Minister. And it
includes both users, civilian and special users, and
the antimonopoly and trade ministry and the ministry
of finance, the ministry of economy, the Ministry of
Foreign Affairs, they are all present there.
     Due to a number of problems we have encountered

that have to do, mostly with sanitary and hygiene
requirements that we're all faced with today, we will
also get the healthcare ministry on board as well as
the state industrial military community. So the
primary objective of this group has been determined,
well, first of all, determined the requirements for
operators to develop 5G network, we heard a lot of
interesting information from our colleagues today. We
are looking at providing 100% coverage by 2025. And
100% coverage of key roads and railways and highways
and motorways. So we have to determine what spectrum
we will have, if we can address this global task and
by extension this will give us a chance to look at the
development models, vis-a-vis 5G deployment.

   Next slide, please.

   As far as the frequency spectrum is concerned.
So next slide, please.

   We are looking at those frequency bands that have
been harmonized in Europe and streamlined in Europe,
and our approach dovetails with a number of countries
that surrounds us. So we want to use 700 megahertz,
2.6, and 3.6 and 26 gigahertz. As far as
700 megahertz is concerned, already today we are
running a number of steps to release it by digital
television. And by 2021-22, we will be ready to offer
it across our territory.

   At the same time, we have trail operations
running on large scale, and these tests involve 5G
networks and the operators are very keen to use this
spectrum they already have. And so today, we will
look at those possibilities, including in such bands
as 900, 100 and 800 and other bands already being used
by the operators.

   Next slide, please.

   As far as the models are concerned, here are what
I would like to say is I was happy to hear from other
colleagues that we are not very far away from what the
rest of the world is doing. We are looking at several
different model, whereby one operator will address
such important task as building 5G networks. Second
competitive model, whereby each operator and today we
have four of them, will have their own piece of the
spectrum for the active part, and they can
configure -- correction, consolidate their efforts to
build their own transportation networks and the third

model is to use passive infrastructure on a shared
basis whereby each operator will operate its own
bands, but then there will be one single
infrastructure that will be used for building
transport services and this will be done by one
operator and they will basically provide other
operators for the infrastructure on an equal footing.

Next slide, please.

We have developed our own algorithm, as to how we
are going to introduce 5G networks, and I think it
might be interesting for those countries that are just
beginning to approach this, and, I mean, other CIS
countries, primarily we should ask ourselves, what do
we do in terms of certification. How do we make sure
that this equipment works in our territory? The
second important stage is trial and test operations so
that the operators can touch and feel the equipment,
but also make sure that the specs mentioned in the
documentation really exist in practice and then they
have to have backup systems so that -- and we have so
see what sort of an interest we will have in the
industry, in agriculture and other sectors with
respect to these technologies.

Today at the request of the ministries, we have
requests -- we have received a number of proposals
from our colleagues, both in terms of the timelines,
coverage and the service level and primarily the
ministry of agriculture and the ministry of food. And
then we have to understand what sort of resource we
have in our hands, and this way we can understand
which tasks we can achieve. And I support our
colleagues who spoke before me. We need to formulate
the systemic requirements for the operators because we
are looking at the deployment of 5G networks in our
country and Belarus, primarily for the purposes of
enabling our governments and our industry to move to
this new network, and improve our transit potential
and capabilities and close all of our transit
corridors.

So by extension, when we formulate the
requirements we are faced with another task which also
requires a very solid approach, and robust approach.
I'm talking about the control system and control that
is exercised by the regulators. Here we have to look
at it.

We need to determine the fees that the separators would be paying subsequently. And there are a number of approaches there. We have our own vision, and yesterday we started a particular research that we have a team that deals with this research on a standalone basis, a designated team and soon enough we will have the options there. To top it off, we will build 5G networks and like I said, this particular issue is being supervised by the president and the governments of Belarus and hopefully very soon next week, literally this issue will be resolved and we will move on to implement some practical steps, start forming frequency packages and sell them to operators.

Next slide, please, which is very important in my view. We would like to show what is going on in the European Union. Here you see a very well-known picture. This is the 5Gobservatory5.com website. If you look at this slide and look at the bigger picture, you can see that from Warsaw, we have the so-called Baltic corridor running from Warsaw up north, and on our slide, we would like to see how we would like to see it. We would like to be a part of this process. We would like to join the global and regional projects so that we have appropriate junctures, along these corridors and this is where we are going to deploy 5G networks, along such highways as Berlin, Warsaw, Minsk, Moscow and another transit area would be Odessa, Kiev, and Belarus and then on to St. Petersburg.

And there's a third component, which would be a juncture with the line running to the capital of Lithuania. So we would like to discuss these particular items with our colleagues in the future.

And my last slide. Sour practical proposals are as follows. Today we see that we need to harmonize our strategy our strategic plans, and set the timelines, and coordinate these timelines for 5G deployment with our neighboring countries. This has to be addressed with either us, members of the European partnership or members of EU or the CIS. So for us, our dear friends Latvia, Lithuania, Poland, Russia, and Ukraine, and so we have to discuss with them our plans and perhaps we should discuss our plans with our regional groups, such as CEPT and RCC. So we need to synchronize. We need to synchronize our plans

in terms of 5G implementation, synchronize our roadmaps, and each country is developing these roadmaps and we have to synchronize our timelines, deployment timelines, coverage.

What kind of services are we going to offer in neighboring areas?

So when Belarus and Poland reach our borders, we have to be prepared and wait for them on our side of the border so we can provide this juncture, these nodes so to speak. And a third point that is exceedingly important, we need to determine the requirements for this 5G equipment so that we can achieve the goals that these 5G networks are designed to achieve in terms of transport infrastructure.

Ensure seamless coverage of our entire transport infrastructure across all of our countries.

>> Wrap up.

>> DIMITRY KORZUN: So the last thing that we are proposing is that this has to be with the broadest information exchange with those for 5G network. Thank you very much for giving me the floor and thank you for your attention and I will try to answer your questions later.

>> JULIAN: Without hesitation, I will give the floor to Jaroslaw Ponder for the closing, head of the regional office for Europe.

Thank you very much.

>> JAROSLAW PONDER: Thank you very much, and one more time thank you also to the interpreters for extending our time. I will be really extremely short. It was a very busy, but with a lot of coverage for the WRC, of the 5G and several national approaches towards addressing the challenges, how to handle the incoming 5G technology from the broadcasting point of view, but also most important from the spectrum.

So, ladies and gentlemen, I will not be repeating. We will be diving even deeper tomorrow into the subject. Tomorrow, we are starting at 10:00, as according to the agenda. And please don't hesitate to log in 10 minutes prior or 15 minutes prior and all of us, we can be ready in the system and we can interact a little bit in the system and to make the benefit of the online platform to know each other and to interact.

So one more time, thank you to all speaker and

moderators. You did an excellent job but also let me
thank the excellent audience, your excellent, we are
to the end and congratulations to this. We are
looking forward to tomorrow deliberations and to
continue the seminar.

Thank you very much and see you tomorrow. One
more time, thanks a lot to the captioners and the
interpreters. Thank you.

And see you tomorrow.

(End of session)

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