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Analysis report on the public consultation

Concerning

**The re-tender for and award of mobile radio frequencies in Switzerland by
1 January 2014**

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1 Summary

The re-tender procedure for all mobile radio frequencies (in particular a re-tender for the GSM900/1800 bands) envisaged by ComCom is rejected by the Swiss mobile radio network operators and their industry associations. Such an award, they say, would be economically questionable, would represent an “*ex post*” intervention in the market and would be incompatible with article 1 of the Telecommunications Act (TCA). The intended procedure would underestimate repercussions and requirements, which in the rest of Europe are leading to allocations being made in advance in the form of extensions or renewals. Switzerland’s standing as a business-friendly location would be put at risk unnecessarily and with no benefit. Instead, these parties are demanding a renewal/extension of the existing licences for at least 10 years, especially for the frequencies already allocated in the GSM bands (900 MHz, 1800 MHz), although opinions vary regarding the range of frequencies to be allocated, particularly in the 900 MHz band. With regard to the unallocated frequencies (the digital dividend, former Tele2 GSM1800 frequencies, former Telefonica frequencies in the UMTS core band and the free frequencies in the UMTS extension band), the majority favour an auction. If a procedure of this type were not to be approved by OFCOM and ComCom respectively, pre-selection preceding any auction is proposed as a compromise. If it emerges that only existing mobile radio providers remain in the running for the subsequent award, an extension of the existing licences and an auction of the unoccupied frequencies would be an option. In addition, the introduction of optional frequency trading is being proposed.

Other submissions, however, expressly favour the intended re-award by means of an auction. A re-tender would on the one hand enable a new telecommunications service provider (TSP) to enter the market and on the other hand the existing licensees would be able to re-evaluate their required frequency spectrum and adapt this to market conditions. Such a move could be significant in this dynamic market.

The terms of the new or extended licences should be at least ten years from 2013. If new frequency allocations require infrastructure to be constructed, as would be the case for a newcomer, for example, a licence would have to be valid for at least 15 years.

The desired allocation units for an award of the currently unused frequencies are generally frequency blocks of 5 MHz. Exceptions are on the one hand the frequencies in the GSM bands, in which, because of the distribution of preferred frequencies at national borders, smaller units are preferred, and on the other hand the frequencies in the UMTS extension band, for which allocation units should comprise a multiple of 5 MHz.

A transition period from the current frequency allocation to a new one which is shorter than 3 years is considered to be unrealistic.

GSM is expected to remain in service for a long time (until about 2020). The parallel operation of at least two connection technologies is seen as a long-term fact, as technologies continue to develop continuously.

LTE (Long Term Evolution) is seen by the majority as the technology for the further expansion of networks to provide data services. One submission favours WiMAX. It is becoming apparent that the evolutionary path of networks will involve fast-growing data traffic on additional frequencies in the UMTS core band and in the 2.6 GHz extension band (provisionally with LTE). In the medium term, at least parts of the 1800 MHz band and the 800 MHz frequencies will be used to extend area coverage. The commercial roll-out of LTE and the associated adequate penetration of LTE terminals in Switzerland is predicted to take place around 2012. The free choice of technology is therefore welcomed.

The existing possibilities for network sharing are considered to be adequate and there is apparently no need for its further expansion.

From the spatial planning and environmental protection viewpoints, in terms of the uniformity of the legal system, it is not only the clause setting out the purpose of the TCA which is critical for defining the goals of the award. A re-award of frequencies would primarily have to serve the goal of achieving good coverage of telecommunications services with minimal effects on space and the environment. Easing the precautionary emission limits of the Ordinance on Protection against Non-Ionising Radiation is out of the question, on the basis of the criteria of the Environmental Protection Act. With regard to health protection, moreover, concerns are expressed that it is not only the frequency but also the technology applied and the radio service which are relevant. For example, lower equipment limits according to biological criteria, with a reduction to at least 0.4 to 0.6 V/m for radio equipment and a restrictive definition of equipment, are being demanded. It is further pointed out that non-ionising radiation also includes non-thermal effects in addition to the thermal effects dealt with in the Ordinance on Protection against Non-Ionising Radiation. The point is made that current knowledge of these non-thermal effects of non-ionising radiation below the valid limits indicates that the modulation and temporal pattern of the radio signal are biologically relevant, in addition to the carrier frequency.

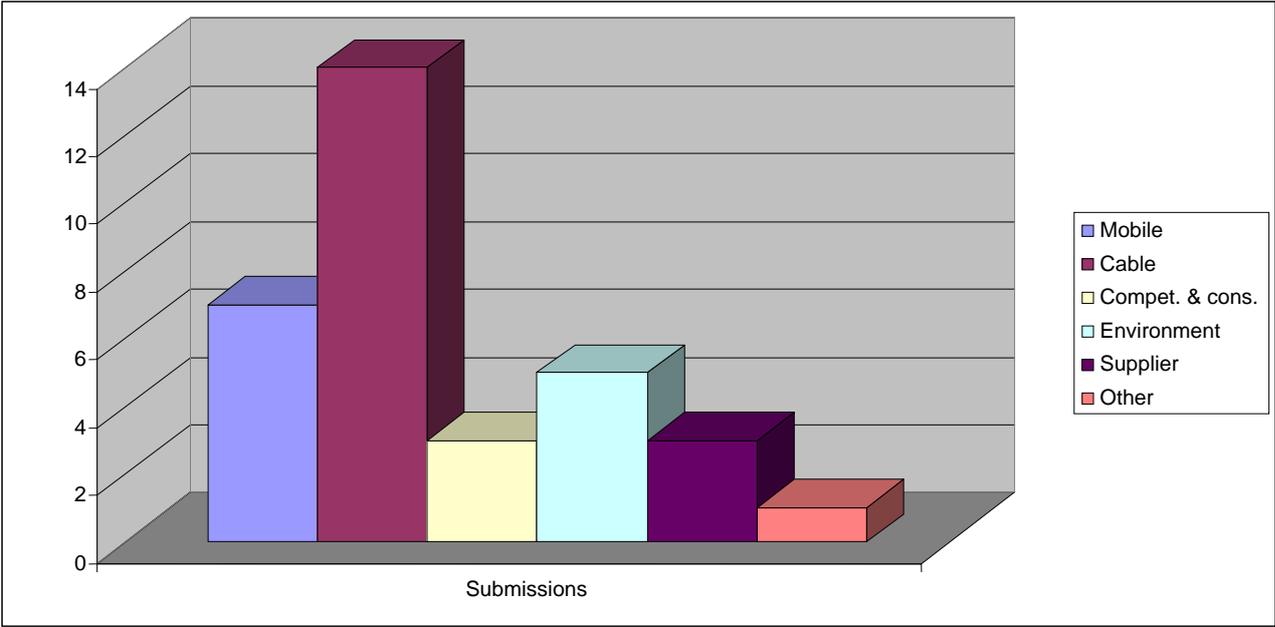
The cable network industry is critical of the release of the 790-862 MHz frequency range (the digital dividend) for mobile radio services. It fears severe interference effects on its cable network infrastructure and on its customers' receivers (TV receivers, set-top boxes, internet modems, etc.). Reference is made to German and Austrian studies which have already investigated and demonstrated this interference problem. In order to avoid interference, technical limitations on the implementation of new mobile radio frequencies or total relinquishment of mobile radio services in this frequency range are being demanded.

With regard to the market situation, the market share between the 3 largest mobile radio operators, which has remained constant for many years, and the experience of Tele2 lead to the conclusion that there is little or no chance of a fourth national network operator and even that the market may move toward consolidation. The number of mobile telephone users will continue to grow. This trend is due to the increase in the number of users with multiple SIM cards, continued switching from the fixed network and the increase in machine-to-machine applications. The mobile radio industry expects strong growth in the demand for, and use of, voice and data services. In the next few years, the volume of data will continue to grow rapidly. The new multimedia devices, data cards and USB modems strongly stimulate the use of data services and therefore have a major effect on the growth in the volume of data traffic. Nevertheless, price levels and average revenue per user will fall considerably.

According to the prevailing opinion, mobile radio with broadband transmission technologies such as LTE will not be capable of replacing a fixed-network connection in the future but will merely be a complement or alternative to it, though in certain areas may even be in competition with it. The award of national mobile radio licences was endorsed almost unanimously. Most rate the chance of survival for business models based on regional networks as slim.

2 Parties making submissions

Thirty-three respondents submitted their comments on the public consultation. These can be sub-divided according to comments from mobile radio operators and their industry associations, cable network operators, spatial planning and environmental organisations, suppliers of network equipment, competition and consumer protection organisations, and others.



3 Summary of the comments on the analysis report

In section 4 of the questionnaire, respondents were given an opportunity to make general comments and observations on the analysis report appended to the questionnaire.

3.1 Mobile radio operators and their industry associations

In principle, these groups decisively reject a re-award of all mobile radio frequencies by means of an auction. Instead, they are demanding a renewal/extension of the existing licences for at least 10 years, especially for the frequencies in the GSM bands which are already allocated (900 MHz, 1800 MHz). With regard to the unassigned frequencies (the digital dividend, former Tele2 GSM1800 frequencies, free former Telefonica frequencies in the UMTS core band and the free frequencies in the UMTS extension band), the majority favour an auction.

Various submissions assume that a re-award, especially of the allocated 900 MHz spectrum, would result in the displacement of network elements to other frequency ranges. The delays and adverse effects of conversions and new construction of appropriate antenna installations would lead to a noticeable reduction in quality for all customers because of the problems posed by spatial planning procedures and the Ordinance on Protection against Non-Ionising Radiation. The auction being considered by ComCom was thought to involve a substantial risk for important public interests, as the market, and therefore the economy and population, would not enjoy guaranteed continuation of existing service provision for the period following the expiry of the licences. For network conversion without added value, investment would be required though would not be forthcoming for an economically expedient expansion of networks using new broadband technologies. This would also be incompatible with article 1 of the Telecommunications Act.

It is considered that an open auction of this type would also be subject to serious innate uncertainties. These result not only in high costs for all market players but also result in a situation subject to a degree of uncertainty because the current providers must consider different variants and though they prioritise them, they must nevertheless prepare simultaneously for all variants, and this certainly puts a brake on investment in innovation, etc. Since an auction generally achieves higher prices, which must also be paid immediately, capital would also be withdrawn from the market. This would reduce investment security and hinder further expansion and innovation, because long-term security of the investment already made and planned investment would no longer be guaranteed.

Also, some of the responses from this group note possible damage to competition and an inadmissible *ex post* intervention in the market. Since 1998, operators' existing mobile networks have developed under free market competition. Intensification of competition in the mobile radio market via a re-allocation of frequencies which does not take into account these asset values of operators – i.e. the existing network – would therefore constitute an *ex post* intervention in the market.

With regard to the mobile radio frequency allocations already implemented and still to be implemented in Europe, it is pointed out that no country has simultaneously auctioned off all occupied and free frequencies. Apart from certain refarming measures (which have already taken place in Switzerland in part for the 900 MHz and 1800 MHz band), only free frequencies have been or are being auctioned. It cannot be demonstrated why a different procedure should produce to a better result in Switzerland in particular.

Also, some of the responses express concerns that a market leader, given its financial strength, might acquire further competitive advantages and further reinforce the existing asymmetry in competition.

Respondents stated that the analysis report gives the impression that GSM frequency bands are interchangeable. In section 1.2.4, OFCOM presents an assessment of the attractiveness of different frequency bands. However, only the propagation characteristics of different bands are evaluated, whereas the availability of terminals for the different systems (UMTS and LTE) and the current network structure of the various operators should also be taken into account. Furthermore, the analysis report allegedly does not adequately reflect customers' needs. The predicted increases in voice and data capacities with HSPA+ and LTE are considered to be very optimistic. In practice, these values would be somewhat lower.

Making frequency utilisation more flexible (neutrality with regard to technology and services) is explicitly supported in most responses from this group. One comment, however, refers to the possible interference effects of UMTS900, and in future LTE900 as well, on GSM-R operation. There are demands that the frequencies "close to" GSM-R (880-882MHz and 925-927 MHz respectively) should not be allowed to be used by public mobile radio providers. It is proposed that these ranges be defined as guard bands, with a respective width of approximately 2 MHz, which should be kept free.

In terms of environmental protection and spatial planning, some submissions express concern that municipalities are increasingly using planning instruments to restrict or delay mobile radio installations. In concrete terms, planning zones are being declared which block any mobile radio project for two to three years. In parallel, planning conditions are then being imposed which cannot be complied with.

From the viewpoint of market saturation, falling prices and growing administrative requirements and difficulties, ComCom estimates that there is a low probability that a provider not currently active in Switzerland will come forward as a candidate. This view is shared by the majority of respondents from this group. No possibility is seen for a newcomer to build another mobile radio network with its own infrastructure in Switzerland. It is stated that the experience of Telefonica and Tele2 has already clearly demonstrated the difficulties concerning entry into the market in Switzerland.

With regard to utilisation of the frequencies from the digital dividend, a majority of the responses expressly support the decision of the Swiss regulator to use these frequencies for mobile radio in future. In this connection, OFCOM is expected to push bilateral and multilateral negotiations with the governments of neighbouring countries to prevent interference in regions near the borders and to lay down the general conditions to ensure protection from reciprocal interference effects between mobile and broadcasting applications.

3.2 Cable network operators

In the comments by cable network operators, concern is expressed that the introduction of mobile radio services in the 790-862 MHz frequency range would lead to interference in the cable networks and terminals connected to them (set-top boxes, TV sets, modems, etc.). The result would be intense interference in their service products (TV, radio, telephony and internet) for thousands of customers. In this connection, reference is made to the results of technical studies by the German Institute for Radio Technology (Institut für Rundfunktechnik IRT) and the German cable network operators' association (ANGA), a private Austrian report and a study by the British regulator OFCOM UK. Even at a transmission power corresponding to about a hundredth of the peak power of a GSM mobile phone, picture interference for TV reception would occur within a radius of 20-40 metres from a mobile telephone. Cable network operators point out that these interference effects affect equipment and terminals which are manufactured and operated according to current internationally recognised standards on electromagnetic compatibility. The necessary measures to eliminate interference would involve disproportionate consequences in terms of cost to consumers, industry and cable network operators.

The 470-862 MHz frequency range has been predominantly used since the 'sixties for terrestrial and wirebound television transmission. The release of the upper UHF range of 790-862 MHz for mobile radio is meeting with incomprehension from cable network operators.

Many cable network operators stated that they had expanded and modernised their infrastructure in the last 10 years beyond the 790 MHz frequency range in order to meet the growing needs for additional broadcasting and broadband services. The cable network operators now see the millions they have invested endangered. In this context, the talk is of "material expropriation" of the cable network operators in favour of the mobile radio sector. Demands are being made for the general technical conditions relating to the operation of mobile radio in the upper UHF band to be defined in such a way that the problem of interference with existing broadcasting services (terrestrial and cable network, with particular reference also to consumers' receivers and installations) is eliminated, taking into account the currently applicable standards on electromagnetic compatibility. Alternatively, if this is not possible, the operation of mobile radio in the UHF band should be banned entirely.

3.3 Suppliers of telecommunications equipment

Hardly any comments from telecommunications equipment suppliers were submitted concerning the frequency award by auction as under consideration by ComCom. Only one comment pointed out that an award by auction involves certain imponderables relating to business planning and to the necessary investment by network operators and might possibly delay the introduction of new technologies.

In principle, however, ComCom's intention to make mobile radio frequencies available in accordance with market needs and network operators' business plans is favoured by telecommunications equipment suppliers. In this context, explicit reference is made to envisaging use of the UMTS extension band, even though there may currently be little interest in this.

The possibility of technology-neutral use of the frequencies to be auctioned is supported by the supplier side. In this context, one response notes that the situation analysis (especially section 1.2.6) focuses excessively on the future HSPA+ and LTE technology and insufficiently on WiMAX. It is considered that this might give the false impression that the development of WiMAX is less advanced than the continuing development of systems based on the UMTS standard. With 475 WiMAX networks (including 100 networks with mobile WiMAX), WiMAX is already considered a very successful technology (e.g. Eastern Europe, South Korea, Japan, Taiwan and the USA).

3.4 Spatial planning and environmental organisations

These respondents welcomed the fact that a newcomer is not encouraged. Responses suggest that the re-award of frequencies should primarily serve the goal of achieving good coverage of telecommunications services with minimal effects on space and the environment. In terms of the uniformity of the legal system, it is not only the clause setting out the purpose of the TCA which is considered critical for defining the goals of the award. It is suggested that the award procedure should be designed so that no service provider can justify the construction of additional or unnecessarily intrusive installations in sensitive areas by maintaining that it has too few frequencies at its disposal. In order to ensure this, however, privileges might even be necessary for those current licensees with a country-wide network. The timing of the new tender procedure for licences should be exploited to strengthen the requirements relating to weighing up planning interests in decisions on sites and to improve coordination between mobile radio providers and the authorities giving consent. Practice shows that the current obligations on joint use of sites according to art. 36 para. 3 TCA are having little or no effect. It is therefore considered necessary to include in the licences a binding formulation on the obligation to coordinate (in particular within the construction zones). In addition, coordina-

tion should be improved between mobile radio providers and the municipal authorities responsible for planning consent.

One comment argues for the construction of a single infrastructure network. Regardless of the volume of traffic a threefold network infrastructure would mean an unnecessary tripling of the basic load, because each station, whether large, small or micro, GSM or UMTS, would radiate a broadcast channel day and night. Since, with the new frequency allocation, the operators wish to be present on all frequencies, the base load would be further multiplied if there were no common network infrastructure. Furthermore, with regard to spatial planning, each antenna would lead to an increased radiation load and have the potential for generating resistance and disputes. With a common infrastructure, existing sites could be better used to meet requirements, or certain sites could be dismantled entirely by redistributing the radiation load.

It is further pointed out that non-ionising radiation also includes non-thermal effects in addition to the thermal effects dealt with in the Ordinance on Protection against Non-Ionising Radiation. It is said that current knowledge of these non-thermal effects of non-ionising radiation below the valid limits indicates that the modulation and temporal pattern of the radio signal are biologically relevant in addition to the carrier frequency. From the viewpoint of preventive health protection and in view of the inadequate data situation concerning possible long-term effects, archiving of data relevant to health such as information on the type of technology used and the type of mobile radio services on the frequencies used should definitely be attempted and if necessary this information should be made available to universities. In this context, a corresponding licence condition is seen as thoroughly reasonable.

3.5 Competition and consumer protection organisations

The responses received welcome the intention of carrying out a re-tender for the licence by means of an auction instead of a competition based on criteria. A re-tender is said to be preferable to a renewal for several reasons: a re-tender would on the one hand enable a new TSP to enter the market and on the other hand the existing licensees would be able to re-evaluate their required frequency spectrum and adapt it to market conditions. It is believed that this could be significant in this dynamic market. Respondents stated that in order to enable service providers without their own network to enter the market and thereby stimulate competition at the level of services, non-discriminatory access to one of the existing networks must be possible.

End users must always be a prime concern when setting an objective for an allocation of frequencies. This objective can only be pursued by means of an adequate number of strong providers, with their own network infrastructure and their own frequency utilisation rights, which can generate intensive and sustainable competitive pressure.

4 Technological development issues

1. *In your opinion, within what timeframe could GSM technologies be definitively superseded by technologies with higher transmission bandwidths and better spectral efficiency?*

Generally, technologies with higher spectral efficiencies are expected from 2015 onwards. GSM use is expected until about 2020. No shift of network capacities away from GSM to other technologies will take place before 2015-2018. However, LTE might be in use at an earlier date.

Roaming, area coverage and border coordination are and will remain important aspects in the replacement of technologies. It therefore has to be expected that GSM as well as UMTS/HSPA will remain in operation for a long period (GSM until about 2020, UMTS/HSPA beyond 2020) and the existing infrastructure will migrate to new technologies in a continuous process. In addition, it will be possible to further amortise investments.

WiMAX and LTE are seen as superposed data networks which complement the existing 2G and 3G networks with fast data services.

The cable network operators are resolutely opposed to the 800 MHz band coming into operation before 2015. It is stated that more time is needed for clarification of the potential for interference.

2. *Within what timeframe do you see the introduction of LTE (Long Term Evolution) in Switzerland, with regard to the frequency bands that are the subject of the invitation to tender (800MHz, 900MHz, 1800MHz, 2.1GHz, and 2.6GHz)? What migration scenarios do you identify with reference to the introduction of LTE in the different frequency bands?*

According to the assessment of the network operators, new frequency bands will be needed for the introduction of LTE as the frequencies allocated today are being used intensively by the existing 2G and 3G networks.

A key factor in the introduction of LTE is said to be the adequately high penetration of end-user terminals; this would take 2-3 years from the time they become available.

One scenario often cited is the introduction of LTE in the 2.6 GHz band from about 2010. Parts of the 1800 MHz band are also a possibility given the availability of appropriate devices. LTE should be rolled out to extend capacity in the 2.6 GHz band in the short term and in the 800 MHz band in the medium term to supply broadband data services to rural areas. The 900 MHz band is deemed to be serviceable only at substantial cost and with investment in other technologies, as the occupancy of this band by GSM is very intensive and is expected to remain so. In the medium and long term, existing UMTS/HSPA networks will not be converted to LTE. One submission sees considerable "time-to-market" advantages for WiMAX, as in other countries or continents such networks are already in successful operation.

3. *In your view, should LTE transmission technology be regarded as exclusively for mobile data networks to enhance GSM/UMTS or as an integrated overall solution which also provides voice services, in a quality commensurate with that currently provided by the use of GSM or UMTS technology?*

LTE should be used to expand the capacity of the existing data networks in the short term. The circuit-switched (CS) components of the 2G and 3G networks are expected to remain in

service for a long time to come. In this respect, the integration of voice services into the data networks is deemed to be progressing slowly and is seen as a long-term goal.

The long-term parallel operation of at least two technologies is seen as a normal case. This fact is based on technology lifecycles and the respective penetration of end-user terminals.

4. *In your opinion, from when will network components and terminals be available in sufficient quantities for use with LTE/ UMTS transmission technology for the 800 MHz frequency band (digital dividend) and the 900 and 1800 MHz frequency bands?*

The first LTE terminals are expected to be available from 2010. Commercial take-off is expected by about 2012. Sufficient market penetration of UMTS/LTE terminals will take between one and four years depending on the needs of the respective market. The availability of LTE network components clearly does not represent a bottleneck.

5. *In your view, what reasons are there for or against a technology-neutral configuration of the licences?*

The responses submitted see advantages in independence in terms of technology and services. A discontinuation of obligations is generally welcomed. The cable network operators, however, raise concerns that the compatibility requirements of all systems must be taken into consideration, in particular with regard to the frequencies from the digital dividend. In terms of the health consequences, one submission considers that electromagnetic fields can also include non-thermal effects, though the state of knowledge about this is still in its infancy.

6. *In their media release of 21 February 2002¹, ComCom communicated its position towards joint use of mobile radio infrastructure (at that time with reference to UMTS technology). According to its interpretation, ComCom, on application, allows the joint use of Node B and RNC network elements, as long as these can be controlled independently by each sharing partner, i.e. as long as a unitary network with a frequency pool is not created as a result. In your opinion is there a need to configure the possibilities of joint use of mobile radio infrastructures in a technology-neutral way and to extend it to other network elements?*

Network sharing is welcomed or even demanded by interest groups concerned with health and spatial planning and by cable network operators, because of the potential reduction in immissions.

The mobile network operators are content with current possibilities or see no immediate need for further expansion of the options. With regard to new technologies, one supplier maintains that it is necessary to examine the joint use of a core network by multiple operators (Multi Operator Core Network approach, MOCN) for relevance to competition in the current market situation, as new opportunities are opening up with the new technologies for joint use of the access and transmission network.

¹ <http://www.comcom.admin.ch/aktuell/00429/00636/00712/index.html?lang=de&msg-id=1782> (only available in German or French)

5 Market development

7. *How do you view the development of the Swiss mobile radio market in the next 5-10 years with regard to*
- a. *market structure,*
 - b. *the number of mobile radio users,*
 - c. *demand and ARPU,*
 - d. *price level,*
 - e. *the development of data communications?*

a. Market structure

A constant market structure over the last 8 years permits the assumption that the situation will continue unchanged. The opinion was expressed that there was a need for profound changes to improve the current market structure with regard to competition aspects. Responses from the mobile radio industry express the opinion that the Swiss mobile radio market is too small for more than 3 national mobile radio operators and that new entries into the market are difficult and somewhat improbable. The only conceivable scenario would be the entry of a niche player focusing on a profitable market segment, without the construction of a national network.

On the other hand, market pressure and falling margins require consolidation of the market and convergence of fixed and mobile networks. New alliances may also be forged and this may result in shifts in market shares.

b. the number of mobile radio users

It is basically assumed that there is still a certain potential for an increase in market penetration. However, growth rates are falling. The upward trend is accounted for by the increase in machine-to-machine applications and the increase in the number of users with multiple SIM cards. Customers are concluding separate contracts for voice communication and data services/internet access. It is assumed that market penetration will exceed 130%. One particularly optimistic scenario assumes a market penetration of up to 200% over the next 5 years.

c. demand and ARPU

A strong increase in the demand for, and use of, voice and data services is expected. The substitution of fixed network connections by mobile connections is cited as a reason for the growth in voice traffic.

The majority of respondents are of the opinion that the ARPU for voice and data services will fall considerably. It will only be possible to partially compensate for this erosion of ARPU due to the expected price reductions through content or additional services. One response, however, assumes that the average revenue per user will increase thanks to the expected high use of data services – data ARPU would amount to half the voice services' ARPU.

d. price level

According to the majority opinion, price levels will continue to fall. In the past, this was due in particular to the evolution of termination charges. In comparison with other countries, how-

ever, prices are rather high. There is an assumption that the level of prices will adapt as a result of the opening-up of the EU borders.

e. the development of data communications

The demand for data services, and consequently the volume of data, will continue to increase rapidly over the next few years. One response considers a scenario in which the proportion of mobile broadband connections amounts to 80% of all broadband connections in 2014 to be realistic.

8. *How much will/may the introduction of new multimedia devices such as the iPhone or other smart phones, as well as data cards and USB sticks, affect the behaviour of mobile radio customers with regard to the use of mobile data services and the resulting volume of data?*

According to the prevailing opinion, the new multimedia devices, data cards and USB modems strongly stimulate the use of data services and therefore have a major effect on the growth in the volume of data. The strongest engine for growth in the data sector is said to be the use of USB modems. However, certain limitations are conceivable because of the potential interference caused by multimedia devices to permanently installed modems, fax machines and telephone equipment (so-called Customer Premises Equipment, CPE).

It is also maintained that the iPhone and similar devices, as well as data cards and USB modems, will be used by only a small (though growing) customer segment. This customer segment currently amounts to some 10%.

According to one response, multimedia computers, smart phones and the like will increase total mobile radio traffic by a factor of 20 in the period from 2007 to 2015. Customer-friendly, simple and secure operation and use at an affordable price is critical for the uptake of data use.

9. *Will mobile radio using broadband transmission technologies such as LTE (Long Term Evolution) be able to replace the fixed network connection in future? In rural areas in particular, is LTE an alternative to an optical fibre connection (FTTH)?*

Only a minority of the submissions express the conviction that modern radio networks will be able to replace DSL networks without any problems. The others are of the opinion that mobile radio using broadband transmission technologies such as LTE cannot replace the fixed network connection in the future. Mobile transmission technologies will not be able to match the data rates and capacities of wire-bound and fibre-optic technologies. They can only be a complement or an alternative to the fixed network. It was surmised that LTE might replace a fixed network connection only for basic services (internet and voice services) but not for services such as HD-IPTV. The parallel existence of fibre-optic networks and LTE-based data networks could generate additional dynamics in competition.

10. *Is there a need to operate local or regional mobile radio networks in Switzerland? Should there be a frequency allocation with national or regionally restricted use for this purpose?*

Most of the submissions were in favour of the award of national licences. Co-existence of different frequency plans is not deemed appropriate in Switzerland. According to some representatives of the mobile radio industry, business models based on regional networks offer little hope of long-term survival. One submission explains this with reference to the failed attempt by Tele2 to operate city networks. The benefits and attractiveness of a regional mo-

Mobile radio networks are very limited from a customer viewpoint. Mobile radio customers expect uniform tariff systems and value special conditions for on-net (same network) calls. In addition, the difficulties in finding sites and the stringent limits on non-ionising radiation would complicate the construction of additional networks in highly populated areas such as Geneva or Zurich, for example. It would be almost impossible to recover the high fixed costs for operating a regional network due to the limited coverage area. Moreover, the use of regional networks would lead to inefficient frequency utilisation and an increased need for coordination between the different networks, in particular in regional and international border areas.

Other respondents approve the award of regional licences, but with the abolition of the minimum coverage obligations. The regional licences should cover large areas and be easy to combine together. It must be possible to conclude agreements between operators to optimise business and maximise coverage.

Furthermore, the concept of the joint network was also proposed.

6 The award procedure

11. How do you assess the award scenarios considered by ComCom in section 2.2 of the analysis report?

A new allocation of all mobile radio frequencies by auction as outlined in the analysis report is resolutely rejected by the Swiss mobile operators and their industry associations. The entire structure of networks and mobile radio cells, the network topology and transmission sites are based on the frequencies allocated at present. A new distribution of frequencies and the resulting construction and conversion of sites which would be required would endanger mobile radio coverage, at least for a transitional period, and lead to an increase in prices. An advantage of Switzerland as a location favourable for businesses would be put at risk unnecessarily and with no benefit. In some responses, it is also pointed out that an auction could favour the incumbent because of its greater financial strength.

From the supplier side it is generally noted that they would favour a procedure with as few effects as possible on the operation of networks by the operators. The UMTS extension band frequencies and the digital dividend should be awarded as soon as possible.

In response to this question, the cable network operators stated in only very general terms that they would prefer award scenario 2 because of the better planning possibilities for the network operators.

One response from a competition and consumer protection organisation points out, in the event of a simultaneous award including the frequencies in the UMTS core band allocated up to the end of 2016 (scenario 2), that on the one hand the evolution of the market could not be predicted to that point in time and on the other hand the regulator's freedom of action would be restricted (no possibility of influence despite a changed market situation at a later point in time).

12. Which of the two scenarios described would be preferable, in your view, and why?

- a. *Scenario 1: a staggered procedure with allocation of all frequencies available at the end of 2013, in 2010/2011, and another, later allocation of the UMTS core band frequencies available at the end of 2016.*
- b. *Scenario 2: award of all frequencies available at the end of 2013 incl. all UMTS core bands available from 2017 in 2010/2011. The new allocation for all frequencies available at the end of 2013 applies from 2014; the allocations for the UMTS core band frequencies becoming available at the end of 2016 apply from beginning of 2017.*

On the basis of the general reservations about an auction, the mobile radio operators favour neither of the two alternatives but instead assess both variants as problematic. Scenario 1 is considered to have a shorter time horizon and would therefore be easier to plan for than scenario 2. However, scenario 1 would withdraw more capital from the market and would also weaken competition, because of the dual auction. Another opinion was that scenario 2 better reflects the trend of technology-neutrality and the future convergence of GSM networks with UMTS networks into one unit for mobile radio customers.

From the point of view of the suppliers, scenario 2 is preferable. In this context, the demand for the earliest possible award of the frequencies in the UMTS extension band is repeated.

The response from the cable network operators is that an early award of all frequencies would encourage the construction or conversion of essential infrastructure. Advantages in scenario 2 are also seen.

It is also stressed that the decision to implement scenario 1 or scenario 2 depends on whether the award of the GSM and UMTS frequencies includes value interdependencies. If this were the case, the frequencies according to scenario 2 would have to be awarded at the same time, as the participants in the auction might otherwise bid strategically.

13. What other award scenarios do you see as a viable alternative to the procedure outlined by ComCom?

Instead of an auction, some of the Swiss mobile radio operators and industry associations would like a renewal of the existing licences. With regard to the unallocated frequencies (the digital dividend, the former Tele2 GSM1800 frequencies, free former Telefonica frequencies in the UMTS core band and the free frequencies in the UMTS extension band), these parties propose an auction. An auction with pre-selection is also seen as an alternative to an immediate further renewal of the licences. In this case, if it turns out that only existing mobile radio providers remain in the running for the subsequent award, an extension of the existing licences and an auction of the unoccupied frequencies would be an option. Another submission suggests a strengthening of competition even before the beginning of 2014 by allowing unused spectrum to be allocated immediately along with the technology-neutral utilisation of frequencies.

The supplier side did not address question 13 in any great detail. For one cable network operator there is no valid alternative to the scenarios envisaged by ComCom.

14. In your view, is a shorter transition period (from the existing to the new frequency allocation) than two or three years as considered by ComCom also conceivable?

The majority of operators consider shorter transition periods as unrealistic and that distinctly longer transition periods should be assumed. Depending on the extent of the change in frequency allocation, network operators would have to implement massive network conversions. A shorter transition period would be possible only in the event of minor changes to frequency allocation.

The cable network operators also argued against shorter transition periods.

15. What opportunities and risks do you see in the award scenarios considered by ComCom?

If frequencies which are currently free are allocated efficiently and in accordance with the needs of the market by means of a transparent and objective procedure, this is considered a real opportunity. However, operators fear that if the design of the auction is not configured adequately, bidders will be incited to bid irrationally and tactical purchasing of spectrum with a view to damaging competitors will be encouraged. There is also a risk that the result of the auction will not lead to the desired combinations of 5 MHz blocks for the mobile radio providers. Concern is also expressed that an auction will further reinforce the market power of the incumbent as a financially strong participant in the auction and will damage competition in the Swiss telecommunications market.

With regard to the award scenarios envisaged by ComCom, the cable network operators see the risk of substantial interference caused by new mobile radio services affecting customers in the UHF band. The best possible utilisation of new services is seen as an opportunity if the outstanding problems can be resolved.

According to the supplier side, the award scenarios envisaged by ComCom may involve uncertainties for the network operators' business plans and delay essential investment in the introduction of new technology. An award of the frequencies in the UMTS extension band in

2009/10 might encourage the introduction of modern mobile broadband services in the Swiss telecommunications market.

7 Frequency configuration

16. Which bandwidths from which frequency ranges do you consider appropriate for the operation of a national mobile radio network? What is the minimum necessary for the operation of a national network?

The responses from the ranks of the existing network operators and their pressure groups indicate the desire to preserve the current allocation situation as a minimum. In general, however, they want even more bandwidth, especially in the lower frequency bands, in order to meet the increasing capacity requirements. The topic of the allocated preferred frequencies in the 900/1800 MHz bands for GSM coverage at the national borders is also raised in relation to the pure allocation bandwidth. It is also mentioned that national coverage using only frequencies from the 2100 and 2600 MHz bands is too expensive.

The manufacturing industry tends to keep its responses open and makes frequency demand dependent on different factors such as the required network capacity, the business model or the frequency bands used. The range extends from 2x5 MHz to 2x100 MHz, though without specifying which frequency bands these should include.

The cable networks' pressure group merely states that the 800 MHz frequency range should not be used for mobile communication, or should only be used in this way if the risk concerning the feared interference to cable networks and end-user terminals such as television sets or set-top boxes can be demonstrably eliminated.

From the viewpoint of those interested in protection of the environment, the configuration of the award procedure should be one in which operators do not have to justify the construction of additional or unnecessary installations in sensitive areas because of a shortage of frequencies (cf. also the comments in relation to the situation analysis).

In summary, the following situation results in relation to the interest in the different frequency bands:

800 MHz	Moderate interest 2x2x20 MHz
900 MHz	Very great interest 2x40 MHz to 2x55 MHz
1800 MHz	Great interest 2x70 MHz to 2x85 MHz
2100 MHz	Interest 2x50 MHz to 2x55 MHz
2600 MHz	Little interest 3x2x20 MHz

17. Do you consider a bandwidth of 5 MHz appropriate as an allocation unit? If not, in what units, in your view, should the frequencies being allocated and why?

In general, an allocation unit of 5 MHz is considered to be an appropriate size by almost all parties with reference to the use of UMTS. One exception is the 2600 MHz frequency band. Here some operators consider a minimum unit of 10 MHz to 20 MHz as appropriate. One reason among others is to avoid fragmentation of the individual allocation. With larger allocation blocks, operators have the option of using wider LTE signal modes which are more spectrum-efficient.

Some operators want smaller allocation units, particularly for the GSM bands, because this allows a more equitable distribution of frequencies with preferential utilisation at the national borders.

There is also a proposal to sub-divide each frequency band into three consecutive blocks. However, it is stated that an attempt should be made to achieve a uniform distribution of frequencies with preferential utilisation in the traditional GSM frequency bands.

From the viewpoint of stimulating competition, choice of the size of the allocation units should be left to the operators. Nevertheless, it would also be conceivable to create smaller allocation units to facilitate the entry of a new TSP into the market.

The manufacturing industry and the associated pressure groups state they are clearly in favour of 5 MHz allocation units, as this would conform to the CEPT recommendations. On the other hand, however, allocation units of 10-20 MHz are also being considered in this group.

Another aspect which could affect the size of allocation units is the services which are adjacent to the frequency bands dealt with here. The formation of blocks at the band limits should take this into account in order to be able to maintain the required guard bands.

In summary, the parties making submissions acknowledge an allocation unit of 5 MHz as standard. However, in order to make full use of LTE, this unit should be 10 or 20 MHz in the 2600 MHz frequency band in order to avoid fragmentation of the spectrum allocated to an operator into individual 5 MHz blocks. Existing operators express a wish to allow allocation units smaller than 5 MHz to enable preferred frequencies to be divided more fairly.

18. In defining the auction, should so-called spectrum caps be designated in order to achieve a final result which promotes competition? If so, in what frequency bands and to what extent?

Basically, the existing operators and the associations linked to them are clearly in favour of spectrum caps. However, they make their size dependent on several conditions. The following options were mentioned:

- Separately spectrum caps for each band and each operator. However, in this context the question arises of whether the authority has sufficient knowledge of the undertakings to anticipate the evolution of the market.
- Spectrum caps across the entire allocated spectrum of an operator; however, no operator should receive more than one third of a frequency band if the other operators do not wish this. In the 800 MHz band there should be an option to acquire more than one third where necessary. This should in turn be made dependent on the allocation situation in the 900 MHz band. In addition, there should be spectrum caps for the preferred frequencies. For the currently unused frequencies in the 2600 MHz band, the 2100 MHz band and the 800 MHz band, the following caps would be conceivable:

2600 FDD: 2x (2x25) MHz and 1x (2x20) MHz

2100 FDD: 3x (2x20) MHz

800 FDD: 3x (2x10) MHz

- Spectrum caps predominantly for the 800 and 900 MHz frequency bands. These caps should be based on the minimum required spectrum according to Question 16.

The manufacturers' group tends to oppose limitation by spectrum caps.

For many responding parties, spectrum caps play only a subordinate role.

In conclusion, it is above all the parties which already have allocated frequencies today which are unequivocally in favour of defining spectrum caps.

19. For what period should the licences be awarded?

From the responses of the operators and the equipment manufacturers there emerges a minimum term of 10 – 15 years for the licences. In the case of allocations which involve an operator in network infrastructure to perform conversions, 15 years would be the minimum term.

For technical reasons related to competition, however, shorter awards would be beneficial. They would enable shorter adaptations to licences and allocations as a result of changes in the market.

20. As a result of the revocation of 3G mobile licence by ComCom, three UMTS FDD carriers in the UMTS core band are unused and would be available for overcoming any capacity bottlenecks up to the conclusion of an award procedure, provisionally in 2010/2011.

- a) Do you consider an allocation of individual channels on application, until the conclusion of an award procedure at the latest, expected in 2010/2011, to be appropriate?*
- b) Would you be interested in using a UMTS FDD carrier accordingly? If so, outline the reasons and indicate how you wish to use these carriers.*

a)

There is a degree of interest in more spectrum in the UMTS frequency band for immediate temporary use on the part of the operators and their industry associations. However, in this regard the question is of protection of investment, though this cannot be expected with the prospect of a return without renewed allocation in the year 2010.

b)

The operators are very interested in an additional carrier which can be used for the longer term from 2010 onwards. The reason for this is the increasing traffic on UMTS and the associated essential capacity expansion in the radio network. In individual cases, the same attitude is conveyed by the manufacturers' pressure group. The free UMTS frequencies should be allocated to the existing operators if no new operator enters the market.

An allocation to the existing operators would also lead to better market opportunities.

8 Environmental protection and spatial planning

21. Will additional base station sites be needed in the future as the result of the introduction of new transmission technologies such as LTE? If so, to what extent?

The submissions from the mobile operators assume that, with the introduction of new transmission technologies such as LTE, more additional transmitter sites will be needed, as spectrum resources are limited and the Ordinance on Protection against Non-Ionising Radiation restricts existing installations. In order to adapt the migration to new technologies to customers' needs, the parallel operation of current networks and future technologies and frequencies is essential. Since here the Ordinance also limits the equipment on existing sites, new sites will be necessary. It is also noted that additional sites are needed not only in connection with innovations in the area of transmission technology but also as a result of innovation in the products sector. Moreover, new sites will also be needed because the general conditions for the existing sites change (legal basis, leasing contracts, local conditions such as zoning in the vicinity of an installation).

According to network equipment suppliers, more sites will be needed in addition to the expansion of existing 2G and 3G sites using LTE technology to guarantee correspondingly higher data rates for mobile services. It was stated that it might be possible to partially meet the additional requirement for transmission capacities using appropriate coverage solutions inside buildings (femtocells, picocells).

From the spatial planning perspective, it is pointed out that the award procedure should be designed so that no service provider can justify the construction of additional or unnecessarily intrusive installations in sensitive areas by maintaining that it has too few frequencies at its disposal. One submission under the heading of environmental protection expressed concern that incompatibilities between new LTE equipment and UMTS or GSM transmission technologies will require additional temporary sites, at least for a transition period as required for the technology migration, and that these could eventually become part of the tolerated permanent inventory. In this context, it is pointed out that this problem would not occur in the case of a unitary network, as sufficient sites are already currently available for this and there would only be one antenna network operator.

22. Will additional exposure to non-ionising radiation occur as a result of the use of new transmission technologies? What effect will new networks and technologies have on transmitter power and exposure to radiation?

The network operators expressed the view that the non-ionising radiation load will increase as a result of the use of new additional transmission technologies. In this regard it is pointed out that the Ordinance on Protection against Non-Ionising Radiation is based on worst-case considerations and that therefore the introduction of new technologies leads to an increase in the calculated immissions in the site data sheet. The actual load will be dependent on the actual volume of traffic. Newer technologies allow better utilisation of transmission power. Unlike other areas of the environment, the non-ionising radiation immissions are not an undesirable by-product of telecommunications but are the actual product, i.e. the transmission of information.

The equipment suppliers also expect an increase in the non-ionising radiation load.

Likewise, one submission from the group of environmental protection organisations anticipates an increase in the radiation load as a result of the use of new transmission technologies.

23. How many infrastructures and networks respectively will an operator have to operate in parallel in future, at least for a transition period? How long do you estimate the duration of this transition period?

From the viewpoint of the mobile radio operators and the cable network operators, it is to be assumed that because of the longer lifecycle of GSM and the delayed start-up of UMTS, parallel operation appears inevitable, at least for a transitional period. This period is expected to extend beyond 2020, even if one does not assume that in the future at least two parallel networks will always have to be operated.

According to one submission from the group of environmental protection organisations, the period of co-existence of different techniques will be determined by the lifetime of “telephone-only GSM mobiles” and by the will of operators to encourage the desire to change through advertising and price promotions.

Suppliers of network equipment are of the opinion that, in the final analysis, the answer to this question is dependent on the operator’s network-building and expansion strategy. They maintain that base stations supplied by the network equipment suppliers are capable of being operated in multi-mode, i.e. additional transmitters are not necessarily essential for the operation of different technologies such as GSM, UMTS and LTE. Furthermore, LTE technology is considered backwards-compatible with GSM and UMTS.

24. In your view, to what extent might resistance based on the fear of non-ionising radiation and spatial planning concerns impede or prevent the extension of the existing networks with additional frequencies from the digital dividend and the UMTS extension band?

From the network operators’ viewpoint, the problems will be kept within bounds if the implementation of the Ordinance on Protection against Non-Ionising Radiation is handled pragmatically. However, mobile radio is threatened if implementation is stricter. There is believed to be a fairly large degree of legal certainty with regard to objections focusing on non-ionising radiation, although it is regretted that this has had little effect on the sometimes prolonged duration of objections and legal actions. Massive resistance has developed over the last two years as spatial planning factors have been applied in many locations for purposes other than those intended. This is said to be due to the fact that in its judgements the Federal Court has only sketched out the spatial planning influences with regard to the general conditions of spatial planning and building permission. It is believed that it is not possible to guarantee an adequate quality of coverage in certain municipalities because of the competent authorities’ complicity in fundamental resistance to mobile radio infrastructure. It is suggested that the mobile radio industry requires of the government and the administration to provide a stable framework founded on a scientific basis. With regard to the use of the digital dividend frequencies, the better propagation characteristics could lead to a reduction in the transmitter stations needed in the future.

The network equipment suppliers see no resistance to the introduction of LTE. The problem apparently results from a lack of adequate information on electromagnetic loads. The situation could be defused by means of an appropriate information policy on the part of the government.

25. In your view, to what extent do planning concerns and resistance to non-ionising radiation impede or prevent the deployment of new antenna equipment by existing or additional network operators? Is the construction of an additional country-wide mobile radio network still realistic under the general conditions prevailing today?

According to the mobile radio operators, construction of an additional independent mobile radio network is not economically feasible due to existing resistance and the resulting delays. Despite apparent delays, the expansion of existing networks is currently feasible, but an additional network operator with its own infrastructure would also cause increased resistance to the expansion of existing networks. One respondent pointed out that the situation in Switzerland is becoming worse as a result of the currently applicable limit values for non-ionising radiation, which are more restrictive than the recommendations issued by the WHO.

From the cable industry's viewpoint, the construction of new mobile networks implies a necessity for a change in the legislation.

In the telecommunications equipment suppliers' view, the situation could be defused by means of an appropriate information policy on the part of the government.

26. Do you see any possibilities of using the additional frequencies to be allocated to reduce the transmission power of existing base stations?

The majority of responses submitted by operators envisage little possibility of reducing transmission power. Indeed, in individual cases the new frequencies, possibly in conjunction with new technologies such as LTE, might open up new possibilities of optimisation and therefore lead to an improved immissions situation. In general, however, the use of additional frequencies is expected to have the opposite effect.

In the view of the suppliers of telecommunications equipment, a reduction in the radiation load by covering an area using an appropriate combination of frequencies from different bands is considered possible.

Although the environmental protection bodies did not express expectations about reducing the transmission power of existing installations as a result of additional frequencies, they stated that these possibilities should nevertheless be clarified. If solutions exist for reducing the transmission power of existing or future base stations, the additional frequencies should preferably be used to serve this purpose. For example, it would be conceivable to use repeaters or femtocells in buildings, so that the shells of the buildings would not have to be penetrated from outside using high transmission power.