

Comparative Assessment of the Licensing Regimes for 3G Mobile Communications in the European Union and their Impact on the Mobile Communications Sector

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Executive Summary

What regulatory lessons can be learned from the Third Generation Mobile Licensing Process in the European Union and what is its current and future impact on the Mobile Communications Sector? From mid January till mid April 2002, McKinsey & Company conducted, upon request by the European Commission, a comparative assessment of 3G licensing in the Member States of the European Union, and formulated a number of policy recommendations in view of future licensing exercises, focusing on the possible advantages of and scope for coordination and harmonization of licensing methods and conditions at the level of the European Union.

This Executive Summary highlights first the policy recommendations themselves, subsequently clarifies the role of the European Union and finally summarizes the main findings of the impact of the 3G licensing process, on which the recommendations have been based.

FUTURE SPECTRUM ASSIGNMENT POLICY AND REGULATION SHOULD TAKE INTO ACCOUNT FIVE GUIDING PRINCIPLES

In future licensing exercises, regulation of spectrum based services should cover both the market entry or clearing phase, and the initial years of market functioning. These initial years do require particular policy attention, as technological instability and uncertainty of demand take-up may substantially hamper longer-term development and competition. In order to develop and implement an adequate regulatory policy with regard to spectrum based services, we specifically recommend that policy makers and regulators take five guiding principles into consideration, three focusing on market entry and two addressing initial market functioning:

Guiding principle 1: Build spectrum assignment on the notion of “sustainable market”

The first principle is to assess whether and to what extent the market is ready for additional spectrum. Spectrum assignment regulation should envisage the creation of sustainable business models in the industry. A major concern hereby is that the cost of rolling out a new technology should be in line with expected revenues from the corresponding services. In particular, the number of licenses offered is a key regulatory tool, as it defines the number of networks to be rolled out and defines upfront a predominant part of the cost of supply.

Guiding principle 2: Allow for the gradual introduction of a new technology and/or capacity

A second key policy concern is to adequately address the uncertainty that exists with regard to the technical success and operational applicability of a new mobile technology that is being introduced in a market. Spectrum assignment policy should ensure that regulation is put into place and measures are taken with the purpose of limiting the negative impact of the risks, related to the introduction of the new technology. Depending upon the situation of the market and the status of the technology, policy and regulation may differ significantly. In case significant uncertainty exists with regard to the technology, measures that could be taken into consideration would include the introduction of a competition-neutral pioneer license for a limited period, or a series of subsequent award waves over time.

Guiding principle 3: Design the process for spectrum assignment so as to minimize distortions

We observed that a number of distortions could occur in the process of spectrum assignment. In this respect, we learned that the impact of the evolution of capital market expectations' over time, and the extent to which the assignment processes contributed to a “now or never” sentiment, appeared to be highly relevant. The latter one was especially characterized by the impression of a “one-off” awarding event, the degree to which it drove an atmosphere of a “prisoners’ dilemma” for incumbent operators, and finally by the fact that, in general, spectrum assignment processes were organized in a sequential way, both in and across the Member States of the European Union. Specific measures that could embody the third guiding principle would include shortening the duration of the award process and allowing spectrum trading under certain conditions.

Guiding principle 4: Align license conditions and other regulatory levers to allow for financial stability

We believe that in the initial years of market functioning, it could prove quite important to ensure an alignment of license conditions and other regulatory levers with the financial stability of the operators who were awarded a license. This would, in particular, be the case where the effective introduction of the new technology can be identified as a strategic concern in the political and industrial policy. In order to avoid financial instability, regulation of spectrum based services could, in particular, avoid imposing substantial coverage obligations and/or payment schedules in the initial years of rollout. In addition, also other value-driving regulatory levers will have to be taken into consideration (for instance call termination to mobile and roaming) as these levers will substantially impact the financial strength of the players concerned, at a moment where they are still making substantial capital expenditures in license fees, technology rollouts and application development.

Guiding principle 5: Support take-up of market demand

Spectrum policy traditionally focuses on defining the conditions of the supply-side of the market to come into place. We however believe that, in parallel, it is also appropriate from a policy perspective to consider explicitly the demand side of the market. In future spectrum assignment exercises, ensuring that market demand and development of applications and services is sufficiently stimulated, should explicitly be taken into account as a policy concern, while defining the corresponding overall spectrum assignment policy and regulation of spectrum based services.

We consider these five guiding principles to be both necessary and sufficient for future spectrum assignment exercises and regulation of spectrum based services. We believe they force a clear upfront and ongoing assessment of the impact on the markets and all major stakeholders (operators, vendors, end users, government, etc.), including the consequences for the ongoing dynamics and major trends in the markets and the industry.

However, it is obvious that the degree to which each of them could and would be effectively implemented in a future exercise will in practice strongly depend upon the very concrete circumstances at the time when the new spectrum assignment process is taking place. In this respect, three components will prove instrumental for adequate regulatory policy, namely the policy ambition, i.e., the extent to which the introduction of the new technology is considered important for the development and prosperity of the European Information society and achievement of general policy targets, the situation and evolution of the capital market

expectations at the time of the assignment process, and the degree of uncertainty and technological instability of the new technology that is being introduced.

THE EUROPEAN UNION'S POSITION IS CRUCIAL IN ENSURING AN APPROPRIATE APPLICATION OF THESE PRINCIPLES

Within the new EU telecom regulatory framework, spectrum assignment policy and regulation of spectrum based services strongly remains a Member State competence. As such, Member States hold a critical position in addressing the key guiding principles, developed in the previous section. The new EU telecom regulatory framework provides the Member States with the necessary tools to effectively address the key issues related to the guiding principles.

Given the high potential of differentiation in spectrum assignment policy and regulation of spectrum based services, and resulting distortions on key issues between Member States, we believe that the European Union has a critical and active role to play, in particular in order to ensure that those issues and corresponding guiding principles are properly addressed by the Member States. Harmonization and coordination tools provided by the new EU telecom regulatory framework and the Spectrum Decision, should allow the European Union to ensure this in an appropriate manner.

In a minimal scenario, the European Union should at least consider determining specific rules with regards to the assignment process itself, limiting its duration and thus the potential distortions resulting from substantial evolutions in market expectations, and strive to avoid significant changes in other key value-driving regulatory levers during the first years of market functioning. The European Union should also actively track progress by Member States, conduct research and publish reports, in particular on spectrum technologies, market readiness and potential, and on assignment techniques, in order to ensure maximum dissemination and transparency of key learning.

In practice, there is always the probability that several Member States might diverge on a number of key issues. Where appropriate, the European Union could therefore also opt for a more pro-active scenario. Depending upon the situation, we would recommend the European Union to consider employing its regulatory tools in the following way:

- ¶ As a rule, the *harmonization* instrument would be the most appropriate to employ, as it allows to orient Member States towards the key issues in spectrum policy according to the five guiding principles, while maintaining sufficient leeway for the Member States with regard to effective implementation and development of their proper socio-economic policy.

- ¶ In parallel, *coordination* will definitely also be needed in certain areas. Topics to be taken into consideration include i.a., reducing the negative consequences of the sequential character of the bidding processes in and across Member States, and limiting the impact of license payments and coverage requirements during the initial years of market functioning, in line with demand take-up.
- ¶ Finally, *common measures* could also prove appropriate in certain circumstances, in particular in areas that fall within the intrinsic competences of the European Union such as e.g., conducting research and applying the new technology in its proper services, and addressing other specific regulatory levers.

RECOMMENDATIONS ARE BASED ON KEY LEARNING FROM THE 3G LICENSING PROCESS IN THE EU MEMBER STATES

The guiding principles that have been outlined in the previous section have been derived directly from the lessons learned from the 3G spectrum assignment processes that recently took place in the different Member States of the European Union. It should allow to avoid some of the distortions and undesired impacts that the 3G licensing processes already resulted in or is likely to have on the mobile telecommunications sector and on its different stakeholders such as operators and investors, equipment vendors, content providers, end users, and governments.

3G licensing allowed for three types of distortions to occur

Procedures and conditions of 3G licensing substantially differed across Member States. Their absolute value and interplay, both in and between Member States, obviously influenced the license values and affected the 3G licensing outcome, as each condition directly or indirectly influenced the business case for contenders.

However, only three elements in the market clearing regulation were really decisive for the ultimate market structure, the dynamics, the coverage commitments, and the license fee levels they strongly influenced. The 3G licensing outcome revealed in a number of cases three types of distortions, driven by the evolution of the market expectations over time, the number of licenses offered, and the design of the award method:

- ¶ The most prominent distorting factor was the impact that *evolution of market expectations* had over time. For the initial awards at the end of 1999 and the beginning of 2000, market expectations drove relatively high license fees and coverage requirements, and attracted a high number of potential candidates. As market sentiment significantly deflated over time, 3G spectrum awards in Member States that followed later in the

award sequence across the European Union resulted in relatively lower license fees and attracted a lower number of interested candidates.

- ¶ The second factor of distortion was *the number of licenses offered*. On average the Member States of the European Union allowed for one additional license compared to current 2G operators, active on the national mobile markets. This additional license influenced the number of potential candidates and stimulated competition among interested operators. It drove corresponding players' bids, and in addition substantially increased the competition potential on the national mobile markets going forward, in certain cases beyond market sustainability.
- ¶ Finally, also the *specific characteristics of the awards methods and the way they were designed* in the Member States pushed the operators' bids, as it significantly contributed to the creation of a "now-or-never" momentum in the industry. Characteristics that were instrumental in this regard were the sense of "one-off" character of the 3G licensing processes, the "prisoner's dilemma" in which incumbent 2G operators found themselves, and the sequential organization of the award process (via, in general, the multi-round nature of the auctions, and the organization of 3G licensing across the Member States over more than a two-year period).

3G licensing is creating significant transition problems in mobile markets while coping with demand-supply imbalances, in certain cases most probably requiring restructuring

In our assessment, the impact of 3G licensing concerns first and foremost the mobile markets where operators face the majority of transition problems, and have no choice but to make the best out of their situation.

As a direct consequence of the 3G licensing processes, substantial value was extracted from the mobile sector, both directly through high license fees in certain Member States, and indirectly through deflating stock prices and worsening debt ratings to which 3G substantially contributed. This has resulted in significant funding problems for several operators, and in a number of Member States has already led to delays in planned 3G network rollouts and application developments.

In addition, from a market perspective, 3G licensing substantially increased the 3G cost of supply compared to 2G, as the number of licensed operators and corresponding networks was potentially increased by almost 30%, and as high network coverage ratios in several Member States were committed to. As a result, a substantial imbalance arose between the 3G cost of supply and the expected

demand and potential revenues in a number of Member States. At the European level, 3G should on average generate during more than 10 years an EBITDA margin, similar to today's 2G margins, in order to cover the 3G cost of supply.

Obviously, the situation is not homogeneous across the European Union. Depending on projected market development scenarios, and allowed degree of network sharing and reduced coverage commitments, we anticipate anywhere between 2 and 12 of the Member States to still have an imbalance between 3G demand and supply beyond the duration of the 3G licenses. At the EU level, 3G is therefore likely to have a catalyzing effect on the ongoing trend of industry consolidation, pushing certain European players to delay rollouts or even withdraw from certain mobile markets.

Other stakeholders will also have to deal with the consequences of the big bet on 3G

The impact on the other stakeholder groups, such as vendors, content providers, end-users and governments, is indirect, but will still prove significant. They will all have to review downward their expectations with regard to 3G and, in particular, be more patient as to the development of the mobile markets in the European Union in the years to come:

- ¶ *End-users* will have to be more patient for the full range of new mobile data services and applications to enter the markets, and potentially and initially at relatively higher price levels. Governments might find fiscal income reduced, as financial returns of mobile operators could be more limited and pressure on mobile operations increases.
- ¶ *European vendors* will experience delays, shifts and reductions in 3G equipment sales, as operators are in the process of implementing measures to reduce their 3G capital expenditures, and as the mobile handset market becomes more diversified, allowing other players to enter the game. Vendors will most likely have to adapt their strategies, potentially by helping operators to reduce capital expenditures and by seeking other revenue sources, in particular, in other geographic markets, to ensure reasonable profitability targets.
- ¶ The effect of 3G licensing on *content development* will be predominantly indirect, as restructuring and reprioritization already started after the telecom and Internet bubble burst in the course of 2000. Startups and a significant number of media-related companies are under serious financial constraints in the years to come. Operators, seeking short-term profitability through successful applications, will probably take the lead in focused content applications and services.

¶ Finally for *governments*, 3G will most probably prove to be a mixed blessing. Several Member States received unexpectedly high license fees, shifting significant value away from the European telecom sector and creating a substantial funding burden in the communications sector. Where governments held stakes in incumbent operators, this bonus however has been, partially and for the time being, offset by lower capital market valuations of the operators in which they hold capital stock.

Through the licensing processes in the course of the last two years, all stakeholders in Europe have explicitly or implicitly put a big bet on the 3G technology. Considerable resources and funds have been committed to its rollout and development. For the years to come, a significant mortgage has thus been put on the mobile telecommunications sector in the European Union. Not only with regard to financials and profitability, but most probably also from the perspective of alternative mobile technologies trying to find their way to the market.

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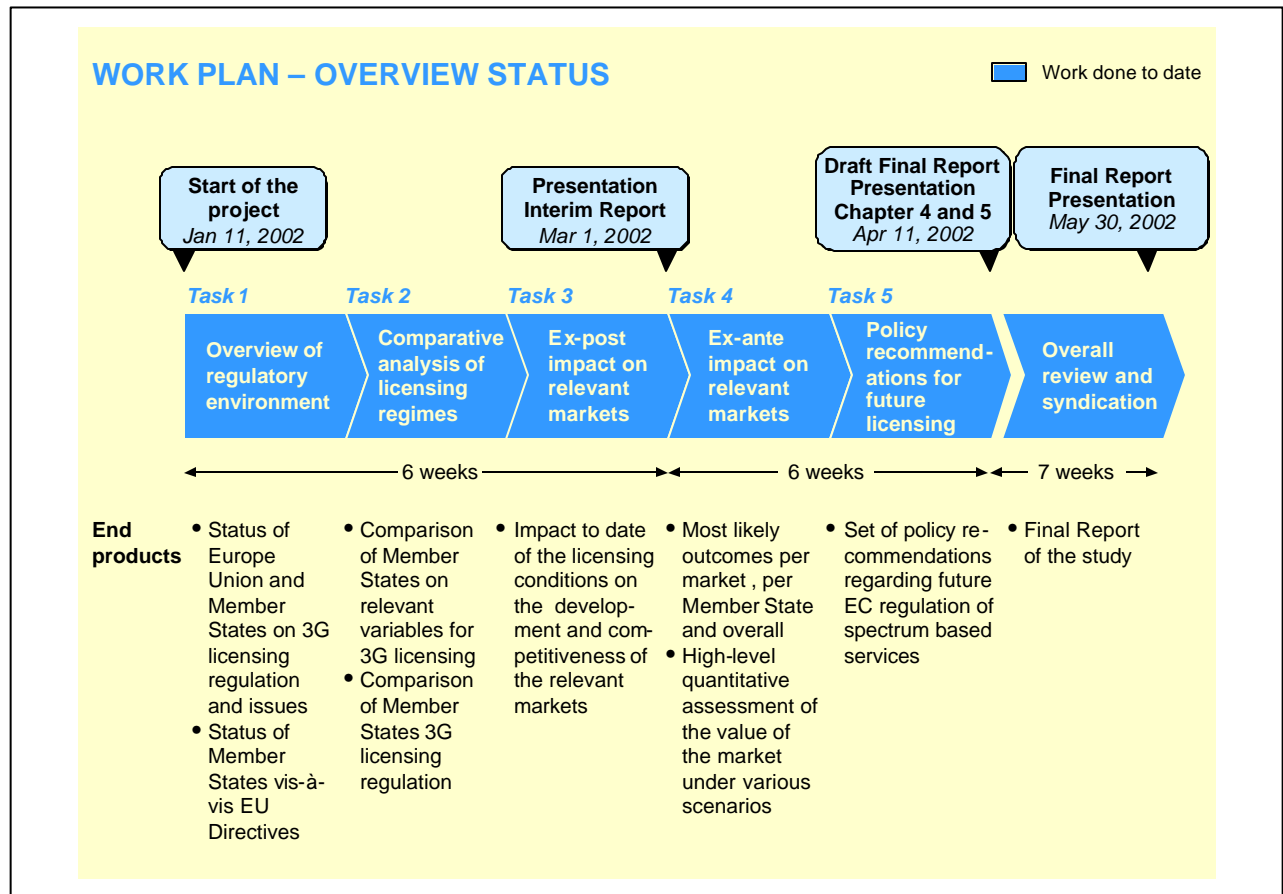
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Exhibit 1



Introduction

What regulatory lessons can be learned from the Third Generation Mobile Licensing Process in the European Union and what is its impact on the Mobile Communications sector? In this document, we formulate an answer to this question, based upon our detailed comparative assessment of 3G Licensing Regimes and their impact on the mobile communications sector in the Member States carried out between mid January and mid April 2002.

This Final Report is divided into five chapters which address the three tasks as defined in the Terms of Reference¹:

- ¶ The comparative analysis of the 3G license conditions in the Member States (addressed in the first two chapters of this Report).
- ¶ The impact of license conditions on the Internal Market and on the development and competitiveness of the mobile communications sector at national and European levels (analyzed in chapters three and four, addressing the impact to date and the likely future impact, respectively).
- ¶ The formulation of policy recommendations in view of future licensing exercises, in particular with reference to the possible advantages of and scope for coordination/harmonization of licensing methods and conditions at EU level, is discussed in the fifth chapter.

The Report's five chapters are as follows (Exhibit 1):

- ¶ **Overview of the Mobile Regulatory environment in the European Union and the Member States**

This first chapter briefly describes the context within which the 3G regulation regime took shape.

- ¶ **Comparative analysis of 3G licensing conditions in the European Union and the Member States**

The report lists each of the licensing conditions, and identifies the conditions with the largest impact on the evolution of the mobile sector.

¹ In particular the third section of the Terms of Reference

¶ **Assessment of the impact so far of licensing conditions on the Internal Market and on the development and competitiveness of the mobile communications sector at national and European levels**

The report looks at the relevant stakeholders and analyzes the changes in industry structure, conduct of different players, and performance so far.

¶ **Likely future impact of licensing conditions on the Internal Market and on the development and competitiveness of the mobile communications sector at national and European levels**

Based on additional research, the report anticipates the type and degree of changes in development the different stakeholders are likely to face, distinguishing between different countries.

¶ **Recommendations and Guiding Principles for future spectrum assignment in the European Union**

In this chapter, we draw conclusions from the 3G licensing regimes, put forward a number of key policy principles and develop specific recommendations for Member States and the European Commission, on how to optimally address the key policy issues around spectrum assignment for similar exercises in the future.

In these five chapters, you will find a textual elaboration of the key findings, as well as a number of exhibits that highlight the results of the key analyses or summarize the key logic and issues; all the footnotes related to these exhibits can be found in Appendix G.

This Report is based, i.a., on factual analysis, multiple market and regulatory benchmarking, and applying different methodological frameworks. Special attention was given to in depth interviews with major stakeholders such as Units of the European Commission directly involved in the study, telecoms incumbent and new entrant mobile operators, European vendors, National Regulatory Authorities, and international and European organizations involved in the 3G licensing process such as ITU², ETSI³, ETNO⁴, and GSM⁵ Europe.

In attachment to this report, you will find a number of appendices, explaining in more detail the methodologies used, and providing an overview of the sources consulted and the terminology used.

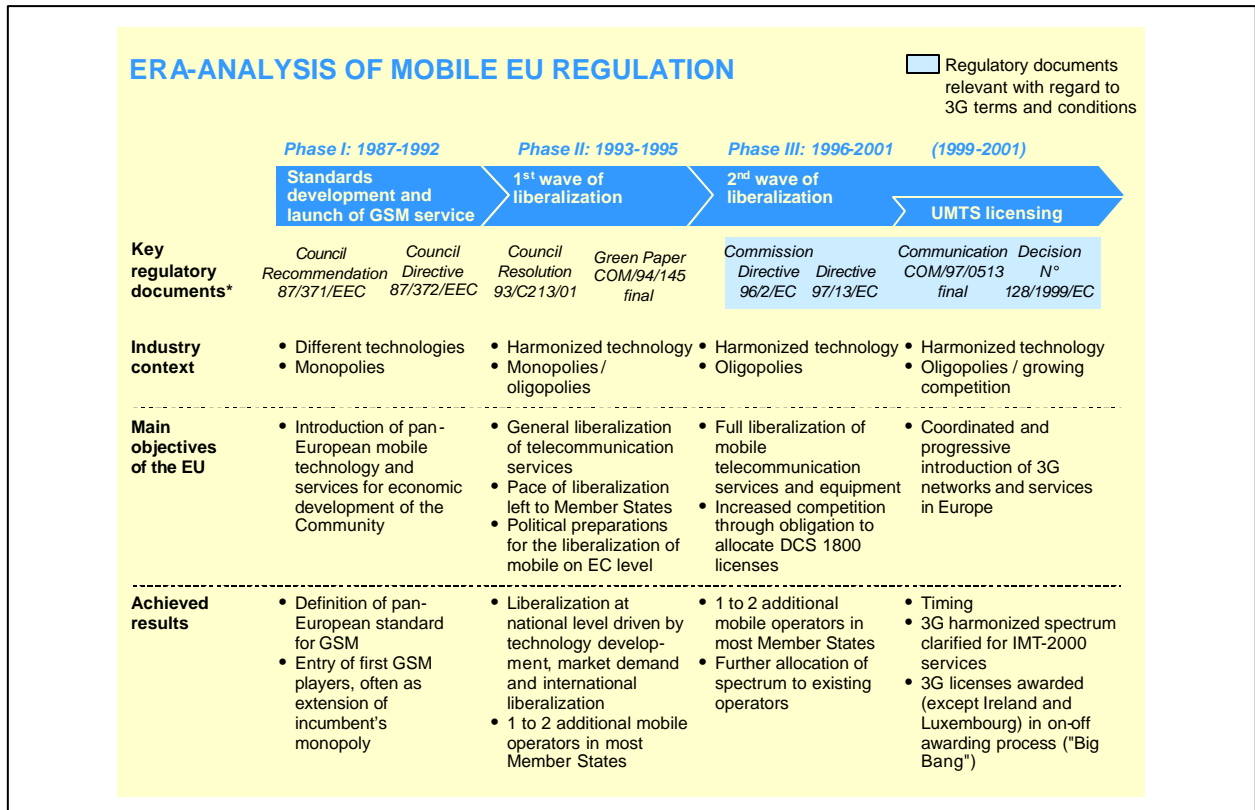
² International Telecommunications Union

³ European Telecommunications Standards Institute

⁴ European Telecommunications Network Operators' association

⁵ Global Standard for Mobile

Exhibit 2



Chapter 1: Overview of the mobile regulatory environment in the European Union and the Member States

In order to adequately address the comparative analysis of 3G license conditions in the Member States, this first chapter discusses the evolution of the EU regulatory policy with regard to mobile telecommunications, and evaluates the introduction at the EU and the Member State level of the regulation with regard to the third generation of mobile technology.

Footnotes referred to in the exhibits of this chapter can be found in Appendix G.

The Member States have distributed authorizations for mobile telephony since 1987. To avoid having these processes occur in a vacuum, and thereby risk destroy crucial stakeholder value, they have always been guided by regulatory frameworks and policies. These structures, set up at both the EU and the Member State level, were implemented to establish an optimal environment in which to introduce new technologies. Regulation for mobile services in Europe has been developed in stages. Regulation for the third generation mobile technology (3G) builds further on the results of 2G regulation.

1.1 EUROPE'S MOBILE REGULATORY POLICY OVER THE LAST 15 YEARS FALLS INTO THREE DISTINCT PHASES

Looking back at the development of the European Union and Member State mobile communications regulation over the last 15 years, three major phases can be identified ([Exhibit 2](#)); the first phase focuses on technological harmonization and standardization, while the second and third focused more on gradual liberalization of the mobile markets in Europe.

1.1.1 Phase one focused on technological harmonization and standardization

In the first phase (1987 – 1992), at the start of mobile technology, a regulatory framework was defined to ensure an efficient pan-European introduction of mobile technology and services. The economic development of the community would benefit from an efficient introduction of this new technology. The key regulatory

documents – 87/371/EEC: Council Recommendation of 25 June 1987⁶ and Council Directive 87/372/EEC of 25 June 1987⁷ - focused on ensuring technological harmonization and standardization within the GSM technology sector, in order to facilitate network deployment and services adoption. This approach resulted in the definition of a pan-European standard for GSM and the introduction of the first GSM players, most of whom considered these GSM activities as an extension of their incumbent activities.

1.1.2 Phase two and three focused more on liberalization

From 1993 to 1995, regulation entered a second phase: the first wave of liberalization. The EU chose to liberalize the market through regulation of market entry and functioning. Liberalization generates competition and competition drives development, quality and price of the services offered and thus allowing end-users, governments, shareholders, and vendors a more balanced share in the value creation of the telecommunications sector. The Council Resolution of 22 July 1993⁸, together with the Green Paper COM/94/145 final⁹ set out to develop a general but progressive liberalization of the telecommunications services without a priori focusing on the mobile market. This allowed all Member States to set their own pace within a general European trend towards liberalization as fostered by the European Commission. These regulations paved the way to further liberalization of the mobile telecommunication services on an EU level. This first wave of liberalization resulted in a liberalized market at national level and the gradual introduction of one to two new entrants in most Member States.

The second wave of liberalization began in 1996 with the third phase of EU and Member State regulation of the mobile sector (1996-2001). The main objectives of this third phase were to realize full liberalization of mobile telecommunications services and equipment production, and a further increase in competition (cf. Commission Directive 96/2/EC of 16 January 1996 amending Directive 90/388/EEC¹⁰ and Directive 97/13/EC of the European Parliament and of the Council of 10 April 1997¹¹) through the obligation to allocate DCS1800¹² licenses.

⁶ “87/371/EEC: Council Recommendation of 25 June 1987 on the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community”, OJ L 196, 17/07/1987, p. 0081-0084

⁷ “Council Directive 87/372/EEC of 25 June 1987 on the frequency bands to be received for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community”, OJ L 196, 17/07/1987, p. 0085-0086

⁸ “Council Resolution of 22 July 1993 on the review of the situation in the telecommunications sector and the need for further development in that market”, OJ C 213, 06/08/1993, p. 0001-0003

⁹ “Towards the Personal Communications Environment: Green paper on a common approach in the field of mobile and personal communications in the European Union”, COM/94/145 final

¹⁰ “Commission Directive 96/2/EC of January 16 1996 amending Directive 90/388/EC with regard to mobile and personal communications”, OJ L 020, 26/01/1996, p. 0059-0066

¹¹ “Directive 97/13/EC of the European Parliament and of the Council of 10 April 1997 on a common framework for general authorizations and individual licenses in the field of telecommunications services”, OJL 117, 07/05/1997, p. 0015-0027

Again, one to two additional mobile operators entered the market in most Member States and the remaining spectrum was further allocated to existing operators.

Through this regulatory process, the EU succeeded in establishing a common technological base on which the market could further be developed. By gradually opening the market, additional operators could enter the sector, thereby progressively enhancing competition. By focusing both on market development and market competition, the EU was able to obtain a balanced distribution of the total market value among all stakeholders.

1.2 THE 3G LICENSING EXERCISE TARGETED BOTH SECTOR DEVELOPMENT AND COMPETITION

With the development of the third generation of mobile technology, a new regulatory framework was required to create - in the fully liberalized market - a balanced environment, favorable to a proper introduction of 3G for all stakeholders.

1.2.1 Thorough preparation preceded the UMTS¹³ licensing regulation

To prepare this phase of regulation, the European Commission actively contributed to the UMTS Task Force and assisted in the creation of the UMTS Forum. The UMTS Task Force¹⁴ was driven by three objectives:

- ¶ Provide 3G services to a mass market at low cost.
- ¶ Attain high growth of national economies.
- ¶ Realize a trans-European global network with homogeneous infrastructure¹⁵.

The Task Force formulated considerations and views on the development of a European strategy with regard to the introduction of 3G technology. In addition, the Task Force identified the need for and brought about the establishment of the UMTS Forum. Vendors and telecom operators took up an important role in the Forum¹⁶. In the UMTS Forum, a need was felt for European harmonization of licensing in order to be able to repeat the success of the Council Directive 87/372/EEC of 25 June 1987. The goal of the Forum was to contribute to the

¹² Digital Cellular System operating in the 1800MHz band

¹³ Universal Mobile Telecommunications System

¹⁴ Including representatives from the European digital mobile industry, the European Commission and ETSI

¹⁵ I.a., confirmed during the interview with ETSI representatives

¹⁶ In comparing the introduction of 3G with GSM, interviews with the different stakeholders (i.a., operators, National Regulatory Authorities, and vendors) pointed towards a driving role by, especially, the vendors

elaboration of European policy for mobile and personal communications based on an industry-wide consensus. Very soon the Forum enjoyed strong support from the industry and several governments.

In parallel, the European Commission organized a broad public consultation, inviting Member States and sector players to comment on core issues linked to the further development of mobile and wireless systems (cf. *Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions* (COM/97/0217 final)¹⁷).

The results of the consultation rounds were published in the Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the regions (COM/97/0513 final)¹⁸, and unveiled the need for urgent action on the side of authorities to:

- ¶ Provide upfront clarification on the licensing regime that was going to be used.
- ¶ Guarantee the availability of the radio frequency in due time.

There was an almost unanimous view of Member States that, when successful, these actions would create favorable conditions for the development of UMTS and therefore help preserve the competitiveness of European industry.

Other important messages generated through the public consultation rounds were:

- ¶ The development of UMTS should be market-led with industry playing a predominant role and regulators having limited impact on market forces.
- ¶ Basic customer interests should be ensured, e.g., Europe-wide roaming for mobile multi-media services, guaranteeing the same pan-European service as GSM does for voice communication.

From this preparatory work, the European Commission developed a list of recommended actions addressing international issues, regulation, frequency allocation, technology standardization, and research and development (COM/97/0513 final). With this Communication, the European Commission confirmed that existing rules on licensing and interconnection would apply also to UMTS activities, in particular regarding: (1) the limitation of the number of licenses, (2) the implementation of ETSI standards where they exist, and (3) the

¹⁷ “*Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on the further development of mobile wireless communications – Challenges and choices for the European Union*”, COM/97/0217 final

¹⁸ “*Communication from the Commission to the Council, the European Parliament, the economic and social Committee and the Committee of the regions – Strategy and policy orientations with regard to the Further development of mobile and wireless communications (UMTS) – Outcome of the public consultation and proposals for creating a favourable environment*”, COM/97/0513 final

Exhibit 3

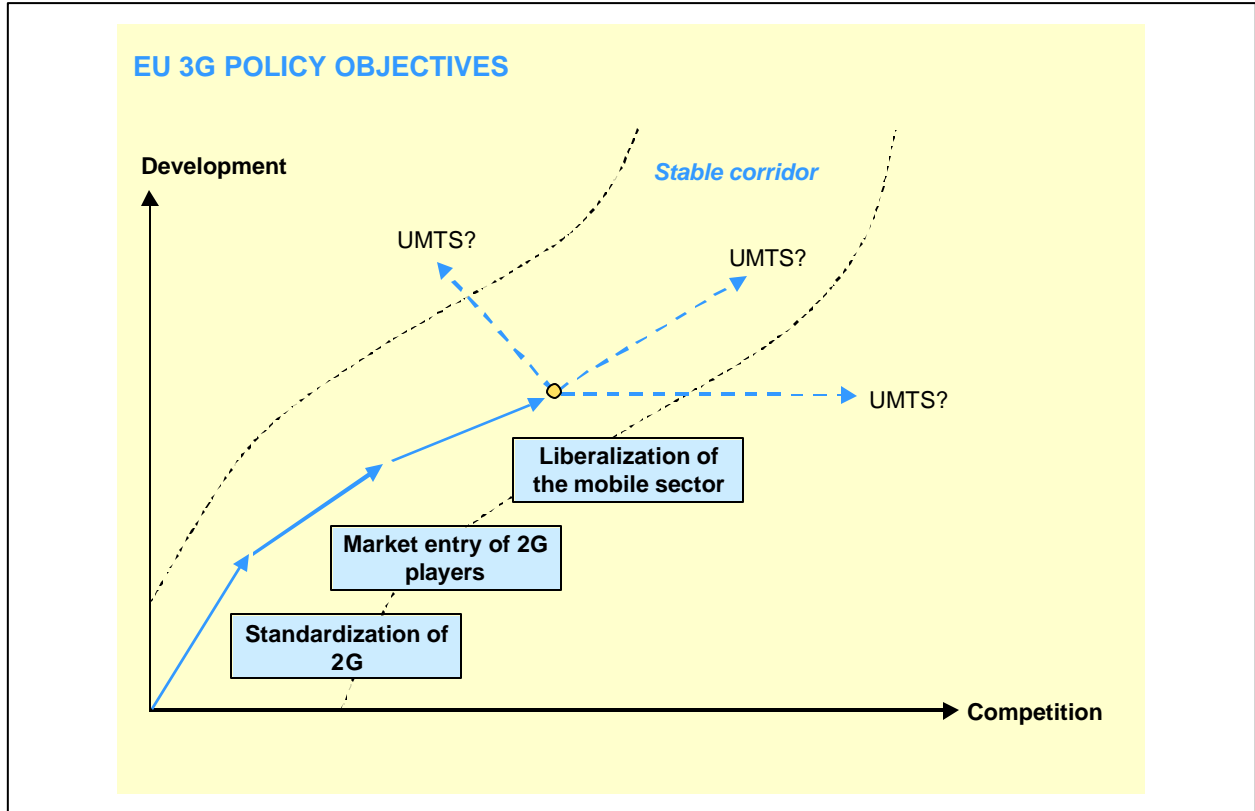
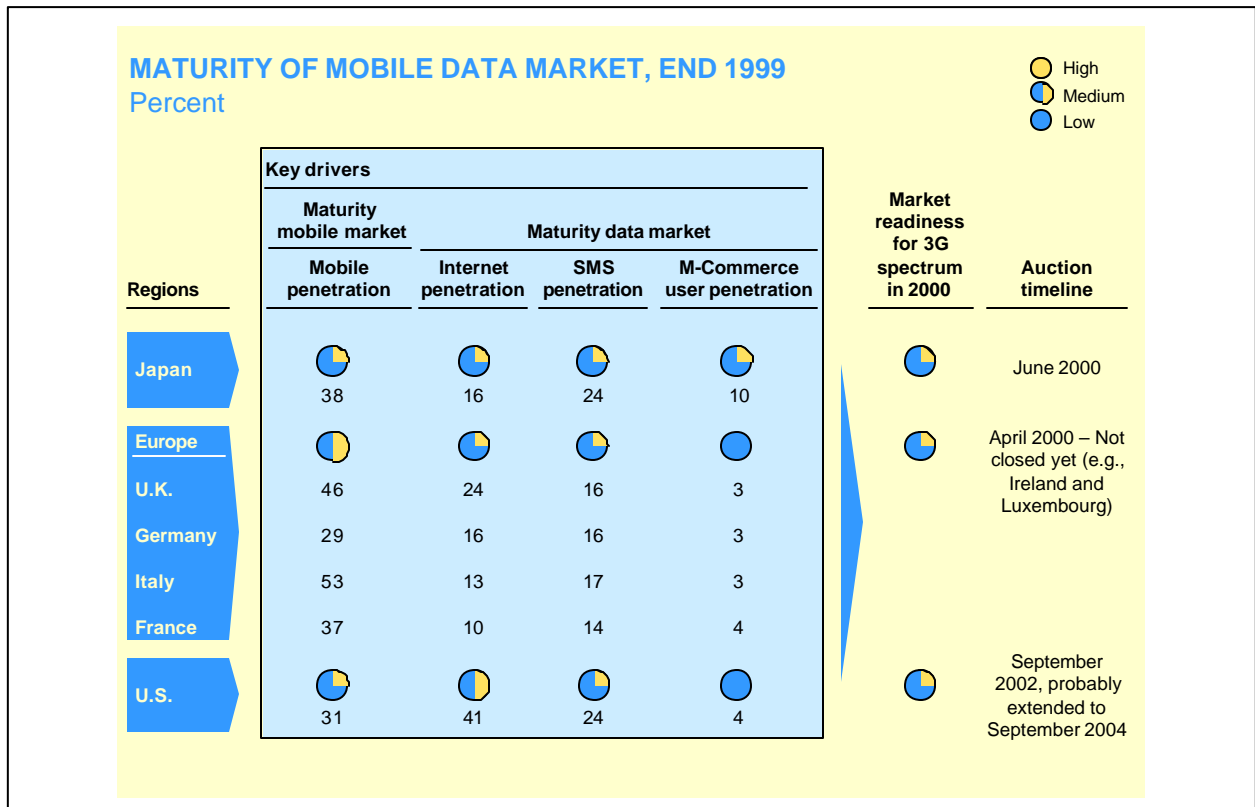


Exhibit 4



principle that current operators will not automatically be granted UMTS licenses or excluded from bidding for such licenses.

1.2.2 The European Union focused on both development and competition

From the EU telecom objectives listed in Decision No. 128/1999/EC of the European Parliament and of the Council of 14 December 1998¹⁹, it is clear that with 3G the EU focused (as it had done with 2G) on both development and competition. Market development was defined as the development of the telecommunications industry/ technology and of the information society as a whole including the level of employment, while sustaining the worldwide leadership of the EU in mobile technology and services. At the same time, the EU had expressed the desire to create a sufficient level of competition, allowing for a dynamic market and broad competitive service offering. The aim of Decision No. 128/1999/EC of the European Parliament and of the Council of 14 December 1998 “shall be to facilitate the rapid and coordinated introduction of compatible UMTS networks and services in the Community on the basis of Internal Market principles and in accordance with commercial demand” (Article 1)²⁰.

Developing the market along these two axes would avoid the pitfalls of market instability caused by focusing only on the market development or on competition (Exhibit 3 and Appendix B).

1.2.3 The specifics imposed by the UMTS Decision²¹ were limited

The specific conditions and procedures imposed by Decision No. 128/1999/EC of the European Parliament and of the Council of 14 December 1998 were quite limited: they clarified the 3G standard issues and process and set a timeframe by which the licensing conditions needed to be clarified and 3G services introduction made possible in the Member States.

This timeframe (2000-2002) was determined on the basis of the recommendations that resulted from the public consultation, the 3G policy in other parts of the world (Japan and US), the booming 2G mobile penetration in all EU Member States and the take-off of fixed-line Internet penetration (Exhibit 4). But that Decision left a lot of room for each Member State to fill in the timeframe as desired. Whereas

¹⁹ “Decision No. 128/1999/EC of the European Parliament and of the Council of 14 December 1998 on the coordinated introduction of a third-generation mobile and wireless communications system (UMTS) in the Community”, OJ L 017, 22/01/1999, p. 0001-0027

²⁰ These objectives are reflected at the Member State level. When interviewed, National Regulatory Authorities stressed out that government objectives encompassed areas such as having efficient spectrum allocation and realize full economic value, having an open market for next generation technology, ensure sufficient, better, and sustainable competition and being at the forefront of technology

²¹ Decision No. 128/1999/EC of the European Parliament and of the Council of 14 December 1998

with 2G a gradual rollout was imposed, 3G regulation opted for more of a ‘big bang’ approach that allowed Member States to award multiple licenses to existing or new players almost immediately and indifferently to whether or not a stable 3G technology base was in place.

Not only on the issue of timing but also on the issue of harmonization and unification of the market, a lot of leeway was granted to the individual Member States. Member States were expected to:

- ¶ Coordinate their own approach to enable compatible types of UMTS systems in the Community (Article 3).
- ¶ Encourage organizations providing UMTS networks to negotiate among themselves cross-border roaming agreements to create seamless Community-wide service coverage (Article 4).

In the past, detailed harmonization of policies and regulation at European level with regard to spectrum assignment were most of the time absent, i.a., hindered by a reluctance of the Member States to accept constraints on their sovereignty in disposing of national assets. The start of the 3G-assignment process in general followed the same path. The EU had to leave a lot of room to allow for the specific interpretation and/ or implementation of Member States. The fact that more coordination and harmonization of licensing conditions and procedures can be useful and is often time crucial to ensure an undistorted single market is still not a widespread conviction.

Chapter 2: Comparative analysis of 3G licensing conditions in the European Union and the Member States

In accordance with the Terms of Reference, in this chapter we analyze the differences of 3G clearing mechanics and license conditions across the Member States of the EU and identify the key issues.

Footnotes referred to in the exhibits of this chapter can be found in Appendix G.

In Appendix C, we provide an overview of all licensing and network obligations data, which have been gathered from the official Member State 3G licensing regulation, and validated by the National Regulatory Authorities. This data has been used extensively for our comparative assessment of the licensing conditions across the Member States of the European Union.

2.1 OUT OF THE WIDE VARIETY OF LICENSING CONDITIONS, ONLY A FEW PROVED TO BE KEY TO THE 3G OUTCOME

The procedures and conditions applied with regard to 3G licensing differ substantially across the Member States. Their absolute value and interplay, both in and between Member States, obviously influenced the license values and thereby affected the outcome of the process of awarding 3G licenses, as each condition directly or indirectly influenced the business case for the different contenders.

It has become clear, though, that only three components in each Member State were decisive for the market structure and dynamics, and hence have influenced the outcome in the 3G mobile markets in terms of coverage commitments and license fee levels. The 3G licensing outcome revealed in a number of cases three types of distortions, driven by the evolution of market expectations over time, the number of licenses offered, and certain specific characteristics of the design of the award methods used.

The 3G licensing outcome revealed a number of distortions in the licensing processes, both in and between the Member States, negatively impacting the Internal Market. We have distilled the drivers for these distortions to the following

Exhibit 5

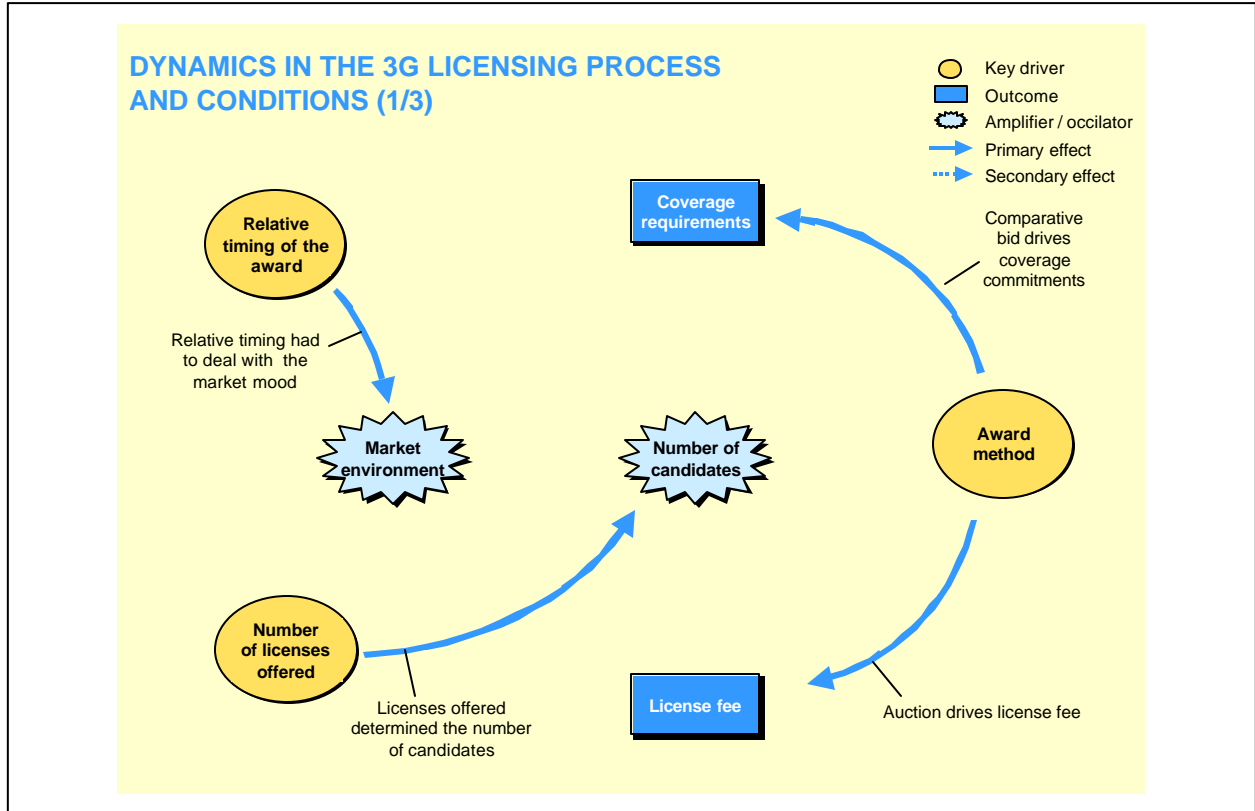
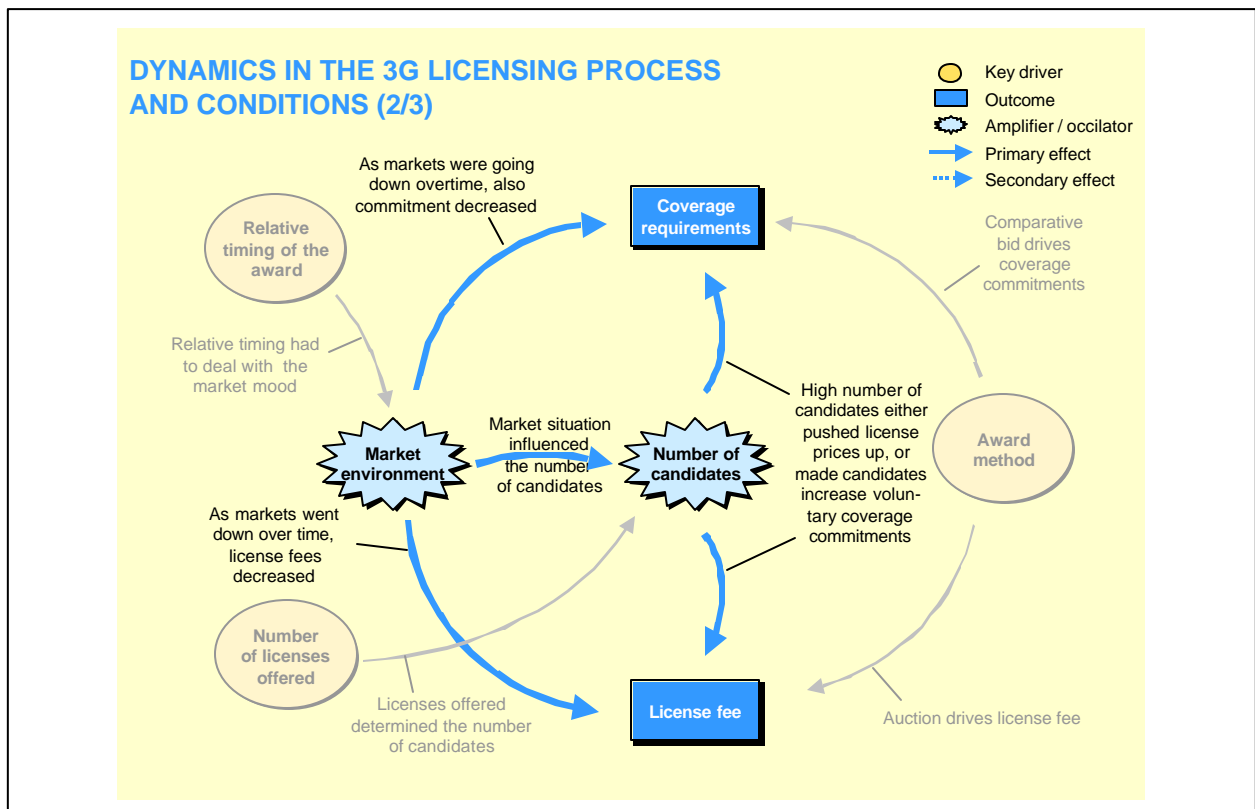


Exhibit 6



three: (1) market expectations over time, (2) the number of licenses offered, and (3) certain specific characteristics of the award methods used (Exhibit 5):

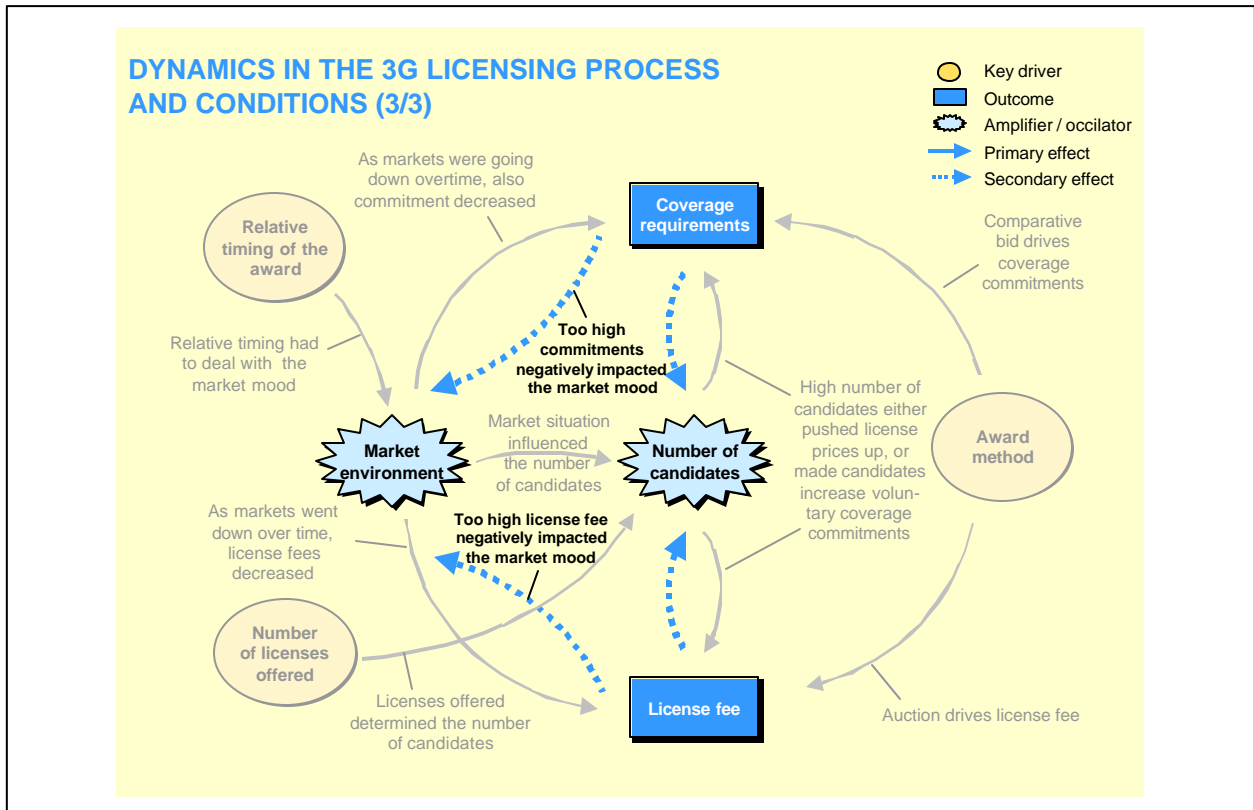
- ¶ The most prominent distorting factor was the *impact that market expectations had over time*. For the initial awards at the end of 1999 and the beginning of 2000, market expectations drove relatively high license fees and coverage commitments, and attracted a high number of potential candidates. As market sentiment deflated over time, 3G spectrum awards in Member States that followed later in the award sequence across the EU, resulted in relatively lower license fees and attracted a lower number of interested candidates.
- ¶ The second factor of distortion was the *number of licenses offered*. On average Member States allowed for one additional license compared to the number of current 2G operators. The availability of an additional license influenced the number of potential candidates was a key component in stimulating competition among interested operators, and driving players' bids up. In addition, it substantially increased the competition potential on the mobile markets²².
- ¶ Finally, also the specific *characteristics of the awards processes* in the Member States contributed significantly to creating a "*now-or-never*" *momentum*, again pushing bids up. Key components hereto were the seemingly 'one-off' character of the 3G licensing, the prisoner's dilemma²³ in which incumbent 2G operators found themselves, and the sequential organization of the award process (both via the, in general, multi-round nature of the auctions applied by Member States, and the fact that 3G licensing was organized across the Member States over more than a two-year period).

The above indicated three components played a key role in shaping two major outcomes of 3G licensing, i.e., the coverage obligations and license fees, players were willing to commit to. They were a decisive factor in the number of candidates that showed up and the capital environment during a particular award process (Exhibit 6). As market expectations gradually deteriorated over time, also

²² In addition, we will analyze and discuss in the fourth Chapter that in certain occasions, the cost of supply will go beyond sustainability of the national mobile market in the corresponding Member State

²³ In this Chapter, we will further elaborate on the issue of the prisoner's dilemma. It is a phenomenon that can occur, in particular when a new technology and new spectrum is introduced on an existing market. In the case of 3G licensing, in assessing the value of 3G spectrum offered, existing operators were willing to include (a part of) the valuation of their current 2G operations, as they considered the risk of losing 2G operations and profitability in the mid-term, in case they would not be able to provide 3G services to their customer base. Customers, seeking 3G-type services, would indeed be tented to leave the uniquely 2G operator for a 3G operator, able to provide both 2G, 2.5G and 3G-type services. This would substantially negatively impact the 2G operator's profitability. Despite uncertainties about the 3G technology, availability, its applications and successful services, this prisoner's dilemma contributed to the fact that incumbent operators, in a number of cases, may end up bidding more than their business case standalone would lead them to. As other candidates were obviously trying to enter the market, they had to match these bids

Exhibit 7



the attractiveness for the interested operators and their financial possibilities decreased, resulting in decreasing numbers of potential candidates, and reducing license fees and coverage commitments. In addition, the high license fees and high coverage commitments resulting from the assignment processes in the initial Member States also negatively impacted the market mood. Key driver hereby was that the markets were extrapolating the results for the awards in the subsequent Member States, and started to doubt the feasibility of the high expectations in the 3G business case (Exhibit 7). Similarly, potential candidates will decide not to participate or withdraw from assignment processes in later subsequent Member States when it became clear to them that fees and/or commitments wouldn't be achievable for them.

2.2 THE THREE KEY DRIVERS ARE THE TIMING OF THE AWARD PROCESS, THE NUMBER OF LICENSES OFFERED, AND THE CHARACTERISTICS OF THE AWARD

2.2.1 Market expectations over time impacted the licensing outcome

Member States that awarded licenses early in the EU licensing timeframe, operated in a more favorable macro-economic environment, with high initial expectations and a high level of interest by many players. This resulted in higher license prices²⁴. Member States that awarded licenses at a later stage had to organize their awarding process in a more 'skeptical' and 'downturn' environment. Over time this resulted in a distortion between Member States as fewer candidates showed up and spectrum valuation decreased. As such, this distortion might have had a negative influence on the development of the Internal Market. It is, of course, only with the benefit of hindsight that the impact of this condition has become clear.

In addition, the time span of the award process per Member State between the fixing of the licensing conditions and the deadline for applications resulted in some cases, in substantial changes in the market expectations. The situation of France illustrates this: even though four new 3G licenses were being offered, only two candidates went through the whole selection procedure the first time around.

²⁴ Interviews with stakeholders and international bodies (e.g., ITU, National Regulatory Authorities, and operators) indicate that in the beginning phase of the 3G assignment across the EU, the resulting license fees should be considered high

2.2.2 The number of licenses determined how much supply was added

The number of 3G licenses awarded per Member State, given its size, is a major criterion as it has the most direct impact on the size of the business opportunity that existing 2G participants and potential new entrants are likely to capture²⁵.

In addition, in most of the Member States, at least one additional 3G license was offered compared to the incumbent 2G mobile operators. This had a stimulating effect in the award process on competition amongst interested operators, driving the corresponding bids and potentially substantially increasing the competition level on the mobile markets in the Member States.

During the initial years of market functioning, the N+1 approach towards the number of licenses offered in general by the Member States, will have an additional effect. In particular compared to current 2G operations, it automatically increases the cost of supply on each national mobile market. As we will further elaborate in chapter four, in the occasions where this approach will lead to an over- or undersupply on the corresponding national market, painful market transition costs, delaying market development and technology introduction, will most probably be the result. Consequently, development of the corresponding national markets and of the Internal Market will most probably be negatively impacted.

2.2.3 The award method created a “now-or-never” momentum

Although our analyses demonstrated that the award method was an important driver of the 3G licensing outcome, the key differentiation as such was not ‘auction’ vs. ‘comparative bid’. More impact was identified from the degree ‘one-off’ character of the licensing exercise, the presence to a certain extent of a ‘prisoner’s dilemma’ for the existing mobile operators, and the sequential organization of the award process itself²⁶:

- ¶ The *‘one-off’ character* of the award approach contributed to a ‘now-or-never’ mindset that there would not be a second chance to obtain a 3G license in a reasonable time period as the new technology application and service might have already reached maturity by the time a second round of licenses would be awarded.

²⁵ This was clearly reflected in the interviews with major stakeholders such as operators and National Regulatory Authorities

²⁶ In addition, interviews with operators and National Regulatory Authorities revealed that operators would have hesitated to indicate that 3G valuations might be potentially high, as this action could have negatively impacted their valuation on the capital market. This could have been especially the case during the initial phase of assignment processes across the EU

- ¶ In addition, a *prisoner's dilemma* for the existing mobile operators also came into play. It contributed to an environment where existing operators were pushed towards acquiring a 3G license in order to safeguard their current 2G operations. Hereby they were aiming to avoid the risk that, without the availability of the new technology in their mobile applications, they would run out of a compelling future commercial offer in the mid-term.
- ¶ Finally, the *sequential character* of the award method used (cf. in general, the multi-round character of the auctions in several Member States, and the sequential 3G awarding across the different Member States) also left significant leeway for game theory to enter into the award process. Relative positions and bidding strategies of operators were therefore influenced, both by the strategies of the competitors, the outcome of the previous award process and expected outcome of subsequent awarding in other Member States.

As explained in the beginning of section 2.1, market expectations over time, the number of licenses and characteristics of the award method, drove a number of distortions in the outcome of 3G licensing, both in and between the Member States and made the outcome to a certain extent unpredictable to the operators involved. In this regard, the effect in auction and comparative bid were similar. We identified that these three outcome drivers thus led to relatively higher license prices (in particular in auctions) and coverage commitments (in particular in comparative bids). As such, players with more capital and/ or stronger starting positions²⁷ were favored.

2.2.4 Other criteria influenced the outcome only to a lesser extent

It is remarkable that the three above-mentioned key drivers of a number of distortions in the 3G outcome all relate to the award process and market clearing mechanisms. As such, they do not contain license conditions that determine the way the 3G licenses have to be used. Nevertheless, they will be key to market functioning in the coming three to five years as they have set the environment in which the market will operate.

Several other criteria have been identified relative to market functioning and the operation of the license: extra spectrum for new entrants, payment conditions, license duration, spectrum size, infrastructure sharing, roaming and access rights. Several of these are quite important to the likely development of the market. Most

²⁷De facto, a difference between the impact of the license fees and the coverage commitments may remain: where license fees to date predominantly has been paid, the impact of coverage commitments in several Member States will only occur in later years and could be the object of policy debate

Exhibit 8

Member States	Award method		Number of licenses offered: N + ...	Payment modality***		
	Auction	Comparative bid		Immediate	Installments	Percentage of revenues
Austria	✓		0-2	✓		✓
Germany	✓		0-2	✓		
Italy*	✓		1	✓	✓	
UK*	✓		1	✓	✓	✓
Belgium	✓		1	✓		
Netherlands	✓		0	✓		
Greece	✓		1		✓	✓
Denmark	✓		0		✓	
Spain		✓	1		✓	✓
Ireland		✓	1		✓	
Portugal		✓	1	✓		
France		✓	1	✓		✓**
Sweden		✓	1			✓
Finland		✓	1		✓	
Luxembourg		✓	2		✓	✓

of these levers influence only to a lesser extent short-term cash needs and profitability outlook of the business.

Introduction of periodical installments and infrastructure sharing both reduce short-term pressure on cash or capital expenditures, but their impact is expected to be an order of magnitude smaller than the three main drivers mentioned before. Levers such as roaming and access rights are expected to have a very low impact on the short term. Extra spectrum to new entrants was also not perceived as a major lever on the business case as no network saturation is expected on the short term and 2G operators with 3G networks still have the 2G networks they can re-use. License duration did not appear either as a major lever because there is no direct correlation between the duration and the license prices that were offered. As the impact of these levers was easier for the parties involved to predict and assess and was therefore generally taken into account in the candidates' business plans, their impact on the short term development is limited.

2.3 DIFFERENCES IN MARKET CLEARING MECHANISMS HAVE DRIVEN DIFFERENT OUTCOMES

In driving the development of the market, Member States designed the award so that it, to a certain extent, reflected a preference for either competition or for the qualitative development of 3G on the mobile market.

2.3.1 Several Member States opted more for development, others for development and competition

In most cases, Member States that explicitly wanted to stimulate and enhance competition have opted for market clearing conditions with a high likelihood of significantly altering the market structure of the current 2G industry. In general, these countries used auctions to award licenses, because with auctions the financial power and health of the candidates and the attractiveness of the business case determine who wins the licenses. These countries also typically aim at fostering explicitly the market entry of new operators. This is realized through offering more 3G licenses than the number of existing 2G operators, enhancing not only competition on the market but also during the award. Finally, these countries focused on immediate payments to increase the commitment of the licensees involved ([Exhibit 8](#)).

Award designers in Member States that went more in the direction of market development, adopted in most cases the comparative bid process as this allows more the emphasis on the qualitative aspects of the development, such as coverage. Typically the number of licenses offered will remain equal to the existing number of 2G licenses plus one. Payment will often happen through

Exhibit 9

Member States*	Effective number of mobile operators before 3G licensing 2G licenses	Effective number of mobile operators after 3G licensing, end of 2001**			Total number of mobile network operators after 3G licensing	Net effect
		2G operators with 3G license	3G new entrants	Remaining only 2G operators		
• Austria	4	4	2	0	6	N+2
• Belgium	3	3	0	0	3	N
• Denmark	4	3	1	1	5	N+1
• Finland	4	4	0	0	4	N
• France	3	2	0	1	3	N
• Germany	4	4	2	0	6	N+2
• Greece	3	3	0	0	3	N
• Italy	4	3	2	1	6	N+2
• Netherlands	5	5	0	0	5	N
• Portugal	3	3	1	0	4	N+1
• Spain	3	3	1	0	4	N+1
• Sweden	3	2	2	1	5	N+2
• U.K.	4	4	1	0	5	N+1
Total:	47	43	12	4	59	

installments or percentage of revenue, as the applicants' commitment (e.g., on coverage) is secured in the license conditions.

2.3.2 The overall result was a major increase in the potential number of operators

The award processes across the Member States resulted de facto in a substantial increase²⁸ in competition-potential on the mobile markets in the European Union as the number of licensed network operators increased by 30%. At the end of 2001, the number added up to 43 2G operators, 12 3G operators, and four 2G operators without a 3G license. This amount was driven by the increase of the number of 3G licenses compared to the current 2G mobile operators on the markets²⁹, increased by the fact that not all 2G incumbents operators were able to obtain a 3G license, nevertheless remaining on the corresponding mobile market with their 2G operations (Exhibit 9).

This substantial increase in potential competition will not necessarily result in greater 3G service competition on the mobile market. In a number of cases, it is clear that the 'winners' of the 3G licensing process had to invest substantially to obtain the 3G license, and as a result, they might have to reconsider their rollout plans of 3G infrastructure and services due to insufficient finances. This will especially be analyzed in chapter four where the likely future impact on the mobile market will be investigated.

We can observe the difference between the licensing conditions across Member States by looking at each of the market clearing conditions that were specified; we distinguish five groups.

2.3.3 The award method was evenly split between auctions and comparative bids

The different types of award methods were evenly spread across Member States. Auctions were organized in seven Member States (Austria, Belgium, Denmark, Germany, Greece, the Netherlands and the United Kingdom) while comparative bids took place in seven others (Finland, France, Ireland, Luxembourg, Portugal, Spain and Sweden). Italy opted for a hybrid approach. The award method, we believe, had a dual impact.

Firstly, auctions have led to substantially higher license fees as compared to comparative bids. In total, auctions have driven EUR 103.9 billion license fees compared to the EUR 5.2 billion from the comparative bids.

²⁸ Approximately a 30 percent increase in the total number of 2G and 3G operators, compared to current 2G operators, growing from 47 to 59 licensed mobile operators

²⁹ On average, N+1 licenses

Exhibit 10

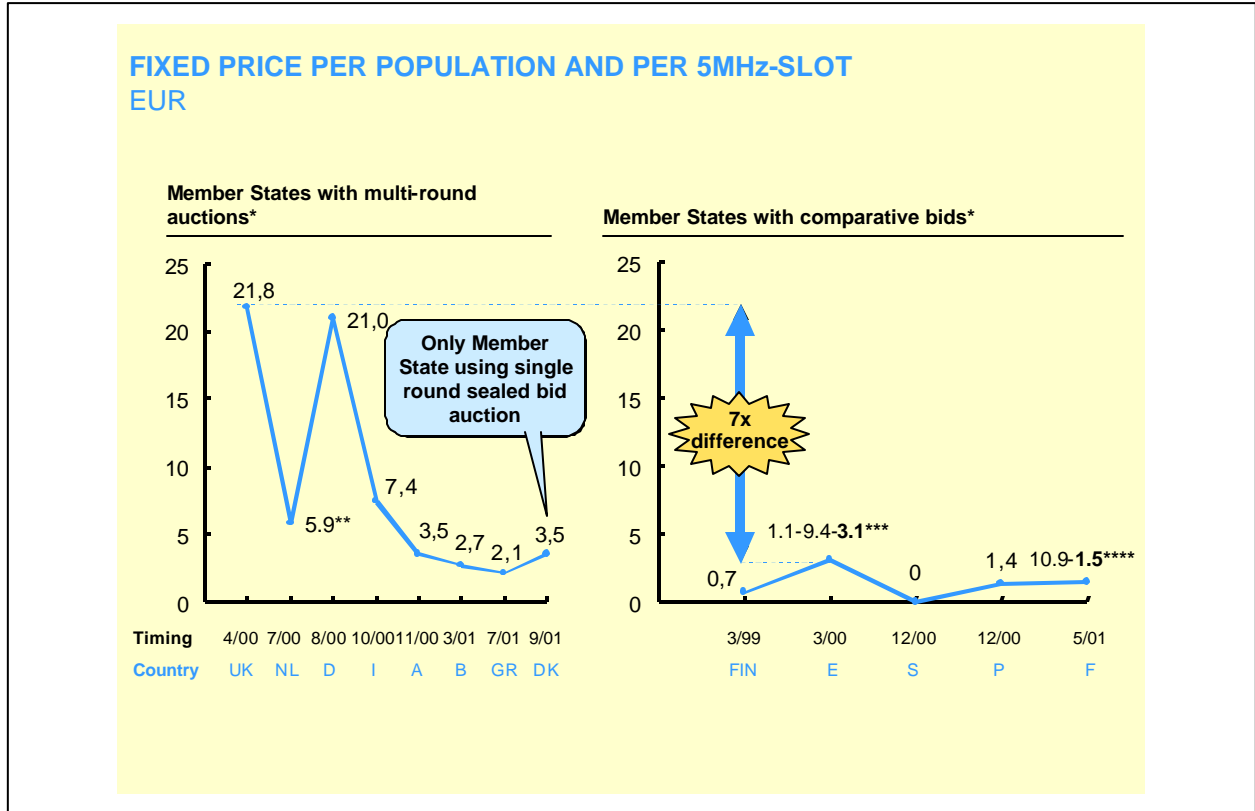


Exhibit 11

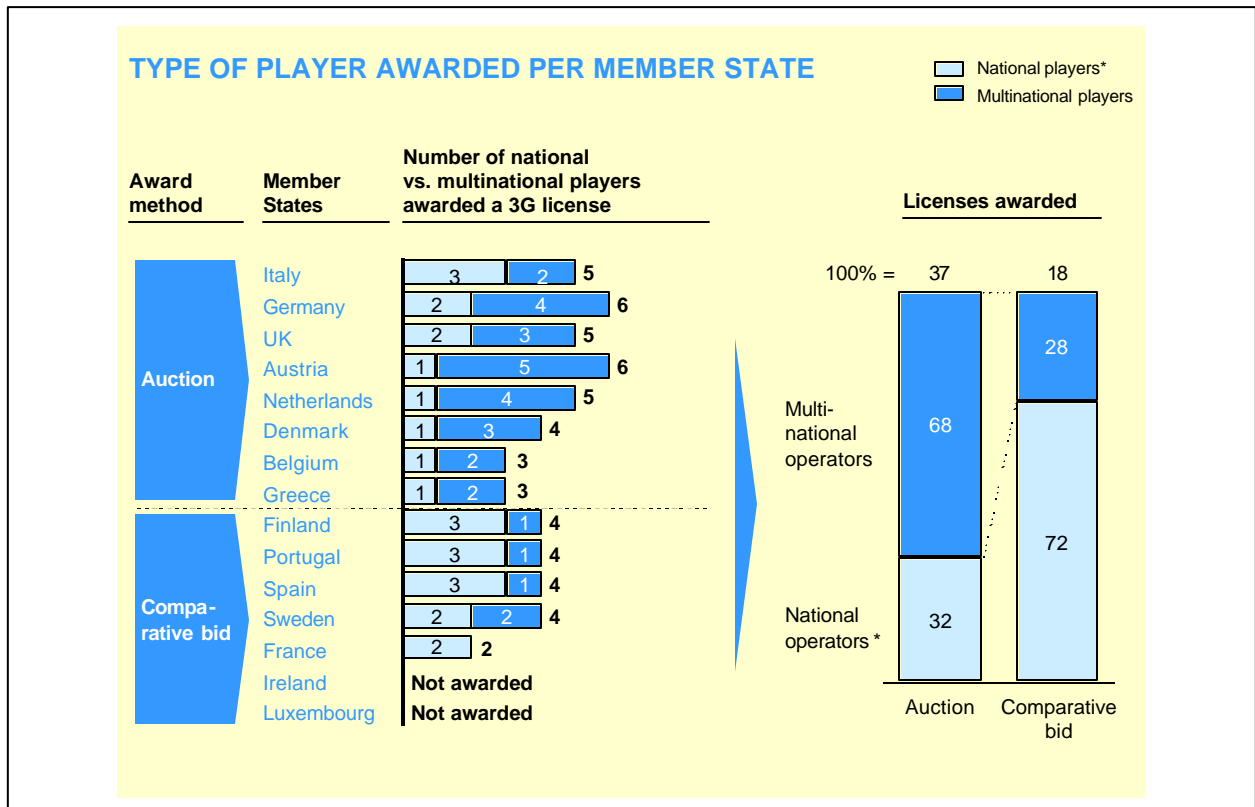


Exhibit 12

NUMBER OF LICENSES PER MEMBER STATE						
Award method	Member States	3G licenses offered vs. 2G Licensees at moment of 3G licensing		Number of 2G operators at moment of 3G licensing	Number of 3G licenses offered	Number of 3G licenses awarded
Auction	Belgium	N+1	3		4	3
	Italy	N+1	4		5	5
	U.K.	N+1	4		5	5
	Denmark	N	4		4	4
	Netherlands	N	5		5	5
	Austria	N / N+2	4		4-6	6
	Germany	N / N+2	4		4-6	6
	Greece	N+1	3		4	3
Comparative bid	Luxembourg	N+2	2		4	N/A
	Finland*	N+1	3		4	4
	France	N+1	3		4	2
	Ireland	N+1	3		4	N/A
	Portugal	N+1	3		4	4
	Spain	N+1	3		4	4
	Sweden	N+1	3		4	4

□ Difference in outcome versus planned process

Exhibit 10 shows the evolution, over time, of the 3G license fees per population and per 5MHz slot, paid in the different Member States with auctions and with comparative bids. The fees cover the fixed prices including annual administrative and spectrum fees, not adjusted for the net present value of installments. They do not include variable fees imposed by some Member States as a function of the revenues. With the exception of the Netherlands and more recently of Denmark, the license fees from auctions went down over time. Except for the latest adjustments in Spain, the fixed license fees from comparative bids are lower than the lowest fee paid from the auctions (Greece and Belgium). It is also worth noting that Denmark was the only Member State using the sealed bid auction (in a single round).

Spain and France are the only Member States which went through a revision of the license fixed fees, with Spain doing two revisions, the first time, upward, six months after the award (from 1.1 to 9.4 EUR/pop/5 MHz) and the second time, downward, one year and a half later (to 3.1 EUR/pop/5 MHz). France revised downward the license fees from 10.9 to 1.5 EUR/pop/5 MHz.

Secondly, the award method affected the type of operators successfully obtaining a 3G license. As shown in Exhibit 11, comparative bids tended to favor national players, whereas auctions appear to have favored multinational players with pan- or trans-European ambitions. Auctions awarded a total of 37 licenses across Europe with 68 percent held by multinational operators while the 18 licenses from the comparative bids were mostly granted to national operators, representing 72 percent of all licenses. A national player is defined as an operator owned for more than 50 percent by companies of this Member State and a multinational operator is a player having operations in the Member State considered but also in other Member States and is owned for less than fifty percent by companies of the Member State under consideration.

2.3.4 The number of licenses was typically higher for 3G than for 2G

On average, the number of 3G licenses offered equaled the number of existing 2G licenses³⁰ plus one. Exhibit 12 shows for each Member State the number of 3G licenses offered and awarded, compared to the 2G licenses. Member States having awarded 3G licenses through comparative bids have done so by offering N+1 licenses, except in Luxembourg where N+2 licenses are offered, N being equal to the number of existing licenses. In Finland, after 3G licensing (N+1) had occurred in March 1999, the new entrant 3G operator was subsequently (January 2000) awarded a 2G license. The Member States with auction can be split into three groups, based on the licenses offered. A first group of three countries comprising Belgium, Italy and the U.K. awarded a number of licenses equal to N+1, like in

³⁰ I.e., both GSM and DCS1800 licenses

almost all comparative bids. A second group consisting of Denmark and the Netherlands only decided to award N licenses because of the existing high degree of competition due to the already high number of 2G licenses. Finally, a group consisting of Austria, Germany and Greece did not impose the number of licenses but set a minimum and a maximum based on restrictions on the number of frequency blocks to be purchased. These three countries were the only ones that did not define any specific number of licenses upfront.

However, the outcome of the licensing award process did not always reflect the policy targets such as the competition objectives, as was the case for Belgium and France, which both offered four 3G licenses but effectively were only able to award three and two licenses respectively.

2.3.5 New entrants were only attracted indirectly

Most Member States attempted only indirectly to attract new entrants to the market, using mainly three different levers, i.e., offering N+1 licenses, offering more spectrum to new entrants, and requiring 2G-3G roaming.

Offering N+1 licenses revealed to be key to market entry as it ensured that interested newcomers were given a fair chance to obtain a 3G license in competition with the incumbent 2G mobile operators. Nine Member States put one additional license up for bid³¹. Offering only N licenses implies that new entrants will have little or no chance of winning a license as existing 2G operators will want to secure by all means their future business via a 3G license. The fact that in the Netherlands and Denmark, the governments chose to offer only N licenses, is related to the already high level of competition.

Offering more 3G spectrum to the new entrants only occurred in the U.K. where the larger license was only available for a new entrant. Currently in Ireland, a slightly different approach is anticipated; two 2x5MHz blocks are available for new entrants if they show a need for more spectrum.

Finally, the last lever that was used in award design was to require 2G-3G roaming to be offered by existing 2G operators in order to allow 3G entrants, before completely rolling out their network, to have the same time to market and initial commercial footprint as existing 2G operators with 3G licenses. Countries applying this lever were Austria, Belgium, Denmark, France, Greece, Ireland, Italy, Spain, Sweden and the U.K.

³¹ N+1 3G licenses compared to N 2G licenses

2.3.6 Substantial differences existed in license prices and price ratios between Member States

Despite the fact that, at the EU level, the auctions drove a total of EUR 103.9 billion compared to the EUR 5.2 billion generated from the comparative bids, the license prices that were obtained differed substantially across the Member States. As shown in Exhibit 10, the highest auction price superseded the highest comparative bid price by a factor of 7.

Three main factors drive the license price: the award method, the timing, and the potential for new entrants through the number of licenses:

- ¶ As we already identified, auctions drove corresponding license prices significantly higher, compared to awards that were based on comparative bids.
- ¶ The second important factor is the timing relative to other Member States. The earlier in the EU timing the award process took place, the higher the results of the auction, and this because of higher market expectations. Over time, some Member States opting for comparative bid increased the minimal license fee as a function of the market expectations and the results from previous awards, previously organized in other Member States.
- ¶ Finally, the possibility for a new operator to enter the market was the third factor in determining prices. This factor seems to have had a negative influence on the license fees where such possibility was not offered. For instance in the Netherlands, the auction price only yielded a fee per population and per 5MHz three and a half time lower than the U.K. and the German auctions which took place at around the same time. One potential explanation³² lies in the fact that the Netherlands was not considered as a very attractive market to newcomers compared to the U.K. and Germany and that competition was already very high. Therefore there was no expressed need to offer more 3G licenses than the five current 2G operators.

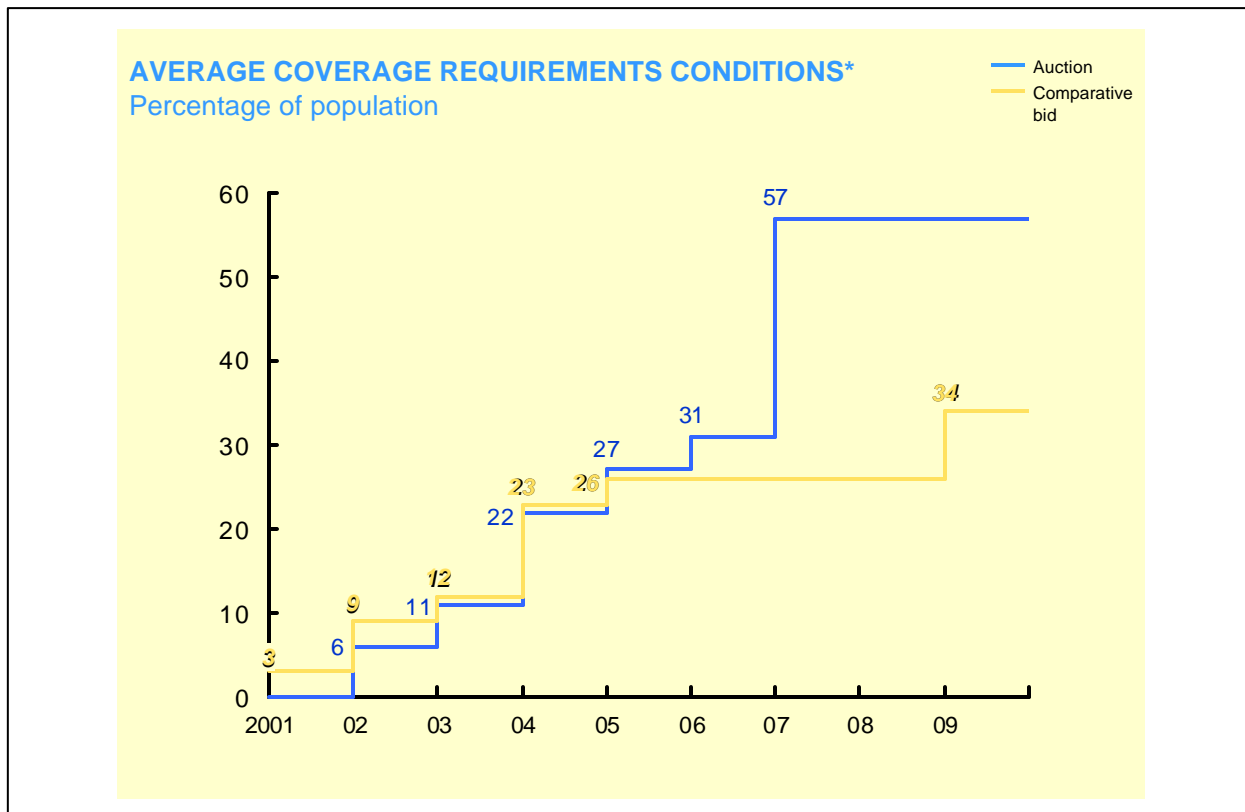
2.3.7 Different payment modalities did not directly influence the outcome

Different modes of payment had different cash flow implications for operators, but did not seem to influence the outcome of the bidding.

There are three different payment modalities: immediate payments, installments, and annual percentage of revenues.

³² Confirmed during interview with Dutch Regulatory Agency

Exhibit 13



- ¶ *Immediate payments* imply the bulk³³ of the upfront payment of the total license fees to be paid within a few months after license being awarded and some additional annual fees. Member States opting for an auction process typically also opted for this payment method (Belgium, Germany, the Netherlands). Italy and the U.K. offered two payment options to its 3G licensees: the immediate or the installments payment method. In comparative bid countries, this payment method is only used in Portugal.
- ¶ In case of *installments*, a more regular repartition of the payments over time was allowed. In this situation, payments were more evenly spread over the total duration of the license. Denmark opting for the auction as award process, uses this system. Finland and Ireland are the only comparative bid countries using this method.
- ¶ Finally, the third payment method involves a *percentage of revenues*. This formula varies considerably between Member States, varying from 0,08% to 2% of 3G revenues. This payment method is used in France, Luxembourg, Spain, Austria, Greece, and Sweden.

2.4 DIFFERENCE IN LICENSING CONDITIONS HAVE BEEN IN LINE WITH THE CHOSEN MARKET CLEARING APPROACH

In terms of conditions linked to the licenses themselves, one can observe that Member States opting for an auction process were less explicit and detailed on the conditions attached to licenses. The Member States opting for a comparative bid, however, pushed the thinking further along a number of dimensions, such as coverage obligations, license duration, size of the assigned spectrum, roaming, and obligations with regard to access to mobile networks.

2.4.1 Coverage obligations were substantial in comparative bids

Member States opting for the auction process imposed, on average and on the long term (after 2005), higher coverage requirements³⁴ than Member States using comparative bids. For the short term, the situation is reverse³⁵, as depicted in Exhibit 13. However, it is worth mentioning that some Member States using comparative bids did not impose any coverage requirements at all. These Member

³³ As operational criterion, we considered as an immediate payment, a payment schedule requiring at least 80% of the total license fee to be paid immediately

³⁴ When interviewed, representatives of ETNO mentioned that not only coverage was important, but also service quality

³⁵ Interviews with several National Regulatory Authorities indicate that Member States opting for auctions avoided too strong coverage requirements during the initial years of the license

Exhibit 14

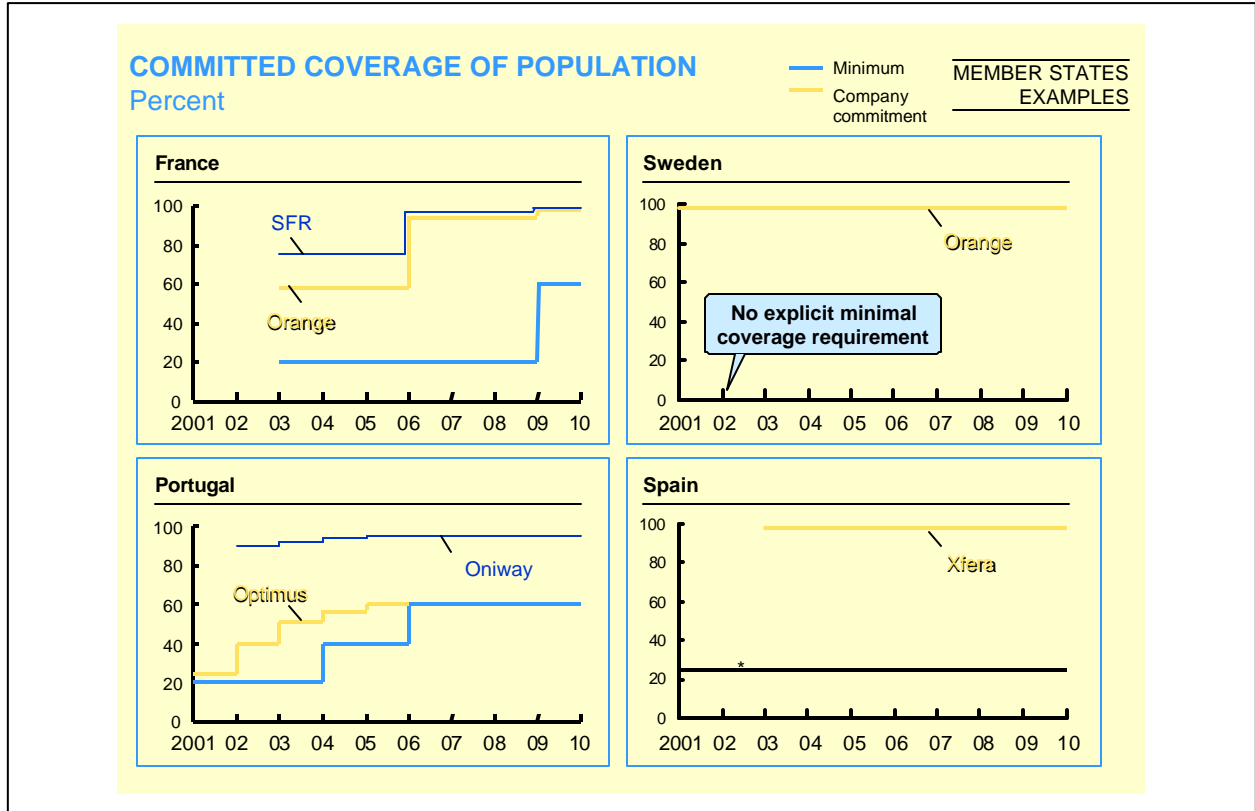


Exhibit 15

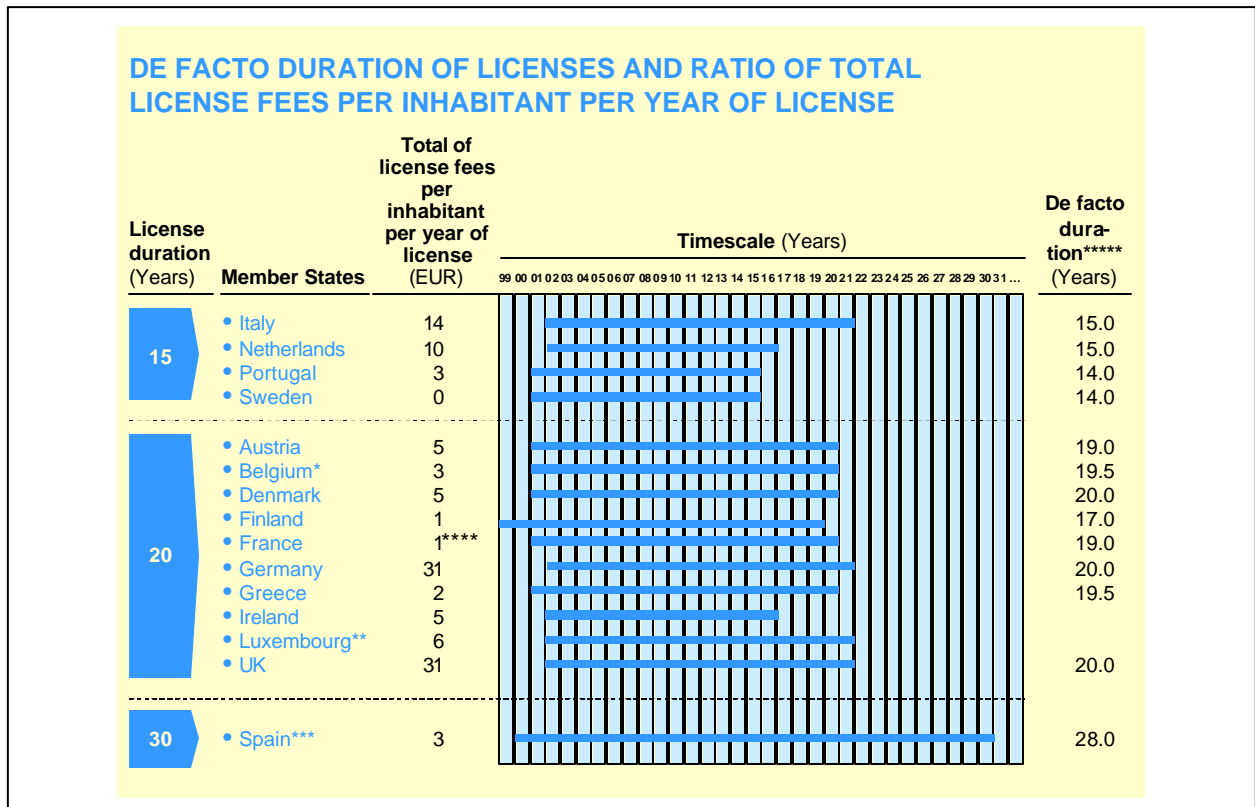
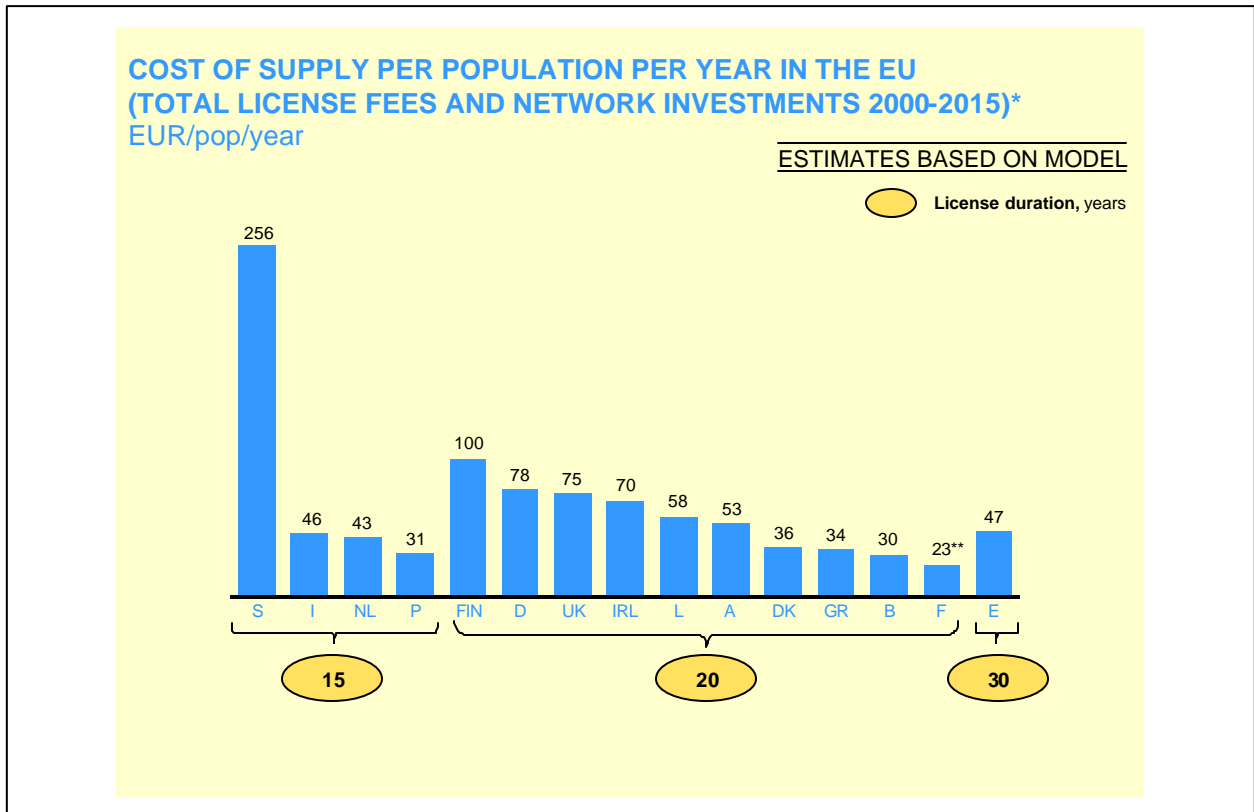


Exhibit 16



States were included in the average coverage requirements of comparative bid countries, lowering this average.

However, looking at the actual coverage commitments by candidates, in practice comparative bids fostered substantially higher voluntary coverage commitment than the requirements imposed by the auctions (Exhibit 14). At the Member State level, in France for example, the requirements of the comparative bid stipulated minimum coverage of 20% till 2009 and 60% afterwards which have been surpassed by both 3G licensees committing to a minimum of 60% between 2003 and 2006 and going up to 98% afterwards. Other examples applying to Sweden, Portugal and Spain can be found on the same exhibit.

2.4.2 There was no clear correlation between prices and license durations

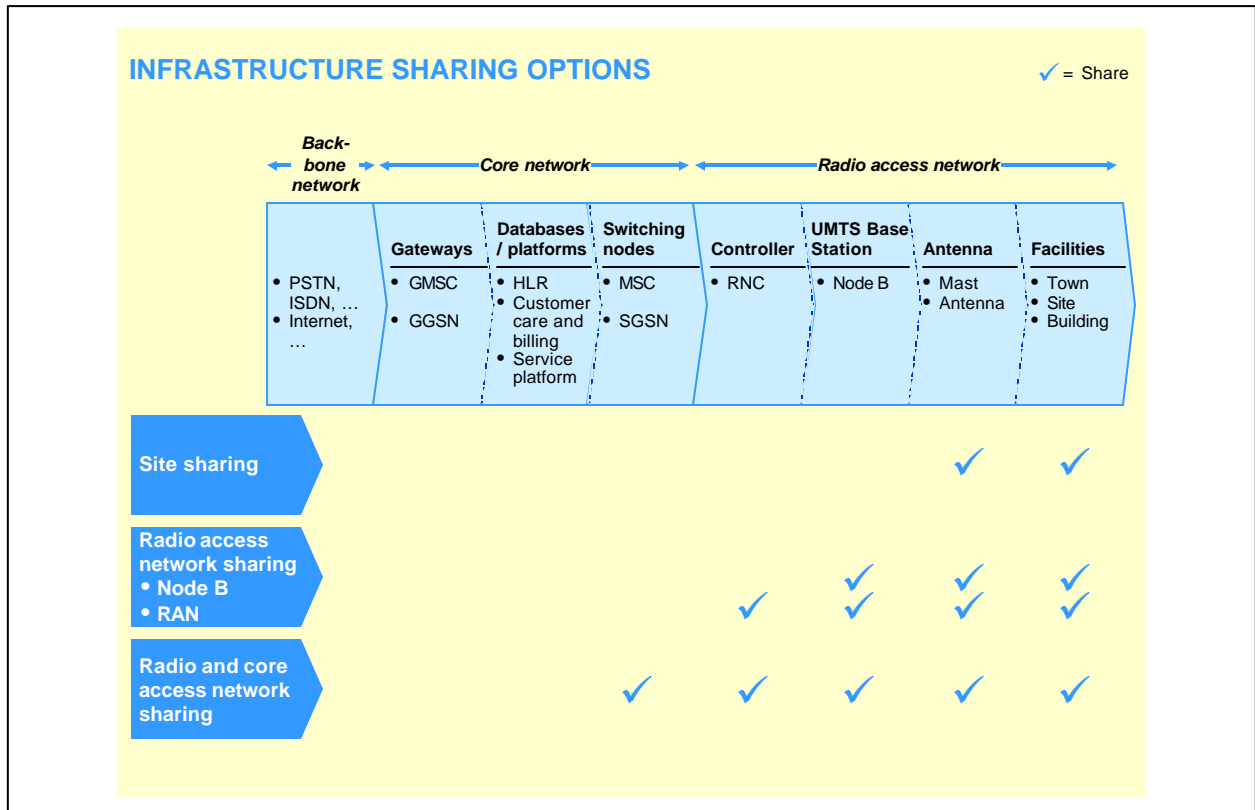
The majority of the Member States awarded licenses for a period of 20 years, while four States (Italy³⁶, the Netherlands, Portugal and Sweden) awarded them for a period of 15 years. In several Member States (Belgium, Spain and Luxembourg), specific clauses were included in the 3G license allowing, under certain conditions, for an extension of the license duration. In updating their rollout plans today, license holders are, however, looking at somewhat shorter lifecycles to earn back their investments, given that one year or more has passed since the award.

It is interesting to note that there is no clear correlation between the de facto license duration and the final 3G license price (Exhibit 15). Looking at the ratio of license fee cost per inhabitant and duration of the license, no impact of duration of the license on its price could be identified, although intuitively one might expect some correlation between duration of the license and the price paid for it. Including the total of supply (i.e., license fees and network investments) into the comparison, still no clear correlation can be identified in this regard, as is shown in Exhibit 16. A potential explanation lies on the fact that operators may have expected license duration to be extendable in a later stage, beyond the normal economic business horizon and did not specifically consider the license end because it fell in the terminal value period of the business case that by definition has little impact on current operations or financials. Typically the terminal value in the business case would start after 10 – 15 years of operations.

The issue of license duration was only raised in Member States, after the award had been closed and spectrum had been assigned to operators, and especially after market sentiment was going down substantially (e.g., France where license duration meanwhile has been increased by 5 years to 20 years and Italy where the increase in license duration from 15 years to 20 years is still under debate).

³⁶ A draft proposal to extend the license to 20 years is currently under debate

Exhibit 17



2.4.3 Network infrastructure sharing only became an issue after the licensing

The possibility of network sharing was not a prescient issue when licensing conditions were defined and the 3G licenses were awarded by the first wave of Member States. Consequently, this option was not excluded explicitly at that time. By now, however, infrastructure sharing has become an important variable to control the cost of supply³⁷. Member States allow different degrees of leeway.

As shown in Exhibit 17, the main options considered are site sharing, radio access network sharing, and radio and core access network. Site sharing consists of sharing the facilities such as the building or tower, the mast and the antenna. Radio access network sharing consists of sharing the UMTS base station³⁸, either passive or both passive and active elements and, in some instances, also the radio network controller (RNC). Finally, core and radio access network sharing also involves the sharing of core network nodes (such as the MSC³⁹ and the SGSN⁴⁰). As will be demonstrated in chapter three, network sharing allows for substantial savings in the early years of infrastructure deployment. National regulators start allowing for some degree of network sharing, usually the site and some equipment of the radio access network provided that operators have, at least logically⁴¹, independent networks in order to guarantee a sufficient level of competition. In several Member States, e.g., Germany, U.K., Sweden and the Netherlands, different degrees of infrastructure sharing are being discussed between operators. Although the regulatory discussion in several Member States is currently still taking place, the degree to which operators are allowed to share infrastructure appears to differ between Member States⁴². Where site sharing appears to be widely accepted, as it already de facto was occurring on the mobile market for 2G late entrants, more diversity remains with regard to more intense type of infrastructure sharing⁴³.

³⁷ Confirmed during the interviews with vendors, operators, and National Regulatory Authorities. Operators recognize the positive impact of infrastructure sharing on the short-term investment needs. In the longer term, some operators point to the fact that infrastructure sharing will increase the complexity of operations, as it will require substantial coordination in case of capacity increases in the network and in case of network upgrades

³⁸ Also called NodeB

³⁹ Mobile Switching Centre

⁴⁰ Serving GPRS Support Node

⁴¹ The requirement of maintaining logical separation of the networks, in case of infrastructure sharing, revealed important during the interviews with several National Regulatory Authorities

⁴² This was evidenced by several equipment vendors and operators interviewed

⁴³ E.g., radio access network sharing. Infrastructure sharing appears to be more broadly allowed in, e.g., Sweden, compared to, e.g., Germany

Exhibit 18

SPECTRUM ASSIGNMENT IN THE EUROPEAN UNION		MHz					
	Countries	Repartition of the spectrum available for the different licenses offered					
Same spectrum allocation adopted by half of the Member States	• Belgium	}	2 x 15 + 5	2 x 15 + 5	2 x 15 + 5	2 x 15 + 5	2 x 15 + 5
	• Denmark						
	• Finland						
	• France						
	• Ireland						
	• Luxembourg						
	• Portugal						
• Spain							
• Sweden							
Different spectrum allocation for the other half of the Member States	• Austria	2 x (2 x 5) + 2 x 5	2 x (2 x 5) + 2 x 5	2 x (2 x 5) + 1 x 5	2 x (2 x 5)	2 x (2 x 5)	2 x (2 x 5)
	• Germany	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10
	• Greece	2 x 20 + 1 x 5	2 x 15 + 1 x 5	2 x 15 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5
	• Italy	2 x 15 + 1 x 5	2 x 15 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5
	• Netherlands	2 x 15 + 1 x 5	2 x 15 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5
	• UK	2 x 15 + 1 x 5	2 x 15	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5	2 x 10 + 1 x 5

2.4.4 The size of the assigned spectrum was driven by technical considerations

Overall, the spectrum does not appear to have significantly guided applicants' behavior⁴⁴.

The size of the assigned spectrum differs only to some degree between Member States, varying between 2x10MHz and 2x20 MHz of paired spectrum and between 0 MHz and 2x5 MHz of unpaired spectrum. The most frequent sizes of frequency blocks are, however, 2x10MHz and 2x15MHz for the paired spectrum and 1x5MHz for the unpaired spectrum. As can be seen in Exhibit 18, half of the Member States used the same spectrum allocation scheme, namely four licenses of 2x15MHz of paired spectrum and 5MHz of unpaired spectrum while the other half of the Member States used different schemes. Overall, Member States having adopted comparative bids have allocated frequency blocks of equal size of 2x15 MHz + 1x5 MHz, which is the size recommended by the UMTS Forum⁴⁵.

The spectrum size and the differences between spectrum allocation schemes have been driven by five factors: recommendations by the UMTS Forum, required technical minimal size, the number of licenses offered, specific auction design, and advantaging new entrants:

- ¶ Recommendations by the UMTS Forum stipulate that the preferred solution for minimum spectrum required by a public UMTS operator is the 2x15MHz + 1x5 MHz package. This package offers full functionality of services and allows flexible deployment of hierarchical cells. These packages are used by most of the Member States, with the exception of Austria, Germany, Greece, Italy, the Netherlands and the U.K.
- ¶ The technical minimum size for carrying traffic and service in Europe is 2x10 MHz. Some problems with high data rate services might still occur in certain areas, predominantly urban city areas, as demand take-up and higher capacity applications find their way to the market. Technical minimum sized frequency bands were offered in Italy, the Netherlands and the U.K.
- ¶ Furthermore, if the number of licenses desired exceeds four, the available spectrum (2x 60 MHz paired and 35 MHz unpaired) does not allow anymore all licenses to have the recommended 2x15MHz paired

⁴⁴ Interviews with the operators confirmed the fact the preference for 10 versus 15 MHz is strongly driven by a financial and economics equilibrium. Increasing the number of base stations and increasing the spectrum are the prominent drivers of increasing the network capacity. As both imply specific costs, from the point of view of network efficiency, a financial equilibrium can be struck

⁴⁵ Confirmed during interviews with members of EICTA (European Information, Communications and Consumer Electronics Industry Technology Association)

and 1x5MHz unpaired allocation, like it was the case in Austria, Germany⁴⁶, Italy, the Netherlands and in the U.K. Greece, even though it was using four licenses, could not follow this allocation scheme because of one bigger license of 2x20MHz.

- ¶ The auctions that left it up to the operators to decide for themselves on the number of licenses and size, ended up with a lot of variation with countries such as Germany and Austria having awarded licenses from 2x10MHz to 2x10MHz and 2x5MHz and Greece having issued three different sizes of spectrum (2x20 MHz, 2x15 MHz and 2x10 MHz).
- ¶ Finally, in one case (U.K.), new entrants were offered to bid for one license with more spectrum (2x15 MHz + 1x5 MHz) in order to encourage market entry and sustainable competition, to compensate for the advantages of existing 2G operators in rolling out the network.

2.4.5 Roaming rights and obligations ensured mainly transition from 2G

Roaming obligations have typically been imposed on 2G operators with a 3G license, to give a 3G new entrant the right to roam on its existing 2G networks, hereby decreasing the initial rollout effort to reach the majority of the territory with mobile services. This type of roaming allows new entrants to offer 2G services while building their own 3G networks. Almost all Member States imposed this type of roaming as an explicit license obligation for incumbent operators acquiring a 3G license. Only Finland, Germany and the Netherlands did not impose 2G-3G roaming explicitly but allowed it under commercial terms.

3G to 3G roaming gives the right to 3G operators to roam on other 3G networks. This type of roaming is only, and to some extent, imposed in Denmark in the form of a general obligation to negotiate requests for national roaming. In Spain 3G to 3G roaming is prohibited and all other Member States have no explicit 3G to 3G roaming obligations. This condition was perceived as a non-issue at the time of the award process and was therefore not imposed as such.

2.4.6 MVNO⁴⁷ and other access obligations, in general, were not explicitly imposed in the license conditions

In general, specific mobile network access obligations were not explicitly imposed by 3G license conditions⁴⁸. As such, network access on 3G networks and for 3G services will therefore be governed by general access rules as defined in Telecom

⁴⁶The number of licenses offered could vary between 4 and 6

⁴⁷ Mobile Virtual Network Operator

⁴⁸ Based on analysis of the Member State regulation, National Regulatory Authority and operator interviews

Exhibit 19

NETWORK ACCESS CONDITIONS

Denmark – As for national roaming

- **National roaming agreements (including MVNO agreements)** are to be based on **commercial terms and conditions, negotiated between operators** (...). However, access and prices must be based on objective, transparent and non-discriminatory terms. In addition, providers must ensure that products are made available to others on the same terms and of the same quality as made available to the party's own services (...). Pricing concerning roaming is not explicitly covered by telecommunications regulation...
- However **pricing, and the terms and conditions of national roaming agreements are subject to general competition law** ...

France – Non-discriminatory service provisioning

- L'accès à ces services doit être facilité grâce au jeu d'une concurrence ouverte et loyale sur le marché des services. **Les opérateurs devront veiller, dans le cadre des accords commerciaux qu'ils concluront éventuellement avec les fournisseurs de services, à ne pas créer de discrimination entre fournisseurs de services**
- Dès lors, les **abonnés de l'opérateur doivent effectivement être en mesure de choisir** le ou les fournisseurs de services de leur choix avec lesquels l'opérateur a conclu des accords commerciaux. Ce choix ne doit pas être entravé par la mise en œuvre de mesures particulières, notamment de dispositifs techniques, visant à privilégier l'accès à certains fournisseurs de services

Germany – Obligations to services providers

- The licensee shall undertake to offer his services in such a way as to **allow providers** of publicly available telecommunications services **to market and offer to their customers these services in their own name and on their own account**... The licensee may not bind service providers exclusively or for an unreasonably long period, nor restrict them in respect of their own pricing, terms and conditions, or any other field of activity.
- He may **not offer** to service providers **any less favorable conditions than to his own marketing organization or affiliated companies**, unless this is objectively justified ...

Ireland – Evaluation criteria for "Type A" licenses

- **All applicants for the "A" license are invited to offer a voluntary binding commitment relating to the provision of access to the radio access part of their 3G mobile network** and, where applicable, any 2G mobile radio access network in which the applicant has, or might in the future have, an ownership interest ("MVNO access"), priced on a **"retail minus X"** basis

United Kingdom – Not regulated but under scrutiny

- [The]... consideration of these factors has led to the conclusion that regulatory action to require the provision of services to MVNOs is **not justified at present**. (...) While OFTEL does not intend to act now, the mobile market is reviewed regularly

Sweden – Obligation if available capacity

- "A license holder shall satisfy a request to provide access, on normal market terms, to network capacity ... However, such an obligation only exists to the extent that there is available capacity within the network and provided this can be done without detriment to the network or its users or the disruption of the network. The obligation does not apply in relation to other license holders who own a telecommunications network for mobile telecommunications services.
- Access provided in accordance with the first paragraph shall be provided on terms that are non-discriminatory in relation to what the license holder applies for its own activity and which are, if the access is provided for several parties, neutral as regards competition in the relationship between such parties."

Full size exhibit can be found in the Annex to this document

regulation of the different Member States. There were, however, a few exceptions where 3G license conditions in Member States contained certain provisions defining network access rights and obligations (Exhibit 19):

- ¶ Sweden, where MVNO access is only explicitly stipulated for mobile network operators (i.e., both 2G and 3G) to the extent that there is overcapacity in the corresponding networks.
- ¶ Ireland, where providing for MVNO-access is one of the evaluation components of the comparative bid criteria.
- ¶ Germany, where non-discriminatory service provider access is mandatory (i.e., not less favorable conditions than for its own marketing organization or affiliated companies, unless objectively justified).
- ¶ Denmark, where MVNO agreements are treated within the regulatory framework of the 3G to 3G national roaming obligations.

However, policy debates with regard to network access obligations were taking place in the Member States in the course of the defining of license conditions and the licenses assignment phase. Also, worldwide, sector discussions were taking place on the MVNO business case and its potential to expand competition and increase consumer choice. This was in parallel to policy initiatives in the fixed-line telecom sector to unbundle the local loop of incumbent operators, where the European Union took an explicit Regulation⁴⁹ on unbundled access to the local loop on 18th December 2000, applicable as of 1st January 2001.

The issue of network access, by i.a. MVNO-type of mobile service providers will be further addressed in the fifth chapter, while discussing the first Guiding Principle, based on the notion of “sustainable market”.

2.4.7 None of the Member States specified conditions in relation with spectrum trading and license transferability

In this respect, specific attention needs to be given to the element of spectrum trading and license transferability. None of the Member States in their regulation with regard to spectrum based services, explicitly regulated spectrum trading as such. De facto, however, most Member States explicitly stipulated that undertakings could not participate at the 3G license award via more than one consortium. In addition, Member States excluded that undertakings, though changes in ownership structures of mobile operators could occur, would, even partially, acquire multiple 3G licenses on the same national mobile market (e.g.,

⁴⁹ “Regulation (EC) No 2887/2000 of the European Parliament and of the Council of 18 December 2000 on unbundled access to the local loop”, OJ L 336, 30/12/2000, p. 0004-0008

Germany when in such case, the undertaking is required to hand in the corresponding 3G license).

Chapter 3: Assessment of the impact so far of 3G licensing on the Internal Market and on the development and competitiveness of the mobile communications sector at national and European levels

In accordance with the Terms of Reference, we will now assess the likely impact of 3G licensing on the Internal Market and on the development and competitiveness of the mobile communications sector at national and European levels. While in the present chapter we will focus on the impact to date, in chapter four we will examine the likely impact in the years to come.

As defined in the Terms of Reference, in this third chapter we will in particular look at the way the 3G licensing process and the cluster of licensing conditions have impacted to date in terms of rollout of the new services, interact with and impact on 2G mobile communications, emergence of new technologies, development of a competitive market, and development of pan-European services and networks.

It is important to highlight that in practice, it proved impossible to single out the individual impact of each of the licensing conditions. We therefore addressed the impact of the 3G licensing process and the licensing conditions in their integrality.

In the present chapter, we have focused our analysis on the market structure, the conduct of the different stakeholders, and/ or the performance of key mobile players, both for 2G and for 3G (i.e., mobile operators, equipment vendors, governments, end-users).

Footnotes referred to in the exhibits of this chapter can be found in Appendix G.

3.1 METHODOLOGY USED IS BASED ON INDUSTRY STRUCTURE, CONDUCT AND PERFORMANCE OF DIFFERENT STAKEHOLDERS

In assessing the impact of the licensing conditions on the mobile sector, we are using the stakeholder framework introduced in Appendix D. It describes the stakeholders of the mobile market, namely the operators (and investors), the equipment vendors, the content providers, the governments and end-users (both business and residential). In this chapter, we focus primarily on the effect of the

licensing conditions on the operators and on the vendors, as they are typically the first to be affected when a discontinuity presents itself in a sector. As the content provider market has not been significantly impacted so far, considering that hardly any 3G mobile content is currently available on the market, these stakeholders will not be discussed in this chapter but will be explicitly addressed in the fourth chapter. The methodology used to measure the effect of the licensing conditions is based on industry structure, conduct and performance of the different stakeholders, as is also detailed in Appendix E. Changes in the market after the 3G license award process are measured by means of a quantitative evolution of a set of variables, describing the structure of the market (i.e., number of players, type of players, and industry concentration), the conduct in the market (i.e., evolution of penetration, and end-user prices), and the players' performance (i.e., current bottom-line profit, stock price as a proxy for expected players' performance, and debt ratio as a measure of funding capability).

This assessment is obviously complemented by a number of more qualitative observations, e.g., on the behavior of players, rollout of new services, interaction with, and impact on 2G mobile communications, emergence of new technologies, development of a competitive market, development of pan-European services and networks, and resulting structural changes in the mobile sector (both 2G and 3G).

3.2 SO FAR, MAINLY FINANCIAL VALUE HAS SHIFTED AWAY FROM OPERATORS AND SOME FROM VENDORS, LEAVING END-USERS OUT OF THE PICTURE

The impact of 3G licensing at the Member State and European level is incomplete, because to date, 3G is still very much in its infancy. Operators are beginning the process of rolling out infrastructures, and operations are only active in very limited test areas. Real high-speed mobile data services⁵⁰ are not yet significantly present on the market. It is therefore still premature to understand the full impact of 3G licensing on the mobile sector, on the different players and on the Internal Market itself.

However, already today changes can be observed in the position of at least three of the four groups of stakeholders, i.e., operators, equipment vendors, and governments. The 3G licensing conditions that played a major role were the number of licenses, the price of the licenses and the coverage obligations. For end-users, the impact so far has remained relatively limited.

⁵⁰ E.g., GPRS (General Packet Radio Service) services as opposed to enhanced 2G networks

Operators

Operators are already clearly in a weakened position. While, in the European Union, the growth of 2G mobile voice services was slowing down, the Internet bubble had burst and the telecom stock market had fallen, the number of potential competitors in the mobile market overall increased significantly through the 3G licensing process. At the same time the cost of supply of 3G increased given the substantial price tags attached to obtaining, rolling out and operating a 3G network. This weakened situation of the mobile operators and the delays in 3G equipment in a number of Member States triggered rollout delays. Suddenly, the promise of the mobile data opportunity looks less attractive, and as a result, investors and debt holders have revised their predictions of expected performance of operators across Europe sharply downwards.

Equipment vendors

For the equipment vendors in the European Union, 3G licensing and infrastructure investments occurred at a moment where 2G infrastructure investments and handset sales in the European Union were slowing down⁵¹. 3G investments will represent a significant part of equipment vendors' sales in the coming decennium in the European Union. Part of the potential, however, is likely to disappear or be delayed as the mobile operators struggle to match supply with demand.

Governments

In a number of Member States, governments received unexpectedly high license fee revenues. Although this is obviously a one-time income, it has taken billions of Euros out of the telecom sector in the European Union, creating an additional funding burden for the sector. To the extent that the governments in question held stakes in the incumbent operators, this bonus is, at least partially and for the time being, offset by the deterioration of the stock market position and the debt ratings of their respective incumbent operators.

End-users

Consumers and businesses have not seen many changes in the market so far, as 3G services are not offered yet. Penetration of 2G services has continued to evolve as planned, while retail pricing and ARPU⁵² levels appear to have stabilized. This evolution is predominantly driven by the fact that 2G mobile markets are reaching a high level of maturity, and by the change in focus of operators away from market share growth towards improvements of the bottom-line and value share. The latter shift occurred after the crash of the Internet and telecom stock markets. The effect

⁵¹ Cf. mobile 2G network deployments were in practice completed except for late 2G new entrants and mobile markets not having reached high maturity levels

⁵² Average Revenue Per User

Exhibit 20

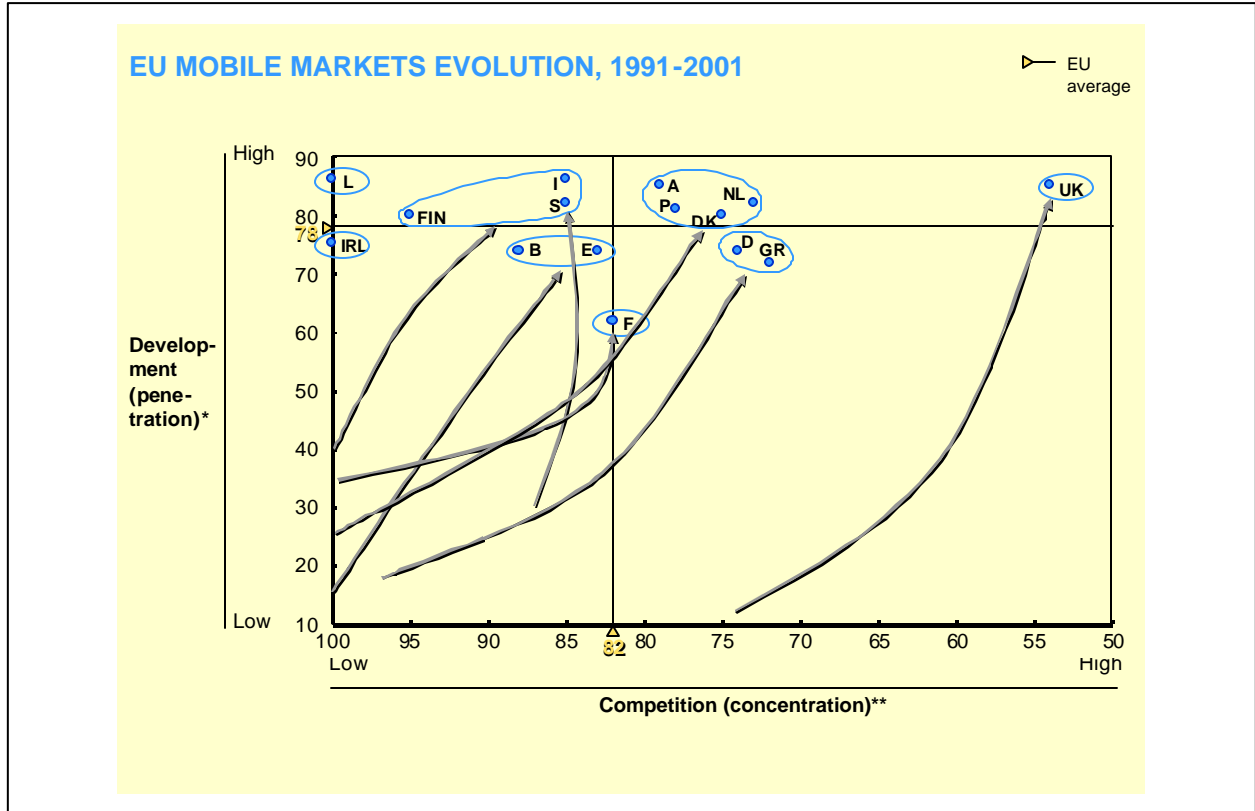
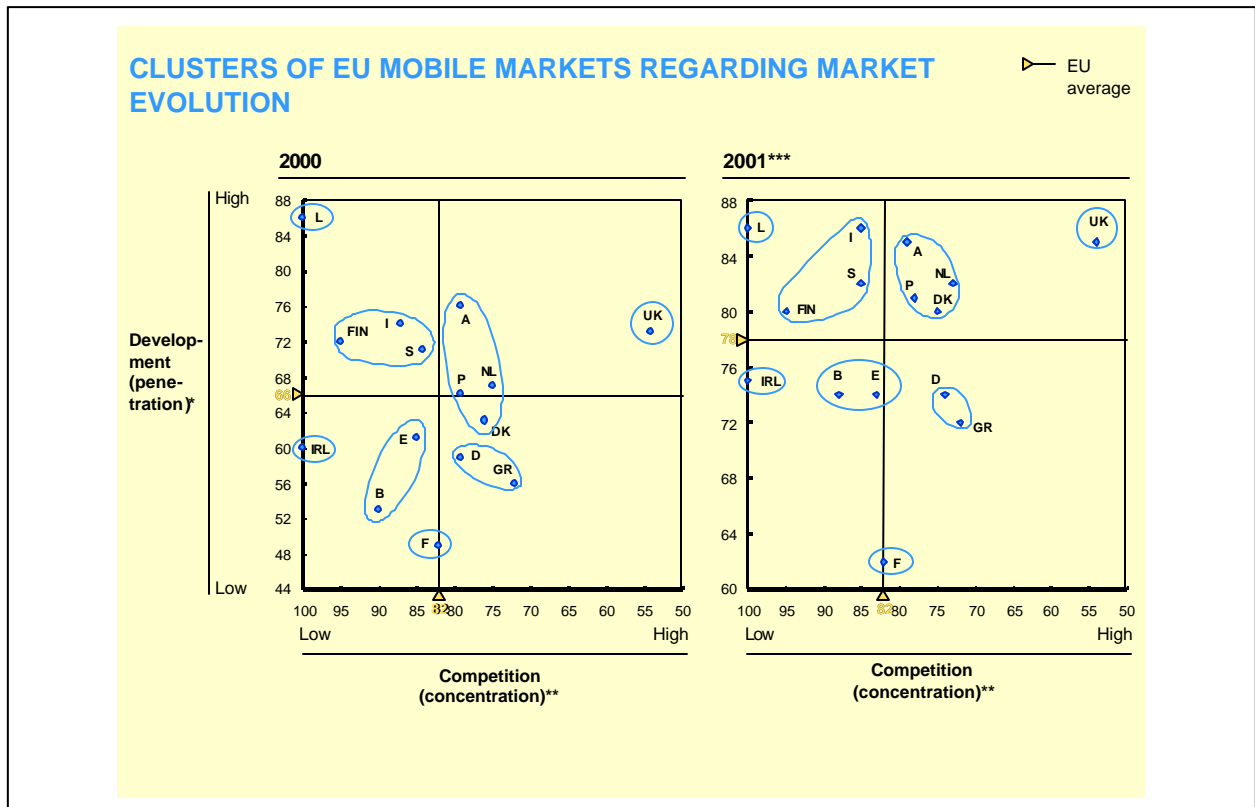


Exhibit 21



of the 3G licensing process as a catalyst is still limited. It is, however, impossible to isolate the specific impact of each of these drivers, for the time being.

3.3 OPERATORS HAVE MAINLY BEEN IMPACTED THROUGH THEIR VALUATIONS SO FAR

So far, the major impact of 3G licensing on mobile operators has been financial: the expectation in their future performance as reflected in their stock prices have decreased, and the debt position of mobile operators has increased, which has weakened their negotiation power with financial markets to raise funding.

3G licensing has not yet led to major changes in the market structure of each Member State. Despite the differences in amounts paid for the licenses in the Member States, most existing 2G mobile operators have acquired a 3G license, with only a few exceptions. In addition, an average of one new entrant per Member State obtained a 3G license. While preparing their pan-European 3G mobile strategy major operators went through a merger and acquisition phase prior and during 3G licensing, which significantly changed the pan-European landscape.

Finally, the increase of supply and the cost of that supply to rollout 3G networks has not yet significantly influenced the actual market structure, as measured by the number of active mobile players and the market concentration, nor did it affect players' conduct, as defined by ARPU levels. Although the number of licensed players increased significantly because of the 3G licensing process, the number of players providing services on the market did not effectively increase.

3.3.1 Evolution of the mobile market followed a similar pattern in the Member States

Over the past decade the evolution of the mobile market in most Member States occurred in three waves, with a first wave focusing on development and a second and third wave focusing on achieving gradual increases in competition.

As explained in Appendix B, there are different parameters that can be used to quantify market development and competition. In a growing market such as the mobile market between 1991 and 2001, two major parameters are relevant for defining the market, namely penetration⁵³ for the market development, and concentration⁵⁴ for the market competition. These parameters have been analyzed and used in Exhibits 20 and 21.

⁵³ Defined as the number of mobile users divided by the total population

⁵⁴ Defined as the market share of the top two players

Exhibit 22

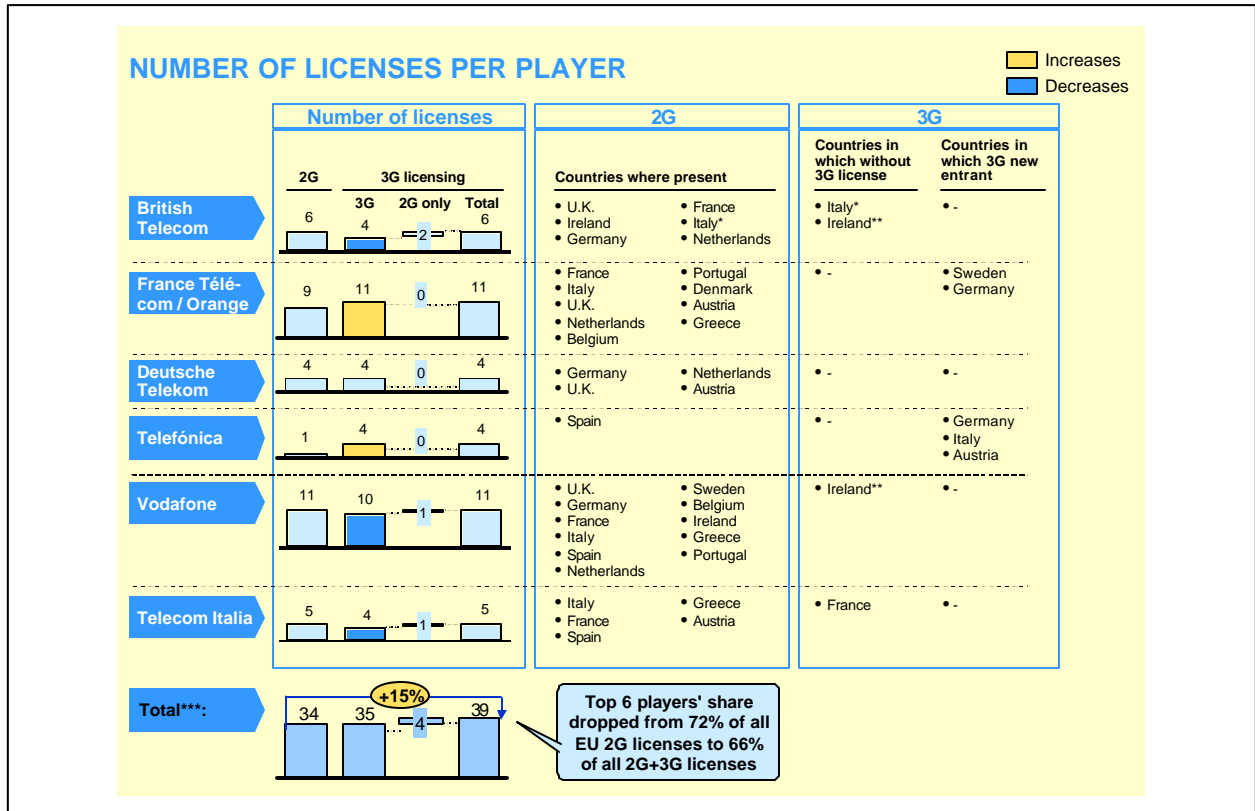


Exhibit 23

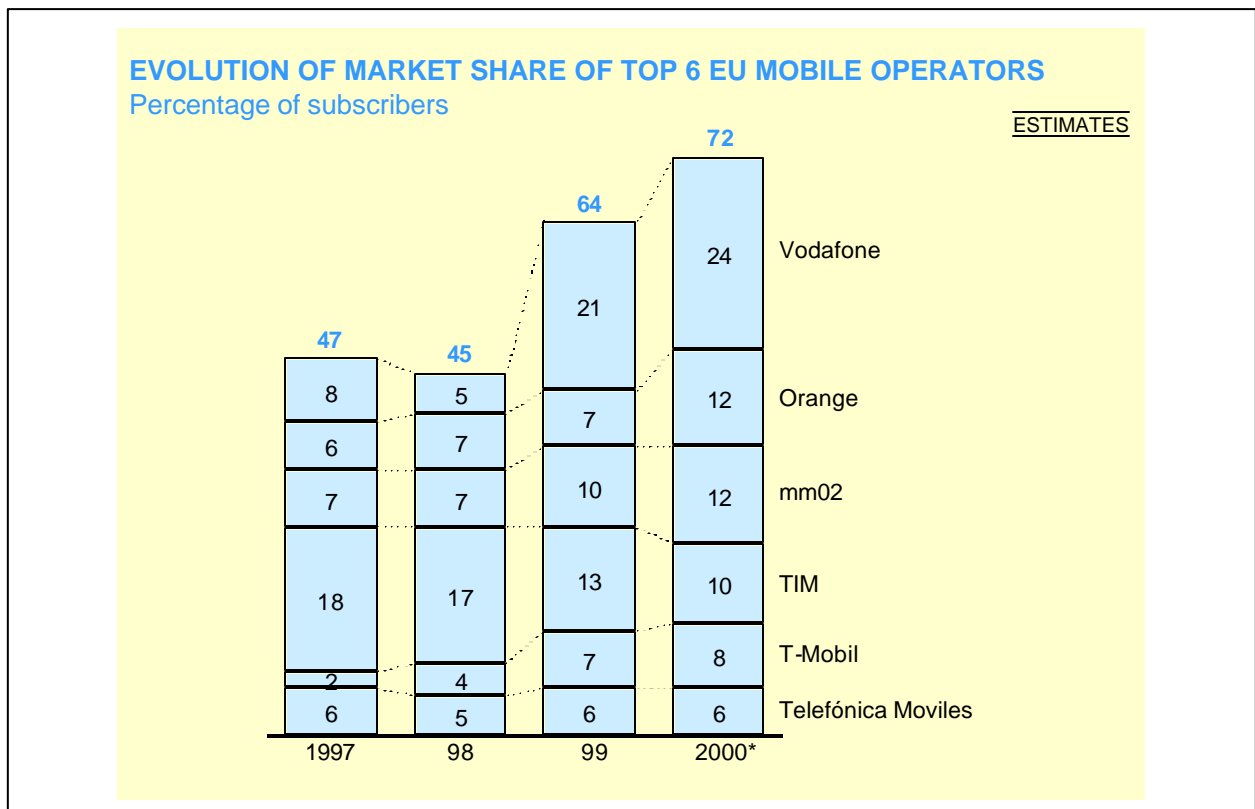


Exhibit 24

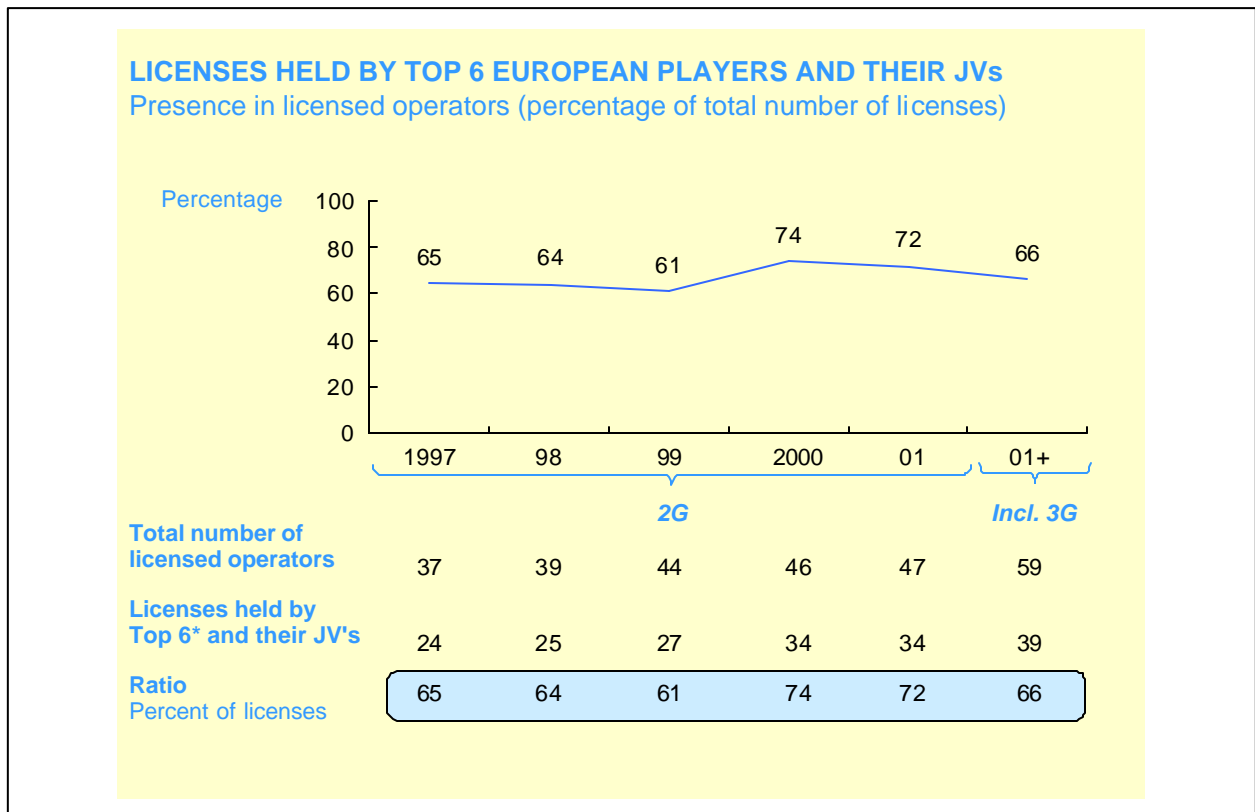


Exhibit 20 shows that the mobile markets in the EU evolved towards maturity somewhat faster through development than through competition. Four major groups of Member States can be identified (Exhibit 21), which, despite having followed separate evolution paths, managed to arrive at more or less comparable levels of competition and development.

In parallel, the sector has gone through a significant degree of increased internationalization, with several players acquiring other players in order to strengthen their European footprint.

3.3.2 3G licensing process resulted in increase in supply and cost of supply with not much impact so far on the industry structure

The increase in the supply and in the cost of the supply as a result of the 3G licensing process is major but it has not yet impacted fundamentally the industry structure or the market conduct.

Despite the increase of the number of licensed operators from 47 to 59 (i.e., an increase of 26%), at the pan-European level, however, the 3G licensing did not substantially extend the footprint of the operators involved⁵⁵ (Exhibit 22). Vodafone was already a truly pan-European player prior to 3G licensing. The France Telecom/ Orange combination was able to add additional countries to its geographical span (i.e., Sweden, Germany) and Telefonica expanded outside its national country through 3G licensing. The top six European players moved from 34 mobile licenses (2G) to a total of 39 licenses (2G and 3G combined), which is an increase of only 15% versus the total increase of licenses of 26% previously documented. Adding to this the fact that 4 out of the 39 licenses are pure 2G it becomes clear that the 6 pan-European players did not significantly expand their pan-European footprint.

In addition, the total market share of the top six European mobile operators increased since 1998 from 45% to 72% of total mobile subscribers (Exhibit 23). The stakes the top six operators owned in other licensed players grew from 61% in 1999 to 72% in 2001. However, with 3G licensing, these operators held stakes in only 4 of the 14 new players and therefore their total participations temporarily dropped to 66% (Exhibit 24). As will be explained in the next chapter, the consolidation trend is expected to pick up again.

Operators have to absorb a massive increase in the cost of supply considerably over the coming decade, as will be discussed more extensively in the next chapter. Around EUR 350 billion of additional fixed costs are potentially being invested

⁵⁵ Interviews with several National Regulatory Authorities and operators revealed that high license fees during the initial phase of spectrum assignment across the EU, and the degrading market expectations over time, made it difficult for the operators involved, to effectively implement their potential pan-European strategies

Exhibit 25

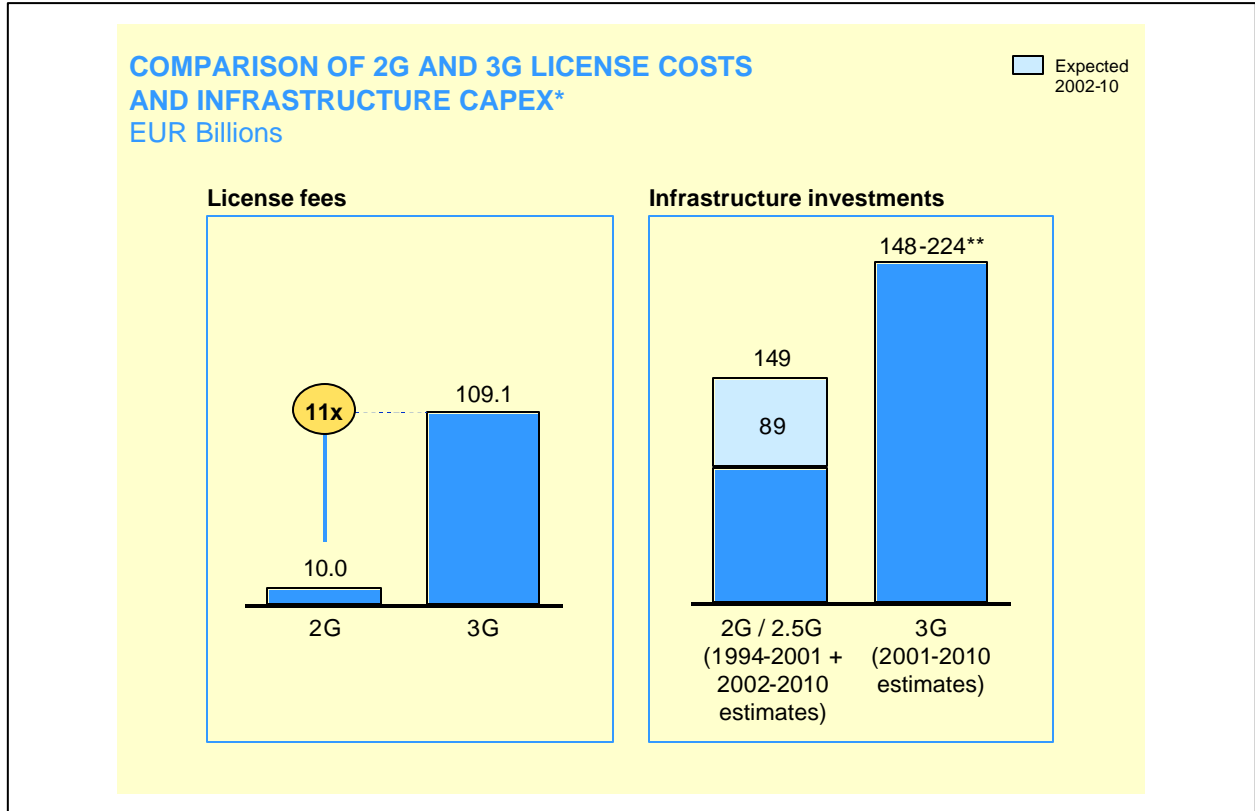
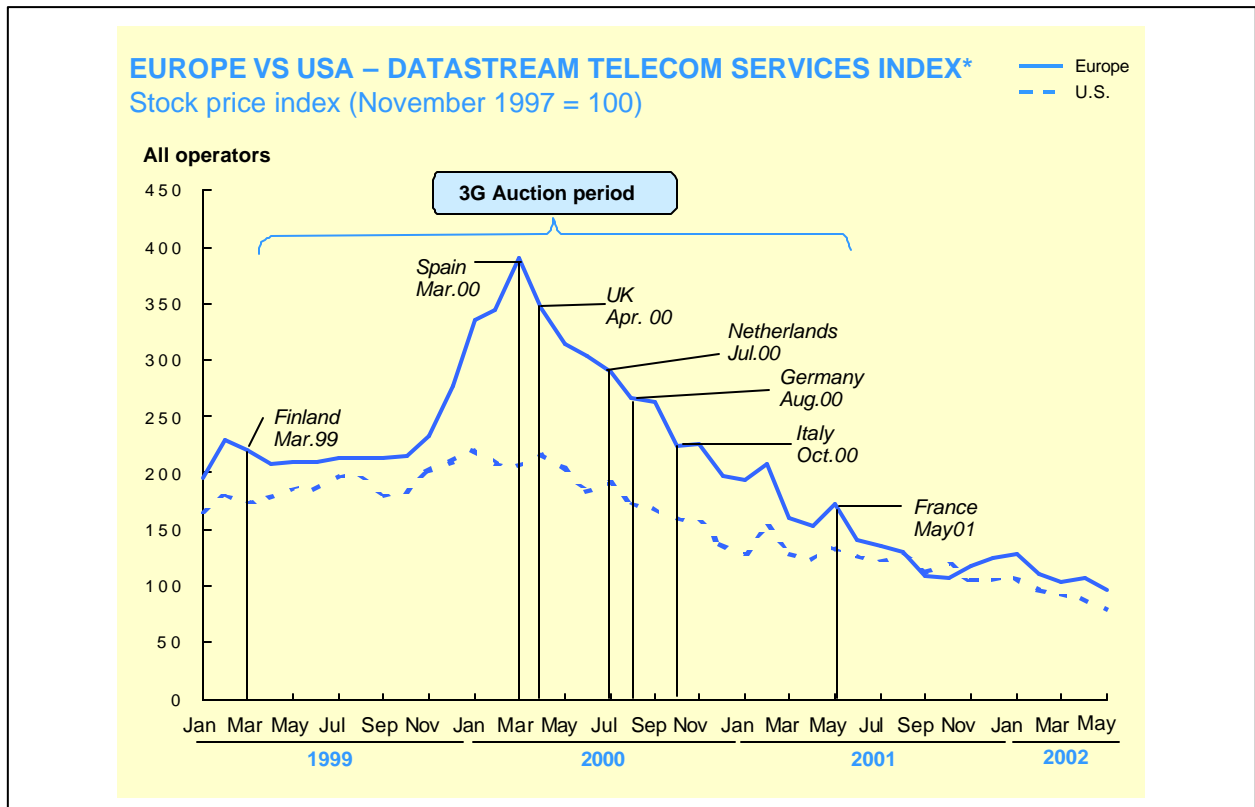


Exhibit 26



through licenses costs, 2G/2.5 G network investments and 3G network investments. Looking at the total amount of license fees paid across Europe⁵⁶, 3G licenses have been 11 times more expensive than all 2G licenses (EUR 10 billion). Based on different broker reports and as indicated in Exhibit 25, 3G infrastructure spend estimates for the period of 2002 to 2010 range from EUR 148 billion to EUR 224 billion while another 60 billion is expected to be spent on 2G/2.5G infrastructure on top of the 89 billions already spent to date. This will encompass 2G network investments for late 2G entrants, maintenance of 2G networks and upgrades to 2.5G networks. It is, however, worth noting that the fact that 3G investments will be more important than 2G investments is counter balanced by the much higher capacity that 3G will offer. Based on the methodology we developed and applied in the fourth chapter (and described in Appendix G), estimates of the cost of supply for 2001-2010 are in the area of EUR 145 billion. This figure is at the lower end of the estimates found in recent broker reports, which range between EUR 148-224 billion⁵⁷.

3.3.3 3G licensing has contributed to creating a funding problem for operators

The major financial impact of 3G licensing occurred on the expected performance of the operators and has clearly been reflected in their deflated stock prices.

Exhibit 26, based on DataStream information, shows the evolution over time of the telecom services index for Europe and for the US⁵⁸. Both indexes followed a similar trend with an increase during 1999 and a decrease since the beginning of 2000, reflecting the burst of the Internet and telecom bubble. However, during 2000, the degree of variations of the European index was much stronger than the American one, most probably reflecting the effect of 3G licensing on the European telecom market. Expectations in Europe were high before and during the first phase of 3G licensing and went down seriously over time as additional auctions took place after March 2000. Around October 2001, the telecom services index reached the level of 100, coming from the value of 370 in March 2000 and from the value of 200 in January 1999. This already severely limited the equity funding capability of operators.

⁵⁶ 109 billion EUR including all fees besides the ones based on a percentage of operator revenues. As discussed in Appendix F, for modeling reasons, we considered a 16 year time period (cf. 4 year expected for the market to come at a level of "cruising speed"). As the remainder of the incremental fees due to the rest of the license duration is not significant, we didn't recompute the total value

⁵⁷ Aegis spectrum engineering and Connogue Limited, Burns, J., Kirtay, S., Court, D., "Study on administrative and frequency fees related to the licensing of networks involving the use of frequencies", 14th November 2001; Gartner Dataquest, Richardson, P., "Mobile Terminals: Western Europe, 1996-2005", 14th June 2001

⁵⁸ Based on DataStream information. Indexes include both wireless and wireline services

Exhibit 27

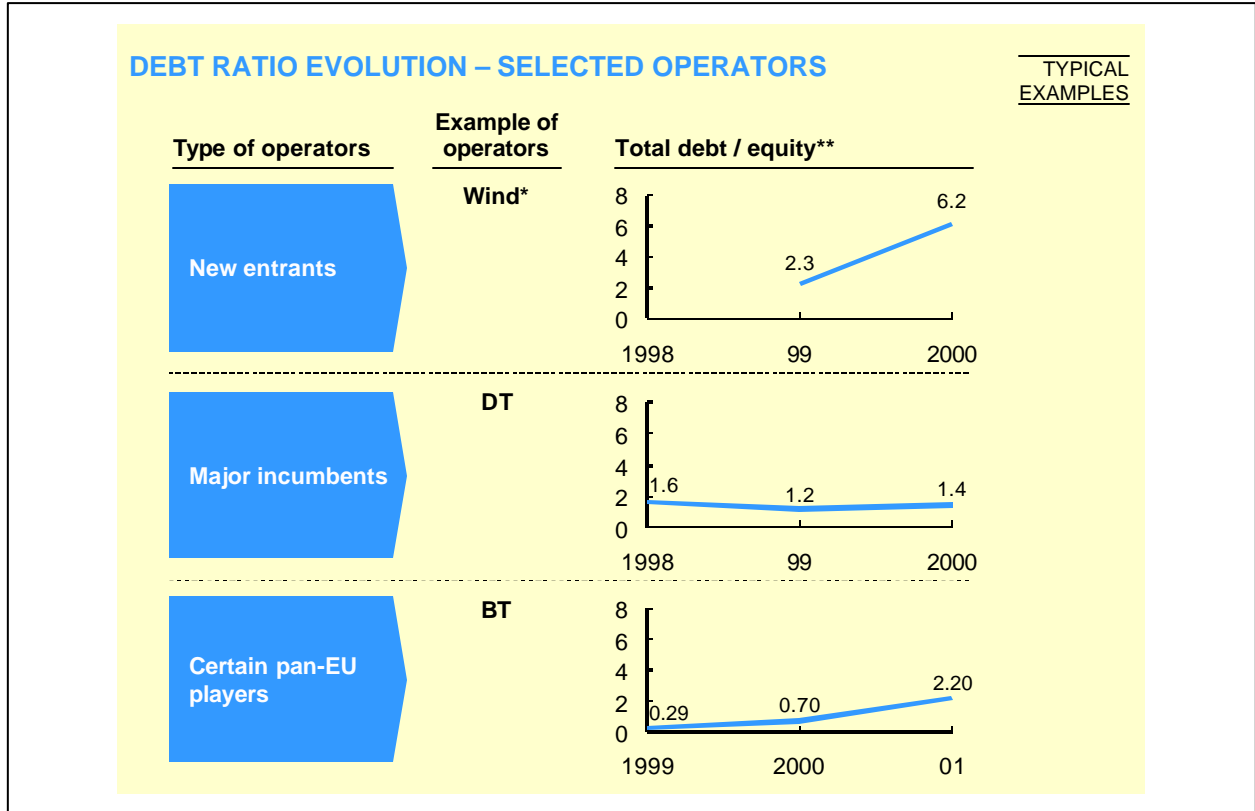
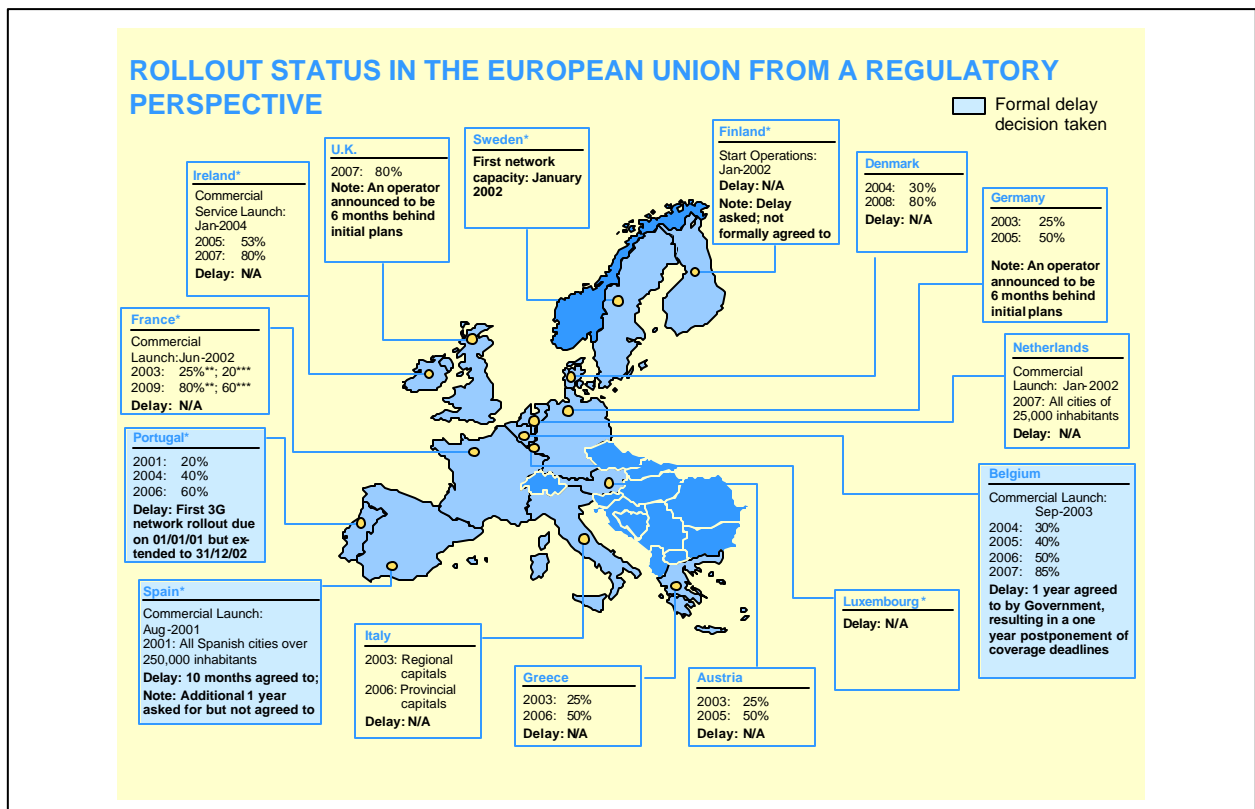


Exhibit 28



Full size exhibit can be found in the Annex to this document

In addition, the sharp increase in debt ratios of a number of operators further reduced their external funding capability, creating a financial headache⁵⁹ for operators that needed to finance multiple 3G license fees and 3G network investments. As can be seen on Exhibit 27, 3G licensing impacted the debt ratio of new entrants and certain pan-European players in a negative way.

3.3.4 Operators have started to ask for more regulatory flexibility as they are confronted with economic and technical issues

The mobile telecom sector has increasingly put pressure on national regulators to relax certain specific 3G license conditions, in particular those that have an explicit impact on the short-term funding problems of a number of mobile operators, both 2G and 3G.

These regulatory revisions currently focus on delays of coverage obligations, reduction of and/ or delays in license fee payments, extension of license durations and infrastructure sharing considerations. All these measures result in a relaxation of the pressure on the debt of the operators and a decrease of short-term financing requirements. The extension of the license duration allows for a longer payback period and years of profitability.

Exhibit 28 provides an overview of the rollout status and coverage obligations of each of the Member States. We can identify, delay relaxations by regulators are occurring in a growing number of Member States more explicitly, in particular in those Member States with short-term coverage requirements (i.e., in particular 2002-2003). To the extent that rollout conditions would not have substantially changed in the following years, it can be expected that similar relaxations will be asked for in those Member States with longer-term coverage requirements (cf. 2004 and later). At the same time, and as was reflected in a number of interviews with mobile operators and the ETNO, mobile operators must fulfill network rollout obligations with regard to public health and environmental issues (e.g., electromagnetic radiation) of 3G base stations and the requirements differ between Member States. As an example, they must perform research to verify that the health effect of a 3G base station in a given area will be minimal, and they must perform measurements of the sites radiation.

Mobile operators are also facing permit problems for installing 3G antennas on existing 2G sites or additional sites. Belgium is a concrete example of this situation where operators must negotiate a permit for every antenna, even if deployed in the same location as existing GSM antennas.

⁵⁹This finding was confirmed in the interviews with several operators. In 2000, all EU incumbent operators were willing to pay high 3G license fees, i.a., because management considered to launch IPOs (Initial Public Offerings) for their mobile subsidiaries (e.g., dicit Moody's in FET 8th May 2002)

Exhibit 29

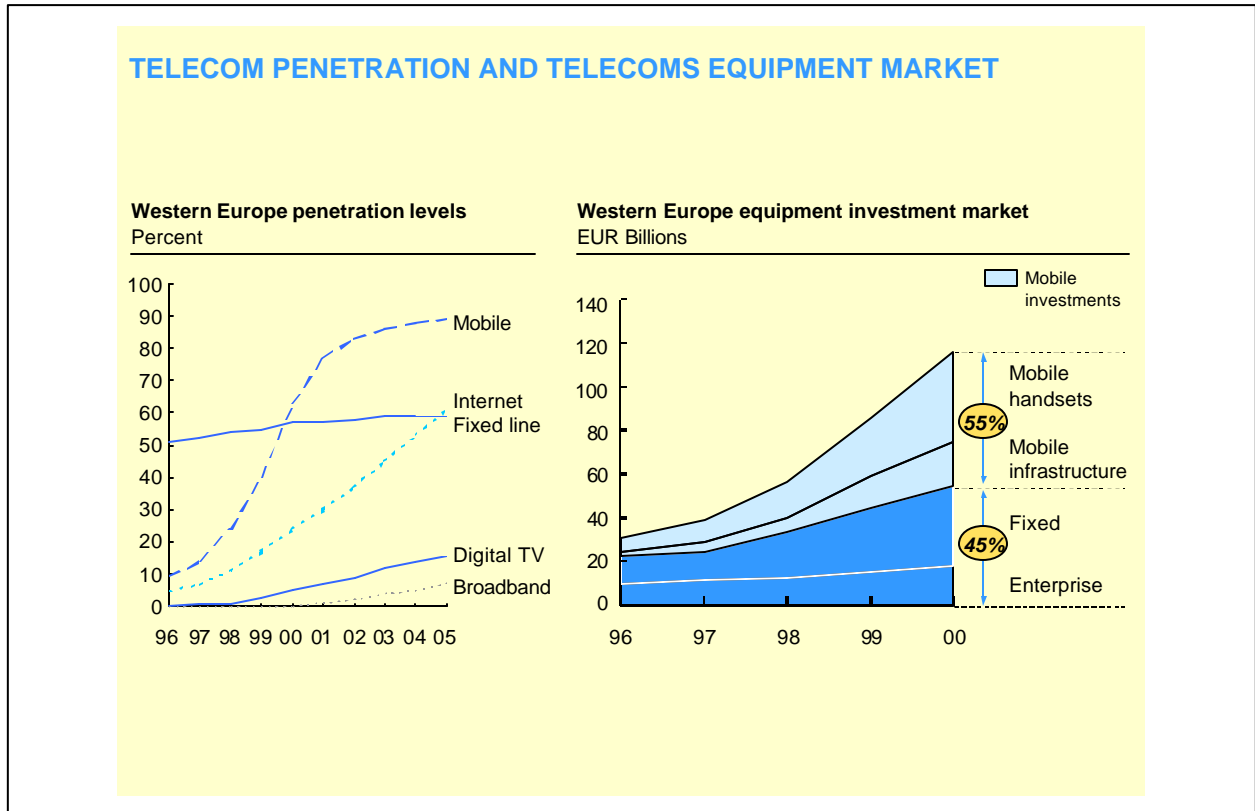
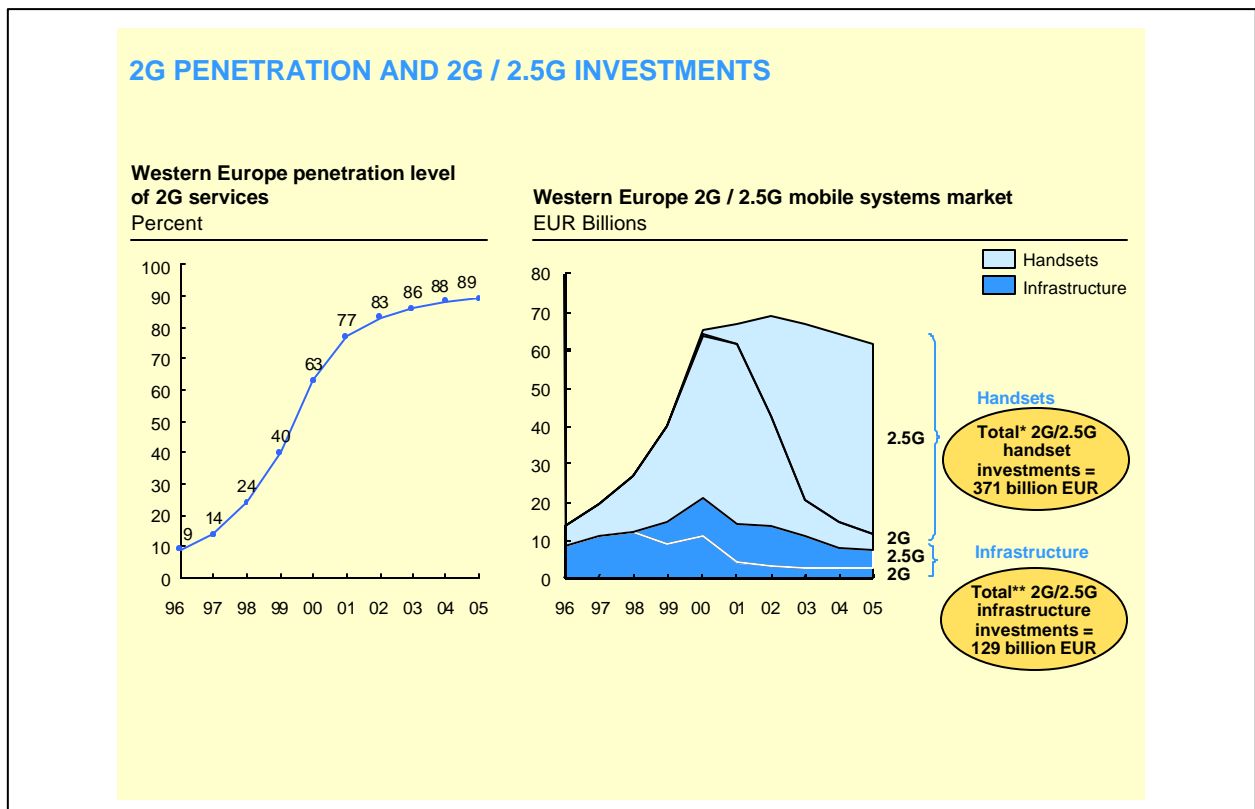


Exhibit 30



3.4 VENDORS HAVE HAD TO REDUCE THEIR HIGH EXPECTATIONS DUE TO DELAYS AND REDUCED ORDERS

The numerous 3G licenses and coverage requirements translate into significant investments in 3G networks. Equipment vendors invested large amounts in R&D to develop new 3G products and launch them as fast as possible, pushing for early adoption of standards.

At the same time, because of the downturn in the telecom sector, the severe CAPEX⁶⁰ reduction programs that operators are confronted with nowadays lowered their level of equipment purchases in both fixed line and wireless networks.

These cost reductions, which have been worsened by the outcome of 3G licensing (e.g., high license fees), can already be felt for the 3G market, as operators are delaying the rollout of 3G networks, sharing part of the rollout costs with other players or even pulling out from markets less attractive to them. To relax their short term financing problems, some operators have also been entering into pre-financing agreements with equipment vendors, which has sometimes been a decisive selection criterion. These pre-financing agreements risk to further increase the debt ratio of the vendors.

As a consequence, many equipment vendors are finding themselves in a difficult financial situation.

3.4.1 Initially, 3G was seen as one of the key new development areas for mobile vendors

For a number of equipment vendors, both European and non-European, the mobile equipment and handset markets have been at the core of their development and profitability in the course of the past decade.

In Europe alone, as can be observed in Exhibit 29 for the year 2000, mobile equipment currently drives more than half of the total telecom investments in the European Union. Mobile handsets are expected to reach a penetration level of around 90% by 2005, an order of magnitude much higher than the penetration of Internet and fixed line (60%), and even more than for digital TV (15%) and broadband (5%).

However, the 2G mobile markets in the European Union are gradually maturing, with a leveling off of the penetration and a decrease in mobile equipment and handset investments. As shown in Exhibit 30, penetration is expected to grow at a slower pace, from a current level of 77% to 89% in four years. The decrease in 2G mobile equipment and handsets since 2000 is expected to be only partially offset

⁶⁰ Capital Expenditures

Exhibit 31

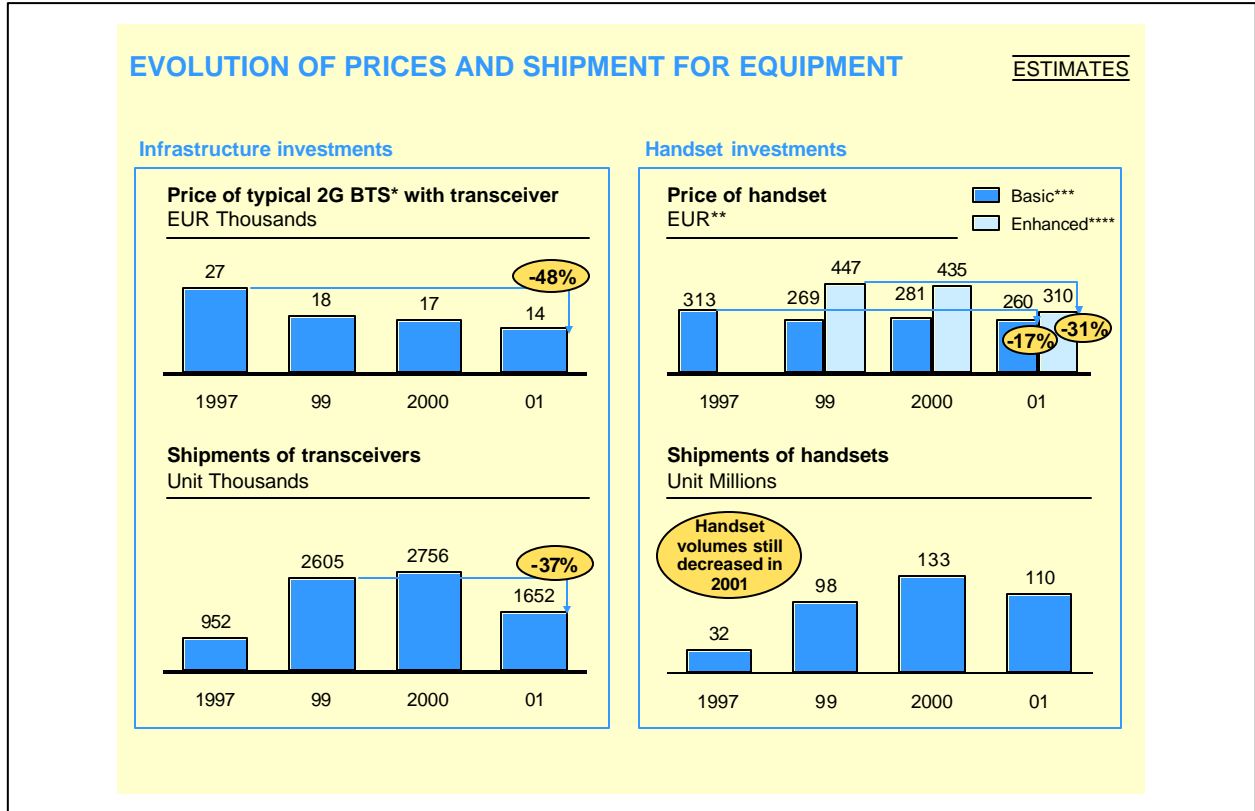


Exhibit 32

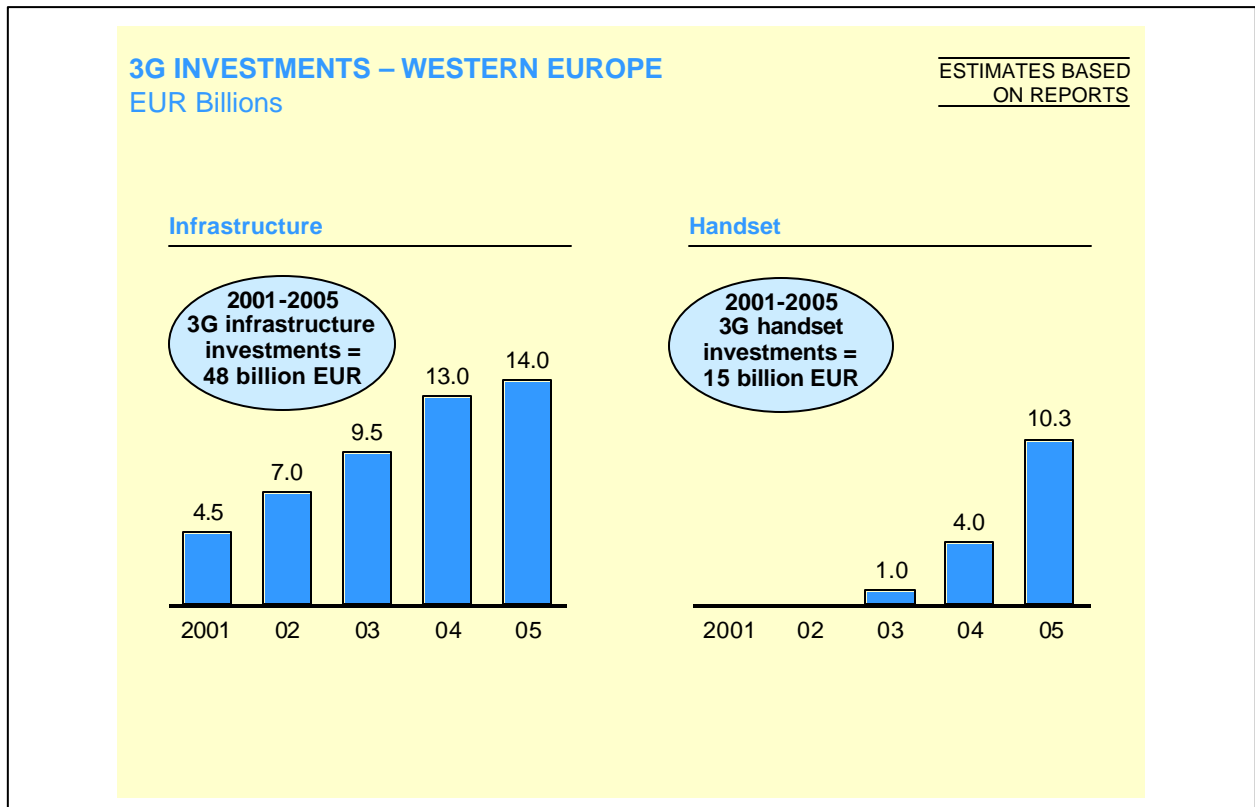
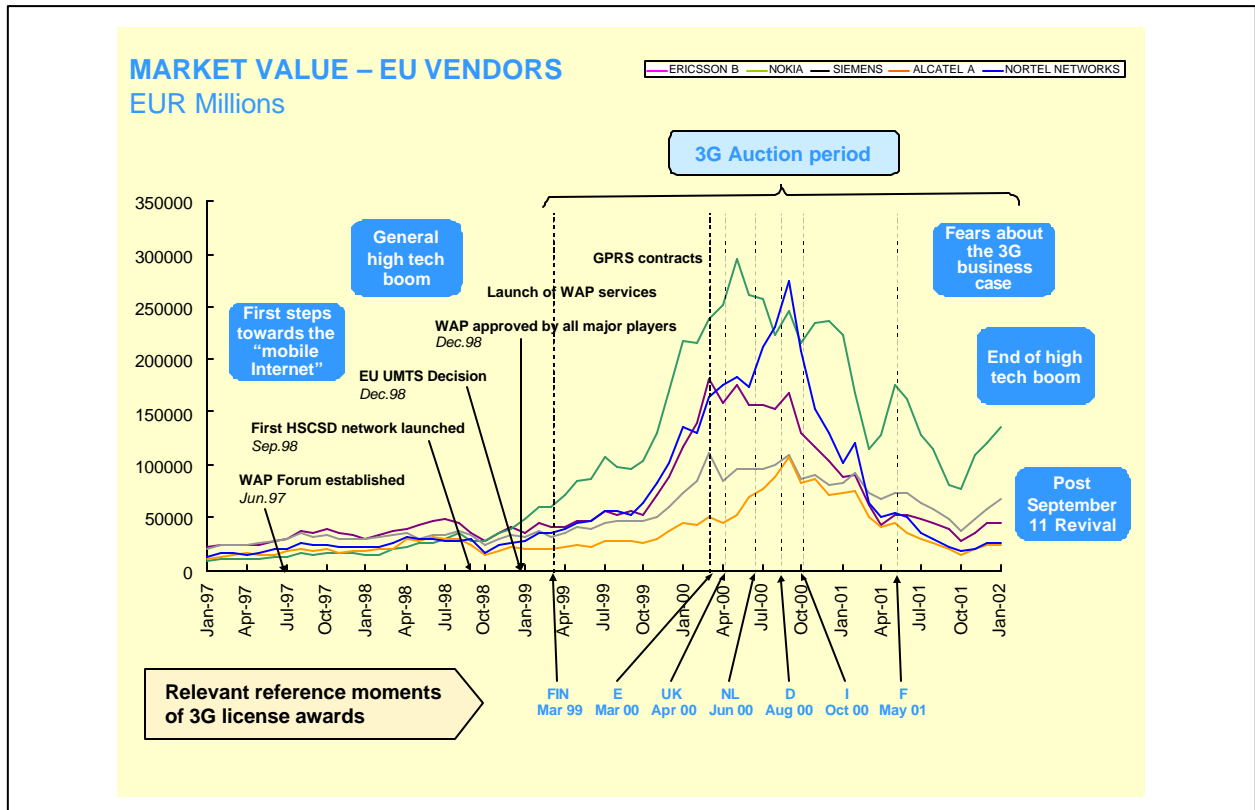


Exhibit 33



by 2.5G⁶¹. This is linked to a decline in shipments as well as in prices for both infrastructure and handsets. Over the past four years, prices for typical mobile equipment such as a BTS⁶² have typically dropped by 50%, while shipments of such equipment have decreased by more than one third since 2000, as shown in Exhibit 31. The same exhibit shows the same trend for the price of handsets declining by 17 to 31% over the last few years, based on the type of handset while the number of handsets sold decreased by 21% between 2000 and 2001.

Under these circumstances, the 3G licensing process was seen as a welcome and attractive growth opportunity. Equipment vendors pushed for early standard adoption of 3G technologies, believing that 3G would represent a high growth opportunity in the mobile industry. While pushing for the standards, they have been investing heavily in R&D over the past years. These investments were justified by the fact that 3G product requirements are of an order of complexity much higher than the 2G product generation. Examples of investments for the handsets include battery constraints, chipset complexity (running at much higher speed) and hand-over issue (inter-operability between a 2G base station and a 3G base station).

It is expected, as shown in Exhibit 32, that short-term 3G investments will be predominantly infrastructure based and might represent about EUR 50 billion between 2001 and 2005, while 3G handset sales will only become important after 2005, corresponding to the start of a mass-market take-up⁶³.

3.4.2 Vendors experience pressure because operators reduced their telecom spend

The collapse of the Internet and overall telecom stock market has decreased the operators' and service providers' demand for telecom equipment and thus resulted in a decrease of the vendors' expected performance, leading to a deflation of stock prices. As can be seen in Exhibit 33, the collapse of the vendor stock market, which had reached its highest value at the beginning of 2000, started in the second and third quarter of 2000, following the operator stock market decline⁶⁴ and is currently continuing. The impact of the high 3G license prices on the operators' cash positions will probably impact the vendor market growth in the European

⁶¹ Intermediary generation of mobile telephony. These technologies enhance data capabilities of 2G. 2.5G typically allow for 'always on' features and higher data speed transmission

⁶² Base Transceiver Station

⁶³ In the short-term, the handset market in the European Union could represent 15 billion EUR

⁶⁴ As recent announcements by the major vendors (Nokia, Ericsson...) slashed hopes for a quick recovery in the sector due to slower than expected demand pick up of 3G equipments, the market continues to down rate the shares of the equipment vendors community (e.g., "On April 18th 2002, Nokia shares slumped 10 percent [...] after the Finnish company [...] cautioned that sales for the full-year would grow only between 4 and 9%, rather than its earlier 15% [...] estimate" (Reuters 18th May 2002); "On April 23rd 2002, Ericsson share price dropped by 24% after it warned it was facing a second year of losses and could not give any indication on when a market recovery could be expected" (BWCS 23rd April 2002)

Exhibit 34

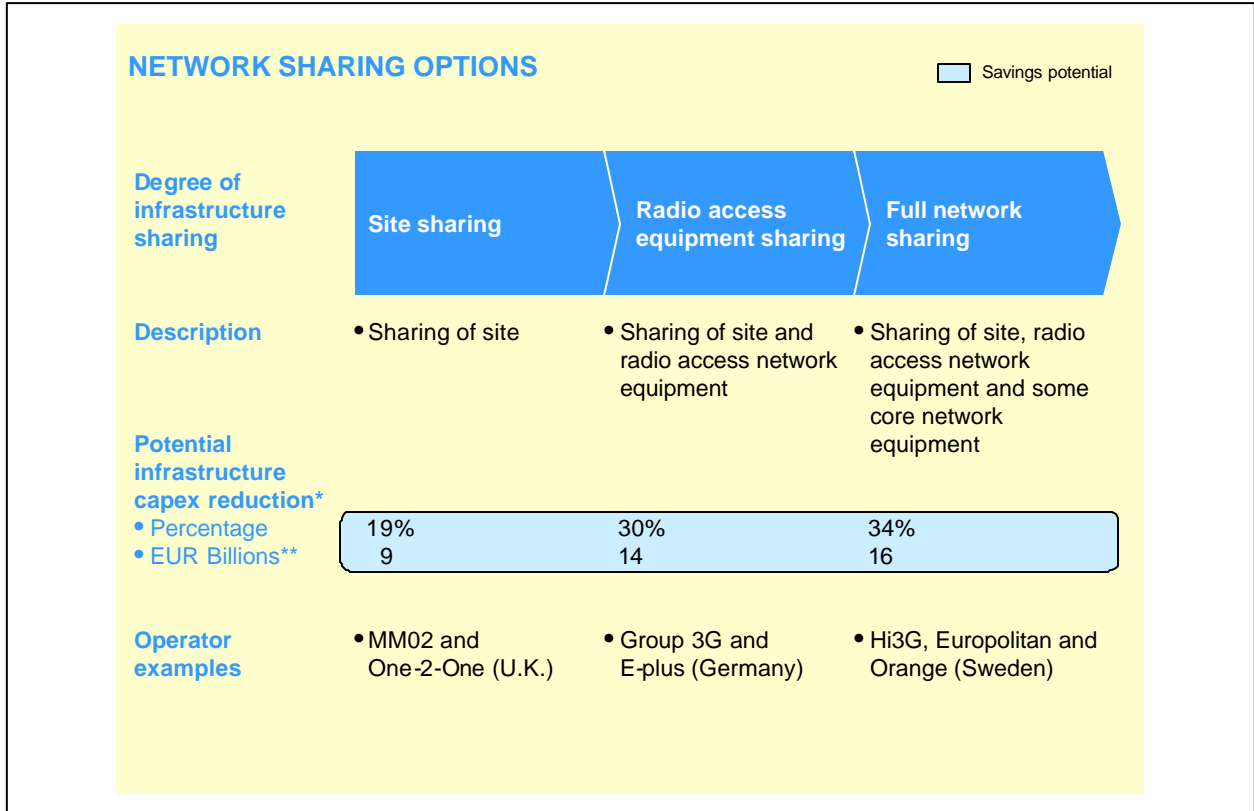
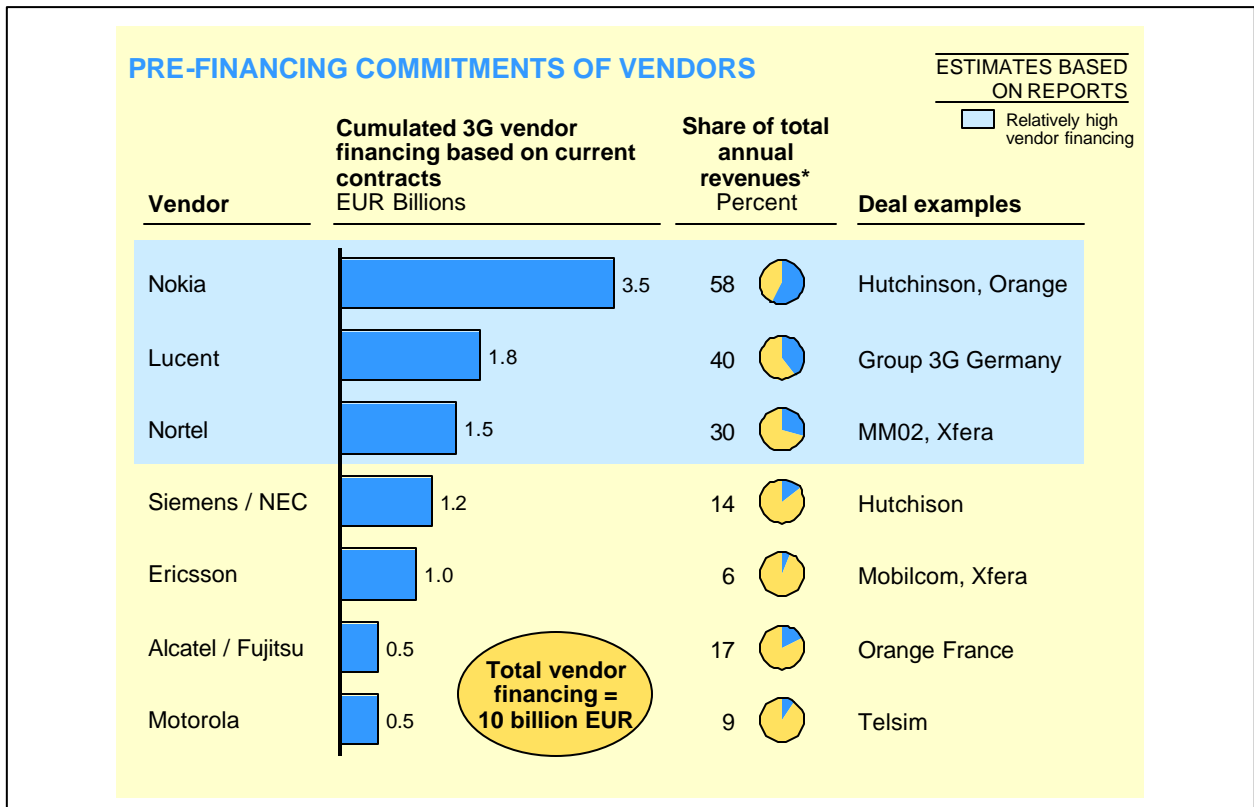


Exhibit 35



Union since it will, amongst others, delay, and most likely even reduce 3G network rollouts⁶⁵ by mobile operators under serious financial constraints.

3G mobile operators affected in this manner are trying to improve their short-term position by cutting down on deployment costs in striking deals for network sharing. Network sharing options, introduced in chapter two, allow for different levels of cost reductions for the deployment of 3G networks. Exhibit 34 indicates that these reductions are of the order of 20% for site sharing and 30% for site and radio access network sharing⁶⁶. Sharing in addition some equipment of the core network would lead to an incremental cost reduction of only a few percent and would therefore not contribute significantly to the overall potential cost savings. Assuming total infrastructure CAPEX costs of EUR 48 billion for 2001-2005, site sharing would potentially bring EUR 9 billion savings while radio access network sharing would bring an additional EUR 5 billion.

As mentioned by major European vendors while being interviewed, the changes in the requirements put by mobile operators on the equipment functionality, e.g., to account for network sharing forced vendors in the European Union to adapt their 3G equipment and, together with technical problems still being solved, may have shifted the launch of 3G products backwards by a couple of years.

In addition, the operators' financial constraints led a number of them to push for vendor pre-financing⁶⁷, thereby putting an incremental burden on vendors, leading to a potential increase in their debt ratios. In Exhibit 35, it appears that vendors have already agreed to pre-finance approximately 20 % of the 3G market until 2005 (roughly EUR 10 billion).

Adding both effects of network sharing and vendor pre-financing, the net effect can be detrimental to the equipment vendors. Similar as for the operators, also for vendors, guaranteeing short-term profitability is becoming a growing success factor in dealing with the difficult market situation⁶⁸.

⁶⁵ This might impact current coverage commitments, incorporated as obligations in the license

⁶⁶ These figures are based on interviews with operators and vendors. Similar reduction ranges can be found in Northstream AB, "*Network sharing – savings and competitive effects*", 30th September 2001; Cap Gemini Ernst & Young, Gouteix, O., "*Saving Costs on 3G Rollout: The Networksharing Alternative*", 25th July 2001; CSFB (Credit Suisse First Boston), "*European Mobile Quarterly, Capex sharing – will it boost the sector?*", 16th March 2001

⁶⁷ This point was clearly reflected in the vendors' and operators' interviews, indicating vendor pre-financing could be an important element for the operators' financials in the initial phase, in particular for late 2G and 3G new entrants. As such, the individual operator's cost of capital will be a key driver to define to what extent vendor pre-financing will be requested for

⁶⁸ Equipment vendors increasingly turn to cost cutting measures to ensure future profitability. Ericsson's recent announcement to lay off 17.000 employees on top of the layoffs of last year, indicating that employment levels in the sector are in a downward trend. "Ericsson [...] started a cost saving plan last year to cut its costs by SEK20bn (\$1,93bn) a year. The company [...] plans to cut a further SEK10bn (\$0,96bn) in costs in both 2002 and 2003. This will mean further job cuts, probably around another 17.000, which will reduce the payroll to around 65,000 employees. The company shed [already] 20.000 of its employees, who were either cut or moved to outside contractors last year" (Computerwire News 23rd April 2002)

Exhibit 36

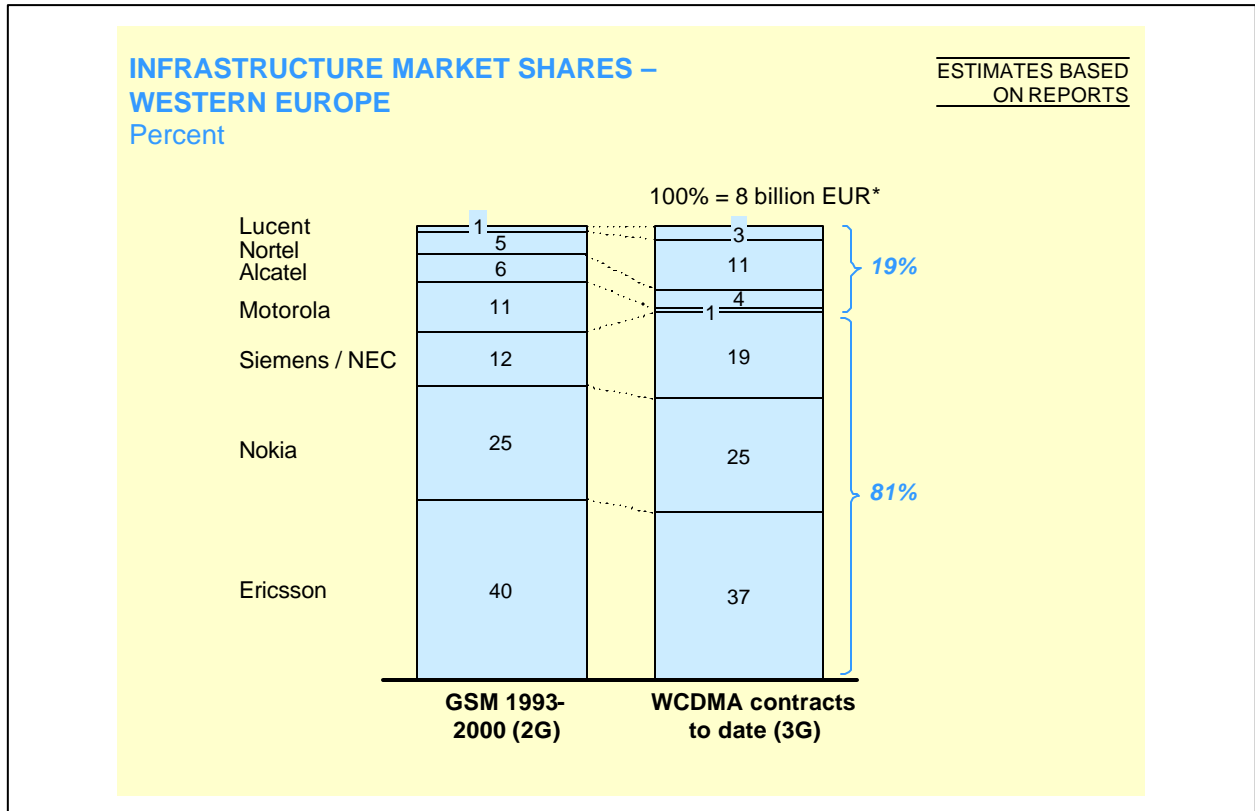


Exhibit 37

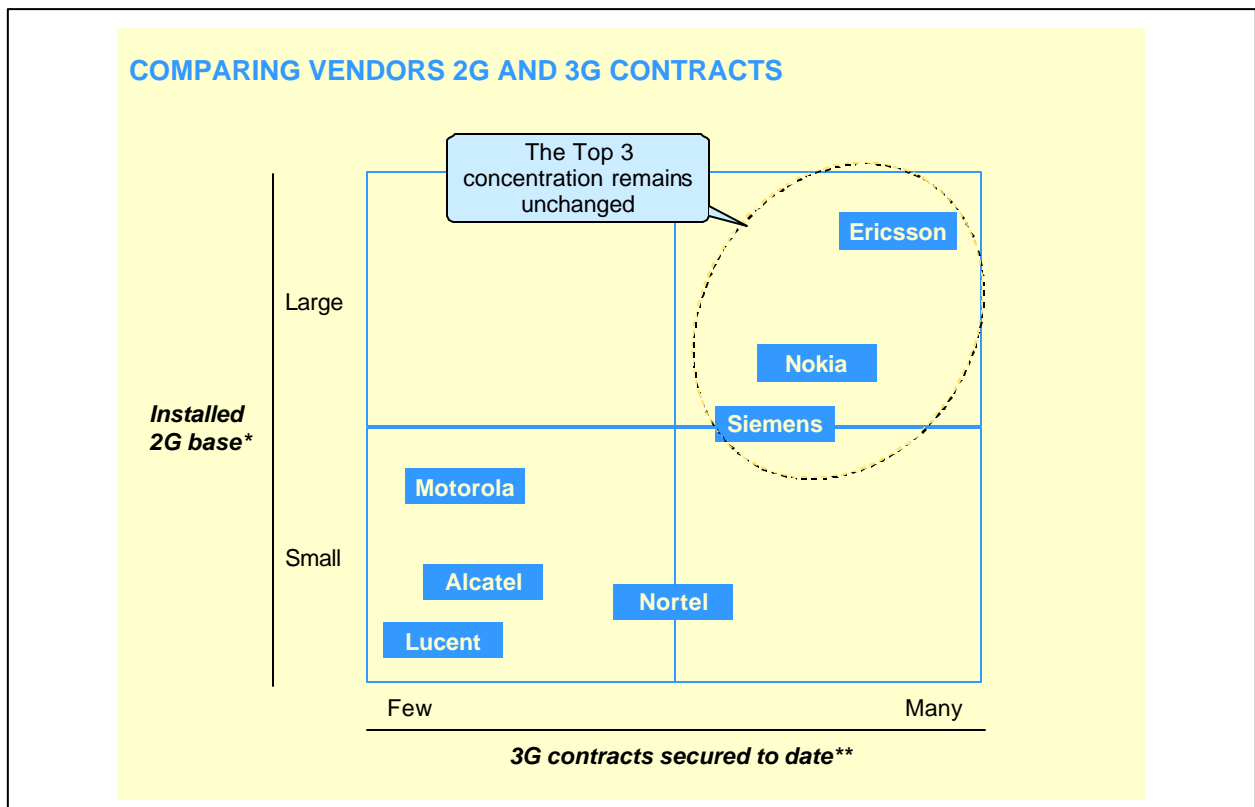
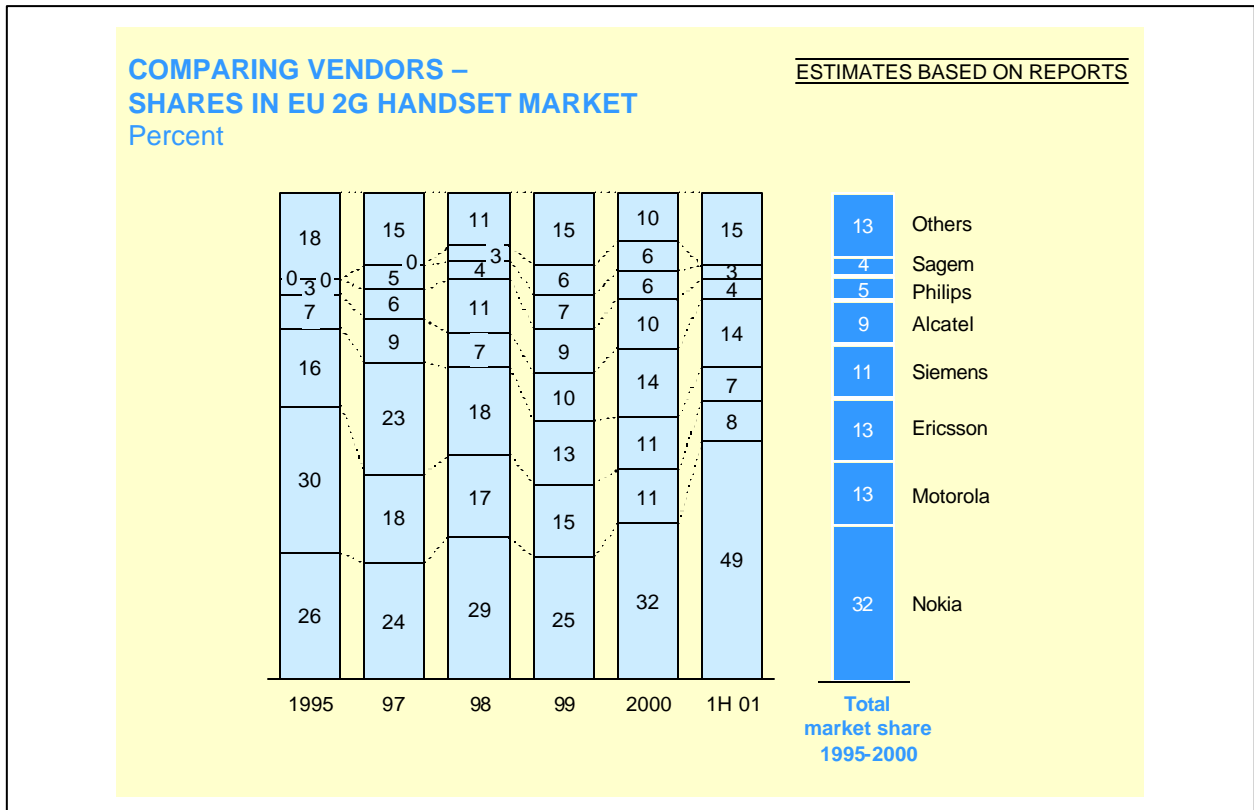


Exhibit 38



3.4.3 No restructuring in the vendor industry so far as European vendors remain in the lead

3G licensing has not had an impact on the number of vendors so far, nor has it triggered any change in vendor market concentration. However, some consolidation might occur later, the reasons for which will be explained in the next chapter.

So far, the economics of supply have not changed significantly, neither in terms of the number of vendors or in terms of market concentration. Based on preliminary information of 3G contracts secured to date, the top three European manufacturers are expected to retain a market share of over 75%, rendering the entry of new players difficult (Exhibit 36). Therefore, the European vendor market will probably remain oligopolistic and substantially concentrated. A comparison of 3G contracts secured to date and the vendors of 3G equipment versus 2G equipment sold in Europe reveals that, so far, the vendor market reached a status quo and that new entrants will experience difficulty in winning 3G infrastructure contracts (Exhibit 37).

Existing European handset manufacturers also have a strong competitive advantage over new entrants, as shown in Exhibit 38 with the evolution of the EU 2G handset market share since 1995. Roughly 85% of the handset market is in the hands of European players.

Integration has started as a number of European vendors have entered into alliances with foreign companies. These alliances permit the vendors to strengthen their product portfolio and to leverage economies of scale by playing in different markets. Examples of recent integrations include joint ventures between Siemens (51%) and NEC (49%), called Mobisphere, in November 1999, and Alcatel (66%) and Fujitsu (34%), called Evolium, in May 2000. The main drivers for these ventures were similar: capturing synergies, reducing time to market and building on the partner's complementary geographic strengths and technological expertise. The April 2001 equal partnership between Ericsson and Sony called Sony Ericsson mobile Communications, was mainly driven by mutual complementary technological skills: the strength of Sony in electronics and entertainment and the strength of Ericsson in mobile technology. The venture will focus on the coordination and integration of R&D, marketing, sales distribution and customer services.

3.5 A MIXED BLESSING FOR GOVERNMENTS: ONE-TIME 3G LICENSE PROCEEDS ARE OFTEN OFFSET BY THE LOWER VALUATIONS OF OPERATORS

3G licensing shifted significant value out of the telecom industry towards the national governments, to different degrees among the Member States.

Exhibit 39

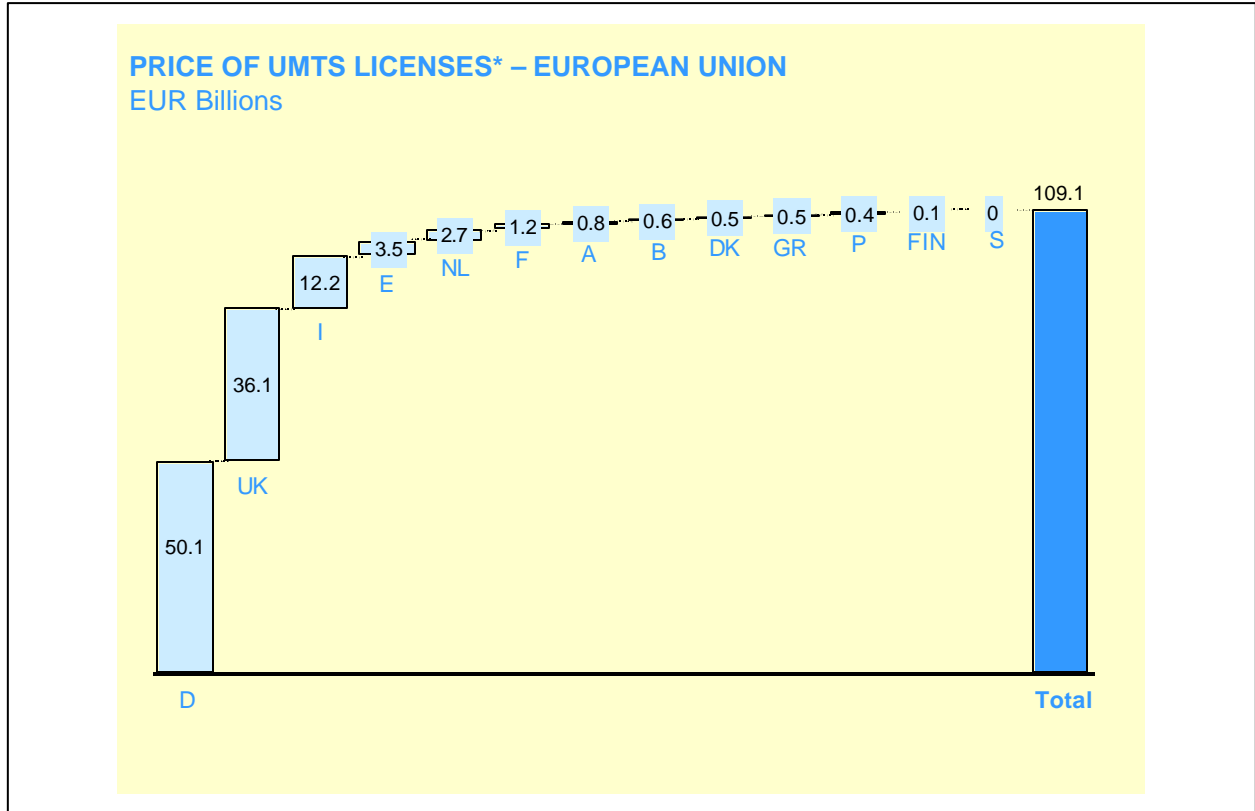


Exhibit 40

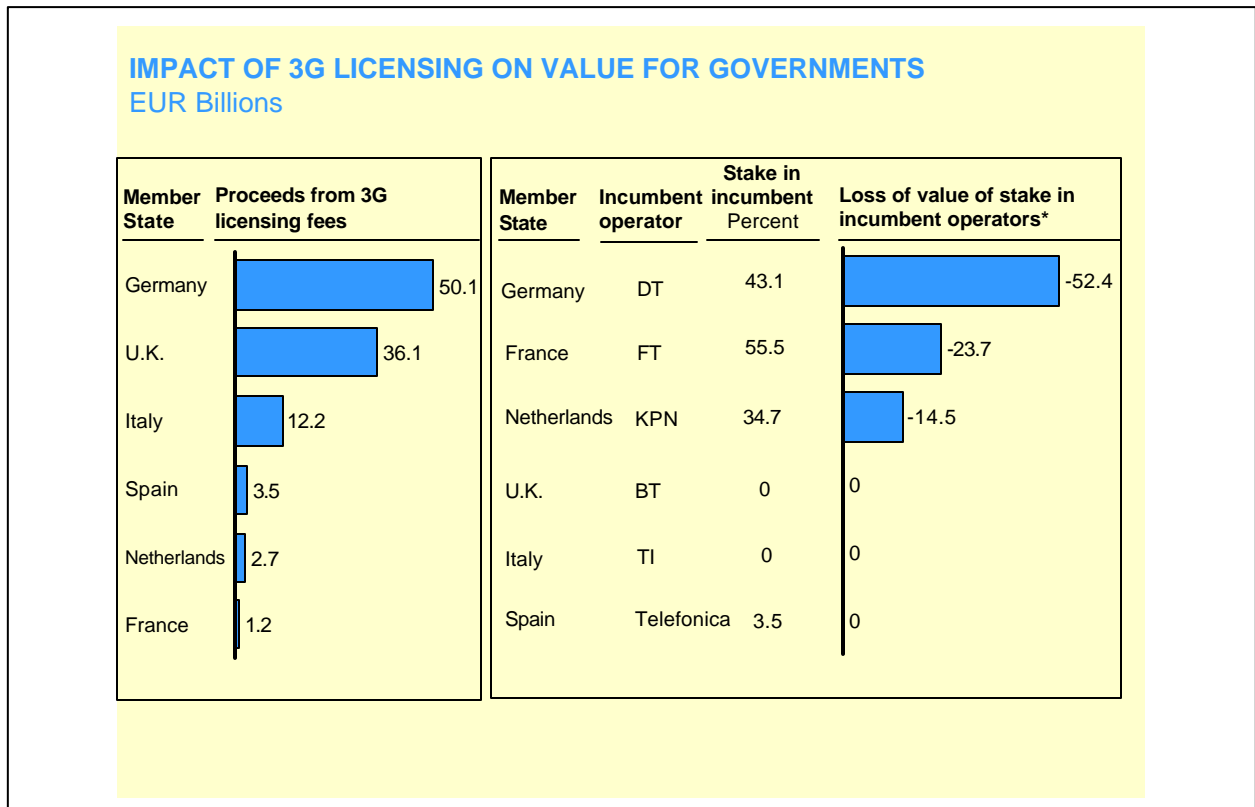


Exhibit 41

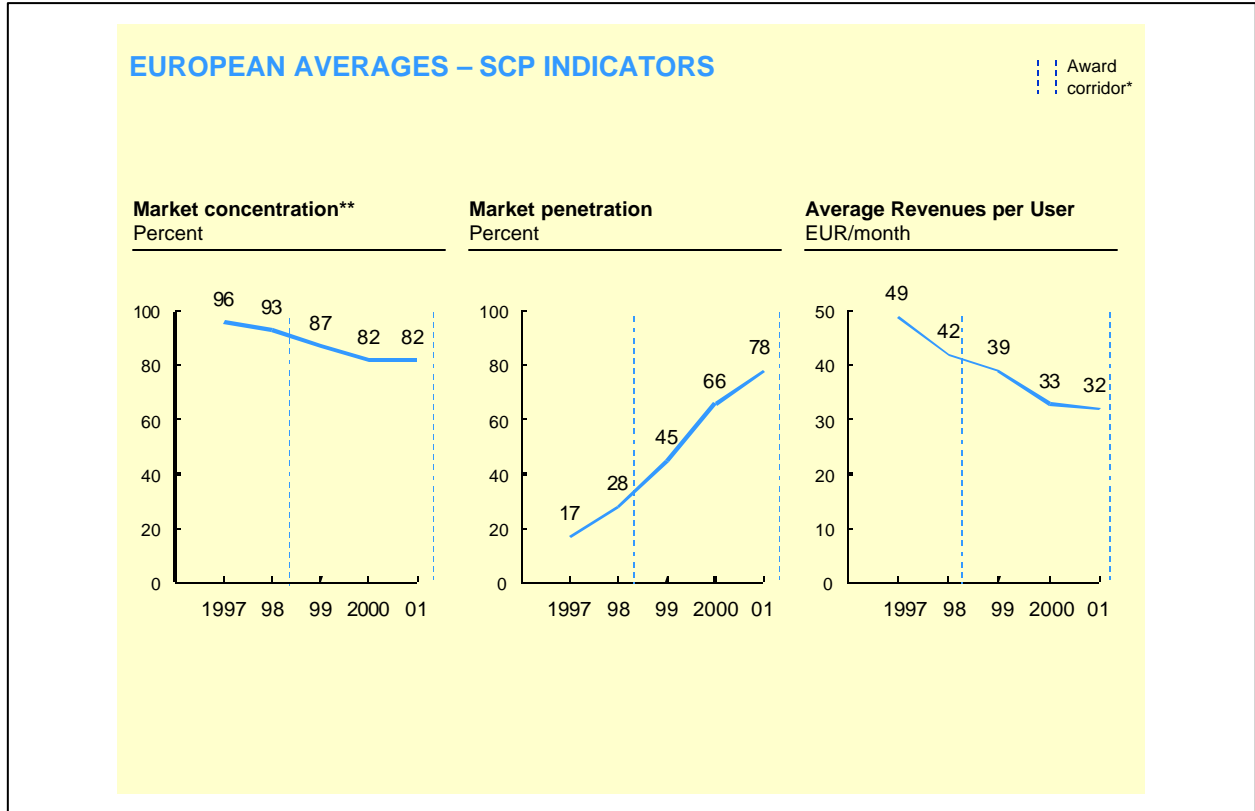


Exhibit 42

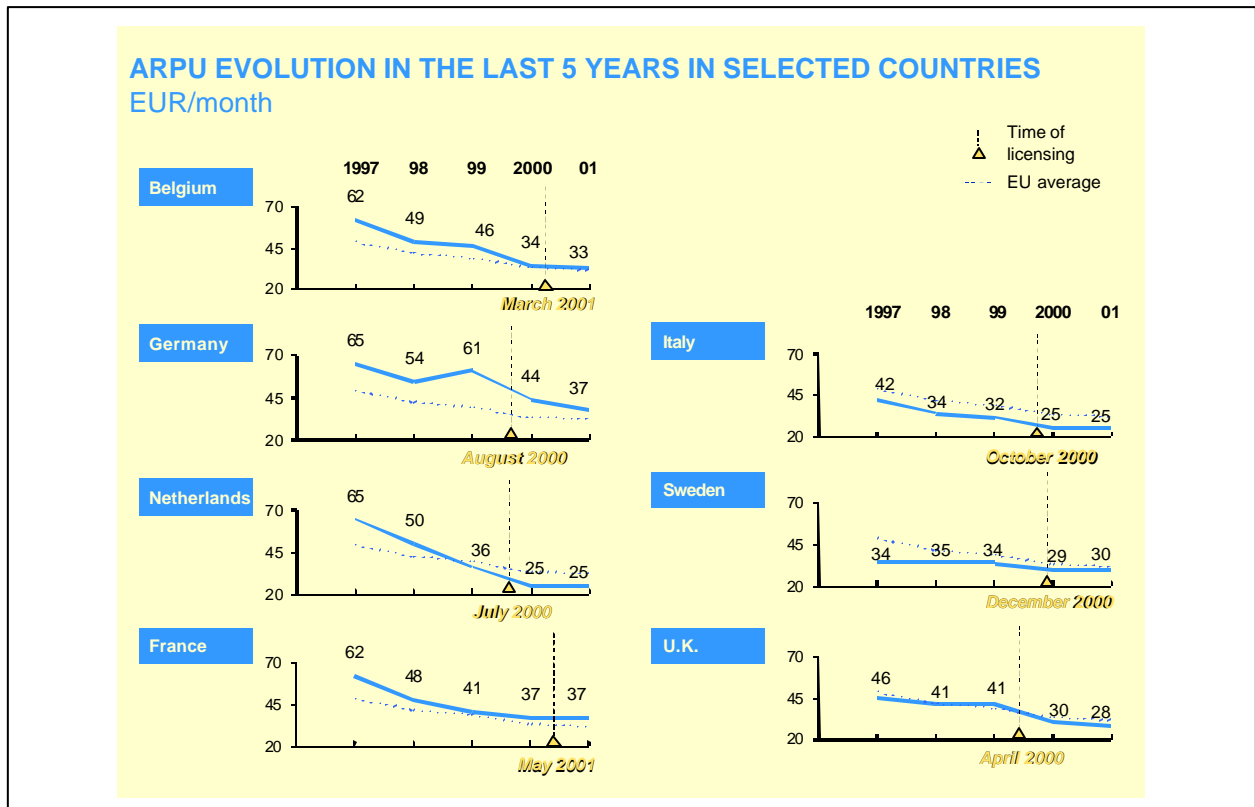


Exhibit 39 shows an overview of prices paid for 3G licenses per Member State. These figures include fixed costs comprising one-off fees and installments over time and leave out variable costs of the annual contribution based on percentage of revenues. The largest part of the total 3G licensing proceeds⁶⁹ of EUR 109 billion was spent in Germany and the U.K. Spain and Italy also contributed significantly to this total income. All other Member States combined contributed less than 10%.

To the extent that the governments held stakes in the incumbent operators, these one-time proceeds for the governments are, at least partially, indirectly offset by the deterioration of the stock market position and the debt ratings of their respective incumbent operators.

Focusing on the Member States which still retain a significant stake in their incumbent players, we found that if some governments were to sell their stake in incumbent operators, they would lose a value that currently is higher than the value gained during the entire 3G licensing process. Examples of such countries are Germany, France and the Netherlands. In other cases, governments were able to capture a lot of value through 3G licensing with no or a very limited stake in incumbent operators such as in the U.K., Spain and Italy (Exhibit 40).

3.6 END-USERS HAVE NOT SEEN DIRECT IMPACT YET, WITH THE 2G MOBILE MARKET CONTINUING TO DEVELOP AS EXPECTED

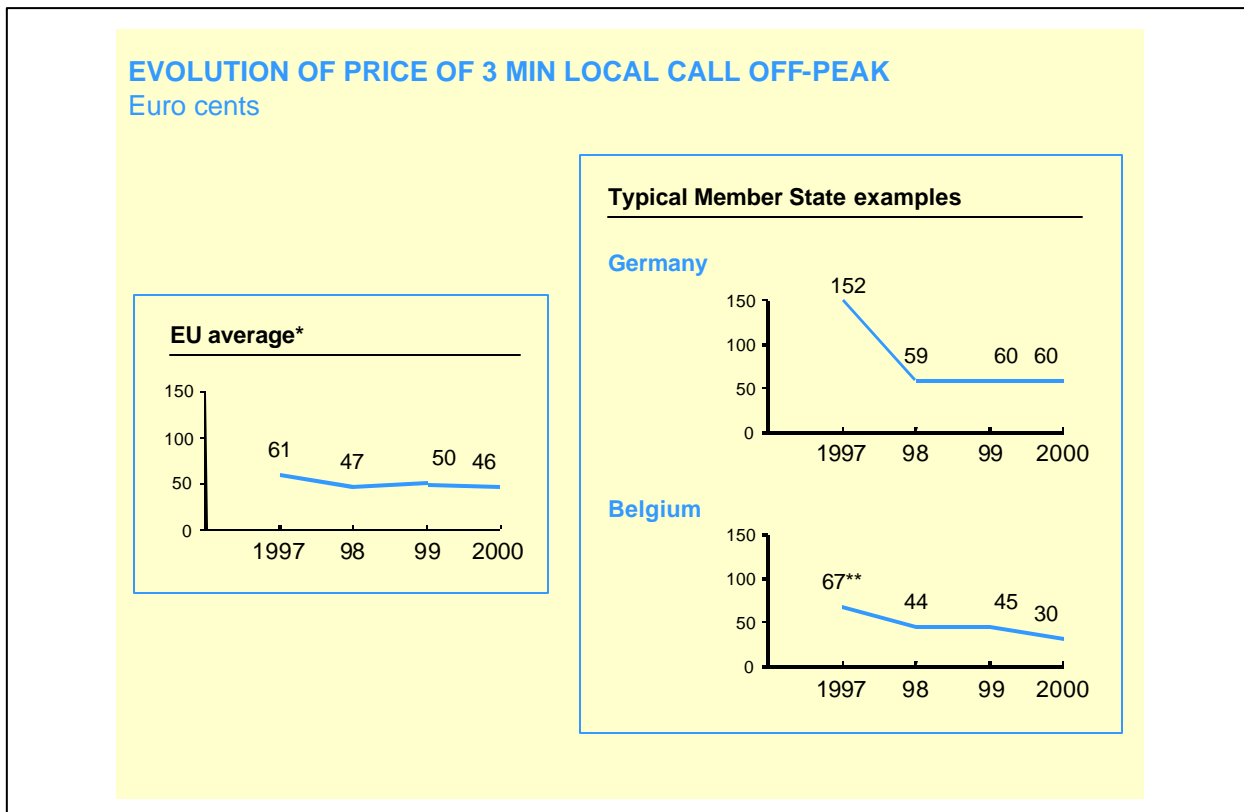
Customers have, so far, not experienced the effect of changes in the market from 3G licensing as no 3G services are already available. The evolution of key indicators such as market concentration, market penetration and ARPU follows the expected trend that is characteristic of a maturing 2G mobile market, without any measurable impact of 3G licensing to date.

The above parameters have been calculated at the European level and plotted in Exhibit 41 from 1997 until 2001. In the timeframe during which most licenses were issued (1999-2001), there is a continuation of the previously ongoing trend. Concentration and ARPU have kept on decreasing (at a rate which slowed down after 2000, because of the saturation of the market) while penetration of mobile handsets continued to grow (also at a decreasing rate after 2000 for the same reason).

Looking at the ARPU evolution over the past five years for a few European countries in Exhibit 42, we see a general decrease that is characteristic of maturing mobile markets, with some countries with high ARPU levels experiencing a faster decrease than other countries with lower ARPU.

⁶⁹ For modeling reasons, a 16-year time period was considered. As incremental annual fees due for the remains of the license duration are not significant, the total value was not remodeled

Exhibit 43



Finally, taking an off-peak three-minute local call as a reference in Exhibit 43 to analyze the decrease in price, prices reached a certain degree of stability at the global European level and for some countries.

Chapter 4: Likely future impact of 3G licensing on the Internal Market and on the development and competitiveness of the mobile communications sector at national and European levels

In accordance to the Terms of Reference, this chapter will address the likely future impact of 3G licensing on the Internal Market and on the communication sector. It will, in particular, discuss issues such as the rollout of new services, interaction with and impact on 2G mobile communications, emergence of new technologies, development of a competitive market, and development of pan-European services and networks.

It is important to highlight that in practice, it proved impossible to single out the individual impact of each of the license conditions. We therefore addressed the impact of the 3G licensing processes and the licensing conditions in their integrality. As we already identified in the second chapter, the 3G licensing outcome revealed in particular three types of distortions in the licensing process, both in and between Member States, negatively impacting the Internal Market. These distortions were driven by the evolution of market expectations over time, the number of licenses offered, and certain specific characteristics of the award methods employed.

We are applying the same methodology of analyzing the future impact of 3G licensing for the different stakeholders, namely the mobile operators, the equipment vendors, the government/ society and the customers. We will also, when addressing the mobile operators, include an analysis of the future impact of 3G licensing on the mobile data content and applications market, as it has been an emerging market, and therefore was not explicitly addressed in the previous chapter.

Footnotes referred to in the exhibits of this chapter can be found in Appendix G.

4.1 CURRENT IMPACT METHODOLOGY IS EXTENDED TO TAKE THE EVOLUTION OF POSSIBLE SUPPLY AND DEMAND IMBALANCES INTO ACCOUNT

While assessing the likely future impact on the mobile sector and the Internal Market in the European Union, both the stakeholder framework and the SCP-analysis⁷⁰ around industry structure, player conduct and performance, as introduced in chapter three, were re-used. This helped to focus our findings on the different groups of players including mobile operators, content and data application providers, equipment vendors, governments and customers.

In addition, a modeling tool has been developed in order to assess the impact of 3G network investments on the operator market in the European Union. The tool identifies the possible evolution of supply/ demand imbalances under different scenarios.

The model starts by calculating the cost of supplying 3G networks for all the countries of the European Union, assuming that the number of networks to be deployed is equal to the number of 3G licenses which have been allocated so far, as a base case. It accounts for capital expenditures related to the deployment of 3G core and access networks⁷¹ and for the fixed license costs⁷². It also accounts for radio access network savings from the re-use of DCS1800 masts.

The model then estimates how easy or difficult it will be to earn back the cost of supply in the market, by calculating how many years of EBITDA⁷³ earning power “at cruising speed” are required to fully cover the costs incurred. This disregards the first couple of years of 3G operations where EBITDA margins may still be negative or in a ramp-up phase, and it also assumes that all 3G financing is dealt with, using the cost of capital rates of mobile operators today.

Several scenarios are subsequently worked out with this methodology, looking at ways to reduce the supply/ demand imbalances. The major variables on the supply side are the coverage obligations and the degree of network sharing. On the demand side, the key variables include the level of EBITDA that 3G can achieve compared to 2G, and the speed at which 3G services can be fully commercialized. More information on the modeling tool can be found in Appendix F.

⁷⁰ Structure-Conduct-Performance analysis

⁷¹ Site, equipment and access network costs, including components replacements

⁷² Upfront license fees and annual fixed administration and spectrum fees

⁷³ EBITDA: Earnings Before Interest, Tax, Depreciation and Amortization

4.2 ALL STAKEHOLDERS WILL HAVE TO DEAL WITH THE CONSEQUENCES OF THEIR BIG BET ON 3G, WITH OPERATORS FACING THE BIGGEST TRANSITION PROBLEMS

In our assessment, the likely future impact of 3G licensing concerns first and foremost the operators, which face the majority of transition problems, and have no choice but to make the best out of their situation. In most cases, this will lead to revised plans and delays in 3G rollout. In several cases, we expect this to lead to substantial restructuring among operators.

The impact on the other stakeholder groups (i.e., content providers, vendors, end-users and governments) is indirect, but still significant. All will have to adjust their expectations downward with regard to 3G, and be more patient as to the development of the mobile market in Europe in the coming three to five years. In the last two years, all stakeholders in Europe have implicitly put a big bet on 3G. Given the amount of funds committed to its development, alternative technologies are difficult to justify for the moment, and all have to live with the consequences.

Mobile operators

At the EU level, 3G licensing contributed substantially to the emergence of cross-European players and the trend towards more regional players like in Scandinavia. In the short to medium term, we expect industry dynamics to be significantly driven by market restructuring, and to a lesser extent by ongoing consolidation. The imbalance between the cost of supply, including the 3G license fees and network rollout costs, and the potential revenues from 3G services will be the key factor in the coming years. However, the situation will not be homogeneous across the European Union as Member States can be grouped around three likely expected outcomes.

On the longer term further consolidation at EU level might take place, driven primarily by four factors: scale, scope, skill gap and achievability. How competition in 3G will eventually evolve at Member State and EU level is difficult to assess. Whether the competition levels envisaged by the 3G licensing procedures will be reached, remains however to be seen.

Content and data application providers

3G licensing can be expected to have a predominantly indirect and catalyzing effect on the developments in the content and data applications market in Europe that had already started its restructuring and reprioritization after the telecom and internet bubble burst in the course of 2000. As quite some content startups went bankrupt, and most media-related companies operate under serious cash constraints in the coming years, initiatives on the content market might be predominantly driven by mobile operators focusing on generating short-term

profitability through successful content applications⁷⁴ to offset the cost of supply they already incurred⁷⁵.

Mobile equipment vendors

The EU vendor market will be experiencing a delay and a reduction in the demand for 3G network investments. As operators struggle with ways to reduce their capital expenditures, those vendors that can address this need will clearly be best placed. In order to maintain their profitability targets, vendors will need to find other sources of revenue to compensate for this decrease in demand, apart from the aggressive cost cutting they have already initiated. As Europe has committed itself so strongly to 3G, the potential for other technologies in this geography is likely to be more limited in the course of this decennium.

End-users

3G licensing did extract significant financial value from the industry, shifting money from content and application development to infrastructure investments. This, in turn, may lead to a substantial delay in rolling out the networks; customers may need more patience before having rapid access to the full range of new mobile data services. In addition, mobile operators might consider putting premium prices on some of the first generation services they will offer, thereby addressing only the high-end of the residential market and the business community in the beginning⁷⁶. Given the big bet on 3G, it is also unlikely that other broadband mobile technologies will massively invade Europe in the coming years.

Governments

3G is also unlikely to bring a lot of positive news to governments in the coming years. The financial returns of many players could be more limited, thus reducing the potential for fiscal income for several governments. To date, it remains very speculative to assess the impact of 3G licensing on the employment in the information technology and telecommunications sector, i.a., because of its entanglement with the general consolidation trend in the European mobile sector. In a similar way, also the societal impact in terms of networked readiness is difficult to outline, although the supply vs. demand imbalance and corresponding restructuring potential in certain national markets, might put the current lead position that many Member States in Europe have had compared to other regions, at risk. We believe both components could significantly impact the European Union and Member States' futures. A systematic tracking and further assessment will be of great importance in the years to come.

⁷⁴ Initially most probably as services, supported by applications running on 2.5G networks

⁷⁵ Predominantly 3G license fees and network investments

⁷⁶ Addressing the business and high-end-users market is frequently encountered in initial years of market functioning when a new technology is being introduced

Exhibit 44

COST OF SUPPLY* – KEY COST COMPONENTS							
EUR Millions							
Formula:	$\text{License fee} \oplus \left[\left(\text{network} \oplus \text{replacement investments} \right) \otimes \text{number of networks} \ominus \text{partial re-use of DCS1800 masts} \right] \ominus \text{3G cost of supply}$						
Member states	Licenses fee**	Network invest-ments	Replacement investments***	Number of licenses	Re-use of DCS 1800 antenna masts	Total 3G cost of supply	Total net present value**** of 3G cost of supply
Austria	832	674	389	6	312	6900	3927
Belgium	566	904	576	3	171	4836	2766
Denmark	533	415	261	4	196	3042	1697
Finland	102	1414	805	4	722	8259	4309
France	1241	6698	4364	2	1708	21658	12241
Germany	50100	5675	3458	6	2225	102673	74122
Greece	485	1198	677	3	257	5853	3188
Ireland	333	598	332	(4)	0	4052	2107
Italy	12166	3777	2268	5	804	41584	26785
Luxembourg	55	49	40	(4)	9	399	236
Netherlands	2721	1070	655	5	601	10743	6927
Portugal	400	633	515	4	0	4993	3144
Spain	3451	4013	2551	4	0	29709	16725
Sweden	4	4937	4193	4	0	36524	22346
UK	36098	4274	3074	5	1704	71137	55920
	109085				8709	352362	236440

4.3 MOBILE OPERATORS WILL NEED TO COPE WITH DEMAND-SUPPLY IMBALANCES, REQUIRING RESTRUCTURING IN CERTAIN MEMBER STATES

The mobile operator market in the European Union is expected to further restructure over the coming three to five years, a trend that can already be spotted at present⁷⁷. This future restructuring is driven by the substantially increased cost of supply and the weakened financial situation of certain mobile operators. In particular, this might occur in a limited number of national markets, where the industry won't be able to adequately cover these costs through corresponding revenues⁷⁸.

4.3.1 At the European level, 3G should generate more than 10 years of EBITDA margins similar to today's 2G margins in order to fully cover the cost of supply

The total cost of supply at the European Union level, if all licensed operators were to deploy their 3G networks and respect their coverage obligations and commitments with a minimum coverage of 80% by 2010⁷⁹, would be equal to EUR 352 billion, including the license fees⁸⁰. At present value, for which the methodology used can be found in Appendix F, this represent a cost of EUR 236 billion.. This is shown in Exhibit 44 where, for each country, an overview of the license fees and network investments is given⁸¹.

Depending on the revenue scenario one believes, it will take between 11 (in the optimistic scenario) to over 30 years (in the pessimistic scenario) to offset the high additional cost of supply for 3G, including license fees and network rollout, at the European level. The explanation of the two scenarios follows later. The compensation for the license fees alone to date is expected to require at least five years. Given that today's licenses are typically valid for around 15 years, and that

⁷⁷ Report on U.K.'s 3G auction by the U.K. Committee of Public Accounts of the U.K. Parliament Indicating a risk that the amount raised through the U.K. 3G auction could slow the successful development of the industry and limit the extent of competition (April 2002)

⁷⁸ Confirmed in several interviews with operators and National Regulatory Authorities

⁷⁹ Based on interviews with operators and vendors, we assumed in principle a coverage of 80% by 2010 in each national Market. When, however, a higher coverage with imposed or committed to by operators, this percentage was used for assessing the cost of supply (e.g., France where a minimal coverage of 60% was imposed, but where operators committed to approximately 98% coverage)

⁸⁰ The revenue-based portion (only in Sweden, fees are entirely based on revenues) of the license fees was not taken into account while assessing the cost of the license fees. Key reasons are the practical impossibility to assess future 3G revenues, and the fact that the consequences at the EU level are limited, because revenue-based fees are applicable in only 7 Member States, license fees are only to a smaller part based on revenues and, finally, the reference % to be applied to calculate the amount of license fee are small

⁸¹ Accounting for the network cost itself and the replacement investments. This number is multiplied by the total number of networks and takes into account savings from partial re-use of DCS1800 masts by existing DCS1800 operators. This approach was confirmed by interviews with operators

Exhibit 45

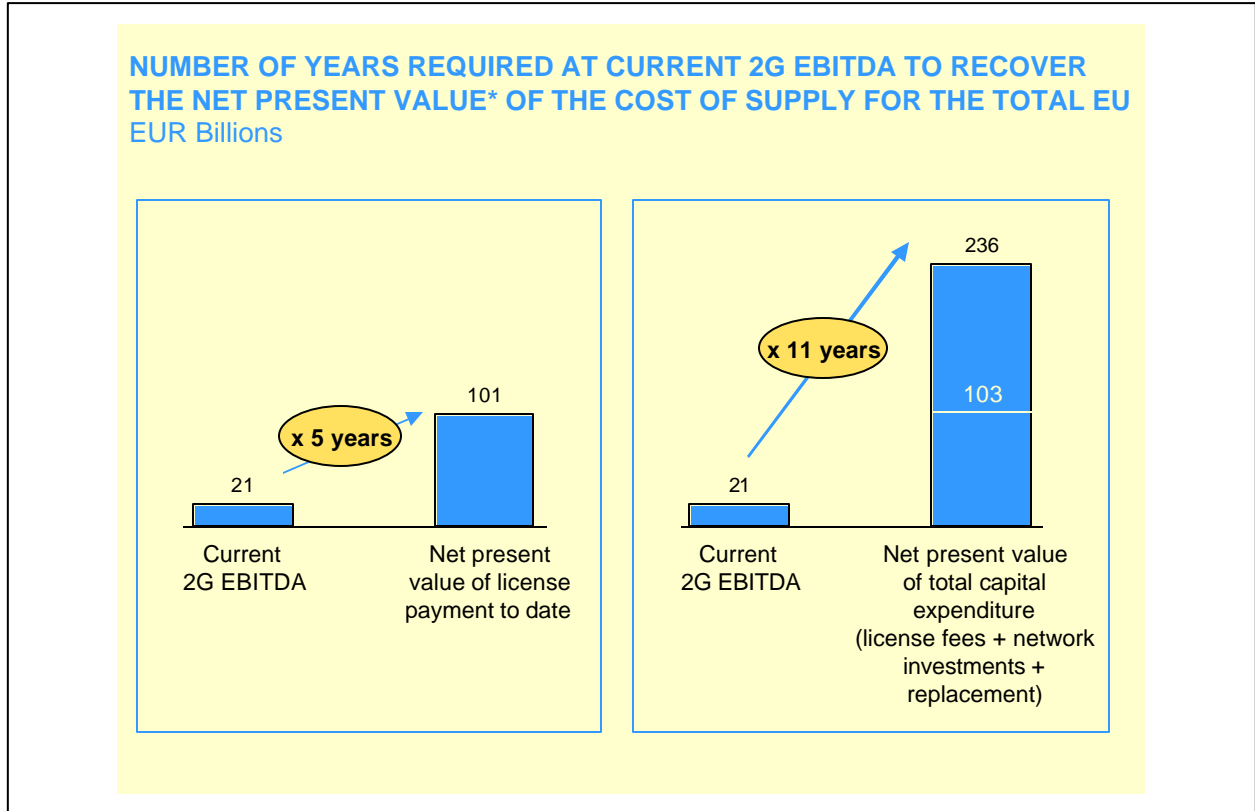


Exhibit 46

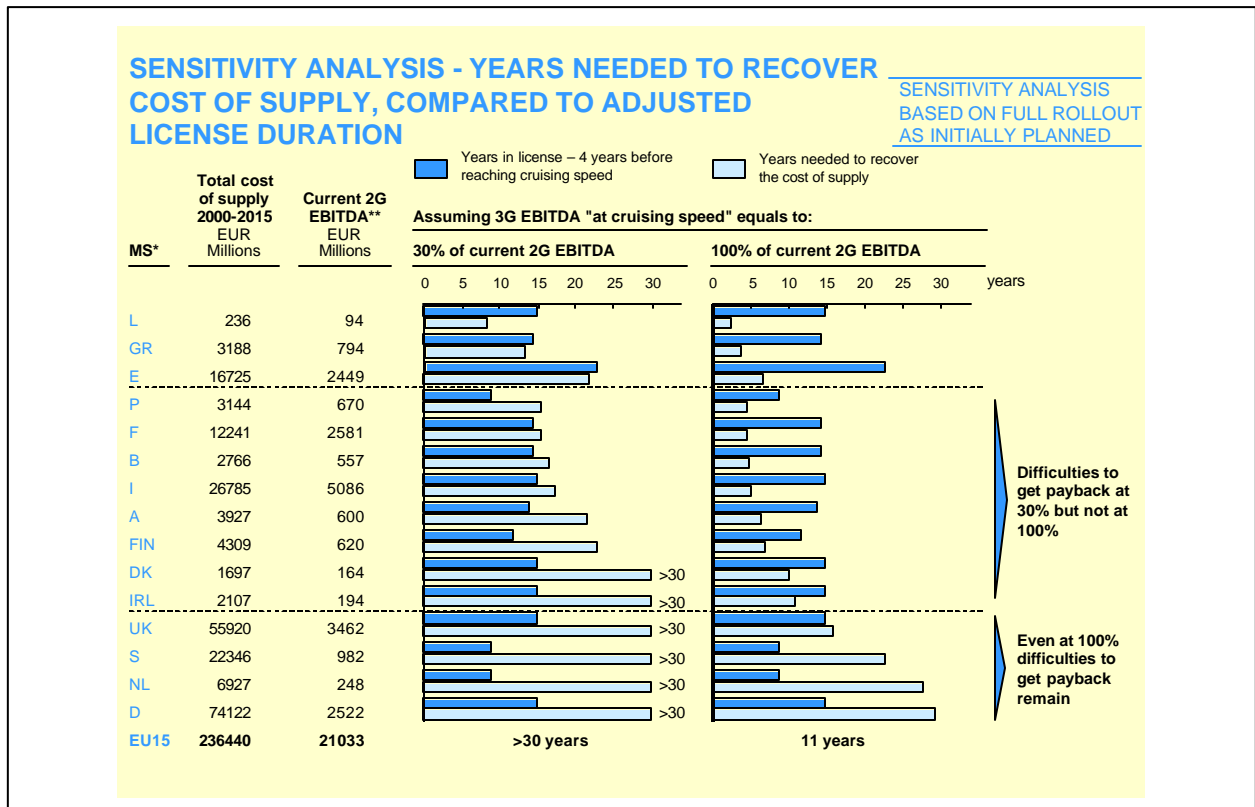
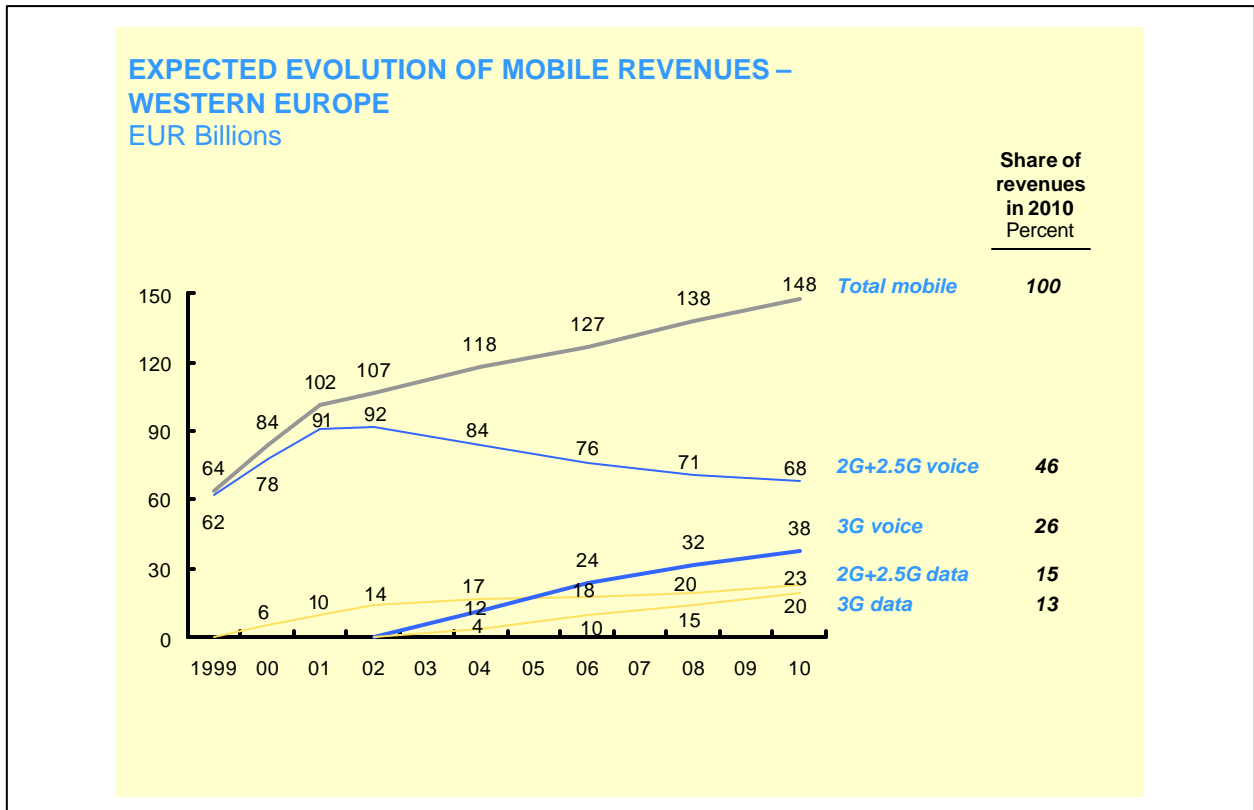


Exhibit 47



it will take a number of years before 3G will be at “cruising speed”, there is a real risk of supply/ demand imbalance (Exhibit 45).

4.3.2 For the majority of Member States, a supply/ demand balance can be achieved without major restructuring

While these general conclusions are drawn for the European Union as a whole, there are clear differences between the countries based on parameters such as the number of 3G licenses and therefore the number of networks likely to be rolled out, as well as the total license fees and coverage obligations/ commitments taking population density into account.

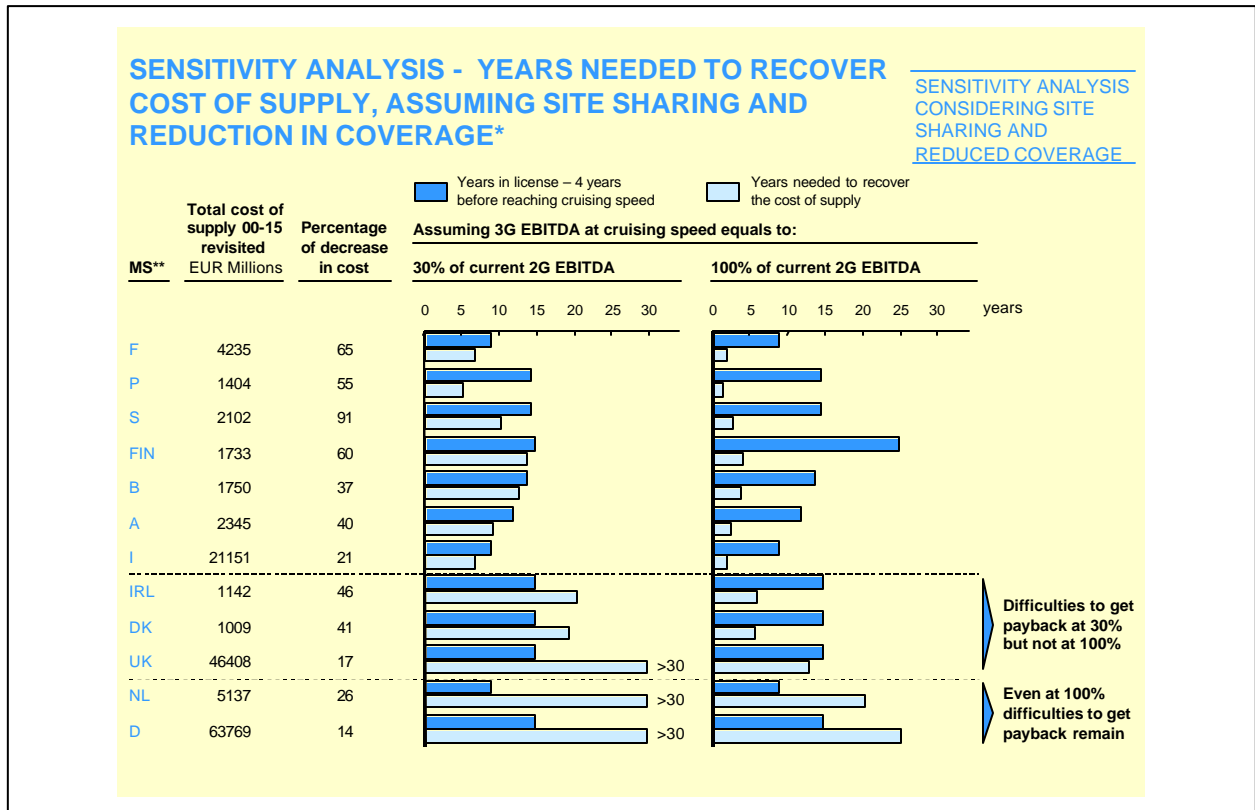
In order to identify the discrepancy between supply and demand imbalances in the different Member States, a sensitivity analysis of the total cost of supply for the rollout of 3G networks between 2000 and 2015 was calculated at the country level, and compared to the potential revenues from 3G based on two scenarios (Exhibit 46).

For the cost of supply, every licensed operator was considered to rollout its 3G network, leveling off at 80% population coverage unless a higher coverage percentage had been committed to in the respective member state. Neither infrastructure sharing, nor more cautious network rollout was considered at this stage of the analysis. Cost savings by DCS 1800 operators, reusing part of their infrastructure, was taken into consideration. To assess future profits of future 3G services, current 2G EBITDA profit margins were taken as a reference. The number of license years taken into consideration in the sensitivity analysis equaled the duration of the license minus 4 years (reflecting a minimum period for the market to grow towards ‘cruising speed’ and yield projected profit margin levels).

To determine the number of years required to recover the 3G expenditures, two scenarios were assessed in the sensitivity analysis. The first – more pessimistic - scenario, assumes that “at cruising speed” the 3G EBITDA margins generated will be around 30%⁸² of the current 2G EBITDA level. The 30% is derived from what market reports expect the ARPU development and the split between 2G and 3G based services to look like. A second scenario assumes that this 3G EBITDA will be equal to today’s 2G EBITDA levels, meaning that operators manage to keep growing margins with the discount rate of around 8 percent, and that all of the available EBITDA margin is used to fund 3G only. The total cost of supply is divided by this value to obtain the number of years that would need to be considered in order to offset the supply. The result is compared to the available license duration minus five years – to allow for a ramp up period - to see how

⁸²This value of 30% is based on the net present value of the expected 3G ARPU by 2010 in market reports. As such 3G ARPU represents 30% of the current 2G ARPU (Exhibit 47). The underlying revenue estimates by market report differ substantially (cf. CIR Report of 2001: EUR 57 billion by 2010; UMTS Forum 2001 estimates: EUR 86 billion)

Exhibit 48



likely it is to reach a supply-demand balance before the end of the license duration.

The outcome is that, even for very optimistic assumptions of 3G revenues (the 100% assumption on 3G EBITDA compared to current 2G EBITDA), four Member States out of 15 (Germany, the Netherlands, Sweden and the U.K.), are unlikely to reach a balance between supply and demand during the available license duration. The most pessimistic case brings the number of Member States in imbalance to 12, keeping only Luxemburg, Greece and Spain in balance.

A number of tools are available to reduce the imbalance in respective Member States. In Exhibit 48, the 3G cost of supply has been readjusted downward by considering cost reduction actions including network sharing (assuming an overall 20% cost saving) and lower coverage rollout obligations (assuming a coverage of 60% of the population by 2010). This could help, for the optimistic case, two additional Member States – Sweden and the U.K. - to reach a supply/ demand balance within the available time frame, while, for the pessimistic case, seven out of the 12 countries with an imbalance could be able to payback their 3G rollout investments in time.

Therefore, even after applying these cost reduction levers, two Member States - Germany and the Netherlands - will be unlikely to generate sufficient revenues and margins to compensate for a limited rollout by all license holders. Even an extension of the license durations would not be a satisfactory solution. A tougher transition period will ensue in those markets. If it is the objective to reach a more balanced market, a more drastic restructuring will be required. This could include mergers between and/ or withdrawals by certain operators. Pan-European players are expected to prioritize their investments across countries.

4.3.3 At the European Union level, in the shorter term, financial constraints and restructuring in the mobile sector will impact players

In parallel with the transition the different markets will go through, it is likely that the ongoing consolidation at the EU level will continue and push certain European mobile players to delay and/ or even regroup their activities in some Member States.

In the course of our study, we have mainly identified four reasons for consolidation⁸³. First, the increased level of potential competition pushes smaller players to combine forces. Second, the deteriorated financial situation of the operators forces them to focus on improving short-term profitability. Mergers and acquisitions can be an effective way to help achieve synergies and savings. Third, pan-European players may want to change their stake in some of their holdings in

⁸³ This is confirmed by the interviews with operators. Operators point to key drivers such as efficiency gains in procurement, applications' and services' development, cost of capital, and competitive advantages of a pan-European footprint (e.g. the unique consumer experience for customers traveling across Europe)

order to optimize control and improve their impact on the operations. Finally, governments that still have large stakes in telecom players may be more and more open to consider further privatization, spin-offs or other forms of shareholding arrangements for their often-indebted PTOs⁸⁴.

In the shorter term, however, we believe that the key driver in the mobile industry dynamics will, however, most probably remain the financial constraints as experienced by a certain number of operators and the restructuring on certain national mobile markets, coping with imbalance between supply and demand. Apart from the corresponding national mobile markets, we do believe that in this respect, also the Internal Market might be significantly impacted.

Going forward, we may see significant shifts in the investment priorities set by a certain number of players. When experiencing serious cash constraints, i.a., triggered by the need to cover license fee payments and high upfront capital expenditures through equity or external debt, players will probably delay the rollout in or even withdraw from markets that seem less attractive to them, with the aim of improving their profitability and viability⁸⁵.

In this respect we would like to highlight the different aspects of the impact of the license fees already paid or to be paid in the short term. For each individual operator, the totality of the license fees related to the licenses obtained will to a stronger or lesser extent negatively influence the financial situation of the operators and will be a driver in an operator's strategic decision to delay rollout in certain Member States. In which Member States to roll out, however, will most probably not be impacted by the license fee specifically paid in the corresponding Member State. Indeed, we believe that operators will *a contrario* consider mainly the market potential, their respective starting position, the rollout requirements and the needs in each market accessible to them. To the extent financial constraints would not allow an operator to rollout and invest in all Member States in which he acquired a license, the operator can be expected to most probably shy away from national markets where they are a late 2G entrant or in states that are already fairly penetrated, and where they are a new 3G entrant. Instead, they will favor investments in national markets where they believe to have a stronger position.

4.3.4 Going forward, consolidation in the mobile sector might intensify at the European Union level

In the following section, we specifically focus on the further consolidation potential in the mobile communication sector at the EU level, to which 3G licensing may prove to have a catalyzing effect. As we already indicated in the

⁸⁴ Public Telephony Operators

⁸⁵ Interviews with in particular operators, reveals that currently, given the changed market expectations and operators' economics, operators might consider increasing their impact in certain new entrants/joint ventures. This in turn might lead to reduced presence or even withdrawal from certain other markets

Exhibit 49

WITH 3G LICENSING, CROSS-EUROPEAN PLAYERS BECAME AN IMPORTANT CATEGORY IN THE MOBILE MARKET □ Key areas of change

Type of player	Description	Before 3G licensing		After 3G licensing	
		Number	Company	Number	Company
Pan-European	• Player present on majority of the EU Member States	2	• Vodafone • FT / Orange	2	• Vodafone • FT / Orange
Cross-European	• Players present in 4 to 6 EU Member States with 1 or 2 big markets* without any regional focus	4	• DT • BT • Telecom Italia • Telenor	8	• DT • BT • Telecom Italia • Telenor • Hutchison • KPN • Sonera • Telefonica
Regional	• Players present on adjacent markets limited in number	3	• KPN • Tele2 • Telia	2	• Tele2 • Telia
Local	• Players present in 1 Member State only	8	• Telefonica • Sonera • Amena • TMN • Bouygues	6	• Amena • TMN • Bouygues • Radiolinja • Radiolinja • TDC • Telering
External	• Player not present in EU	1	• Hutchison	0	• –

Full size exhibit can be found in the Annex to this document

second chapter, it has proven impossible in practice to disentangle the impact of individual license conditions to this respect. However going forward, we do identify a high probability of an overall impact of the 3G licensing process on the consolidation in the mobile sector in Europe.

In the course of the gradual development of the mobile markets in the Member States, operators entered in alliances or acquired stakes in other 2G license holders to position themselves strategically on the European map. At the beginning of the 3G licensing process, this had already resulted in the emergence of four types of players:

- ¶ Pan-European players aiming to cover as much as possible the whole of Europe (e.g., Vodafone, Orange).
- ¶ Cross-European players focusing on some of the major European markets (e.g., DT, and BT).
- ¶ Regional players concentrating on a specific region grouping a limited number of adjacent markets (e.g., Tele2, and Telia, both focusing on Scandinavia).
- ¶ National players developing activities, in essence, in a single Member State (e.g., Sonera in Finland, and Telefonica in Spain).

The process of 3G licensing contributed in a significant way to two major changes in the structure of the mobile market, namely an increase in the number of cross-European operators and a continued Nordic consolidation.

First, the number of cross-European players doubled from four to eight, making this in numeric terms, the dominant category in the 3G market (Exhibit 49). The auctioning of 3G licenses was perceived by national and external (external with regard to the corresponding Member State) players as an unique opportunity to enter larger, economically important European markets. In order to increase the chances, players entered in alliances. Two major alliances were formed:

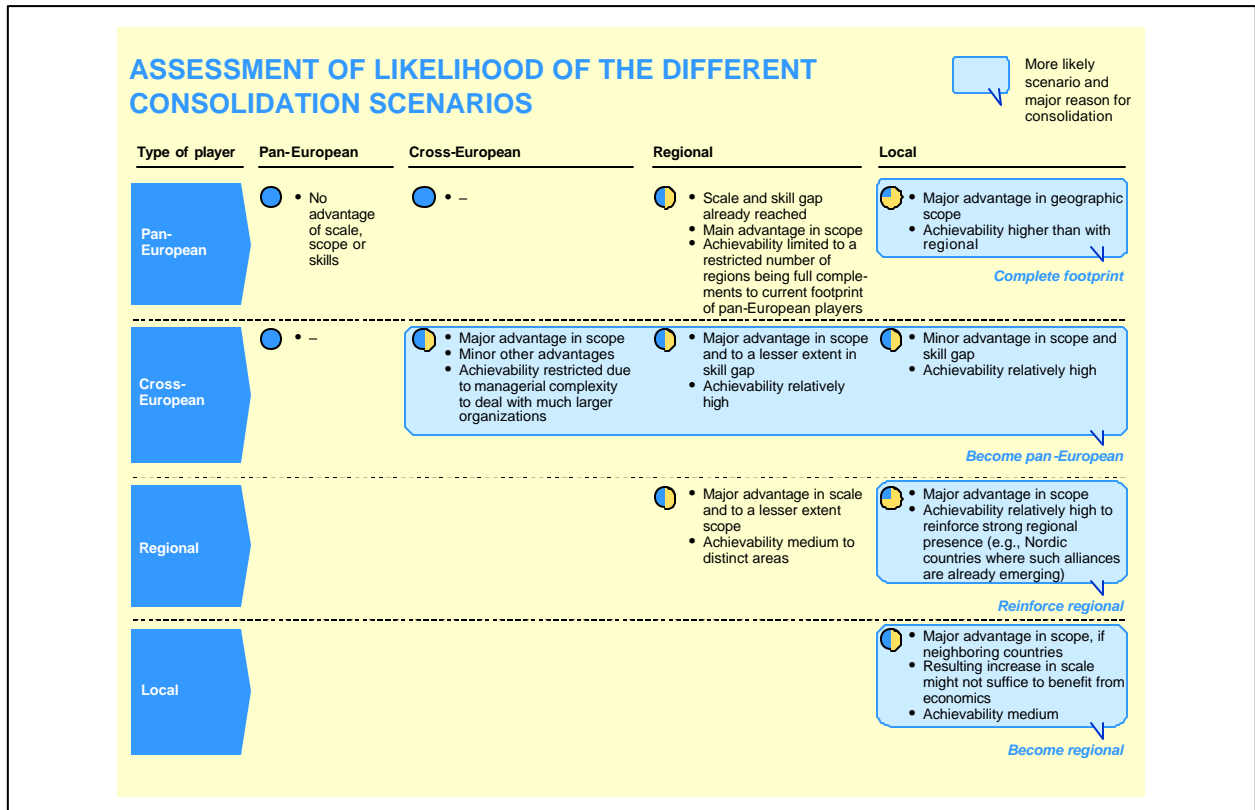
- ¶ Telefonica Moviles⁸⁶, teamed up with Sonera⁸⁷, obtaining licenses in Germany and Italy, and hereby becoming cross-European players.
- ¶ Hutchinson, an Asiatic operator, teamed up with KPN⁸⁸ to enter the European market. They obtained licenses in Austria, the UK and Italy⁸⁹.

⁸⁶ Telefonica Moviles expanded into Austria, Germany, Italy and Switzerland via the acquisition of 3G licenses (together with other partners through alliances in which they hold a majority stake)

⁸⁷ Sonera expand outside its own home market by gaining a 3G license in Germany, Italy and Spain (in addition to Norway) through alliances with other players (mainly Telefonica in Germany and Italy)

⁸⁸ KPN expanded their reach from a regional perspective (with footprint in the Netherlands, Belgium and Germany) to a cross-European one by encompassing the British and Austrian markets

Exhibit 52



Full size exhibit can be found in the Annex to this document

In total Hutchison entered five key markets and KPN added two key markets to its footprint, hereby becoming cross-European players.

Second, recent events confirmed the trend towards further consolidation in the Nordic arena. The Nordic is to a larger extent the only region in Europe where larger (pan- or cross-European) players are not present to a large degree (Exhibits 50 and 51). Recent announcements with regard to a planned Telia (Sweden) - Sonera (Finland) merger, and the ongoing talks with TDC (Denmark) seem to confirm the determination of Nordic players to defend their strong position.

On the longer term, we expect that the ongoing trend towards market consolidation at EU level is likely to pick up again. This consolidation will then be determined primarily by four factors⁹⁰:

- ¶ ***Economies of scale***: consolidation reduces costs by grouping equipment purchase activities (realizing e.g., volume discounts) and by sharing resources (e.g. overhead and R&D).
- ¶ ***Serviceability***: consolidation allows to attract new customers by offering seamless regional/global voice/data roaming to individuals or seamless business solutions to companies.
- ¶ ***Skill superiority***: consolidation improves competitiveness and economics by obtaining superiority in technology, business model and/or operational skills.
- ¶ ***Achievability***: consolidation increases the managerial complexity of the new organization proportionally to the number of the partners involved and their size.

Based on these four components, an initial assessment of likely future consolidation scenarios can be made. Exhibit 52 gives an overview of potential interplays and consolidation likelihood⁹¹:

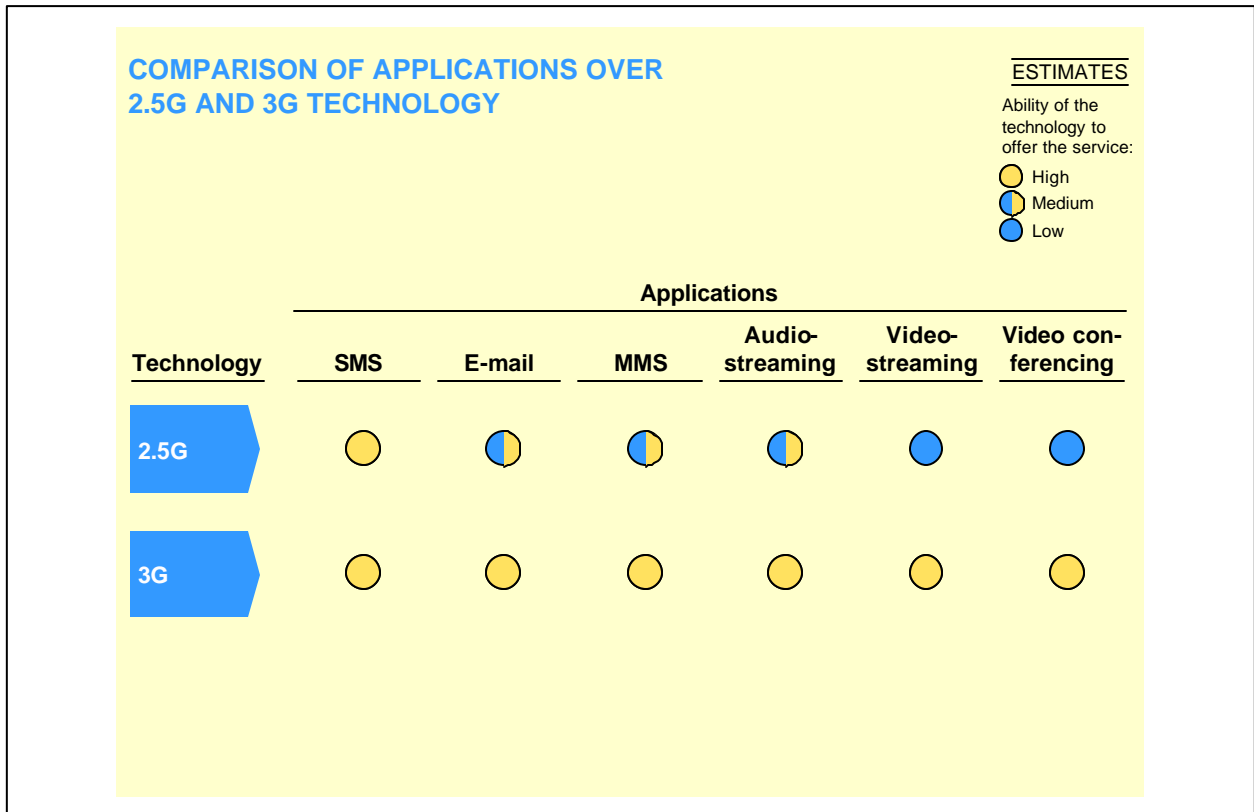
- ¶ ***Pan-European players***: as scale will remain instrumental for mobile operators to ensure profitability, existing pan-European players can be expected to further reinforce or even expand their footprint across Europe by increasing their stakes in existing operations or by e.g., acquiring regional/local players.

⁸⁹ Hutchison and KPN obtained a license together with NTT DoCoMo in Austria. Then Hutchison obtained a license in the UK selling stakes of it to KPN and NTT DoCoMo. Finally in Italy KPN and Hutchison got a license together by KPN sold its stake back.

⁹⁰ This is confirmed by the interviews with operators. Operators point to key drivers such as efficiency gains in procurement, applications' and services' development, cost of capital, and competitive advantages of a pan-European footprint (e.g. the unique consumer experience for customers traveling across Europe)

⁹¹ Based on McKinsey market analysis and interviews with operators and several National Regulatory Authorities

Exhibit 53



- ¶ ***Cross-European players***: increase of coverage (serviceability) and to a lesser extent, cost reductions could push certain cross-European players to enter in alliances with each other leading to the creation of potentially one or more new pan-European player(s).
- ¶ ***Regional/national players***: certain regional players might retain their current footprint and further build on their regional expertise to secure their customer base. The possibility exists that some might team up with other national players to reinforce the regional cohesion of their activities.

Based on these preliminary and initial findings, it can be expected that going forward, the existing pan European players will try to strengthen their position and that potentially one or more additional pan-EU player(s) might arise from the cross-European players group. Other cross-European players, in particular when constrained by financial or operational difficulties, may decide to remain cross-European turning to a market strategy that does not require adjacent service areas, while others, suffering from lacking profitability in certain national markets or overall financial limitations, might even opt to reduce their footprint and become regional players focusing on regional or national expertise.

4.4 CONTENT DEVELOPMENT WILL BE DRIVEN BY THE NEED TO IMPROVE SHORT-TERM BOTTOM-LINE RESULTS

The mobile content and data applications market will only indirectly be affected by 3G licensing because of the financial problems faced by the operators that will aim at improving shorter-term bottom-line results. The operators will try to reach profitability by finding new revenue streams for their current 2G/2.5G infrastructures.

The operators will not wait for 3G to be deployed before starting to launch and market mobile data services, which could already be offered with 2.5G technologies (such as GPRS⁹²). These services include multimedia messaging (combining text and images), web access and e-mails (with limited size of attachments). It is only for data applications requiring higher bit rates, such as extensive e-mails, video conferencing and interactive gaming, that 3G bandwidth will be necessary (Exhibit 53).

⁹² General Packet Radio Service

Exhibit 54

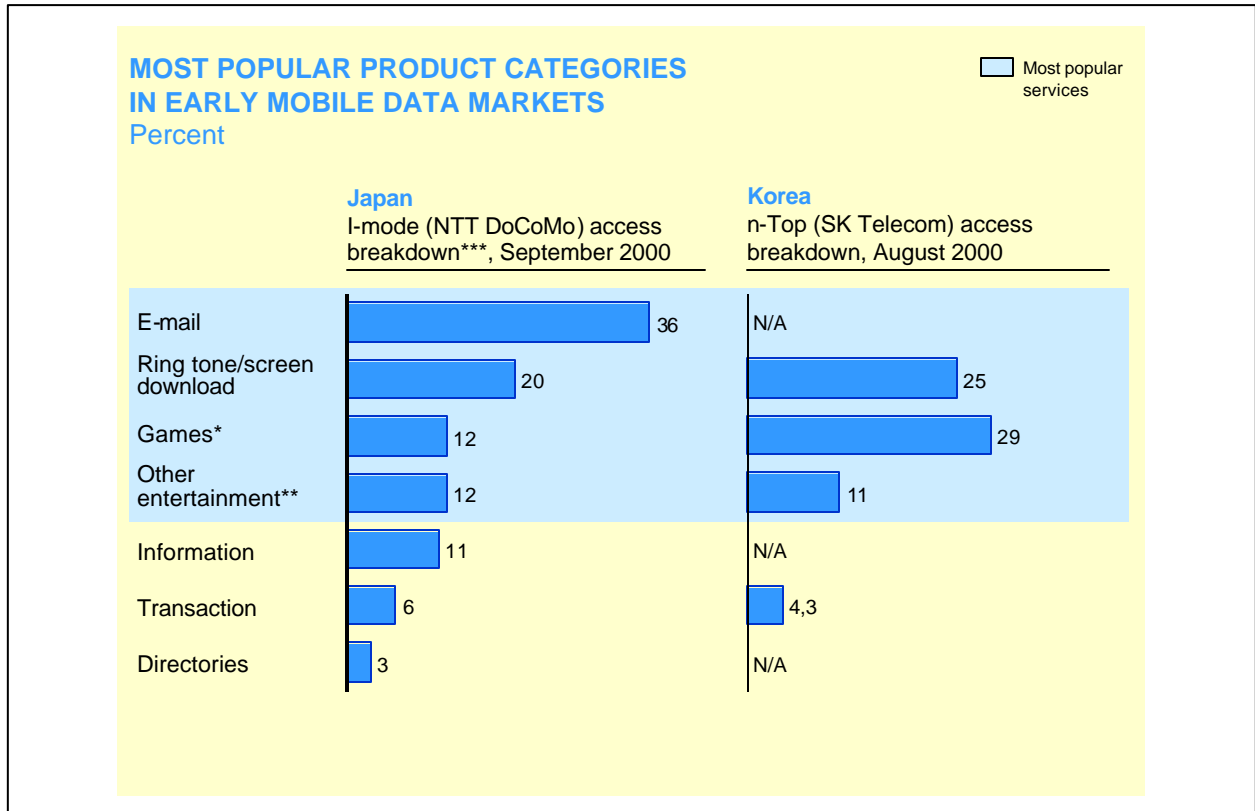
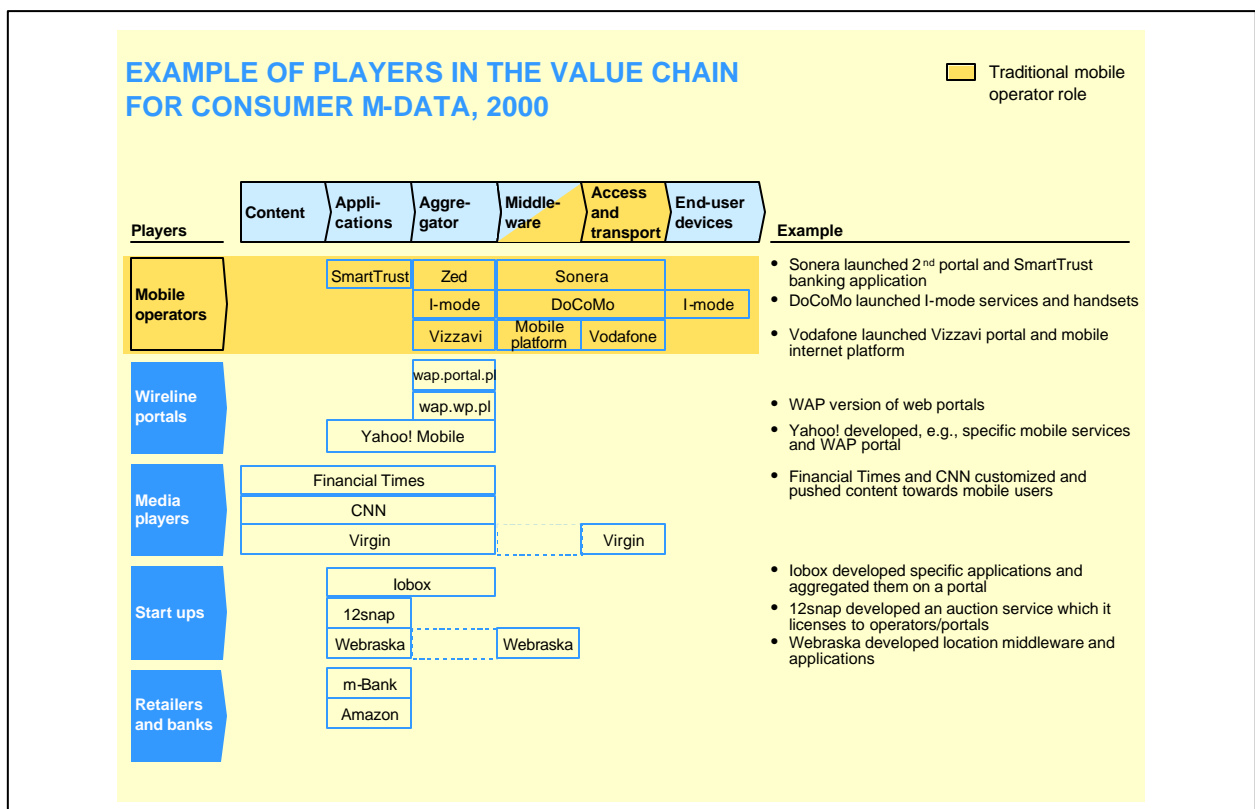


Exhibit 55

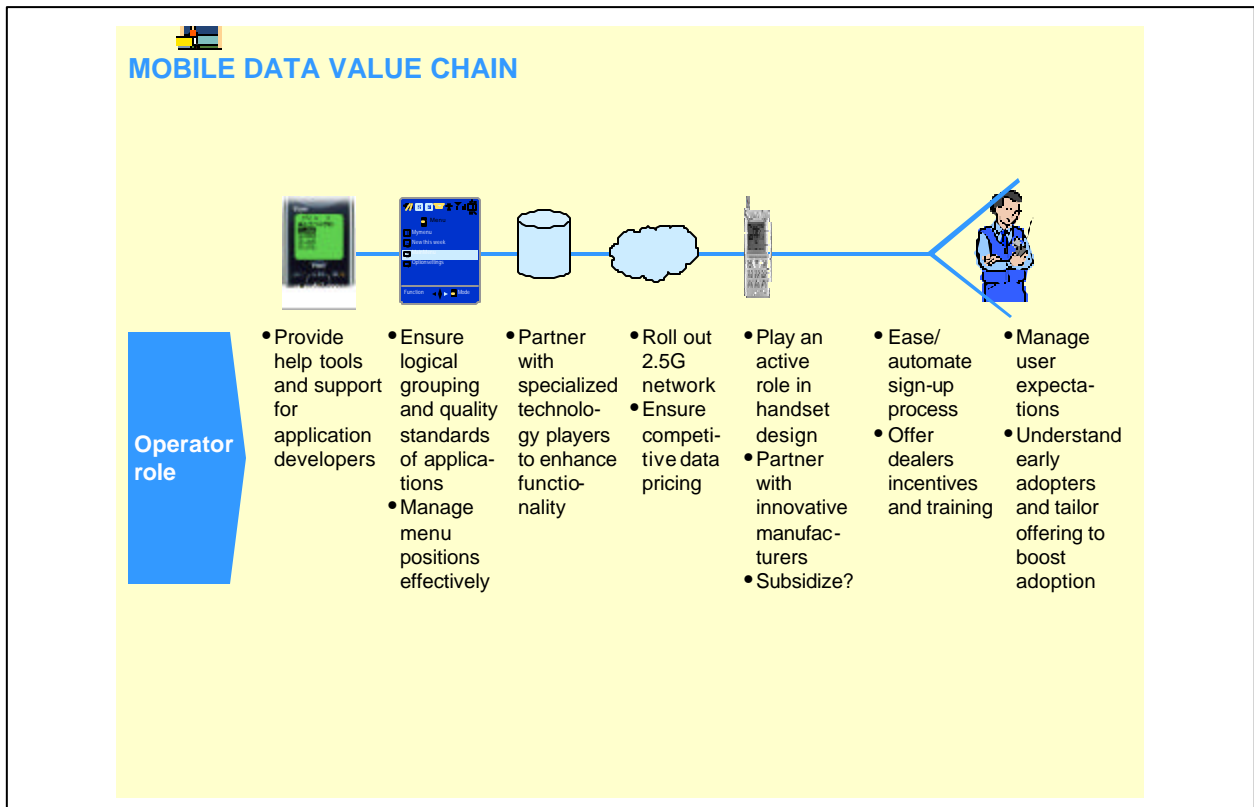


Full size exhibit can be found in the Annex to this document

Exhibit 56

CURRENT STATUS OF SOME EXAMPLE OF MOBILE CONTENT START-UPS		EXAMPLES
Impact on start-ups	Company	Activity
Acquired	<ul style="list-style-type: none"> Breathe Halebop lobox Speedy Tomato Digital Mobility 	<ul style="list-style-type: none"> Multi-access portal Mobile portal Mobile portal Mobile portal Mobile application development
Financial distress	<ul style="list-style-type: none"> ABNW Aspiro Mviva Vizzavi 	<ul style="list-style-type: none"> Mobile internet application development Mobile applications provider Multi-access portal Multi-access portal
Bankruptcy	<ul style="list-style-type: none"> Riot-E Room 33 	<ul style="list-style-type: none"> M-gaming Independent mobile portal

Exhibit 57



4.4.1 First wave of data applications likely to be extensions of current ones

The success of mobile data services will largely depend on reaching a critical customer base and on the availability of the applications to support the services. Even though the so-called “killer” applications are still unclear, the advantages of multimedia messaging puts it in a promising position in the short to medium term, as text messaging is already widely adopted by 2G users in Europe. Multimedia messaging has also become technically feasible, as evidenced by major handset manufacturers launching devices with larger color screens and camera interfaces.

When looking at the success of mobile data services in other continents like Asia⁹³, the most successful services so far have been based on messaging and entertainment, as shown in [Exhibit 54](#). Communication-centric services, such as messaging, are prime candidates to be successful in Europe as well. It remains unclear whether other services (e.g., entertainment) will be equally successful in Europe.

4.4.2 Fewer players will be around and they will refocus their mobile data activities

The plethora of players that initially intended to develop content and data applications for mobile has been directly and seriously impacted by the state of the financial markets. As shown on [Exhibit 55](#), two years ago, many new players entered the mobile portal and applications business, both start-ups and established players like mobile operators, wireline portals, hardware vendors, media companies, retailers and banks. They were involved in many service areas ranging from content aggregation (e.g., multi-access portals or pure mobile portals), to application development and provisioning.

The end of the telecom market hype has starved a lot of start-ups, with several players having gone bankrupt or in financial distress, and other players having been acquired by operators or fixed line Internet Service Providers ([Exhibit 56](#)).

Remaining players are refocusing their activities, driven by short-term profitability concerns. Mobile operators for instance, in an effort to maximize their immediate profits and drive customer adoption of mobile data services, will have to focus on developing and launching certain types of data services which can readily be used on 2.5G infrastructures. This requires building and adapting a software platform in order to support the mobile data services. [Exhibit 57](#) summarizes possible actions that mobile operators could take along the mobile data value chain.

⁹³ Confirmed during the interviews with operators. It was however pointed out that transposing applications and services between continents might involve substantial adjustments, in order to cope with cultural differences and mobile usage patterns

The content developer landscape itself is under a continued restructuring. As such, this restructuring may impact the Internal Market, in particular linked to the mobile operator arena. Certain operators may attempt to vertically integrate further with content providers and aggregators. Market indications in this respect however still remain highly unclear and speculative in their outcome. Also other models could be envisaged. In particular a more service provider oriented market model might also develop. In this model, service providers, with access to the 3G licensed operators' networks, would play a more pronounced role in future 3G service provisioning (e.g., MVNO). As we have indicated previously in this and the third chapter, providing service providers access to their newly built 3G network might indeed be viewed as attractive by certain 3G network operators in order to strengthen their short term revenue base.

The other remaining content players, such as fixed line ISPs⁹⁴, will probably try to enter into commercial partnerships with other players such as operators, provided that they can find compatible business models and agree on revenue sharing options.

4.4.3 Having a clear view on the business model to adopt will be key to deliver mobile data services profitably

A major challenge for the operators will be to develop and the elaboration of appropriate business models for mobile data services. These models will obviously represent a significant increase in complexity, compared to the current revenue stream from mobile voice and SMS⁹⁵-type of services. Parallels can be found in the e-commerce arena, which has shown the substantial challenges related to striking the right balance of involvement of the partners in the corresponding value chain (e.g., sharing the development cost of content and applications, sharing the risk amongst the partners involved, and revenue sharing⁹⁶).

Despite the cultural and market differences between Europe and Japan⁹⁷, European operators could draw conclusions from the lessons learned by Japanese operators with the launch of their mobile data services on 2G networks. The major key success factors of Japanese operators so far have been the use of an efficient business model. It is based on a high degree of flexibility and openness to content providers, as well as a functioning value chain (with operational control over most of the value chain from server to handset dealer), a transparent billing system, ease

⁹⁴ Internet Service Provider

⁹⁵ Short Message Service

⁹⁶ This is reflected market assessment reports and was also clearly pointed out during interviews with operators

⁹⁷ I.a., in Japan, 3G services will be provided by three licensed network operators

of content integration thanks to cHTML⁹⁸ standard, mass market availability of handsets and excellent marketing.

4.5 VENDORS WILL NEED TO FIND OTHER SOURCES OF REVENUE TO COMPENSATE FOR LOWER-THAN-EXPECTED 3G EQUIPMENT REVENUES

The indirect impact of the transition problems facing the EU vendor market is likely to continue and potentially in certain cases even worsen⁹⁹. As we identified in the third chapter, the high cost of supply of the license fees and corresponding network investments contributed to the weakened financial situation of a number of mobile operators in Europe. Their efforts to reduce capital expenses in order to improve financially, in turn hit the vendors. In general, we could not identify any significant difference between Member States. Basic reason for this is that operators, in general, have interests in several Member States, making the geographic area in this respect less significant. Exception to the rule might be a number of purely national operators, although the consequences for the European level and the Internal Market will probably prove not significant. It is only by adapting their strategies towards the operators in Europe, by reducing their internal cost base, and by looking for other sources of revenue that the vendor market can compensate for the lower-than-expected 3G equipment business.

4.5.1 Order books will continue to be below expectations

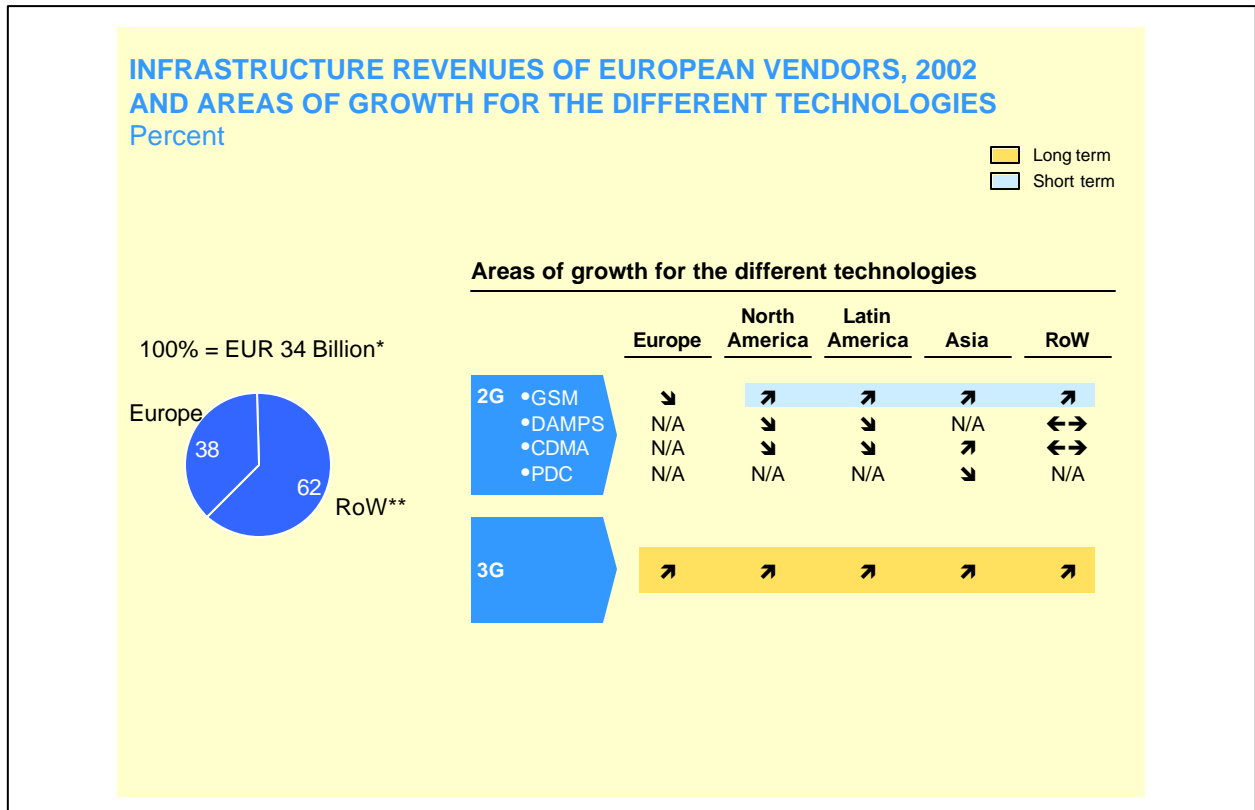
Similar to the current impact described in the previous chapter, the future impact of 3G licensing on the vendor market is the consequence of lower-than-expected demand, affected by the financial health of mobile operators and the take up of mobile data services. We may expect not all license holders will rollout their networks, and rollout plans are probably revised downward to take a more cautious approach.

Economies of infrastructure supply are most probably not going to be affected by 3G licensing. The European market is expected to remain highly concentrated, as is evidenced by the high market share among the top 3 manufacturers of 3G contracts secured to date. However, not all 3G licensees have signed definite and full-fledged agreements with equipment vendors and the pre-deployment phase in which operators are situated today gives them an opportunity to re-assess vendors. Significant opportunities for non-European manufacturers can still arise.

⁹⁸ Compact Hyper Text Markup Language

⁹⁹ Cf. statements by, i.a., Ericsson, indicating it expected demand for mobile systems to fall by 10 percent this year, instead of rising by up to 10 percent as previously predicted. Its forecast echoed similarly downbeat reports by Finnish rival Nokia and Canada's Nortel Networks (Reuters 24th April 2002)

Exhibit 58



4.5.2 Vendors could adapt their strategies to help operators reduce capital expenditure costs

As operators are looking for ways to minimize their capital expenditures, vendors could be forced to pro-actively look for ways to help them realize their objectives in order to maintain and/ or strengthen their own positions. Vendors that do not innovate sufficiently in this direction might jeopardize their longer-term position in the European market.

Vendors have already proposed technical solutions to facilitate network sharing arrangements in order to accommodate operators and could explore ways to push this further. Also offering network equipment inter-operability would bring them an advantage.

In addition, there may be opportunities to insert other 3G technological solutions that can help reduce the mobile operators' overall cost or timing of network rollouts. For example, EDGE¹⁰⁰-technology, used in a technically adjusted 2G environment could represent a short to medium term opportunity for mobile operators before a full-blown UMTS network sees the day.

4.5.3 Other sources of revenue will need to be found for equipment manufacturers

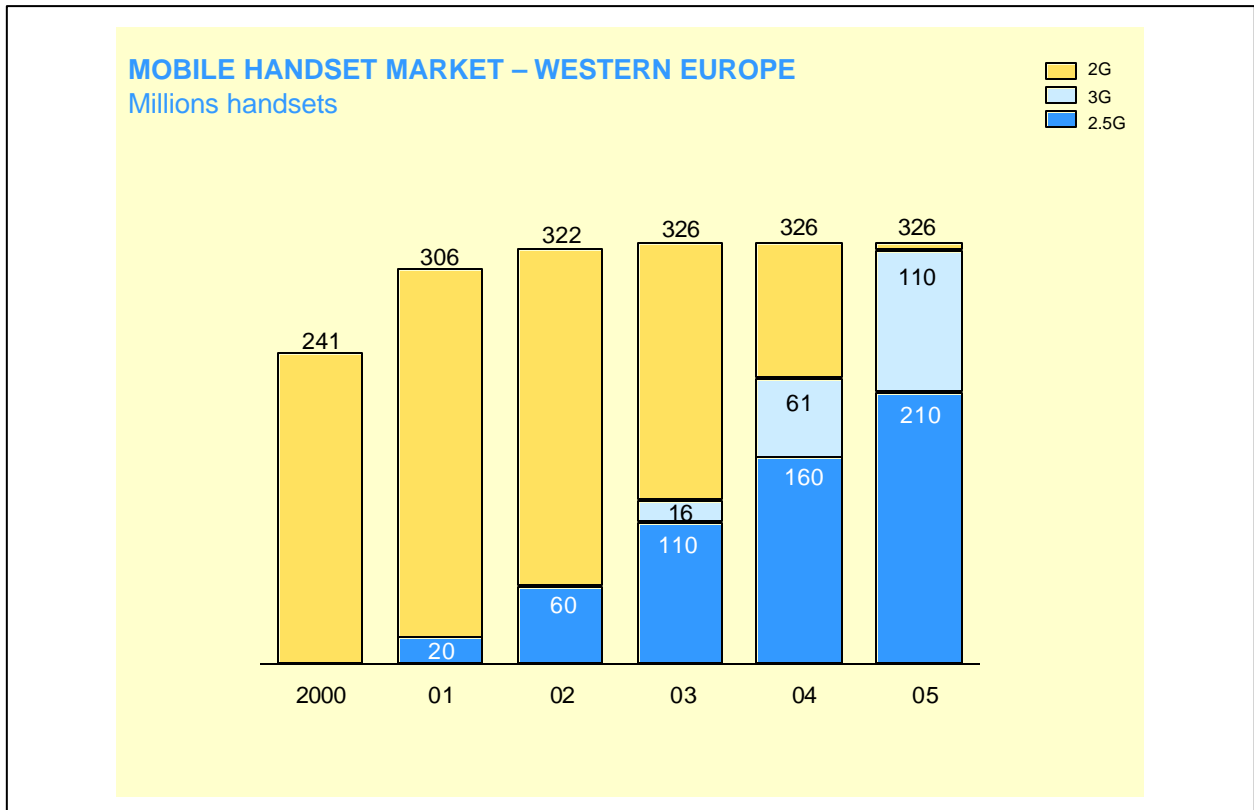
In order to reach their profitability targets, European mobile manufacturers will, besides reducing their cost base, have to further expand outside the European market, which is set to saturate in terms of mobile penetration. As indicated in Exhibit 58, European mobile equipment vendors generate most of their revenues (62%) outside Europe already, and worldwide GSM infrastructure revenues are expected to still increase by 30% until 2005.

European manufacturers could expand their 2G activities in the rest of the world, driven by the saturation of the 2G market in Europe and the remaining high growth potential in African, Asian and American countries. Looking at Asia, the expected mobile penetration will double between 2001 and 2005 to reach around 460 million customers. Even in North America there still seems to be a growth opportunity for GSM equipment, as some operators are migrating their 2G platforms to GSM technology.

With 3G technologies, European vendors could not only maintain their current positions in Europe but also expand further in Japan and the US. The high adoption rate of mobile data services in Japan can be a first incentive for market entry while the relatively high adoption rate of the UMTS standard outside

¹⁰⁰ Enhanced Data GSM Environment; Enhanced Data rates for Global Evolution. The standard based on EDGE is IMT -SC. Existing but technically adjusted (i.a., implying the introduction of new equipment and software) 2G networks would be able to support EDGE applications and services.

Exhibit 59



Europe, e.g., in Japan and, to a lower extent, in the US could be a second incentive.

Finding other sources of revenue through pushing new technologies in Europe outside the IMT-2000 suite seems less realistic. The stakeholders in Europe have committed themselves to UMTS to such an extent, that it is hard to imagine and to justify that a radical departure towards other technologies would be chosen in the years to come. In this respect, although to a certain extent still speculative at this time, the introduction of wireless LAN¹⁰¹ can probably more likely be expected to evolve into a complement¹⁰² to UMTS in Europe, rather than a substitution of it as it provides local areas (the so-called hot spots) with high bit rate low mobility data services¹⁰³. Obviously the outcome of wireless LAN is not yet clear in terms of technology, applications, and market introduction. Several types of players could deploy it. While both fixed line and mobile operators are well positioned to provide wireless LAN services, mobile operators could have a distinct advantage in rolling out 802.11¹⁰⁴ networks due to their existing SIM¹⁰⁵ infrastructure and economies of scale in site deployment.

4.5.4 The handset market will continue to become more competitive

Considering the European handset market, the total demand will probably not be impacted in overall volumes because of the currently high levels of mobile services penetration in Europe. The growth rate in the number of 'classical' mobile handsets will decrease substantially in the coming three to five years while the data mobile handsets (2.5G/ 3G) will become more and more important. However, a delay in 3G rollout would, however, imply a shift of the demand for dual-mode handsets in favor of an increased number of GPRS handsets (Exhibit 59).

Economies of handset supply are expected to evolve significantly over the coming years, driven by the growth of the mobile data market. As the mobile data market is developing, the market is becoming more fragmented as the number and type of devices for mobile data services are starting to increase significantly with the proliferation of consumer electronic devices, PDAs¹⁰⁶ and computing devices. Most consumer device manufacturers are exploring ways to expand the functionalities of their devices. As a consequence, consumer electronic device manufacturers are starting to build radio interfaces in their products, while handset

¹⁰¹ Local Area Network

¹⁰² Confirmed during interviews with equipment vendors

¹⁰³ WLAN does not support traditional voice

¹⁰⁴ Standard for wireless LAN

¹⁰⁵ Support Interface Module

¹⁰⁶ Personal Data Assistant

manufacturers are looking at ways to enhance their handsets with additional features such as wide color screens, keyboards and built-in camera. As a result thereof, the trend towards more partnerships and/ or consolidation between vendors will probably intensify.

Chapter 5: Recommendations and Guiding Principles for future spectrum assignment in the European Union

In this chapter we will formulate policy recommendations in view of future licensing exercises in accordance with the Terms of Reference¹⁰⁷, i.a., in particular referring to the possible advantages of and scope for coordination/harmonization of licensing methods and conditions at EU level. As asked by the European Commission, such recommendations will only apply to future possible licensing procedures and do not address existing 3G licenses. We do however take into account the lessons learned from the 3G licensing regimes as elaborated in the first four chapters, and are developing a set of recommendations that apply both the European Union and the Member States for future spectrum assignment exercises.

For the recommendations to be as specific and effective as possible, we have synthesized them in five Guiding Principles. The purpose of these Guiding Principles is to ensure that an adequate regulatory environment is established during the spectrum assignment process and maintained during the initial years of market functioning during which services, based on the spectrum, are introduced on the market. They aim at contributing to a solid base for market growth of the national markets and the Internal Market, both in terms of market development and effective competition, where the Member States and the European Union can adequately pursue their envisaged economic and social objectives¹⁰⁸.

Whether or not to push for a key guiding principle and employ the corresponding regulatory tools available, will in practice, however, strongly depend upon the very concrete circumstances at the time when the new spectrum would be assigned. Predominant drivers hereto will be the policy ambition of the authorities concerned and their respective competences, the market expectations at the time of the award process, and finally also the degree of uncertainty and technological stability of the new technology that is being introduced.

We list the Guiding Principles for your reference upfront: they include three principles dealing with market entry: (1) base spectrum assignment on the principle of a “sustainable market”, (2) allow for a gradual entry of a new

¹⁰⁷ Terms of Reference, in particular point 3. 3)

¹⁰⁸ We refer to the overall goals of the European Union and Member States government action, i.a., aimed at efficiency of production in the industry, user satisfaction (e.g., availability of better services, reasonable prices), and social inclusion (i.e., availability of services for lower income consumers, underprivileged, and other social inclusion aspects)

technology, and (3) minimize distortions in the allocation process; and two principles dealing with the initial years of market functioning: (4) manage for financial stability of the players and (5) stimulate the take-up of market demand.

Subsequently, we have determined the specific responsibilities of the Member States and the European Union with regard to addressing the key issues linked to the five Guiding Principles. What can the Member States do and what can the European Union do? We have based ourselves for this section on the new EU telecom regulatory framework¹⁰⁹ and the EU Radio Spectrum Decision¹¹⁰ that are being put into effect. For each of the issues linked to the five Guiding Principles we are also giving concrete examples of the type of regulatory measures Member States and the EU can consider.

For the European Union in particular, we have also developed a number of scenarios that can be followed. There is a minimal and a more hands-on scenario, as well as a policy frame that allows prioritization of the use of different measures depending on the extent to which EU wants to achieve its objectives. For each of these scenarios, we describe both what the European Union can consider doing, and which type of measures to use to get it done.

5.1 RECOMMENDATIONS SHOULD GO BEYOND SETTING OBJECTIVES TO ACHIEVING THE DESIRED OUTCOME

The first lesson learned from the 3G licensing processes is, that despite alignment of objectives and regulation, in line with the EU telecom framework, the desired outcome was not entirely achieved. This implies that it is important for future spectrum assignment exercises that EU and Member State policy to be more specific and to go beyond the setting of objectives to ensure the realization of its objectives.

5.1.1 In theory, the 3G licensing objectives and regulation of the European Union and the Member States were in line with the EU telecom regulatory framework

The objectives and the regulation of the current EU telecom framework formed the basis for the 3G licensing. In effect, the Mobile Directive¹¹¹ of 1996 and the Licensing Directive¹¹² of 1997 set out the core regulation at EU and Member State

¹⁰⁹ New EU telecom regulatory framework includes the Access Directive, the Authorisation Directive, the Framework Directive, the Universal Service Directive, and the Regulation (EC) No 2887/2000 on unbundled access to the local loop. the Privacy Directive is under debate

¹¹⁰ “Decision No 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community (Radio Spectrum Decision), OJ L 108, 24/04/2002, p. 0001-0006

¹¹¹ Commission Directive 96/2/EC of 16 January 1996 amending Directive 90/388/EEC

¹¹² Directive 97/13/EC of the European Parliament and of the Council of 10 April 1997

Exhibit 60

Key 3G license conditions and circumstances		Possible key areas of regulatory focus					Rationale (focus on industry structure)
		Industry structure	Pricing	Interconnection	Customer access	Quality of service	
Number of licenses	✓						On average, 3G licensing allowed for one additional mobile operator per market; Number of 3G licenses equals the number of networks build
Award method	✓	✓	✓				Highest bidding operators were awarded a 3G license
Relative timing of the award	✓						Number of interested candidates for 3G awards went down after mid-2001, in line with market expectations
More spectrum for 3G new entrant	✓				✓		Aimed at allowing for a level playing field for new entrant versus existing 2G operators with a 3G license
Payment modalities	✓	✓	✓				Modalities did not substantially affect industry structure
License duration	✓						Defines duration of 3G services provisioning on the mobile market
Spectrum size	✓					✓	Given scarcity of 3G spectrum, increased spectrum size per operator implies less licenses
Roaming rights / obligations	✓			✓		✓	Defines use of networks by other operators; improves overall service availability
Access obligations	✓			✓	✓		Defines potential for service providers in a market

✓ Key focus
 ✓ Second-order focus

Full size exhibit can be found in the Annex to this document

level with regard to mobile communications. In particular, they specified the policy objectives and conditions under which Member States should assign and manage spectrum, and which networks and services can be deployed and operated.

The UMTS Decision of December 1998 set the framework for the Member States to define the licensing conditions and procedures for the 3G licensing. As Exhibit 60 indicates, the UMTS Decision predominantly addressed industry structure regulation. Also at Member State level, despite the wide variety of licensing procedures and conditions as described in chapter two, 3G licensing remained within the boundaries of the framework¹¹³.

5.1.2 In practice, however, three types of distortions occurred

The 3G licensing outcome revealed in particular three types of distortions in the licensing processes, both in and between Member States, negatively impacting the Internal Market. These distortions were driven by the market expectations over time, the number of licenses offered, and the characteristics of the award method:

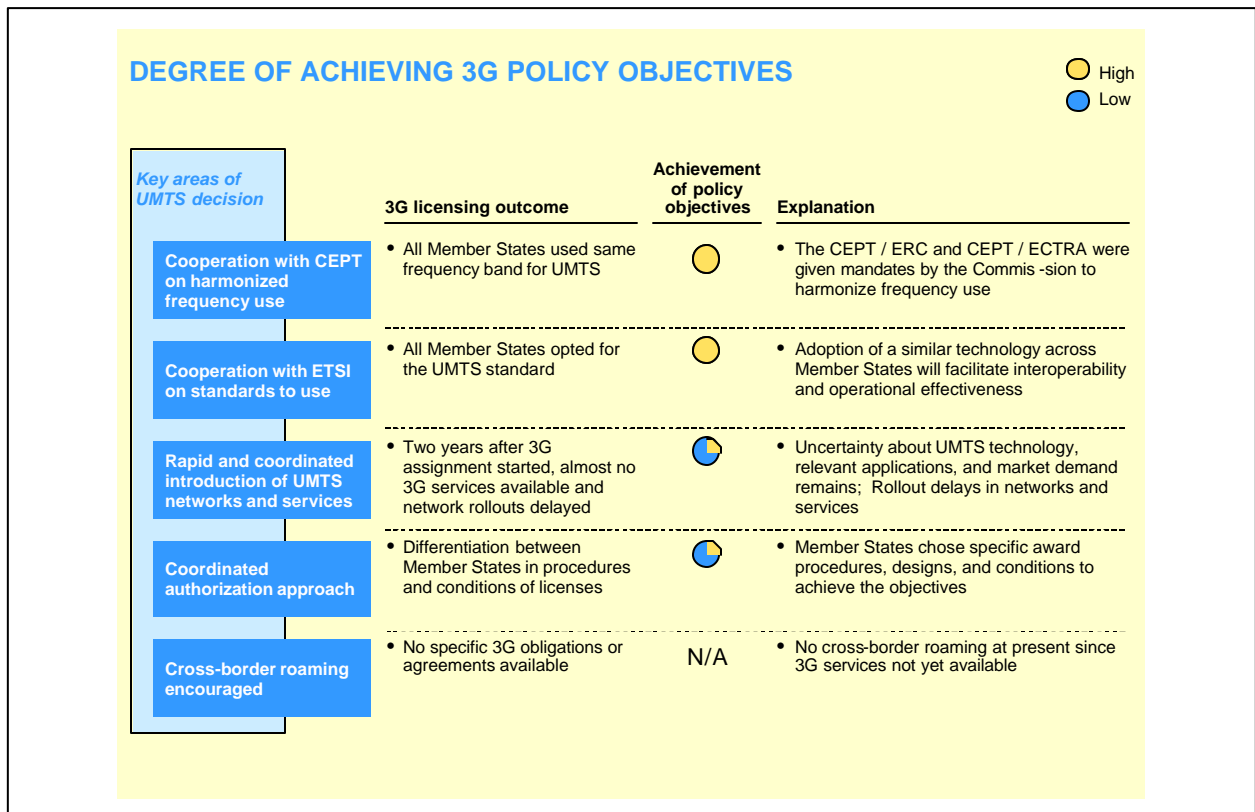
- ¶ The most prominent distorting factor was *the impact that market expectations had over time*. For the initial awards at the end of 1999 and the beginning of 2000, market expectations drove relatively high license fees and coverage commitments, and attracted a high number of potential candidates. As market sentiment deflated over time, 3G spectrum awards in Member States that followed later in the award sequence across the EU, resulted in relatively lower license fees and attracted a lower number of interested candidates.
- ¶ The second factor of distortion was *the number of licenses offered*. On average Member States allowed for one additional license compared to the number of current 2G operators. The availability of an additional license influenced the number of potential candidates was a key component in stimulating competition among interested operators, and driving players' bids up¹¹⁴. In addition, it substantially increased the competition potential on the mobile markets and, as we have seen in the fourth chapter, in certain occasions beyond sustainability of the corresponding national market¹¹⁵.
- ¶ Finally, as we identified in chapter two and three, also the specific *characteristics of the awards processes* in the Member States contributed significantly to creating a "*now-or-never*" momentum, again

¹¹³ This was confirmed in several interviews with vendors, operators, and National Regulatory Authorities.

¹¹⁴ See analysis conducted in chapter two of this document, in particular under the corresponding sections that are dealing with, i.a., the number of licenses, the license fees, and the coverage commitments

¹¹⁵ See the in-depth analysis, conducted in chapter four of this document, in particular when addressing the 3G cost of supply for each of the Member State national markets

Exhibit 61



Full size exhibit can be found in the Annex to this document

pushing bids up. Key components hereto were the seemingly ‘one-off’ character of the 3G licensing, the prisoner’s dilemma¹¹⁶ in which incumbent 2G operators found themselves, and the sequential organization of the award process¹¹⁷ (both via the, in general, multi-round nature of the auctions applied by Member States, and the fact that 3G licensing was organized across the Member States over more than a two-year period).

By contrast, it was observed in chapter two that the award method itself, i.e., auction, comparative bid, or a hybrid form, did not substantially differentiate the impact on the 3G licensing outcome. The impact on the industry structure was similar in all three approaches: on average N+1 3G licenses were awarded, and 2G incumbents almost always obtained a 3G license. Auctions proved to reflect almost immediately evolutions in market expectations, where comparative bid experienced some delays because it implied regulatory resetting of the minimum fee. In addition, multi-round auctions provided candidates the opportunity to become aware of the evaluation results of their competitors, re-examine their evaluations, and adapt their bids. As we also identified in chapter two, in parallel, this gave more leeway to components of game theory to come into play¹¹⁸. Finally, compared to comparative bid, however, auctions removed substantially more value from the mobile industry.

5.1.3 As a result, the 3G licensing outcome did not entirely correspond with what, in general, had been envisaged

The key areas that were targeted in the UMTS Decision were only partially achieved ¹¹⁹. In this regard, Exhibit 61 is explanatory, as it compares the 3G licensing outcome with the key areas envisaged by the UMTS Decision. With regard to harmonization of frequency and standards, the 3G licensing outcome in the Member States was in line with the intended objectives. A key contributor to

¹¹⁶ As addressed in chapter two, the prisoner’s dilemma is a phenomenon that can occur, in particular when a new technology and new spectrum is introduced on an existing market. In the case of 3G licensing, in assessing the value of 3G spectrum offered, existing operators were willing to include (a part of) the valuation of their current 2G operations, as they considered the risk of losing 2G operations and profitability in the mid-term, in case they would not be able to provide 3G services to their customer base. Customers, seeking 3G-type services, would indeed be tented to leave the uniquely 2G operator for a 3G operator, able to provide both 2G, 2.5G and 3G-type services. This would substantially negatively impact the 2G operator’s profitability. Despite uncertainties about the 3G technology, availability, its applications and successful services, this prisoner’s dilemma contributed to the fact that incumbent operators, in a number of cases, may end up bidding more than their business case standalone would lead them to. As other candidates were obviously trying to enter the market, they had to match these bids

¹¹⁷ See analysis in chapter three, in particular with regard to the key licensing components that were instrumental to the 3G licensing outcome

¹¹⁸ As has been analyzed in chapter two, the effect however was not entirely positive, as it allowed for additional leeway for game theory components to come into play. In certain case, this has lead candidates to bid more than the intrinsic value of the spectrum offered in a particular auction

¹¹⁹ This was confirmed in several interviews with National Regulatory Authorities

this effect was the coordinative mandate given to CEPT/ERC, CEPT/ECTRA¹²⁰, and ETSI. In areas, however, such as rapid and coordinated introduction of UMTS networks and services, coordination in the authorization approach between Member States, and cross-border roaming, envisaged policy targets were not entirely reflected in the licensing outcome. Indeed, two years after 3G assignment started, almost no 3G-type services are available and network rollouts are delayed in several Member States. In addition, significant differentiation in authorization approaches occurred between Member States. Finally, to date, no specific 3G obligations or agreements are identified with regard to 3G cross-border roaming.

On the contrary, the 3G licensing process extracted substantial value from the mobile sector. This contributed¹²¹ significantly to the current funding problems for operators, to delays in 3G network rollouts and application developments, and most probably will result in a more cautious and targeted services launch with a higher price setting. In addition, it might contribute to the risk of imposing a substantial ‘mortgage’ in the coming years on the introduction of future spectrum and technologies (e.g., extension of the 3G spectrum, introduction of Wireless LAN, and development of 4G type technologies).

In parallel, also the 3G cost of supply increased substantially compared to 2G, as 3G increased the number of licensed operators and corresponding networks by 26%. As a result, a substantial imbalance appeared between the 3G cost of supply and the corresponding demand in Member State markets. In Member States where this imbalance may have a more structural character, a painful market transition period can be expected, negatively impacting applications and overall market development.

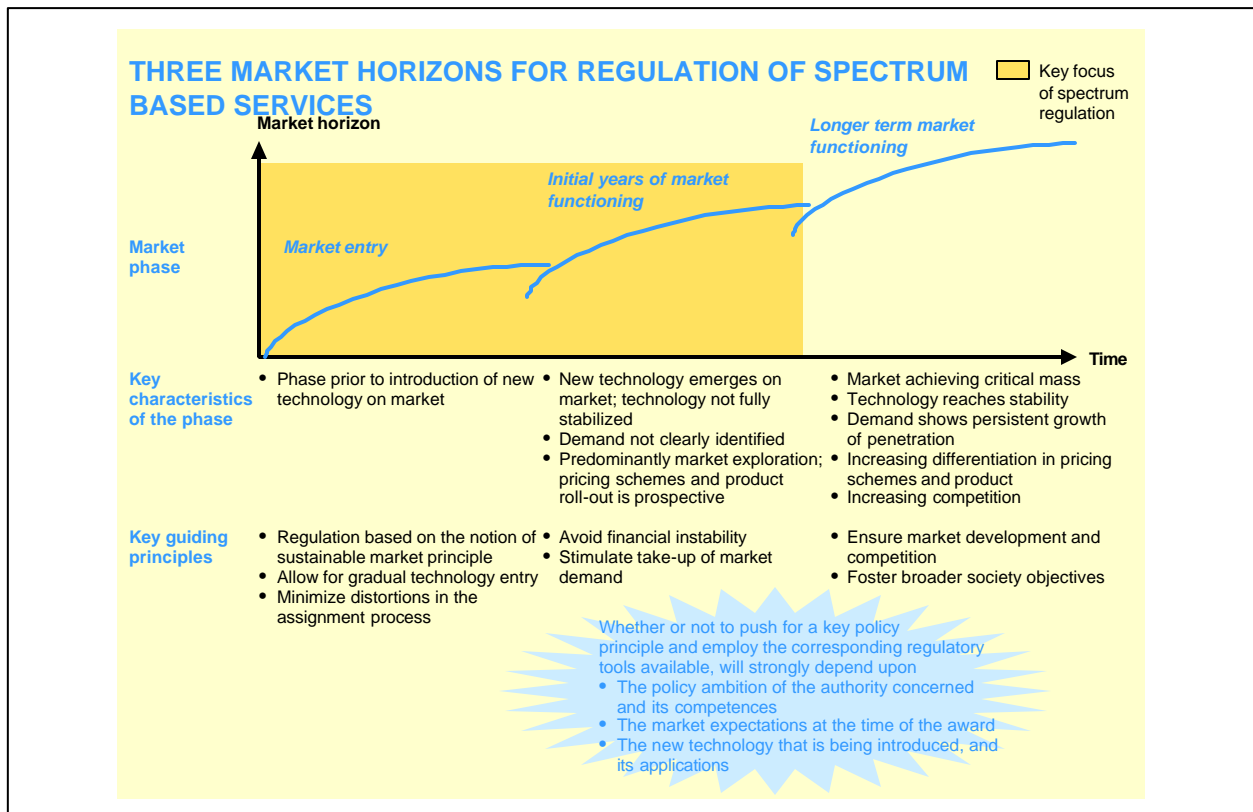
5.2 REGULATION OF SPECTRUM BASED SERVICES SHOULD COVER BOTH MARKET ENTRY AND FUNCTIONING, AND TAKE A HOLISTIC VIEW ON INDUSTRY AND REGULATION

The second lesson learned from 3G licensing is that spectrum assignment regulation should be considered in its broadest sense. The 3G licensing outcome revealed that regulation with regard to spectrum based services should not be limited to purely regulating market entry but that it will also need to encompass the overall evolution of the mobile sector and broader telecom and competition regulation.

¹²⁰ European Conference of Postal and Telecommunications Administrations; European Radiocommunications Committee; European Committee for Telecommunications Regulatory Affairs

¹²¹ In addition to the detrimental effect of the Internet bubble burst and the overall degradation of the telecom positions on the capital markets

Exhibit 62



Full size exhibit can be found in the Annex to this document

5.2.1 Considering both market entry and initial market functioning is key in regulating spectrum

Markets do not arise as such, but typically develop under three subsequent time horizons, i.e., market entry, initial market functioning, and market at “cruising speed”, each phase impacting the subsequent phase(s). Exhibit 62 elaborates on the relation between the three market horizons and the corresponding focus of spectrum regulation.

In the future, spectrum regulation will need to focus both on market entry and initial market functioning¹²², in order to reach the envisaged general policy objectives, and in order to allow for the market at cruising speed to be successful:

- ¶ The core domain for spectrum regulation always remains spectrum allocation and assignment processes, as spectrum is a scarce resource where demand normally outweighs supply. Regulation should therefore in particular (1) set the market clearing rules and procedures, (2) define the number of licenses offered, as this will be instrumental for the eventual industry’s structure¹²³, and finally (3) define the rollout and usage conditions.
- ¶ In addition, spectrum regulation should also take the initial years of market functioning into account. Indeed, during this phase, either the market conditions and/or the new technology that is being introduced have not yet reached adequate stability. The new EU telecom regulation allows for regulatory policy to exempt newly emerging markets from regulation where appropriate. In this respect, it should be remarked that a strongly unfavorable financial and regulatory environment might lead to painful market transitions, during which market growth and development could be delayed. As we identified in chapter three, the negative effects of the introduction of a new technology in an existing market may even substantially hamper a market that is already at “cruising speed”¹²⁴.
- ¶ Finally, socio-economic policy and regulation on a market will only be able to be effective in achieving their objectives of efficiency of production in the industry, user satisfaction (availability of better

¹²² This concern was, i.a., also reflected in the operators’ interviews

¹²³ The number of licenses offered defines, in general, the minimal number of players that are expected to enter and be active on the market, in particular during the initial years of market functioning. If the number of licensed operators is too high, a transition period will occur during which the structural supply-demand imbalance will be adjusted. If the number of licensed operators is too low, insufficient competition might hamper appropriate development of the market

¹²⁴ As been discussed in chapter three under the operators’ section, in general, the high 3G license fees and coverage commitments have contributed substantially to the degrading financial situation of the 2G operators. As a consequence of negatively impacting the 2G operators, also the current market of 2G mobile services might be negatively influenced in the years to come, e.g., through stabilizing pricing, slow down of 2G-type of applications and services, and overall increase of profitability focus of the 2G operators concerned

services, reasonable prices), and availability of services for lower income and underprivileged consumers, at the moment when both the market and the new technology are able to come at sufficient cruising speed. This will however only occur after the initial years of market functioning, when both market development and competition will be in the process of reaching a level of maturity, whereby the regulatory policy can gradually move away from ex-ante into the direction of an ex-post regulation.

5.2.2 A holistic view on industry and regulation is needed to take into account the implications on all stakeholders

In addition to the three-horizon approach, where we recommend that spectrum regulation should focus both on the market entry and the initial years of market functioning, spectrum regulation should also take a holistic view on the industry and on the mobile telecom regulation at EU and Member State level as a reference framework.

3G licensing has demonstrated that the outcome of an assignment process will always impact the underlying market and its players (cf. 3G licensing impacting the current mobile market and 2G operators). Making a clear and upfront assessment of the impact on markets and players is therefore key. In particular, the ongoing dynamics and major trends in the market and the mobile sector should be considered upfront, and should be reflected in the spectrum regulation (e.g., the general trend in mobile towards consolidation; access to mobile networks).

Apart from the industrial environment, spectrum policy and regulation should not be considered separately, but as an integral part of the entire set of regulatory levers applicable to the mobile sector. A selected number of those regulatory levers are key as they define the most critical value flows in and towards the mobile sector. Significantly changing the regulatory environment might entail the risk of negatively impacting the financial situation of players at a moment when they are still doing substantial capital expenditures in license fees, technology rollouts and application development. This idea will be further developed under Guiding Principle four, where we recommend that license conditions and other regulatory levers should be aligned to allow to avoid substantial financial instability.

5.3 THREE GUIDING PRINCIPLES ARE RECOMMENDED TO REGULATE MARKET ENTRY

Based on the 3G licensing, three policy decision components in spectrum assignment and management need to be taken into account during the market entry phase: a first one that tries to assess whether and to what extent the market is ready for additional spectrum, a second one that then aims at introducing the

Exhibit 63

GUIDING PRINCIPLE 1: BUILD SPECTRUM ASSIGNMENT ON THE NOTION OF "SUSTAINABLE MARKET"		
Issues to explore	Rationale	Examples of regulatory tools that could be explored, within the boundaries of the existing regulation, at the time of the licensing
Structural balance between demand and cost of supply	<ul style="list-style-type: none"> If too many licenses are awarded, a transition period, will be required (in certain cases even structural), resulting in a reduction of the cost of supply 	<ul style="list-style-type: none"> Limit number of licenses in function of market sustainability, to the degree this can be implemented from a legal/regulatory perspective Assign licenses in several waves in line with technological evolution and market demand Push for measures to reduce cost of supply (e.g., network sharing, coverage requirements) Conduct research on sustainability of market and ways to assess this Conduct regular industry and broader consultations Develop a set of tools to be used to assess sustainability in the Member States
Ability to fund the introduction of the new technology	<ul style="list-style-type: none"> Mobile industry is characterized by high upfront capital expenditure, allowing only for a limited number of infrastructure providers 	<ul style="list-style-type: none"> Allow late/ new entrants to bid for a more limited amount of spectrum Initially, award licenses to late/ new entrants on market during first few years, followed by 2nd licensing wave

Full size exhibit can be found in the Annex to this document

right amount of capacity into the market, and a third one which targets a process as fair as possible to actually assign the capacity to the different market players. We elaborate on each of them in detail.

5.3.1 Guiding principle 1: Build spectrum assignment on the notion of “sustainable market”

The synthesis of this section can be found in [Exhibit 63](#).

Spectrum regulation should start by ensuring the creation of sustainable business models in the industry through keeping the cost of rolling out a new technology in line with revenue expectations from services based on this technology.

The number of licenses offered is instrumental in this regard as it sets the number of networks to be rolled out and therefore defines upfront the cost of supply. As we identified in chapter four, license fees and upfront investment cost of rolling out a network determine to a great extent the 3G cost of supply in mobile markets. The cost of supply of a new mobile technology on a national market therefore strongly depends upon the number of licensed network operators, even when deploying a reduced footprint to offer services in a commercially attractive and efficient way. Therefore, mobile markets can only sustain a limited number of infrastructure players because of the high upfront capital expenditures¹²⁵ while, as 2G markets today in general demonstrate, in practice achieving effective levels of competition.

One could argue that investments can also be funded by proceeds from the existing product base. In 3G, however, several operators were able to acquire multiple licenses across several Member States, in many cases as a late 2G or a new 3G entrant. The proceeds from the existing product base would de facto prove clearly insufficient to finance the multiple license payments and network rollouts.

Spectrum assignment regulation (regulating market entry) should therefore take into consideration the impact on the cost of supply and the industry’s ability to fund the introduction of a new technology. The cost of supply should be recoverable over a reasonable period of time, striking a fair balance with the revenues that can be generated by the new technology. If not, over- or undersupply will result in painful market transition costs, delaying market development and technology introduction. As a result, the development of the corresponding national markets and of the Internal Market would be negatively impacted.

¹²⁵ Interviews confirmed the high importance of market sustainability (i.a., operators, and several National Regulatory Authorities, some of them finding that having the assistance of competition authority is key). Whereas the number of network operators is limited, competition is clearly present in the respective national mobile markets as barriers for expansion on the market (and subsequently increasing market share) as low

While measures to limit and reduce the upfront capital expenditures should be taken into account¹²⁶, several ways can be explored to ensure that an adequate number of licenses are awarded in line with what a market can sustain. The most direct way is to define the number of licenses as a function of minimal technical spectrum band requirements and as a function of market sustainability. Where the policy objective is to increase competition, the introduction of a new technology on an existing market can be accompanied by awarding more (i.e., one or several) network licenses (e.g., introduction of DCS1800 on the 2G mobile market) compared to the number of existing operators.

Another approach to limit the upfront cost of supply in future spectrum assignment exercises, would be to reduce the number of licensed network operators to a maximum of one or two. The network operators would be required to allow licensed service providers (i.a., MVNO) onto their networks to provide services to the end users, hereby ensuring competition on the services market. As such an approach substantially impacts the economics of the licensed network operators, such conditions would have to be explicitly defined upfront. Issues to be further investigated and subsequently tracked would be, i.a., whether the network operators would be allowed to provide services to the end user, being allowed to enter into competition with the licensed service providers, and whether the number of licensed service providers requires any limitation, considering market sustainability.

Where the introduction of a new technology is surrounded by a significant degree of uncertainty, several license waves can be considered. This will limit the initial investment risks on the market while allowing for gradual testing of the technology and the corresponding applications and services. Systematic monitoring of technological and market evolutions will be required to adequately define whether and when to launch the subsequent licensing waves, in line with the technological development and market demand.

To keep the number of licenses in line with what a market can sustain, a strong understanding of the market is necessary. Launching and publishing research could help to explore, among others, how to assess market sustainability, to identify promising alternative technological developments, and to understand market demand patterns and relevant time horizons. A kit with instruments to assess the market sustainability could be developed, in particular aligning approaches on how to assess the markets and defining relevant market indicators¹²⁷. In addition, regular industry and broader consultations can be organized to understand the stakeholder positions vis-à-vis major trends.

¹²⁶ Components such as network sharing, roaming rights for new entrants, and economically supported coverage obligations

¹²⁷ A crucial component will remain the assessment of the evolution and the levels of future demand for services. Several approaches can be further considered. One approach is to use the methodology employed by McKinsey in

Exhibit 64

GUIDING PRINCIPLE 2: ALLOW FOR THE GRADUAL INTRODUCTION OF A TECHNOLOGY AND CAPACITY		
Issues to explore	Rationale	Examples of regulatory tools that could be explored, within the boundaries of the existing regulation, at the time of the licensing
Introduction of new technology in new market	<ul style="list-style-type: none"> Both market and technology are emerging, implying absence of an adequate level of technological stability 	<ul style="list-style-type: none"> Allow for a competition neutral pioneer license Allow for a gradual assignment of licenses Link license strictly to corresponding technology
Introduction of new technology in existing market	<ul style="list-style-type: none"> As the market already exists, the key differentiation will be, to what extent increased competition is looked for from or policy perspective 	<ul style="list-style-type: none"> When seeking increased competition <ul style="list-style-type: none"> Allow for N+1 or 2 licenses for the new spectrum Allow first move by new entrant When sufficient competitive players <ul style="list-style-type: none"> Number of licenses in line with what market can bear Consider spectrum as additional capacity
Addition of capacity in existing market	<ul style="list-style-type: none"> As market and technology exist, key policy differentiation will again be, to what extent increased competition is looked for 	<ul style="list-style-type: none"> When seeking increased competition <ul style="list-style-type: none"> Allow for N+1 or 2 licenses for the new spectrum When sufficient competitive players <ul style="list-style-type: none"> Consider spectrum as additional capacity

Full size exhibit can be found in the Annex to this document

In principle, the industry should be able to fund new technology introductions on the mobile market. Two policy objectives play a determining role in this respect, namely the extent to which the introduction of the new technology itself is a key policy objective, and the extent to which the impact of incumbency on market competition requires mitigation. When these policy objectives have a high priority in the regulator's mind, options can be explored to encourage the provision of the new technology or the development of competition. For instance, during an initial limited period of time, licenses could be offered uniquely to late entrants on the market only (e.g., DCS1800 players in the 2G markets) or to new entrants for a new technology only (e.g., 3G new entrants), thus allowing these new players¹²⁸ to build up experience with regard to the new technology and effective applications and services, while acquiring an effective customer base. The late/new entrants would be required to disseminate the technological and market learning obtained in the course of these initial years, in particular to the government and to the incumbent operators, in order to ensure non-discrimination. After this initial limited period of time, incumbent operators would be allowed on the market, profiting from the learning of the first wave operators and their already established customer base.

5.3.2 Guiding principle 2: Allow for the gradual introduction of a technology and/ or capacity

The synthesis of this section can be found in Exhibit 64.

A second key concern for spectrum licensing policy is the uncertainty around the technological success and operational applicability of a new mobile technology that is being introduced in a market¹²⁹. Obviously, the rollout of a new technology will always be surrounded by a certain lack of clarity. Aligning spectrum licensing to the technological considerations should therefore not be done in a light manner. However, if substantial uncertainty exists regarding the situation of the market and the new technology¹³⁰, corresponding investments would involve a significant risk for the market and the society as a whole, as it might bind substantial value and resources to such failing technology. As a result, the development of both the corresponding national markets and the Internal Market could be hampered significantly. In this respect, a number of policy strategies might be considered:

chapter four of this document, i.e., using current EBITDA margins on the corresponding national mobile market as a reference point, as these EBITDA margins at least can be expected to be a reflection of the potential market earnings from a fairly mature consumer group who is already used to employing mobile services

¹²⁸ The importance to late 2G entrants and 3G new entrants was confirmed during the interviews with several National Regulatory Authorities and operators

¹²⁹ Cf., i.a., NTT DoCoMo that conducted a limited "proof of concept" launch of its 3G technology (i.e., with a limited volume of trial users and for a limited period of time), in order to assess and resolve performance bugs during a 6 to 12 month period, ending around May 2002

¹³⁰ This challenge was confirmed during the interviews with operators and National Regulatory Authorities

¶ ***A new technology in a new market*** (cf. introduction of GSM on the market of mobile communication). In this case, the technology would still lack stability, and applications and market demand would be unknown at the time of the spectrum assignment. Policy measures to be explored could include the understanding of technology and market via research, consultations¹³¹, and the development of toolkits to assess the corresponding evolutions. Also, explicitly stimulating standardization effort (as occurred in the 3G process¹³²) by industry would help to lift the lack of technological certainty, and in addition, would reduce investment risks and costs. In addition, authorities could consider limiting the commercial risks related to the launch of a new technology in a new market¹³³. The introduction of a competition-neutral pioneer license¹³⁴, granted to one or two operators for a limited period, could for instance address this concern. It would allow testing the technology, applications, and market demand potential. Also subsequent award waves over time could be considered, in line with the technological evolution¹³⁵. Spectrum trading can be another measure to be explored, as it allows correcting spectrum allocation when this would prove inadequate to effectively operate the new technology. In this case, operators in need for additional spectrum could use spectrum trading as a means to acquire additional capacity to match their operational needs.

¶ ***A new or an existing technology in an existing market*** (cf. introduction of 3G on the existing mobile market¹³⁶). Here key factors to be studied are again the extent to which the new technology itself is a key policy objective, and the extent to which the impact of incumbency on market competition requires mitigation. If this is the case, the new technology and development of competition could be encouraged. A measure to be explored would be initially to limit via licensing the possibility to operate the new technology for a limited period exclusively to late or new entrants on the market, providing them the opportunity to test the new technology while deploying their customer base. In addition, also

¹³¹ As was done for 3G by the European Commission before proposing the UMTS Decision and by the national governments while in the process of defining the respective license conditions

¹³² Cf. coordination efforts by ETSI, CEPT, and ERC

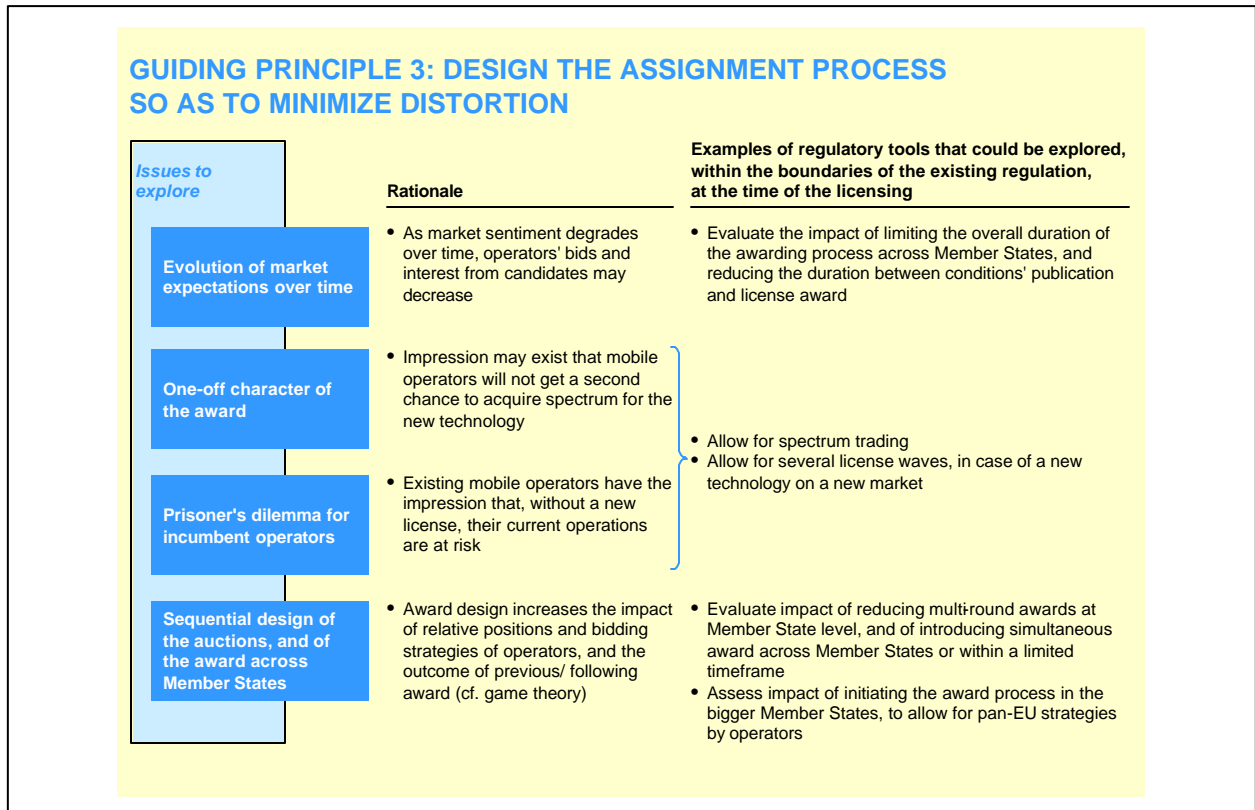
¹³³ In addition, this might also reduce the chances of remaining un-licensed spectrum after the assignment process has been finalized

¹³⁴ Cf. use of the tool of a pioneer license was already applied in the US for mobile services, awarded in 1996 to American Personal Communications (later bought by Sprint) and Ominpoint (later became Voicestream)

¹³⁵ Cf. as technology is stabilizing, interfaces are being standardized, interoperability issues are resolved, and hardware and software shipments are dealt with

¹³⁶ This point was explicitly discussed and confirmed during several interviews with National Regulatory Authorities. It was however pointed out that at the moment of assignment of 3G in the Member States, National Regulatory Authorities were confronted with a substantial lack of clarity on what 3G would bring. This rendered it difficult to define whether the 3G applications and services would imply the emergence of a new market, or rather the introduction of a new technology on the existing mobile market

Exhibit 65



Full size exhibit can be found in the Annex to this document

extending the number of licenses at the moment of spectrum capacity increase can prove to be an effective means to increase competition.

5.3.3 Guiding principle 3: Design the assignment process so as to minimize distortions

The synthesis of this section can be found in [Exhibit 65](#).

The third key concern in spectrum licensing regulation should be to avoid significant distortions in the assignment processes. In this section, we will further elaborate on the resulting negative impact on the licensing outcome at Member State level and on the hampering effect on the development of the Internal Market. With regard to the distortion effect of the assignment design, four characteristics could be identified, namely the impact of the evolution of market expectations over time, the ‘one-off character’ of the spectrum assignment exercise, the degree to which the ‘prisoners’ dilemma applies to incumbents, and the sequential organization of the award process itself in and across Member States:

¶ ***Evolution of market expectations over time***¹³⁷. This impact was already described previously in this and the second chapter of this document, pointing out the strong evolution in behavior of candidates and license fees paid over time in the case of 3G¹³⁸. Over time, this resulted in a distortion between Member States as, over time, fewer candidates showed up and spectrum valuation decreased. This distortion might have had a negative influence on the development of the Internal Market. Future licensing will need to take this impact into account. I.a., referring to several interviews with National Regulatory Authorities in the course of the study, we would recommend to further explore the consequences of limiting the overall time award process period across the Member States, in addition to reducing the time between publication of conditions and awarding licenses in each Member State. Both measures would result in a stronger similarity in market sentiment across the Member States, and therefore in the valuation of the spectrum that is offered in each Member State. This would create a more stable economic time window for the operators/investors to secure the financial means through debt or equity.

¶ ***The ‘one-off’ characteristics in spectrum licensing***, i.e., the stakeholders’ sentiment that there will not be a second chance to obtain a

¹³⁷ That fact that the evolution of market expectations over time had an impact on the 3G outcome, was considered during several interviews with National Regulatory Authorities, as a distortion between Member States

¹³⁸ In chapter two, we identified that, over time, as market expectations were going down and correspondingly the opportunities to implement a cross-Member State or pan-European strategy were being reduced, the number of interested candidates decreased (in particular in the course of 2001) and the license fees and/or coverage obligations, candidates committed to, decreased

license within a reasonable time period. Operators would face such a risk for instance in case services and market demand would already have reached maturity by the time a second licensing round could be expected. Spectrum trading¹³⁹ is the most prominent measure to be explored in this context, as this possibility is also explicitly referred to in the new EU telecom regulatory package. It allows operators not to participate in the award, keeping the possibility open to enter the market in a later phase by acquiring spectrum from an existing license holder. In addition, the upfront announcement of several licensing rounds over multiple years can be considered to avoid the ‘now-or-never’ notion. Both scenarios would allow to reduce their potential impact on the assignment outcome (i.a., number of interested candidates and height of the license fee). In addition, specific attention will have to be given to the reduction of the number of players and/or the resulting asymmetry of spectrum available to players, resulting from spectrum trading. Apart from pure competition law principles, here again in particular the assessment of market sustainability in each particular case will be key to the successful outcome.

¶ *The effect of a prisoners’ dilemma.* This can occur when a new technology is introduced on an existing market through a ‘one-off’ award. It could push incumbent operators to bid for the new spectrum, with as a main objective to safeguard their current operations. Hereby they avoid the risk that, without access to the new technology, they would run out of compelling future commercial offers and applications. Under the prisoner’s dilemma theory, incumbents would logically include the value of their current operations into their overall valuation of the new spectrum, and thus consider bidding a license fee that is higher than the stand-alone business case would imply. Where an additional license was offered, also the new entrant would be pushed, via the dynamics of the award mechanism, to match the bids of the incumbents. As such a distortion appeared between the lower intrinsic value of the spectrum offered, and the higher license fees that operators were willing to pay. Also in this case, spectrum trading and the organization of several license rounds over multiple years might bring a solution. In these circumstances, incumbent operators would again be having the opportunity of not participating in the assignment process and taking the time to assess the real impact on their current operations by the initial rollout of the technology. Both spectrum trading and subsequent licensing waves would allow the incumbent to enter at a later time, based

¹³⁹ Interviews with several National Regulatory Authorities and operators confirmed the fact that spectrum trading is a key pre-requisite for efficient and dynamic spectrum allocation and assignment

on a better understanding of the consequences for their current operations.

¶ *The sequential design of award process*, i.e., the fact that spectrum is awarded via multiple rounds. In 3G, the sequential character occurred in those Member States that awarded spectrum via auctions, in general were organized in multiple rounds (except in Denmark, using a sealed bid in the auction). In addition, also at the European level, the 3G licensing had a sequential character, namely in the fact that 3G licenses were awarded sequentially across the 15 Member States (although this was not an intended strategy). As a result, positions and bidding strategies of operators were explicitly influenced by the strategies of their competitors, and by the outcomes, both real and expected, from previous and subsequent award processes¹⁴⁰. It contributed to the fact that bids went beyond the intrinsic value of the spectrum offered in each Member State¹⁴¹. Measures to be explored in this regard are the limitation of the number of rounds or opting for a sealed bid auction. In particular the cross Member State sequential character, further analysis should be ideally focused i.a., on the impact of awarding spectrum simultaneously or within a limited timeframe across Member States¹⁴². In addition, specific attention should go to the (i.a., legal) possibility of¹⁴³ starting awards in bigger Member States first to allow operators to go for a pan-European, a regional, or a Member State approach.

Finally a remark has to be made with regard to the award method itself, i.e., auction, comparative bid, or a hybrid form. As already explained in this and the

¹⁴⁰ For literature regarding the impact of sequential bids on candidate behavior and award outcome, we, i.a., refer to the following academic papers: Klemperer P., “*What really matters in auction design – revised and extended version*”, Nuffield College, Oxford University, February 2001; Klemperer P., “*Why Every Economist Should Learn Some Auction Theory*”, Nuffield College, Oxford University, July 2000; Engelbrecht-Wiggans R., “*Why do bidders drop out of a sequential auction*”, 26th January 2000; Jehiel, P., Moldovanu, B., “*Licence Auctions and Market Structure*”, ENPC, CERAS and UCL, University of Mannheim, 2nd July 2000; Chanel O., and Vincent S., “*Price decline in sequential auctions: reasons and measures*”

¹⁴¹ This is the normal effect of the fact that the sequential character of the 3G licensing process made way for a multitude of bidding moments during which, components of game theory could enter the game. E.g., candidate A could participate in an award process for a market that was not crucial to him, but that was key to its competitor (e.g., its home market). A possible strategy could be to participate in the process, hereby driving higher prices and knowing its competitor could not risk not having a license. Subsequently, the financial means of B to participate in award processes for a market that is crucial in A strategy would be reduced. Obviously, also B could follow the inverted strategy. As a result, candidate A and B would both find themselves in a situation where they could have paid more than what they would have done without the strategic consideration of its competitors. The more moments are provided by the award design, the more potential exist that above described and similar strategies would take effect

¹⁴² Further analysis should in particular focus on foreign experience and literature (e.g., based on recent US experience in spectrum assignment), as well as explicit impact analysis modeling. Specific attention should go to the interaction (i.a., reaction speed in both directions) between the operators' bids and the capital markets, and to what extent it would be useful to allow/introduce methods to potentially adjust license fees and funding means in a non-discriminate manner to (partially) neutralize substantial changes in capital market expectations over time

¹⁴³ During interviews, several National Regulatory Authorities pointed to the appropriateness of coordination and harmonization with regard to timing of the assignment process across Member States

Exhibit 66

GUIDING PRINCIPLE 4: ALIGN LICENSE CONDITIONS AND OTHER REGULATORY LEVERS TO ALLOW FOR FINANCIAL STABILITY		
Issues to explore	Rationale	Examples of regulatory tools that could be explored, within the boundaries of the existing regulation, at the time of the licensing
Limit coverage obligations in initial years	<ul style="list-style-type: none"> • Too high initial coverage requirements increase upfront capital expenditure, not covered by market demand 	<ul style="list-style-type: none"> • Avoid or limit coverage requirements during initial years • Avoid area coverage requirements during initial years, focusing on population coverage
Allow for extended payment schedule	<ul style="list-style-type: none"> • Reduces the financial impact of the license fee during initial years, and facilitates financial coverage with revenues from the new technology 	<ul style="list-style-type: none"> • Move bulk of license fees away from initial years through <ul style="list-style-type: none"> – Annual installments – Extending the duration of the payment schedule • Levy a percentage on revenues, hereby linking payments to the actually realized new revenue streams
Stabilize in key value-driving regulatory levers	<ul style="list-style-type: none"> • Certain regulatory levers drive key value flows towards the substantial mobile sector; reducing those flows may degrade the financial situation of the mobile operators 	<ul style="list-style-type: none"> • Avoid additional funding problems by stabilizing regulatory levers that drive key value for the mobile sector (e.g., call termination to mobile, roaming) in case of significant market instability • Avoid introduction of additional significant burdens (e.g., environmental, and urbanistic regulation)
Consider a lenient attitude in competition matters	<ul style="list-style-type: none"> • The notion of "sustainable" market is to be taken into consideration in assessing agreements and mergers in the mobile sector 	<ul style="list-style-type: none"> • Apply notion of "sustainable market" while assessing whether e.g., agreements contribute to improve production or distribution of goods, or to promoting technical or economic progress • Refer to notion of "sustainable market" while considering "economic efficiency" and "failing firm" doctrines in order to determine the impact of mergers and joint ventures

Full size exhibit can be found in the Annex to this document

second chapter with regard to 3G licensing, they all had a similar impact on the industry structure and as such were not a key differentiator in the 3G licensing outcome: on average N+1 3G licenses were awarded, and 2G incumbents almost always obtained a 3G license. Member States in general achieved their policy objectives. Irrespective of the award method used, only in three Member States, not all licenses were awarded: Belgium and Greece where auction as award method was used, and France, which applied a comparative bid. The key area where auctions and comparative bids significantly differed however, was the way in which they extracted value from the mobile sector, i.e., auctions in general extracting substantially more value from the mobile industry/investors, compared to competitive bids. In addition, auctions proved to reflect almost immediately evolutions in market expectations, where comparative bid experienced some delays because it implied regulatory resetting of the minimum fee and/or coverage requirements. In addition, multi-round auctions provided candidates the opportunity to become aware of the evaluation results of their competitors, re-examine their evaluations, and adapt their bids. As we identified in the second chapter, in parallel, this gave more leeway to components of game theory to come into play¹⁴⁴.

Therefore, where spectrum policy aims at optimally and instantly reflecting the spectrum value, 3G experiences demonstrate that auctions seem most appropriate. Policy objectives might, however, want to limit the risk that too much value is extracted from the industry. In that case, the comparative bid method seems to be more appropriate, as incremental capital expenditures (e.g., coverage commitments by candidate operators) would remain within the industry.

5.4 TWO ADDITIONAL GUIDING PRINCIPLES ARE RECOMMENDED TO REGULATE THE INITIAL YEARS OF MARKET FUNCTIONING

Adequate spectrum regulation does not stop after the phase of market entry. Also during the initial years of market functioning and technology introduction, two particular issues need to be addressed, namely avoiding substantial financial instability in the mobile industry and stimulating the take-up of market demand for services, based on the new technology.

5.4.1 Guiding principle 4: Align license conditions and other regulatory levers to allow for financial stability

The synthesis of this section can be found in [Exhibit 66](#).

¹⁴⁴ As been analyzed in chapter two, the effect however was not entirely positive, as it allowed for additional leeway for game theory components to come into play. In certain cases, this might have lead candidates to bid more than the intrinsic value of the spectrum offered in a particular auction

As already mentioned in the introduction to this chapter, the question whether or not to push for a guiding principle and correspondingly employ the regulatory tools available within the boundaries of the existing legislation, will strongly depend upon the very concrete circumstances at the time of the licensing. This, in particular, will be the case for the following two (i.e., principles four and five) guiding principles that apply to the initial years of market functioning, as they will interact with other policy objectives and regulatory strategies, i.a., such as competition, industrial, and social policy areas. An essential driver in this respect will be the policy ambition of the authorities concerned and their respective competences with regard to the introduction of the new technology¹⁴⁵. The more the new technology will be considered important to the overall society in Europe and the Member States, the more authorities could consider effectively applying the fourth guiding principle.

Within the policy environment as described in the previous paragraph, and in order to avoid financial instability¹⁴⁶ in the course of the initial years of market functioning, regulation with regard to spectrum based services should set the right level of coverage obligations and appropriate payment schedules, and align a number of other key value-driving regulatory levers to the financial strength of the players:

- ¶ ***Right level of coverage obligations***¹⁴⁷. For future spectrum assignment, it should be taken into consideration to ensure sufficiently limited coverage requirements, hereby limiting the upfront capital expenditures and the corresponding financing needs during the initial years. In this respect, future spectrum regulation might consider limiting coverage conditions and/ or area coverage requirements (compared to population coverage), or avoiding them altogether.
- ¶ ***Extension of license fee payment schedules***. This would directly and positively impact the financial situation of the operators concerned. Authorities might consider moving the bulk of the license fee payments away from the initial years via provisions for annual installments over a sufficiently long time. Alternatively, they could extend the duration of the payment schedules, or express the license fee as a percentage of revenues, in particular where license conditions link the awarded spectrum to a certain technology (e.g., 3G licensing linked spectrum awarded to the use of 3G-type of technologies). In addition, this approach might create an incentive for operators/investors to hand in


¹⁴⁵ As already discussed previously, other key components in the overall consideration are the market expectations at the time of the award process, and the degree of uncertainty and technological stability of the new technology that is being introduced

¹⁴⁶ The need for adequate financial stability during the initial years of market functioning was confirmed during several interviews with National Regulatory Authorities

¹⁴⁷ Confirmed in several interviews with National Regulatory Authorities

Exhibit 67

OVERVIEW OF KEY VALUE-DRIVING REGULATORY LEVERS		
Regulatory areas	Relevant telecom regulatory levers and their translation in mobile
Industry structure	<ul style="list-style-type: none"> • Number of network operators • Ownership and control rules • Licensing procedures and conditions 	<ul style="list-style-type: none"> • Number of spectrum licenses • Limiting license to one per operator • Award method for spectrum as scarce resource
Pricing	<ul style="list-style-type: none"> • Controls against abusive retail pricing • Controls against abusive international pricing • Access deficit compensation applied to mobile operators 	<ul style="list-style-type: none"> • – • International roaming price regulation • ADC applied to mobile operators
Inter-connection	<ul style="list-style-type: none"> • Rights and obligations to interconnect • Structure and level of charges • Collocation and infrastructure sharing • Requirements for national roaming • Special access regulation for types of service operators 	<ul style="list-style-type: none"> • F2M tariff regulation • Site and network sharing • Roaming rights for new entrants • MVNO access regulation
Customer access	<ul style="list-style-type: none"> • Numbering plan • Number portability • Length and ease of carrier selection codes 	<ul style="list-style-type: none"> • Rules with regard to SIM-cards • Mobile number portability • –
Universal service and performance	<ul style="list-style-type: none"> • Universal access and service obligation definitions • Universal service funding mechanism • Network rollout and coverage requirements • Service quality targets 	<ul style="list-style-type: none"> • – • Including mobile operators in USO funding base • Coverage obligations in spectrum license • –

 Focus areas for regulatory stability

Full size exhibit can be found in the Annex to this document

(e.g., to the government or to the market via spectrum trading where this would be allowed) spectrum where they would not be successful.

¶ Spectrum licensing cannot be considered separately from the entire set of *other regulatory levers that drive key values for the mobile sector*. In the course of several interviews, in particular also with National Regulatory Authorities, the importance of these regulatory interactions/interference was pointed out, and the appropriateness of harmonization/coordination in this respect was raised. Indeed, specific regulatory levers can often drive critical value flows in and towards the mobile sector¹⁴⁸. Negative evolutions would therefore directly impact the financial situation of the mobile sector. In this respect, the growing impact of environmental and health regulation is significant for the mobile sector¹⁴⁹. In addition, authorities might want to explore the possibility to keep the most critical regulatory levers stable during the initial years of market functioning and avoid creating additional value shifts away from the players. At the least, it is important for the regulators to understand what the likely impact is of their rulings on these levers. As is indicated in Exhibit 67, the key areas where substantial value is at stake are, for instance, the interconnection regime applicable to mobile services, the regulation with regard to roaming, in particular the national markets for international roaming, and finally the introduction of forms of retail pricing regulation. Hereby, it would be relevant to first explore the impact of such policy measures on the corresponding award outcome (e.g., bid price) before changing the rules of the game:

- The *interconnection regime*, in particular with regard to fixed-to-mobile call termination rates, represents a substantial value flow from the fixed to the mobile telecom sector, especially for late entrant, mobile operators. Measures touching on these aspects should be carefully considered as they can put substantial value at stake in the mobile sector;
- If the principle of cost orientation finds its way into the *roaming regime*, in particular the national markets for international roaming, there is a risk of downward pressure on the corresponding roaming tariffs. The impact of this would be a decrease in value available to mobile operators that provide access to their networks to other mobile operator;

¹⁴⁸The importance of these regulatory levers for the mobile sector was confirmed during several interviews with the National Regulatory Authorities. It was pointed out that in this respect, coordination and harmonization would be appropriate

¹⁴⁹ Confirmed during the interviews with operators and National Regulatory Authorities, which were also mentioning that EMF regulation, differing between Member States, should be harmonized

- Retail *price regulation* does currently not exist for mobile services. It is an example of another domain that could cause a substantial decrease in the value flow in the direction of the mobile sector¹⁵⁰.

¶ Finally, in this regard, we would like to explicitly refer to *the European competition policy*, in particular the application of the Articles 81 and 82 of the Treaty establishing the European Community. As discussed in the fourth chapter of this Report, industry restructuring might occur during the initial years of market functioning. This can take the form of mergers, joint ventures, agreements or concerted practices between operators (e.g., infrastructure sharing) and/or vendors (e.g., vendor pre-financing or network management by vendors), or similar decisions by their associations. To the extent that the conditions as described in the introduction of the fourth Guiding Principle are met, the European Commission and the respective Member States might consider a lenient attitude within the legal boundaries as defined by the Treaty. This could imply:

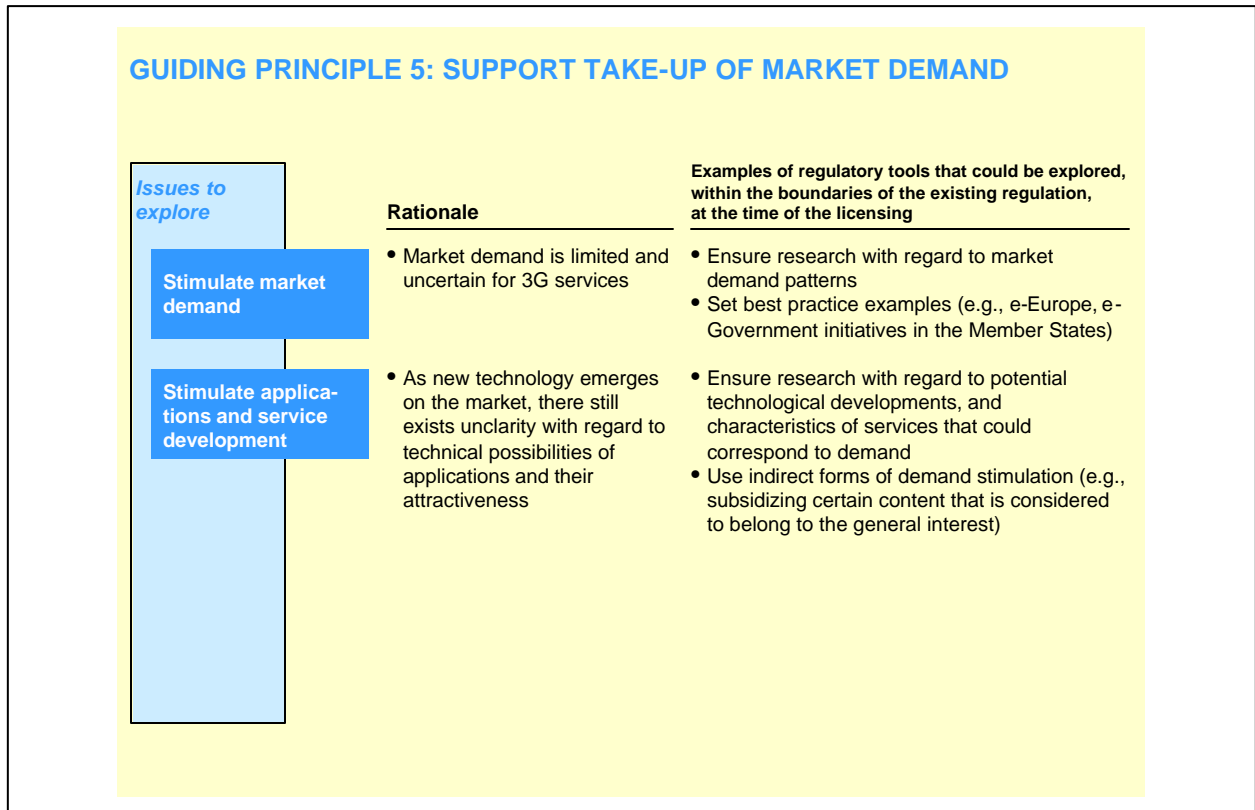
- ***With regard to agreements, decisions, or concerted practices:*** to the extent that these would fall within the scope of Article 81, 1. of the Treaty, the European Commission and the Member States could consider applying the exemption provided in the Treaty (i.e., Article 81, 3.)¹⁵¹ in the light of the notion of “sustainable market” (cf. first Guiding Principle), while assessing whether these agreements, decisions, or concerted practices could contribute to improving production or distribution of goods, or to promoting technical or economic progress, while allowing consumers a fair share of the resulting benefit;
- ***With regard to mergers and joint ventures:*** also in these cases, the European Commission and the Member States could refer to the notion of “sustainable market”, while considering the legal and economic rationale of the “economic efficiency” and “failing firm”¹⁵²

¹⁵⁰ Cf. similar retail price regulation currently already in existence for fixed line telecom services that are provided by operators with significant market power

¹⁵¹ Article 81, 1. of the Treaty establishing the European Community “ prohibits “[...] all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the common market, [...]”. Article 81, 3., however, defines an exemption to this prohibition: “The provisions of paragraph 1 may, however, be declared inapplicable in the case of [...] which contributes to improving the production or distribution of good or to promoting of technical or economic progress, while allowing consumers a fair share of the resulting benefit [...]”

¹⁵² The “economic efficiency” doctrine refers to the fact that mergers can find approval within the legal framework of the Articles 81 and 82 of the Treaty establishing the European Community, if the merger leads to improved

Exhibit 68



Full size exhibit can be found in the Annex to this document

doctrines, in order to determine whether the impact on the market, the corresponding industry's structure, and the benefits to the consumer is acceptable under the terms of the Treaty.

5.4.2 Guiding principle 5: Support take-up of market demand

The synthesis of this section can be found in [Exhibit 68](#).

Both Member States and the EU can take measures to work on the demand side¹⁵³. Although they may be less deterministic in nature, we believe that the stimulation of market demand and development of applications and services should be a last policy concern to explicitly take into account:

¶ ***Stimulation of market demand.*** During the initial years of market functioning, demand for a new technology is likely to be limited and uncertain. Therefore, a number of measures could be taken into consideration:

- Research could zoom in on assessing potential demand patterns, and identifying services for which demand would be significant¹⁵⁴ cf.. Findings and best practices should be published and disseminated;
- In addition, authorities at EU and Member State level might want to stimulate usage of the new technology by setting the example and using the new technology in their own services¹⁵⁵.

¶ ***Stimulation of development of applications and services.*** During the emergence of a new technology, lack of clarity might remain with regard to the content and the services that could take advantage of that new technology. In this regard, authorities might consider, i.a., the following measures:

- Conduct and stimulate research and best practice initiatives to push development of applications and services, both at the European and the Member State level¹⁵⁶;

economic efficiency on the market. The “failing firm” doctrine refers to the fact that, where to non-approval of the merger would most probably lead to the bankruptcy of one of the players, the merger would result the same impact on the market

¹⁵³ Confirmed during several interviews with National Regulatory Authorities that a specific market demand policy would be appropriate, in order to improve consumer confidence

¹⁵⁴ Such as the multi-year research programs in most member States and the EU Research Area 6th Research and technical development Program

¹⁵⁵ eEurope initiatives (e.g., eContent and IST/Mobile initiatives as part of the Research Framework Program) and similar eGovernment initiatives launched by several Member States

- Also more direct forms of applications and services stimulation might be explored. Partial or project-based demand-side subsidies of certain types of services that fall within the framework of more general public interest could be taken into consideration¹⁵⁷;
- Finally, permitting temporarily certain types of preferential agreements within the boundaries of the Treaty¹⁵⁸ between e.g., operators and between operators and content providers, to stimulate development of services and applications¹⁵⁹.

5.5 THESE FIVE PRINCIPLES SHOULD AND CAN BE IMPLEMENTED WITHIN THE NEW TELECOM FRAMEWORK, PUTTING THE MAJORITY OF THE BURDEN ON THE MEMBER STATES

This section discusses the level at which the responsibility and competence to take measures can be located. As a basis for this reflection we are using the new telecom regulatory framework that will be transposed into Member State regulation soon, and the recent EU Spectrum Decision .

5.5.1 Objectives and regulation in the new telecom framework allow addressing the key issues of spectrum assignment

The new Framework Directive¹⁶⁰ defines three major objectives that Member States should achieve, namely the promotion of competition in networks and services, the contribution to the development of the Internal Market, and the promotion of the interests of the citizens of the European Union. In addition, to achieve these objectives, different levers are indicated:

- ¶ For the promotion of competition in networks and services, Member States should maximize user benefits, avoid distortion or reduction of

¹⁵⁶ Cf. initiatives taken by the European Commission that are beneficial to the rollout of 3G (e.g., eEurope, eContent, and IST/mobile initiatives) and similar eGovernment initiatives launched by several Member States, that are beneficial to the rollout of 3G

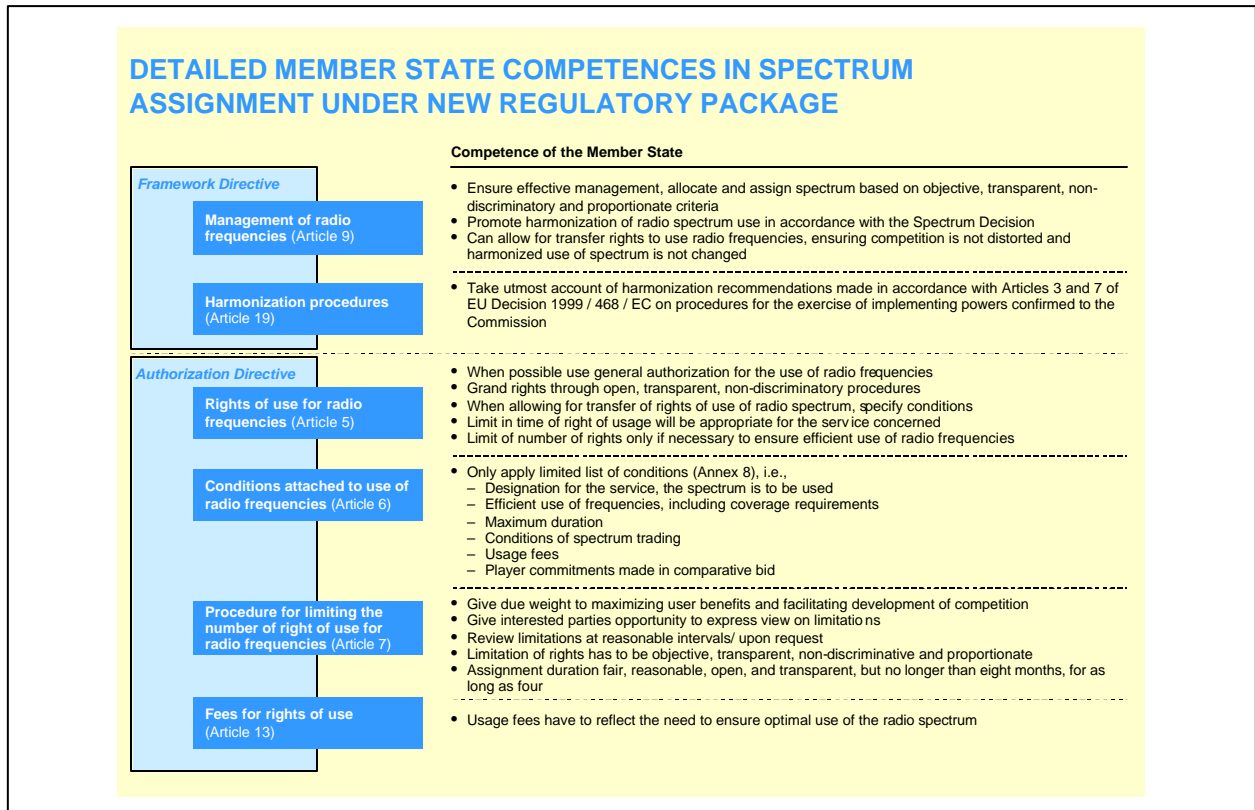
¹⁵⁷ E.g., access to different types of information provided by national, regional, and local authorities. The Treaty establishing the European Community allows for Member State and European Union based consumer subsidies. Such measures would, in addition, be validated in the broader WTO framework (cf. potential non-discrimination issues)

¹⁵⁸ Treaty establishing the European Community

¹⁵⁹ As already referred to previously in this chapter, under certain conditions, the exemption of Article 81, 3. could apply

¹⁶⁰ Article 8 of the "Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive)", OJ L 108, 24/04/2002, p. 0033-0050

Exhibit 69



Full size exhibit can be found in the Annex to this document

competition, ensure efficient investments and innovation, and ensure efficient use of spectrum.

- ¶ For the development of the Internal Market, Member States should contribute by removing remaining obstacles to the provision of networks, participate in ensuring the realization of trans-EU networks, interoperability, end-to-end connectivity, and non-discrimination between players, and ensure consistent regulatory application of the Directives.
- ¶ Finally, for the promotion of the interests of the EU citizens, Member States should ensure access to universal service, protection of privacy, provision of clear information, addressing the needs of specific social groups, and ensuring integrity and security of public networks.

As such, these objectives and corresponding supporting levers allow addressing the key concerns and policy principles that were developed in the previous sections.

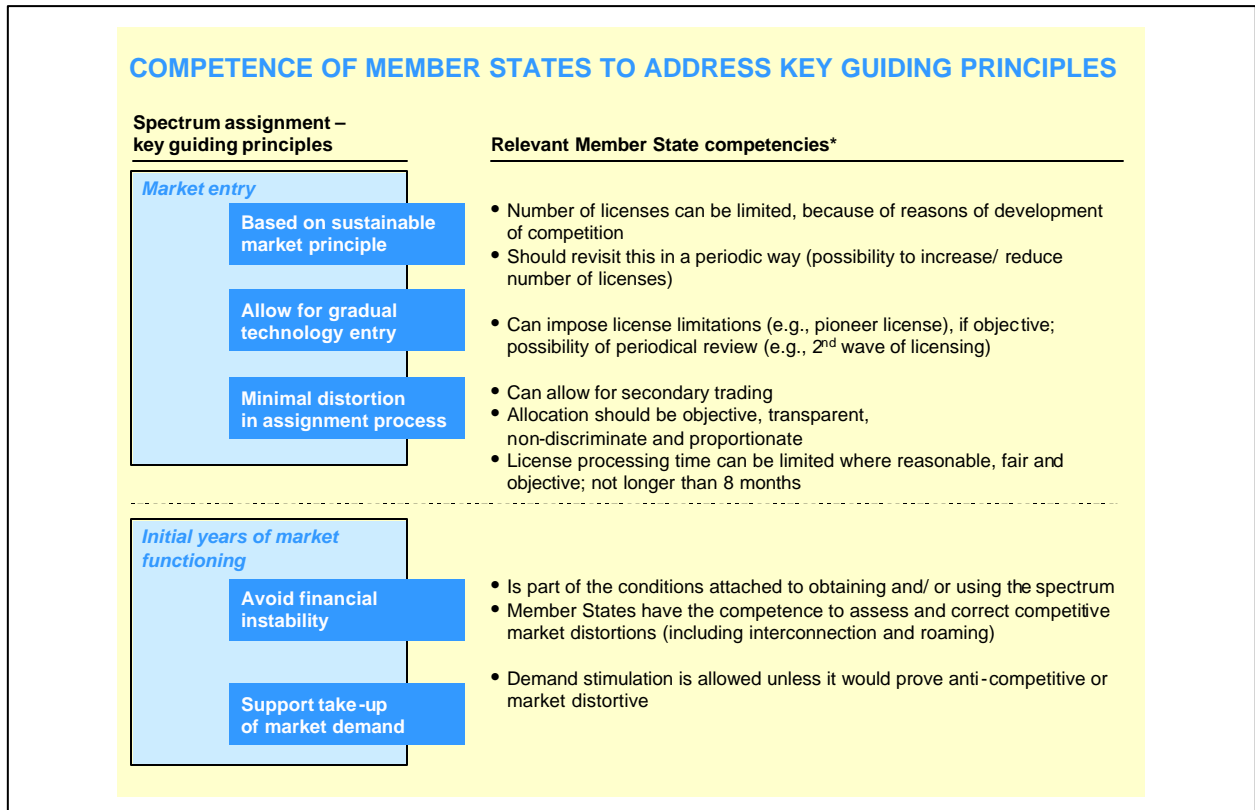
5.5.2 The framework also confirms the predominant competence of the Member States with regard to spectrum assignment

The new telecom regulatory framework and the recent EU Spectrum Decision¹⁶¹ confirm to a large extent the current regulatory situation and the role of the Member States. The Framework and the Authorization Directive specify the Member State competences in detail, as is demonstrated in Exhibit 69:

- ¶ Regarding spectrum management, Member States should assign spectrum on objective, transparent, non-discriminatory and proportionate grounds, ensure effective management, and promote spectrum harmonization. Secondary spectrum trading can be allowed, in so far as competition is not distorted and spectrum use is not changed.
- ¶ In defining spectrum usage, Member States should specify spectrum trading conditions, limit usage in time as appropriate for the service concerned, and limit the number of licenses to obtain efficient use, efficient use of spectrum, including coverage requirements, usage fees, and players commitments made in comparative bids.
- ¶ Regarding the procedures to take into account, Member States should consult all interested parties, and give due weight to maximizing user benefits and facilitating development of competition. Usage limitations

¹⁶¹ I.a., chapter II and chapter III of the Framework Directive address the Member States competencies with regard to telecom regulation; , the Spectrum Decision addresses with coordination of policy approaches and harmonization with regard to spectrum based services

Exhibit 70



Full size exhibit can be found in the Annex to this document

have to be reviewed at reasonable intervals and upon request. Duration of the spectrum assignment process is required to be fair, reasonable and proportionate, and should not extend eight months.

- ¶ Finally, Member States should ensure that fees for use of rights reflect optimal use of the corresponding spectrum.

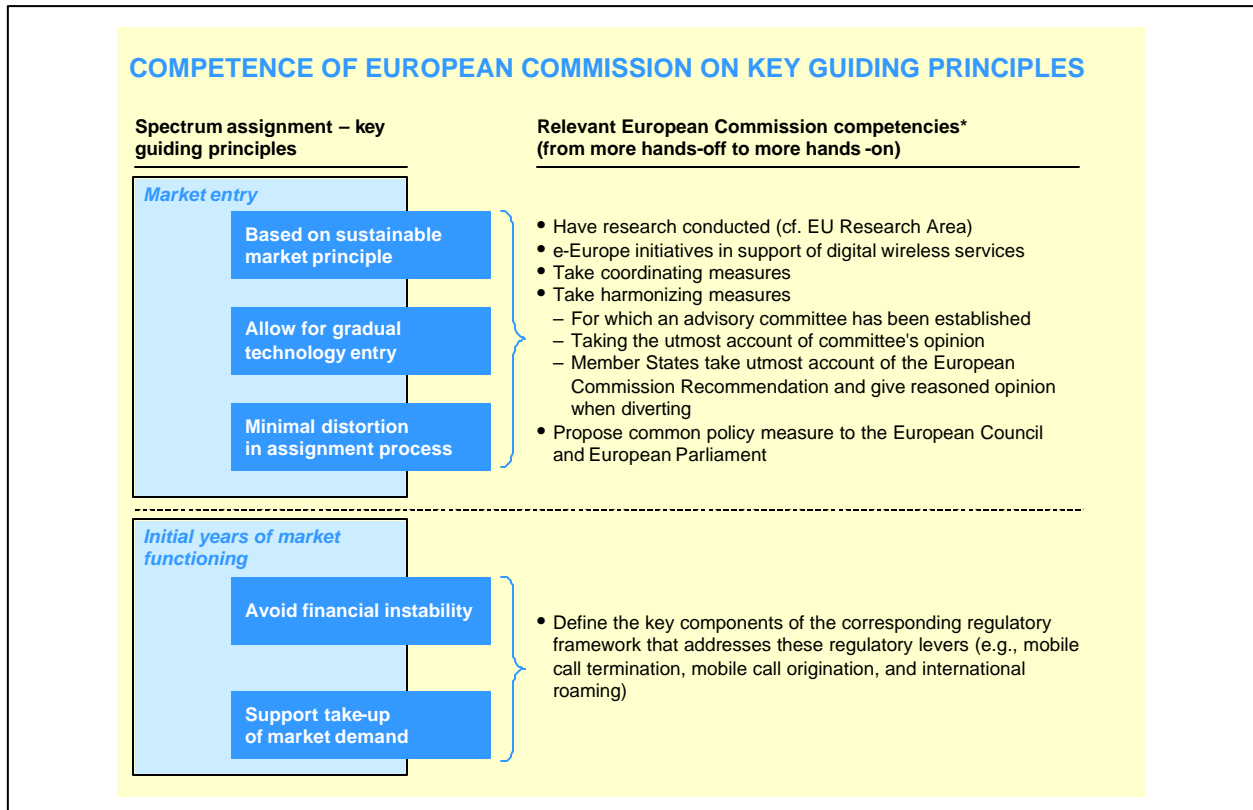
In this respect, the recent EU Spectrum Decision aims at establishing a policy and legal framework in order to ensure the coordination of Member State and EU level policy approaches and, where appropriate, harmonized conditions with regard to the availability and efficient use of spectrum.

5.5.3 The majority of the burden in future exercises will therefore remain with the Member States

Based on the new telecom regulation framework, Member States will remain the key authority in charge of spectrum regulation. As such, they hold a critical position in addressing the key policy principles, developed in the previous sections. In addition, explicit analysis, as indicated in [Exhibit 70](#), shows that the Member States in effect have the necessary regulatory tools at their disposal to address the key issues according to the five guiding principles for adequate spectrum regulation as addressed previously in this chapter:

- ¶ In order to ensure the *notion of sustainable market* (i.e., first guiding principle), Member States can, in defining the number of licenses that are going to be offered in a future spectrum assignment, for instance limit the number of licenses, based on the consideration to give due weight to facilitate development of competition. Within reasonable intervals, Member States can revisit the number of licenses, based on e.g., the development and competition levels in the market.
- ¶ In order to foster *gradual technology introduction* (i.e., second guiding principle), Member States are entitled to impose conditions in the license, such as i.a. providing for a pioneer license, and can periodically review the number of licenses.
- ¶ In order to *avoid distortion in the assignment process* (i.e., third guiding principle), Member States can, among others, allow for secondary spectrum trading, hereby reducing the potential effects of i.a., “one-off character”, the “prisoners’ dilemma”, and in addition, can limit the duration of the assignment process.
- ¶ In order to allow *financial stability* (i.e., fourth guiding principle), Member States can define payment schedules and coverage requirements as license conditions, and can correct competitive distortions on the mobile market.

Exhibit 71



Full size exhibit can be found in the Annex to this document

- ¶ In order to *support market demand take-up* (i.e., fifth guiding principle), Member States are in general terms competent, in so far as EU regulation is not violated (cf. competition issues, and distorting the market).

5.6 THE EUROPEAN COMMISSION HAS A CRITICAL ROLE AND SHOULD MAKE SURE THE MEMBER STATES ADDRESS KEY ISSUES APPROPRIATELY

As discussed in the previous section, Member States retain the core competences with regard to spectrum regulation. As such, the European Union is restricted in its potential role in spectrum policy and regulation. Nevertheless, the European Union has important instruments at its disposal that it can and should put to use to ensure the successful implementation of the recommended key policy principles¹⁶². In this respect, both the new EU telecom regulatory framework and the recent EU Spectrum Decision will prove instrumental.

5.6.1 The new telecom framework and Spectrum Decision provide the EU with explicit procedures and regulatory tools

Apart from confirming the role of the Member States, the new EU telecom framework and the EU Spectrum Decision provide the European Union with explicit procedures and regulatory tools to ensure coordination, harmonization, and common measures where this would prove appropriate. Based on the co-decision principle with regard to the development of telecom regulation, apart from the European Commission, also the role of the European Parliament will be more explicit¹⁶³. In particular with regard to spectrum regulation, as Exhibit 71 shows, the European Union can take a number of initiatives:

- ¶ Based on its *own competences*, the EU can ensure and conduct research, such as the EU Research Area 6th Research and technical development Program, and can develop proper initiatives, such as the e-Europe activities in support of, among others, digital wireless services.
- ¶ The *new EU telecom regulatory framework*, provides a suitable number of mechanisms for encouraging cooperation and coordination between Member States. In this regard, the European Commission has expressed its intention to set up a European Regulators Group for Electronic Communications Networks and Services, in order to promote the development of the internal market, and to see to achieve consistent application in all member states, in particular in areas where NRA are

¹⁶² These findings were confirmed in the interviews with operators and National Regulatory Authorities

¹⁶³ In the new EU telecom regulation package, telecom regulation falls within the scope of the co-decision. As a consequence, also the involvement of the European Parliament can be expected stronger and more explicit in the development of future spectrum policy and regulation

Exhibit 72

SCENARIO 1: MINIMAL EUROPEAN COMMISSION ROLE				
Spectrum assignment – key guiding principles	Minimal potential European Commission role to explore	Evaluation of the impact of the measure considered		Potential ease of implementation for the EU
		PRO	CON	
<i>Market entry</i>				
Based on sustainable market principle	<ul style="list-style-type: none"> Track Member States progress on assessing sustainability of market 	<ul style="list-style-type: none"> Allows to assess to what extent issues are addressed, and to take corrective measures where needed 	<ul style="list-style-type: none"> Risk of inability to take corrective measures in due time, and of increasing divergence in key component in assignment outcome 	
Allow for gradual technology entry	<ul style="list-style-type: none"> Conduct EU research on relevant radio spectrum technologies Define the technology to be used or the process to define the technology 	<ul style="list-style-type: none"> Increases transparency on the applicability/ functionality of the technology; Creates stability with regard to the technology to be used 	<ul style="list-style-type: none"> High exposure of mobile industry in case of technology with too low degree of stability 	
Minimal distortion in assignment process	<ul style="list-style-type: none"> Explore the impact of limiting the award time line on the efficiency of the spectrum award method 	<ul style="list-style-type: none"> Limits impact of evolution in market expectations on the assignment outcome 	<ul style="list-style-type: none"> Difficulty to sufficiently limit the corresponding time frame; No assurance that one-off character and prisoner's dilemma are addressed 	
<i>Initial years of market functioning</i>				
Avoid financial instability	<ul style="list-style-type: none"> Keep regulatory levers that impact key value for the mobile sector stable in the coming years (e.g., definition of relevant mobile markets), and evaluate potential impact on the award price 	<ul style="list-style-type: none"> Anticipated cash flows with initial years of high capital investments are not further burdened 	<ul style="list-style-type: none"> Might be difficult for the European Commission, given other EU policy considerations; Other components such as coverage requirements and license payments are left up to the Member States to address 	
Support take-up of market demand	<ul style="list-style-type: none"> Launch EU Research Area and take e-Europe type initiatives in support of digital wireless services 	<ul style="list-style-type: none"> Research and initiatives with regard to applications and services is boosted 	<ul style="list-style-type: none"> No assurance that best practices might be disseminated between the Member States, and roll out delays in line with market take up is left to Member States 	

Full size exhibit can be found in the Annex to this document

given considerable discretionary powers. In addition, NRA are required to cooperate with each other and with the European Commission in a transparent manner to ensure consistent application of the new telecom framework in the Member States, with a particular focus on the types of instruments and remedies best suited to address particular types of situations in the marketplace. In this respect, balanced information and consultation procedures have been established. This cooperation could take place, inter alia, in the Communications Committee and in the European Regulators Group. .

- ¶ In addition, the recent *EU Spectrum Decision* has established a number of procedures to facilitate policy making with regard to the strategic planning and harmonization of the use of radio spectrum in the European Union. This provides the European Commission with a potentially powerful tool to ensure coordination of policy approaches, and where appropriate, harmonized conditions with regard to availability and efficient use of spectrum, necessary for the establishment and functioning of the Internal Market in Community policy areas such as electronic communications, transport and research and development.
- ¶ Finally, the European Commission can also use levers in *other regulatory domains* to impact the mobile sector¹⁶⁴, including other areas in the telecom regulation (e.g., interconnection, and roaming), and certain aspects of competition policy (e.g., in the situation of handling restructuring cases in the mobile sector in the years to come).

5.6.2 In a first scenario, the European Commission should as a minimum consider determining specific rules with regards to the assignment process

The overall synthesis of this section can be found in Exhibit 72, describing in greater depth the advantages and disadvantages of the actions proposed, including an initial assessment of the potential ease of implementation by the European Union.

Developing a minimal scenario, the hypothesis is taken that Member States would explicitly support the five key policy principles in spectrum regulation and would take appropriate measures. Even in this case, the European Union can and has to take an active stance by taking coordinative and/or harmonizing measures, own initiatives or in certain instances even common measures, all in function of the guiding principles that will have to be ensured and depending upon the concrete situation the European Union and the Member States will be confronted with in

¹⁶⁴ E.g., the current Draft EU Guideline on the definition of relevant markets, including definition of the market for mobile call termination, mobile call origination, and the national market of international roaming

future spectrum assignment processes. The measures to be taken into consideration would predominantly aim at ensuring that Member States adhere to the key policy concerns. Specifically:

- ¶ In order to ensure the *notion of sustainable market*, the European Commission should consider tracking the progress made by the Member States. The downside of this approach is that it might be difficult for the EU to take corrective measures in a timely manner. Policy and regulation divergence would be the outcome. Implementation of this measure should be on the other hand quite achievable.
- ¶ In order to foster *gradual technology introduction*, the European Commission could continue to promote and execute research on different types of spectrum technologies, including the timeframe for those technologies and their applications, and issues that might impact or hamper the introduction of the new technologies into the European markets. In addition, it could explore the possibilities of defining the technology to be used in the spectrum or define the process to select such technology. These actions will increase clarity with regard to the relevance of a technology and reduce market uncertainty. Sufficient caution is, however, required as a too limited degree of technological stability would imply a high-risk exposure of the mobile industry. Again, implementation seems achievable.
- ¶ In order to *avoid distortions in the assignment processes*, as described previously in this and the second chapter, the European Commission should explore the impact of the duration of the award process on the efficiency of the assignment. The purpose would be to limit the impact of a possible evolution in market expectations on the assignment process. In this respect, it would be appropriate that the European Union also investigates the impact of limiting the duration of the assignment process across Member States and/ or in each Member State. Apart from the difficulties to adequately address the above-mentioned issues, there is no guarantee that these measures solve the distortions driven by the ‘one-off’ character and the prisoners’ dilemma. Although these measures are less straightforward, their implementation still seems quite achievable.
- ¶ In order to allow *financial stability during the initial years* of market functioning, the European Commission could explore the possibilities to limit changes in the other regulatory levers that drive key values towards and from the mobile sector. As a result, the corresponding and anticipated cash flows that are necessary to cover high capital expenditures would not be further burdened. It may, however, prove difficult for the European Union to consequently implement this approach in practice, as other policy objectives pursued by the EU may interfere. In addition, the policy with regard to other components that

Exhibit 73

SCENARIO 2: MORE PRO-ACTIVE ROLE FOR THE EUROPEAN COMMISSION		Evaluation of incremental measures that can be considered		Potential ease of implementation for the EU
Spectrum assignment – key guiding principles		PRO	CON	(Legend: Yellow = High, Blue = Low)
Market entry Based on sustainable market principle	<ul style="list-style-type: none"> Conduct research on technology, alternatives, market demand factors Publish key analysis and findings on sustainability Define guidelines on assessment of market sustainability by Member States (including consultation) Harmonize infrastructure sharing conditions 	<ul style="list-style-type: none"> Stronger and steeper learning curve in the EU and alignment in the way to assess sustainability and to improve network investment efficiency 	<ul style="list-style-type: none"> Still risk that number of licenses might lead to transition issues in initial years 	
Allow for gradual technology entry	<ul style="list-style-type: none"> Harmonize initial licensing in case of high uncertainty about technology (e.g., pioneer license) 	<ul style="list-style-type: none"> Limit negative impact on mobile industry in case technology defaults 	<ul style="list-style-type: none"> Would be strong precedent in EU experience with regard to spectrum assignment, normally falling within the Member State competence 	
Minimal distortion in assignment process	<ul style="list-style-type: none"> Publish key analysis and findings on award mechanisms Harmonize introduction and conditions on secondary trading and/ or set timeline for several assignment waves 	<ul style="list-style-type: none"> Assuring similar introduction of spectrum trading, which is key to (partially) offset the one-off character and the prisoner's dilemma 	<ul style="list-style-type: none"> License procedure conditions increase impact of strategies and award outcomes (cf. game theory) 	
Initial years of market functioning Avoid financial instability	<ul style="list-style-type: none"> Harmonize license fee payments, moving the bulk of payments away from the initial years Harmonize limitation coverage requirements, especially during the initial years 	<ul style="list-style-type: none"> Financial impact of the two key capital expenditure drivers in the initial years is limited 	<ul style="list-style-type: none"> Is again strong precedent, in particular with regard to coverage requirements, as this can be a component in a Member State policy objective of quality of services 	
Support take-up of market demand	<ul style="list-style-type: none"> Increase EU Research Area and e-Europe type initiatives in support of digital wireless services Ensure rapid and transparent dissemination of best practices in technology and applications Harmonize network roll out delays in line with market demand take up 	<ul style="list-style-type: none"> Stronger and steeper learning curve in the EU and alignment in the roll out delays to avoid distortion 	<ul style="list-style-type: none"> Might still take a number of years before market demand really takes up because lack of direct stimulation; Some resentment on increasing EU budget for wireless applications 	

Full size exhibit can be found in the Annex to this document

impact short-term financial stability, such as coverage requirements and license fee payments, are left to the Member States.

- ¶ In order to *support market demand take-up*, the European Commission can conduct research and take several initiatives in support of the digital wireless services. This approach would help boost relevant research on applications and services. In addition, it should prove easy to implement. However, conducting research as such does not guarantee that best practices are disseminated between the Member States. Furthermore, rollout delays are left to the individual Member States to decide.

5.6.3 In a more pro-active scenario, the European Commission could also use harmonization policy for some key levers

The overall synthesis of this section can be found in Exhibit 73, describing in greater depth the advantages and disadvantages of the actions proposed, including an initial assessment of the potential ease of implementation by the European Union.

Pursuing the minimal scenario still leaves significant risk for substantial divergence in spectrum regulation between the Member States. In addition, there are hardly any guarantees that the required policy principles will be effectively developed and executed by the Member States.

This could lead the European Union to consider playing a more coordinative and more harmonizing role. Therefore it could be recommended that the European Union, in addition to the actions proposed under the minimal scenario, would consider the following additional measures in order to achieve the desired impact and control on the implementation of the five guiding principles:

- ¶ In order to ensure the *notion of sustainable market*, the European Commission could increase research on technology, alternative technologies and market demand factors. In addition, it should publish key analyses and findings on market sustainability, and define guidelines how to assess market sustainability. Finally, the European Union could also harmonize the conditions on infrastructure sharing. These measures would increase the alignment in the way to assess market sustainability, in addition to increasing network investment efficiency in the Member States. Overall, the recommended measures appear fairly achievable. The risk, however, remains that the number of licenses, being decided by the Member States, might still lead to transition problems during the initial years of market functioning.
- ¶ In order to foster *gradual technology introduction*, the European Commission could explore the possibility of harmonizing initial

licensing in case of relatively high uncertainty about a new mobile technology (e.g., use of competition-neutral pioneer licenses). In case technology defaults, the negative impact on the industry would then be limited. This measure, however, has a significant precedent value, as assignment so far fell within the core of the Member State competence. Achievability of this measure can therefore be expected to be relatively low.

- ¶ In order to ***avoid distortions in the assignment process***, the European Commission could publish key analysis and findings with regard to assignment methods, procedures, and outcomes. Additionally, in future spectrum assignment processes, the EU might consider harmonizing upfront the conditions on spectrum trading, and might even explore to possibility to set a timeline in case the option would be taken to organize several licensing waves to award a new technology. Via this approach, introduction of spectrum trading would come about in the Member States in a fairly similar way. This would allow, at least partially, to offset the one-off character and to avoid the prisoners' dilemma. This measure appears quite achievable for the European Union. Nevertheless, the risk remains that Member States would consider introducing licensing procedures that might trigger distortions (cf. components of game theory outcomes).
- ¶ In order to push ***financial stability during initial market functioning*** one level further, the European Commission could consider harmonizing certain components of the license fee payments, in particular with the aim of moving the bulk of payments away from the initial years, and harmonizing certain aspects of the coverage requirements, with the aim of avoiding too high requirements during the initial years. The financial impact of these two measures could reduce substantially the capital needs early on. Again, this type of measure could potentially create a significant precedent. The implementation achieved by this measure will be challenging, in particular, as Member States that impose coverage requirements, consider payment as a way to ensure quality services.
- ¶ In order to ***support market demand take-up***, the European Commission can consider increasing¹⁶⁵ its research efforts in the EU Research Area and initiatives in the e-Europe frame in support of digital wireless services. Transparent dissemination of best practices could be boosted, and delays in network rollout harmonized, hereby ensuring alignment of network build with the evolution of demand. As a result, rollout alignment is improved. These measures seem to be reasonably

¹⁶⁵ Cf. i.a., the initiatives by the European Commission, in particular with regard to the Draft Communication on eEurope 2005 to be presented at the Seville European Council of June 21 and 22, 2002

Exhibit 74

Spectrum assignment – key guiding principles		Key issues for EU spectrum assignment policy	How far should the European Commission consider to go?			Rationale
			Coordination	Harmonization	Common measure	
Market entry						
Based on sustainable market principle	Ensure assessment of market sustainability in the Member States		✓		Market assessment has to be done at Member State level because of particularities in the markets	
	Publish key issues and findings (incl. consultation)			✓	EU can take a leading role in disseminating key learnings and key issues	
	Ensure number of licenses based on market sustainability; Publish key issues and findings on award mechanisms		✓	✓	Development at EU level hampered if inadequate number of licenses in several key markets; EU can take a leading role in disseminating key learnings and key issues	
Allow for gradual technology entry	Ensure limited number of licenses (e.g., 1 st wave or pioneer license) in case of (highly) uncertain technology		✓		Development at EU level hampered if in several key markets significantly different approaches are taken	
	Ensure additional technological research (incl. applications)	✓		✓	Initiatives can be taken, both at Member State and EU level	
Minimal distortion in assignment process	Limit the impact of evolution in market expectation during the assignment processes in each State and across Member States			✓	Allowing too strong role of market expectation evolution had cross-Member State impact	
	Neutralize on-off character and prisoner's dilemma		✓		Development at EU level hampered if in key markets, license waves would differ substantially	
	Reduce negative consequences of sequential bidding	✓	✓		Development at EU level limited by reducing cross-Member State award process time	
Initial years of market functioning						
Avoid financial instability	Key regulatory levers that impact key value for the mobile sector stable during initial years (cf. i.a., definition of relevant mobile markets)		✓	✓	Requires formal position by both EU (definition of markets) and Member States (NRA competence)	
	Ensure impact of license fee payments and coverage requirements is limited during initial years	✓	✓		Development at EU level limited if high impact of license fees and coverage requirements in key markets	
Support take-up of market demand	EU Research Area and e-Europe initiatives in support of digital wireless services	✓		✓	Initiatives can be taken at Member State and EU level	
	Ensure roll out delays in function of demand take up	✓			Market assessment has to be done at Member State level; coverage requirements can be component of Member State policy regarding quality of service	

Full size exhibit can be found in the Annex to this document

achievable. Nevertheless, the measures might not prevent a slow take-up of demand in the succeeding years. The same resentment exists with regard to increasing the EU budget for wireless applications.

5.6.4 A flexible policy frame is provided to determine the right level of actions by the European Commission to address every possible sub-scenario

The synthesis of this section can be found in [Exhibit 74](#).

In practice, there is always the probability that several Member States might diverge on a number of key issues. Therefore, an infinite number of variations and sub-scenarios can arise during a future spectrum assignment. For this reason, it is appropriate to introduce an overall and flexible policy frame that can be used as a reference to address any situation. It zooms in on the key interests that the European Commission may want to ensure in each of the five guiding principles in spectrum regulation, and the tools it would have to consider in that regard, i.e., coordination, harmonization, and/ or common measures:

- ¶ In order to ensure the *notion of sustainable market*, the European Commission should focus on ensuring an adequate assessment of the sustainability of the relevant markets by the Member States, publishing analysis and key findings on this topic, hereby ensuring the offering of a number of licenses that is based on the sustainability of the market.
- ¶ In order to foster *gradual technology introduction*, the key components of the EU policy could be to ensure that the award of licenses offered in case of a relatively highly uncertain technology is limited, and that additional technological research is conducted on the new and alternative technologies and their applications.
- ¶ In order to *avoid distortions in the assignment process*, the key components of the EU policy should be the limitation of the impact of the evolution in market expectations during the assignment process in and across Member States, ensuring that the effects of the one-off character and the prisoner's dilemma are neutralized, and that the negative consequences of sequential bidding are reduced.
- ¶ In order to ensure *financial stability during initial market functioning*, the European Union could consider to keep the regulatory levers that impact the mobile sector to a large degree more stable, and to ensure that the impact of license fee payments and coverage requirements is limited during that period.
- ¶ In order to *support market demand take-up*, key policy components for the European Commission should ensure that EU Research Area and eEurope initiatives in support of digital wireless services are conducted,

and that rollout delays are aligned with the evolution of the take-up of market demand.

To ensure the achievement of the above-mentioned five key principles of European Union spectrum assignment policy, the European Commission could consider employing its regulatory tools in the following way:

- ¶ As a rule, the *harmonization instrument* would be the most appropriate to employ as it allows to orient Member States towards the key issues in spectrum policy, while maintaining sufficient leeway for the Member States on the implementation side.
- ¶ In parallel, *coordination* of Member State actions will be needed in certain areas, in particular with regard to reducing the negative consequences of the sequential character of the bidding processes in and across Member States. In addition, coordination would prove appropriate to ensure that adequate research is conducted in the area of technology, applications, and services, that the impact of license payments and coverage requirements during the initial years of market functioning is limited, and that the rollout delays are aligned with the demand take-up.
- ¶ Finally, in certain circumstances, however, *common measures* would prove the most appropriate. This would be, in case the policy domain would also fall within the intrinsic competences of the European Union (e.g., research), and/ or in case the alignment of Member State policies would seem essential from a European perspective. The following circumstances can be considered:
 - Publicizing key findings on market sustainability, the spectrum assignment methods, and their outcomes;
 - Ensuring that research is conducted and best practice initiatives are taken with regard to the new mobile technology, its applications and services;
 - Limiting the impact of evolutions of market expectations over time;
 - Maintaining stability in those regulatory levers that impact key value flows during the initial years of market functioning towards the mobile sector.

We believe that with this framework the European Commission can keep its pulse on the implementation of the five policy principles that we have recommended, and take appropriate action if and when it sees fit.

APPENDIX A: Interviews

Based upon recommendation by the European Commission, interviews have been conducted with officials of different Directorate Generals involved, as well as with the different stakeholders of the mobile market, namely operators, vendors, international organizations, and National Regulatory Authorities.

Find herewith a more detailed listing of the stakeholders interviewed in the course of the study.

¶ Operators

Mobile operators:

Deutsche Telekom/ T-Mobil/ One-2-One

KPNO

MMO2/ Cellnet

Telefonica

Vodafone Group

Operators' associations:

ETNO

GSM Europe Association

¶ Vendors

Equipment vendors:

Alcatel

Ericsson

Nokia

Vendors' association:

EICTA

¶ International organizations

ETSI

ITU

UMTS Forum

¶ National Regulatory Authorities

Austria

Belgium

France

Germany

Netherlands

Sweden

U.K.

Exhibit 75

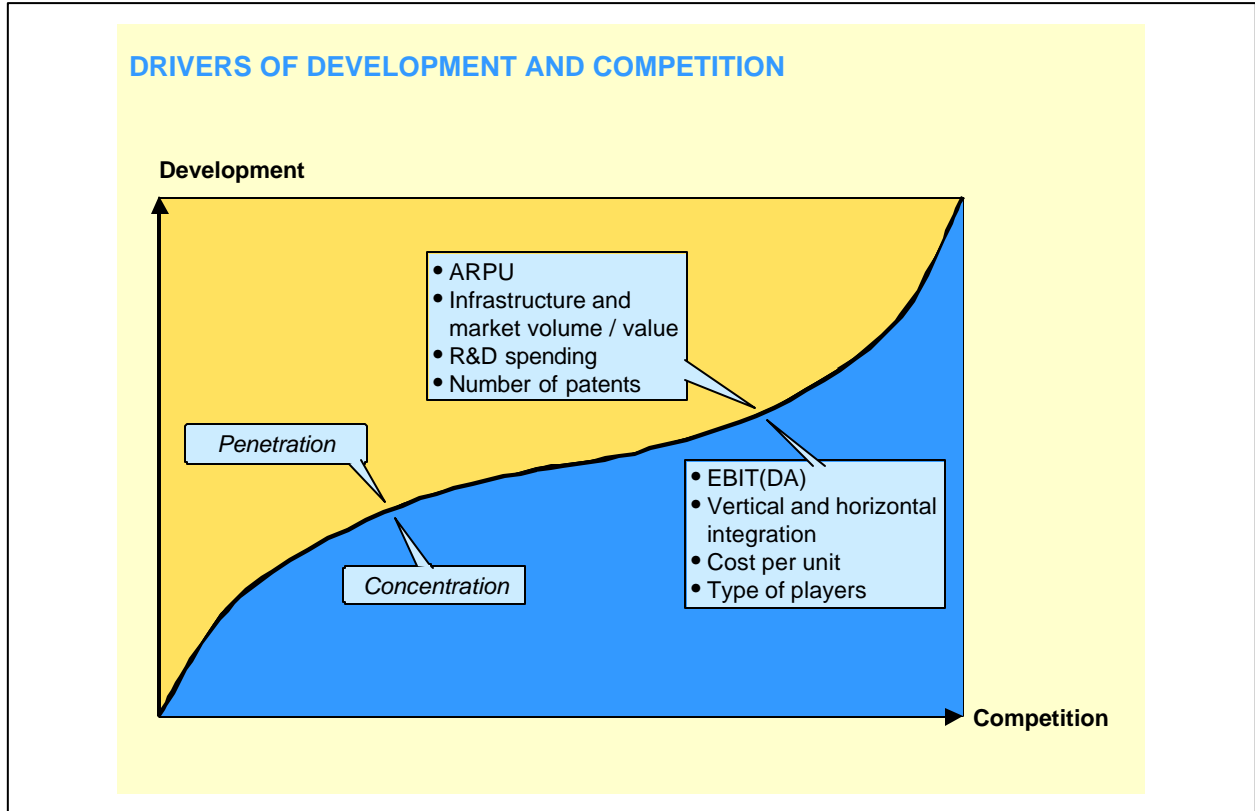
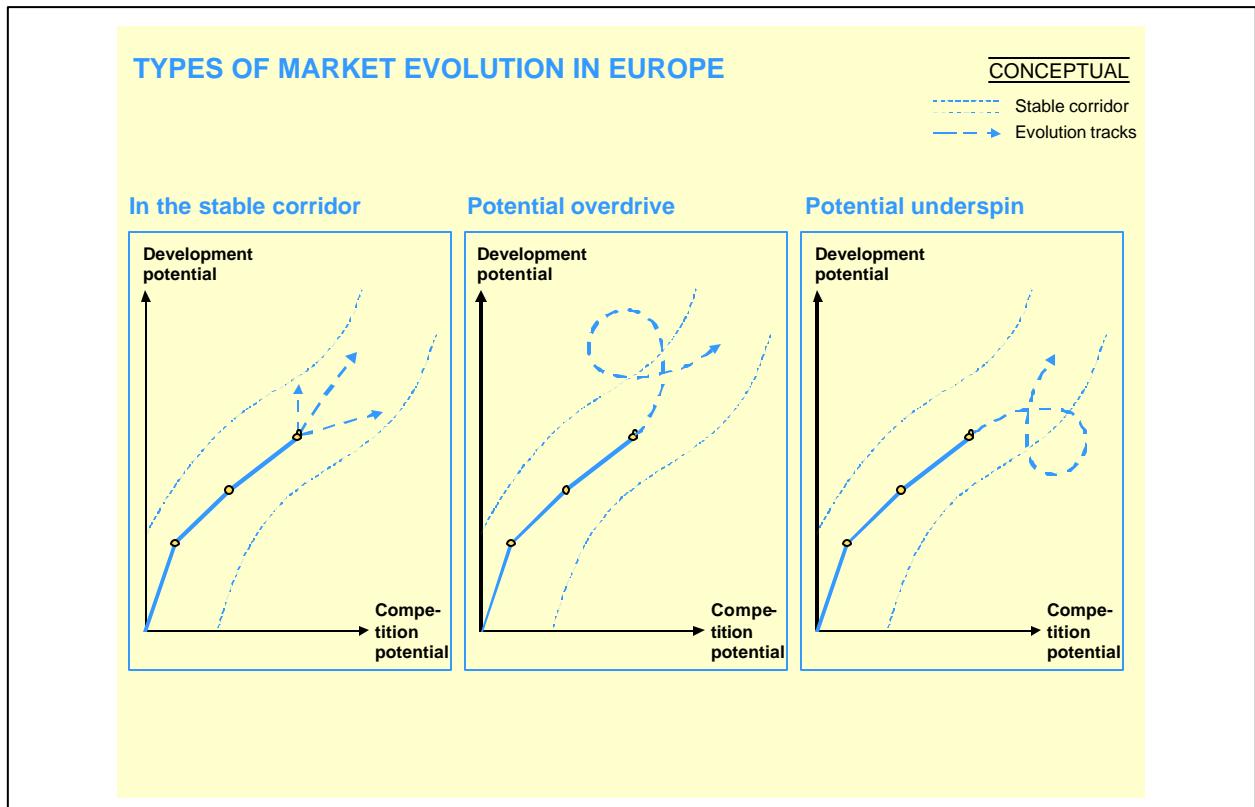


Exhibit 76



APPENDIX B: The stable development-competition corridor

Market evolution can be analyzed through a wide variety of parameters. Two parameters that are insightful in order to assess the evolution of the mobile market in Europe are the “degree of development” and “degree of competition”. The degree of development can be assessed through a multitude of variables. During the first phases of market development, however, penetration¹⁶⁶ is probably the most significant one, as it is an appropriate variable to track a market’s development in a quantitative way. For the same reason, market concentration¹⁶⁷ is an appropriate variable to define competition on the market. As a market is reaching maturity, the relevance and importance of the other development and competition variables will become increasingly relevant (Exhibit 75). These other drivers of development are, e.g., evolution in ARPU-levels, infrastructure buildout, and research and development spend. For competition, in the later stage of market evolution, EBIT(DA) evolution, cost per unit per customer, and degree of integration of operations becomes more significant.

Tracking both development and competition, the evolution of the market over time can easily be visualized. In general a market will evolve along one of three potential tracks as illustrated on Exhibit 76:

- ¶ Market evolution within the boundaries of a stable development-competition corridor. In this case, the market follows an evolution path where competition and market development are in balance.
- ¶ Market evolution in an “overdrive”. This scenario is characterized by a fast growing penetration (i.a., driven by technology), with a lacking parallel evolution on the competition side. Deteriorating offerings could be the result, as quality might be lacking and speed of development could decrease, while prices increase. As a result, in a second phase, sales can be expected to go down, resulting in lowering penetration growth. As a consequence of customers being less satisfied and lacking service take-up rates, opportunities are created for a new competitor to enter the market. When this new competition enters, market evolution returns to a zone where competition and penetration reach a new balance (i.e., the stable corridor), ensuring steady growth of the market.

¹⁶⁶ Defined as the number of mobile users divided by the total population

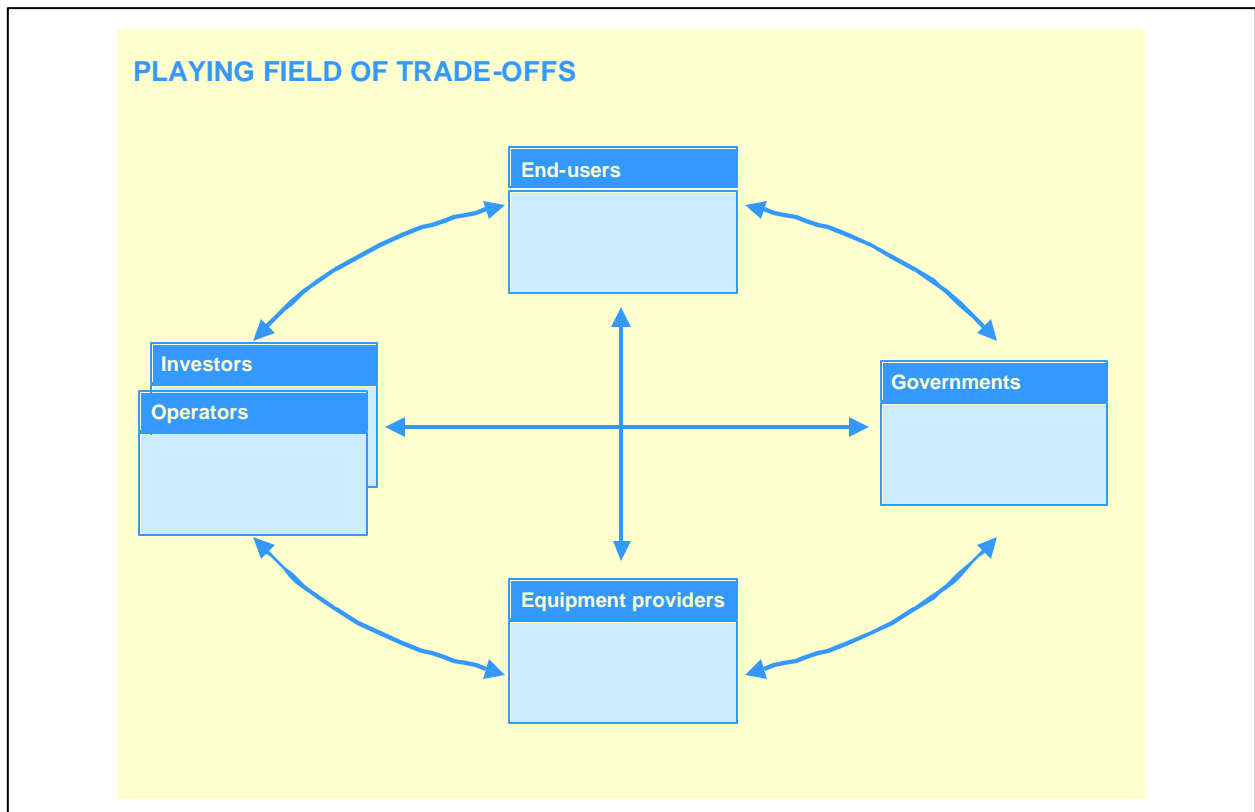
¹⁶⁷ Defined as the market share of the top two players

¶ Market evolution in an “underspin”. During this phase, market evolution would be predominantly driven by competition, with lacking development as a result. Competition can be expected to be prominently based on price competition, rather than on R&D and infrastructure and equipment investments. This market situation will result in lower levels of innovation, as well as a lesser focus on quality of service. This, again, will have negative repercussions on sales, and on penetration as a consequence. As the situation of competitors on the market will deteriorate over time, some might have to consider, reducing their offer, merging, or even withdrawing from the market. This will lead to a gradual relaxing of competition. As a result, the market evolution will return to a “stable development-competition corridor”.

APPENDIX C: List of 3G conditions

Comparative tables can be found in the Annex to this document.

Exhibit 77



APPENDIX D: Objectives and trade-offs to be made in any regulatory policy – the stakeholder analysis

Sector related regulatory policy and stated or implicit objectives, aim at allowing the corresponding sector to development, and aim at regulating the dynamics between the different stakeholders. In case of the mobile market, the main stakeholders are the national and European authorities, end-users, operators (incumbent and new entrants), potential foreign investors, and equipment vendors (Exhibit 77). In regulating the dynamics between the different shareholders, regulatory policies want to strike a balance of all key shareholders interests. Four issues bring significant degrees of complexity in this exercise:

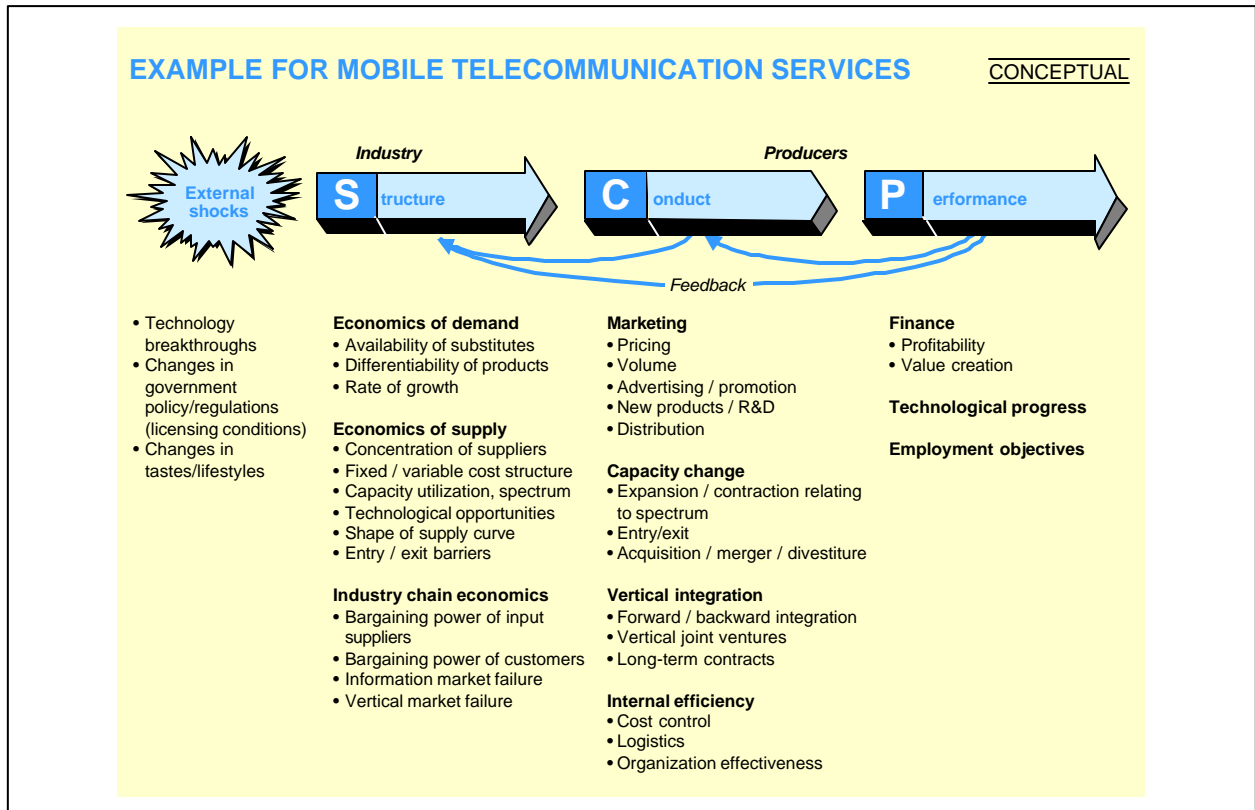
- ¶ The economic value of the issues dealt with is often very large.
- ¶ All stakeholders influence to a certain extent each other's behavior, making the number of forces to deal with high and introducing complex feedback loops.
- ¶ The interests of stakeholders are often opposite.
- ¶ The very nature of political processes that implies iteration, debate and compromise in the decision-making processes.

Regulatory policy is inevitably an iterative and evolving process. The exact road followed and the regulatory outcome itself are therefore unique to each policy level, be it the European Union or the Member State. It will reflect compromises struck between stakeholders.

In addition, changes such as the introduction of the 3G technology in the mobile sector, will also result in significant changes in the overall industry structure, service cost levels, customer relationships and ownerships, repartition of revenues along the value chain, and prices and offerings. Understanding which stakeholders are likely to win or lose in the process, why and by how much, is crucial to manage and regulate the dynamics between stakeholders in a balanced way.

A governing thought in this context is that, in the end, the value distribution amongst stakeholders should be consistent with broadly accepted economic principles, and that natural market forces should be encouraged as much as possible by removing artificial subsidies and artificial barriers to market entry or market functioning.

Exhibit 78



APPENDIX E: Methodology used to assess the impact of 3G licensing on the market and the players: SCP framework

The method used to assess the impact of the license award process and licensing conditions in the different Member States, relies on the analysis of the industry structure, and of the conduct and performance of the different stakeholders. This is illustrated in Exhibit 78. In the context of the present study, the SCP methodology aims at assessing the changes in the market that are being triggered by the 3G license award processes in the Member States. In particular, the quantitative evolution of a selection of variables is analyzed:

- ¶ The structure of the market (i.a., number of players, type of players, and industry concentration¹⁶⁸).
- ¶ The conduct by the players on the market (i.a., evolution of penetration¹⁶⁹, and of end-user prices).
- ¶ The players' performance (i.a., current bottom-line profit, stock price as a proxy for expected players' performance, and debt ratio as a measure of funding capability).

This assessment is complemented by a number of observations of a more qualitative nature. This would involve in particular, e.g., observations on the behavior of players, rollout of new services, interaction with, and impact on 2G mobile services, emergence of new technologies, development of a competitive market, development of pan-European services and networks, and the resulting structural changes in the mobile sector (both 2G and 3G).

Finally, it needs to be noted that the SCP framework is dynamic in nature. Structure will indeed influence conduct. As a consequence, conduct will lead to evolution and differentiation in performances. This in turn, may again lead to changes in structure and/ or conduct.

¹⁶⁸ Defined as the market share of the top two players

¹⁶⁹ Defined as the number of mobile users divided by the total population

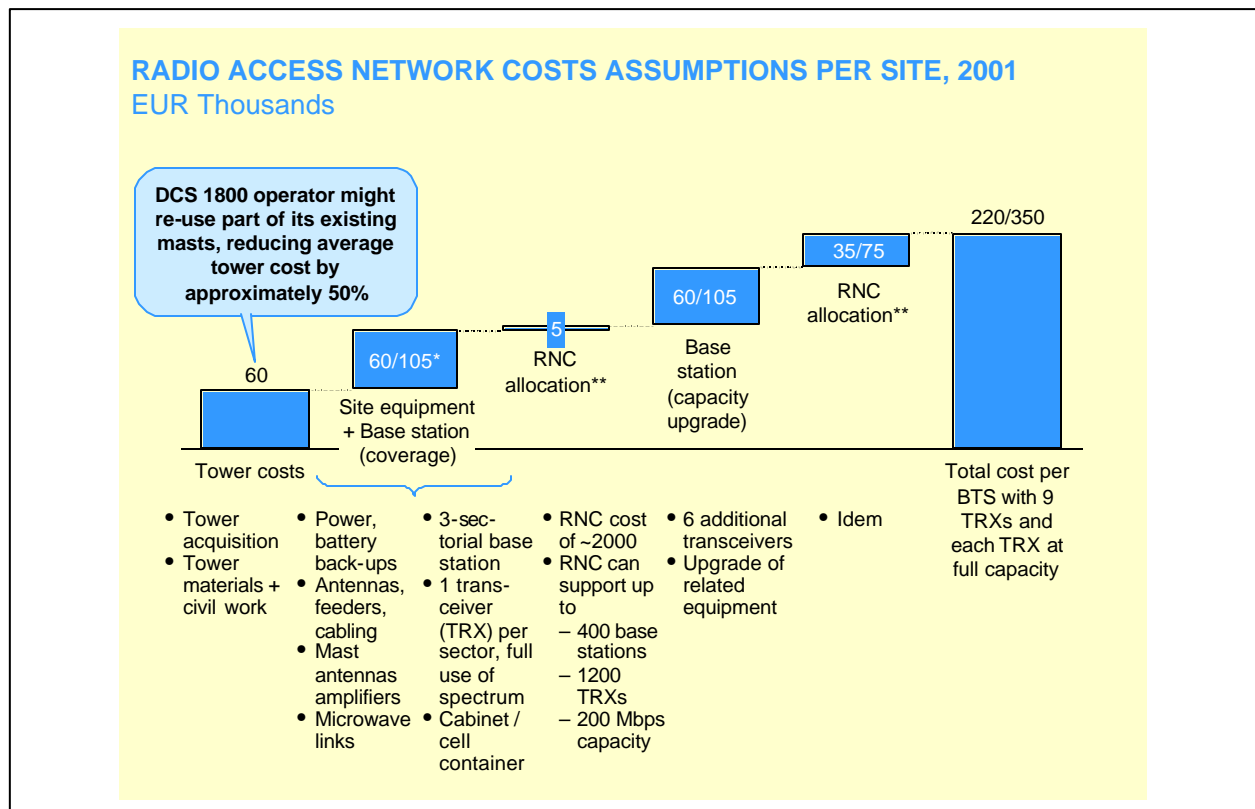
Exhibit 79

KEY DRIVERS FOR THE COST OF SUPPLY

Key drivers for cost of supply	Value / range	Rationale										
Licenses costs	<ul style="list-style-type: none"> All fixed license fee payments 	<ul style="list-style-type: none"> Including one-off license fee, annual installments, annual administrative and spectrum fee (e.g., Spain), excluding percentage of revenue payments Based on Aegis Spectrum Engineering Report and press releases 										
Cost per BTS EUR Thousands	<ul style="list-style-type: none"> 3 transceivers BTS <ul style="list-style-type: none"> Rural (low capacity): 125 Urban (high capacity): 170 9 transceivers BTS (full) <ul style="list-style-type: none"> Rural (low capacity): 220 Urban (high capacity): 350 50% antenna masts cost reduction for DCS1800 operator: 30 	<ul style="list-style-type: none"> Rural BTS require lower transceiver capacity (3 of 9 potential transceivers) because of lower usage As usage increases, BTS capacity needs to be enlarged DCS 1800 operator will enable to reuse part of its existing DCS 1800 antenna masts Based on Nokia and Ericsson inputs; Interviews with operators and McKinsey analysis 										
Number of BTS	<table border="1"> <thead> <tr> <th>Density (people/km²)</th> <th>Km²/BTS</th> </tr> </thead> <tbody> <tr> <td>>2000</td> <td>1.66</td> </tr> <tr> <td>500-2000</td> <td>5.11</td> </tr> <tr> <td>250-500</td> <td>12.58</td> </tr> <tr> <td><250</td> <td>26.62</td> </tr> </tbody> </table>	Density (people/km ²)	Km ² /BTS	>2000	1.66	500-2000	5.11	250-500	12.58	<250	26.62	<ul style="list-style-type: none"> Depending upon population density, BTS footprint and corresponding coverage will differ Based on Eurostat and McKinsey analysis
Density (people/km ²)	Km ² /BTS											
>2000	1.66											
500-2000	5.11											
250-500	12.58											
<250	26.62											
BTS roll-out	<ul style="list-style-type: none"> Constant # BTS/year Higher # BTS if coverage requirements are not met Increase of capacity when rolled out, linear over time to reach full capacity by 2015 	<ul style="list-style-type: none"> Operators will gradually build out BTS, first focusing on urban areas and subsequently on rural areas Coverage obligations impact BTS rollout Operators initially go for coverage and only as demand takes up, will increase capacity over time Based on NRA documents and operators' inputs 										
Population coverage by 2010	<ul style="list-style-type: none"> 80% Higher coverage if obligation 	<ul style="list-style-type: none"> Coverage increase over an average 80% will exponentially increase number of BTS and corresponding cost (on average covering the last 20% increase BTS cost by 100 to 200% depending on country) Coverage requirements or commitments in comparative bids (e.g., 99.9% by operator in Sweden) Based on NRA documents and operators inputs 										
Replacement costs	<ul style="list-style-type: none"> 8.7% of cumulative investments 	<ul style="list-style-type: none"> Based on McKinsey industry comparison 										

Full size exhibit can be found in the Annex to this document

Exhibit 80



APPENDIX F: How to evaluate the cost of supply

The cost of supply was a key element to assess the impact of the 3G licensing conditions on the mobile market in Europe. Two elements are key drivers in the computation of the cost of supply (Exhibit 79):

- ¶ Cost of the license;
- ¶ Cost of rolling out the networks.

THE COST OF THE LICENSE

The cost of the license is composed by different elements:

- ¶ Spectrum fees with the once-off payment and the annual payments;
- ¶ Administrative fees with the once-off payment and the annual payments;
- ¶ The portion of the license cost that depends on the revenues in future years was NOT taken into account. In practice, the corresponding amounts would be very difficult to predict.

All data are available from public sources such as the official 3G licensing regulation, NRA websites, comparative reports by independent research agencies.

THE COST OF ROLLING OUT THE NETWORKS

With regard to the second component, the cost of rolling out networks, information was not publicly available. Therefore, a specific methodology was used, taking into account the different key cost components.

The cost of a Basic Transceiver Station

The first step was to calculate the cost of the radio access part of the network. The main driver in this regard is the cost of a BTS (Base Transceiver Station). The cost of such a BTS can be split into different elements (Exhibit 80):

- ¶ The cost of the site, which includes tower cost and civil works. Based i.a., on discussions with operators and on McKinsey team analysis, the average site cost is estimated at EUR 60.000. Operators with a DCS1800

network can re-use partially their sites and will hereby reduce their site cost by EUR 30.000.

- ¶ The cost of the BTS itself. Based on discussions with vendors, operators, and McKinsey team analysis, a value of EUR 60.000 was considered for a BTS with 3 transceivers of low capacity for the rural areas and EUR 105.000 for a BTS with 3 transceivers of high capacity for the urban areas.
- ¶ Finally the next cost is the one of the RNC (Radio Network Controller) allocated to a BTS. As all BTS are connected to a RNC, the cost of a RNC had to be divided by the number of BTS connected, leading to reach a value of EUR 5.000.

The three previous costs components are relevant for the first phase of network rollout, where the operators are focusing on rolling out their networks without significant investments in capacity increase, as there is no need for it in the initial years. A coverage rollout would first happen in urban areas, followed by rollout in rural areas till coverage obligations have been met. After the rollout phase in each area operators would begin to increase their BTS capacity in the subsequent phase, inducing new costs:

- ¶ Cost of adding 6 transceivers to the 3 existing ones, equals the initial cost of EUR 60.000 to EUR 105.000 for, respectively, rural and urban areas.
- ¶ Cost of the RNC will now be much higher as the capacity of the RNC is constraint. Increasing the number of transceivers will therefore lead to a corresponding increase of the RNC cost of EUR 35.000 in rural areas and of EUR 75.000 in urban areas.

This led to a total cost per BTS for the radio access part of the network of EUR 220.000 in rural areas and EUR 350.000 in urban areas.

The rollout and capacity increase of a network

The next step in the methodology was to estimate the way an operator would effectively rollout its network:

- ¶ To define the number of BTS to be build, each Member State was divided into regions according to population density data, based on the Eurostat database. Based on the population density, the number of BTS needed in each region was computed. Buildout started in the more concentrated region (i.e., urban areas) and subsequently followed by a buildout in lesser concentrated areas, until the level of population coverage obligations (required by the governments or committed by the operators) was reached.

- ¶ Regarding the rollout, rollout in first instance is expected to occur in urban areas. In a second phase, build out in more rural areas will take place. At the same time, the capacity of urban BTS is increased in a linear way to reach a full capacity of them by 2015. In addition, also the capacity of the rural BTS is increased at the moment in time when all of them have been build. In the assumptions of the model they reach full capacity by 2015.

The cost of the core network

Based on operator interviews and McKinsey team analysis, the assumption is taken that, on average, the cost of the core part of a mobile network (e.g., backbone, MSC, SGSN) is around 30% of the total cost of a network. This allowed to calculate the average cost of the core network for a 3G mobile network operator as an increment on top of the cost of the access network.

The replacement cost of a network

The last component of the networks costs is the replacement cost. These are the cost components associated with the replacement of the different elements of the access networks after a number of years. As a hypothesis, a replacement cost of 8,7% of total network investments made to that date was taken. This is based on a cross mobile industry study based on a statistically significant number of operators across Europe.

The cost of supply per Member State

The cost of supply in each Member State is expressed as a multiple of the cost of one network. This cost is based on two key drivers:

- ¶ Number of licenses awarded, as each licensee is required to develop its network;
- ¶ A reduction factor for DCS1800 network operators that can partially re-use their network (i.e., operators with a DCS1800 network for at least 1.5 years, assuming at that time the availability of an extended network).

The NPV calculation of the capital expenditures

The last element to calculate is the Net Present Value of the capital expenditures. Hereby future costs are discounted at a rate of 7,9% a year (based on the average WACC (weighted average cost of capital) for the 6 pan-European players in 2001). This computation does not take the financial situation of the operators concerned and their ability to finance their 3G investments.

The calculation of the payback period

In order to assess the importance of the cost of supply, the corresponding payback period is calculated. As a reference, current 2G EBITDA margins are taken. In addition, 4 years are considered as a minimal period for operators to recover the operational losses in the initial years. At cruising speed, the market is considered to deliver an average EBITDA level, expressed as a percentage of the current 2G EBITDA level. As a result the available payback period is shorter than the net duration of the license period.

APPENDIX G: Comments and Sources to the Exhibits

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1	WORK PLAN– OVERVIEW STATUS	1
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	* Policy documents have no legally binding effect upon Member States	
	Source: EUR-Lex; McKinsey team analysis	
3	EU 3G POLICY OBJECTIVES	7
	Source: Decision No. 128/1999/EC; Communication COM/2001/141 final	
4	MATURITY OF MOBILE DATA MARKET, END 1999	7
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5	BUSINESS DYNAMICS – 3G LICENSING PROCESS AND CONDITIONS (1/3)	10
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6	BUSINESS DYNAMICS – 3G LICENSING PROCESS AND CONDITIONS (2/3)	10
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7	BUSINESS DYNAMICS – 3G LICENSING PROCESS AND CONDITIONS (3/3)	11
	Source: McKinsey team analysis	
8	MARKET CLEARING MECHANISMS PER MEMBER STATE	14
	* Different payment methods: In UK, 100% upfront or 50% upfront + installments for 5 years; In Italy, 100% upfront or EUR 2 billion upfront + installments for 10 year	
	** In France, EUR 619 million upfront and the rest as percentage of revenues after operators' pressure on government	
	*** Payment of license fee, including on-off and annual administrative and spectrum fee; Immediate payment means more than 80% of total fixed license cost to be paid within a few months after license being awarded and some additional annual fees; Installments mean a more regular repartition of cost over time	
	Source: McKinsey team analysis	

9	NUMBER OF LICENSES OF MOBILE NETWORK OPERATORS	15
	<p>* Excluding Ireland and Luxembourg where 3G license awarding has not taken place yet (Ireland – three 2G operators, four 3G licenses offered; Luxembourg: two 2G operators, four 3G licenses offered)</p> <p>** To date, four 2G operators in Finland. After 3G licensing (N+1 licenses) in March 1999, the new entrant 3G operator was subsequently (January 2000) awarded a 2G license</p> <p>Source: McKinsey team analysis</p>	
10	FIXED PRICE PER POPULATION AND PER 5MHz-SLOT	16
	<p>* Fixed price including one-off fees, annual administrative and spectrum fees not adjusted for NPV of installments, variable price not taken into account</p> <p>** No additional 3G license for 3G new entrant offered in an already strongly competitive market</p> <p>*** The Spanish government decided to raise the annual spectrum fees from EUR 5 million to EUR 150 million after the completion of the beauty contest and the high fees paid in countries with auction as allocation method; The year after, they decided to reduce these spectrum fees by about 75%</p> <p>**** In October 2001, after pressure from operators, the French government reduced the original fee of EUR 4.95 billion to EUR 619 million and a percentage of revenues from UMTS services; The duration of the licenses was also extended from 15 to 20 years</p> <p>Source: Aegis; Factiva; McKinsey team analysis</p>	
11	TYPE OF PLAYER AWARDED PER MEMBER STATE	16
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	<p>* 3G licensing occurred in March 1999, by which four 3G licenses were awarded on a 3-player 2G market. Subsequently in January 2000, the new entrant 3G operator was also awarded a 2G license</p> <p>Source: EMC database 2002</p>	
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	Source: Member States' UMTS legislations; McKinsey team analysis	
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	Source: McKinsey team analysis	
18	SPECTRUM ASSIGNMENT IN THE EUROPEAN UNION	22
	Source: Member States' UMTS legislations; McKinsey team analysis	
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	Source: National regulations; <i>Information Memorandum</i> (DK); <i>Ruling by the President's Chamber</i> (D); <i>Information Memorandum</i> (UK); <i>Annexe à la Décision No. 00-835</i> (F); <i>Information Memorandum</i> (IRL); <i>Telecommunications Act</i> (S);	
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	Source: ITU – Yearbook of Statistics, 2002; McKinsey team analysis	
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	Source: CIT - <i>The Yearbook of European Telecommunications</i> , 2002; Worldscope; McKinsey team analysis	
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	** Total 2G infrastructure investments = EUR 74 billion; Total 2.5G infrastructure investments = EUR 55 billion	
	Source: ITU Yearbook of Statistics – <i>Telecommunication Services</i> , 2002, 2001; Yankee, 2001; Gartner, 2001	

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	** 1999 USD to EUR exchange rate	
	*** Basic hand-portable terminal supporting voice only with keyboard and 1/16 VGA screen (basic GSM phone)	
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	Source: Gartner Dataquest, February 2002, Mobile Technical Statistics	
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	**** Net present value calculated in 2000 and assuming a discount factor of 7.9% per year	
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	Source: Aegis and Connogue – Study on administrative and frequency fees related to the licensing of networks involving the use of frequencies, 2001; Member states' UMTS legislations; McKinsey team analysis	
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- * 60 corresponds to a "low -end" base station in which each transceiver provides less than half ~900 Kbps throughput;
105 corresponds to a "high-end" base station in which each transceiver provides up to 900 Kbps throughput
- ** In the initial years, there is no capacity constraint and, at that time, an RNC can support 1200 TRXs (400 Base Stations); But after that applications have taken off, there will be a capacity constraint of 200 Mbps/RNC meaning that an RNC can support only 25 BTS high end and 50 BTS low end

Source: Interviews with operators; McKinsey team analysis

APPENDIX H: Glossary and acronyms¹⁷⁰

2G

Second generation of mobile telephony. 2G is a generic term encompassing a set of technologies (GSM, DCS1800, etc). These technologies allow voice and data transmission through radio-spectrum.

2.5G

Intermediary generation of mobile telephony. 2.5G is a generic term encompassing a set of technologies (GPRS, EDGE, etc). These technologies enhance data capabilities of 2G. 2.5G typically allows higher data speed transmission and 'always on' features.

3G

Third generation of mobile telephony. 3G is a generic term encompassing a set of technologies (UMTS, others). These technologies allow voice and high-speed data transmission through radio spectrum. 3G networks should provide data rates to at least 300 kbps, and as fast as 2.0 Mbps. Typical 2G networks provide a data rate of 9.6 kbps.

A

Access line

Network connection, regardless of the physical or other medium, from the user to a local switch of a communications network.

Applications

Telematic services available in the professional and private spheres such as telework, telemedicine, tele-education and teletraining or telemanagement of traffic.

ARPU (Average Revenue Per User)

Measurement that reflects the average amount of revenue generated by each subscriber. It is typically expressed in Euros per month.

¹⁷⁰ Source: DGInformation Society online glossary; 6th report on the Implementation of the Regulatory Package – annex 6: glossary, Newton's Telecom Dictionary, 17th Edition; Telecommunications magazine February 2001; Trends in Telecommunications Reform: Effective Regulation ITU February 2002; McKinsey

Auction

Competitive award method of spectrum: the award decision is based on financial criteria such as the amount offered, rather than technical criteria.

B***Bandwidth***

The width, or transmission capacity, of a communications channel. In analog communications, bandwidth is measured in Hertz. In digital communications, bandwidth is measured in bits per second (bps). Affiliated terms are narrowband and broadband.

Bits/Bytes

The smallest discrete elements in a binary system: eight bits comprise one byte.

Broadband

High transmission capacity that enables to move large amounts of voice, data and video. Broadband technology lets different networks coexist on a single piece of heavy-duty wiring. It isolates signal as a radio does; each one vibrates at a different frequency as it moves down the line. Its opposite is baseband, which separates signals by sending them at timed intervals.

C***CAGR (Compound Annual Growth Rate)***

Typical measurement of annual growth: it is the growth rate applied to an investment or a part of a company's activities over a multiple-year period. The formula for calculating CAGR is $(\text{Current Value} / \text{Base Value})^{(1 / \# \text{ of years})} - 1$.

CAPEX (Capital expenditure)

Accounting value that includes expenditures on new and replacement property, plant, and equipment. In the telecommunication industry, these expenditures are one of the major items of the balance sheet.

CEPT (European Conference of Postal and Telecommunications Administrations)***cHTML (compact Hyper Text Markup Language)******Comparative bid***

Competitive award method of spectrum: the award decision is based on technical criteria such as the applicant's ability and commitment to provide the designated service, rather than financial criteria.

Coverage

Percentage of a population group having access to a specific mobile technology. Often licensing conditions or other legal instruments define minimal coverage requirements expressed as a percentage of population at specific date.

D

DCS1800

Digital cellular system operating in the 1800MHz band.

DECT(Digital European Cordless Telecommunications)

European standard for digital cordless telecommunications.

DG (Directorate- General of the European Commission)

E

EBITDA (Earning Before Interest Taxes Depreciation and Amortization)

EC (European Commission)

ECC (Electronic Communications Committee)

ECO (European Communications Office)

ECTRA (European Committee for Telecommunications Regulatory Affairs)

EDGE (Enhanced Data GSM Environment; Enhanced Data rates for Global Evolution)

EICTA (European Information, Communications and Consumer Electronics Industry Technology Association)

E-mail (Electronic-mail)

The most common use of networks. It is an application which allows computer users to send electronic messages to other computer users. The use of sophisticated software ensures that the sent message will find its way along different networks until it reaches the address.

EMF (European Monetary Fund)

ERC (European Radiocommunications Committee)

ETNO (European Telecommunications Network Operators' association)

ETSI (European Telecommunications Standards Institute)

EU (European Union)

F

G

GPRS (General Packet Radio Service)

GSM (Global Standard for Mobile)

GSM is a pan-European standard for digital mobile telephony which provides a much higher capacity than traditional analogue telephones as well as diversified services (voice, data) and a greater transmission security through information encoding for users across Europe.

H

HSCSD (High-Speed Circuit Switched Data)

I

ICT (Information and Communication Technology)

IMT2000 (International Mobile Telecommunications 2000)

Incumbent

Operator that has historically been present on the market, as opposed to a “new entrant”. In 2G markets, the incumbent is typically the operator that enjoyed monopoly before liberalization. In 3G markets, incumbents are typically the operators that already hold a 2G license.

Infrastructure sharing

The act of sharing site and network components among operators. An infrastructure sharing agreement can include passive elements such as power supply and sites. It also can include active elements such as databases, network links and others.

Interconnection

The physical and logical linking of telecommunications networks used by the same or a different organisation in order to allow the users of one organisation to communicate with users of the same or another organisation, or to access services provided by another organisation. Services may be provided by another organisation; services may be provided by the parties involved or other parties who have access to the network (Article 2(1)(a) of the Interconnection Directive).

Internet

The world's largest computer communication system, with an estimated 100-million users. Originated in the United States, though now operating worldwide, the Internet is a loose confederation of principally academic and research computer networks. It is not a network but rather the interconnection of thousands of separate networks using a common language. Developed by the Pentagon, the Internet first linked government agencies and colleges. Now the Net also connects thousands of companies and millions of individuals worldwide who subscribe to on-line services.

Interoperability

Devices, in particular application programmes, are inter-operable when, in addition to communicating with each others, they can also execute together a common task. They co-operate. This requires additional standards, such as API (Application Programme Interfaces).

IP (Internet Protocol)

ISP (Internet Service Provider)

ITU

International Telecommunications Union, headquartered in Geneva, Switzerland is an international organization within which governments and the private sector coordinate global telecom networks and services.

J

JV (Joint-Venture)

Undertaking by two parties for a specific purpose and duration, taking any of several legal forms. Two corporations, for example, may undertake to provide a product or service that is distinct, in kind or locations, from what the companies offer on their own.

K

L

LAN (Local Area Network)

Network for communication between computers confined to a single building or in a closely located group of buildings, permitting users to exchange data, share a common printer or master a common computer, etc. Linked groups of LANs extended over a larger area are termed Wide Area Networks (WANs). WANs may connect users in different buildings or countries. Networks which extend over city-wide areas are called Metropolitan Area Networks (MANs).

Local loop

Section of the telephone transmission network between the local telephone exchange and the subscriber's premises, which mainly consists of copper wiring. New medium such as optical fibre and wireless are also used but to a lesser extent.

M***Mhz (Megahertz)***

One million cycles per second.

MM (Multimedia)

The concept of closely combining voice, text, data, as well as still and moving image. A multimedia database, for example, would contain textual information, images, video clips, tables of data, all equally easy to access. A multimedia telecommunications service (such as B-ISDN) would permit the user to send or receive any of these forms of information, interchangeability at will.

MMS (Multimedia Systems)***MS (Member States)***

Member State of the European Union

Mobile sector

Industry of Mobile Cellular Telephony services. It therefore regroups 2G operators as well as 3G operators.

Monopoly

A market structure in which there is a single supplier, usually regulated with exclusive rights of supply maintained.

Mobile Telephone, Cellular

A system of mobile telephony whereby a country is divided into thousands of small areas (cells), each of which is served by its own "base station" for low-powered radio transmissions. This allows a user in one cell to transmit on the same frequency as another user in another cell without interfering in each other's conversation. Cellular networks may employ analogue or digital transmission. Existing networks are largely analogue, while new networks use the European GSM digital standard.

MSC (Mobile Switching Centre)

MVNO (Mobile Virtual Network Operator)

It is a difficult term to define. Different understandings of the term exist, in the course of this study we understand MVNO as an operator who has the opportunity to offer its own SIM card on a given network, issue its own code, and be responsible for its own roaming agreements and routing.

N

NCA (National Competition Authority)

NRA (National Regulatory Authority)

NPV (Net Present Value)

Network

Communication networks are a complete system of communications between users terminals. Networks may be "point to point" (the transmission goes from a fixed origin to a fixed destination), "switched" (the transmission is switched, so as to reach a single destination out of many) or "broadcast" (the transmission goes simultaneously to multiple destinations). Networks may be "public" (owned by an operator and open to any member of the public that subscribes) or "private" (owned or leased by an individual or company or group of companies exclusively for its own use).

Network, Data

Network specialised in the transmission of data rather than voice. Among such networks are Circuit Switched Data Networks (CSDN), Packet Switched Data Networks (PSDN), Frame Relay Networks, and Switched Multimegabit Data Service Networks (SMDS).

New entrant

A company that enters a market for the first time.

Number portability

Ability of an end-user to change operator while retaining the same telephone number. Portability can apply to geographic and non-geographic numbers.

O

Operator

Operators that install, manage and operate their own (wire or wireless) telecommunications transmission network to provide public telephony services.

Oligopoly

A market structure in which there is a small number of suppliers, usually regulated with exclusive rights of supply maintained.

P

PDA (Personal Digital Assistant)

Penetration

A measurement of access to telecommunications, normally calculated by dividing the number of subscribers to a particular service by the population and multiplying by 100. Also referred to as teledensity (for fixed-line networks) or mobile density (for cellular ones).

Portal

A portal is a starting platform for accessing the wider Internet. A web site or service that offers a broad array of resources and services, such as e-mail, forums, and entertaining features.

PTO (Public Telephony Operator)

R

R&D (Research and Development)

Re-farming

The re-allocation of radio spectrum, in particular the re-allocation of radio spectrum currently licensed for use with equipment complying with GSM or DCS1800 standards to allow the use of equipment complying with a third-generation standard.

Roaming

Roaming occurs when cellular customers leave their operator's home area. Another operator then carries out the telecommunication service.

S

SCP framework

The Structure-Conduct-Performance model asserts that the performance of individual firms is determined wholly by the conduct of participants (including themselves), and that conduct is largely determined by industry structure. SCP provides an organizing framework to identify key issues and create understanding of links between S, C, and P as well as possible effects of external shocks. Structure: economics of demand, economics of supply, industry chain economics.

Conduct: marketing, capacity change, vertical integration, internal efficiency. Performance: finance, technological progress, employment objectives. External shocks: technology breakthroughs, changes in regulations, changes in consumer preferences. Reference: Industrial Market Structure and Economic Performance, Sherer and Ross, Houghton Mifflin (1990).

Service provider

Enterprises that offer public telecommunications services mainly via third-party (wire or wireless) networks, excluding fixed voice telephony service providers who do not provide voice telephony within the meaning of Community law, such as simple resellers, calling card services providers and call back operators; they may also manage, operate and control leased lines.

SIM (Support Interface Module)

SGSN (Service GPRS Support Node)

SMS (Short Message Service)

Spectrum Allocation

The act of spectrum allocation links ranges of frequencies to a category of use or uses. For example, the 1800 MHz band is allocated for 2G mobile telephony throughout Europe.

Spectrum Assignment

Member States, through the act of spectrum assignment, authorize for use of specific frequencies or frequency pairs. Mobile communications authorizations are typically granted to private users or to mobile operators.

Spectrum Award - See spectrum assignment

Software

That which belongs to the domain of intellectual creation in contrast to the appliances which facilitate their reproduction. The programmes for computers, CD-ROM and video games are all software.

Subscriber

Any natural or legal person who or which is party to a contract with the provider of publicly available telecommunications services for the supply of such services (Article 2(1)(h) of the Interconnection Directive, as amended by the Numbering Directive).

T

U

U.K. (United Kingdom)

UMTS (Universal Mobile Telecommunications System)

third-generation mobile and wireless communications system capable of supporting in particular innovative multimedia services, beyond the capability of second-generation systems such as GSM, and capable of combining the use of terrestrial and satellite components (Article 2 of the UMTS Decision).

US (United States)

Universal Service

Defined minimum set of services of specified quality which is available to all users independent of their geographical location and, in the light of specific national conditions, at an affordable price (Article 2(1)(g) of the Interconnection Directive).

V

VAS (Value Added Service), VANS (Value Added Network Service)

Services other than those under monopoly may be offered by other service suppliers which use national network as the basic transmission medium but "add value" to the basic transmission facility. What is exactly included in the notion depends on the regulatory situation of each country.

Vendor

A company that manufactures cellular handsets and/ or network infrastructure.

Video-on-demand

Systems that enable the viewers to order and see a given programme at the exact time the viewer specifies. Near-video-on-demand (NVOD) systems approximate this capacity by staggering the start of a programme every 15 or 30 minutes.

W

W-CDMA (Wideband Code Division Multiple Access)

Code that enables the transmission of voice and data through radio-spectrum. One of its major benefits is the increased capacity and more efficient use of spectrum.

Write-off

Accounting act of charging an asset amount to expense or loss to reduce or eliminate the value of the asset, which reduces profits. Write-offs are taken in accordance with allowable tax depreciation of a fixed asset, and with the amortization of certain other assets.

APPENDIX I: Sources and Bibliography

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