An economic analysis of the new European regulation concerning frequency spectrum and fixed broadband access and its effects on the Dutch telecom market

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An economic analysis of the new European regulation concerning frequency spectrum and fixed broadband access and its effects on the Dutch telecom market

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Preface

This document is my graduation thesis, the result of my work the pas year at Dialogic. It has been an exiting and challenging time. There are a number of persons I would like to give thanks to:

First I would like to thank my supervisors of the TU/e - Rudi Bekkers and Ted Clarkson - which provided me with the necessary feedback and support to conduct this study successfully. Their expertise in the field of electronic communication still inspires me.

Second, I like to thank my supervisor at Dialogic, Stein Smeets, for the useful comments and discussions and his critical view which has guided me through the process. There has always been the opportunity to ask questions, and he has supported me in my time at Dialogic. Furthermore I would like to thank everybody at Dialogic for taking an interest in my research their critical views, especially Reg Brennenraedts, Hugo Gillebaard, and Jurgen Verweijen. I would also like to thank Dialogic for giving me the opportunity to participate in some research projects, which allowed me to further develop myself. All together I have felt welcome at Dialogic and have very much enjoyed my time there.

I would also like to thank all the experts that I have interviewed for their useful inputs for this research. I could not have conducted the research without them, and beside the useful input they have responded enthusiastic on the research and given me much support.

Then I would like to thank, my student colleagues and friends for the discussions and feedback, without their help I would have never been able to graduate. Finally I would like to thank my parents, which have continuously given me their support whenever I needed it.

Thank you all, I have learned much this year, about the subject and about myself.

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Executive Summary

In the last two decades the telecommunications sector in most European countries has evolved from a national, state owned monopoly to a dynamic competitive market. The goal of this research is to analyze the regulatory environment of the telecommunications sector from an economic perspective and its effect on future market developments. The telecommunication sector is regulated by specific regulation to safeguard and simulate competition in the European Union. The sector specific regulation is presented by a regulatory framework. Recently, this regulatory framework has been revised. First, this study focuses on the impact of the regulatory changes for which the main economic principles of the new regulatory framework are analyzed. Second, the expected effects of the new regulation on the Dutch telecommunications sector are analyzed concerning two subjects of interest: broadband access and frequency spectrum.

First, a number of economic principles and models were identified that have shaped competition law and sector specific regulation. These perspectives and models were used to determine whether the new regulation is based on economic principles. The analysis concludes that there are a number of perspectives that have shaped sector specific regulation and competition law. These perspectives mainly differ in when a market can be considered to be competitive (enough). Furthermore, a number of economic models were analyzed that specifically apply to infrastructure-based markets, such as the telecommunications market. These models (lock-in effects, network effects, cost structure, increasing returns) indicate that the telecommunications market is likely to converge and further consolidate.

Second, the development of the electronic communications sector was analyzed. The analyses concluded that already much has been done to create a competitive European telecom market, such as: liberalizing the market, harmonization of equipment, and harmonization of regulation in the member states. The previous framework focused on addressing the convergence of telecommunications, ICT, and media market. This convergence presented new problems for the effectiveness and scope of the sector specific regulation.

Third, the changes of the new framework were identified and analyzed. In total six main changes were identified: a new market authority, reduction in the number of relevant markets, a new tool for the national regulatory authorities (functional separation), new regulation concerning universal services and data protection, next generation access regulation, and spectrum management regulation (the digital dividend in the UHF band). These changes were analyzed using the economic models and perspectives identified in the first part. This analysis concludes that not all changes are fully compatible with the economic principles. The new market authority and reduction of the relevant markets do not affect the market much. Therefore it is hard to determine whether they are compatible with the economic principles. But these changes seem to be motivated by other principles, such as more social and political ones. The universal service and data protection changes are clearly more socially motivated. Functional separation is in line with the transactions cost theory, a more modern economic perspective. It has turned out to be difficult to determine whether the next generation access regulation and digital dividend regulation are in line with the economic principles. This depends on the perspective taken, and there also seem to be other motives that have influenced the (proposed) changes.

Finally, the implications of the regulation were analyzed in terms of their future market developments and whether they correspond with the intended effects of the European Union. The scope of this research was narrowed down to the implications for two subjects of interest in the Netherlands.

The first subject of interest concerns the proposals for next generation access networks. These proposals should increase regulatory certainty, stimulate infrastructure competition, and stimulate investments. The main conclusions are that the new regulation will not create more regulatory certainty. This is due to market uncertainties, such as: the strategy of the incumbent, which will not be affected much by the regulation, and the legislation itself, which has several exceptions (co-investment regulation of fiber, multi-fiber regulation, and the internal rate of returns access cost model) which make the regulation more complicated and less transparent. The regulation theoretically will indeed create more infrastructure competition and investments. However, in practice the regulatory changes are not expected to change much in the Netherlands, mainly due to uncertainty in the market (uncertain strategy incumbent).

The second subject of interest concerns the proposals for spectrum management - the digital dividend in the 800MHz. These proposals should: improve the European spectrum coordination, increase the flexibility and effective use of the spectrum, and contribute to the goals of competitiveness and growth. The transition from analogue to digital television transmissions (whereby the digital dividend is created) will indeed lead to a more efficient use of the spectrum in Europe. However, the Netherlands has already switched-over some time now, and can only fully use the digital dividend when the surrounding member states will switch over to digital transmissions (due to interferences in the border areas). Also flexibility is increased because the spectrum can both be used for broadcast and mobile broadband services. However, if the spectrum is used for mobile communication a number of complications exist (relocating some channels used for program making and special events services, the already granted licenses for digital terrestrial television, which have been granted to 2017, the interference of proposed standard for mobile communication on fixed cable networks). Finally it has to be concluded – if the problems can be overcome – that using a part of the digital dividend for mobile broadband services will stimulate the mobile communications market, and thereby will stimulate economic growth. However, the problems mentioned and the uncertain spectrum management in the Netherlands can reduce the effects of this potential growth.

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1. Introduction

The telecommunication sector is a rapidly changing sector that has been extensively discussed in economic- and telecommunication policy- literature. The telecommunication sector is considered to be important for the future economy in Europe. Telecommunication is a part of our daily lives and plays a large role in today's global economy. Many different services are part of the telecommunication sector such as: fixed and mobile telephony, internet, television, and radio broadcasting.

The telecommunication sector has certain characteristics that distinguish the sector from most other sectors. One of the differences from other sectors is that the telecommunications market is infrastructure-based, which poses challenges for competition policy. This has not always been a problem, as most infrastructure markets in the past were perceived to be utilities. Since then, a transition has been made and the market has been opened for competition by liberalizing the market. The liberalization has also taken place in other previously utility based government owned infrastructure-based markets, such as: the energy-, railway-, and postal- markets. Due to the liberalization the sector became subject to competition, but new entrants were unlikely to enter the market as they faced competition with the large previously state owned firms. Therefore, to stimulate competition, special sector specific regulation was introduced to transform the market into a competitive one. The sector specific regulation has not disappeared since.

Nowadays the telecommunication market has become increasingly complex. There are network operators that own the physical infrastructure, service providers that do not own any infrastructure, and vertically integrated firms that provide services and have their own infrastructure. Access by a service provider to an operator's network is unlikely to be provided – on reasonable terms – on its own. Therefore sectors specific regulation was implemented to enhance competition in services, but also between infrastructures.

The European Union has established a framework, in which the sector specific regulation is presented to create a level playing field in the electronic communication sector. Recently the regulatory framework for the telecommunication sector (officially electronic communications sector) has been revised. The changes are important for the electronic communication sector as it sets out the rules for infrastructure and service competition for the coming years.

This thesis will focus on the impact of regulatory changes of the new framework. Two particular areas of interest are analyzed in more detail: next Generation access networks and the digital dividend. The impact of the regulatory framework on these subjects is analyzed for the Dutch electronic communication market. The intended effects of the regulatory changes are analyzed in an economical context. Subsequently the expected effects are verified. With the comparison between the intended and expected effects the changes can be evaluated.

1.1 Research Justification

Regulation in the telecommunication sector should maintain and even stimulate competition. Ideally the regulation would create a competitive market where sector specific regulation would no longer be

required. The economical perspectives and models that influenced competition law and sector specific regulation are therefore analyzed. The perspective and models are used to analyze the new regulation of the electronic communication sector. The main subjects of interest are: next generation access networks, and the digital dividend which is concerned with spectrum management. Questions for these subjects are:

- Are the proposed changes in line with economic models, or are there other considerations that dominate the proposed regulations?
- Will the expected effects of the regulation be what was envisioned / intended?
- How will the Dutch markets of interest be affected by the changes in the European framework of electronic communication?

These questions are addressed and it is determined whether the proposed regulation is necessary, adequate, and appropriate. The questions posed can be placed in a broader context, which will now be explained.

1.1.1 Scientific Relevance

Industrial organization models are often used in policy studies. Competition policy and law are historically heavily based on neoclassical models, such as the structure-conduct-performance model. This study will assess telecommunication policy with various economical models and perspectives in order to analyze the new (proposed) European telecom regulation. The effects of the changes in regulations can have far reaching consequences for the electronic communications sector. This study contributes to literature by reflecting on the new regulation in terms of the intended and expected impact of telecommunication policy in relation to economic models and principles. Especially in two subjects of interest: next generation access networks, and spectrum management.

1.1.2 Social relevance

The European policy regarding telecommunications policy seems to have two main objectives: to create a single competitive market, and to look after the interest of consumers. Often these two go hand in hand, as increased competition will bring benefits for consumers. However, one could question if certain regulatory measures are not focused on creating the maximum possible consumer surplus. In the long run this could hamper competition and result in disadvantages for customers, which reduces consumer surplus. Researching the proposed changes from an economical perspective contributes to sector specific policy in general.

1.2 Research Question and Objectives

The main objective of this study is to research the effects of the changes in the regulatory framework for electronic communication, and thereby:

- Provide insight into the motives of the regulatory changes, and if these changes are economically justified.
- To provide insight into the new regulatory changes itself in relation to their intended effects.
- To provide insight of expected effects (of the market) of the changed regulation.
- To provide insights on whether the new regulation will be effective, from an economical policy perspective.

The main research question is:

The main research question:

What are the economic principles behind the new regulatory framework, and what are the expected effects concerning frequency spectrum and broadband access for the Dutch telecom market?

A number of sub-research questions will provide an answer on the main research question. The study consists of three parts. The first part will answer the first sub-research question (1). The second and third part will both answer two sub-research questions, (2a,b) and (3a,b).

Sub research questions:

1. On what economic principles are market regulation and competition law based?

2a. How has the electronic communications sector developed, since the 1990s in terms of regulation?

2b. What are the changes in the new (proposed) electronic communications framework, and are they compatible with the economic principles?

3a. How do actors affected by the electronic communications framework percieve the new changes in terms of future market developments?

3b. What are the expected effects of the regulatory changes and do they correspond with the intended effects by the European Commission?

1.3 Scope of the Research

As the research questions are relatively comprehensive, the scope is narrowed down. First, in the economical analysis, only those economic perspectives are used that are relevant in relation to competition law. Furthermore, the analyzed economic models are limited to those which are relevant for the electronic communications sector.

In the second part it is researched how the market has developed in terms of regulation. The research is limited to European regulation and the emphasis is on both the former and new electronic communications framework. The main changes are identified by means of a number of introductory semi-structured qualitative interviews. Subsequently these identified main changes are compared with the identified economic models and perspectives.

In the third part of the thesis the intended and expected effects of the new framework are analyzed. The analysis of the expected effects is limited to subject areas:

- Broadband Access, which will be referred to in terms of next generation access networks with emphasis on optical networks.
- Spectrum management, the part called the digital dividend in the UHF-band.

These two areas are explored in more detail in two cases. In each case the future market developments induced by the changes in regulation are analyzed from an economic perspective. The two cases will only focus on the intended and expected effects in the Netherlands.

1.4 Methodology

This study uses an explorative qualitative research method to analyze competition and future market developments in the telecommunications market. A qualitative method is chosen as quantitative methods are unsuited to analyze future market developments in dynamic infrastructure-based markets, such as the telecommunications market. Moreover, quantitative data analyses would reduce the scope of the research, while explorative qualitative methods broaden the perspective. Qualitative explorative research uses tools, such as: document collection, and semi-structured interviews which focuses on knowledge accumulation (Baarda et al., 2000). Semi-structured interviews are used in qualitative exploratory research which allows theories to be tested and at the same time includes other factors, see Figure 1.

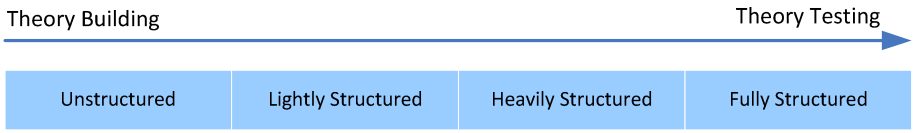

Figure 1: Interviewing structure in relation to theory development [source: Wengraf, 2001]

The research starts with the identifications and analyses of economic models and perspectives that are relevant for competition regulation and the telecommunications market. These were identified by literature research into the field of competition law and telecom regulation.

The second part of the research focuses on the development of telecommunication regulation. Mainly document of the European Commission (such as: draft decisions, regulations, white and green papers), scientific articles from journals (such as: Telecommunications Policy, and the European Economic Review), and other data sources (such as: market reports, Eurostat, and OECD) were used for orientation in the subject. Furthermore, to identify the latest regulatory developments in telecommunications four semi-structured qualitative introductory interviews were conducted to determine and identify the main changes. These interviews were selected by identifying experts in the field of telecommunication regulation and a brief discussion with my colleagues at Dialogic and my supervisor at the TU/e.

The third part focuses on the future market developments for which twelve semi structured interviews were conducted with actors affected by the regulatory changes. The selection of these actors was based on a quick scan of the actors in the telecommunication sector and brief discussions with my colleagues and my supervisor at the TU/e. The interviews started with an introduction and some general questions into the subject. Thereafter more detailed, but open ended questions were asked, for instance – *Will the new regulation stimulate infrastructure competition?* If the interviewees did not came up with particular

issues addressed in the regulatory proposals more specific questions were asked, for instance – *will the proposals concerning multi-fiber solutions stimulate infrastructure competition, and why (not)?*

Finally, news websites were also used in the research, especially to keep track of further market developments. News websites are less accurate then scientific articles but are more up to date.

1.5 Thesis Outline

This thesis is divided into six chapters. Chapter 2 gives a general introduction of the subject of sector specific regulation and its challenges that have to be faced in the electronic communication sector. Further on in chapter 2 the economic perspectives that have influenced competition law and economic models concerning infrastructure-based markets are discussed. The regulatory history will then be set out in chapter 3, which provides insight in the previous regulatory framework. The new (main) regulations of the new regulatory framework are discussed and analyzed using the economic models and perspectives of section 3.5 to determine the key motives for change. Two main subjects of interest are discussed in chapters 4 and 5 in more detail to identify the expected future market developments based on the proposed regulation. The first subject of interest concerns the next generation access network regulations, which are discussed in chapter 4. In chapter 5 the digital dividend regulation is discussed. Finally, chapter 6 draws conclusions, makes recommendations and reflects on the research. Figure 2 shows the schematic overview of the thesis.

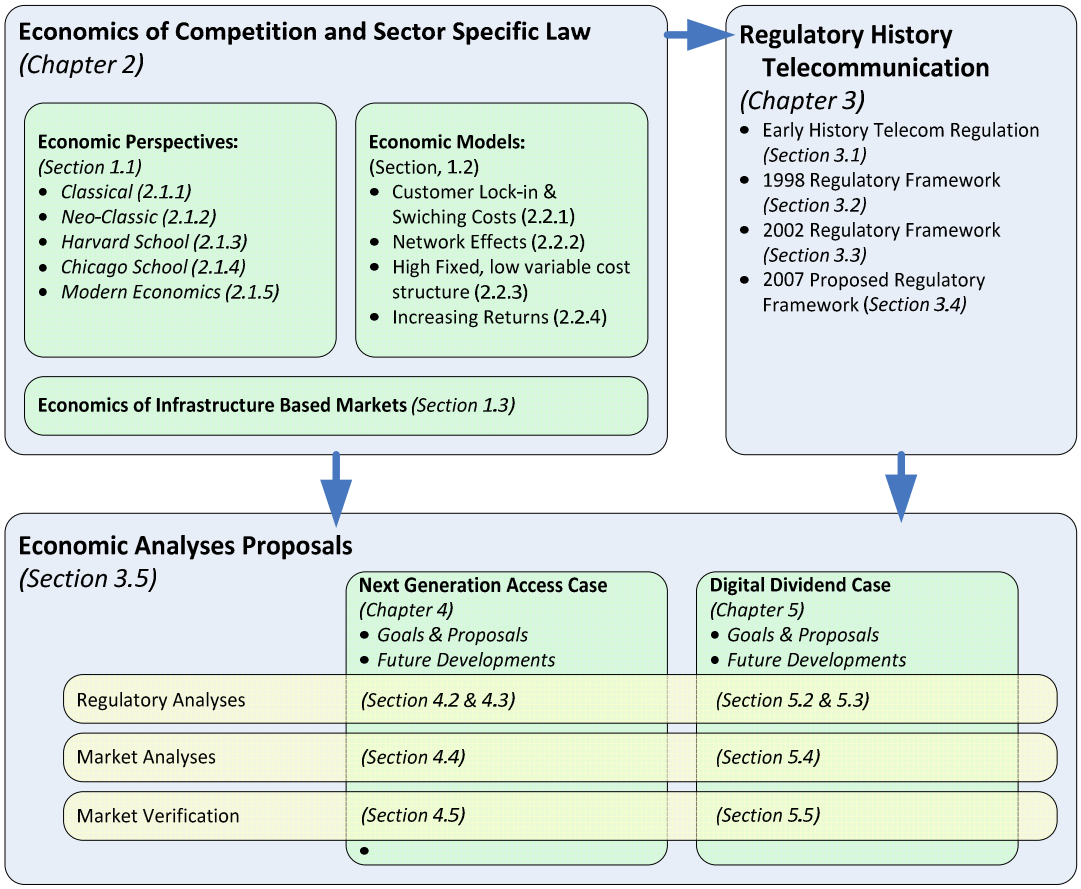

Figure 2: Schematic view of the thesis

1.6 Background information

In 2007 the first proposals of the new European framework for electronic communication were presented. Several updates of these proposals have been made, and in November 2009 the latest proposals have entered into force[1]. However, this thesis is based on the regulatory proposals for the new European framework of 2008[2] and not the finally adopted regulation. It seems that the 2008 proposals and finally adopted regulation do not differ much, but this has not been analyzed thoroughly. Therefore, the new regulation will be referred to as: “the proposals” or “the proposed regulation”.

[1] Directive 2009/140/EC, Directive 2009/136/EC and Regulation 2009/1211

[2] Communication COM(2008)724,Communication COM(2008)723 and Communication COM(2008)720.

2. Economic analyses of competition law and sector specific regulation

Economics of competition and competition law have been extensively discussed in economic and policy literature. This chapter discusses the economic principles that are needed to analyze telecommunication policy and telecommunication law. The identified perspectives and models are used to assess and determine the validity of the proposed telecom regulation. First, the perspectives that have influenced competition law in general are identified and discussed. Second, the economic models that are relevant for the electronic communication market are discussed. With these perspectives and models the previous and new proposed telecommunication policy is analyzed. This chapter answers research question 1a:

1. *On what economic principles are market regulation and competition law based?*

In order to answer the first sub-research question various economics perspectives are briefly discussed which present different considerations in determining the level of competition in section 2.1. Second, various economic models, which are specific for infrastructure-based markets, are identified in section 2.2. Third the relation between the perspectives and the influence on the economic models is discussed in section 2.3. Finally, section 2.4 concludes the main findings of the analysis that are used in the next chapters to analyze telecom policy and telecom law.

2.1 Economics of competition analyses

Generally, competition is seen as desirable, it tends to lead to cost efficiency, low prices and innovation. Moreover, markets that are competitive lead to higher consumer welfare, where markets that are not competitive do not. Therefore, competition law is about protecting competition, or the process of competition. Generally, competition leads to lower prices and more output than in the absence of competition. Over the years several economic perspectives have had their influence on how to assess market situations that lead to consumer welfare. First, it has been influenced by of the Harvard School of thoughts with the structure-conduct-performance model. This model and underlying beliefs were later contested and / or supplemented by the Chicago School of thoughts. More recently new perspectives on competition have been introduced by the transaction cost approach, theory of contestable markets, and behavioral science, such as game-theory. Three main focus areas of competition law can be distinguished: collusion control, concentration control, and abuse of a position of power. The first formal competition legislation dates from 1890, see Box 1.

Box 1: Sherman Act

The Sherman Act of 1890 was the first formal competition legislation in the world. Besides the political objectives, this legislation was based on the prevailing economical principles of the ninetieth century. The act was based on classical economy that defines competition as the market process of rivalry that takes place on open markets. The Sherman act prohibits all contracts, combinations, and conspiracies that obstruct trade. As well as behavior that aims at acquiring a monopolist position by exclusion of competitors.

2.1.1 Classical Economics and Competition Law

The first perspective on competition analyses dates from Adam Smith (1776) and his book 'Wealth of Nations'. His view was that the behavior of the individual unconsciously helps to serve common wealth by an 'invisible hand'. This invisible hand determines market prices as a reaction on competition.

Furthermore he saw that competition was a process by which a balance in prices and costs could be predicted. He was aware that process needed some legal structure to safeguard free market entry and exit, and guarantee the freedom of competition. This classical period was characterized with a number of beliefs: competition is a force that determined the market price, and mutual competition exists.

2.1.2 Neo-Classical Economics and Competition Law

In the nineteenth century the neo-classical price theory was introduced where the notion of 'perfect competition' emerged. This structural notion allows the wealth properties of the market to be analyzed. Although the model is a simplified representation of reality, it helps in explaining it. According to the model, perfect competition is an equilibrium which is efficient as it delivers both productive efficiency and allocative efficiency. This leads to that there is no better possible result for society and individuals. In this situation it is not possible to reallocate resources so that at least one person gains while no other persons are worse off; this situation is called Pareto Optimal.

In a monopoly market one actor determines the quantity and price of a product or service. This allows the monopolist to set the price above marginal costs as competition of other actors is absent, see Appendix I. Therefore, a monopoly according to the neo-classical theory, and any disequilibrium, creates inefficiencies and thus welfare losses. The welfare loss due to a monopoly situation is called the dead-weight-loss. According to Berg (1997) these losses justify the cost of anti-trust legislation. The monopolist model assumes many market conditions[3]. However, these factors can not be reached in reality. The model's lack of realism and separation into either perfect competition or monopoly has been criticized by many researchers, such as: Chamberlin (1933), Robinson (1964), and Sraffa (1926).

In contradiction to the classical theory, neo-classical theory argues that competition itself forms the market structure. The basic assumptions of the neo-classical model are that firms act as price takers (therefore sufficient competitors are needed), there is freedom of information, and competitors have to trade independently.

2.1.3 The Harvard School

The Harvard School integrates economics into competition law. The focus of the Harvard School is on the analysis of market power and structure, and evaluates the result of a specific industry by means of a structure-conduct-performance paradigm designed by Mason (1939). This paradigm describes that market results depend on the behavior of suppliers and consumers. The behavior is determined by the structure of the market and the structure is dependent on fundamental conditions, such as the availability of technology and demand. Clark (1940) realized that competition policy should not pursue the ideal of perfect competition but should formulate criteria that determine to what degree an industry is 'workable competitive'. Scherer & Ross (1990) have set up criteria by the model of Sosnick (1958) to determine whether an industry is workable competitive. In Figure 3 the criteria set for market, structure and performance are given (Scherer & Ross, 1990). These abstract criteria often are not easy to measure. Some measurement indicators for market structure, conduct and performance can also depicted in Figure 3. The model also shows that public policy can have an effect on the structure and conduct of a market (Scherer & Ross, 1990).

[3] These market conditions are summarized in Appendix I

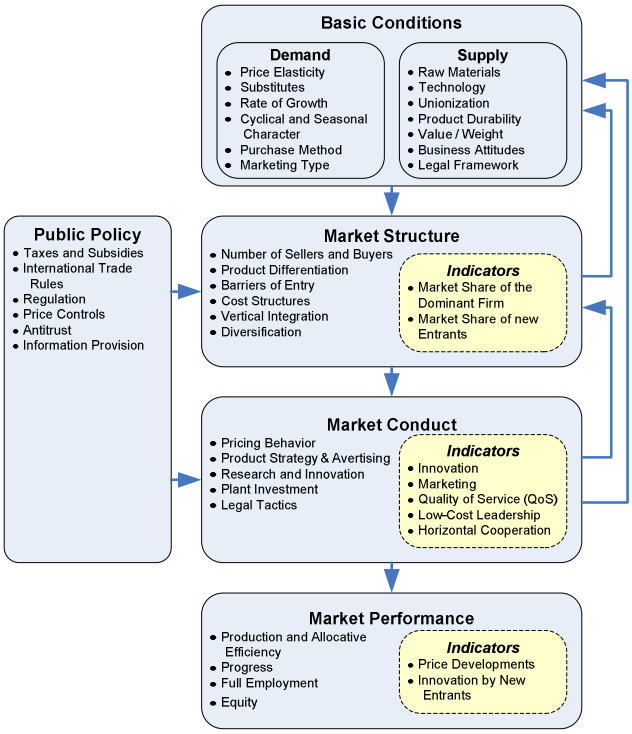

Figure 3: Structure-conduct-performance model with indicators [source: adapted from Scherer & Ross, 1990]

Bain (1968) distinguished some of the most important points according to the Harvard School. First, the models of perfect competition and monopoly should be complimented with more realistic and usable models of incomplete competition. Second, not the individual but the entire industrial sectors, or group of firms, should be the focus of investigation. Third, the objective of competition law is workable competition, if there is workable competition then: the firms have normal profits on the long turn, the industry is technical efficient, and the produced goods are of normal quality, and not too expensive. Fourth, in strong concentrated markets actions should be taken to reduce concentration to at least to pursue a wide oligopoly market. Fifth, exclusion practices and horizontal concentrations are unwanted unless it can be shown that there is an increase in efficiency ('rule of reason').

Competition as a Dynamic process

Schumpeter (1981) approaches competition not from a structural perspective, but views competition as a process of creative destruction. Firms introduce new products and production methods and thereby create new markets. The dynamics give these firms an initial monopolist position but in the same time it stimulates others to imitate. The cycle of innovation and imitation improves economical progress. According to price-theory, where monopolies are seen as unwanted, Schumpeter (1981) argues that monopolies can be needed to finance research and development. Because in a state of competition some research and development would never be undertaken because of too high risks and costs (Bergh, 1997).

2.1.4 The Chicago School

The main basis of the Chicago School can be traced back to neo-classical price theory. The Chicago School's point of view is that profit maximization behavior equals competitive behavior. Moreover,

markets are able to correct market imperfections on their own. This has led to two policy directives; profit maximization is legitimate, and competitive behavior should be judged not by models but whether they improve efficiency. The influence of the Chicago School in Europe is less than the influence it has had in the USA. Two areas in which the Chicago school has had influence are: vertical integration, and predatory pricing.

Vertical Integration

Vertical integration are situations were producers install restrictions down the value chain to make their products exclusive in location, price i.e. which seems a form of vertical collusion, and thus inefficient. However, according to the Chicago school there are several reasons why vertical integration will not lead to inefficiencies; allowing vertical integration can solve the free rider problem, it can secure the level of quality, it can lead to chain efficiencies, and not allowing it can lead to entry barriers.

Predatory pricing

Predatory pricing is to sell products or services below cost price. This can be used to prevent new market entry or to out-price competitors to eliminate them. When the competition is eliminated, a position of power is created and the losses during the period of predatory pricing can be of-set by setting higher prices. However, according to the Chicago school the higher price set, when a competitor has exited the market, will be contested by new entrants who will be attracted by high price and want a share of the profits. Therefore this type of pricing is only rational when competitors are chased away by which enough market power can been gained.

The Chicago School argues that abuse of market power is strongly exaggerated. Often large firms are more efficient than smaller ones, due to economies of scale. This makes new entry in the market more difficult, and therefore the market can evolve into one with a limited number of firms. The concentration of the market thus has developed by efficiency and not an abuse of market power. According to the Chicago School it can not be concluded that the profitability of concentrated sectors is higher than in less concentrated sectors, implying that there is no direct correlation, at least not in the long run. In the Chicago School intervention for concentration control is to prevent prices to rise beyond a certain level for an extended period of time. An important issue of market power and concentration is to determine what the 'market' is. However, the evaluation of markets depends on multiple factors, not merely the level of concentration.

2.1.5 Modern economics and competition law

There are three more theories that have provided new insights for competition law and policy. These behavioral of dynamic perspectives are; the theory of contestable markets, the transactions costs theory, and strategic behavior theories. These theories mainly complement the more static perspectives discussed above.

Contestable Markets

A contestable market is market with few competitors which nevertheless is characterized by competitive pricing because of the treat of entry. In contrary to Harvard economists not the fixed costs but the sunk costs are seen as crucial to gain insight into market structures. The theory of contestable

markets does not study market structures *ex ante*[4] to determine the results. Abnormal profits and inefficiencies in the long run are not possible in the theory of contestable markets. Moreover the theory of contestable markets argues that concentrations and monopolies are not necessarily undesirable. Entry in monopoly- and oligopoly- markets can only be prevented by competing prices according to the theory of contestable markets. If prices rise above the competing price then hit-and-run entry will be provoked (Baumol, 1982). In a completely contestable market, entry and exit are easy, and exiting is costless. Complete contestability will bring the same result as perfect competition will; prices will equal marginal costs (Baumol et al., 1988). The main point of the theory of contestable markets is that the degree of concentration does not say anything about the efficiency.

Transaction Costs

Cost differences between the market and the firm not originating from production costs or transport costs are called transaction costs. These can for example be; search and information costs, bargaining costs, and enforcement costs. Vertical integration and mergers are methods to reduce the transaction costs – such as negotiation and bargaining costs – and can thereby improve efficiency. Therefore, according to Coase (1972) they are not necessarily unwanted. In case of merger control, when a merger is prohibited, the transaction costs savings should be taken into account in the decision (Williamson, 1968).

The implications of the transaction cost approach are important for competition policy. The analyses of 'efficient allocation of resources' looses validity when high transaction costs have to be made to come to an efficient result. Therefore before a wealth assessment can be made the transaction costs have to be taken into account. The main influence of the transaction cost approach has been on vertical integration, because vertical integration limits transaction costs. Monopoly-, oligopoly- and perfect competition- models do not take transaction costs into account and therefore these models can give a misleading and premature outcomes / predictions.

Strategic Behavior

Another insight has come from the analysis of strategic behavior. This perspective argues that strategic interaction has an important impact on the market structure and market results. Game theory offers formal economic models for analyzing strategic behavior; which behavior leads to welfare losses. The basis of game theory lies in that the choice of one actor - its strategy - has an effect on the choice of another. If allocative efficiency is pursued it is important that every 'player' will act as competitive as possible: every competitor behaves as competitive as possible and strives for profit maximization taking into account the behavior of its competitors. Equilibrium is reached when none of the players have an incentive to alter its chosen strategy because altering the strategy in any way does not lead to an increase in profit. The equilibrium reached is called a Nash-equilibrium. An important aim of game theory is to study the characteristics of such equilibrium.

[4] *Ex Ante* regulation is regulation that can be enforced before collusion, significant market power, or concentrations have been identified which hamper the competitiveness of the market. Examples of markets that are regulated *ex ante* are the electronic communications market and the energy market. *Ex Post* regulation is the opposite of *ex ante* regulation, and is used to enforce measures after problems have been identified, an example is regular competition law.

A Nash-equilibrium can be reached without collusion. Moreover a non-cooperative Nash-equilibrium in an oligopoly market does not require full disclosure of information between the competitors. For competition law it is important to know which behavioral characteristics are operational, as some of them can indicate collusion (Phlips, 1995). Collusion is more likely to occur when price information is easily accessible and prices can be changed rapidly, and becomes harder when there are more players in the market. However, important to note is that the absence of price competition does not say anything about the desirability of a particular market situation.

2.1.6 Conclusions on Perspectives

Competition law in general has been influenced by different perspectives. The economic models of various competitive situations have been set out against their assumptions. An indirect link can also be made between the competitive situations and the level up to which competition is allowed by the different schools of thought; see Table 1. The (neo)-classical economic theory focuses on competitive markets based on a number of assumptions. The Harvard school of economics focuses on workable competition. The structure, conduct and performance model is used to determine whether a market is competitive. In strongly concentrated markets actions should be taken to reduce concentration to at least to pursue a wide oligopoly market (therefore the Harvard School only partly covers the oligopoly market structure), therefore monopolist situations are considered as unwanted. The Chicago school of thought argues that market structures which are less competitive are not necessarily unwanted if they increase efficiency. Generally the Chicago school of though argues that profit maximization behavior equals competitive behavior and that markets are able to correct market imperfections on their own. However, profit maximization in monopolist markets results in inefficiencies, which the market will then correct. Therefore monopolist markets are seen as inefficient, and unwanted.

Perspectives:	*(Neo-)Classic*			
	Harvard School			
	Chicago School			
Assumptions	**Perfect Competition**	**Workable Competition**	**Oligopoly**	**Monopoly**
Profit maximization	Yes	Yes	Yes	Yes
Barriers entry and exit	None	Medium	High	High
Number of firms	Many	Many	Few	One
Relative firm size	Small	Various	Large	Large
Profits in the long run	Normal	Normal	Above Normal	Above Normal

Table 1: Assumptions per Market situation and Perspectives

The more modern perspectives complement the more static perspectives (Classic, Neo-Classic, Chicago School, and Harvard School). The theory of contestable markets is mainly based on the Harvard school but uses different indicators to determine competitiveness. The transaction cost theory adds another perspective to analyze models, such as: vertical integration, and efficient allocation of resources. The implications of taking transaction costs into account influence the efficiency of particular market situations. The last perspective analyses the influence of strategic behavior on the market structure.

These perspectives can be used to analyze some economic models that apply specific to infrastructure-based markets, such as the electronic communications market. These perspectives will also be used to determine on what motives of the regulatory proposals are based.

2.2 Economics of electronic communication

In this section economic models that specially apply to infrastructure-based markets, such as the electronic communications sector. These models are: lock-in, switching costs, network effects, infrastructure-based cost-structures, and increasing returns which combines the various models.

2.2.1 Customer lock-in & Switching Costs

The first economic model which is discussed is based on switching costs resulting in lock-in. Customer lock-in occurs when a customer is better off sticking with a product or product group it has already purchased, because switching to another product will have disadvantages. These disadvantages can express themselves in four categories: physical investment, informational investment, artificially-created- and a psychological- investment (Klemperer, 1995).

- A physical investment is the need for compatibility with existing equipment. Other forms of a physical investments is the transaction costs of the switching supplier.
- Informational investments are the costs of learning to use and operate new products.
- Artificially-created investments are investments made in buying a high priced first unit that then allows subsequently cheaper units.
- An example of a physiological investment is brand loyalty.

When switching costs are high enough, the customer will be locked-in. A product typically has switching costs when a buyer will repeatedly purchase a product and will find it costly to switch to another merchant. Purchased "follow on" or "aftermarket" products - such as services and repairs - are seen as another form of switching costs. Farrell & Klemperer (2007) refer to switching costs as:

> *"A product has classical switching costs if a buyer will purchase repeatedly and find it costly to switch from one seller to another" (Farrell & Klemperer, 2007, p. 1972)*

In the case of "follow on" products:

> *"A switching cost results from a consumer's desire for compatibility between his current purchase and a previous investment" (Klemperer, 1995, p. 517):*

High switching costs will lock-in the customer from the moment the first product has been purchased. From that point on a long-term relation is governed by short-term contracts unless all future prices and qualities are specified for the future, which is rarely the case. Large switching costs create *ex post*[5] market power, for firms that compete *ex ante*; resulting in strategies, such as: penetration pricing, price wars and introductory offers (Klemperer, 1989; Monrou, 2003).

High-tech products are often hard to use and thus training is required to use or operate a product. Once a user has invested in training, the user is less likely to switch to another product. Moreover technological products do rarely stand alone and often depend on other products and technologies (Arthur, 1996). The lock-in effect increases with the number of complementary products that have been purchased by a customer because this will increase switching costs. Therefore firms often compete not by locking-in a product on their own, but by building alliances of companies that amplify positive feedbacks. Compatibility is generated by building these product groups; thereby making it easier to lock-

[5] *Ex Post* regulation is the opposite of *ex ante* regulation, and is used to enforce measures after problems have been identified, an example is regular competition law.

in customers and creating higher switching costs (Arthur, 1996). Either for a single firm, or a 'ecologies' of firms, switching costs give firms market power and therefore create the potential for monopolistic profits.

Another related concept to lock-in is path-dependency. Path-dependency is the notion that earlier choices matter for future decisions, and can also cause lock-in (David, 2007). One way that future decisions are based on previous decisions is the notion of sunk-costs. These are cost that cannot be recovered once they have been incurred. Bernheim & Whinston (1990) argue that traditional economics does not take sunk costs into account, because it is not rational. The principal of sunk costs comes not from traditional economics but from behavioral economics. Game theory shows that a tier of rational decisions, not taking sunk costs into account, can lead to a 'disaster'.

2.2.2 Network Effects

There has been substantial research into network effects and network externalities, of which only the general implications for electronic communication will be discussed. A complete study into this field is beyond the scope of this thesis. The concept of 'network externalities' has been defined by Katz & Shapiro as followed:

> *"There are many products for which the utility that a user derives from consumption of a good increases with the number of other agents consuming the good"* and " […] *the utility that a given user derives from a good depends upon the number of other users who are in the same network.*" (*Katz & Shapiro, 1985, p. 424)*

Thus, the more people that adopt/depend on a certain network, the more valuable the network becomes. However, the value can also decrease if the number of agents increases. In conclusion, there are positive and negative network effects.

There is also a difference between indirect and direct network effects. Farrell & Klemperer (2007) and Katz & Shapiro (1985) differentiate between these effects. Direct network effects are generated through a direct physical effect of the number of purchasers on the quality. If with each user's adoption the payoff increase (adoption by different users in complementary) the incentive to adopt will then increases with more adopters. An example of a direct network effect is the connection of households to the telephone network. An example of an indirect network effect is the improved availability of software for a lower price, as the number of computers increases. In general, indirect network effects are situations when complementary goods become increasingly available and lower in price as the number of the good increases (scale effects).

Network effects create an incentive to 'heard' with other customers, they cluster in their decision to adopt a certain network (Klemperer, 2005). One important property of network effects is positive feedback; which ultimately makes large networks larger and small networks smaller. A typical example is the early telephone network (Holmén, 2005). Moreover, merely the expectation that a particular network will dominate over another can be enough for customers to adopt a particular network, and thereby 'tip' the market in favor of the 'expected' prevailing network. Consequently, the way competition works depends on the adopters. If customers are able to coordinate their choices;

competition will result in all-or-nothing competition as the adopters focus on joining the winner (will also neutralize horizontal differentiation).

When adopters fail to coordinate their choices they will fragment among different networks and standardization is likely to be slow. In the case of sequential adoption, the behavior of early adopters in the long-term will influences the behavior of later adopters. This will lead to lock-in as described by Arthur (1996). The effect, that some wait to adopt until others have adopted, is called the 'bandwagon effect' (Rogers, 1962). Consequently this effect can also result in adoption by actors that previously opposed to adopt. The actors which initially opposed to adopt will eventually do so – when there is a critical mass – due to fear that they will miss-out on the positive network effects when choosing for the alternatives (Farrell & Saloner, 1985). Therefore a strong need exists for establishing a large customer base by which sufficient critical mass can be gained.

Gateway Technologies and Interconnection

A notion that has implications for customer lock-in and network effects are gateways. A gateway is a component attached to a system which allows it to interface with other incompatible systems. For example, if there are two separate networks both based on a different technology are connected which allows them to interact with each other. Thus, gateways are compatibility solutions whereby the networks interconnect. David & Greenstein (1990) describe a gateway as:

> *"A gateway is a component that is attached to a system to allow it to interface with another incompatible system."* (*David & Greenstein, 1990 , p. 21)*

The interconnection has important implications for network effects, which is also described by (Klemperer, 1995) which identifies compatibility in relation to lock-in. Network effects, as discussed, increase the value of a network as the number of actors using the network increases. However, if a small network – thus having a competitive disadvantage compared to a large network – is interconnected by a gateway with a large network, the small network can benefit from transferred network effects. Subsequently, gateways have important implications for competition between (compatible and incompatible) infrastructures and competition for customers. However, gateways can also work imperfectly or have other disadvantages. According to Bekkers (2001, p.179) the introduction of gateways can result in: increased costs (e.g. gateway design), degraded performance, and sacrificed functionality.

2.2.3 High fixed low variable cost structure

High-tech infrastructure products usually have high fixed and low variable costs. Kennet & Ralph (2006) distinguish two characteristics of the costs of setting up and maintaining a network. First, these high-tech goods are heavy on know-how in terms of design and therefore require high up-front costs. Second, they are often light on resources, leading to higher costs for research and development compared to production costs per unit.

According to Kennet and Ralph (2006) and a report by Liberty Global (2009) the initial investments cost of setting up a network are. These costs form a substantial entry barrier. Generally, the so called 'last mile') is very expensive to deploy in network markets. The 'last mile' represents the connection between

the core network and the customers. The operator has little incentive to roll out new infrastructure if there is an already existing infrastructure, even if this increases the capacity and/or quality.

2.2.4 Increasing returns

An article by Melnicoff (1999), based on a paper by (Arthur, 1996), describes the world of increasing returns that has been applied to the world of electronic communication, see Figure 4. This model connects different economic theories which are at play in the telecommunications market: network effects, lock-in and infrastructure-based cost structures. Farrell & Klemperer (2007) also distinguish network effects and switching costs as economic models that are central to infrastructure-based markets. The combination of the economic models can especially be seen in infrastructure markets, such as the electronic communication market and energy-market (Levi-Faur, 1999).

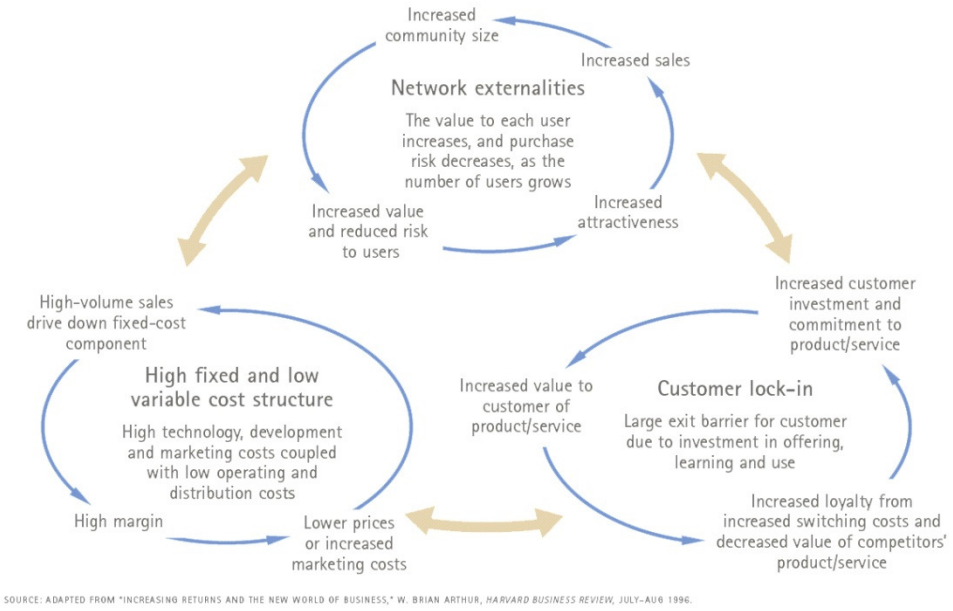

Figure 4: eEconomics; increasing returns of scale [source: Melnicoff, 1999]

The traditional economic models are based on the assumption of markets with decreasing returns. A market of deceasing returns implies that products or companies that grow and prosper in a market eventually run into limitations. Thereby a predictable equilibrium of prices and market shares is reached. Increasing returns is the tendency that companies that grow and prosper will continue to do so, and companies that loses advantage will further loose advantage. Increasing returns is a mechanism of positive feedback. This is generated as follows; when a company or a technology gets ahead – by technological superiority, clever marketing strategies, economics of scale or scope – increasing returns can make this advantage even larger thereby locking-in the market.

Arthur (1996) argued that increasing returns is a characteristic of the 'new' industries which are often knowledge-based and high-tech (Arthur, 1996). The world of decreasing returns takes place in the more traditional parts of the industry, often light on know-how and commodities, and heavy on resources. As the two 'worlds' differ in behavior, they call for different strategies and different regulation. In a market of increasing returns the growing and prospering company will slowly begin to dominate the market,

thereby also locking-in customers (network effects). The network effects, lock-in, and cost structure combined result in winner-takes-most market competition. Therefore companies focus on hitting the market first. This also implies that under increasing returns, the 'winning' technology isn't necessarily the best one. In traditional markets competition is stimulated by deregulation. However, in markets of increasing returns deregulation will likely result in less competition and higher prices as the number of competing firms will continuously decrease.

A possible result of a market with increasing returns is that one product or technology will prevail and thereby become dominant. However, it can sometimes be justified to let one product or technology dominate a market. For example lock-in brings convenience as there is only one standard or because the technology is truly superior. However, this it is often not justified, as a locked-in product can obstruct technological advancement.

Scarcity

Technological advancement can also be stimulated by scarcity; other materials can be found or the product will be used more efficiently. The scarcity of a product also has implications for the competitiveness of a market. If efficiency increases the availability of a scarce good, a reduced amount of the scarce good is needed whereby competition is likely to increase. Scarcity also takes place in the mobile electronic communication market (available frequency spectrum) and reduces competition as it restrains the number of competitors.

2.2.5 Conclusion economic models

The economics in infrastructure market is different from other markets. Infrastructure markets are characterized by networks effects, lock-in, and specific costs structures. These models combined result in a market of increasing returns and a winner-takes-most competitive market. However, there are some models, such as gateways and interconnection, which can decrease the effects. Without regulation the infrastructure-based markets, and especially the telecommunications market, are likely dominated by a single firm.

2.3 Competition in infrastructure-based markets

The different perspectives discussed in section 2.1 are based on certain assumptions. However, these assumptions do not always apply to infrastructure-based markets as shown in section 2.2. The conditions of infrastructure-based markets are similar to oligopoly markets, and have to be analyzed according. As discussed competition law has three main focus areas: collusion, positions of significant market power, and concentrations. In this section the focus areas are explored in more detail in relation to the economic perspectives and economic models of infrastructure-based markets.

Collusion

Collusion is an agreement between two or more entities to limit open competition. It is an agreement among firms to divide the market, set prices, or limit production. Generally collusion is less likely when the number of competitors increase, and will then also have less influence on the competitiveness of the market. Collusion is more likely when prices can be changed rapidly and when price information is easily accessible. Prices change rapidly as new technological developments constantly create competitive

advantages in infrastructure-based markets, such as the electronic communication market. Therefore the telecommunications market is more likely to collude.

The classic and neo-classic perspectives and models assume that firms operate independently, and do not take any collusive behavior into account. The Chicago school of thoughts argues that collusion creates inefficiencies and should therefore be avoided. The more modern and dynamic perspectives rationalize collusive behavior and suggests that collusive behavior does not always lead to inefficiencies (Carter & Wright, 1999). Game theory suggests that a natural equilibrium can occur in a comparative market. Therefore collusion does not always indicate a lack of competition in a market. Carter & Wright (1999) argue that collusion in the electronic communications market can also lead to lower consumer prices. Nevertheless collusion is generally considered to lead to inefficiencies.

Collusion is also likely when operators require continuous collaboration with other operators, such as interconnection and gateways. Carter & Wright (2003) and Alderighi (2008) both identify that the limited number of operators increase the risk of collusion in the telecommunication industry. Especially by the fact that two-way interconnection requires continuous collaboration between networks. The collaboration and agreements are likely to be damaging to customers according to Carter & Wright (1999). Therefore it is argued that some control is required. Examples of collusion in the telecom market concern the interconnection rates and the 3G-auctions (Klemperer, 2002).

Positions of power

A position of (significant) market power is generally seen as negative, as it indicates that a firm can exercise its monopoly power. According to the classic and neo-classic economic perspectives, monopoly profits can be gained with monopoly power which consequently creates inefficiencies. The Harvard school argues that when the market structure is negatively affected resulting in decreasing performance, action should be taken. According to the Chicago School, market power can also be gained by scale effects which increase efficiency. The more modern and dynamic perspectives also argue that positions of power are not necessarily inefficient. The transaction cost theory, which is in line with the Chicago school perspective, argues that positions of power increase efficiency. The theory of contestable markets argues that monopolies are not necessarily bad because the supposedly abnormal profits are not sustainable in the long run, and will provoke hit-and-run entry. Game theory argues that a position of significant market power might still be an outcome in a market of full competition.

However, in infrastructure-based markets some perspectives are not valid as the assumptions on which the models are based are not met. For example the theory of contestable markets does not apply to the electronic communications market as the theory assumes entry is easy, and exiting is costless in a perfect contestable market. However, there are significant entry barriers due to the high initial cost in infrastructure markets.

Concentrations

The classical theories assume in their models that there are many suppliers and buyers, whereby perfect competition can be achieved, which creates the most benefits. Workable competition already allows some concentration, as the Chicago school, as long as efficiency is increased. The Harvard school also incorporates monopoly and oligopoly markets models in its analyses, therefore concentrations are

allowed as long as the outcome is positive. The more modern theories, such as the transaction cost theory, suggest that concentrated markets do not necessarily have to be inefficient if transaction costs are taken into account. According to the theory of contestable markets, monopoly and oligopoly market positions can be sustainable in the long run. The threat of potential (short-term) entry will prevent the incumbents from raising its prices. If they do raise their prices beyond average, new entrants will exploit the price level for easy profit. When the incumbent firm responds by returning prices to levels consistent with normal profits, the new firms will exit. Because of this, even a single-firm market can show highly competitive behavior. However, contestable markets are based on several assumptions, such as: that entry and exit are free, which is not the case in infrastructure-based markets. Moreover, the inefficiencies during that period are not taken into account and can be substantial. Game theory argues that concentrations, such as oligopoly markets result in an equilibrium state, but not an efficient one and creates inefficiencies. In an infrastructure-based market the model of increasing returns makes an oligopoly-market a possible stable long-run market outcome. However, interconnection between networks reduces the entry barriers by eliminating some of the network effects. Therefore, a wider instead of a narrow oligopoly market is supported.

Policy challenges for infrastructure based markets

Infrastructure markets are subject to increasing returns resulting in a winner-takes-most market. Therefore the market will continue to concentrate which will finally lead to a narrow oligopoly or monopoly market. An additional factor in infrastructure-based markets, such as the electronic communications market, is that these markets in the past were utility markets, as will be more extensively discussed in chapter 3. These monopolistic state owned utility companies have been liberalized (revoking of the exclusive rights) opening up the market for competition. However, the liberalization will not remove the monopoly position of the companies, and make new entry very unlikely. Thus, the starting position has been a monopoly market while the market also tends to concentrate. Therefore regulation for infrastructure-based markets should be different than non-infrastructure-based markets. The electronic communication market and energy markets are regulated *ex ante*. These markets are both infrastructure-based were both initially state owned monopolies which have been liberalized). The role of policy can be visually represented in the model of increasing returns, see Figure 5. Thus, policy should be aimed at reducing market shares to generate a more competitive market (green lines).

However, in case of the infrastructure markets, the starting position is a monopoly position. Due to increasing returns and without any regulation this would likely result in an oligopoly or monopoly market unless policy will intervene (see Figure 5 – line: monopolist market). There is a constant struggle to diminish the power of the incumbent and also any power gained by other actors under increasing returns to keep the market competitive.

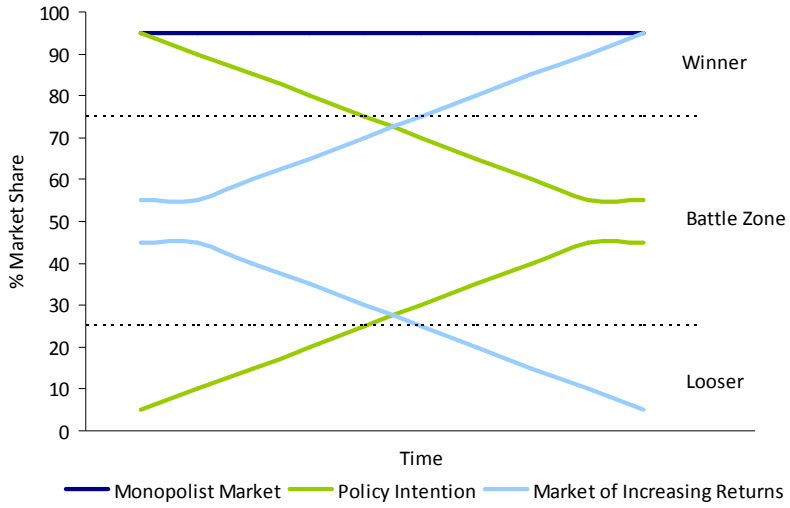

Figure 5: Likely outcome telecom market without intervention [source: own research]

2.4 Conclusion

The main purpose of this chapter was to identify on what economic principles market regulation and competition law are based. Therefore several different economic perspectives were discussed that have influenced competition law over time. The perspectives define the levels of acceptable collusion, concentration and positions of power. These perspectives therefore define the level of competition that should be reached in a market to optimize the wealth benefits. The economic models that are at play in infrastructure-based markets have shown that regular competition law is insufficient to make these markets competitive on their own, especially given their utility based history. Therefore special *ex ante* regulation is required that anticipates developments that can lead to an unacceptable level of collusion, power position, or concentration. The models and perspectives discussed can be used to identify on what economic model(s) the proposals are based on to secure competition.

3. Telecom regulation

In this chapter, the development of the sector specific regulation of the electronic communication market in the European Union is analyzed. The development of the regulation over time and the motives for the issued regulation are explored. Thereby research question 2a is answered:

2a. How has the electronic communications sector developed, since the 1990's, in terms of regulation, and is this compatible with the economic principles?

As discussed in section 1.6 the new framework has already entered into force. However, this thesis is based on the regulatory proposals of 2008. The proposals for the RF'07, dating from 2008, are reviewed and the most important changes are identified with help of introductory interviews. The most important changes are analyzed in terms of their motives, and whether these motives correspond to economic theory. Thereby research question 2b is answered:

2b. What are the changes in the new (proposed) electronic communications framework, and are these proposals compatible with the economic principles?

First in section 3.1 the early regulatory history of the telecommunication sector is briefly explored which provides a foundation for telecom regulation. In section 3.2 the first regulatory package (RF'98) is discussed. Section 3.3 discusses the second regulatory framework (RF'02). Section 3.4 discusses the proposals for the new regulatory framework (RF'07). Thereafter, in section 3.5, the regulation is analyzed in more detail in relation to economic theory discussed in chapter 2. Section 3.6 will conclude this chapter.

3.1 Early history of European telecom regulation

The telecom sector has always been strongly regulated. The sector has developed from a tradition of strong public service monopolies to one of increasing privatization and competition. The telecommunication sector, until then, has not been subjected to competition regulation because most governments considered the electronic communication as a utility on which European competition-law did not apply.

First, policy focused on common technological development, which started in 1984. Since the beginning the European Community has recognized the importance of a powerful telecommunications sector for a successful internal market (EC, 1985). In 1987 the focus shifted to liberalization, as a European liberalized telecommunications market with several providers was deemed essential for further development and growth of economy in Europe (As, 1999). Mainly because the monopolistic government controlled markets were hard to justify against the fundaments of the European Union which pledges for free trade of services and goods (Clarkson & Smits, 2002). The liberalization meant that the exclusive rights of the monopolies were abolished, such as: exclusive rights for radio spectrum, terminal equipment, and standardization (Bekkers, 2001). The Greenpaper[6] of 1987 (EC, 1987) is seen as one of the most important policy document for electronic communication in the EU (Clarkson & Smits,

[6] See Appendix II for explanation of a Greenpaper.

2002), and is the first document which clearly states 'the competitiveness of the European Union' as a goal. In that Greenpaper several trends were identified which, according to the Commission, needed to be addressed: rapid technological development and diversification, expanding range of new forms of access to sources of information, explosive growth in communications requirements, and the major importance of scale effects. The Commission urged to address these trends, also by pressure from measures already taken by Japan and the USA. The European Parliament believed that:

> *" …there needs to be liberalisation of the existing equipment supply monopolies in order to permit greater freedom for individual users to connect their equipment to the telecommunications infrastructure, and for suppliers to sell their products in other Community countries" (EC, 1987, p. 3)*

Liberalization alone was not enough to accomplish the freedom principles of the European Union. In order to establish pan-European competition there had to be harmonization, interoperability, and standardization in technical specifications (Clarkson & Smits, 2002). A review took place of telecommunication sector in 1992. The conclusion of the review was that further liberalization was necessary (EC, 1992; EC, 1993). The Green Papers of 1994 (EC, 1994a; EC, 1994b; EC, 1994c) announced that the Commission wanted to abolish all exclusive and special rights in the telecommunication sector (Bekkers, 2001). In the Netherlands, as in most member states, the telecom sector was finally liberalized in 1998, making competition in the market possible.

3.2 The regulatory framework of 1998 (RF'98)

The first so called regulatory package – consisting of a number of directives, regulations and guidelines – was introduced in 1998. The overall objective of this regulatory package was to further manage the transition from monopoly to competition. Many of the Directives in this regulatory package, called the Regulatory Framework for Electronic Communications (from now on abbreviated as the RF'98), were based on earlier decisions. The main advantage of the framework approach was that several directives were implemented around the same time. The intention was not to change this regulation (much) until the next revision. Thereby the framework approach increased regulatory certainty and security.

The RF'98 focused on harmonization of the market as it was recognized that merely liberalizing the market would not result in the overall objective of making the electronic communication sector competitive. The networks and terminal equipment were based on different technology standards in 1998. This made interconnection between different networks difficult and expensive. Harmonization was seen as the solution to remove these barriers and to stimulate competition.[7] Other rules were also put in place, such as the protection of privacy.

The RF'98 consists of a number of directives. Formally the package consists of directives concerning 'open network provision', 'interconnection', 'leased lines', and 'voice telephony' (see Appendix III). The RF'98 formed the basis of legislation which should establish a truly competitive European electronic communications market. Other regulations which are often also considered to be part of the framework are: the Radio communications and Terminal Equipment Directives, Data Protection Directives, and Licensing Directives (see Appendix III).

[7] Standardization of networks will make interconnection less expensive, thereby smaller networks could better compete with large networks (as the prices decrease for interconnection services).

The RF'98 contains two types of measures: for market behavior and technical harmonization. Harmonizing measures for market behavior are the so called open network provision (ONP) measures. These measures can relate to for example technical interfaces, conditions of supply, conditions of use, and tariffs. The ONP-measurers can be seen as a supplement of general competition rules. The new ONP regulation aims at public network operators that have significant market power, which then was generally 25% market share or more (Bekkers, 2001). The ONP-directives are based on certain principals that are still used today to design telecommunication regulation. The regulation has to be: transparent, non-discriminatory, guarantee equal access, and be based on objective criteria.

Technical harmonization measures mainly focus on interconnection between networks and equipment. The first measures were concerned with 'type approval'. If a type was approved in one of the member state, it automatically was approved in another member state. These type approvals were based on standards on the European Conference of Postal and Telecommunications Administrations (CEPT, see Appendix IV). However, CEPT allowed for some national choices concerning standards. This is considered to be one of the reasons why it did not work. Therefore a new method was designed where standards were developed by the European Telecommunications Standard Institute (ETSI, see Appendix IV).

3.3 The regulatory framework of 2002 (RF'02)

The 1998 framework was designed to create a truly competitive telecommunications market in Europe by liberalization and harmonization. In 1999 the framework was reviewed to determine whether the framework was making progress on its objectives to create a truly competitive market. The conclusion of the European Commission was that the RF'98 had increased competition in the EU and thereby prices had decreased, quality had improved, and that the market had become more innovative. In conclusion it had performed well on its objective. New developments in the electronic communications market had to be addressed in 1999, e.g. the development of the Internet which was revolutionizing the way of communication and business. The revolution consisted of the convergence of the telecommunications, media and information technology sectors. The regulatory policies of the EU had to adapt to the changes in the market in order to remain effective. A balance was needed to stimulate competition and innovation, and also safeguard key public interests. According to the Commission a new framework was required to accomplish these objectives

> *"In a sector that is as dynamic as telecommunications, regulatory policy can't stand still" (EC, 1999: p.1)*

The convergence of telecommunications, media and information technology sectors was possible because of digitalization. This meant that all communications networks, whether telecoms, cable TV or satellite and terrestrial broadcast, could carry any form of digital information (voice, image or data). Therefore, regulatory policy should not distinguish between different communications infrastructures anymore. It was therefore essential that the framework treated all transport network infrastructures and associated services in an equivalent manner, irrespective of the types of services carried. To address the convergence the framework was designed to cover all communications infrastructure and services associated with an infrastructure. The regulatory framework of 2002 (RF'02) applies to satellite networks, fixed and mobile terrestrial networks (whether circuit- or packet-switched), cable TV networks and other networks used for radio and television broadcasting, as well as to facilities, such as Application Program Interfaces (API) which control the access to services. The regulation does not cover

services carried over that infrastructure, such as services providing broadcasting content, or internet services.

The final proposals were adopted on 11 December 2001. The member states were given 15 months to implement the new regulations into national law. The main debating point was Article 6 of the framework directive whereby the Commission would gain a wide-ranging power of veto over the actions of the National Regulatory Agencies (Dommering et al., 2001). However, the final adopted regulation downgraded the Commission's power and a veto only could be used in defining the relevant markets and determining significant market power. According to the Commission the framework will: reduce regulation, improve coordination, maintain the universal service obligations, promote European standards, and establish a policy framework for the coordination of radio spectrum policy.

3.3.1 The framework set-up

The Commission issued six proposals on the 12th of July 2000 which were adopted before spring 2002. These Directives form the formal new electronic communications regulatory framework, see Appendix V. The Framework Directive contains all the common regulations that underlie the other measures in the new framework. This includes the assessment of significant market power (SMP) according to the defined relevant markets. The underlying directives are the authorization directive, an interconnection directive, a user rights and universal service directive, and a data protection directive:

- The Authorization Directive aims at simplifying administrative controls on market access for operators.
- The Access and Interconnection Directive establishes common principles for the regulation of access and interconnection for all communications infrastructure.
- The universal service directive consists of measures to protect the right of consumers of electronic communication networks and services.
- The Data Protection Directive contains the regulation to protect the interests of users and the consumer.

The framework

According to Buigues & Ray (2004) there are six main changes introduced in the new framework. First, a broader scope of market regulation under 'electronic communications', which covers broadcasting networks, telecoms and cable TV network services. Second, the principle of 'technological neutrality' is introduced whereby the regulator evaluates the nature of services, rather than on what infrastructure it is provided. Therefore, telecom networks (fixed and mobile) and broadcasting networks (cable, satellite and terrestrial) are different technologies providing the same type of services to users. Third, an increase of the role of the European Commission in ensuring a better coordination with National Regulatory Agencies (NRAs) and ensure homogeneity of regulatory implementation between members states. Fourth, regulators can now grant general authorizations instead of the previous licenses. This means that any firm will be able to offer similar services, build a network, and to enter into competition with other operators. Fifth, the application of the principle of general competition will now prevail over previously sector-specific regulation. Therefore, the previously used notion of 'significant market power' (SMP) is replaced by the concept of 'Dominance'. Furthermore, others factors will be considered, such as: 'the control of essential facilities' and 'the absence of potential competition'. Hence a regulatory authority will intervene when an operator's market share exceed 40% and not the previously 25% (Art.

82 EC Treaty). Last, the market analysis assessment will be performed more often by NRAs in order to determine whether there is a need to introduce ex-ante regulation in a relevant market.

Other legislations

Two other legislative documents are often also considered to be part of the framework, but formally are not. These legislative documents are the local loop unbundling regulation (EC, 2000), and the radio spectrum decision (EC, 2002a).For the difference between directives, regulations and other formal European documents see Appendix II.

Competition in the local loop

The local loop is the least replicable and least competitive part of the electronic communication market, which is further discussed in chapter 4. The local loop unbundling regulation (EC, 2000) provides a legal base to enforce unbundled access to local loops of operators which are dominant. The regulation has a number of provisions (Sunderland, 2000). First, the incumbent operators are required to provide competitors with unbundled access to their local copper loops – both on the basis of exclusive use and of shared use – on fair, reasonable and non-discriminatory terms. This includes the right for competitors to have access on the same terms as those offered to the operators themselves or their associated companies. Second, physical access must be granted at any technically feasible point on the copper loop. It also includes the right for the new entrant to co-locate its own network equipment with that of the incumbent. Third, the price for unbundled access to the local loop must be cost-oriented, as long as competition is not sufficient to prevent excessive pricing. Finally, operators must publish a reference offer for unbundled access to local loop, including prices, terms, and conditions.

Radio Spectrum Decision

The role of the European Union in radio spectrum management has always been small, but the European Union is slowly expanding its involvement in spectrum management. Historically, due to interference of radio waves, radio spectrum management has mostly taken place globally and nationally. The Radio Spectrum decision (EC, 2002a) establishes principles and procedures for the development and implementation of EU radio spectrum policy. This includes ensuring the harmonization of conditions for availability and the efficient use of spectrum so that equipment can be used throughout the EU. Therefore it also includes proposing and enforcing technical implementing measures. Another related decision is the establishment of the Radio Spectrum Policy Group (EC, 2002b) – RSPG, – which is an advisory group that assists the European Commission in the development of radio spectrum policy (see Appendix IV). The decision on establishing the RSGP is not always considered to be part of the framework, see Appendix V.

3.4 The new regulatory framework (RF'07)

The RF'02 has been revised and the new telecom package has recently been adopted. The new telecom package was presented by Commissioner Viviane Reding (the former EU commissioner for information society and media) to the European Parliament in Strasbourg on the 13th of November 2007. In June 2008 the European Council of Telecom Ministers gave their view on the new regulatory packages. Thereafter the European Parliament (EP) debated the reform, first at Committee level and on the 2nd of September 2008 in plenary session. The European Parliament voted, in first reading, on reform package

on the 24th of September. The second vote took place on May the 6th 2009. The European Parliament and the Council of Ministers reached an agreement on the EU Telecoms Reform proposed by the Commission on the 4th of November 2009, after intense negotiations brokered by the European Commission, and debated in the legislative process since that time. As mentioned in section 1.6, the new regulatory framework has officially entered into force on 25 November 2009.

The review of the RF'02

The design of the new package started with the evaluation of the previous regulatory package, the RF'02. The review which represents the opinion of the Commission mainly stresses the progress made since 2002. The efforts of opening up the electronic communications market is seen as successful and need to be continued in the next framework (EC, 2006). The Commission identifies two specific areas where actions should be intensified:

- Management of radio spectrum
- The market review procedure (by the National Regulatory Authorities - NRAs)

Other areas in which the Commission is planning further changes are consolidation of the internal market, strengthen consumer and user interests, improve security, and remove outdated provisions. Furthermore, the Commission stresses that new technological developments have to be closely monitored. Policy should aim to anticipate new developments and take these developments into account. Examples of new developments addressed in the review are: the migration to "All Internet Protocol (IP)" networks, deployment of fiber optic connections in the local access network, increased use of wireless communications and wireless access platforms, and the transition to digital television.

The Commission review mainly stresses the accomplishments of the RF'02 and thereafter identifies areas in which intensified actions are required. The main shortcomings of the RF'02 are: the absence of conceptual alignment between NRAs, misalignment of regulation and anti-trust methodologies, questionable selection of remedies leading to complex regulation, and inefficient evaluation of NRAs.

The proposals

As discussed in section 1.6 the new framework has already entered into force, while this thesis is based on the regulatory proposals of 2008.

In 2007 the first proposals were presented by the Commission (EC, 2007e; EC, 2007f; EC 2007g). After the first reading of the Council the proposals were amended (EC, 2008d; EC, 2008e; EC, 2008f). After second reading the proposals were adopted and made official (Directive 2009/136/EC, Directive 2009/140/EC, and Regulation 2009/1211. Based on the proposals dating from 2008 the changes have been introduced as follows. First, the sector constantly has to deal with new realities, such as the conversion of the telecommunications market with the media market and the internet and changes rapidly. Second, the conversion has created new obstacles which hinder a competitive market. Therefore the regulation concerning the sector needs to be reviewed regularly to determine whether measures are still adequate and effective. According to the Commission driving investments is vital for the health of Europe's economy and will lead to more innovation, more choice of services and products, lower prices, and job creation. The review of the RF'02 already identified a number of areas that should be addressed in the new framework (RF'07).

Besides the review and new market developments, the proposals for the RF'07 are influenced by the Lisbon Agenda and the i2010 Strategy (EC, 2005a), see Appendix VI. They strive to stimulate an open and competitive digital economy and calls for the creation of a single European information space (EC, 2008a). Based on the identified problems, market developments, Lisbon & i2010 initiatives: a number of changes have been proposed. In order to be sure the most important changes in the framework were identified, a number of introductory interviews were conducted with some specialists in the field of electronic communication and regulation, see Appendix VII. The introductory interviews indicated that there were no unexpected changes in the RF'07. In total twelve main changes have been presented by the Commission (which have later been summarized in MEMO/09/219) which have been reduced to six main objectives:

- To address the poor handling of personal data and security of communication network by: recognition of the right to internet access, consumer protection against personal data breaches and spam, a more open and more 'neutral net' for the consumer, better access to emergency services, 112 (see Paragraph 3.4.1)
- A European telecom market authority is proposed to create the right conditions for a single market by ensuring that EU rules are applied consistently across the EU. The new authority provides the Commission with a say on competition remedies but national telecoms regulators will gain greater independence (see Paragraph 3.4.2)
- Regulate less but more effectively by reducing regulation where competition has already delivered results (see Paragraph 3.4.3).
- Give national regulators a flexible toolbox of remedies to tackle market failures. They will give regulators a new instrument, functional separation (see Paragraph 3.4.4)
- Tackle bottlenecks in the broadband market by encouraging competition and investments in next generation access networks (NGAs) (see Paragraph 3.4.5)
- Better management of radio spectrum and boost 3G mobile services (see Paragraph 3.4.6).

According to the interviews, with experts in the field of electronic communication and regulation (see Appendix VII), the most drastic proposed change is the new regulatory authority. The initial proposals have been amended, thereby decreasing the power and role of the proposed authority (see Paragraph 3.4.2). According to the introductory interviews the measure of functional separation will most likely not be used in the Netherlands. Furthermore, the interviewees argue that the other proposals are mainly a continuation of existing policies. Therefore, the proposed regulation is considered to only have a limited effect for the Netherlands which is further explained in chapters 4 and 5. The proposals will be discussed in more detail in the following paragraphs.

3.4.1 Empowering European consumers

One of the important pillars in the European Union is the interests to the consumers. A number of measures are taken to protect the interests of the consumers and that also included the empowerment of consumers. The reform calls for better informed European citizens, better services, and improved consumer protection by truly independent telecoms watchdogs. The proposals are targeted particular at strengthening security and privacy as well as promoting the quality of services and free access to digital content. The RF'02 already provided a number of measures to empower customers (for instance

transparency in telecom tariff, emergency services, privacy protection, protection against spam and malicious software). However, the proposals complement on these:

- Better information on consumer products and service costs
- Reducing switching times between fixed or mobile operators while keeping the same phone number.
- A more efficient European emergency number (112) by providing location information of the person who requests emergency services.
- Free-phone or business service numbers access abroad.
- Improved accessibility for users with disabilities.
- Better privacy and security (spam, personal information).
- Greater access and guaranteed 'net freedoms'.

Therefore a chief network security officer was proposed to guard privacy, network security provisions, and more clarity as to the security measures taken by providers. The first proposals were to integrate the ENISA (European Network and Information Security Agency - see Appendix II) with the new European telecom authority. However, due to the many changes in the proposals of the European telecom authority, ENISA will remain a separate agency.

3.4.2 The European market authority

The Commission proposed to establish a European market authority to create a single telecom market. The market authority should increase economic growth, and provide competitive (pan-European) services to consumers. The current telecom market is characterized by competition, although not in every member state. The 27 regulatory systems (national regulatory systems of the 27 member states) make it hard for companies to deliver pan-European or cross-border services, which hinder a competitive European market. The different degrees of independency of national regulators and differences in regulation play an important role. The new market authority will:

- Improve the quality and consistency of regulation in the European Union
- Reinforce cooperation between national regulators and the Commission
- Provide expertise for regulatory issues linked to cross-Community telecoms services

An existing agency that has more or less the same objectives is called the European Regulators Group (ERG, see Appendix IV). However, there are problems with the effectiveness of this body due to its formal power. Because of the limited power to harmonize the market, the Commission has proposed to replace the ERG with the new market authority. The initial mandate was to: ensure that the 27 national regulators work as an efficient team on the basis of common guiding principles, deliver opinions and assist in preparing single market measures of the Commission for the telecoms sector, improve the accessibility of telecoms services and equipment for users with disabilities, monitor closely the use of the single European emergency phone number, facilitating cross-border EU services in relation to rights-of-use for scarce resources, such as: spectrum and numbers, and addressing network and information security issues.

There has been a lot of discussion regarding the market authority as it would give the authority the power to veto[8] decisions made on a national level. Therefore the proposals were changed several times; from ETMA into EECMA, BERT, BETR, GERT and finally BEREC. BEREC stands for Body of European Regulators for Electronic Communication, which consist of the 27 NRAs (National Regulatory Authorities). The European Commission and BEREC will have joint veto-power whereby the Commission can overrule a decision made by the NRAs if BEREC supports the veto with a majority vote. Therefore the final mandate has been substantially reduced. BEREC will be an independent expert advisory (as the ERG) and will issue opinions and recommendations to help the Commission upon request of the European Parliament and the Council. BEREC will adopt its opinions by a two-thirds majority.

3.4.3 Reducing the number of *ex ante* regulated markets

The *ex ante* regulation in the electronic communication market allows the EU and member states to intervene in the market which are not competitive on its own. These markets are subject to change as the market constantly develops. Therefore the markets are reviewed on a regular basis to determine whether they are competitive or not. If they are competitive the *ex ante* regulation can be reduced or repealed. There are different perspectives on the *ex ante* regulation. For instance Möchel (2009) criticizes the Commission on why it has not repealed the *ex ante* regulation in the electronic communications sector after the liberalization of the market. However, Larouche (2000) makes a strong argument for sector specific regulation to be maintained, as repealing the regulation would lead to a monopolistic market. The proposals in the RF'07 are to reduce the number of markets pre-defined by the Commission.

The Commission already issued a Recommendation (EC, 2007b) which defines a new list of markets which are more likely not to be competitive in 2007. In that list the number of pre-defined markets has been reduced from 18 to 7. The list of remaining relevant markets can be found in Appendix VIII - Table 6. The remaining relevant markets will address those markets where antitrust remedies would be insufficient to redress competitive problems, see Box 2. The regulation of the remaining markets will be repealed. The regulation will be repealed in five retail markets, and two of the remaining retail markets have been merged into one. The Commission argues that enough competition exists in these retail markets, and that this will remain so because of effective wholesale regulation that will keep the retail market competitive. The NRAs should analyze the pre-defined markets and take appropriate measure when a market is not competitive (enough). The markets analyzed by an NRA can deviate from the recommendation.

Box 2: Selection of the relevant markets

The relevant product markets are defined where *ex ante* regulation can be enforced on actors that have significant market power. When an actor has been found to have SMP in a relevant market, regulatory obligations can be used which are often highly intrusive (Richards, 2006).

In principle the Commission selects only markets where antitrust remedies would be insufficient to redress competitive problems on the basis of a test based on three cumulative criteria (Streel, 2008):

(i) high and non-transitory entry barriers of a structural, legal or regulatory nature;
(ii) market structure which ,behind the entry barriers, does not lean towards effective

[8] Veto is the political right to disapprove of (and thereby stop) the process of a decision, a law etc.

competition within the relevant time horizon;

(iii) Insufficiency of competition law alone to adequately address the market failure(s) concerned.

Then, the Commission delineates the product boundaries of the selected markets on the basis of the hypothetical monopolist test (HMT) or small but significant non-transitory increase in price (SSNIP)test, used in antitrust policy.

3.4.4 Functional separation

According to the Commission the telecom market is still not competitive enough in many member states. Mostly because the former state owned monopolies still have dominance. Moreover, these incumbents are vertically integrated, whereby they both operate and own the network infrastructure and provide services. Thereby higher efficiencies can be achieved, but it will also raise the barrier for new entrants and could hinder competition. An NRA is required to make an assessment of the state of competition in specific markets and impose proportionate remedies when a dominant position is identified, see Paragraph 3.4.3. The current measures are not sufficient for all member states to prevent discriminatory behavior from a vertically integrated operator. Discriminatory behavior can effect the competitive environment negatively in wholesale and retail markets. Therefore the Commission has proposed to add a new tool to the toolbox of the NRAs: 'functional separation'. Functional and structural separation has received much attention lately as several countries – Sweden, Italy, UK and New Zealand – have, or considering to, use it as a regulatory remedy (Cave, 2006).

Functional separation demands vertically integrated operators to separate its businesses – for example by establishing new business units one for its upstream wholesale customers, and one for its downstream customers. This usually means that a dominant operator needs to separate its network infrastructure activities and services activities that are provided over its infrastructure. Functional separation allows operators to continue to benefit from the vertical integration (discussed in chapter 2) as long as these benefits do not come from a monopoly on infrastructure (ERG, 2007). Functional separation is only effective when there are sufficient incentives in place to provide equal access. It is important to note that functional separation is a measure of last resort.

The proposal of functional separation was first introduced in the 2006 review (EC, 2006) and was welcomed by most, but not by all. For instance, the European Telecommunications Network's Operators Association (ETNO, see Appendix IV) argued for deregulation. ETNO (2007) believes that functional separation is: disruptive, discourages investments, damages harmonization, and innovation. Despite some critique, the measure was advocated in 2007 by the 27 national regulators in a unanimous decision.[9]

3.4.5 Next generation access

Next generation access (NGA) networks are networks based on new technologies that can handle high speeds, such as optical fiber and wireless technologies. According to the European Commission these NGA networks are the way forward and will replace inefficient traditional copper-wire networks (EC, 2009a). The proposals made by the Commission should preserve the incentives to invest and take into

[9] Functional separation had already been implemented in the UK since January 2006 where it triggered a surge in broadband connections (from 100.000 unbundled lines in December 2005 to 5.5 million 3 years later) which probably contributed to the unanimous opinion.

account the risks involved in allowing access to the NGA networks. The new proposed measures will ensure a fair return on investments (RoI) of NGA networks. The Commission also provides more detailed regulatory guidance on next generation networks. The specific regulation concerning NGA networks is discussed more extensively in chapter 4.

3.4.6 Digital dividend

The objectives of the EU are to enhance competition, to extend the broadband coverage, and to deliver better and more innovative services. Therefore the Commission has proposed a more efficient spectrum management which should add to economic growth significantly. The current division of the spectrum is believed to be scattered, wasteful, and inefficient. Due to technological developments a valuable part of the spectrum could be made available for other purposes. The full potential of the digital dividend can only be utilized by European harmonized approach. The frequency spectrum that can be made available originates from the switchover of wireless analogue to digital television. Thereby a part of the spectrum will become available for new purposes as digital transmissions are more efficient than analogue. The specific proposals concerning the digital dividend will be discussed more extensively in chapter 5 - Case: Digital Dividend.

3.5 Economics and regulation

In previous sections the historical development of sector specific regulation has been described. Using the economic models identified in chapter 2, the previous frameworks are briefly analyzed. Thereafter the proposals (RF'07) are discussed in more detail. This section provides research question 2b:

2b. What are the changes in the new (proposed) electronic communications framework, and are these proposals compatible with the economic principles?

The environment of the telecom market is constantly changing which calls for updated or new measures to secure competition in the market. Developments affecting the telecom market are various, and the motives on which proposals are made can also differ. This section analyzes whether the proposals are based on the economic principles and models. First briefly the previous frameworks are discussed and there after the proposals of the 2007 framework are discussed.

3.5.1 General telecom regulation

Whether the regulation since the 1990s is compatible with the several economic theories and perspectives is hard to determine as different levels of focus and detail can be taken. This paragraph will only determine, on a general level, whether the objectives of the regulatory packages were based on the economic principles or not.

The first regulation of the Commission focused on common technological development. Common technological development can reduce interconnection costs between networks (and countries). Secondly, it can reduce switching costs for consumers, if different operators use similar equipment.

Thereafter the Commission focused on the liberalization of the market. Liberalizing the market removed all exclusive and special rights of incumbent telecom operators, opening up the market for competition. Removing these special rights allowed new entrants to compete with the incumbent operator. The framework of 1998 (RF'98) focused on harmonization, which was seen as the solution to further remove

entry barriers and to stimulate competition. By further harmonization of equipment the step to common technological development was taken to the next level. The motive was to introduce competition by lowering the entry barrier (reducing switching and interconnection costs - ONP measures). The framework of 2002 (RF'02) focuses on the market changes, such as the conversion of ICT and Media. Another development is to safeguard key public interests in the electronic communication market. The scope was also broadened to include all electronic communication. The broadened scope was necessarily as unfair competition took place due to the convergence. Other measures were taken to modify the term dominance in the market. Thereby more market power was allowed, which can be seen as a change in economic perspective from the traditional classic (which until then clearly dominated, as the objective was to create perfectly competitive market) towards more modern economic perspectives. Other measures were to facilitate better European coordination, general authorizations, and more regular market assessments.

The general motives in the electronic communication market have been economically based. They attempt to increase competition by mainly reducing entry barriers (reducing network effects, reduce high fixed cost structure, reduce switching costs etc.). The RF'02 also includes other motives which seem more socially motivated, such as the protection of key public interests.

3.5.2 The new regulatory framework proposals

A number of introductory interviews were conducted with some specialists to make sure the right changes in the framework (RF'07) had been identified, see Appendix VII. The introductory interviews had two objectives. First, to make sure that the most important changes were identified. Second, to discuss whether these changes had been proposed based on economic or other motives. The identified motives of the main proposals will now be discussed.

3.5.2.1 Empowering European consumers

The proposals attempt to better protect customers and their user rights. These include the fight against spam, viruses and other cyber attacks, but also data protection and protection of personal information. The proposals are very similar to, or even are, public goods[10]. In the electronic communication sector the universal services, as the term indicates, intends to ensure that these services are available to all EU citizens. The legislation that provides the universal services are socially motivated, economically they often are not viable. Examples of universal services are a single European emergency number, the availability of affordable basic communication services for everyone, and improved accessibility for users with disabilities. An increasingly important issue in electronic communications is the protection from cyber attacks, spam messages, protection of networks, and the protection of data (privacy). These regulations are similar as national defenses, in this case European electronic communication 'defenses'. These measures for 'defense' can both be found in the universal services proposals as proposals for data protection. The protection of data protection and privacy are presently widely discussed.

[10] In economics public goods are considered to be goods and services that a market fails to provide; and therefore need to be provided collectively. There are two reasons that these goods should be provided collectively: non-excludability and non-rivalry. Public goods are non-excludability meaning that the goods cannot be confined to those who have paid for it. The second characteristic of a public good is non-rivalry; the consumption of one does not reduce the availability of goods to others

3.5.2.2 European telecom market authority for single market

The proposed mandate for the market authority should increase economic growth and provide competitive services to consumers. This could be accomplished by improving the quality and consistency of regulation, reinforcing cooperation between NRAs and the Commission, and providing expertise for regulatory issues linked to cross-community telecoms services. Improved, consistent, and better coordinated regulations are mainly internal optimization processes which – due to increased transparency – could reduce entry barriers. However, there seem to be other motives why a new market authority has been proposed beside the economic benefits.

3.5.2.3 Functional separation

The incumbent often has the most extensive network, and new entrants often depend on the incumbent's infrastructure for access and interconnection. Even now, the incumbent operators often dominate the national markets in terms of infrastructure and services. These incumbent operators both own the network infrastructure and provide services. Hence, there is no separation of the services activities and network activities. For the incumbent operators this vertical integration can have efficiency advantages, but it can also hamper competition. The NRA has a set of measures which it can be used to safeguard competition if it is lacking, in either the service or infrastructure markets. However, it is hard to determine when multiple regulated markets (wholesale and retail, services and infrastructure) are served by one (vertically integrated) company. One of the new measures proposed in the RF'07 is the tool 'functional separation'. This tool is specifically aimed at a dominant party that abuses its dominance and thereby hampers competition in the market. The intended effect of functional separation is to force a vertically integrated firm to become more transparent by separating its operations into infrastructure and services, without actually breaking up the company (which is called structural separation). By forcing more transparency it can more easily be determined if the dominant position is abused in the infrastructure of service market. It has to be noted that functional separation is a measure that a NRA can only use as a last resort; when all other measures have failed. The motive to introduce functional separation is to add transparency in the market, and increase or maintain its competitiveness. The measure is likely influenced by the economic transaction cost approach model (see Paragraph 2.1.5) which recognizes the efficiency gains of vertical integrated firms.

3.5.2.4 Relevant product markets

The measure of reducing the number of relevant markets is a separate recommendation of the Commission. This mainly affects the framework directive. The motives to reduce the number of markets could indicate an improvement of market performance, and thus competitiveness in the market. However, the reduction of the number of identified markets is made in the retail markets. These markets are considered to be competitive, but can probably only maintain competitive if wholesale regulation (in the local loop) is maintained. Moreover, retail markets were no longer regulated in most member states. Some relevant markets are merged into one; therefore regulation is not reduced much. Moreover nations can also identify relevant markets themselves beside the market identified by the Commission.

The proposals presented in paragraph 3.5.2.5 and 3.5.2.6 will be discussed in more detail as they concern the two subjects of interest: next generation access networks and the digital dividend.

3.5.2.5 Next generation access networks

The proposed NGA measures have several motivations. First, the proposals attempt to safeguard competition by extending the existing access regulation to NGA networks. Second, while safeguarding competition, the Commission also attempts to encourage infrastructure competition. Access is granted to the network of the incumbent (fiber of copper) to maintain competition. However, the incumbent than has no incentive to deploy new infrastructure as it has to bear the risks of the investment while it has to grant an alternative provider access to the network. Therefore, the high investments made, when access regulation is extended to NGA networks, can not as easily be captured as investments in conventional networks. However, the Commission intends to stimulate infrastructure competition by encouraging deployment of NGA networks, but recognizes the higher risks in deploying NGA networks, than deploying conventional networks with the proposed access regulation. Therefore a reasonable return on investment of NGA networks is proposed which covers some of the risk involved for the incumbent in deploying NGA networks.

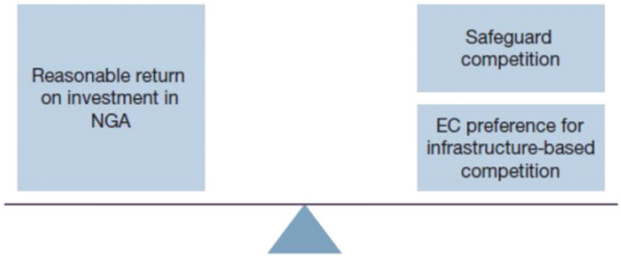

Figure 6: NGA regulation: A balancing Act [source: Analyses Mason, 2009]

Hence, the proposed regulation has resulted in balance between ensuring competition and providing an incentive for the incumbent to invest in NGA networks, see Figure 6. The motivation to safeguard and increase (infrastructure) competition is economically motivated. More competition between infrastructures will reduce prices and lower the effects of increasing returns.

Mandated access regulation attempts to reduce entry barriers and increase competition. However, mandated access regulation also interferes with the normal functioning of the dominant operator. Therefore a reasonable return on investment on NGA networks is provided to restore the investment incentives of the operator. This return on investment in NGA networks can be seen as a subsidy which according to Weimer & Vining (2004) can distort competition. One could argue to remove the access regulation and any subsidies, whereby the balance is also guarded. However, the resulting entry barriers would most likely prevent entry, and possibly prevent a competitive market in the future. There also seem to be other motives supporting the proposals. High-speed access to the internet, which can be provided on NGA networks, is increasingly seen as a utility service. And some believe that the lack of investments and roll-out of NGA networks is some sort of market failure, in which the government should intervene. The regulation is discussed in more detail in chapter 4.

3.5.2.6 Digital dividend

The digital dividend proposals aim to enhance competition, extend broadband coverage, and deliver better and more innovative services. This should be accomplished by more efficient spectrum management which should positively influence economic growth. The efficiency gains will allow other

markets to use (additional) spectrum. The frequency spectrum often is considered to be a scarce good as it is limited, and demand supposedly high. Thereby these markets can be stimulated by providing them with the scarce good of (additional) spectrum. The proposals aim to use the frequency spectrum in the best way possible, and thereby maximizing the potential added value. However, granting the spectrum to one market will also mean not granting it to another market. The markets involved are the broadcast and mobile broadband market. However, as the market has converged supporting one market also affects the other. The motives of the proposals are therefore economically motivated. However, some of the considerations for the proposals also have other motives, such as the measure to provide broadband access for everyone. This is discussed in chapter 5 in more detail.

3.6 Conclusion

The regulation of the electronic communications sector has mainly developed according to the economic principles. The (neo)-classical perspectives have mainly influenced the sector specific regulation. In the 1990s the main motivation for the proposed regulation was to transform the sector into a competitive market as soon as possible. The RF'02 and the proposals for the RF'07 also show other regulation which focuses on the protection of user rights and data. Moreover the proposals seem to be more based on dynamic economic models.

Designing and introducing new legislation in the European Union is clearly a process that takes much time. In addition, the time between a revision and the actual adoption can be several years. That is why the legislation often lags behind on actual developments. The new proposals are designed to anticipate future developments. Nevertheless, the legislation of the frameworks mostly addresses developments in the market which have already taken place (conversion of media and ICT market, roll-out of NGA networks). The latest developments can simply not be included at the latest moment[11]. Therefore legislation addressing novel technological or market developments concerning the telecom market occurs outside the regulatory framework (e.g. the NGA and digital dividend proposals).

The proposals for the RF'07 are much less radical compared to changes for previous regulatory frameworks. The new proposals seem to be mainly focused on establishing a new market authority. However, the proposals on the new market authority have been substantially slimmed down, whereby the framework is considered to be more an incremental update of the previous framework. New proposals concerning user rights, privacy and data protection also are important changes in the RF'07. However, the motives for these measures are not economically motivated but more socially motivated. The measures concerning the relevant markets mainly reside in the framework directive which determines dominance. However, in the Netherlands this will not change much. The proposals for functional separation also are based on economic principles, but the tool is probably not going to be used in the Netherlands.

The next generation access regulation seems to be in line with the economic principles, but is difficult to determine. The measure to safeguard competition, by mandating access, reduces entry barriers and

[11] The EC is entitled to modify its proposals at any time during the legislative process. This is an important part of the EC's right of initiative and explicitly foreseen in Article 250 of the EU Treaty. Modifying proposals will however slow down the legislative process, as the proposals will have to be discussed by all parties.

thereby stimulates competition, but also interferes with the incumbents business. The mandated risk premium to stimulate investments seems not to be in line with the economic principles. It can be argued that setting the access prices higher than competitive price level is a form of subsidy, which generally distorts competition. However, as mandated access interferes with the incumbents business, the investment incentive is restored by setting a risk premium. The measures of the digital dividend do seem to be based on economic principles, but clearly there have also been other motives. These two subjects of interest are discussed in more detail in chapters 4 and 5.

4. Case: Next generation access

In this chapter one of the new regulatory proposals is analyzed in more detail: the next generation access proposals. Research questions 3a and 3b are answered in this chapter:

3a. How do the actors affected by the electronic communications framework perceive the new changes in terms of future market developments?

3b. What are the expected effects of the regulatory changes and do they correspond with the effects intended by the European Commission?

To answer this question, first the scope of the next generation access proposals is determined based on consultation documents and a technical delineation, see section 4.1. Thereafter the goals or intended effects of the regulation are set out in section 4.2. The main question in this chapter is whether the goals will and can be achieved, which is analyzed in section 4.3. The analyses will use economic and policy literature to determine the effects of the regulation. The European regulation is tailored to each member state's situation. Therefore, to determine the effect of the regulation in the Netherlands, an analysis has been made of the Dutch market situation, see section 4.4. The analyses of the regulation and market are verified by means of interviews with various Dutch actors. The responses and conclusion are set out in section 4.5 which concludes this chapter.

4.1 Scope of next generation access market

Next generation access networks (NGAs) are networks based on new technologies which handle high speeds on, for instance, optical fiber networks. The term next generation access is not one technology or a specific service. The definition used in consultation documents and draft recommendations is:

> *"NGAs are access networks which have been substantially upgraded either wholly or in part, using existing local access infrastructures and technologies and/or using new optical fibre infrastructures, and which are capable of delivering broadband access services with bandwidths significantly above those currently widely available." (EC, 2008a, p.5)*

The definition contains four elements which are further discussed in the following paragraphs. Thereafter a synthesis of these elements combined is given. In addition, the technologies which are considered to be NGA networks are identified. The elements are: networks, broadband, and next generation Access.

Networks

In the European Union there are multiple network infrastructures. The three main fixed infrastructure solutions to connect customers and provide access are copper-, coaxial-, and fiber- networks. The core networks in Europe, consists for the most part out of fiber. The core networks (European-, National-, Regional- level) demand high speeds and need to cross long distances. Fiber networks are usually most cost efficient as they have very high capacities and almost no attenuation. Therefore these networks do not demand (much) additional active (expensive) equipment, in contrary to copper networks. Lower in the network hierarchy (the access network) the networks are also increasingly being replaced (or newly

rolled out) with optical fiber. Therefore the main differences exist in the last part of the network – the access network – which physically connects the consumer to the network, see Figure 7.

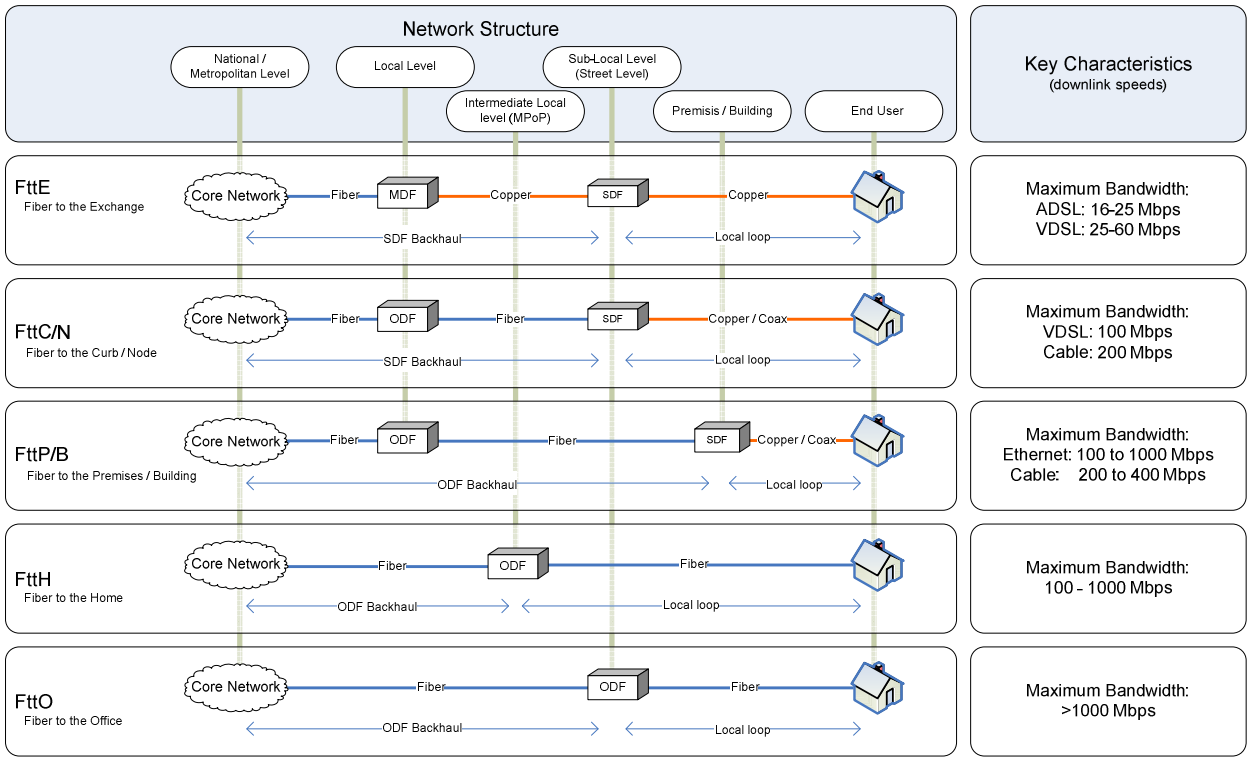

Figure 7: Network Structures and degree of fiber deployment [source: own research & Liberty Global, 2009]

The different networks also use different technological standards on their transmission lines (copper, coax, fiber). The standards used depend on the transfer point of fiber to another transmission medium. As depicted in Figure 7, in Fiber to the Exchange topology (FttE), copper is used to connect the Main Distribution Frame (MDF) to the Sub Distribution Frame (SDF) and finally to the end user. The used standard in this case is often ADSLx[12]. The downlink speeds that can be delivered on an FttE-copper hybrid network based on ADSLx technology is approximately 25Mbps[13]. Some operators also offer VDSL[14] via the MDF whereby downlink speeds can be offered of 60Mbps. However, the capacity depends greatly on the distance of the customer to the MDF. The 60Mbps downlink speed offered is likely to be a best case scenario.

In case of a Fiber to the Node/Curb network topology (FttN/C) is used, than copper or coax is only used from the SDF to the consumer. Therefore the distance that has to be crossed is smaller and higher downlink speeds are possible as there is less attenuation. The VDSLx standard can reach maximum downlink speeds of 100Mbps. This topology is also often used by cable-operators which have deployed coax to the end user. Since the infrastructure of Cable operators is supposedly closer to the consumer,

[12] ADSL stands for Asymmetric Digital Subscriber Line, the 'x' is used because there are several updates of the initial ADSL standard such as ADSL2 and ADSL2+

[13] Mbps stands for the number of bits that can be transferred in a second, in this case Mega bits: 2^{10} bits (Gbps means Giga bits – 2^{20} bits per second.

[14] VDSL stands for Very-high-bitrate Digital Subscriber Line

and coax supports higher capacities over greater distances, high speeds can be achieved. A widely used standard for coaxial networks is the Data Over Cable Service Interface Specification standard (Docsis). The latest version in Europe is EuroDocsis 3.0 which can reach maximum downlink speeds of 200Mbps, even 400Mbps with 8 channels. When networks have a Fiber to the Premises/Building design (FttP/B), the fiber connects to an Optical Distribution Frame (ODF) where the distance to the customer is small. Thereby high speeds can be offered both on copper (Ethernet) and coax networks.

The last network topologies are Fiber to the Office (FttO) and Fiber to the Home (FttH) which uses fiber to connect straight to the consumer. The maximum downlink speeds of fiber are a very high which can exceed speeds of 1Gbps.

Broadband

The term 'broadband' normally indicates a network with high capacity. If the band, on which information is sent, is larger (e.g. broader), more information can be transmitted on it. The bandwidths for NGA networks should significantly be above those currently widely available according to the definition. However, the bandwidths widely available differ significantly between the different member states. The average advertised downlink speed to the end user in the OECD countries is about 20Mbit/s (OECD, 2009). In addition, bandwidths strongly depend on the transmission medium used and the network topology. Cable Europe, in its reaction to the second NGA consultation (EC, 2009a) link the NGA definition to the definition of the draft broadband state aid guidelines[15]:

> *"Only VDSL, Cable and FttH will then be able to provide sufficient bandwidth to deliver multiple high-bandwidth applications….[…] …as being a first step towards the FttH networks and providing similar services as the cable networks based on EuroDocsis 3.0 cable modem standard, any network built upon the VDSL or VDSL2 technology should also be expressly included in this definition" (Cable Europe, 2009, p. 6-10)*

This leads to the conclusion, conform the view of Cable Europe, that VDSL networks should be included. However, only when a VDSL networks is offered based on an FttN/C and not an FttE design. Thus, the minimum that can be considered a NGA network is a VDSL network based on an FttC/N network design which can approximately provide 100Mbps downlink speeds.

Next generation access

The 'access networks' normally indicates the last part of the network that connects the consumer to the network. Next generation access networks are those infrastructures that have substantially been upgraded to provide higher bandwidths than average. The VDSL standard requires fiber to be deployed to the ODF, which requires new equipment to be installed. Thereby the network is indeed upgraded – as the definition of NGA requires. However, the technology is more seen as a transition technology to bridge the gap to a full fiber network (FttH/O) in the Netherlands. In case of FttH, the complete infrastructure is rolled out by fiber which requires substantial investments. Thereby the MDF becomes obsolete. The cable operators in the Netherlands have upgraded, or are upgrading their networks, to support EuroDocsis 3.0 which can handle higher bandwidths. Thereby the backhaul network has to be

[15] State Aid Broadband Guidelines: (EC, 2008b; EC, 2009b).

upgraded as well, which is usually done by FttP deployment in combination with coaxial local loops. Upgrading the coaxial networks requires fiber deployment to a local ODF and new active equipment.

The coaxial networks are based on a different technology which is incompatible with the (former) xDSL networks[16]. Thereby cable / coaxial networks are difficult to interconnect with the DSL based networks, and rarely do so. As there are no cable operators that have dominance, the cable operators also do not have to provide broadband access to other operators.

NGA networks

Given the definitions of networks, broadband, and next generation access the following networks are considered to be NGA networks:

Next generation access networks are networks based on the technology standards VDSL (in an FttC/N situation), Coax networks with EuroDocsis 3.0, and fiber networks (FttH).

These networks all have downlink capacities to the end user of approximately 100Mbps or higher. All these networks require investments and further deployment of fiber, to the end user, in the backhaul network. Thereby they comply with the definition presented by the Commission. The only uncertainty is whether VDSL networks are really 'next generation'. VDSL networks are generally seen as a intermediate step for full-fiber deployment (FttH) and are also not considered to be future proof (Telecompaper, 2009a) given that the demand for capacity keeps increasing (Dialogic & TNO ICT, 2009). This party also applies to cable based network, but they can more easily be upgraded incrementally and already offer speeds much higher as VDSL networks. Most believe that FttH is the end game, but meanwhile hybrid fiber-copper networks (FttN, FttB) allows fiber roll-out with a shorter time to market (EICTA, 2009), and will probably be around for some time.

4.2 Goals and Regulation

It is important to determine the motives and objectives of the Commission regarding NGA networks before the proposals for change will be discussed. The Commission has a number of goals which they wish to accomplish. The remedies proposed should, naturally, lead to the accomplishment of these goals.

The NGA proposals have been presented in two draft recommendations (EC, 2008a; EC, 2009a). The first draft recommendation was presented in an open consultation document on which stakeholders could give their responses (see Appendix IX). Based on the responses on the first consultation and other regulatory and market developments – such as the decision on relevant markets (EC, 2007b) – a second draft document was made. The second consultation is based on numerous contributions of stakeholders, such as the views of operators, NRAs[17], the European Parliament, and the European Council. The second consultation is also based on new market developments and the notifications from NRAs relating to the newly defined relevant markets (especially markets 4 – wholesale access to the

[16] The dominant (incumbent) operator in the EU normally deploys fiber networks as a replacement of their xDSL networks. These networks are structured in a way which is often incompatible with the technologies used for cable networks which are 'broadcast' based.

[17] NRA stands for Nation Regulatory Authorities, the Dutch NRA is OPTA, see Appendix IV.

local loop, and market 5 – wholesale access, see Appendix VIII) (EC, 2007b). Given the new developments and perspectives the Commission has made use of the views and contributions of all interested parties on the new draft document. The new draft recommendation differs much from the first draft recommendation. There are two sets of objectives, the more general and the more explicit objectives. The general objectives are:

- Further develop the European economy
- To stimulate economic growth in Europe
- To come to a single European market
- Maximize the benefits for consumers
- Contribute to the goals of the Lisbon agenda[18]

The progress of the Lisbon Agenda was evaluated in 2004 which concluded that the results until then were disappointing. Therefore the Commission urged the member states to give the Lisbon Agenda a new start. Therefore the Commission defined three priority areas of which two clearly have had influence in setting the objectives regarding NGA networks:

- Investments in networks and knowledge
- Strengthening competitiveness in industry and services

The general objectives of the NGA proposal have, to a large extent, been influenced by the objectives set in the Lisbon agenda and the preliminary evaluation of the Lisbon agenda in 2004. Other factors which influenced the proposed regulation are recent market developments, such as: the conversion and technological innovations, and changes in network topologies and services. The more explicit objectives set in the draft recommendation(s) and consultation document(s) are:

- Creating (more) infrastructure competition. (Entry, interconnection, product differentiation), and thereby choice for consumers (EC, 2009a, pp. 4-6).
- Promote innovation and investments in NGA networks by reinforcing existing regulation and promote efficient investments in new optical fiber networks taking into account the risks involved (EC, 2009a, pp. 2-6).
- Creating regulatory certainty by preventing undesirable divergences of regulatory approaches trough harmonization. Especially creating consistent remedies to operator who has Significant Market Power (SMP). Thereby guiding the transition to NGA networks in a timely and efficient manner (EC, 2009a, pp. 2-3).

General and Explicit goals

The first question, before analyzing the NGA proposals, is whether the general objectives can be reached by pursuing the explicit objectives. From an economic perspective the objectives, such as development of the market and maximizing benefits, can be accomplished by stimulating growth.[19] The

[18] See Appendix VI for an overview of the Libson Agenda

[19] From a growth accounting perspective the determinants for economic growth according to Cobb & Douglas, 1928) are: labor (L), productivity (A), capital (K), and innovation (α) in the following relation ($Y = A * K^{\alpha} * L^{1-\alpha}$). Increasing investments (capital) and innovation thus leads to economic growth. Important to note is that growth accounting can not account for all the increase of economic growth, but it is wildly recognized that these factors

NGA proposals therefore mainly focus on increasing investments. ETNO supports the view that investments in NGA will stimulate European economical development:

> *"The world is now facing an economic and financial crisis. The ICT industry, given the right conditions, could play a major role in overcoming this crisis by channeling investment to high-speed fiber access networks. It is widely acknowledged that such investments would positively effect productivity growth, the competitiveness of EU businesses and eventually help to preserve and create employment in the EU. […] Over the past 35 years investments in modern telecommunication infrastructure in the OECD area has generated significant economic growth." (ETNO, 2009, p2)*

It is argued that by pursuing the explicit goals of encouraging innovation and investments growth and thereby development of the European economy is achieved. Increased investments in infrastructure should also increase the competitiveness of the market, and thereby maximize the consumer surplus and maximizes the benefits for consumers. The proposals also create a single approach for NGA networks by which regulatory certainty should be created. Therefore the general objectives could be reached by pursuing the explicit objectives.

4.3 NGA Regulatory Proposals and Objectives

In order to accomplish the objectives a number of remedies are proposed concerning NGA networks. First the objectives concerning infrastructure competition are analyzed and defined more clearly in relation to a newly presented (economic) theory in Paragraph 4.3.1. Thereafter the NGA proposals are set out in paragraph 4.3.2 and 4.3.3. In paragraph 4.3.4 the goal of regulatory certainty is analyzed as regulatory certainty has to be evaluated based on all remedies. Finally, in paragraph 4.3.5 the Dutch proposals concerning NGA networks are discussed.

4.3.1 Infrastructure competition

One of the main objectives of the NGA proposals is infrastructure competition. Infrastructure competition is nothing more than competition between infrastructures. Infrastructures are generally constructed hierarchically. Several levels can be identified in fixed telecommunication networks (National, Regional, Metropolitan, Local, sub-local, and some intermediate levels). Infrastructure competition can take place on one or multiple levels. In telecommunications the main infrastructure competition takes place in the access part of the networks which is the main competitive problem area. The higher network levels (National, Regional, and Metropolitan) in the Netherlands are mainly fiber based, and duplication is relatively not so expensive. Infrastructure competition can be stimulated by two actions which can take place on one or multiple levels:

- Deployment of new infrastructure
- Upgrading network infrastructure

Ladder of investment

Infrastructure competition is thought to be more sustainable than service competition. The so called service competition in which competitors resell services fails to provide consumer with: choice, variety, low prices, and innovation (Cave, 2006). Therefore infrastructure-based competition is stimulated and

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(A,K,L,α) determine economic growth for a large proportion. By increasing one of the factors, the output - economic growth - is increased.

encouraged. In the past policy was designed according to the ladder of investment principle. The ladder of investment principle encourages operators to make investments in network assets which are less and less replicable. Cave (2006) identifies several levels of networks assets and their corresponding level of replicability, see Figure 8.

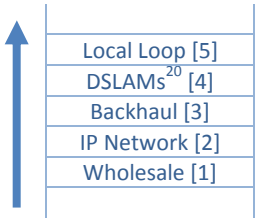

Figure 8: Ladder of replicability for broadband [source: Cave, 2006]

The lowest step is called 'wholesale'; which is the reselling of services to others on the network of the incumbent. This does not involve any infrastructure of the reselling party at all [1]. The next step up the ladder is providing wholesale services over an IP-network. At that step an alternative operator connects somewhere to the core network of the incumbent, and uses the incumbent's network to provide services to its customers. The European Commission has defined these wholesale products as a relevant product market - Market 5.[21] The next step up the ladder is that the alternative operator provides its services on its own core and backhaul network. The remaining part of network to the customers is again used from the incumbent. The backhaul network connects to the DSLAMs[22] at an MDF location [4]. Usually each operator has to install their own DSLAMs, although theoretically these could be rented from the incumbent. Therefore step [3] and [4] are often taken at once. The DSLAMs can easily be upgraded to support new features.

The European Commission has identified another relevant product market on this level - market 4, which is called wholesale access to the local loop as merely the local loop of the incumbent is used. The last step up the ladder is to own the complete infrastructure, including the local loop. In this case products can be offered to customers directly without interference of another provider, most incumbents are situated on this step.

The ladder of investment principle allows new entrants to start up their business on a wholesale level and slowly climb up. Existing operators can also climb the ladder in the same way. As market share and customers have been gained, any revenue can be reinvested in upgraded or new infrastructure, or as Cave (2006) describes:

> *"The key is the encouragement of investment both by the historic monopolist and by entrants. The latter may have to acquire capital assets progressively, as they acquire customers and revenues. This approach has been linked to climbing the ladder of investment. [...] In order to enable a step by step increase of*

[20] DSLAM is a typical term used in xDSL based network, however in fiber or cable networks there are equivalents for the DSLAMs. The term is used for convenience, but it has to be kept in mind that the model also applies to other networks.

[21] See Appendix VIII where the relevant markets are discussed in more detail.

[22] DSLAM stands for Digital subscriber Line Access Multiplexer which aggregates all the signals and distributes them to the end users – DSLAMs are designed for the copper networks.

investment the NRAs must regulate prices of the various access products consistently…." (Cave, 2006, p224)

The Commission has identified two levels on which alternative operators can gain access to the network of the incumbent operator. These can be linked to the ladder of investment and the network modes identified by Bijl & Peitz (2002). These levels are distinguished by means of relevant product markets. In case of the NGA regulation these are market 4 and 5. Access regulation for market 5 - *service based wholesale access over the IP network* – can be linked to the IP Network level [2]. Thereby an alternative provider can interconnect to the incumbent's network at the core locations (which is discussed later on in more detail in Paragraph 4.4.1). Access regulation in market 4 – *Access to the terminating segment* – can be linked to the local loop level of the ladder [5]. The alternative operators then interconnect at the MDF locations, and use the local loop of the incumbent operator.

Technically even more access products are possible. For example an intermediate level between the wholesale access products and dark fiber is possible. Access to the local loop could then be provided at by sharing time slots (TDM – Time Division Multiplexing) or frequencies (FDM – Frequency Division Multiplexing) techniques.

4.3.2 NGA proposals in the Local Loop

The levels of access and corresponding NGA proposals can better be analyzed by a top-down approach of the ladder of investment, thus starting with the local loop. The assumption is made that the incumbent is dominant, which also the case in both relevant product markets for the Netherlands (market 4 & 5). Hereafter when referring to the incumbent, the operator which has dominance is meant.

Civil engineering infrastructure works

As established by the theory of the ladder of investment, the local loop is least replicable. Therefore not all operators deploy their infrastructure up to the end user. To encourage operators to deploy their own infrastructure in the local loop, in stead of using the infrastructure of the incumbent, access is granted to the civil engineering infrastructures of the incumbent (e.g. ducts, bridges, tunnels, manholes, network access points).

According to the NGA proposals it should be determined whether operators have civil engineering infrastructures that can be used by other operators when one or more operators is dominant in market 4 (wholesale access to the local loop). If there is a dominant operator, alternative operators should be allowed to use these civil engineering infrastructure works to deploy a NGA network infrastructure. The task of the NRAs is to communicate information about location and capacity of these infrastructure works, such as ducts and other infrastructure works. Based on market demand, access to these civil engineering infrastructures should be mandated at cost oriented prices (by mandating reference offers). The proposals also mandate that when new civil engineering infrastructure works are constructed by the incumbent, sufficient capacity should be installed so that other operators can also make use of these facilities. The dominant operator(s) therefore have to provide detailed information on the access network architecture and determine (in consultation with access seekers) the viable access point to the terminating segment.

Multi Fiber

Another measure to circumvent the replicability problem in the local loop is deploying multi-fiber solutions. When an operator with dominance deploys fiber in the local loop, they are encouraged to deploy multiple fiber lines. These additional lines, which the incumbent will not use, can then be used by alternative operators. Thereby services can be provided to the consumer on separate fibers by different operators simultaneously.

The NGA proposals state that, where possible, the incumbent needs to be obliged to deploy multiple fiber lines in the terminating segment. The cost oriented access obligation should not be imposed by the NRA when: the dominant operator deploys FttH with multiple fiber lines, grants fully equivalent access to at least one independent alternative operator in the downstream market, or has jointly with an other provider deployed a network. However, when anti-competitive behavior, such as collusion, takes place on FttH networks based on multiple fiber lines, cost-oriented access should be imposed.

The multi fiber proposals are based on the Swiss and Slovakian model, where multi fiber roll-out is already taking place. The multi fiber line solution might stimulate infrastructure-based competition as it provides an alternative solution for the replicability problem in the local loop. Thereby the natural monopoly that emerges when the incumbent deploys FttH based on single fiber lines can be prevented. The multi-fiber line solution is less relevant in member states that already have duplication in the local loop by for instance cable infrastructure.

Fiber Networks (backhaul and local loop)

First of all, where fiber is deployed in the access network on greenfield sites[23], NRAs should not require the dominant operator to additionally deploy a parallel copper networks in order to meet its existing obligations (universal service obligations). Where the incumbent deploys FttH, access to the local fiber loop should be mandated including supporting measures assuring co-location and backhaul. Therefore access should be provided at the most appropriate point in the network, normally the MPoP (Metropolitan Point of Presence). Access should be mandated irrespectively of the network topology implemented by the incumbent. Also, the existing reference offer should be complemented to include unbundled access to the fiber loop. The price for access to the unbundled fiber loop should be cost oriented, but should include the investment risk incurred by the dominant operator.

Where FttN is deployed by the incumbent, access should be mandated to civil engineering infrastructures. NRAs should impose obligations to meet reasonable requests for unbundled access to the copper sub-loop. However, access to the copper sub-loop, where appropriate, should be supplemented by backhaul measures, such as: fiber and Ethernet backhaul, ancillary remedies, non-discriminatory access to facilities, or else virtual co-location. When access to copper sub-loop unbundling is imposed the incumbent should complement the existing local loop unbundling reference offer with all necessary items, the prices should be cost oriented.

The main impact of the proposed NGA regulation concerns the proposals for FttH and FttN. Deploying FttH networks is considered to be risky. The risk of deploying fiber networks consists of a number of

[23] Sites where there is no fixed infrastructure available at all (also see Box 4, paragraph 4.4.2.)

elements. First the incumbent usually has a widely spread copper network by which it has a large installed customer base, fiber deployment often is a duplication of this infrastructure. Second, deploying fiber networks requires high investments and the investments are long term. Third, it is unclear if there are any services that require NGA infrastructure that can not be offered on copper networks. Fourth, it also remains the question whether there is any consumer demand for NGA networks and its new capabilities, and more important are willing to pay (more) for it. Last, the copper network can still be enhanced to increase its capabilities.

Because of these risks, and especially the last one, the Commission has proposed cost oriented access with an additional risk premium for access to the local fiber loop. When an alternative provider wants to use the local fiber loop, it has to pay an additional risk premium that allows the incumbent to appropriate some of its risks / investment costs.

Migration

Another main issue is that due to FttH and FttN deployment the network topology of the incumbent will change. The changes affect the alternative operators as they interconnect to the network on core level, or on Local level (MDF). In the terminating segment the MDF locations will be removed and new interconnection points are then constructed closer to the consumers. Thereby more interconnection points are required to access the same amount of end-users. Alternative providers currently making use of access to the terminating segment are therefore forced to adapt / extend their network to interconnect. The NGA proposals therefore include regulation for the migration to NGA network topology and interconnection. The proposals state that access obligations for the incumbent should remain the same, even if there is a change in network topology or technology unless an appropriate migration path is agreed upon. If such an agreement is not reached, the alternative operator should be informed five years in advance before interconnection points will be decommissioned. This announcement period could be shortened if equivalent active access is provided by the incumbent.

4.3.3 Wholesale NGA proposals

The relevant product market, and the second step of the ladder of investment [2], is wholesale access to the IP network, also called wholesale broadband access (WBA) product market. The NGA proposals for WBA mandate that where dominance is found in market 5, WBA remedies should be maintained, or amended for chain substitutes. VDSL networks are considered to be a chain substitute. Therefore the WBA regulation also applies to changed network topologies, such as NGA networks based on VDSL technology. The NRA needs to decide whether cost orientation is mandated to the WBA product market. If cost orientation is not mandated, the pricing behavior of the incumbent should be evaluated to ensure sufficient margin to maintain effective competition in the downstream market. As new NGA networks are being deployed, the NRAs should oblige the incumbent to make new wholesale broadband access products. These products should be based on the NGA network capabilities to enable alternative operators to compete effectively. Therefore the appropriate technical specifications for wholesale broadband access products provided over NGA networks should be defined. Second, NRAs should not impose an obligation of cost orientation where the incumbent has jointly – with at least one other provider of electronic communications services competing on the downstream market – deployed an FttH network based on multiple fiber lines. Third, NRAs should analyze whether an obligation of cost

orientation on mandated wholesale broadband access is necessary to achieve effective competition in case functional separation or other forms of separation are applied. Finally, NRAs should normally not impose an obligation of wholesale bitstream access if there is effective access to the unbundled fiber loop of the incumbent's network, and that such access is likely to result in effective competition on the downstream market.

To summarize: the main changes presented in the proposals are that wholesale broadband access products have been extended to include NGA networks. Whether an NRA should impose remedies depend on whether effective competition is maintained on the downstream market. Therefore the incumbent has to comply with certain obligations. Also there are a number of exceptions when cost orientation should not be mandated for the wholesale access products, such as any form of separation of the incumbent's business and any joint deployment of fiber.

4.3.4 Regulatory Certainty

An important aspect of investment decisions is certainty. Two types of certainty are distinguished: the first is regulatory-certainty and the second is market-certainty. The analyses of market-certainty requires some more indebt analyses of the Dutch market and which will be discussed in section 4.4. One of the objectives of the Commission is to establish increased regulatory certainty throughout Europe by harmonizing the regulatory approaches on which NRAs base their regulatory remedies. Harmonization of regulations among the member states alone does not create regulatory certainty; the regulation itself also needs to comply with several conditions. On European level the reactions to the draft recommendation question whether the proposed NGA proposals, such as access and price regulation will work at all, and thereby also create uncertainty as regulation is therefore likely to be changed in the future.

An important aspect to regulatory certainty is the consistency of regulation. If the regulation is more consistent with the old regulation, the more certainty it will provide. Maintaining regulatory consistency and certainty in the European Union is difficult as the member states have large differences in terms of electronic communication infrastructure(s) between them. These large differences present problems for a single uniform regulatory approach. Therefore the regulation is designed to be as specific as possible, but allows flexibility for the NRAs so that they can tailor regulatory remedies to national situations.

Regulatory certainty also implies consistent regulation over longer time periods. The regulatory time-scale of the NRAs are determined by the Article 7 procedure by which the NRAs need to conduct a market analyses to determine if there are operators who have dominance. If operators have been found to be dominant in one or multiple relevant product markets, remedies can be imposed by the NRA. These market analyses take place every three years. However, European Commission can issue new regulation and decisions at any time. Therefore NRAs, which mainly depend on their market analyses, can not guarantee long term certainty. Adding to uncertainty is the time it takes to implement European legislation into national law, and the legal procedures that often follow implementation. However, to increase regulatory certainty and consistency the Commission and NRAs both make best efforts to make sure new regulation is as consistent as possible with the previous regulation.

Regulatory certainty also depends on the transparency and complexity of the regulation. Complexity in regulation is increased by the amount of regulation and the number of exception is regulatory remedies. A concern is article 12 of the framework directive which in combination with the proposed NGA regulation can impose symmetric regulation on all investors of NGA networks, regardless of their market positions.[24] Increased complexity is also induced by other related legislation, such as: the state aid guidelines (EC, 2008b; EC, 2009b) and relevant market definitions that are used in the Article 7 procedure of the framework directive. The degree that state aid is allowed will influence investment decisions in the market. This adds a new level of complexity which is induced externally to the proposed regulation, but also has to be taken into account.

4.3.5 Dutch NGA Regulation

In this paragraph the goals of the proposed NGA regulation are analyzed in relation to the Dutch market. The Netherlands has, in advance of the NGA recommendation and RF'07, implemented regulation concerning NGA networks. In the design of the Dutch regulation the developments of the Draft recommendation have been taken into account. Therefore the Dutch NRA does not expect that any (large) changes that have to be made for implementing the new framework and NGA recommendation.

Access to the Local Loop in the Netherlands – Market 4

The Dutch NRA makes a few distinctions in the relevant product markets and NGA regulation (OPTA, 2008; OPTA, 2009a; OPTA, 2009b) that the European proposals do not. For regulated access to the local loop a distinction is made between access to FttH and FttO networks, despite that the relevant product market and network topology is similar. In both cases the incumbent provides access to its local fiber loops infrastructure. However, the costs that the incumbent can charge for access to its local fiber loop networks differ for FttO and FttH networks. The Dutch NRA determined that wholesale access to the local loop for businesses (FttO) is competitive enough, and roll-out is market driven. However, there is some discussion whether the FttO-market can be considered to be part of the same market as FttH (Telecompaper, 2009b; Telecompaper, 2009c; Telecompaper, 2010a). Finally this has resulted in the abolishment of two decisions (OPTA, 2009a; OPTA, 2009b); wholesale access to the local loop, and unbundled fiber access - non-FttH (CBp, 2009). The new decisions have not changed much, but now focus specific on FttO networks. (OPTA, 2010a; OPTA, 2010b). By the decision the incumbent must charge prices for FttO access by means of an EDC/WPC[25] cost calculation method, which is a standard method for calculating the prices for mandated access (OPTA, 2010b). Thus, the price for access to the FttO local loop is cost oriented whereby alternative operators can compete with the incumbent.

FttH networks differ from FttO networks as fiber is mainly rolled out in a different way. The roll-out of FttH has only just started and the scale of deployment is much higher. Moreover the costs for wide

[24] Art. 12 states that where access is deprived on an alternative basis due to the need to protect the environment, public health, public security or to meet the town and country planning objectives; the sharing of facilities or property can be imposed; see amendment 14 on Article 12 of Council Common Position of 9 February 2009, 2007/0247 (COD).

[25] Discussing the different pricing mechanism is beyond the scope of this thesis. The basic principles of access pricing are summarised in Armstrong (2002), Vogelsang (2003) and Zarakas (2005). The EDC/WPC calculation method is considered to be the standard method for calculating the tariffs for access to a network by an alternative operator. The prices are mainly based on investment costs of the incumbent.

spread (highly penetrated) fiber networks are high, which is not the case for FttO which only connects a limited number of users directly. The 'standard' EDC/WPC calculation method is therefore not suited and the access prices for FttH are calculated differently (OPTA, 2010b). The investments risks in general are also higher compared to conventional copper networks (long term investment, high initial investment costs). Therefore the FttH access regulation is based on another cost model so that the incumbent can more easily appropriate some of its risk of investment by the Internal Rate of Return (IRR) calculation method. Thereby the incumbent can ask higher prices for FttH access. The difference in price models should simulate the incumbent to deploy FttH networks in stead of conventional networks.

In case of FttC the incumbent is also obligated to provide access to the local sub loop for cost oriented prices as well as to the SDF backhaul, see Figure 7. The Dutch NRA has concluded that the incumbent is the only one who offers SDF backhaul, and therefore the same competition problems exist for unbundled sub-loops as for unbundled local loops. The dismantling of SDF or MDF location will only be allowed by approval of the Dutch NRA, whereby a reasonable transition period for dismantlement is used.

Wholesale Broadband Access of the IP network (WBA) in the Netherlands – Market 5

On market 5 the Dutch NRA has also imposed regulation for access. For WBA a distinction is made between Wholesale Broadband Access of High Quality (WBA-HQ) and Wholesale Broadband Access of Low Quality (WBA-LQ). WBA-LQ is mostly used to provide services to consumers, WBA-HQ are almost only used by businesses as it is much more expensive (see Box 3). The regulation imposed by the Dutch NRA does not regulate the WBA-LQ market for fiber, and thereby the incumbent does not have to provide access to alternative operators.

Box 3: High Quality WBA vs. Low Quality WBA

The distinction between WBA-HQ and WBA- LQ depends on the overbooking factor. WBA-HQ has an overbooking factor of 1:1 to 1:20, and WBA-LQ has an overbooking factor of 1:20 and higher. The ratio indicates the number of users by which the capacity has to be shared. For example when a customer of firm has a connection of 10Mbit/s with an overbooking factor of 1:1; the customer has a guaranteed connection of 10Mbit/s. If a customer has a connection of 10Mbit/s with an overbooking factor of 1:10; the customer has a guaranteed connection of 1Mbit/s, and shares the connection. If other users do not use their connections, a capacity of 10Mbit/s will be available. Operators use the overbooking factors to reduce costs, and because home consumers rarely require the full capacity of a connection.

Implications Dutch regulation

The regulation in the Netherlands has lead to the following cost calculation methods for the different relevant markets and network topologies, see Table 2. Because the WBA-LQ market is not regulated for fiber, the Dutch NRA hopes to stimulate fiber infrastructure roll-out by the alternative operators. This could be the only way for alternative operators to reach its customers and offers higher speeds. If this market was regulated, alternative operators would most likely interconnect to the incumbent network on a *Regional* or *Metro* level for cost oriented prices. By not regulating WTB-LQ for fiber, the alternative operators have two choices. Option one is to negotiate interconnection with the incumbent, but whether the alternative operator is allowed to connect – and on which terms – depends fully on the incumbent. The second option is to deploy their own network to a lower level in the network hierarchy so that they can use access to the local loop, or deploy their networks directly to the consumer. The further the alternative extends its network, the more investments will be required.

Market			Access Obligation	Tariff Calculation Method
4	Consumer	Copper	Yes	EDC/WPC
		FttC	Yes	EDC/WPC
		FttH	Yes	IRR (Internal Rate of Return) cost calculation method.
	Business	Copper	Yes	EDC/WPC
		FttO	Yes	EDC/WPC
5	WBA-LQ (B2C)	Copper	Yes	EDC/WPC
		Fiber	No	No
	WBA HQ (B2B)	Copper	Yes	EDC/WPC
		Fiber	Yes	EDC/WPC

Table 2: Access cost calculation methods

The WBA-LQ regulation in combination with the access regulation for fiber networks in the local loop forces alternative operators to invest in their networks when the incumbent decided to upgrade its network and thereby changes its network topology. Recently there are signs that the incumbent, under pressure from the alternative DSL operators and the current real-estate market, might upgrade its network without changing the interconnection point. Thereby the alternative operators would not be forced to deploy additional infrastructure to interconnect. However, additional investments are likely as DSLAMs of equivalents need to be upgraded

4.3.6 Synthesis

In general the proposals can be seen as an update of the previous framework, such as the proposals for mandated access to the local fiber loops. The NGA proposals contain a number of exceptions to the previous regulation such as the access and tariff regulation of NGA networks. The main exceptions are based on: return of investments for fiber access, and multi fiber in the local loop which has an effect on access and price regulation in both markets 4 and 5. Another exception in price regulation is proposed when fiber is deployed based on a cooperation between the incumbent and another operator. For NGA networks the normal price regulation will not provide (or even hamper) investments in networks and thereby hamper competition. Therefore the proposals depart from the normal cost calculation method to determine access prices. The proposals suggest a special pricing mechanism (IRR-cost calculation method) for access to the fiber loop, which accounts for investment risks of deploying fiber.

The Dutch proposals adopt the calculation method for the fiber local loop, but also make a distinction between wholesale broadband of high- and low- quality. The wholesale broadband access regulation of high quality is regulated the same for copper and fiber. The wholesale broadband access market of low quality is regulated differently. Thereby investments in infrastructure and roll-out should be stimulated, but the measures depart somewhat from the ladder of investment principle.

4.4 The Dutch telecom market

The market situation in The Netherlands has a large influence on the attainability of the goals set in the proposed NGA regulation. Therefore the Dutch market is discussed in more detail. First, Paragraph 4.4.1 discusses the main infrastructure operators in the Netherlands and provides an analysis of the competitive situation in relation to investments. Second, Paragraph 4.4.2 discuses the competitive situation in relation to investments and the position of the Netherlands in Europe. Finally, Paragraph 4.4.3 discusses the influence of the market situation on regulatory certainty.

4.4.1 Dutch Telecom Operators

The Incumbent:

OPTA (the Dutch NRA) has determined by its market analyses that KPN is dominant in multiple relevant markets in the Netherlands. KPN is also the incumbent operator in the Netherlands. Because the incumbent is dominant in several markets it has to comply with the *ex ante* regulation (The incumbent is dominant in market 4 and 5, see Appendix VIII). The incumbent has an extensive network with nationwide coverage. In 2005 the incumbent presented a strategy which consists of a plan to upgrade its network. This implies that its (copper / fiber) ATM[26] switched based network is changed into a packet switched 'ALL-IP' network. To make the transition from an ATM based network to an ALL-IP network the network topology has to be changed. The existing ATM switching locations will be dismantled together with the MDF locations where many alternative DSL operators are interconnected. From the 1361 MDF locations, only 130 to 200 locations are planned to remain. In total approximately 28000 ODF/SDF locations would be deployed. The transition for KPN will result in improved efficiency and capacity. However, the transition poses problems for the many (competing) alternative DSL operators which depend on the incumbent's network for sub loop unbundling (SLU) and wholesale broadband access (WBA).

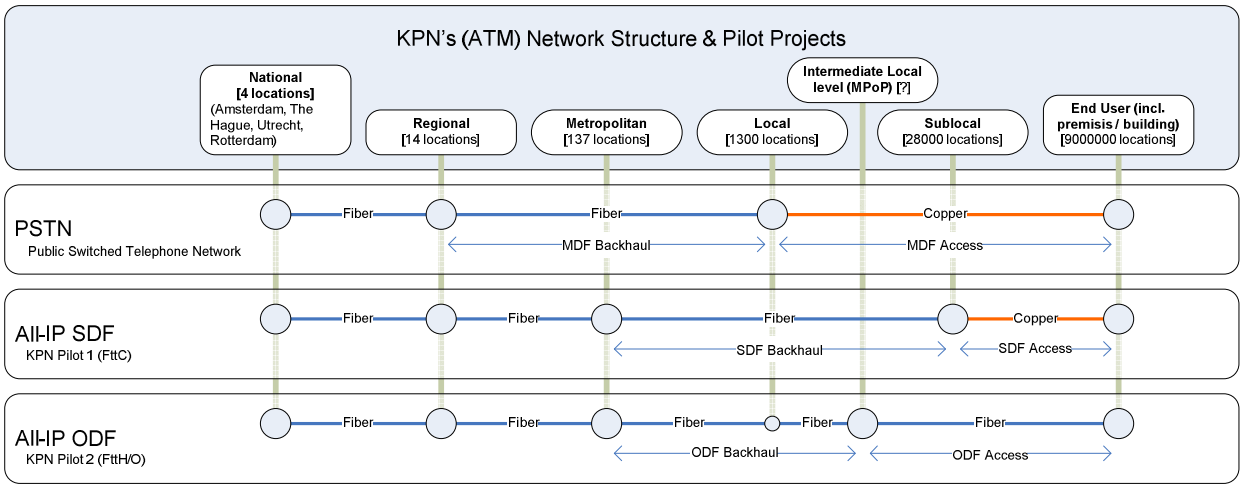

Figure 9: ATM Network KPN & Interconnection Levels [source: adapted from OPTA, 2008]

The incumbent provides wholesale access based on two models: Wholesale Broadband Access (WBA) and Sub Loop Unbundling (SLU) with the possibility for SLU (SDF) backhaul. The Netherlands is subdivided into fourteen regions [regional] which have a Wholesale Access Points (WAP), see Figure 9.

The regions are connected by a star-network, where Amsterdam is the national interconnection point. These fourteen points are called the core network; the rest is called the access network. The transition from the ATM switched infrastructure to the Ethernet switched infrastructure is also depicted in Figure 9. The 'old' network interconnection points are depicted under PSTN, and are changed to either All-IP SDF (FttC) or All-IP ODF (FttH). In case the All-IP SDF (FttC) option is chosen the locations will be closer to the end users, and can then support VDSLx access which can provide higher speeds (Telecompaper,

[26] ATM stands for the network protocol Asynchronous Transfer Mode

2009d). In case ODF is chosen the number of locations can be reduced as the distance to the end customer does not matter as with fiber there is virtually no attenuation, in contrary to copper. The incumbent is running 10 pilots, five with FttC and five with FttH (Telecompaper, 2009e). KPN has set up a joint venture for the roll-out of fiber with Reggefiber in which it has taken an interest of 41%. The deployment of FttH, compared to FttC, is expensive. Therefore the incumbent is going to evaluate the FttC and FttH pilots to further determine their final strategy. Recently the incumbent has announced that it has changed its VDSL strategy. VDSL will no longer be placed in the SDF locations but in the MDF locations (Telecompaper, 2009f). The implications of this change are that the MDF location will remain to exist and thereby the incumbent will have to invest less in FttC/N deployment. The performance that can be achieved with the VDSL technology is lower, as the distance (over copper lines) to the consumer is larger.

Cable Operators

The main competitors of the copper (incumbent) networks for broadband services are the cable networks. However, not all member states have multiple infrastructures. According to the Commission only 20% of the landlines in the EU face direct competition by cable network (Liberty Global, 2009). In the Netherlands the cable networks, as copper networks, are widespread and have high penetration rates. The networks of the cable operators were originally designed to broadcast radio and television, later on internet services were added. In the Netherlands most households are connected by both a copper and coaxial-cable networks. Only a few large cable operators are left in the Netherlands by mergers and acquisitions of many local cable-television operators in the past. The largest remaining are Ziggo and UPC and some smaller ones are, such as CaiW and Delta. The cable networks have a different network topology than those of the DSL based operators. The DSL operators use a network structure in which every household has a separate wire that leads to a local access point, thus the network is build up as a star. The structure to local access point is known as a Point to Point connection (P2P). The cable operators use a somewhat different topology; moreover they broadcast their data signals (which is different than P2P communication). For two-way communication each modem broadcasts a signal in a particular designated time slot, making two-way communication possible. The difference of network structure makes the cable-operators somewhat incompatible and thereby independent of the network of the incumbent and supporting civil infrastructure works. In the Netherlands the cable operators have, or are, upgrading their networks to support a new technological standard called EuroDocsis 3.0 (Data Over Cable Service Interface Specification). This technology can reach high speeds although the capacity has to be (to some degree) shared with the other consumers connected to the same ring. One of the main differences with services provided on cable networks compared to fiber networks is that the uplink capacity is asynchronous with the downlink speed in cable networks.

Alternative Operators

Beside the incumbent and cable operators there are other operators as well. In the Business to Business market the main companies are British Telecom, and BBeyond (owned by BBned which is owned by Telecom Italia). In the consumer market the number of alternative operators which have their own network infrastructure is limited. Over time most of the small networks have been bought by the incumbent. One operator that provides services to consumers with some scale is Tele2. Tele2 has some infrastructure but also uses the unbundled access of network of the incumbent. Other operators which

could be seen as competitors are smaller (local) fiber initiatives. However, these local fiber initiatives are likely to be bought by a larger operator. An example is a local fiber initiative in Nuenen, in which Reggefiber has gained a majority interest (OPTA, 2008a).

4.4.2 Competition and Investments

As mentioned in Paragraph 4.4.1 The Netherlands has multiple infrastructures, which is not the case in all member states. In Figure 10 the revenues per operator for some member states is depicted. Although there is no direct relation between market share and revenue, it provides an indication. In the Netherlands KPN (the incumbent) has the largest market share followed by the two cable operators Ziggo and UPC, finally the remaining operators, such as: BT, Tele2 and BBned. In most member states the incumbent telecom operators still have an important (dominant) position. Liberty Global (2009) has concluded that broadband penetration is positively related to the number of competing infrastructures. The Netherlands has the most infrastructures in Europe if wireless infrastructures are included (Liberty Global, 2009).

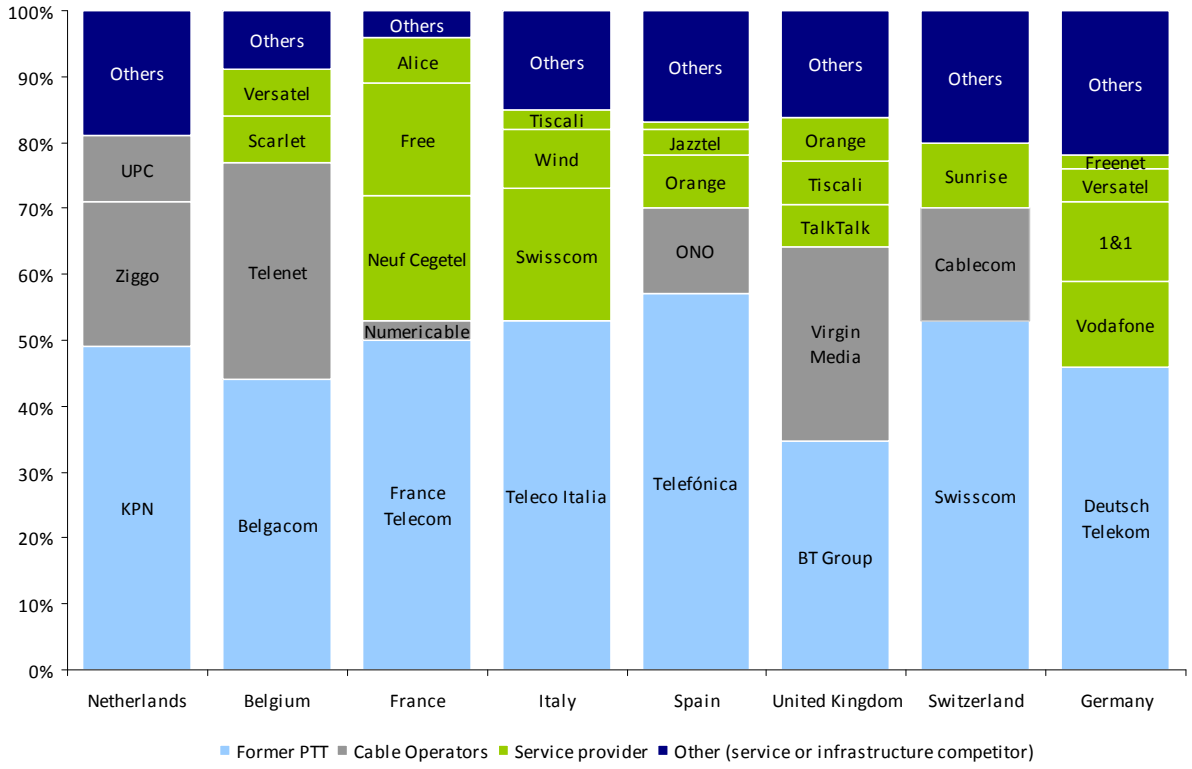

Figure 10: Broadband Revenues Q1'08 (€B) [source: estimated based on figure by Liberty Global, 2009]

The number of infrastructures is often determined historically and differs in each member state. The report by Liberty Global (2009) illustrates the number of infrastructures drive competition and thereby: penetration rates, investments, and the rate of deployment. Investment decisions and rate of deployment also depend on the geographical area, as there is no homogeny distribution of networks. Four different kinds of areas can be distinguished: Black, Gray, and White areas; and Greenfield sites; see Box 4. In the Netherlands there are hardly any white and grey areas due to the high population

density and multiple network operators. This also explains the high penetration rates of broadband in the Netherlands compared to other member states.

Box 4: Area Types of Investment

Infrastructure can be deployed in three kinds of areas; the so called black, grey, and white areas:
The black areas have high population densities and high penetrations of telecommunication infrastructure. The white areas have very low population densities and little or no communication infrastructure. The grey areas fall in between the black and white areas, and are usually areas where it is not commercially viable to sustain two operators. It has to be noted that competition trough subsidized entry may deter the investments that lead to the initial deployment of NGA infrastructure. Subsidized entry devalues the investments of the incumbent operator. While this may have no immediate effect on past (sunk) investment of the incumbent, it changes the incentives for future investments for all market participants in neighboring markets that anticipate subsidized entry (ESMT, 2009).
There are also - the so called - greenfield sites, they indicate newly built residential or office areas. Because they are new, they have no existing communication infrastructure. Investment decisions in these areas are different than for black and grey areas, as no costs of old infrastructure influences the investment decision. In principle the threshold for deploying NGA infrastructure in these areas is lower, as the differences between the costs in deploying NGA infrastructure and conventional infrastructure is small

Consumer demand

Important to include is the demand side of telecommunication services rather than only focusing on the supply side. One of the main drivers for investments in networks is consumer demand. Cable and ADSL subscriptions are available for the large majority of the Dutch consumers with high speeds. However, most users only have a 2 Mbps connection while 20 Mbps connections or higher are available to the large majority of households. Investment in NGA might be an important step in the future, especially as investments in infrastructure are long term. However, for a large majority there is no immediate need for higher capacities, which also is an obstacle for investments. In a recent report of Telecompaper (2009g) 900.000 Dutch household have indicated that they want to have a 50+Mbit/s connection within four years. A report by Dialogic & TNO ICT (2009) has also indicated that the demand for broadband connection will increase significantly in the coming years with a 30% to 40% exponential increase per year:

> *"Based on several trust worthy sources we estimate that the demand for broadband capacity for fixed connections will increase exponentially, in the period from now to 2020 in the Netherlands, with about 30 to 40 percent annually which is a conservative estimation." (Dialogic & TNO ICT, 2009, p.3; roughly translated)*

4.4.3 Market Uncertainty

The telecom market conditions in the Netherlands are presently uncertain. The uncertainty mainly comes from the announced All-IP strategy of KPN, or the lack of strategy. The FttC/N strategy seems to prevail over the FttH strategy. However, the announced deployment of VDSL from the MDF again sends a mixed signal and the FttH plans seem to be postponed. Further FttH roll-out for now seems to depend on the ability of Reggefiber to attract credit capital. Recently there have been indications that Reggefiber will indeed attract credit capital (Telecompaper, 2009h).

Especially in the initially announced scenarios of the incumbent, the alternative providers experienced great uncertainty which strategy that would be perused. Given the recent developments in VDSL strategy some uncertainty has been reduced. However, if KPN/Reggefiber will fully devote to the FttH

strategy then changes in network topology will have to be made which will affect the alternative operators. The terms for interconnection to the fiber loop, especially the calculation method with the risk premium calculation method, remains uncertain. The cable operators do not depend on the network, and are therefore less affected by the uncertainty created by the incumbent.

One of the reasons why the incumbent hesitates to make a choice between large scale deployment of FttC/N or FttH could be the risks concerning fiber network. Fiber networks require large investments, of which the main costs are civil works and not the cable itself (Liberty Global, 2009). In green areas the choice for the incumbent should be easier as deploying copper of fiber makes little difference. However, in areas where the incumbent already has infrastructure, deploying fiber can be considered to be duplication of its network (fiber and copper). Installing VDSLx in black and grey areas is likely to be more attractive. Especially in those areas the return on investments is likely to be higher than in green areas, but less future proof. Moreover as the incumbent's joint venture with Reggefiber is found to be dominant the incumbent has to grant access to its fiber network. Higher investment costs for infrastructure are therefore more risky, as its services must be offered in competition with alternative operators (which do not bare the investment costs). The alternative operators also do not have to bear the risks if consumers are unwilling to pay a higher price for fiber (services).

4.4.4 Syntheses

The Dutch Market is different than most other member states by the number of competitive infrastructures, and the almost absent grey and white areas. This has led to high penetration and data rates. To keep up with the pace of development the operators need to invest in their networks, especially the incumbent operator in the Netherlands. However, the upgrade plans of the incumbent are uncertain, while the cable operators have just invested in their network. Therefore the uncertainty in the market is great, which hampers investments.

4.5 Reactions Market

This section describes the reactions of the market in relation to the goals set in the NGA proposals. The analyses of the proposals, and market, have been verified in the market by means of semi-structures qualitative interviews. A list of the interviewees can be found in Appendix VII, and the questions asked in Appendix XI for replicability of the study (Yin, 2009). First, Paragraph 4.5.1 discusses the responses regarding the first goal set in the NGA proposal which is to increase infrastructure competition in the Netherlands. The second goal discusses whether the proposals increase investments in NGA networks, see Paragraph 4.5.2. Related to the second goals is whether the NGA proposals stimulated new market entry by infrastructure operators which is discussed in Paragraph 4.5.3. Thereafter the goal of increasing regulatory certainty is discussed in Paragraph 4.5.4. Finally, the European goals are briefly reflected upon in Paragraph 4.5.5.

4.5.1 Infrastructure Competition

The first main objective of the NGA regulation is to create more infrastructure competition in the electronic communications market. The NGA regulation proposes several measures to promote infrastructure-based competition: service based wholesale access (Market 5), access to the terminating segment (Market 4), multi-fiber encouragement in the terminating segment, and access to civil

engineering infrastructure of the SMP operator. The combination of these measures should both encourage infrastructure-based competition and the roll out of NGA networks. As discussed in paragraph 4.3.1 there are several ways to increase infrastructure competition.

Civil engineering infrastructure works

The remedy of mandating access to civil engineering infrastructure of the incumbent to other network operators is not new. The access is mandated to the operator who is dominant in market 4. The regulator therefore welcomes the regulation which mandates access to the civil engineering infrastructure for the deployment of NGA networks. It welcomes that the focus has been shifted away from the duct access measures (from the first proposals – EC, 2008a) and believes that the measures are dealt with in a more balanced way, but will not additionally contribute to infrastructure competition.

The incumbent also believes that mandated access to the civil engineering infrastructure works will not create more infrastructure competition in the Netherlands. The effects of the proposals are intended to reduce the investments that will have to be made by alternative DSL operators, cable operators, and possible new entrants. However, investment decisions for new infrastructure in general are costly and do not depend on the access to infrastructure works of the incumbent.

The alternative DSL operators are the main access seekers of the incumbent's civil engineering infrastructure works. They believe that to a certain extent access to passive infrastructures in the local loop encourages infrastructure competition, as it also encouraged infrastructure based competition in copper networks. It will reduce the investment costs, and therefore it will contribute to a positive business case for investments.

The cable operators have their own infrastructure, with its own network structure. Therefore the cable operators rarely use the civil engineering infrastructure works of the incumbent. The cable operators therefore argue that that mandated access will have a very limited impact on infrastructure competition in the Netherlands. One of the cable operators argues that on Greenfield sites access to civil engineering infrastructure works could have a positive effect on infrastructure competition.

In conclusion, the view of the Dutch market is somewhat divided but in general the proposed measures of granting access to the infrastructure works will not encourage infrastructure competition much.

NGA proposals in the Local Loop

The proposals mandate that the operator whom has dominance should make new broadband offers to alternative providers based on the capabilities of any deployed NGA networks. Furthermore a number of exceptions are mentioned in which cost orientated access should not be mandated.

Regarding these proposals the Dutch regulator believes that the proposed NGA proposals clearly focuses on creating more competition in the local loop by regulating access to the fiber networks, rather than on service level. The regulator argues that new roll-out of infrastructure in the local loop depends on whether a business case can be made, especially for fiber networks which require scale. The NGA proposals suggest a compensating for fiber networks, and the regulator therefore believes that a positive business case is thereby stimulated.

The incumbent does not believe that access regulation of the local fiber loop increases infrastructure competition in the Netherlands. Despite what one would expect, the incumbent does not believe that mandated access to the local fiber loop is necessarily a disadvantage. Probably because according to the incumbent the main infrastructure competition takes place between the cable operators and the incumbent.

The alternative operators, which depend on the incumbent's network, believe that the NGA proposals for fiber access are a positive development. Thereby they can offer their customers new products based on fiber connections which they are unable to finance themselves on a large scale. However, issues remain concerning the conditions on which they will be able to gain access to the fiber loop (such as the interconnection points and tariffs for access). The alternative DSL operators do not believe that the proposals stimulate infrastructure competition which is mainly based on whether the network topology will change of the incumbent – and therefore is not directly related to the regulation itself. If the network topology of the incumbent changes much then the alternative DSL operators are forced to roll-out additional infrastructure to interconnect whereby they can only offer the same services to the same amount of customers. Therefore this will not lead to increased competition. The alternative operators question how to the proposals will maintain competition in the market, and not ending up with a monopolist, as the large investments costs could be too much.

The cable operators are once more not directly affected by the proposed regulation because they do not use the network of the incumbent. Whether the proposals result in more infrastructure competition between alternative operators and the incumbent is uncertain according to one cable operator. In general, infrastructure competition between fiber/DSL and cable will only increase. According to another cable operator the proposals will not result in more investments and faster deployment of NGA, and therefore not in more infrastructure competition.

Multi-fiber roll out

As discussed, the local loop infrastructure is least replicable by an identical network. A solution to duplicate NGA local loop infrastructure are multi fiber solutions.

The Dutch regulator questions whether multi fiber roll-out leads to increased infrastructure competition which according to them depends greatly on the way it is rolled-out. It also depends on the definition of multi fiber roll-out, and who owns the fibers. The regulator argues that in the Netherlands multiple fibers are also rolled-out but are all used by the same operator and therefore will not lead to additional competition.

The incumbent believes that the proposals for multi-fiber solution has the potential to increase infrastructure competition but is unlikely to occur in the Netherlands.

The DSL providers mainly conclude that it could stimulate infrastructure competition. One operator argues that duplication of infrastructure is unlikely, moreover consumers in the future will buy all their services from one supplier and not from multiple infrastructures (dual / triple play services).

The cable operators firstly note that in case multi fiber networks are being rolled-out they will not use them. The cable operators want to own their infrastructure where they provide services on, and

therefore will deploy their own (cable based) networks. They also note that multi-fiber solutions will not be rolled-out in the Netherlands, and that the discussion of these networks only takes place on a European (political) level. Most likely multi-fiber solutions will not be used in the Netherlands as they are very expensive, face competition from at least two other infrastructures (Cable, DSL), and have not proven themselves yet.

Wholesale NGA

The regulator believes that not much will change regarding wholesale access to the network of the incumbent. The proposals only include NGA networks in the WBA regulation which the Dutch regulation already did. Concerning the NGA proposals the regulator believes that the cable networks should also explicitly be taken into account, which they are currently not.

The incumbent believes that the proposed wholesale broadband access (WBA) regulation – or the lack thereof – will not stimulate infrastructure competition. The incumbent notes that although low quality wholesale broadband access is not price regulated in the Netherlands, this does not imply that the incumbent will not offer the service to other operators.

The alternative telecom operators who use the wholesale broadband services of the incumbent are mainly concerned with the 'All-IP' strategy of the incumbent whereby interconnection points are relocated. The WBA regulation on its own will not stimulate infrastructure competition.

The NGA proposals regarding wholesale broadband access do not affect the cable companies in the Netherlands, as they do not use wholesale broadband access. Whether the proposals lead to increased competition is unclear according the cable operators. The cable operators note that sustainable competition can only be reached if operators have their own infrastructure. The access regulation on market 5 mainly concerns services, and not the infrastructure, and therefore they doubt if the wholesale broadband access regulation will increase infrastructure competition between the incumbents and other DSL based operators.

Could you indicate, on a scale from one to five, if the NGA proposals will encourage NGA roll-out? (1 = no investment; 5 = yes, much more investments)

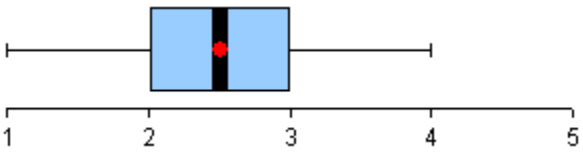

Figure 11: Encouragement NGA roll-out

Overall the market responses indicate that the effect of the NGA proposals on the encouragement of NGA roll-out and therefore infrastructure competition will indeed be stimulated to a certain degree, see Figure 11.

4.5.2 Investment in NGA

The second main objectives of the proposed regulation are to increase investments in NGA networks. The roll-out of new networks, and upgrading the networks, requires high investments. Therefore by

stimulating NGA roll-out, investments are also stimulated. Another important factor is the roll-out speed, which depends on the rate of investments.

The regulator believes that the proposed regulation will increase investments in NGA networks. The proposed measures – mandated price regulation for fiber access in the terminating segment – reduces the barriers / risk for the incumbent to invest in NGA (see Paragraph 4.3.2). An increased rate of NGA roll-out according to the regulator mainly depends on regulatory certainty and the market situation. The proposals do encourage faster roll-out, but the regulator does not believe NGA networks are rolled out faster given the uncertain market conditions in the Netherlands.

The incumbent argues that the proposals do not stimulate investments in infrastructure. The incumbent does not believe that the European Commission is able to provide certainty of investments. In general, less regulation leads to more investments and innovation and the incumbent points to the cable operators for evidence. The cable operators have rolled out the EuroDocsis 3.0 standard without any regulatory interference or incentives. The view of the incumbent is that the regulation mainly focuses on the transformation from conventional infrastructure to NGA infrastructure. However, the regulation focuses too much on preventing market exit of operators that are affected by the transition. An example of protectionism is the time the incumbent has to announce a change in network topology that affects a connected alternative operator before changes can be made. This will hinder and might even slow down investments in NGA. The incumbent does not believe that the European proposals will speed-up NGA roll out in the Netherlands as it is unable to create certainty of investments. The incumbent is currently awaiting the results of some pilot projects (FttH and FttC). Any investment decisions will be based on these pilots and the market situation.

The alternative DSL-based operators do not believe that the NGA proposals lead to increased investments in NGA infrastructure. In general they believe that investments mainly depend on the market situation, which remains uncertain (see Paragraph 4.3.5), and the proposals only reduce barriers for competition. If the incumbent invests in NGA networks, then the alternative operators have to invest because of the changing network topology. One alternative DSL operators argues that they welcome investments by the incumbent because then they can offer new products to their customers. However, consumer demand for NGA infrastructure is low, and therefore also the investments in NGA networks. The investments and speed of roll-out according to one alternative operator is most likely to be stimulated by new devices that require NGA infrastructures. Another argues that the speed of NGA roll-out might even be decreased as the proposals might even decrease regulatory certainty.

The cable operators are not affected by the NGA proposals, as they have their own infrastructure, also in the access network. They argue that they do not have to invest in their infrastructure as they recently upgraded their networks. One of the cable operators argues that the recent investments will act as a market stimulus for the DSL based operators to invest in their networks, as the DSL market is decreasing (Telecompaper, 2009i). One cable operator notes that if the proposed regulation will mainly stimulate fiber roll-out in the terminating segment, it could hinder developments in other infrastructures. The cable operators do not believe the proposals will speed-up NGA roll-out. Increased investments and roll-out speed are determined by competition in the market. As the market is uncertain, and the proposals will not create increased regulatory certainty according to the cable operators; investments and roll-out

will not be speeded-up. One operator notes that in countries where there are two or more competing infrastructures, infrastructure deployment in general is much faster.

Could you indicate, on a scale from one to five, if the NGA proposals will increase investments in infrastructure? (1 = absolutely not; 5 = yes, much more investments)

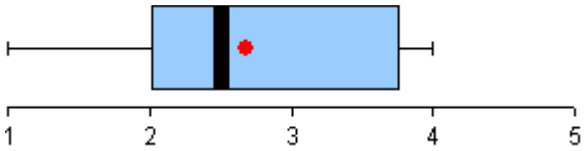

Figure 12: Investment in (NGA) infrastructure

Overall the market responses indicate that the effect of the NGA proposals on stimulation of NGA investments is somewhat positive in the member states, but unlikely in the Netherlands. Nevertheless the market is moderate in their opinion whether the proposed regulation will stimulate investments, see Figure 12.

4.5.3 Market Entry

Infrastructure based competition, in the ideal case, would be stimulated by a new network. This requires entry of a new operator into the fixed network market.

The regulator argues that entry is not included in the NGA proposals, however believes that the ways in which access can be obtained allows possible new entrants. Therefore the regulator does not expect any large new entrants as many barriers exist (such as the uncertain market conditions and the large investments required to reach some scale). However, there are some small local initiatives whereby the market is entered, as discussed in Paragraph 4.4.1 However, the regulator does not believe that these small initiatives will lead to infrastructure competition on a large scale, and there are already cases in which the local initiatives have been bought by the existing operators.

The incumbent agrees with the regulator that it is unlikely that a new infrastructure operator will enter the Dutch market, and the proposals also do not really stimulate it. The incumbent argues that a possible entrant would also have to compete with the existing operators, who have scale advantages.

The alternative DSL operators also do not expect any new entrants. They argue that entry by a new infrastructure operator will not depend on changing regulation, rather on the business case that can be made. It is unlikely that a new infrastructure operator would build its business case solely based on new regulation.[27] The business case that can be made by a new entrant will be difficult as the existing operators already provide access to more than 90 percent of the market. Moreover one alternative DSL operator argues that the current broadband market has converged from a large number of infrastructure operators to only a few. The operator also believes that the Dutch fixed broadband market is saturated in terms of fixed infrastructure operators.

[27] Has already been attempted by several operators with no success examples are Scarlett and Debitel.

The cable operators do not expect any new entrants based on the proposed regulation, but at least one believes that entry is possible. Another cable operator does not believe new infrastructure operators would enter and argues that entry is as likely now, as when the proposals would be enacted.

Could you indicate, on a scale from one to five, if the NGA proposals will stimulate market entry? (1 = absolutely not; 5 = yes market entry is stimulated)

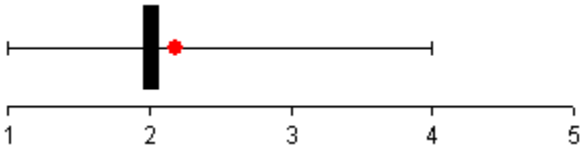

Figure 13: Market Entry

Overall the market responses indicate that market entry is unlikely to occur, and is not stimulated by the NGA proposals. The boxplot also indicates there is almost no variation in the answers (except one, which believes the NGA regulation will stimulate entry, see Figure 13.

4.5.4 Regulatory Certainty

The third goal of the next generation access regulation is to create regulatory certainty concerning next generation access (NGA) networks. The Commission wants to establish increased regulatory certainty throughout Europe by harmonizing the regulatory approaches on which NRAs base their regulatory remedies. Harmonization of regulations among the member states alone does not create regulatory certainty; the regulation itself also needs to comply with several conditions, such as consistency and low complexity.

Regulatory certainty for Europe

The scope of the NRAs are determined by the Article 7 procedure by which the NRAs need to conduct a market analyses to determine if there are operators who have dominance, see Paragraph 4.3.5. These market analyses take place every three years. Based on the market analysis new remedies can be imposed by the NRA. Therefore they cannot provide long term certainty. Adding to uncertainty is the time it takes to implement European legislation into national law, and the legal procedures that often follow implementation.

According the regulator, and many operators, the proposals in general are an update of the existing access regulation. The proposals mainly consist of extending the existing regulation for fiber networks, and thereby do create regulatory certainty.

The incumbent argues that the NRA will have to create certainty for investments as the European Commission unable to do so. The differences between the member states are too large, and according to the incumbent is one of the reasons why harmonization does not work. Fortunately the Netherlands is one of the frontrunners in Europe in terms of telecommunication and thereby the Commission often looks at the Netherlands for chosen regulatory solutions, it can thereby influence European policy[28].

[28] Also it has recently been announced that the Director of the Dutch NRA (OPTA) will become chairman of the Bureau of European Regulators (BEREC) in 2011 (Telecompaper, 2010b).

One alternative DSL operator believes that the NGA proposals theoretically create more regulatory certainty in Europe. If regulatory certainty will actually be created by the proposals depends on a number of conditions, see paragraph 4.3.5. An important condition that affects regulatory certainty is the rate of change of regulations.

The Dutch cable operators believe that European regulation in general does not create regulatory certainty in terms of access and investments because they can suddenly change. Certainty for investments and access are important in the electronic communication sector as investments in infrastructures are long term. Reactions to the draft recommendation question whether the proposed NGA access and price regulation will work at all. This adds more uncertainty, as it is therefore even more likely to be changed in the next review.

Regulatory certainty in the Netherlands

The Dutch telecom market mainly supports the Commission recommendation to harmonize the NGA regulation, but emphasizes that harmonization is a more political discussion. Moreover in general the NGA proposals are considered to be an extension/update of the copper loop regulation. Also the WBA access regulation is updated to include NGA networks.

Therefore the Dutch regulator believes, despite the implications of the article 7 procedure, that they can guarantee regulatory certainty for longer periods. They believe that the Commission, as themselves, will remain as consistent as possible and thereby provide regulatory certainty for access. Regarding any regulatory divergences, the Netherlands is one of the member states that already have enforced several decisions concerning NGA networks. These decisions have been approved by the Commission and are in line with the proposals of the NGA recommendation. Therefore the regulator believes that it is unlikely that major adjustments have to be made in Dutch regulation due to the implementation of the NGA proposals (OPTA/EZ). In terms of certainty of investments the regulator emphasized the importance of long term consistent policy. The regulator does not see any contradictions stimulation of investments and safeguarding competition.

The incumbent also stresses that in order to provide regulatory certainty the proposals seek a balance between stimulation of NGA networks and safeguarding competition. Also the period that will be set to appropriate investments will be important for certainty, which is directly related to regulatory (access) certainty. The incumbent also argues that the regulatory certainty which might be increased by the NGA proposals has already been provided in the Netherlands and that the EC is lagging behind in terms of regulation. Regarding the NGA proposals the regulator believes that it will provide access certainty, but as the cost calculation prices for access are still unclear not certainty of investments.

The alternative DSL operators do not believe that the NGA proposals will create more regulatory certainty in the Netherlands. In general the alternative DSL operators believe that there are many exceptions in the NGA proposals which make the proposals complex, and thereby increase uncertainty. Regarding the Dutch regulations the DSL and fiber operators experience great uncertainty in the conditions to which access is granted to the incumbent's network and the price calculation for access.

The cable operators do not believe the NGA proposals, and Dutch regulation, will create more regulatory certainty for network access. The cable operators do not have to grant access to their networks as they have no dominance. Therefore their knowledge of the access regulation might be more limited.

Could you indicate, on a scale from one to five, if the NGA proposals will accomplish increased regulatory certainty? (1 = no regulatory certainty at all; 5 = yes, much more regulatory certainty)

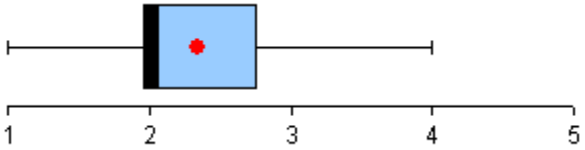

Figure 14: Regulatory Certainty

Overall the market responses indicate that the effect of the NGA proposals on regulatory certainty will be limited, see Figure 14.

4.5.5 European Goals

The ultimate goals of the proposed NGA regulation are to contribute to further develop the European economy, create one European market, and to maximize the benefits for consumers. These goals are quite general given the detailed regulatory proposals. The goals of the European Commission regarding NGA networks originate from the Lisbon goals and the i2010 initiative as discussed in Appendix VI Liberty Global, which operates internationally, recognizes that the NGA goals are strongly related to the i2010 initiative. They believe that the goals are too general, and are unfamiliar to the market. In order to reach these goals they should be communicated in a better way to the telecom market in Europe and they must be clear and reachable.

4.5.6 European Development

The incumbent and most other operators have not much confidence in the effects of the proposed regulation in relation to the development of the European economy.

One alternative DSL operator believes that the NGA proposals and RF'07 can contribute to the knowledge-based economy, as is the goal of the i2010 initiative. Stimulating the roll-out of NGA networks will be a prerequisite to reach that goal.

The cable operators believe that the proposed regulation will stimulate NGA networks in the so called 'grey areas', but not in the 'white areas'. The NGA regulation will not provide a mayor boost in development. One cable operator notes that the uptake of higher internet speeds by consumers will develop slowly, even if high speeds will be available. Therefore the impact of the regulation will be minimal as the uptake is incremental.

A single market

Despite that the proposed NGA regulation will provide a common approach for the NRAs to base their regulation on. The market does not believe a single market will be created. The main argument is that the differences between member states are too large. Some only have one infrastructure with few

operators. Other member states have multiple competing infrastructures with many operators. Large regulatory differences will remain as the NRAs will have to tailor their regulation in each member state. Although the regulation will have the same basis, the implementation in different landscapes will result in different regulation in each member state. This will hamper the creation of a single market.

Maximizing benefits for consumers

The NGA proposals can contribute to increase benefits for consumers by increased competition which should result in lower prices, new services, and choice. Given the Dutch telecom landscape increased infrastructure competition is unlikely (see section 4.4). According to the DSL operators the new framework (RF'07) will provide benefits for consumers in: privacy regulations, contract duration, and switching conditions. The proposed NGA regulation is believed to also contribute to increased benefits for consumers, although the proposals do not present any new measures according to some operators. It is also noted that some of the proposals related to the goal of maximizing the benefits for consumers, such as 100% high-speed internet coverage (mentioned in the i2010 initiative), is unrealistic. Problems remain in the white areas where public money will be needed to provide everyone broadband access.

4.6 Conclusions next generation access case

Infrastructure competition

The proposed regulation should increase the deployment of NGA networks, and thereby infrastructure competition. The Dutch wholesale broadband access (WBA) and wholesale access to the local loop should stimulate alternative operators to invest in (NGA) networks and thereby stimulate infrastructure competition.

However, the Dutch market analysis and market responses are more pessimistic about the effects of the proposed regulation. In general they believe the proposals will not create more infrastructure competition than the current regulation already facilitates. The incumbent will most likely maintain its WBA offer. The WBA offers might become more expensive for alternative operators, but investments in own infrastructure is also very expensive. For alternative operators who already interconnect to the MDF locations, a changing network topology of the incumbent will result in 'forced investments' to maintain interconnection (the phasing out of MDFs to SDF and ODFs). These investments and additional roll-out will most likely not increase competition, as it is merely to maintain interconnection whereby they still have to use the local loop of the incumbent to reach their customers. However, there are indications that the incumbent will maintain their MDFs whereby the alternative operators will not have to invest in infrastructure.

Depending how the incumbent will upgrade its network the alternative operators a few choices. First if the incumbent will keep the MDF locations and upgrade from there the alternative operators do not have to do much (probably replace their active equipment. Second, when the incumbent peruses one of its pilot projects alternative operators need to deploy infrastructure of their own (forcing them up the investment ladder, or remain on the same step). Last, the alternative operators can take a step down on the ladder making them more dependent on the incumbent's infrastructure. The alternative operators therefore most likely will invest in new infrastructure but will not be able to reach more customers. They might offer new (high-speed) services to their existing customers. Thereby infrastructure competition is

increased as they will then mainly compete with the cable operators. Much depends on the strategy of the incumbent. This also illustrates that the telecom market is not one of perfect competition but an oligopoly market. The actions by one party, in this case the incumbent, affect the decisions of others. The market generally argues that the regulation is going to have a small positive effect to increase infrastructure competition. However, I believe that the regulation will increase infrastructure competition more than the market expects, because the incumbent is likely holding their investments until the exact risk premium has been decided.

Investments in NGA

The regulation provides a balance between providing an incentive to roll-out NGA networks and safeguarding competition. In this balance the emphasis lies on creating an incentive to roll-out NGA networks. The market analysis shows that the situation in the Netherlands is uncertain which hinders investments in NGA. However, the incumbent will soon have no choice to invest or otherwise lose ground to the cable operators. On top of that, fiber is the more sustainable infrastructure for the future which is widely recognized also politically, which tends to increasingly give their support to fiber initiatives and large scale roll-out. Nevertheless the market believes that the NGA regulation will not have much effect on investment decisions and therefore also the roll-out speed.

Concluding I believe that the incumbent will have to invest to remain competitive and that the proposed regulation might have a larger effect as the market expects. Therefore I believe that the NGA regulation will stimulate investments to a higher degree than the market expects.

Market Entry

The analysis of the regulation does not focus on market entry, just in seeking a balance between stimulating infrastructure competition and stimulating NGA roll-out. Market entry by a fixed operator mainly focuses on increasing competition in the market, while it has already been concluded that the emphasis in the NGA regulation is to stimulate NGA roll-out. The NGA proposals do not encourage new fixed network entrance in the Dutch telecom market. The market analysis also indicates that new fixed network operators are unlikely to enter. High entry barriers prevent market entry, such as high investments. Moreover the Dutch market already has multiple competing infrastructures, and is highly penetrated. This view is confirmed by the interviewees. Nevertheless, the market analysis has also indicated that there are small (fiber) initiatives whereby the market is entered. However these will most likely be acquired by the large telecom operators.

Market entry in the Netherlands, as the regulatory- and market- analyses indicate, is not stimulated by the NGA proposals. In general, market entry is unlikely especially by a large new operator in the saturated Dutch electronic communications market. As entry is unlikely, new fixed network operators will not increase (infrastructure) competition and investments in the Dutch Market.

Regulatory Certainty

To create regulatory certainty; a consistent, not too complex, and timely regulation is required. As the analysis of the regulation has indicated that the NGA regulation is consistent with the previous regulation, and that the NGA regulation can generally be considered to be an update of the existing regulation. The analysis has also shown that the regulation, despite it can be considered an update, has

become increasingly complex by a number of exceptions whereby different price tariffs and conditions for access are mandated (e.g. fiber investments in the local loop, multi fiber solutions, co-investments). Last, the NGA proposals are lagging behind on the Dutch regulation, and therefore for the Netherlands are not really timely. However, regulating the NGA market on European level will add to increasing regulatory certainty. One respondent pointed out that all operators want infinite regulatory certainty; for access and investments. However, regulators must be able to change regulation to ensure the competitiveness of the market as new market and technological developments take place. Surprisingly, the market responses indicate that main uncertainty in the Netherlands concerning investment, competition and NGA roll-out come from the market itself (indecisiveness of the incumbent strategy), and not so much by regulatory uncertainty concerning fixed networks. Therefore they argue that, compared to the pervious European regulation, the proposals also do not add much more regulatory certainty. Some even argue regulatory certainty is decreased because of the number of exceptions. Considering the reactions and market analyses, the overall opinion is quite positive, and some regulatory certainty is created by the regulation according the respondents.

I believe that regulation needs to seek a balance between regulatory certainty and regulatory flexibility. The NGA proposals are consistent with the previous framework, but have become somewhat more complex which has a negative effect on regulatory certainty. Moreover the NGA proposals lag behind as the Netherlands has already implemented some NGA regulation, whereby the EC proposals will not add much certainty in the Netherlands. Therefore I agree with the responses from the market that the regulation will add (to a limited degree) to regulatory certainty in the Netherlands. For Europe I indeed believe the regulation will add to regulatory certainty, as most member states are only starting with the roll-out of NGA-networks.

European Goals

The goals set by the European Commission are very ambitious, and can naturally not be reached by the NGA proposals alone. The NGA proposals, that are quite specific, can contribute to: economic growth, increased competition, and a single European market. However, the degree to which they can contribute remains uncertain. Regulation can only create the right conditions so that further development can take place. The differences between the member states are too large, that it can be questioned if a single framework is possible to create a one European (harmonized) Market at all. Therefore, in my perspective, a unified European Market will not be stimulated much by the NGA proposals.

5. Case: Digital Dividend

In this chapter the digital dividend proposals are analyzed. Research questions 3a and 3b are answered in this chapter:

3a. How do the actors affected by the electronic communications framework perceive the new changes in terms of future market developments?

3b. What are the expected effects of the regulatory changes and do they correspond with the effects intended by the European Commission?

To answer these questions some basic information is first presented in section 5.1. Second, the formal objectives concerning the digital dividend are set out in section 5.2. Third, the legal setting is analyzed in more detail to determine whether the objectives can reached in section 5.3. Fourth, in section 5.4 an analysis is made of the broadband market and the mobile communications market. Thereafter, in section 5.5, the attainability of the digital dividend objectives are analyzed based on qualitative interviews with several actors. Finally the conclusion is presented in section 5.6.

5.1 What is the Digital Dividend?

The Commission, in its proposals for the new framework (RF'07), has identified spectrum management as a key area of interest for several reasons: to enhance competition, extend the broadband coverage, and deliver better and more innovative services (EC, 2007c). The current division of the spectrum is believed to be scattered, wasteful, and inefficient. Due to technological developments a valuable part of the spectrum can be made available for other purposes.

In many European countries a large part of the electromagnetic spectrum is dedicated to transmitting analogue radio and television signals (in the spectrum range from 50MHz to 1GHz). However, due to new technological developments, such as digitization and compression techniques, more data can be sent using less frequency (smaller bandwidths). By switching-over from analogue to digital transmissions the same amount of information can be transmitted in a fraction of the spectrum used for analogue transmission. Thus, digital signals use less frequency space per channel than the analogue channels. With currently widely available equipment at least six or seven television channels can easily be transmitted in the same frequency space of one analogue channel. Therefore a switchover could greatly improve the efficiency of the spectrum used. Due to the switchover, the current offer of television and radio channels can be squeezed into a fraction of the spectrum designated for television transmission, the part of the spectrum that remains is called the digital dividend. Important to note is that the term digital dividend does not only apply to television signals; every optimization of spectrum due to digitization resulting in unused left-over spectrum can be called digital dividend. However, in this thesis the term is only used to indicate the part that is, or has been, used for analogue television (470 MHz – 862 MHz, or UHF band IV and V); see Figure 15.

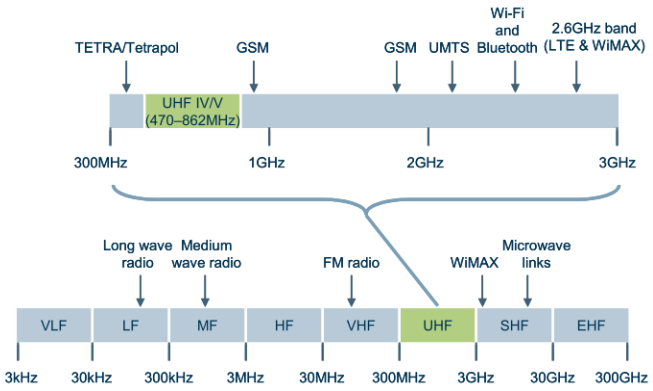

Figure 15: The Electromagnetic Spectrum [source: Analysys Mason et al., 2009]

If analogue television transmissions will switch to digital transmissions, a large part of the spectrum becomes available. The spectrum that will become available is one of the most interesting parts of the frequency spectrum due to its favorable characteristics. High frequency bands have limited range, whereas low frequency bands can carry less information. The digital dividend is the 'best' frequency space as it lies between 200MHz and 1GHz which has the optimal balance between capacity and range. Moreover the frequencies of the digital dividend are ideal for in-building coverage, which is often a problem when higher frequencies are used.

5.2 Goals and roadmap

The proposals of the digital dividend (EC, 2009c, p.2) are not as tangible as the proposals for NGA. However, goals have been set by the Commission, which have been distilled from the digital dividend consultation(s). The digital dividend provides an opportunity for the European Union concerning multiple goals. First, Europe can have a similar role as on the GSM standards, which is considered one of the successes of the EU. Second, the digital dividend can contribute to new economic activity and thereby stimulate competition. Finally, as Europe is experiencing an economic recession, it could help to achieve goals set in the Economic Recovery Plan.

The goals set out in the consultation (EC, 2009c: pp. 2-3) are:

- An improved European coordination of spectrum management
- Harmonization of terrestrial receiving equipment
- To meet the growing demand for spectrum and use this spectrum in a flexible and efficient manner:
    - To support the continuous development of terrestrial broadcasting.
    - To allow new wireless services, such as next generation of mobile broadband.
- To significantly contribute to the goals of competitiveness and economic growth and satisfy some of the important socials, cultural and economic needs for the benefit of European citizens.
- Reach some of the goals set in the Economic Recovery Plan, such as:
    - 100% broadband coverage
    - Further efficiency gains in the broader economy

Based on the consultations several main questions concerning the goals (if they can be met or not) are raised. First, will European coordination improve the coordination of spectrum management? The second question is whether the proposals will improve efficiency and effective use of the spectrum, and

most importantly how the spectrum will be used: either for mobile broadband communication or digital terrestrial broadcasting? The last questions reflect on whether the proposals contribute to the competitiveness and economic growth of the European Union, and contribute to some of the goals set in the Economic recovery plan, such as broadband coverage for everyone.

5.3 Legal setting and Proposals

This section will discuss the formal and legal position of the European Union concerning spectrum management. First the legal setting will be discussed in Paragraph 5.3.1. Second the international developments concerning spectrum management are discussed in Paragraph 5.3.2. Third, the European coordination efforts are discussed in Paragraph 5.3.3. And fourth the Dutch proposals concerning the digital dividend will be discussed in Paragraph 5.3.4. Finally a synthesis of the paragraphs is set out in Paragraph 5.3.5.

5.3.1 Legal Setting

Important in discussing spectrum management is the legal basis on which decisions are made. Two formal decision layers can be distinguished: an international level, and a national level. Thereafter the position the EU is discussed.

International

On international level the ITU makes the decisions on spectrum management, and is a United Nations agency which makes decisions based on consensus, see Appendix IV. These decisions are made at the World Radio Conferences (WRCs). In addition to the world radio-communication conferences an ITU region, or a group of countries, may hold a regional radio-communication conference (RRC). These regional conferences cannot modify the Radio Regulations, unless approved by a WRC. The Final Acts of the conference are only binding on those countries that are party to the agreement.

National (The Netherlands)

The Netherlands is a member of the ITU, and therefore has to coordinate its spectrum accordingly. The agency that sees to the coordination and use of the spectrum in the Netherlands is Agentschap Telecom (AT) which is a department of the ministry of Economic Affairs. Conform the treaty of the ITU (international and regional), AT coordinates the Dutch spectrum. Some parts of the spectrum are free to use, some require licenses, and some frequencies cannot be used as they are reserved for purposes, such as military and emergency services. There are many uses for the radio spectrum, but in general there are three uses; first for broadcasting purposes (one-way transmissions such as television, radio), second for communication (two way transmissions for mobile telephony, data traffic), and finally for receiving purposes only (such as passive radar and radio astronomy). The licenses for mobile communication and broadcast purposes are awarded by AT. These licenses can be granted in different ways, such as: freely, by auctions[29], lotteries, or beauty contests[30].

[29] There is some consensus among economists that auctions are the best design for assigning spectrum as they easily determine who should get it, at what price (Cave et al., 2002; McMillan, 1995).

[30] A beauty contest is an administrative process by which those that are interested in a particular part of the spectrum that is being released to make a proposal for how they intend to use it. After hearing all the proposals, the regulator awards spectrum to those with the most attractive proposals. Beauty contests

The broadcast market in the Netherlands uses the spectrum intensively. Licenses for broadcasting in the Netherlands are only awarded to broadcasters that have permission from the Commissariat for Media.

Spectrum Management and the European Union

As can be deducted from pervious paragraphs the European Union does not directly manage any radio spectrum itself. However, the EU has a large input to the spectrum management across Europe. There are two European bodies whereby input is provided. First, through technical implementation measures that are discussed and developed by the Radio Spectrum Committee (RSC), which was set up under the Radio Spectrum Decision (EC, 2002a), see section 3.3. Second, on a technical level, the RSC works very closely with the European Conference of Postal and Telecommunications Administrations (CEPT) of which the decisions are examined by the European Parliament.

The motive for the involvement of the EC is that they believe radio spectrum is an essential resource on which the important dynamic European sector of wireless communication is based. The Commission argues that an effective spectrum management can provide large benefits for Europe. Therefore the European Union makes efforts to ensure proper allocation and coordination of frequencies, both nationally and internationally. The Commission believes that spectrum management should be coordinated on a European scale to ensure the maximum benefit from its use. The Commission has no formal power to coordinate spectrum but member states. Each member state differs in national spectrum management, but they also must comply with European agreements on frequency use set out in its Decisions of the European Commission. Thereby the Commission can influence National Spectrum Coordination.

In the past the member states have consistently refused control of the spectrum management by the European Union. However, in 1990 the Council agreed to improve coordination on the use of frequencies (EC, 1990). In 1993 The EU attempted to increase its 'power' and establish European coordination. In 1999 there was considerable discussion concerning the 3G spectrum in Great Brittan and Germany, which eventually lead to the adoption of a spectrum decision and the creation of the RSC and RSPG (EC, 2002a; EC, 2002b). The member states have national control of their spectrum management and have agreed to consult each other, preferably in the framework of CEPT, before they introduce any new service to establishing common guidelines so that compatible services are offered throughout Europe.

The role that the Commission played in the standardization of the GSM standard is considered to be one of the large achievements of the European Union, although some disagree (ITU, 2007). According to the EC this has enabled the European industry to establish a competitive edge in this global sector. Therefore the Commission closely watches developments in spectrum policy and the telecom industry. As the industry keeps developing and new radio-based technologies emerge, pan-European spectrum management is becoming increasingly important.

suffer from several problems, such as a lack in transparency and that they are slow. (Cave et al., 2002)

5.3.2 International Developments

After the digitization of the communications sector, the broadcast market has started the conversion to digital technologies. The digitalization of the terrestrial broadcast market started with agreements on European level, by the CEPT, with the introduction of Terrestrial Digital Video Broadcasting (DVB-T). These agreements are recorded in the Chester agreement of 1997 [CH97]. Later on, the ITU Regional Radio-communication Conferences of the ITU in 2004 and 2006 [RRC04, and RRC06] led to the Geneva agreement of 2006 [GE06] – (EC, 2005b). This agreement mandates a new digital frequency plan for the frequency bands III (172-230 MHz), VI (470-582 MHz), and V (582-862 MHz), in which it is assumed that all television broadcast will be digital, see Figure 16 (EZ, 2009). The frequencies that have become available in bands I and III in the Netherlands have since 2006 been used for analogue and digital radio and other communication purposes.

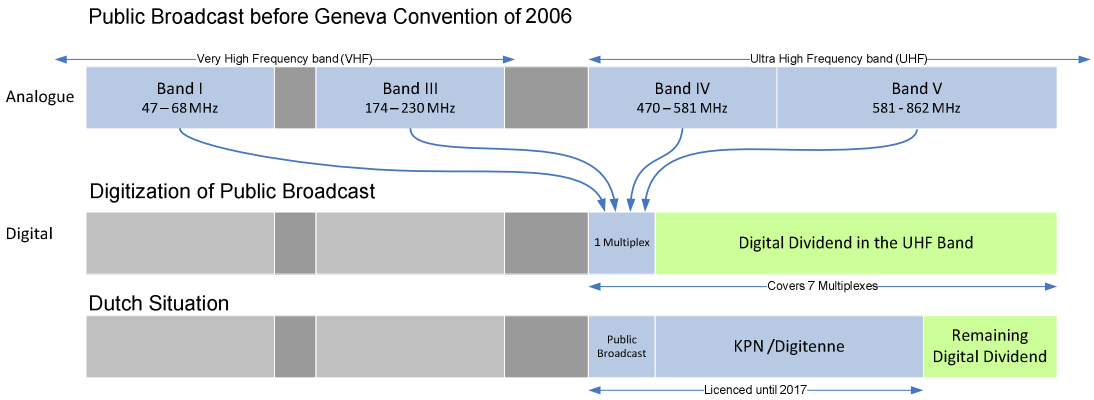

Figure 16: Digitization of (Dutch) Terrestrial Public Broadcast Bands [source: EZ, 2009]

In the past the UFH spectrum (Band VI and V; 470–862 MHz) have always been used for television broadcasting. The analogue television interference-norms are protected until 2015 the latest. From then on the ITU members (in region 1 and 3) are expected to have switched to more efficient digital transmissions. The European member states have jointly agreed that the analogue rights are only protected until 2012. In the GE06 the CEPT Members have expressed that a more flexible use of the band V would be desirable. Therefore a note in the GE06 has been made (Note number: 5.316) that the upper part of band V can also be used for other services than broadcast purposes. Later efforts were made by the Commission at the World Radio Conference of 2007 (WRC-07) to give mobile services the same status as broadcasting services (EC, 2007e). Thereby mobile services can also make use of the spectrum. The next scheduled World Radio Conference is in 2011 (WRC-11).

5.3.3 European Proposals for the digital dividend

Already in 2005 the European Commission published a Communication on the more rapid transition from analogue to digital terrestrial television (EC, 2005c). The Commission argues that more rapid transition provides a opportunity to provide for the growing demand for wireless communication services, and can contribute to the i2010 goals. In November 2007 the European Commission presented a communication (EC, 2007b) which outlined the need and possible approaches for achieving appropriate European coordination. Later the Radio Spectrum Policy Group (RSPG) identified the need to ensure appropriate coordination between member states (RSPG, 2007).

The Commission undertook a number of actions to determine the most appropriate strategy for Europe. First it conducted a large scale study of the social and economic impact of different uses of the digital dividend (Analyses Mayson et al., 2009). This also included an assessment of the value added of possible types of coordination at EU level. Second, a wide range of stakeholders was consulted trough various channels, such as hearings[31]. Last, technical input from CEPT has provided evidence that interference issues can be properly dealt with. These considerations have led to the following European policy intention, which has been presented in a consultation by means of a roadmap (EC, 2009c). The roadmap defines the main action lines which are currently under consideration (EC, 2009c, pp. 5-9):

- Improving consumers' experience by ensuring high quality standards for terrestrial digital television receivers in Europe.
- Ensuring the availability of a compression standard on all DTT receivers[32] sold after 1st January 2012 that is at least as efficient as the H264/MPEG-4 AVC[33] standard.
- Setting standards for the ability of digital TV receivers to resist interference.
- Increasing the size of the digital dividend through further spectrum efficiency gains:
    - Promoting collaboration between member states to share future broadcasting network deployment plans (e.g. migration to MPEG-4 or DVB-T2).
    - Encouraging the deployment of Single Frequency Networks (SFNs), see Box 5.
    - Supporting research into "frequency agile" mobile communications systems.
- Making the 800 MHz band available for low/medium power electronic communications networks, under harmonized technical conditions, following the principle of technology and service neutrality.
- Adopting a common position on the potential use of the "white spaces"[34] as part of a possible extension of the digital dividend.
- Ensuring the continuity and further development of wireless microphone applications and other secondary uses of the UHF spectrum.
- More effective cross-border coordination with non-EU countries.
- Addressing further challenges (such as HDTV and IPTV developments).

Box 5: Single Frequency Networks (SFN)

The digital transmissions by the DVB-T standard are much more efficient than the analogue transmissions for several reasons. First, the compression techniques available can reduce the bandwidth needed for one channel significantly. Second, analogue transmissions needed a separate frequency for each channel. The DVB-T standard makes it possible to use single frequency networks (SFN), which can transmit a number of channels on the same frequency. Moreover the SFN are also more flexible in their use and cause less interferences.

5.3.4 The Dutch proposals for the digital dividend

The transition from analogue to digital broadcasting in the Netherlands has already been made in 2006, and the Netherlands was the first European member state to do so. Despite the rapid switchover, some channels can still not be used (mainly in the border areas) das they would cause interference with the surrounding countries (Belgium, Germany, Luxemburg). These frequencies can therefore only be used

[31] Commission hearing of stakeholders on 13 March 2009
[32] Digital Terrestrial Television (DTT) receivers, such as TV sets, set-top boxes and other similar receiving devices.
[33] A particular compression standard for video, which also supports high definition television (HDTV)
[34] White spaces are unused, license free parts of the spectrum, that are usually located in between licensed spectrum bands used for (digital) television broadcasting.

when the surrounding countries have also switched-over from analogue to digital transmissions in 2012. The Netherlands will then be able to use the remaining channels for broadcasting or mobile telecommunication, depending on how the surrounding counties will use the released spectrum. Important to note is that if the surrounding countries will not harmonize their use of the released spectrum the possibility exists that certain channels can not be used due to interferences. Channel 69 for example is of less quality as both The Netherlands and Germany use this channel in the border area(s). Figure 17 shows the current use of the UHF band. Many of the channels in the Netherlands have already been granted for broadcasting purposes (green channels), and until 2017 can not be used for other applications. The blue channels will become available after 2012, until that time they can not be used as they would cause interference with surrounding countries. The red channels are not available for broadcasting services and are in use for radio-astronomy, navigation, and other services (channels 38, 59, and 63).

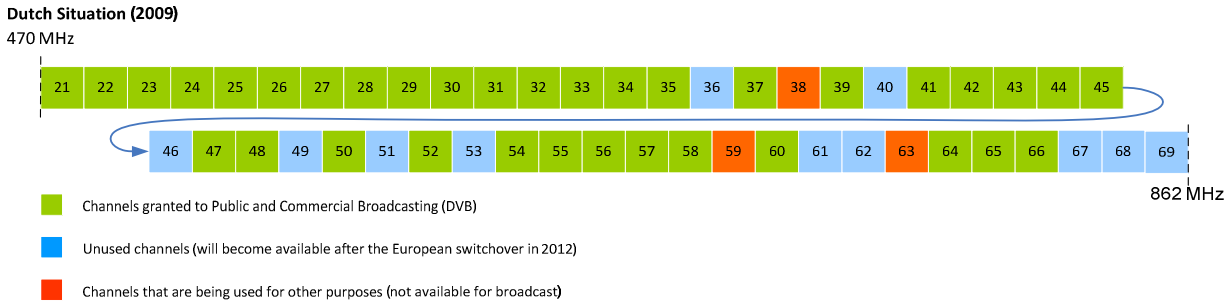

Figure 17: Present Spectrum Allocation in the Netherlands [source: EZ, 2009]

Consultation

The Ministry of Economic Affairs which is responsible for spectrum management has in addition to the European Consultation set out its own Consultation in the Netherlands (EZ, 2009). The consultation proposes two options on how to use the digital dividend:

1. To use the digital dividend for broadcasting purposes based on DVB technology
2. To rearrange the UHF band so that the digital dividend will be available for technological and service neutral services in 2012, whereby it can also be used for electronic communication networks.

Option 1:

The first option is to use the digital dividend for broadcasting purposes only. The channels that will become available in 2012 can then be used for broadcasting, such as: terrestrial broadcasting (DVB-T), and for broadcasting services for handhelds devices (DVB-H). In the Netherlands four multiplexes[35] are awarded to commercial broadcasting, and one multiplex for public broadcasting. In 2012, after a rearrangement of the channels, two more multiplexes become available which can be used to transmit additional television channels. Thereby more additional channels can be transmitted, or just a few additional channels of higher quality (such as HDTV[36]). The transmission efficiency can be increased if

[35] A multiplex is also called a layer and are a set of frequency areas which together form a nation covering area.
[36] HDTV stands for High Definition Television which indicates a substantial increase in quality.

even better compression techniques are used, such as 'H264/MPEG-4 AVC'-compression, whereas presently 'MPEG-2'-compression is used for DVB-T.

Option 2:

The additional spectrum that is being released in 2012 is scattered and spread on different channels in the UHF band in the Netherlands (Blue Channels). Therefore the additional spectrum released is squeezed in between of spectrum that is used for broadcasting. Broadcasting transmitters use high and medium power transmitters, and electronic communication networks use medium and low power transceivers. The two networks interfere with each other, and therefore the additional scattered spectrum is unsuitable for electronic communication networks in its present form. If the spectrum is used for electronic communication, a rearrangement of the spectrum is required to group the spectrum for broadcast and the free channels to avoid interferences. As mentioned t is also necessarily that the surrounding countries harmonize their use of the spectrum and even use compatible standards, or else this will cause interference in the border areas. In ITU Region 1, the UHF band is separated into 49 channels, each 8 MHz wide (Channels 21 to 69). A rearrangement of the channels (to group the used and unused channels) will not affect the number of channels for television broadcasting in the Netherlands. Channels 64, 65 and 66 can be moved to channels that will become available in 2012 (blue channels in the range from channel 21 to 60 - see Figure 18). Any improvements in quality or additional services for broadcasting purposes have to be gained by improving compression techniques in case option 2 is chosen (as the upper part of the UHF band can then not be used for broadcasting). Another possibility in the future to gain additional channels is to use parts of the VHF band (band III, 174-230 MHz).

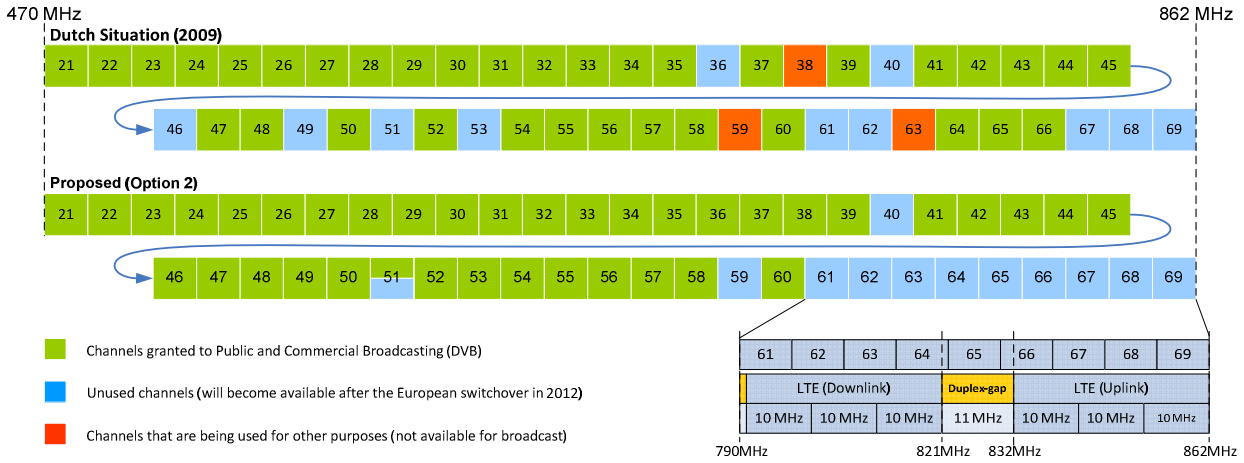

Figure 18: Proposed Spectrum rearrangement (Option 2) [source: EZ, 2009]

There are a few problems with rearranging the UHF band. First, a rearrangement effects the digital television receiving equipment for consumers, and possibly the receivers have to be adjusted or reprogrammed. The second problem concerns channel 63 which is presently used by 'other users'. This channel is dedicated for program making and special events services (PMSE), such as: wireless audio links, low power intercom links, and wireless microphones. If channels 61 to 69 are used for electronic communication than channel 63 needs to be relocated. One of the possibilities is to use channels 61-69

for Long Term Evaluation (LTE, or 4G mobile communication)[37]. If this option is chosen the duplex gap[38] between the LTE uplink and downlink could be used to relocate channel 63 to, see Figure 18. The LTE option is discussed in more detail in paragraph 5.4.2 (also see Figure 18).

Policy Intention

To decide between the two options, the Dutch Ministry of Economic Affairs has set out a research into the social and economic impact (Analyses Mason, 2008)[39]. The report concluded that the digital dividend is indeed valuable, and that it can contribute significantly to the Dutch Economy. One of the possibilities examined in the study is to maintain the current quantity of spectrum allocated for broadcasting (5 multiplexes[40]), and use the upper part for mobile electronic (two-way) communication.

The research analyzed the incremental private value obtained by using the digital dividend for various combinations of services compared to the situation in which the digital dividend is not available at all. If the digital dividend is used for DTT (DVB-T & H) and mobile communication: than the incremental private value added is estimated to be 6.3 Billion Euros compared to 4.5 when the digital dividend is only used for broadcasting purposes (Analyses Mason, 2009; EZ, 2009). Therefore the Dutch policy intention is to make the upper part of the 800 MHz band (790-862 MHz) available for low/medium power mobile electronic communications networks. This implies that the band is cleared of high/medium power broadcasting networks (hence, Option 2). Factors that have played an important role in this decision have been: to maintain the quantity of allocated spectrum for digital television, international developments, such as the decisions of the WRC-07, and the opportunities for the development of mobile broadband in rural areas.

5.3.5 Synthesis

The EU formally has only a marginal role in spectrum management. However, indirectly it has some influence. The EU has contributed to the changed status of the upper part of the digital dividend whereby it can now also be used for mobile communication. The proposals of the EU focus on harmonization, effectiveness, efficiency of spectrum management and thereby economic growth. The proposals divided the digital dividend into two parts, a lower part (470MHz – 790MHz) and the upper part (790MHz – 862MHz). Proposed (Option 2) is to use the lower part for broadcasting purposes – with certain standards – and the upper part for mobile communication. The Netherlands has conducted its own research on how to use the upper part, where after the European Commission came to the same conclusion to preferably use the upper part for mobile communication. As the Netherlands has already switched-over to digital broadcasting it has to wait for the switchover of surrounding countries before it can fully utilize the upper part of the digital dividend. The lower part is already in use for broadcasting purposes. However, rearrangement of the digital dividend to free up the upper part presents certain problems that will have to be overcome.

[37] The 2.6GHz band will most likely also be used for LTE.
[38] The gap between the uplink and downlink in a Frequency Division Duplex (FDD) system
[39] Note that the Dutch Ministry of Economic Affairs researched the impact before the European Commission did.
[40] A multiplex is a Nation covering layer of (frequency) channels on which television/mobile data can be transmitted. The Netherlands has acquired seven multiplex layers in the RRC-06. The policy intention is to maintain five multiplexes for Digital Terrestrial Television, whereby two can be used for mobile electronic communication.

5.4 Market Conditions

To determine the effects of the proposals, and determine the future market developments, the markets which could be affected by the release of the digital dividend is analyzed. The proposals address two markets: the mobile broadband market, and the wireless (mobile) broadcast market. Due to the conversion (of telephone, television, and broadband services) either choice of whether the digital dividend is used for broadcast or broadband services will affect the other market as well. To determine the effects of the proposed changes the broadcast market is analyzed in Paragraph 5.4.1. There after the broadband market is analyzed in Paragraph 5.4.2. Finally the relation between the markets is briefly analyzed in Paragraph 5.4.3.

5.4.1 Broadcast Market

The broadcast market in general can be separated into two groups, first broadcasting via fixed networks, and second broadcast via wireless networks. The fixed networks have to a certain extent been discussed in the NGA case, but are discussed in more detail from the broadcast perspective. The wireless technologies DVB-T and DVB-H are especially important as they make use of the 'digital dividend'. Other wireless- and fixed- technologies are important as they are direct competitors to the DVB-T & DVB-H standards. Table 3 provides an overview of the wireless and fixed broadcast services that are discussed:

	Medium	Analogue / Digital?	Compression	HD-TV offered?	Average Number of Channels offered	Data Rate / Quality (estimates)
Fixed	Cable	Analogue	NA	NA	~32 channels	-
		Digital	MPEG2 SD	Yes	Up to 162 channels	8 Mbps
			MPEG2 HD	Yes	~16 channels	Max. 15 Mbps
	Fiber	Analogue	NA	NA	~52 channels	-
		Digital	MPEG2 SD	Yes	Up to 65 channels	8 Mbps
			MPEG2 HD			22 Mbps
			MPEG4 HD			12 Mbps
	DSL	Digital (IP-TV)	MPEG4	Yes, (10 channels)	~44 channels	4 Mbps
Wireless	DVB-H	Digital	MPEG2	No	9~14 channels	115 kbps
	DVB-T	Digital	MPEG2 SD	No*	~23 channels	3 Mbps
	Satellite (DVB-S)	Digital	MPEG2 SD	Yes	300+ channels	7 Mbps
			MPEG4 HD		~18 channels	12 Mbps
	Mobile UMTS (IP-TV)	Digital	MPEG4	No	~14	64-384 kbps

*HDTV is possible but is currently offered in the Netherlands

Table 3: (average) radio and television offers per infrastructure

In Europe the penetration rates of each of the television infrastructures (fixed and wireless) differs considerably, see Figure 19 (DVB-T and DVB-H are referred as digital terrestrial television or DTT). Free TV also includes free satellite and terrestrial television (In the Netherlands free TV consists of 1 multiplex for Public Service Broadcasts, compared to 4 multiplexes with paid DTT). European countries differ in penetration of infrastructures due to several factors, such as: different terrestrial regulations, penetration of cable, and the historic evolution of the competition. Therefore the national broadcast

markets differ, whereby other considerations are taken into account in each Member State on how to use the digital dividend.

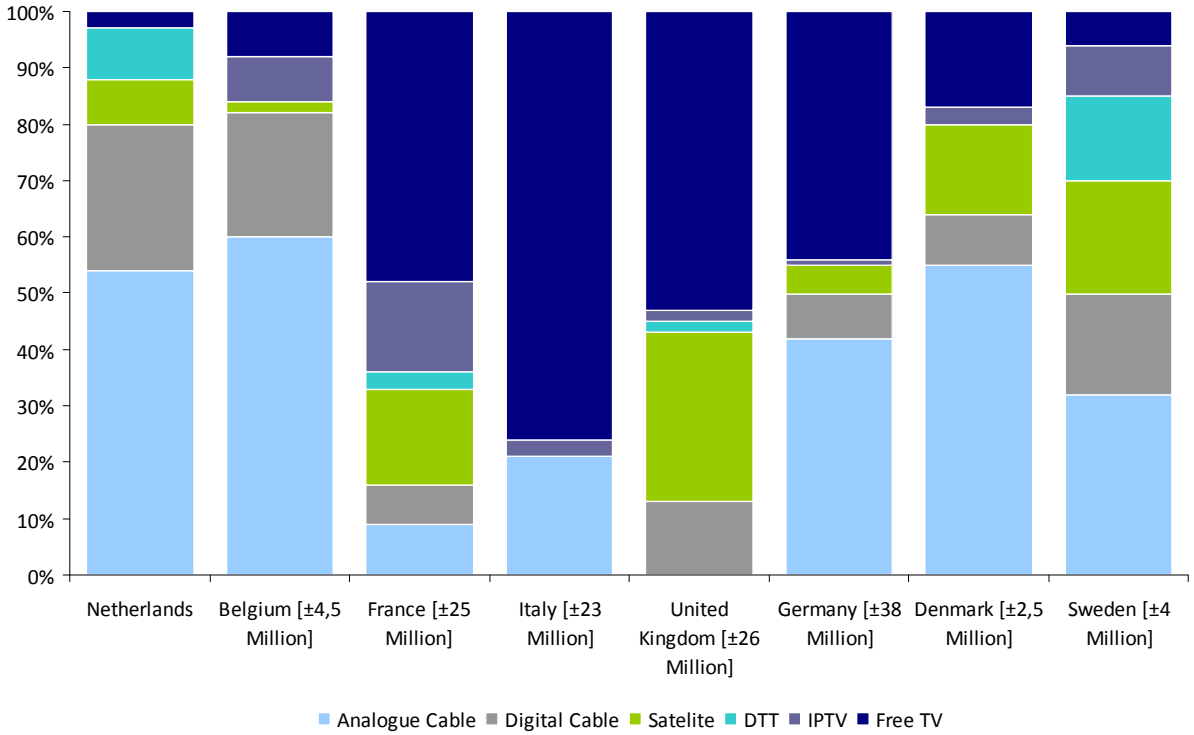

Figure 19: European TV market in 2009 [source: estimated based on figure by Liberty Global, 2009]

Fixed broadcast networks

Several fixed broadcast infrastructures can be distinguished in the Netherlands. First the cable networks which were historically designed for broadcasting purposes. Second are the emerging FttH networks whereby also television and radio are offered. Third, a relative new development of IP television which is offered on fixed wire DSL networks. These will now be discussed in more detail.

Cable Networks

The cable networks that are being used for both broadband and broadcast purposes have already been briefly discussed in Paragraph 4.4.1. Historically the cable networks were used for broadcasting purposes only. Since, cable television networks diffused widely including more and more households. Nowadays almost every household in the Netherlands has a cable subscription, and the penetration 'homes passed' in the Netherlands is about 95% (Liberty Global, 2009; Analyses Mayson, 2008) making it one of the most-cabled countries in the world. Historically there are two main reasons for the high penetration of cable networks. First, the wireless public broadcast only consisted of three (public broadcast) channels, where the cable operators offered much more channels. Therefore wireless broadcasting was considered to be inferior to a cable connection. Second, local cable operators were set up to provide fixed line television as the roof top antennas were perceived to distort city view.

Initially the cable market in the Netherlands was highly fragmented with many small network operators. However, in recent years the industry has been rapidly consolidating with the mergers of Casema,

Essent Kabelkom (@Home) and MultiKabel to form Zesko[41] (with the better known brand name: Ziggo). Thereby Ziggo has become the largest cable operator in the Netherlands, with 54% of the cable TV market. UPC is the second largest cable operator with a market share of 37%. Together they represent a cumulated market share of 91% (Analyses Mayson, 2008). Cable TV providers are now offering a wide range of services ranging from: telephony (first launched in 1996), internet access (since 1999), digital TV (DVB-C, launched in 2000), high-definition TV (launched in 2006), and finally VOD (launched in 2007). On the digital television market the cable operators control about 53% of the market while the analogue subscriptions are decreasing. In the last years cable networks are increasingly contested by satellite (21% market share of digital television), DTT (19,1% market share of digital subscriptions) and IPTV developments, Figure 20.

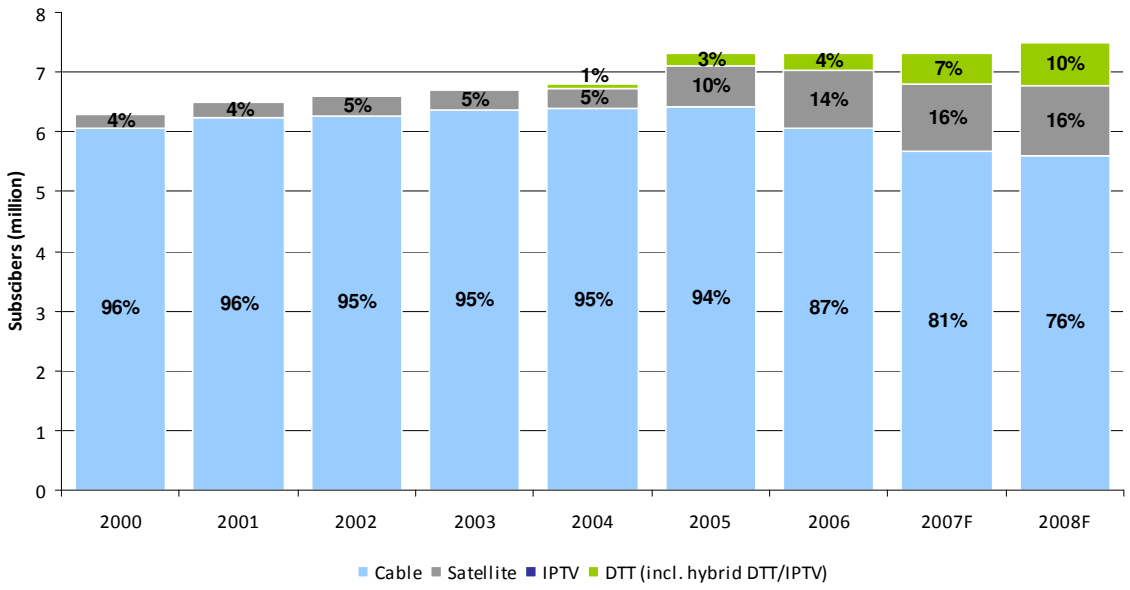

Figure 20: Distribution of pay TV subscriptions in the Netherlands [source: estimated based on figure by Analyses Mason, 2008]

The cable operators in the Netherlands are expected to offer a minimum of 15 television channels of which 6 are 'must-carry'-channels, in accordance with the Dutch Media Act. In November 2006, the Dutch parliament called for obligations to be imposed on the cable industry to allow access to third parties. Recently the Dutch NRA has determined that UPC and Ziggo are forced to offer access to their networks by other operators to provide analogue radio and television (OPTA, 2009c; OPTA, 2009d). This includes access to the broadcast transmission platforms for wholesale line rental (WLR-C).

Fiber networks

Fiber networks provide broadcast services although initially they were mainly designed for data communication, such as broadband services. These networks are also used to distribute: analogue and digital radio, analogue and digital television, and telephony. The penetration of fiber networks is still low and the offer of broadcast services depends on the region – therefore this is not included as a separate

[41] This merger was the result of the acquisition of the three cable operators in 2006 by Warburg-Pincus and Cinven (two private equity firms) for a total investment in excess of EUR 5 Billion.

infrastructure in Figure 20. Surprisingly also analogue television is offered via fiber networks. The KPN/Reggefiber networks even deploy a separate fiber (parallel with the fiber for broadband services and telephony) for analogue television.

Fixed - IPTV via DSL networks

Another fixed television alternative is IP-TV which was launched by Tele2 (Versatel at the time) in 2005, the Dutch incumbent followed later on in 2007. IPTV take-up so far has been quite low. With the All-IP strategy and FttC/H deployment the incumbent is expected to offer higher bandwidths whereby real-time HDTV streaming should become possible. Analyses Mayson (2008) argues that a major driver for IPTV growth is the rate at which HDTV demand increases. The offer of channels is quite large – see Table 3 – which provides an overview of both the fixed and wireless distribution networks for broadcasting public and commercial television in the Netherlands.

Wireless broadcast networks

Second are the wireless technologies which distribute broadcasting services. There are mainly two parts of the spectrum which have been specially allocated for digital broadcasting services, and a third is based on IP-TV via the mobile (UMTS) networks. As discussed before, wireless analogue television broadcast transmissions are no longer allowed in the Netherlands, therefore all these wireless transmissions are digital.

Terrestrial and Handheld Digital Video Broadcasting

The main part of the total digital dividend spectrum is allocated for DVB-T and DVB-H. After the switchover in 2012 (according to the Geneva agreement, see Paragraph 5.3.2) the Netherlands can make full use of the total digital dividend spectrum. The Netherlands was the first who made the transition to digital broadcasting (DVB-T) in 2006. Figure 21 depicts the expected timeframe in which the other member states will cancel their analogue broadcasts and switch to digital broadcasting whereby the digital dividend will become available. Until that time the Netherlands is unable to fully use the digital dividend due to possible interferences in the border areas. The number of member states that plan to switch in 2012 is remarkable high, which could lead to some problems for utilizing the digital dividend in 2012 if there are any delays.

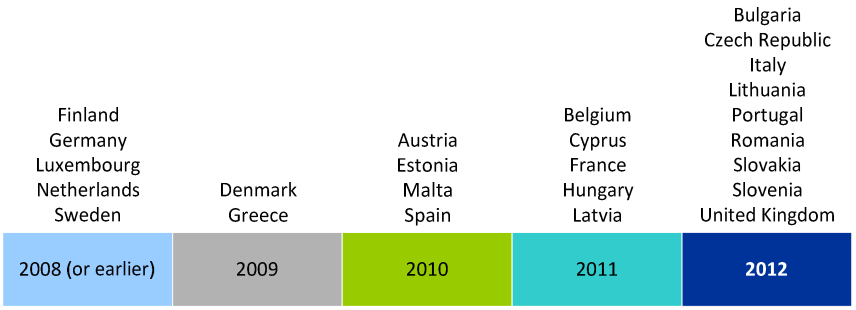

Figure 21: Expected Analogue switch-off dates in member states [source: Analyses Mayson et al., 2009]

The Netherlands has been a frontrunner in the digital switchover of television channels. The Netherlands was the first member state to free-up its spectrum. The licenses for digital video broadcasting were granted in 2002 to Digitenne, and broadcasting started in 2003. Digitenne was owned by four companies – Nozema (30%), KPN (30%), NOB (30%), and Cahanoves Beheer BV (10%). The NOB,

around 2004, decided to reduce its investments and 10% of the shares were acquired by KPN and another 10% by Nozema. In 2006 KPN received permission to take over Nozema and thereby gained 80% of Digitenne's shares. Thereafter KPN acquired the shares of NOB, resulting in a 90% share in Digitenne. The acquisition of those shares is controversial as the initial license agreements provided the possibility to revoke the licenses when a dominant operator would gain a significant share in Digitenne, and would thereby gain control of Digitenne. Nevertheless the acquisition was allowed, and the regulation that made it possible to revoke the licenses was removed (Staatscourant, 2007). Thereby KPN gained a semi-monopolist position in the digital terrestrial market (they are also challenging the fixed broadcast networks by their IPTV offer via DSL).

Digital television by KPN/Digitenne now has coverage throughout almost the entire Netherlands. Although DTT offers an improvement compared to analogue terrestrial TV, the take-up was initially slow as nation wide coverage was limited (which was completed in 2008). DTT really took off in 2005 thanks to increased availability and larger offering of television channels. Its subscriber base has grown rapidly in the last two years and has reached 880.000 subscribers (Telecompaper, 2010c).

In March 2008, the European Commission formally endorsed DVB-H as the preferred European standard for mobile TV, and is urging the 27 member states to adopt DVB-H instead of other broadcasting technologies (EC, 2008c). DVB-H is designed to work in the following bands: VHF-III (170-230 MHz), UHF-IV/V (470-862 MHz) and the L band (1.452-1.492 GHz). The DVB-H is similar to the DVB-T standard, but is optimized for handheld devices. The DVB-H standard can coexist with DVB-T in the same multiplex. The allocated green channels in Figure 18 are designated for the use of Digital Terrestrial Television based on the DVB-T/H standard, and have been licensed to KPN/Digitenne until 2017. These licenses entail the use of five nation covering multiplexes; four for commercial television broadcasts, and a fifth for public television channels. If the remaining spectrum will become available in 2012, two additional nation covering multiplexes will become available.

Digital Video Broadcasting via Satellite

The second part of the spectrum is allocated for digital video broadcasting via satellite (DVB-S). Satellite broadcasting has the advantage that a large number of households can be reached. Satellite reception is independent of antenna site coverage or fixed infrastructure, and is determined by the footprint of the satellite(s). The footprint of the ASTRA satellites, by which CanalDigitaal[42] broadcasts television and radio, covers almost entire Europe. CanalDigitaal is a well established player and launched its services in the mid 1990s. Since, it has slowly achieved a market share of 12% (in terms of subscriptions). New products, such as HDTV channels and VoD[43] which were launched in 2008 can further strengthen CanalDigitaal's position in the market.

IP-TV via mobile communication networks

The third part consists of mobile telecommunication networks which are also capable of broadcasting digital television and radio via IP. On a LTE network even the DVB-T standard can be used to transmit television (Motorola, 2008). These networks will be discussed in more detail in Paragraph 5.4.2.

[42] The main distributor of European television signals in Europe
[43] Video on Demand services

Synthesis Broadcast Market

Terrestrial and Handheld Digital Video broadcasting are contested by fixed and satellite networks. Presently the DVB quality and number of channels available are lower than most other digital television services offered. Nevertheless Digitenne surpassed its expectations in terms of adoption. In light of developments of other broadcasters, KPN/Digitenne will need additional spectrum to provide better quality and a broader offering of channels. The licenses for KPN/Digitenne expire in 2017 which means that a reallocation of channels – to free the upper part and use the spectrum in a more efficient way – would affect KPN/Digitenne.

5.4.2 Mobile Broadband Market

Given the policy intention of the European Commission and the Netherlands to free-up the upper part of the spectrum for mobile broadband communication, the mobile communication market is evaluated more closely.

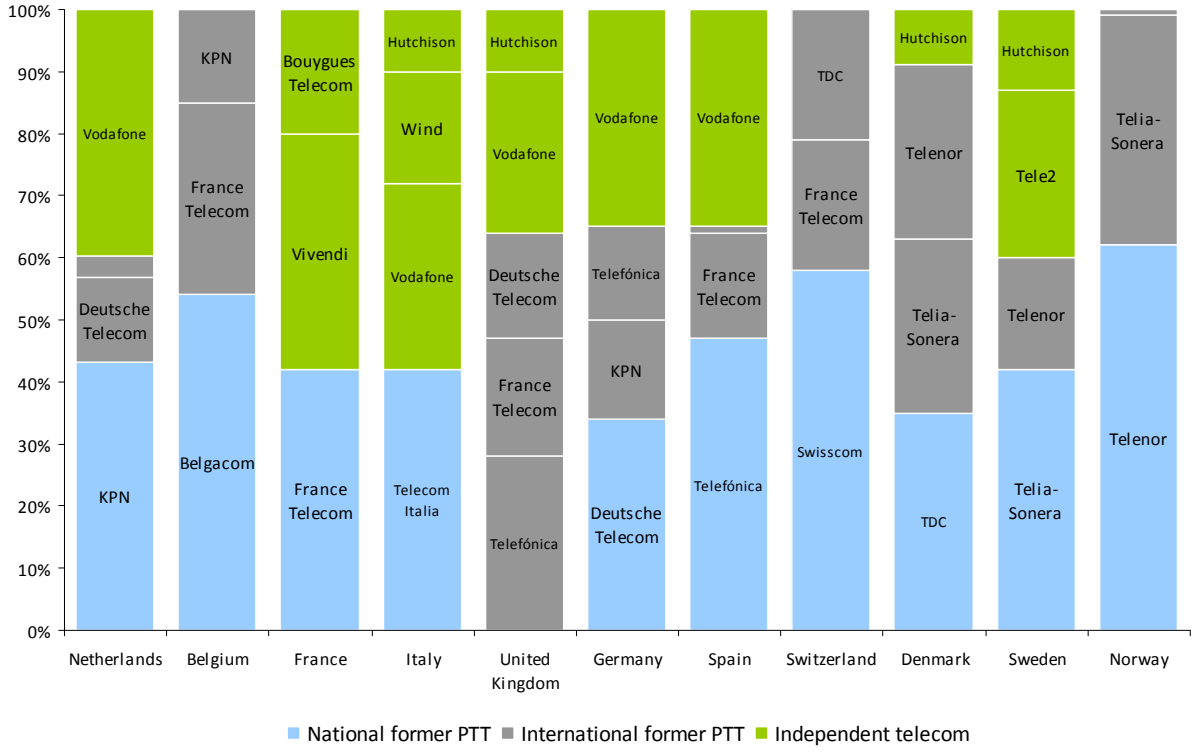

Figure 22: Mobile Service Revenues 2008 (€B) [source: estimated based on figure by Liberty Global, 2009]

The mobile communication market in Europe is dominated by the incumbent-fixed telephone operators, see Figure 22. When mobile communication was introduced commercially the incumbent expanded their services to mobile telephony. As the mobile communication market increased, the demand for spectrum increased. Now once more the demand for spectrum seems to be increasing, and continues to grow in the future (Dialogic & TNO ICT, 2009).

The mobile communication market can be separated: retailers, service providers (SPs), mobile virtual network operators (MVNOs), and mobile network operators (MNO) – (Abduhaziz, 2009). The MNOs have licenses to frequencies of the radio spectrum and own a physical network (e.g. backbone network,

antenna sites). The MNOs in the Netherlands are vertically integrated, which means that there is no separation between infrastructure and services, and that services are provided directly to the end users. MNOs also offer network access to the firms at service level. Firms at service level offer mobile services on the networks of the MNOs to end users. These service operators can be divided into two categories: mobile virtual network operators (MVNOs), and service providers (SPs).The MVNOs lease network capacity of the MNOs an can thereby offer mobile services to its end users. MVNOs often have an incomplete network of their own. MVNOs perform their own subscriber management (Verdonk Klooster Associates, 2008), whereby they maintain a direct relation to the end user, which often includes issuing SIM-cards and exploit the parts of the networks they lease with own network equipment. If an MVNOs owns more network equipment then they have to dependent less on the MNOs which would strengthen their competitive position (as in the fixed communication market, Paragraph 4.3.1) (OPTA, 2001). Service providers (SPs) buy minutes from MNOs and resell them to end users. The difference between a retailer and an SP is that SPs have a contract management with their end users, while retailers only close the telecom deals with end users (Verdonk Associates, 2001).

A parallel can be made to the ladder of investment in the fixed communication sector seen in Paragraph 4.3.1. A new entrant can climb the ladder until it owns infrastructure. First, it can operate as a service provider and resell minutes. The next step up the ladder is to establish a direct relation with the customers and start investing in own network equipment (MVNO). Finally, licenses can be bought to become an MNO. However, this last step requires substantial investments and depends on the issuing of licenses.

MNOs in the Netherlands

As the MVNO, SPs and retailers do not have any telecom licenses, the analysis is limited to the MNOs. There are three large MNOs in the Netherlands that operate both on the mobile voice and broadband market, these are: KPN, Vodafone, and T-Mobile. The mobile networks were initially designed for voice communication and have, by the appropriation of licenses in other bandwidths, expanded their services to mobile broadband services. It started with the GSM frequencies that were harmonized throughout Europe in which the European Commission has played a substantial role. The allocated spectrum for the GSM-standard in Europe is located in the 900MHz band. However, additional spectrum was freed in the 900 MHz band, the so called E(xtended)-GSM frequencies, to increase capacity. The Digital Cellular Service (DCS) frequencies are located in the 1800MHz band, these are also used for telecommunication. The data rates that can be achieved with the GSM and EGSM bands vary from 9.6kbps (original GSM standard) to 384kbps (with the EDGE[44] standard).[45]

As the mobile operators required more bandwidth to provide new services and higher speeds, the 1900MHz band and the 2100MHz band were allocated for mobile communication. The standard used on these bands is the Universal Mobile Telecommunication System standard (UMTS). The licenses for the

[44] Enhanced Data Rates for GSM Evolution (EDGE), which is also known as 2.5G which indicates that EDGE is the 2½th Generation mobile communication standard. EDGE has never been roll-out to cover the Netherlands entirely.

[45] Technological upgrades that have increased the speeds of mobile networks are High Speed Circuit-Switched Data (HDCSD) and General Package Radio Services (GPRS), respectively speeds can be achieved of a plural of 9,6kbps and for GPRS even 48kbps.

UMTS-frequencies were awarded by means of an auction in the Netherlands. The licenses were awarded to five operators in 2001, but presently only three MNOs remain which now own the licenses. With the UMTS-standard data speeds of exceeding 8 Mbps can be reached (with HSDPA 14Mbps). Recently new frequencies are being awarded for a new generation mobile communication in the Netherlands in the 2.6GHz band, and these will probably make use of the Long Term Evolution (LTE) standard (which is the project name of a new high performance mobile communication systems standard). The exact speeds that can be achieves are unknown, but tests have shown that LTE in the 2.6GHz band can reach speeds in excess of 150Mbps which is a substantial increase from the UMTS/HSDPA standard. Another possibility is that the 2.6GHz band is used with the Worldwide Interoperability for Microwave Access (WiMAX)[46] standard, but 68.7MHz of TDD frequencies lies unsold which is ideal for WiMAX[47]. The WiMAX standard is also used in the 3.5MHz band by Worldmax. Worldmax offers broadband connections whereby data rates of 8Mbps are offered. Worldmax was considered to be a serious competitor to UMTS, but roll-out has been slow, and the network coverage is also limited[48].

Last, there is a part of the spectrum that is also used for broadband communication which does not require a license. It is intensively used by the wireless fidelity standard better known as WiFi (IEEE 802.11b/g/n). Because the band is free of use[49] it is therefore mainly used for local wireless networks. Because the band is free of use operators are unable to guarantee: connection (due to interferences), quality of service, and data rates. However, there are a few metropolitan initiatives which cover the centre of cities with a network bases on WiFi, such as Rotterdam and Groningen.[50] However, these networks are not open to everyone, and are used to provide internet access for students (Groningen) and to support large events to provide information to visitors (Rotterdam). Beside the metropolitan networks also many public buildings, hotels and restaurants have so called hotspots which provide internet access freely, or is for a small fee (KPN and T-Mobile also have commercially Hotspots)(Telecompaper, 2010d). These networks only have limited coverage and will only provide wireless access to (parts of) urban areas. Given these limitation the WiFi networks will not be considered a competitor of any new mobile wireless services.

Propagation Characteristics and Investments

The data rates that can be achieved by the different technologies depend for a part on the bandwidth. However, the same bandwidths in the 900MHz band and 2100MHz band are different due to their propagation characteristics. If the frequencies are lower, then the range of the signal is larger. The lower

[46] In the past the WiMAX standard was already used in the 2.6MHz band to Versatel (Telecomwereld, 2006). Verestel sold the wireless local loop licenses (WLL) to Casema in 2006. Casema intended to invest in the WiMAX standard to offer telephony and broadband services. In 2007 Casema merged with @Home and Multikabel into Zesko (better known as Ziggo), which was not so enthusiastic of the WiMAX plans.

[47] In the past licences have also been awarded in the 3.5GHz band to Enertel for a period of 12 years. Worldmax (a joint venture between Enertel and Orascom Telecom) still has the exclusive licenses in the 3.5GHz band

[48] Amsterdam is the only large city in the Netherlands that has access to a city covering WiMAX network.

[49] Free to use by anyone without a license, however within the regulations of interference and below certain transmission power limits.

[50] Draadloos Groningen & Rotterdam Draadloos

frequencies can travel further and can penetrate objects easier (e.g. buildings) than high frequencies can. Thereby high frequency network require more antennas to establish a nation covering network based than low frequency networks. The downside of low frequency networks is that the bands are often smaller and can therefore carry less information, thus can achieve lower data rates. Typically operators want both low and high frequency bands. Low bands for coverage and high bands for capacity. Figure 23 illustrates the investment costs for a geographical area per frequency band (Vodafone, 2009). It has to be noted that the differences between the bands become smaller when the demand for capacity increases, and thereby the number of antenna sites increases.

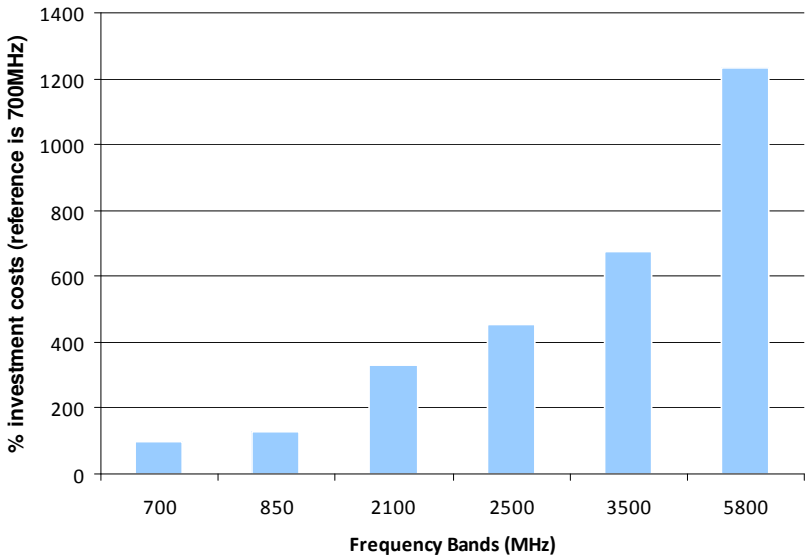

Figure 23: Frequency band vs. investment costs in relation to a 700MHz nationwide network [source: Vodafone, 2009]

A way for MNOs and MVNOs to decrease its investment costs is to share antenna sites. Nowadays antenna sites (which can be located on rooftops or on mast) make use of standardized systems whereby the equipment can be placed in so called rims. However, sharing of antenna sites may decrease costs for existing networks, but networks that use different frequencies, such as the digital Dividend can only partly use existing antenna sites as the range of the transmitters is different. In case of the digital dividend-band the frequencies are lower and therefore (if used for mobile telecommunication) the number of antennas that have to be places are less.[51] The digital dividend frequencies are favorable for new entrants as the number of antenna sites (and thereby investments) for nationwide coverage are relatively low. Nevertheless the existing MNOs have an advantage over new entrants as they can reuse many of their antenna sites locations. A more in-depth analysis of the antenna site market, and how it affects competition, is beyond the scope of this thesis.

The effects of Licenses

The telecom market on service level is quite competitive with a large number of MVNOs, SPs, and retailers. However, there are only a few MNOs in the Dutch market. In the past comments have been made on the way the Dutch government awards the licenses. The main comment is that the

[51] It has to be noted that if the demand for capacity increases the number of antenna sites increases. Therefore the number is not always related to coverage anymore.

government only accounts for the existing operators. The UMTS licenses were granted to five operators which were all the existing operators at the time. Meanwhile, by several mergers, only three MNO remain which together use all five UMTS licenses. Moreover license auctions are rare, as most licenses are awarded for 10 to 20 years. The latest auction In the Netherlands (2.6GHz auction) did allow new entrants to participate in the auction. To make sure new entrants had a chance six operators could bid on the spectrum, and the existing MNOs were limited in the amount of spectrum they could bid on. The limits or caps were based on the already licensed spectrum to the MNOs in other bands. These caps provide evidence that demand for licenses in a particular frequency band are affected by the already available licenses in other frequency band(s). Therefore the mobile broadband market cannot be analyzed without taking all the licenses of the mobile telecommunication market into account. Therefore a complete overview of the licenses, and license duration, in the Dutch market is presented in Figure 24.

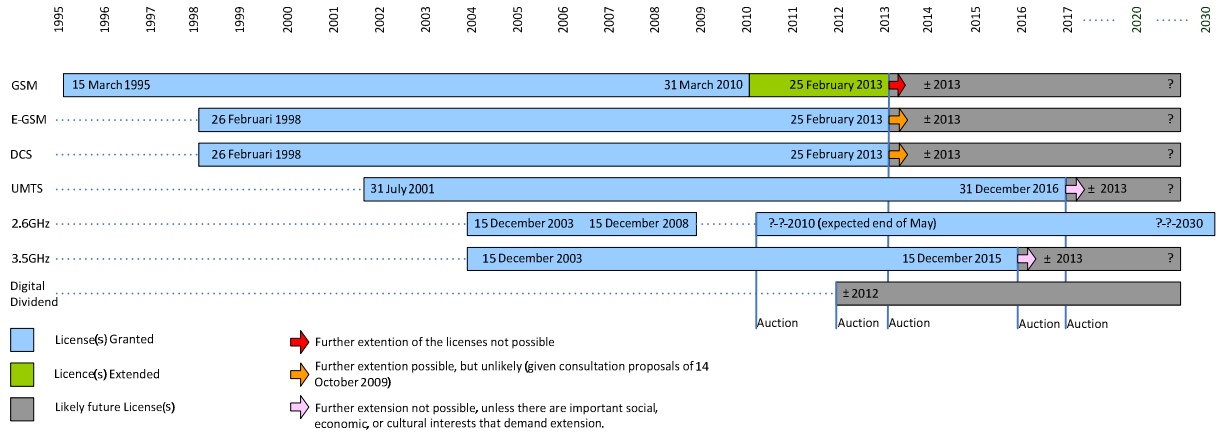

Figure 24: Overview of Dutch mobile communication spectrum Licenses [various sources: Ministry of Economic Affairs, Agentschap Telecom]

As can be seen Figure 24 the GSM licenses were extended once for three more years. Thereby the expiration date of the licenses will be roughly the same as the E-GSM licenses and DSC licenses. These were all issued under the Dutch Telecom Law of 1995, and thereby the granted frequencies could be extended. However, the GSM have already been extended and therefore further extension is not possible any more. The E-GSM and DSC licenses can also be extended because they were also awarded by the regulations of the Telecom Law of 1995. However, a consultation of the Ministry of Economic Affairs proposed that the licenses can not be extended anymore, and auctions are seen as favorable (MinEZ, 2009). The UMTS licenses were granted in 2003 for 15 years by the regulations of the Dutch Telecom Law of 1998. Therefore extension of these licenses is not possible. The UMTS licenses are likely to be re-auctioned sometime in 2016 as the old licenses will expire in the end of that year, see Figure 24. The 2.6GHz license had been granted to Casema at the end of 2003 until the end of 2008. Recently they have been re-auctioned (the auction took place on 26 April 2009). The 3.5GHz licenses have also been granted under the Dutch Telecom Law of 1998 and the licenses expire in 2015. Finally if and when the digital dividend frequencies (the 800MHz band) are auctioned remains uncertain. If the upper part will indeed become available for mobile communication then the earliest auction could start in 2012. However, if there are problems with the switchover of neighboring member states the auction will have

to be postponed. Then the auction could commence in 2015 (when the analogue rights are no longer protected by the ITU).

The most important conclusion from the licenses and expiration periods is that a number of auctions of different frequency bands will take place in a relatively short time period. Therefore it is remarkable that limitations have been used in the 2.6GHz auctions (see Appendix X for the awarded spectrum per telecom operator). This induces uncertainty in the mobile communication market for other auctions. Another possible effect is the participation of actors to prevent that licenses are awarded to competitors, or lack of participation to acquire more licenses in other frequency bands. These effects are somewhat reduced as the licenses can not be traded until two and a half years after the licenses have been granted (MinEZ, 2010, Art. 40). Thereafter the ministry and competition authority need to allow trade any trade of the licenses (Dutch telecommunication law, Article 3.8). However, operators can also sub-let their licenses, but then they are responsible for any abuse (e.g. interference) of these frequencies.

LTE and the digital dividend

If the upper part of the digital dividend Spectrum is used for mobile communication the likely standard used is LTE, as can be concluded from various market signals (Telecompaper, 2009j). LTE is a successor of UMTS. The 4G mobile communications technology includes an all-IP flat networking architecture. The Commission announced in 2009 that it will invest a total of €18 million into researching the deployment of LTE and LTE-Advanced (Betanews, 2009). The LTE specification should provide downlink peak rates of at least 100 Mbps, an uplink of at least 50 Mbps. LTE supports scalable carrier bandwidths from 20MHz down to 1.4MHz and supports two different techniques known as frequency division duplex (FDD) and time division duplex (TDD). Part of the LTE standard is based on a flat IP-based network architecture which is designed to replace the GPRS Core Network and ensure support for, and mobility between, some older standards (e.g. GSM, UMTS) and also non-3GPP systems (e.g. WiMAX)

A possible problem with the allocation of the upper part of the digital dividend to mobile broadband (LTE) is the interference with fixed cable networks. The frequencies used by the fixed cable operators are partly the same as the frequencies used by the LTE standard. This is already the case in broadcast networks, but the transmission now do (marginally or) not affect the fixed cable networks. However, if LTE is used, mobile devices will transmit high power signals much closer to the cable modems, wires, and televisions than broadcast transmitters do. This could cause interference on the cable signals, or could possibly even crash the cable-modems (Telecompaper, 2010e). Some studies have already been conducted to determine the affects of LTE on cable antenna installations, and they indicate that interference is caused (AT, 2009; CEPT, 2009). The LTE standard could possibly relocate channel 63 in the duplex gap (gap between upload and download) if the power levels of the LTE (FDD of TDD[52]) do not exceed a particular threshold.

[52] In case of TDD a guard band of at least 1 MHz is required to ensure existing Program Making and Special Events (PMSE) services to operate.

Synthesis

The digital dividend part of the spectrum cannot be analyzed without considering other frequency bands for mobile communication. How the licenses are awarded affects the demand for other frequency bands. It remains the question how to award licenses so that competition is stimulated in the wireless network market and perhaps even fixed network market. The demand for the digital dividend frequencies is likely to be large due to its propagation properties. The main problems are the relocation of the KPN/Digitenne channels, the relocation of the PMSE-services, and interference to the cable networks.

5.4.3 Conclusion

The proposals have made the broadband and broadcast market dependent of each other, both in the fixed and wireless networks. Therefore policy decisions concerning the digital dividend spectrum affects both markets. One of the reasons of the interdependency is the vertically integration and oligopoly nature of the communications market. Another reason is the convergence to the broadcast market, as operators both have fixed and mobile infrastructure networks. On one hand, the digital broadcast market claims to require additional spectrum to improve and expand their broadcast services (Broadcast Partners, 2009; Dutch Media, 2009). On the other hand the broadband market is rapidly increasing, and although there already are several frequency bands which are already available, additional spectrum is required to offer new and faster services. The mobile broadband market has several advantages over the wireless broadcast market. First, it can also provide broadband services over its networks if sufficient capacity is provided. Second, in terms of economic activity the mobile market more added private value than wireless broadcast services. However, there are also problems, such as the interference problems with the fixed cable operators and reallocation of digital dividend Spectrum. From a European perspective harmonization of the spectrum is important adding other considerations as well. The problems with the cable operators in other member states, compared to the Netherlands are smaller, as many do not have fixed cable infrastructures (Liberty Global, 2009). Moreover these member states often have large rural areas whereby broadband access poor. The perspective of the Commission is therefore likely different than in the Netherlands, and probably holds more weight which most could influence the final decision.

5.5 Market Verification

Several interviews were held with various actors in the telecommunication and broadcast market that could be affected by the digital dividend proposals, see Appendix VII. The respondents have been grouped in three types of actors: broadcasters, mobile service providers, and the regulator(s). In Paragraph 5.5.1 the different views of the actors are presented on the coordination role of European spectrum management. Paragraph 5.5.2 discusses whether the proposals contribute to efficient and effective use of the digital dividend. Paragraph 5.5.3 and 5.5.4 discusses the view of the market concerning the options of using the digital dividend for mobile broadcast or mobile broadband respectively. Finally Paragraph 5.5.5 discusses the views of the market on the goals of economic growth and recovery.

5.5.1 European role of improved coordination

The first main goal of the European Consultation concerning the digital dividend is to improve the European coordination of spectrum management, and also the harmonization of technological equipment. A related question is whether there should be European coordination at all, as spectrum management formally is an international and national affair. In general, as depicted in Figure 25, the respondents believe that the proposals will improve European spectrum coordination.

Could you indicate, on a scale from one to five, if the digital dividend proposals will accomplish improved European coordination of spectrum management? (1 = absolutely not; 5 = yes, much more European coordination)

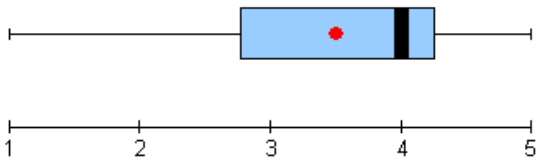

Figure 25: European Coordination

The regulator responsible for spectrum management in the Netherlands argues that in the past European coordination was considered to be a national affair as it mainly consisted of broadcast services, and thereby served national interests. Therefore the EU did not interfere with spectrum national policies. As the market opened up for commercial broadcasting and commercial mobile communication, more telecom and broadcast stakeholders started to lobby on European level, as decisions made in Brussels are more effective. Decisions made in the EU are based on majority decisions, unlike the decisions of the ITU which are based on consensus. Therefore European decisions making is faster.

The broadcast related actors are divided in the meddling of the Commission concerning spectrum management. The decision process in the EU is unclear as there are many committees and interest groups that influence decisions. Therefore it is hard to determine who has power. One broadcast related actor believes that the increasing power of the EU in spectrum management is a favorable development. Thereby regional decisions are speeded-up, which is positive for economic development. However, other actors are less positive of the coordinating role of the Commission. One actor believes that European meddling only complicates the discussion as more actors will participate in the discussion. The meddling will delay and complicate decisions; therefore the decisions will be based on more consent between interest groups which will not make the use more efficient.

The telecom related actors compare the proposals with the decisions made by the EU concerning standardization and spectrum management with actions of the Commission concerning GSM and the roaming tariffs. It also recognizes the role of the EU in setting a policy direction for the ITU, which indeed has made the spectrum management more flexible (by proposing to not use the spectrum exclusively for broadcasting purposes but in a technological neutral way). In general the telecom operators favor the meddling of the Commission in spectrum policy as decisions are faster. The EU coordination is also favorable for (pan-European) economic activity which provides certainty, and thereby an incentive for equipment manufacturers for development and innovation.

5.5.2 Spectrum demand, flexibility and efficiency

The most important objective is to meet the growing demand for spectrum and use any additional spectrum in a flexible and efficient manner. The first question is whether there actually is a greater demand for spectrum, especially given the upcoming auctions of many frequency bands in the Netherlands.

Demand for spectrum

The regulator believes that there is indeed a growing demand for frequency spectrum in the near future. The digital dividend spectrum will become available in all the European member states but also in many other countries around the world. Therefore the demand for this particular spectrum will be higher than other frequency bands. The demand will initially increase but on the other hand compression techniques are likely to improve which decreases the demand for spectrum.[53]

The broadcast related actors firstly remark that the frequency spectrum in itself is a scarce good. However, the demand for some parts of the spectrum is higher than other parts. The digital dividend part of the spectrum is one of the scarce frequency bands because of its favorable propagation characteristics. This makes the spectrum ideal for new MNOs, but also for broadcasting purposes. Two of the broadcast related actors believe that overall the demand for spectrum is not so high, and are a bit skeptical. The arguments used to support their views are the hesitations to participate in the 2.6GHz band and the (forced) return of the old unused frequencies of Telfort by KPN (who took over Telfort) to the state. The future demand for spectrum will greatly depend on the future developments of broadband. One actor argues that if parts of the spectrum are offered, there always will be someone to claim it, therefore the spectrum could be considered to be scarce.

The telecom operators also argue that some parts of the spectrum are more valuable then others. The upcoming auctions of the 2.6GHz, 3.5GHz, and GSM frequencies will not decrease that demand. One of the new developments is that the spectrum is no longer bounded by particular services and technologies, but is now awarded technology neutral. The actors all emphasize the high value of the spectrum as relatively low investments costs for a network in the digital dividend. This is the first reason the demand of the digital dividend frequencies will be high. A second reason is that the operators will need spectrum in both high and low frequencies bands. High frequency bands are needed for capacity, which is increased by devices, such as the iPhone. And also low frequency band(s) for coverage; as networks that do not have nation covering networks will not be accepted by the consumers.

Flexible and efficient use of spectrum

The second question is whether the proposals provide a more flexible and efficient use of the digital dividend spectrum. As depicted in Figure 26; the respondents overall believe that the proposals will indeed accomplish a more flexible and efficient use of the digital dividend spectrum.

[53] One actor also points to future technological developments that will be less depended on frequency band such as cognitive radio devices. These will scan the environment and will use those parts of the spectrum that are available to address the needs of the access seeker such as a certain quality and capacity of a connection at a specific time.

Could you indicate, on a scale from one to five, if the digital dividend proposals will accomplish improved flexibility and efficiency of the digital dividend spectrum? (1 = absolutely not; 5 = yes, much more)

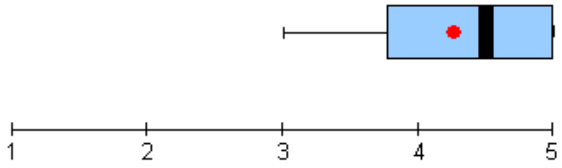

Figure 26: Flexibility and Efficiency

The regulator believes that the proposals will indeed provide more flexible and efficient use. More flexible is created by the ITU decisions to use the upper part of the digital dividend for other purposes than broadcast. And increased efficiency is also created by the switchover to digital broadcasts, and the European coordination of the upper part of the digital dividend.

The broadcast related actors believe that the proposals will indeed increase efficiency in Europe but that the effects on the Netherlands will be limited as the analogue to digital switchover has already been made. The broadcast related actors agree that the flexibility increases by changing the specified use for the upper part of the digital dividend (which was stimulated in the RRC by the European Commission). However, one argues that flexibility is truly increased if frequency licenses also become tradable. The actors are a bit more skeptic whether the spectrum will be used more efficient. One actor argues that efficiency could be increased if the white spaces were also used in a better way. Another actor argues that the Commission has set out a clear vision to stimulate economic development in its consultation, and thereby efficiency is increased. Some actors note that in the future spectrum management will not have to be coordinated anymore; as cognitive radio will start to develop which make use of the spectrum in a more effective and efficient way.

The (mobile) telecom related actors believe that the flexibility of the spectrum is increased as the upper part of the digital dividend spectrum can be used in a technological neutral way. Also the efficient use of the spectrum will be increased as European coordination of the spectrum leads to efficiency gains in border areas. The proposals will also speed-up the switchover from analogue to digital transmission whereby the upper part will be available more rapidly. Therefore the spectrum which cannot be used at the moment will be available sooner. One operator notes that the coordination of the digital dividend is similar to the coordination of the GSM frequencies in the past. However, another operator notes that regulatory certainty is decreased by the unclear vision of other frequencies in the Netherlands. This regulatory uncertainty can lead to inefficiencies in spectrum use. Investments are hampered as it is unclear if frequencies are extended, and on what term auctions will be conducted.

5.5.3 Broadcast

As presented in the consultations there are two considerations, either to use the frequency for broadcasting services only, or to use the lower part for broadcasting and the upper part for mobile communication. First, the consideration for the use of the spectrum for broadcasting purposes is discussed. Overall the respondents indicate that if the digital dividend is used for broadcasting it will not

develop services much further (see Figure 27). Although it has to be noted that services will develop further in member states, as they have not yet switched-over.

Could you indicate, on a scale from one to five, if the digital dividend proposals will further develop terrestrial broadcasting services? (1 = absolutely not; 5 = yes; much development in services, technology and equipment)

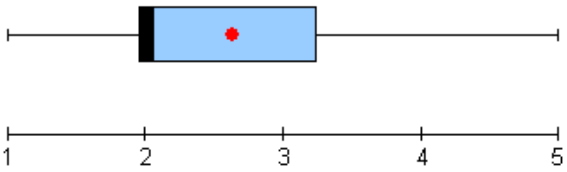

Figure 27: Further Development of Broadcast Services

The regulator notes that the Ministry has already proposed to use the upper part of the spectrum for mobile communication, and adopts this position. The regulator in general does not want to comment on any short term market changes, and argues that in the future cognitive radio devices will cause a paradigm shift in market and thereby also in spectrum management. The Ministry has until now attempted to predict the demand for spectrum, and based their decisions on these predictions. The regulator argues that there is a slow movement to a more facilitating role, than an anticipating regulatory role.

The broadcast related actors would favor that the upper part of the spectrum would be used for broadcasting purposes, but eventually it will not be a technical or economic based decision but a political one. This preference might seem odd as competition between broadcast networks will thereby increase. However, the alternative could hamper their existing broadband and broadcast offer as LTE seems to greatly interfere on the cable networks. One actor even believes that it is not unthinkable that the capacity for mobile broadcasting would be reduced even further to award additional spectrum for mobile communication purposes. Therefore one of the actors proposes to formally shield the lower part of the spectrum to exclusive for broadcasting services. This actor believes that television broadcasts are a social and cultural commodity that needs to be protected. The alternative – using it for additional broadcasting services – is the less of two evils. Moreover the cable operators argue that their fixed television broadcasts services are superior in quality and quantity than the terrestrial broadcast services. The broadcast related actors do not believe that a new entrant would position itself next to KPN/Digitenne, and if the spectrum would be used for broadcasting purposes this would most likely be claimed by them. This would indeed result in increased competition with fixed-IPTV, DVB-C, and DVB-S broadcasters. KPN/Digitenne is already seen as a serious competitor, and could even strengthen their offer if the spectrum would come available. However, some broadcast related actors identify a problem with the current KPN/Digitenne offer, which according to the operators is offered lower in price than the exploitation costs. Some actors argue that the only reason for maintaining the KPN/Digitenne offer is to gain a customer base for television services which could then be migrated to IPTV services on the incumbent's fixed infrastructure. Some actors therefore would not be totally surprised when KPN/Digitenne would stop its DVB-T offer in 2017 when the licenses expire. This line of reasoning is strengthened by KPN's position concerning access to the analogue cable networks and its commitment to VDSL whereby IPTV can be offered relatively easily (and with low investments). One broadcast related

operator argues that in the ideal situation would be if the upper part should be awarded to another actor than KPN/Digitenne.

The telecom related actors also do not believe that the upper part of the digital dividend spectrum will be used for broadcast purposes. One actor argues that television is becoming more personal and demand for pre-programmed broadcasts will decrease. However, if the upper part of the digital dividend would be used for broadcasting purposes, than most likely KPN/Digitenne would become an even larger competitor for other broadcasters. They also do not believe that any other actors will enter the DVB-T/H market, especially as KPN/Digitenne already has a large subscriber base and has invested much in its infrastructure. Thereby the barrier for entry is high and KPN/Digitenne is sort of locked-in by its investments. One actor argues that if the upper part of the spectrum is used for broadcasting, it is likely that it will be used to broadcast HD channels which will increase competition in the broadcast market. However, this actor also questions whether the HD market is not too small, especially as HD is not required for DVB-H devices.

5.5.4 Mobile Broadband

The second option is to use the upper part of the digital dividend for mobile communication purposes. This is discussed in terms of future market developments, such as: the problem areas, market entry, and technology standards. The respondents are quite divided on whether the proposals will provide mobile broadband for everyone: although most the view that broadband access is stimulated.

Could you indicate, on a scale from one to five, if the digital dividend proposals will accomplish (mobile) broadband access for everyone? (1 = absolutely not; 5 = yes, broadband access everywhere)

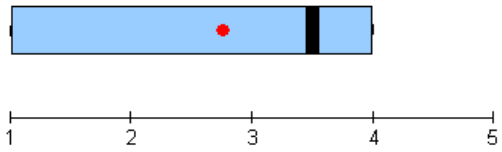

Figure 28: Broadband Access

The regulator responsible for spectrum management adopts the position of the Ministry of Economic Affairs that the upper part of the digital dividend will be used for mobile communication. Networks for mobile communication are significantly different than broadcast networks which can suffice with a limited number of high power transmitters. Mobile communication networks require many small transceiver locations that make two-way communication possible. The regulator argues that consumers do not care by which technology services are offered. The future expectations of the regulator are that traditional broadcast market will become hybrid and that mobile communication networks will offer video on demand.

The broadcast related actors believe that the upper part will be used for mobile communication. First, the economic benefits are much larger, and second the proposals concern all member states where broadband penetration remains an issue (especially in rural areas). The digital dividend is ideal to cover large areas for limited costs because of the favorable propagation characteristics. One actor also argues that the use of spectrum for broadcasting networks will decrease, as video on demand will become

more important. Therefore a slow transition to all-IP networks is likely. The digital dividend is ideal for new actors that want to enter the market. Thereby they can, with relatively limited investments, deploy a nation covering network. However, the spectrum is not ideal for densely populated areas with many users which will need many small cells to provide the high capacities. Possible new entrants are the cable operators (as in the 2.6GHz auction) as they will have to compete with package deals of existing operators which already include mobile services (packages such as triple play and quadruple play). However, one actor is uncertain whether the upper part of the spectrum will be used for mobile communication. This actor refers to the problems of interference with the fixed cable networks. The actor argues that the mobile communication in the digital dividend currently has no established consumer base, while 95% of the households will suffer from interferences of a mobile (LTE) network.

The telecom related actors believe that the upper part of the digital dividend spectrum will be used for mobile communication. The telecom operators indicate that they are all very interested in the 800Mhz band frequencies. One actor believes that the digital dividend could change the telecom market significantly. The telecom related actors also do believe that there will be entry. One actor argues that there will be no new entrants without a wide spread backbone network. Another actor believes that even equipment manufacturers are very interested in the spectrum and could possibly enter the market. A few operators stress that the spectrum management in the Netherlands creates uncertainty. Therefore all spectrum developments, such as auctions in other frequency bands, are monitored very closely. It is very uncertain how much and in what frequency bands spectrum can be appropriated in the future. Especially as the actors have to conclude that the spectrum bands are interrelated as limitations have been set for existing MNOs participating in the 2.6GHz auction. A possible effect is the participation of actors in auctions to prevent that licenses are awarded to competitors, or lack of participation to acquire more licenses in other frequency bands.

Moreover there are additional problems in the upper part of the digital dividend that will have to be overcome. First the issue with the interference of mobile communication in the 800Mhz on the fixed cable equipment; second, the problems and costs of rearranging the upper part of the digital dividend. Any cost of rearrangement of the current DVB-T awarded channels should be compensated according to one actor. Given the uncertainty of Dutch spectrum management and the problems of rearranging the digital dividend spectrum, one actors is concerned about the DVB-T broadcaster position concerning the rearrangement of the spectrum and compensation of thereof. Especially as the DVB-T broadcaster also is an MVO and has interests in mobile communication. Finally, one actor notes that there is no long term spectrum management vision in the Netherlands. One actor adds that the decisions made by the Ministry of Economic Affairs also often change which adds to uncertainty.

5.5.5 Competitiveness and Economic Growth

The last goal of the Commission is to significantly contribute to economic growth and satisfy some of the important social, cultural and economic needs for the benefit of European citizens. As there is currently also a financial crisis which influences the market in terms of revenues and investments, an economic recovery plan has been developed. Some of the goals of the recovery plan are directly related to the telecommunication sector. These goals are to provide 100% broadband coverage in Europe, and in general induce further efficiency gains in the economy. In general most respondents do not believe that

the proposal will increase economic growth in the European Union – see Figure 29, especially in the Netherlands that has already reaped some of the benefits of the switchover.

Could you indicate, on a scale from one to five, if the NGA proposals will accomplish fast and visible increased economic activity? (1 =no increased economic activity; 5 = yes, much more economic activity)

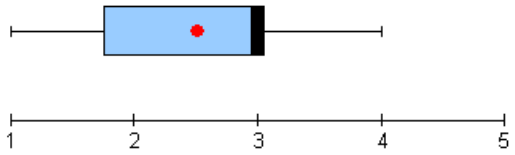

Figure 29: Visible Increased Economic Activity

The regulator agrees with the conclusion of the report presented by Analyses Mason, DotEcon and Hogan&Hartson (2009) which concludes that the digital dividend indeed has a large potential for increased economic activity. The competitive telecom culture in the Netherlands will demand for additional spectrum to provide new services. Also internationally the digital dividend provides much potential for economic activity as the frequency spectrum is freed all around the world. Whether 100% broadband coverage will be achieved in Europe is hard to say, and depend on national regulations. 100% broadband coverage in the Netherlands is not really an issue, as there are already widespread fixed infrastructures which already provide broadband and broadcast access to 99% and 95% respectively in the Netherlands.

The broadcast related actors believe that the goals can contribute to the economic growth, but not given the national situation not so much in the Netherlands. Despite the Dutch policy intention there are considerations to maintain the spectrum for broadcasting purposes, for example to maintain a platform that can compete with the cable operators for broadcast. However, a new network roll-out will take many years. It took the operators from 2001, when the UMTS licenses were awarded, to 2004 before the first UMTS services were launched. Therefore any effects of the digital dividend in the Netherlands, which will mostly come from the upper part of the digital dividend spectrum, can only be seen after a few years and will not have an immediate effect. One actor argues that the Netherlands has high fixed network penetrations whereby the uptake of mobile broadband will be lower than in member states where rural areas do not have high-speed broadband access. The business opportunity in the few remaining rural unconnected areas in the Netherlands will therefore be poor. One actor argues that 100% wireless coverage in Europe and the Netherlands is unlikely unless a universal service obligation is enforced to provide 100% coverage. In relation to fixed networks the question remains whether the services provided by means of the digital dividend will reduce the demand of fixed networks. It is agued network innovations do not drive the demand but new devices, such as the I-Phone, which will increase data traffic, and thereby network innovations and economic growth.

The telecom related actors are somewhat divided in their opinions. Some believe that the digital dividend will indeed generate increased economic activity, especially by European coordination. These operators also believe that the digital dividend, if used for mobile broadband, will be complementary to the fixed network. One operator argues that the economic activity of the digital dividend will be less than expected as the main value resides in providing coverage in rural areas, which is not an issue in the

Netherlands. The value of the digital dividend is also affected by uncertainty of other frequency bands in the Netherlands, which could hamper investments. Another actor believes that the digital dividend will not be complementary to fixed networks, but will be a new competitor. Generally the telecom actors do not believe that 100% coverage will be reached by the proposals, especially not if the spectrum is divided between many operators. Total coverage will only be reached if some form of universal service directive is mandated. If left to the market, the urban areas will first be developed where the business case is more interesting.

5.6 Conclusion digital dividend case

The conclusions are directly related to the goals set in the consultation(s) on the use of the Digital Dividend. The conclusions are based on the market analyses of the telecommunication market and the broadcast market, and the responses of several market actors which are mainly used to verify the market analyses. First the conclusion on the role of the European Union in harmonizing the Digital Dividend spectrum is given, in Paragraph 5.6.1. Second, the conclusion is given whether the proposals will increase the effective and efficient use of the spectrum, in Paragraph 5.6.2. Finally the conclusions on the two possible options to use the upper party are given in Paragraphs 5.6.3 and 5.6.4.

5.6.1 European role of improved coordination

The first objective of the Commission is to improve coordination between the member states. The proposals mainly concern a harmonized use of the upper part of the spectrum and the harmonization of equipment. The proposals also mandate a rapid switchover to digital terrestrial television by 2012. The market analysis has shown that the differences between the member states are quite large. Some have already switched-over, like the Netherlands, but a large majority has scheduled the switchover for 2012. Nevertheless the common approach and harmonization proposals will in general improve European coordination, despite formal decisions are made on international, regional or national level and not by the European Union. However, the EU seems to be an ideal platform to coordinate the use of spectrum throughout its member states, as with the implementation of GSM. The market actors generally believe that coordination is improved by the proposals. The broadcast related actors are a bit more pessimistic and believe that the coordination is improved, but not much.

This leads to the conclusion that the proposals improve coordination between member states. It has to be noted that the coordination will only succeed when all member states adopt the proposals in the same way, including technological standards.

5.6.2 Spectrum demand, flexibility and efficiency

The second objective is to increase the flexibility and efficiency of the spectrum management. The market analyses indicated that the decision of the RCC has changed the status of the upper part of the digital dividend so that it can also be used for mobile communication. This has contributed much to a more flexible use of the digital dividend, as it opened up new possibilities. The extent to which the EU has had an influence on this decision is unclear, but is presumably large. The switchover, as proposed, will indeed make a much more efficient use of the spectrum. However, for the Netherlands this increase in efficiency is limited as it already switched-over. The efficiency gains of the proposals for the Netherlands consist of a more rapid switchover of surrounding member states so the currently

unutilized channels can be used. The conclusions of the market analyses (section 5.4) are mainly supported by the market respondents.

This leads to the conclusion that the European proposals will indeed create a more flexible and efficient use of the digital dividend spectrum. The effects of the proposals on the Netherlands are more limited.

5.6.3 Broadcast

The first option is to use the upper part of the digital dividend for broadcasting purposes. The market analysis (section 5.4) has shown that the incremental private value added is lower if the upper part is used for broadcasting purposes than for mobile communication. The implementation is also much easier and causes fewer problems than using it for mobile communication. Also the competitive potential of DVB-T is increased which can compete with other broadcast infrastructures, which was the main motive in the past. However, the market indicated that it will most likely not be used for broadcasting purposes. The market is divided; some actors favor the use of the spectrum for broadcasting purposes and others for mobile communication. However, the actors that favor broadcast seem to be biased, and base their opinion on the negative consequences it will have on their business if the spectrum is used for mobile communication. Therefore the market actors do not expect much further development of broadcast services in the digital dividend, and some even believe that in 2017 commercial terrestrial broadcasting could stop.

Therefore it has to be concluded that the European proposals to further develop broadband services is limited in the Netherlands as the spectrum will likely be used for mobile communication. However, in Europe terrestrial broadcasting services still have to be developed, and will therefore have a much larger effect.

5.6.4 Mobile Broadband

The second option is to use the upper part of the digital dividend for mobile (broadband) communication purposes. The market analysis showed (section 5.4) that the incremental private value added is highest when the upper part is used for mobile communication. There are problems with the rearrangement of the spectrum, and interference problems with fixed infrastructures. Nevertheless the option of using the spectrum for mobile communication seems the most likely one. The market fully agrees that the use of the upper part of the digital dividend for mobile communication is the most likely one. In contrary to the Netherlands most European member states do not have highly penetrated fixed broadband access networks. Therefore the opportunity and business cases for these member states are much greater than for the Netherlands. Moreover, they do not experience the same problems as in the Netherlands; most member states do not have wide spread fixed cable networks which could possibly be interfered on, and they have not switched-over to digital terrestrial broadcasting so they do not have any rearrangement problems. In the Netherlands the second option is also affected by the Dutch proposals and the spectrum management in other frequency bands which could hamper the investments and efficient use of the released spectrum. For these reasons goal of ‘broadband for everyone’ is questioned if it can be reached by the actors.

Therefore it has to be concluded that the European proposals will stimulate the development of the mobile broadband communication. Thereby mobile broadband communication will become available

more widely. However, the value of digital dividend in the Netherlands is lower given the Dutch market situation (already widely available broadband networks), and its problems (interference with cable networks, relocating the spectrum used for PMSE services, already provided licenses to KPN/Digitenne to 2017). In general the market actors believe that any rapid and visible economic growth is unlikely in the Netherlands for several reasons. First, the Netherlands has almost no rural unconnected areas and therefore the business case will be less interesting. Second, the deployment of new networks is slow. Nevertheless the (economic) effects of the proposals seem to be large which is mostly induced by the continuous increase in demand for mobile (broadband) communication.

6. Conclusions

This chapter will present the author's conclusions and will answer the research questions. This chapter will end with a discussion and recommendation for further research.

6.1 Summary and conclusions

This thesis focused on the impact of regulatory changes of the new framework. The main research question is:

> *What are the economic principles behind the new regulatory framework, and what are the expected effects concerning frequency spectrum and broadband access for the Dutch telecom market?*

A number of sub-research questions have been formulated to answer the main research question. The first part of the thesis, which will answer the first sub-research question (1), focused on the identification of the economic principles of market regulation and competition law. The second part of the thesis focused on the development of the electronic communication sector, research question 2a. With the historic perspective the design of the new regulation can be further analyzed, which answers the research question 2b. The third part focused on how the changes will affect the Dutch telecom market in the future, and whether the expected developments were intended for the two subjects of interest. This will be answered by the last two research questions, 3a and 3b. The conclusions of each research question are presented below.

1. On what economic principles are market regulation and competition law based?

Several economic perspectives and models were identified to determine the principles on which market regulation and competition law are based. The economic perspectives that have shaped market regulation and competition law mainly differs in the degree to which competition is considered sufficient to label a market as competitive. The traditional perspectives and the related models strive for markets of workable or even perfect competition which maximize wealth. More modern theories also strive for wealth maximization, but determine the favorability of particular market situation by market behavior. The changes in perspectives determine when, and if, market regulation should intervene in a market.

The perspectives were supplemented with some economic models that specifically apply to infrastructure-based markets, such as the telecommunications market. The analysis of the models indicates that regular competition law is insufficient to safeguard competition of infrastructure-based markets. Infrastructure markets are industries of decreasing costs and of increasing returns. By the combination of network effects, specific cost structures, and lock-in effects the market is likely to develop to market with a limited number of competitors. Therefore, policy focuses on inducing remedies to counter these effects to maximize welfare. Without intervention infrastructure-based markets are likely to converge to narrow oligopoly or monopoly markets, especially as the media and information technology markets are further converging.

2a. How has the electronic communication sector developed, since the 1990s in terms of regulation.

The electronic communication sector has changed much since the 1990s. Initially the sector was mostly dominated by often state owned public service monopolies. Since, sector specific regulation has focused on making the market more competitive. First, *ex ante* regulation was introduced with the intention to abolish the special and exclusive rights of the state owned monopolies whereby the market was opened up for competition. Second, regulation for harmonization, interoperability, and standardization was introduced to establish interconnection between networks and equipment. More recent regulation has focused on new developments, such as the convergence of the media and information technology sectors. These developments have resulted in a broader regulatory scope and also an increase of regulation.

2b What are the changes in the new (proposed) electronic communications framework, and are they compatible with the economic principles?

The first proposed change is the establishment of a new market authority. The new authority should improve on the internal regulatory processes and thereby facilitate competition by reducing the bureaucratic 'barriers'. Whether such a proposal is compatible with economic theory is hard to determine as the changes do not affect the market much. There also seem to be other motives involved, such as more social and political motives.

The second proposed change consists of a number of remedies for protecting user rights, privacy, and data. Whether these proposals are compatible with economic theory is also hard to determine. These seem to be more socially motivated as they provide universal services and protection (e.g. against malware, spam.). These services are often not provided by the market, as they are not economically feasible.

The third change, which has already been implemented, has reduced the number of relevant product markets identified by the Commission to regulate. This measure suggests that sector specific regulation has been a success, whereby some markets do not need to be regulated anymore. These markets were already considered to be competitive in the Netherlands, and therefore will not change much. It has to be noted that these markets will probably only remain competitive if the remaining relevant markets continue to be regulated.

The fourth proposed change is to add the remedy 'functional separation' to the toolbox of the national regulatory authorities. This measure can be used to force vertically integrated firms to separate their service activities and network activities, while maintaining the advantages of the vertical integration. Thereby it can more easily be determined if a firm undertakes anti-competitive activities (e.g. predatory pricing). The measure of 'functional separation' is one of last resort, and will probably not be used in the Netherlands as the market is reasonably competitive. The measure seems to be especially compatible with the more modern transaction cost theory, which allows vertical integration as long as efficiency is increased.

The fifth proposed change concerns next generation access networks. The next generation access proposals are to some extent compatible with the economic principles. It supplements the previous

regulation to include next generation networks. Thereby access is mandated to reduce entry barrier according to the ladder of investment principle. Another element in the regulation is to stimulate next generation networks. Therefore a reasonable return on investment to the network of the dominant operator is proposed (on which access is mandated). This measure stimulates investments which are needed as the incentive of the incumbent to invest has been decreased by the access regulation. However, it can also be argued that the measure to stimulate investment is not in line with the economic principles, as setting the access prices higher than competitive price level can be seen as a form of subsidy, which generally distorts competition. Therefore it is hard to determine whether the proposals are in line with economic theory. Personally I believe the regulation is in line with economic theory. Efficiency is increased by the access regulation, and by stimulating NGA networks efficiency is also increased in the future.

The last proposed change concerns the spectrum management and specifically the digital dividend in the UHF band. The proposals aim to harmonize the future use of the digital dividend whereby economic growth and other social goals can be accomplished. To use the digital dividend in the most efficient way – by harmonizing it use throughout Europe – seems to be in line with the economic principles, as it maximizes welfare. However, the choice to use it for a particular market will affect other markets (such as the fixed broadband and broadcast market). Moreover the proposals also support certain technology standards. Therefore it is hard to provide an answer if the motives correspond with economic theory, especially as many other motives have influenced the proposals.

The future market developments have been analyzed for two subjects of interest: next generation access networks and the digital dividend.

3a, b How do the actors affected by the electronic communications framework perceive the new changes in terms of future market developments? & What are the expected effects of the next generation access proposals and do they correspond with the effect intended by the European Commission?

The objectives of Commission concerning the proposed next generation access networks regulation are to: increase infrastructure competition, to stimulate the roll out of NGA networks, and to provide regulatory certainty at the same time. The bottleneck of the NGA networks appears to be the last part of the network that connects the user to the operator (the local loop), as it is least likely to be duplicated and therefore least competitive. However, the actors affected by the proposals do not believe infrastructure competition and investments are stimulated much. They do believe that the regulatory proposals set the right conditions for infrastructure competition, but argue that the regulatory proposals do not affects the market much. The actors believe that infrastructure competition will be increased by competition in the market, and not by regulation.

The actors suggest that the incumbent will have to investments in next generation access networks in the future to remain competitive. Therefore the regulation could increase the incentive for the incumbent to invest (sooner) by reducing risks and costs. Therefore the effect of the regulation might be underestimated.

Another objective of Commission concerning the NGA regulation is to stimulate regulatory certainty. The actors affected by the regulation believe that regulatory certainty is only increased in a limited way. Adding to regulatory certainty are the consistent proposals which are in line with previous regulation. Adding to uncertainty are the exceptions in the proposals (access regulation in case of NGA deployment, co-investments, multi fiber solutions) and the Dutch market situation.

The actors no not believe the Dutch market will change much by European proposals. New entrants are not expected, which leaves competition to the existing fixed operators. Therefore it can be concluded that the cable operators seem to have the best position, as well as the fiber based networks operators. However, competition could come from the wireless broadband developments (such as LTE).

3a,b How do the actors affected by the electronic communications framework perceive the new changes in terms of future market developments? & What are the expected effects of the digital dividend proposals and do they correspond with the effect intended by the European Commission?

The first objective of the digital dividend proposals is to improve the European coordination of spectrum management that is being released by the European switchover from analogue to digital television transmissions. The actors affected indeed believe that the proposals will improve European coordination by suggesting a harmonized approach. However, the coordination will only succeed when all member states adopt the proposals in the same way.

The second objective is to use this spectrum in a flexible and efficient manner. Therefore a combination of two possible uses for the digital dividend is proposed. The first part of the spectrum is allocated to digital broadcast services, and the second part is allocated for mobile communication. The combination will indeed lead to a more flexible use of the spectrum, mainly by mandating digital terrestrial television whereby the digital dividend is created. The effects of the proposals for the Netherlands are more limited, as the Netherlands has already switched-over to digital terrestrial broadcasting in 2006. However, using a part of the digital dividend for mobile communication will indeed add to a more flexible use. Whether the spectrum is used more efficiently depends on each member state, as licenses are awarded nationally. The design of the recent auction in the Netherlands by which the existing operators were limited in the amount of spectrum they could acquire can negatively affect the efficient use of spectrum if this design is also used in future auctions. Moreover, several challenges have to be overcome before the spectrum can be used in a more flexible and possible efficient way (e.g. relocation of channels, already awarded licenses to digital terrestrial television). However, the affected actors do believe that wireless broadband communication is be stimulated and will become available more widely.

The final objective is to significantly contribute to the goals of competitiveness and economic growth and satisfy some of the important social, cultural and economic needs for the benefits of European citizens. Several studies have indicated that the proposals can have a large effect and create new (additional) economic activity. The added value of digital dividend in the Netherlands is lower than in other member states as the Dutch market has already partly profited from the switchover. Nevertheless the market analysis indicates that it will likely have a large effect. The actors affected believe that the

added value will mostly be induced by the continuous increasing demand for mobile (broadband) communication.

6.2 Discussion

The research, as most research reports also has its shortcomings. These shortcomings are discussed below, and remedies are proposed to counter these shortcomings in further research where possible.

First, the research has focused on European regulation, and has analyzed the proposals in a European context. However, the effects of the European regulation have only been analyzed for the Dutch telecommunications market. This was inherent to the research question and research scope. But in light of the European discussion, the effects of the regulation should also be evaluated for the other member states. As discussed briefly for both of the subjects of interest – next generation access and the digital dividend - the effects of the regulation differs for each member state. Therefore, by analyzing the effects of the regulation for all member states the total implications of the changes can be given.

Second, not all changes have been included in the analyses of the regulatory framework. The regulatory changes for data protection, universal services, and privacy have not been analyzed. An example of such a measure is the roaming regulation. The roaming regulation allows European citizens to travel within the EU to phone across borders at transparent prices. The EU has set maximum prices for voice conversations via mobile telephones in the European Union. Such a measure can also create (un)certainty in a market and can thereby affect investment decisions. Therefore not a full overview of the effects of the new regulation has been made. A full overview would have increased the scope of the research significantly, and has therefore been excluded in this study. Perhaps, future research on this issue should take place to present a full overview of the effects of the regulation.

Third, at the start of this study much of the regulation was still uncertain and only draft regulations were available. Now, at the end of this study, the regulatory proposals have been formalized and have since changed much. The changing regulatory proposals have made it sometimes hard to present an accurate and up-to-date analysis of the changes induced by the regulation in the two subjects of interest (NGA networks and the digital dividend). Moreover, not only the regulation on European level, but also on national level has changed during this research. In hindsight it might have been easier to analyze the finally adopted regulation, and not the regulatory proposals. However, keeping track of the regulatory changes and seeing them develop has also contributed to a better understanding of the decision processes, and telecom market as a whole.

Fourth, many actors in the field of electronic communication were interviewed for this report at the time that the regulation was still in development. It is important to realize that the market feedback presented, especially in sections 4.5 and 5.5, is based on the regulatory proposals. Therefore, as the regulation was still under development, the actors might have perceived more regulatory uncertainty at the time. Also future developments are sometimes based more on speculation than on clear ideas.

Finally, many of the interviewees are affected by both the changing next generation access regulation and the digital dividend regulation. Therefore, both subjects of interest were combined in one interview (both the subjects are often dealt with by one department, the regulatory department). This sometimes

led to time constrains, whereby the level of detail desired was not always entirely reached. A solution could be to conduct multiple interviews with the same actor, or narrow the scope of the study further.

6.3 Suggestions for further research

This thesis has taken a broad focus of the electronic communications sector and future market developments induced by the proposed regulatory changes. As a large scope has been taken, various interesting subject have briefly been mentioned but have not been discussed or researched further. These will now be discussed:

Political and Social Motives

First, this study has focused on the economic motives in relation to the proposed regulation for the electronic communication sector. For most proposed changes the economic motives could be identified by the economic models and perspective. Although these motives were often identified, it was clear that they were also influenced by other motives. The proposals concerning universals services, data protection, and privacy were clearly also socially motivated. The motives for establishing a new market authority also seem politically motivated. By the establishment of a new authority, more regulatory power is given to the European Commission, and regulatory power is decreased in the European member states. One of the actors believes that the proposal for the new market authority was the main reason to introduce a new framework, and the rest of the changes were merely incremental. However, as the member states disagreed with the initial proposals the role of the new authority has been substantially reduced. It would be interesting to analyze the regulatory framework not from an economic but from a socio-political perspective. This could provide insight into the formal and informal decision processes of European Commission. Included in such a study could be the investigation of the level of influence interest groups and national authorities have in setting European policy.

Convergence and (sector specific) regulation

Second, as concluded in this thesis the market is likely to further converge if sector specific regulation in the telecommunication sector is abolished. It is unlikely that the sector specific regulation will no longer be needed due to the characteristics of the market. Therefore sector specific regulation will be around for some time. This raises the question if sector specific regulation can be abolished at all. Some authors have argued that the sector specific regulation should be abolished, while others argue that when the sector specific regulation would be abolished the market would become a monopolistic one. There are possible developments which could change the characteristics of the market whereby sector specific regulation might totally be abolished. First, by models of monopolist competition, which suggests that monopoly diversified markets can be competitive. Second, by some developments seen in Scandinavia. There, some initiatives have been taken there whereby consumers own the local loop infrastructure, which solves the replicability problem in the access network. Therefore it would be interestingly to further analyze what characteristics have to change, and what other developments are needed, to totally abolish the sector specific regulation and maintain competition in the future. Perhaps, in the future an escape could be possible if competitive 'problems areas' (such as the local loop) can be solved.

Spectrum management

Last, this thesis has provided some insight into the spectrum management in the Netherlands. However, further research concerning the effective use of frequency spectrum could be interesting. First, the

nation covering multiplexes do not seem to be efficient. The rearrangement of the channels, as proposed in the Dutch digital dividend consultation, will free up two nation covering multiplexes. These two multiplexes are realized with 72MHz (790MHz – 862MHz). The other five multiplexes are realized with 320MHz. Thereby the frequency needed for five multiplexes compared to the two is 16:9. Therefore it would be interesting to determine why the efficiency spectrum management differs so much in the Netherlands. A directly related question, which has also been raised in this thesis, is what the effects of efficient use are in relation to licensing. This includes the effects of auction designs on spectrum management and efficient use thereof.

Appendix I. Market models

Markets of Perfect Competition

In markets of perfect competition there are many buyers and sellers. The quantity therefore bought or offered is small relative to the total quantity traded. Thereby changes in these quantities leave market prices unchanged. For the rest of the market characteristics see Figure 30. Based on these characteristics the market price of a product will be equal to the marginal costs of producing a product. This equilibrium applies to all the competitors in the market. When the market price is above the marginal costs, a supplier can make more profit by selling one more product – there is a positive margin. The market price is the same for all the suppliers in perfect competition and therefore each seller will increase its production until the marginal costs equal the market price. In equilibrium all the sellers have the same marginal costs that equal the market price, see Figure 30.

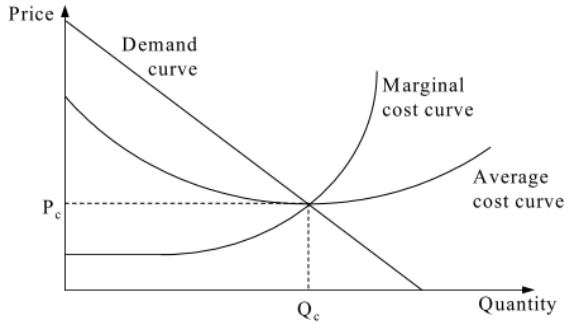

Figure 30: Demand Curve Perfect Competitive Market

In this equilibrium no firm will make profit, if firms would make profits new entrants would enter to earn some of those profits. Thereby the incumbent firms would not make any profit anymore and exit the market, or change price. Moreover perfect competition delivers productive efficiency and allocative efficiency. Thus products are produced at the lowest possible cost. Therefore lack to produce efficient will result in welfare losses.

Monopoly Markets

In monopolistic markets there is only one supplier. This single supplier is therefore able to set the price of a product above competitive level, see Figure 31 (P_m) - (Motta, 2004). The marginal revue curve shows how much a monopolist will profit by selling one more product. However, the marginal revenue curve always lies below the demand curve, because the marginal revenue that he makes is always less than the price at which he sells. The monopolist will therefore set output to where marginal revenue equals marginal costs. Thus monopolies sell less products than would be sold under perfect competition, and thereby do not maximize social welfare. Figure 31 (a,b,c,d) shows the deadweight loss which is the cost to society and indicates that a market does not operate efficiently (Motta, 2004). Social welfare is normally measured in two part: consumer surplus (a,b,d), and supplier surplus (b,c,d). Therefore it is argued that monopolies encourage productive inefficiency and are therefore unwanted.

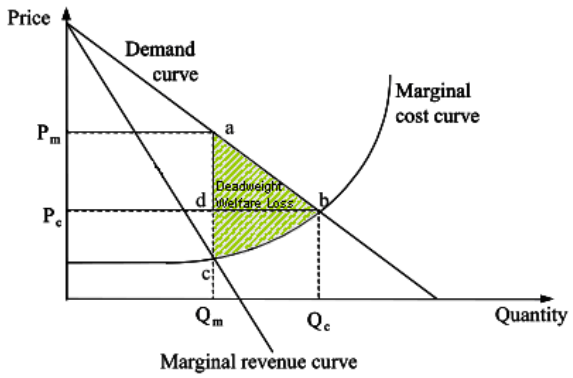

Figure 31: Demand Curve Monopoly Market

Oligopolies

Competition in most industries is not perfect or consists of a monopoly. The monopoly model and that of perfect competition ignore the interaction between companies and how interaction will affect outcomes of the competitive process. In markets of perfect competition there are many companies and consumers. Therefore the behavior of a company of the behavior of consumers does not influence the price for a product or service. In monopoly markets the monopolist is the only supplier and is therefore not affected by behavior of others competing companies as there are none. However, in most markets companies do need to take behavior of others into account, as decisions and actions by one company can affect decisions and actions of others. This would indicate that a highly concentrated market is not competitive. However, oligopolies are not always characterized by lack of competition. In some cases there is indeed not much competition. Companies then know that a reduction in price will lead to a response, and are thus less likely to compete by lowering prices. A definition of oligopoly by Friedman is:

> *" … a market having few firms (but more than one firm) on the supply side and a very large number of buyers on the demand side, each if whom makes a negligible contribution to the market function." (Friedman, 1983, p. 1)*

An example of oligopolies markets with strong competition are markets with monopolistic competition. These are markets in which firms sell differentiated products and thereby each firm has a monopoly on its particular product. If one firm lowers its price then only a few will customers will switch, the rest will still buy on the other market, unlike in perfect competition. The result is that prices are not driven down to marginal costs due to competition. However, this does not mean that there is no effective competition. If there are no barriers for entry, each company in a monopolistic competition situation will make zero profits as profits would lead to new entry. A definition of monopolistic competition is:

> *"Market situation in which there may be many independent buyers and many independent sellers but competition is imperfect because of product differentiation, geographical fragmentation of the market, or some similar condition." (Encyclopedia Britannica, 2008)*

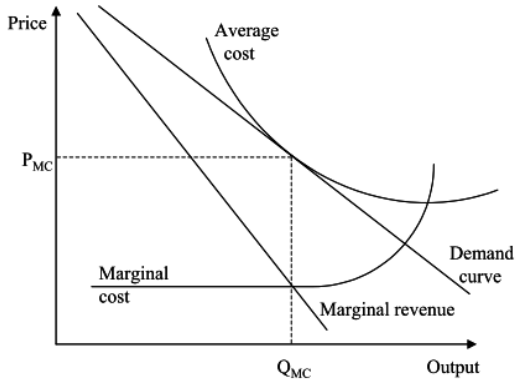

Figure 32: Demand Curve Monopolist Competitive Market

The demand curve, as can be seen Figure 32, is downward sloping because the products are not perfect substitutes for each other and interaction between firms will have an effect on the price in markets of perfect competition. The firms will maximize profits at (q,m,c) where the marginal cost curve cuts the marginal revenue curve (there the average costs curve just touches the demand curve). An important implication of this model is that competition can be effective when firms do have some control over the sales price. The assumptions of the various models are summarized in Table 4 (Abdulaziz, 2009).

Assumptions	Perfect Competition	Monopoly	Oligopoly	Monopolist Competition
Profit maximization	Yes	Yes	Yes	Yes
Barriers entry and exit	None	High	High	Low
Number of firms	Many	One	Few	Many
Price takers	Yes	No	No	No
Relative size firms	Small	Large	Large	Medium
Profits in the long run	Normal	Above Normal	Above Normal	Above Normal

Table 4: Assumptions per Market Situation

Appendix II. Regulatory document types

Decisions

A *decision* is one of the three binding instruments. A decision is a law which is not of general application, but only applies to its particular addressee of the decision. The addressee(s) can be a member states, companies, or individuals.

Directive

A *directive* is a legislative act of the European Union which requires member states to achieve a particular result without dictating the means of achieving that result. Directives normally leave member states with a certain amount of leeway as to the exact rules to be adopted and this need to be transposed into national law.

Greenpaper

Green papers are discussion papers published by the Commission on a specific policy area. Primarily they are documents addressed to interested parties - organizations and individuals - who are invited to participate in a process of consultation and debate. In some cases they provide an *impetus* for subsequent legislation (Clements, 1998).

Recommendations

Recommendation in the European Union (introduced in Article 249/EC) is one of two kinds of non-binding acts cited in the Treaty of Rome. Recommendations are without legal force but are negotiated and voted on. Recommendations differ from regulations, directives and decisions, in that they are not binding for member states. Though without legal force, they do have a political weight. The recommendation is an instrument of indirect action aiming at preparation of legislation in member states, differing from the directive only by the absence of obligatory power.

Regulation

A *regulation* is a legislative act of the European Union which becomes immediately enforceable as law in all member states simultaneously. Regulations are self-executing and do not require any implementing measures.

Resolutions and Opinions

The Commission issues resolutions and opinions but these are not mandatory. However, they do carry important weight due to authority and expertise of the Commission.

Whitepaper

White papers are documents containing proposals for Community action in a specific area. They sometimes follow a green paper to launch a consultation process at European level. While green papers set out a range of ideas presented for public discussion and debate, white papers contain an official set of proposals in specific policy areas, and are preparatory for binding documents.

Appendix III. Regulatory framework of 1998

Formal regulation of the 1998 framework for electronic communications	
Directives	**Description**
ONP framework	
90/387/EEC	28th June 1990 on the establishment of the Internal Market for telecommunications services through the implementation of Open Network Provision.
97/51/EC	Directive of the European Parliament and of the Council of the 6 October 1997 amending Council Directives 90/387/EEC and 92/44/EEC for the purpose of adaptation to a competitive environment in telecommunications.
	Informal consolidated text of the revised ONP Framework directive 90/387/EC as amended by directive 97/51/EC.
Interconnection Directives and Recommendations	
97/33/EC	Directive of the European Parliament and of the Council on interconnection in telecommunications with regard to ensuring universal service and interoperability through the application of the principles of open network provision (ONP).
98/61/EC	Directive of the European Parliament and of the Council of 24 September 1998 amending Directive 97/33/EC with regard to operator number portability and carrier pre-selection.
Leased Lines	
92/44/EEC	5th June 1992 on the Application of Open Network Provision to Leased Lines.
97/51/EC	Directive of the European Parliament and of the Council of the 6 October 1997 amending Council Directives 90/387/EEC and 92/44/EEC for the purpose of adaptation to a competitive environment in telecommunications.
	Informal consolidated text of the revised ONP Leased Lines Directive 92/44/EC as amended by Directive 97/51/EC.
Voice Telephony	
98/10/EC	Directive of the European Parliament and of the Council of 26 February 1998 on the application of open network provision (ONP) to voice telephony and on universal service for telecommunications in a competitive environment.

Other legislation	
Directives	**Description**
Licensing	
97/13/EC	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.
Data Protection	
97/66/EC	The European Parliament and the Council of 15 December 1997 concerning the processing of personal data and protection of privacy in the telecommunications sector.
Radio communications and Terminal Equipment	
89/336/EEC	Council directive of 3 May 1989 on the approximation of the laws of the member states relating to electromagnetic compatibility.
98/13/EC	The European Parliament and the Council of 12 February 1998 relating to telecommunications terminal equipment and satellite earth station equipment, including the mutual recognition of their conformity.
99/5/EC	The European Parliament and the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

Appendix IV. Telecom related actors

RSPG – Radio Spectrum Policy Group

The Radio Spectrum Policy Group (RSPG) is an advisory group that assists the European Commission in the development of radio spectrum policy. The establishment of the RSPG (EC, 2002b) was one of the Commission initiatives following the adoption of the Radio Spectrum decision (EC, 2002a) and it adopts opinions, position papers and reports, as well as issuing statements, which are aimed at assisting and advising the Commission at strategic level on:

- Radio spectrum policy issues,
- Coordination of policy approaches,
- Harmonized conditions with regard to the availability and efficient use of radio spectrum necessary for the establishment and functioning of the internal market.

The establishment of the RSPG (EC, 2002b) is not always considered to be part of the framework 2002 Framework (NRF'02). The mandate of the RSPG is to:

> *"..establishes a policy and legal framework in the Community for radio spectrum policy so as to ensure the coordination of policy approaches and, where appropriate, harmonised conditions with regard to the availability and efficient use of the radio spectrum necessary for the establishment and functioning of the internal market in Community policy areas, such as: electronic communications, transport, and research and development." (EC, 2002b, p.1)*

One of the tasks of the RSGP is to assist and advise the Commission on several matters, such as: spectrum availability, harmonization, frequency assignments, efficient use of spectrum, etc. Thereby the RSPG should take into account not only technical but also economic, political, cultural, strategic, health, and social considerations. The RSPG should look forward and extensively consult on technological, market and regulatory developments. Therefore the RSPG can issue consultations. The members of the Group are representatives of the member states and of the Commission. Representatives of the EEA countries, the candidate countries, the European Parliament, the European Conference of Postal and Telecommunications Administrations (CEPT) and the European Telecommunications Standardization Institute (ETSI) attend as observers.

ERG - European Regulators Group

The mandate of the ERG is to encourage cooperation and coordination between National Regulatory Authorities and the Commission. It therefore promotes the development of the internal market for electronic communications networks and services. It also seeks to achieve consistent application in all member states of the provisions set out in the directives of the new regulatory framework. The ERG acts as an interface between the national authorities and the European Commission. They advise and assist the Commission in consolidating the internal market for electronic communications networks and services. However, there are problems with the effectiveness of this agency because it has to rule by consensus, which means that the heads of all the relevant national authorities have to agree. Often the ERG can not solve cross border disputes without the Commission, some of these cases are: VOIP, mobile termination charges, or mobile roaming charges.

ETNO - European Telecommunications Network's Operators Association

The European Telecommunications Network Operators' Association was established in May 1992 and has become the principal policy group for European electronic communications network operators. ETNO's primary purpose is to establish a constructive dialogue between its member companies and decision-makers and other actors involved in the development of the European information society. ETNO's mandate is to:

- Promote ETNO members' common interests at institutions of the European Union and other European organizations;
- Contribute to the development of policies leading to an efficient and fair regulatory and trading environment for the European telecommunications marketplace.
- Promote cooperation and coordination of activities between its members regarding the development of harmonized telecommunications networks and services.
- Provide a forum for information exchange between members
- Promote market developments and implementation of the information society.

CEPT - Conference of Postal and Telecommunications Administrations

The European Conference of Postal and Telecommunications Administration (CEPT) was established in 1959 by 19 countries, which expanded to 26 during its first ten years. The first members were the monopoly-holding postal and telecommunications administrations. CEPT's activities included co-operation on commercial, operational, regulatory and technical standardization issues. CEPT decided to create ETSI, the European Telecommunications Standards Institute, into which all its telecommunication standardization activities were transferred in 1988.

The postal and telecommunications operators created their own organizations, Post Europe and ETNO, in 1992. In conjunction with the European policy of separating postal and telecommunications operations from policy-making and regulatory functions, CEPT became a body of policy-makers and regulators. CEPT now has 48 members covering almost entire Europe. The role and purpose of CEPT was redefined in 1995. CEPT offers its members the chance of:

- Establishing a European forum for discussions on regulatory issues
- Provide assistance regarding settlement of regulatory issues
- Provide common positions on goals and priorities
- Shaping those areas coming under its responsibilities
- Carrying out its activities at a pan-European level
- Strengthening and fostering more intensive co-operation with Eastern and Central European countries
- Promoting and facilitating relations between European regulators
- Influencing, through common positions, developments within ITU in accordance with European goals
- Responding to new circumstances in a non-bureaucratic and cost-effective way

CEPT established three committees, one on postal matters, CERP (Comité Européen de Réglementation Postale) and two on Electronic Communications issues: ERC (European Radio communications Committee) and ECTRA (European Committee for Regulatory Telecommunications Affairs). The committees handle harmonization activities within their respective fields of responsibility, and adopt recommendations and decisions. These recommendations and decisions are normally prepared by their

working groups and project teams. The ERC established a permanent office in Copenhagen, the European Radio communications Office - ERO - with the purpose of supporting the activities of the committee and conducting studies for it and for the European Commission on the 6th of May 1991. ECTRA also established a permanent office in Copenhagen: the European Telecommunications Office - ETO - for the same purpose on the 1st of September 1994. The ERO and ETO were "de facto" merged in 2001. A Convention establishing the merged body (the European Communications Office: ECO) entered into force on the 1st of July 2009. As a response to the convergence in the telecommunications sector and the requirements of the information society, the two committees dealing separately with radio communications and telecommunications were replaced by the Electronic Communications Committee (ECC).

ETSI - European Telecommunications Standards Institute

CEPT decided to create ETSI, the European Telecommunications Standards Institute, into which all its telecommunication standardization activities were transferred in 1988. The European Telecommunications Standards Institute (ETSI) produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies. ETSI is officially recognized by the European Union as a European Standards Organization. ETSI is a not-for-profit organization with 766 ETSI member organizations drawn from 63 countries across 5 continents worldwide. ETSI's mission is to exploit opportunities in the development and deployment of globally applicable standards for telecommunications and other electronic communications networks and related services, and to participate in appropriate global and regional initiatives.

OPTA – Onafhankelijke Post en Telecom Authoriteit

OPTA is the Dutch National Regulatory Authority (NRA). To enforce and oversee the legislation in the electronic communications market in the Netherlands OPTA (Independent postal and telecom authority) has been created. The operation of the OPTA is documented in the Dutch Postal-Law and Telecommunication-Law.

OPTA is an Independent Administrative Body (ZBO) that, with some distance, belongs to the Department of Economical Affairs. The Department of Economic Affairs does not have direct control on the decisions made by OPTA. However, OPTA is evaluated every four years to verify whether it still operates effectively. All firms that offer electronic communications infrastructure or services are obliged to register at OPTA as well as make a financial contribution, by which the sector can be regulated more effectively.

The main objective of OPTA is to maintain competition and trust in the communication sector. There are two main focal points: to increase competition, and to protect consumers. Once every three years the markets for electronic communication are analyzed in terms of price developments, market shares, and opportunities to enter the market. If a firm is found to be dominant in a market OPTA can enforce obligations on that firm. OPTA also makes sure that firms comply with the legislation. If they do not, they can be sanctioned. Another task of OPTA is to inform consumers about their obligations and rights, and inform firms of new legislation. Other tasks of OPTA are:

- Distribution of phone-numbers

- Track down spammers and distributors of spyware
- To warrant the legal minimum of services of postal and fixed telephony
- To settle disputes between providers on access and interconnection of networks, or the roll out of infrastructure
- To monitor and test the tariffs of the former state owned monopolist KPN
- To see to the certification licensers of electronic signatures.

For the foreseeable future new areas of interest have been identified, these are:

- Prevention of malpractices
- Stimulation of investments in optical-fiber networks
- To increase competition on business markets
- To increase choice on the TV-cable
- Reasonable tariffs for calls in Europe
- Provide internet security
- To reduce irritation of unwanted telemarketing phone calls
- To prevent misuse of paid–information numbers

ITU – International Telecommunications Union

Internationally decisions concerning spectrum management are made by the International Telecommunications Union (ITU). ITU is the United Nations agency for information and communication technology issues, and the global focal point for governments and the private sector in developing networks and services. The members of ITU consist of 191 Countries and more than 700 sector members and associates. The ITU has three divisions: Radio-communication (ITU-R), Standardization (ITU-T), and Development (ITU-D). Managing the international radio-frequency spectrum and satellite orbit resources is at the heart of the work of the ITU Radio-communication Sector (ITU-R). The ITU-R distinguishes three regions, numbered from 1 to 3, see Figure 33.

Figure 33: ITU Regions [source: ITU website]

ITU organizes World Radio-communication Conferences (WRC) every two or three years. It is the job of WRC to review, and possibly revise, the radio regulations. The radio regulations are mandated by the international treaty governing the use of the radio-frequency spectrum, see Box 6. Revisions are made based on an agenda determined by the ITU Council, which takes into account recommendations made by previous world radio-communication conferences.

Box 6: Legal Framework of the ITU

The legal framework of ITU consists of mainly two legal instruments of the Union, which have treaty status (ITU, 2010a):

First, The ***Constitution and Convention*** *of the International Telecommunication Union* signed on the 22nd of December 1992 (Geneva) and which entered into force on the 1st of July 1994. Since its adoption in 1992, the ITU Constitution and Convention have been amended by several conferences (Kyoto, 1994; Minneapolis, 1998 and Marrakesh, 2002). Those amendments entered into force on the 1st of January 1996, the 1st of January 2000, and the 1st of January 2004.

The second legal instrument consists of the Administrative Regulations (***Radio Regulations*** and ***International Telecommunication Regulations***), which complement the constitution and the convention. The last revision of the radio regulations was signed on the 4th of July 2003 (Geneva), and the majority of the provisions entered into force on the 1st of January 2005. The International Telecommunication Regulations were signed on the 9th of December 1988 (Melbourne), and entered into force on the 1st of July 1990.

The general outline of the agenda of world radio-communication conferences is established four to six years in advance. The final agenda is set by the ITU Council two years before the conference. The agenda can be supplemented with additional question that are deemed necessary, any change to the agenda must be accepted by a majority of member states. Under the terms of the ITU Constitution, a WRC can (ITU, 2010b):

- Revise the radio regulations and any associated frequency assignment and allotment[54] plans.
- Address any radio-communication matter of worldwide character.
- Give instructions to the Radio Regulations Board[55] and the Radio-communication Bureau[56], and review their activities.
- Determine questions for study by the radio-communication assembly and the sector's study groups in preparation for future radio-communication conferences.

In addition to the world radio-communication conferences an ITU region, or a group of countries, may hold a regional radio-communication conference. At these regional conferences regions can develop agreements concerning a particular radio-communication service or frequency band. Region 1 consists of Europe, Africa and the Russian part of Asia, see Figure 33. These regional conferences cannot modify the radio regulations, unless approved by a WRC. The final acts of the conference are only binding on those countries that are party to the agreement.

[54] Geographical bounded area in which spectrum agreements have been made.
[55] Board of ITU-R, which consists of twelve elected members.
[56] The Radio-communication Bureau (BR) is the executive arm of the Radio-communication Sector

Appendix V. Regulatory framework of 2002

Framework Directive (2002/21/EC)

A common regulatory framework for electronic communications networks and services

The framework directive is the cornerstone of the RF'02. The framework directive contains all the common regulations that underlie the other measures in the new framework. There are six main common regulations. The first common regulation sets out the scope of the regulation. The scope of the RF'02 covers all forms of electronic communications networks and electronic communications services. This includes, for example, fixed and mobile telecommunications networks, cable or satellite television networks and electricity networks. The second common regulation defines the basic definitions, such as: 'electronic communications network', 'electronic communications service', 'associated facilities'. Third, the relevant product markets are defined where *ex ante* regulation can be enforced on actors that have significant market power to guarantee a competitive environment. The fourth common regulation addresses the duties of the national regulators, such as the obligation to consult widely on all its decisions. It obliges regulators to consult other NRAs on proposed measures before they are adopted. This adds transparency and enhances consistency in the regulatory measures. It also establishes a right of appeal against regulatory decisions, and contains procedures for dispute resolution. The fifth common regulation concerns frequency allocation. It sets out rules for management of frequency and numbers, as well as certain regulations governing rights of way. The final common regulation is the establishment of the communication committee and a high level communications group of national regulators. These will advise and assist the European Commission to make the new framework more effective and that regulation is applied consistent in the member states.

Authorization Directive (2002/20/EC)

Directive of the European Parliament and of the Council on the authorization of electronic communications networks and services

The authorization directive aims at simplifying administrative controls on market access for operators. In the RF'98 member states could use individual licenses which an operator needs before starting operations. This level of control has created administrative barriers for market entry and in some cases was considered to be disproportionate according to the European Commission. The individual licenses had also led to large variations in authorization regimes in different member states. It is argued that this inconsistency was holding back innovation, competition and a single European market with pan-European services. Therefore the RF'02 requires the use of general authorizations for all electronic communications networks and services, with separate rights for the use of radio spectrum and numbering recourses. These general authorizations will limit and harmonize the conditions of the authorizations to a minimum, limit administrative charges, simplify procedures, and will strengthen the internal market by making sure that operators will not face divergent license regimes.

Access and Interconnection Directive (2002/19/EC)

Directive of the European Parliament and of the Council on access to, and interconnection of, electronic communications networks and associated facilities

The access and interconnection directive of electronic communications networks and associated facilities establishes common principles for the regulation of access and interconnection for all

communications infrastructure. By establishing common principles, new entrants can better compete with incumbents whatever the transmission medium. The directive aims to establish a harmonized framework to stimulate competing network infrastructures and interoperability of services by four main objectives. First, by the primary interconnectivity rule whereby all operators have the right and the obligation to negotiate interconnection. Second, by specifying a set of regulatory obligations which regulators can enforce, such as: non-discrimination, cost-oriented pricing, and access to specific network elements. Third, by providing continuity with the existing framework by maintaining existing obligations. And finally, by maintaining existing obligations on providers of conditional access. Conditional access means that access should be offered to their facilities on fair, reasonable and non-discriminatory terms.

Universal Service Directive (2002/22/EC)

Directive of the European Parliament and of the Council on universal service and users' rights relating to electronic communications networks and services

The universal service directive consists of measures to protect the right of consumers of electronic communication networks and services. The framework of 2002 mostly remains the same as in the RF'98 but alterations are made to address to the new developments. Thereby the definition of the scope of services, the rights of consumers, and measures for compensating providers of the universal services without distorting competition. The new universal directive will:

- Update specific user and consumer rights, such as: contracts, quality of service (QoS), and transparency
- Allow NRAs to safeguard consumer and user interests, such as retail price regulation
- The extension of the obligation for number portability to mobile networks
- The right to force (proportionate) obligations on operators for public policy considerations
- To ensure interoperability of digital consumer television equipment
- To ensure the availability of leased lines services
- Services for handling emergency calls in combination with location data

Data Protection Directive (2002/58/EC)

Directive of the European Parliament and of the Council concerning the processing of personal data and the protection of privacy in the electronic communications sector

The data protection directive is updated in the RF'02 to ensure that it is technological neutral and also, as the other directives, broadens its scope to all electronic communication networks and services. The main changes of the RF'02 were:

- The possibility for operators to undertake further processing of traffic data for the purpose of value added services with the consent of the subscriber or user
- Give consumers the right to determine if they want to be listed in a public directory, and control over what is personal data appears in such a directory
- Prohibit unwanted commercial mails (spam), unless subscribers have indicated they want to receive these e-mails

Formal Regulation of the 2002 framework for electronic communications	
Directive	**Description**
2002/21/EC	A common regulatory framework for electronic communications networks and services
2002/19/EC	Directive of the European Parliament and of the Council on access to, and interconnection of, electronic communications networks and associated facilities

2002/20/EC	Directive of the European Parliament and of the Council on the authorization of electronic communications networks and services
2002/22/EC	Directive of the European Parliament and of the Council on universal service and users' rights relating to electronic communications networks and services
2002/58/EC	Directive of the European Parliament and of the Council concerning the processing of personal data and the protection of privacy in the electronic communications sector

Other Legislation	
Type : Code	**Description**
Directive: 2002/77/EG	Competition in the markets for electronic communications services
Guideline: 2002/C 165/03	Market analysis and assessment of significant market power under the Community regulatory framework for electronic communications networks and services
Decision: 676/2002/EC	Strategic planning and harmonisation of spectrum use
Decision: 622/2002/EC	Radio Spectrum Decision (RSPG)
Regulation: 2000/2887/EC	Unbundled access to the local loop

Appendix VI. Lisbon agenda and i2010 strategy

Lisbon Agenda

The Lisbon agenda dates from March 2000. The Lisbon agenda was set to make the EU the most competitive knowledge-based economy in the world, and at the same time preserving or even improving social cohesion and maintain environmental sustainability. The Lisbon strategy's aim is to:

> *"Make the EU the most dynamic and competitive knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion, and respect for the environment by 2010". (EP, 2000, p.1)*

Another motivation for the Lisbon Agenda was the perception that the EU was lagging behind the United States. The time-period was set for ten years and the midterm evaluations found that the goals had not been reached. Because of the lacking results the Lisbon Agenda was forced to change some of the implementation processes. The many quantitative goals were reduced, and only the goal to dedicate three percent of GDP to R&D did not change. The main goals were now on growth, and jobs.

i2010 strategy

The i2010 strategy is the EU policy framework for the information society and media, and was presented in 2005 by the European Commission. It promotes the positive contribution ICT can make to the economy, society, and personal quality of life. The i2010 strategy has three aims:

1. To create a Single European Information Space, which promotes an open and competitive internal market for information society and media services,
2. To strengthen investment and innovation in ICT research,
3. To support inclusion, better public services and quality of life through the use of ICT.

To achieve the i2010 goals a number of actions are taken, such as: research funding, promotion activities, pilot projects, and partnerships. The presented actions are reviewed and updated trough i2010 annual reports, and are summarized each year in digital competitiveness reports. The i2010 strategy is a key element of the Lisbon Agenda for growth and employment. It builds on the eEurope initiative, which came ended in 2005. The i2010 strategy has provided the basis for a modern ICT-enabled society. The internet is expected to become a essential service. To seize opportunities the Commission calls on the member states to actively cooperate on the digital agenda to become more competitive and create a more open digital economy, driving European growth and innovation.

Appendix VII. List of Interviews

Introductory interviews	
Name:	**Firm / Agency**
Dhr. P. de Bijl	Centraal Plan Bureau (CPB)
Dhr. N. van Eijk	Instituut voor informatica recht (IVIR)
Dhr. J.M. Smits	Technische Universiteit Eindhoven (TU/e)
Dhr. L.H.A. Thijssen	Ministerie van Economische Zaken (EZ)

Market verification interviews			
Name:	**Firm / Agency**	**NGA**[57]	**DD**[58]
Dhr. M. Andriessen	NLKabel	-	X
Dhr. A.J. van Dijken	Agentschap Telecom (AT)	-	X
Dhr. E. Evenhuis	UPC	X	-
Dhr. M. Prinsen Geerligs	KPN	X	X
Dhr. R. van der Hoeven	Broadcast Partners	-	X
Dhr. C. Hutchins	Liberty Global (LGI)	X	-
Dhr. W. Kroeze	Vodafone	-	X
Dhr. G. Lieverse	Ziggo	X	X
Dhr. O. Olmer	British Telecom (BT)	X	-
Dhr. R. Polmans	Tele2	X	X
Dhr. F. Sickinghe	ACT / Bird & Bird	X	X
Dhr. R. Stil	OPTA	X	-

[57] NGA: next generation access case
[58] DD: digital dividend case

Appendix VIII. Relevant markets

Retail Markets	
M1	Access to the public telephone network at a fixed location for residential customers
M2	Access to the public telephone network at a fixed location for non-residential customers
M3	Publicly available local and/or national telephone services provided at a fixed location for residential customers
M4	Publicly available international telephone services provided at a fixed location for residential customers
M5	Publicly available local and/or national telephone services provided at a fixed location for non-residential customers
M6	Publicly available international telephone services provided at a fixed location for non-residential customers
M7	The minimum set of leased lines (comprising the specified types of leased lines up to and including 2 Mbps as referenced in Article 18 and Annex VII of the Universal Service Directive)
Wholesale: Markets	
M8	Call origination on the public telephone network provided at a fixed location
M9	Call termination on individual public telephone networks provided at a fixed location
M10	Transit services in the fixed public telephone network
M11	Wholesale unbundled access (including shared access) to metallic loops and sub-loops for the purpose of providing Broadband and voice services
M12	Wholesale broadband access
M13	Wholesale terminating segments of leased lines
M14	Wholesale trunk segments of leased lines
M15	Access and call origination on public mobile telephone networks
M16	Voice call termination on individual mobile networks
M17	The wholesale national market for international roaming on public mobile networks
M18	Broadcasting transmission services, to deliver broadcast content to end-users

Table 5: Relevant identified markets

Decisions 2007/879/EC : Remaining Markets (17 December 2007)		Explanation:
M1*	Access to fixed telephone network	Making and/or receiving telephone calls and related services (such as faxes and dial-up internet) over fixed telephone lines.
M2	Call origination on the fixed telephone network	Wholesale call origination enables alternative operators to offer retail users fixed telephone services, including dial-up internet connections.
M3	Call termination on individual fixed telephone networks	The wholesale services offered by one operator to another that allows calls between operators.
M4	Wholesale access to the local loop for broadband and voice services	Wholesale access to the “last mile” of the public fixed telecommunication network connecting the subscriber to the local exchange and to the main network. Once access is granted, new market entrants can provide both voice and data services over the so-called local loop rented from the incumbent operator.
M5	Wholesale broadband access	Enables new market entrants to offer broadband access services using their own network and the “local” parts of the incumbent’s network. Also known as “bitstream”.
M6	Voice call termination on individual mobile networks	The wholesale services offered by one operator to another that allows consumers to call users on different networks
M7	Wholesale termination segments of leased lines	Operators use leased lines – dedicated communication links – to complete their own network infrastructure or to offer services. The lines are made up of terminating segments, the final part, and stunk segments the rest.

* consists of two merged markets of the NRF: retail markets for business and retail market for residential

Table 6: New Identified Relevant Markets

In relation to the NGA and digital dividend proposals (the new) market 4 & 5 are most important, therefore these will be discussed in more detail:

Market 4

Wholesale access to the local loop is focused on the last part of the network – the access network whereby the customer is connected to the nearest interconnection point. There are a few variations in infrastructure and technology, such as: coaxial or cable networks, copper based networks providing VDSL or ADSL of Ethernet connections, and last fiber connections. Market 4 – wholesales access to the local loop – provides alternative operators access to the interconnection point of the incumbent (dominant) operator, whereby they can use the local loop to provide service to their customers.

Figure 34 depicts the situation in which access is granted to an alternative operators based on Market 4 regulation. Networks operator *A* is the operator who has dominance in Market 4 – the incumbent. Network operator *B* is the alternative operator seeking access to the consumer by means of the incumbent's network. Network operator *B* is granted access by the regulation on the access point of the incumbent provider where access is gained to the local loop. The access point can be an MDF, ODF, or SDF location depending on the infrastructure of the incumbent. The alternative operator can now provide services via the orange line - partly on its own network (Green) and partly on network of operator *A,* (blue). Wholesale access to the local loop is regulated because the incumbent operator most often owns the local loop (which historically has also been paid with public funding). Other operators can deploy their own infrastructure to the customer. However, duplication of infrastructure is most often not viable as the alternative operator is unlikely to appropriate its investments while competing with the infrastructure of the incumbent. Therefore access is mandated to allow alternative operators to provide services to establish a competitive service market.

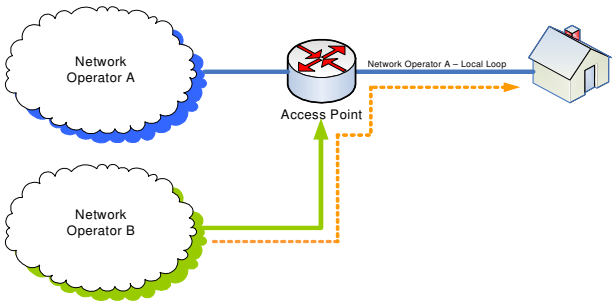

Figure 34: Wholesale access in the local loop (market 4)

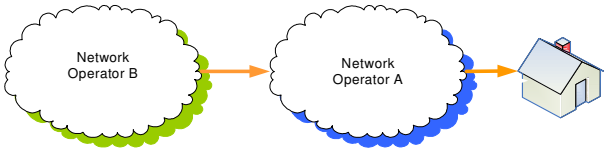

Figure 35: Wholesale access (market 5)

Market 5

Wholesale broadband access to the IP-network (Market 5) is similar to mandated access in market 4. However, in this case the alternative operator does not have a network of its own to the interconnection point of the incumbent operator. Therefore access is granted on a higher level in the network hierarchy. The operator who has been found to be dominant market 5 is also often the incumbent operator. Therefore access is mandated and alternative operators can interconnect to the core networks of the incumbent to provide services to its customers, see Figure 35.

Appendix IX. First NGA consultation

The first consultation addressed the announcements of an engagement in next generation network roll-out for the provision of high-speed broadband services. The first draft recommendation aimed to:

- Give guidance to NRAs on the treatment of regulated access to NGAs
- Prevent fragmentation of the internal market
- Intensify investment in NGAs
- Foster competition in the new environment.

The first consultation mainly addresses access measures. First, access to passive infrastructure works, such as ducts and civil engineering works of the dominant operator is proposed. Access on this level is considered to be necessarily for the roll-out of competing infrastructures. NRAs should encourage any build-and-share projects.

The second level concerns the physical access network (Market 4). In this market NRAs should encourage fiber based deployment in stead of copper, such as FttH networks and FttN networks. Access to the local loop is mandated to the active local fiber loop and access to unlit fiber. For FttH networks the price control should be adjusted for the investment risk of the dominant operator. As the network topology changes the concentration points should be carefully determined. Multiple physical access point may impractical or undesirable, especially for in building wiring. For FttN networks, existing regulation for local loop access is continued, and should not be undone by changes in network topology. This also includes that new mandated access is supplemented with appropriate backhaul measures.

The third access remedies for NGA networks address market 5 - 'wholesale broadband access'. The dominant operator's obligations should be maintained in market 5, unless there are clear indicators of a break in the chain of substitutes as compared to current product markets. The mandating of wholesale access products should reflect the capabilities of the technological and commercial capabilities of the new infrastructure, so that alternative operators can compete effectively. NRAs should ensure that the pricing of wholesale broadband access products based on fiber for market 5 is consistent with the prices charged for physical access products.

Reactions on the First Consultation

The reactions on the first consultation were various. Most parties support the plans for increased transparency, appropriate transition mechanisms to changing network topologies, and the principle of equivalence (ETNO, 2009). Another consensus, with some different nuances, is that proposals are overly descriptive (reactions: BT, ERG, Tele2). The Spanish incumbent – Abertis Telecom - comments that a distinction should be made between high consumer base and low consumer based areas in the risk assessment access prices for fiber. The Dutch incumbent believes the Commission takes the roll-out of fiber to the home for granted, and adds that roll-out in an environment which has many substitutes has few precedents. The Dutch incumbent also comments on the proposals for duct sharing, which is not applicable for the Netherlands and many other member states. The ERG comments on the access to the ducts as follows:

> *"ERG considers that the pricing principles for access to ducts proposed by the Commission in its draft recommendation, and more specifically in its Annex 1, are neither reasonable nor feasible and are generally too prescriptive." (ERG, 2008, p.4)*

Another comment is that the proposals give no guarantee for regulatory certainty. The regulators (Dutch Ministry of Economic Affairs – MinEz, Dutch NRA: OPTA, and the ERG) agree that the proposals are too prescriptive. OPTA comments that multiple access infrastructures, such as in-building wiring, sometimes can be a viable business case, which according to the first NGA draft is undesirable. OPTA and Ministry of Economic Affairs believe that the risk premium and tariff principles are premature and risky, as there is limited experience with tariff principles in the context of NGA regulation. The reaction of Tele2 supports the view of the Dutch regulator(s) and believes that tariff principles should be determined case by case, and not generally by the EU.

Appendix X. Dutch mobile spectrum allocation

Generation		Standards / Technology
0 G		MT-S/A/B/C, IMTS, MTD, AMTS, OLT, Autoradiopuhelin
1 G		NMT, AMPS, Hicap, Mobitex, DataTAC, TACS, ETACS
2 G		GSM, CSD
2½ G		HSCSD, GPRS, EDGE/EGPRS
3 G		UMTS, WCDMA, UTRA
3½ G	***3GPP family***	HSDPA · HSUPA · HSPA+ · LTE (E-UTRA)
	Wimax Family	Mobile WiMAX (IEEE 802.16e-2005) · Flash-OFDM · IEEE 802.20
4 G	***3GPP family***	LTE Advanced
	Wimax Family	IEEE 802.16m

Table 7: Generations Mobile Communication Technologies / Standards

Operator:	Awarded Spectrum (2 February 2010)					Cap for the 2.6GHz Auction (total spectrum available 199,7 MHz) – [awarded in auction]	Total:
	GSM & EGSM	DCS / GSM1800	UMTS / IMT2000	3.5GHz	Sub-Total:		
KPN	24.8MHz	35.2MHz	34.6MHz	-	94.6MHz	20 MHz [awarded: 20MHz]	114.6 MHz
T-Mobile	20MHz	63.8MHz	50 MHz	-	133.6MHz	10 MHz [awarded: 10MHz]	143.6 MHz
Vodafone	22.8MHz	5.2MHz	34.6MHz	-	67.8MHz	25 MHz [awarded: 20MHz]	87.8 MHz
Worldmax	-	-	-	80MHz	80MHz	0 MHz [awarded: 0 MHz]	80 MHz
Ziggo 4 (UPC & Ziggo)	-	-	-	-	-	0 MHz [awarded: 40 MHz]	40 MHz
Tele2	-	-	-	-	-	0 MHz [awarded: 40 MHz]	40 MHz
Remaining In the 2.6MHz							69.7 MHz

Table 8: Awarded Spectrum in the Netherlands

Appendix XI. Interview questions

These are the semi structured introductory interview questions, and the market verification interview questions for the next generation access case, and the digital dividend case.

Introductory interview questions:

1) Dient het huidige regelgevende kader volgens u veranderd te worden? Welke problemen zijn er op het moment in het huidige regelgevende kader *(Nationaal en Europees)*?
2) Wat vindt u van de voorgestelde veranderingen in het nieuwe voorgestelde kader voor telecommunicatie, en welke veranderingen zijn volgens u het / meest ingrijpend?
3) In hoeverre denkt u dat voorgestelde regelgeving economisch ingegeven is?
   (zoals het toevoegen van 'functional seperation' aan de toolbox van de Nationale regulerende autoriteiten)
4) Leidt volgens u het nieuwe regelgevende kader tot meer of minder regulering?
   (enerzijds het aantal gereduceerde markten van 18 naar 7 en anderzijds het oprichten van een nieuwe Europese regulerende autoriteit)
5) Wat is volgens u de impact van de voorgestelde veranderingen voor 'next generation network access' / 'ODF-access' op de telecommunicatiemarkt in Nederland?
6) Wat is volgens u de impact van de voorgestelde veranderingen voor 'digital dividend' op de telecommunicatiemarkt in Nederland?

Next generation access interview questions:

1) Verwacht u dat het (voorgestelde) herziene regelgevende kader regelgevende zekerheid creëert in Europa? In Nederland? (voor toegang, interconnectie, reference offers?)
   - Wholesale toegang tot de locale loop (markt 4)
   - Wholesale toegang (markt 5)
2) Verwacht u dat het (voorgestelde) herziene regelgevende kader infrastructuur concurrentie zal bevorderen in Europa? In Nederland? Gezien de voorgestelde maatregelen:
   - Toegang tot passieve infrastructuurwerken van de SMP operator?
   - Toegangsverplichtingen FttH / FttN?
   - Toegangsregulering van de wholesale markt?
   - Stimuleren van multi-fiber uitrol?
3) Verwacht u dat het (voorgestelde) herziene regelgevend kader toetreding in de markt zal realiseren in Europa? In Nederland?
4) Verwacht u dat het (voorgestelde) herziene regelgevend kader Product en diensten differentiatie zal realiseren in Europa? In Nederland?
5) Verwacht u dat het (voorgestelde) herziene regelgevend kader investeringen en innovatie zal realiseren in Europa? In Nederland?
6) Zal de voorgestelde regelgeving leiden tot een versnelde uitrol (versnelde transitie) van NGA netwerken in Europa? In Nederland?
7) Verwacht u dat het (voorgestelde) regelgevende kader de volgende (Lisbon Agenda) doelstellingen zal bereiken?
   - Verdere ontwikkeling van de Europese economie
   - Eén Europese markt creëren

- Maximaliseren van voordelen voor consumenten

8) Resumerend: Kunt u op een schaal van 1 tot 5 aangeven (1: oneens, 5: volledig mee eens) of de doelen bereikt zullen worden door het voorgestelde regelgevende kader?
   - Creëren regelgevende zekerheid 1 – 2 – 3 – 4 – 5
   - Toegenomen infrastructuur concurrentie 1 – 2 – 3 – 4 – 5
   - Aanzetten tot het maken van investeringen en innovatie 1 – 2 – 3 – 4 – 5
   - Uitrol van NGA netwerken bevorderen / versnellen 1 – 2 – 3 – 4 – 5

Digital dividend interview questions:

1) Is er in Europa, en met name in Nederland, een grotere vraag naar spectrumruimte voor mobiele breedbanddiensten of 'broadcast' doeleinden, en komt de voorgestelde regelgeving hieraan voldoende tegemoet? *(gezien andere herschikkingen: 3.5GHz, 2.6GHz, GSM)?*

2) Dient de herstructurering van het spectrum op Europees niveau te worden gereguleerd? Wat zijn de voordelen en nadelen? En leidt de voorgestelde regelgeving inderdaad tot een flexibeler en efficiënter gebruik het spectrum?

3) Er zijn verschillende mogelijkheden voor de invulling van het Digitale Dividend, met name het bovenste deel (790-862 MHz) zoals voor mobiele breedband toepassingen en omroep doeleinden.
   - Welke invulling is het meest waarschijnlijk in Europa? Nederland?
   - Hoe zou de vrijgekomen spectrumruimte vergeven kunnen worden?
   - Wat zijn de voordelen en nadelen?

4) Als er besloten word het bovenste deel van het digital dividend beschikbaar te stellen voor 'broadcast' doeleinden, wat betekend dit dan voor (c*oncurrentie in) de* 'broadcast' markt? *(Toetreding, Product differentiatie, Investeringen, Technologie standaarden)*

5) Als er besloten word het bovenste deel van het digital dividend beschikbaar te stellen voor mobiele breedbanddiensten, wat betekend dit dan voor (c*oncurrentie in)* de mobiele markt? *(Toetreding, Product differentiatie, Investeringen, Technologie standaarden)*

6) Wordt door de voorgestelde regelgeving inderdaad de dekking van rurale gebieden gestimuleerd?

7) De Europese Commissie ziet groot potentieel in het Digitale Dividend voor economisch herstel en groei, en de competitiviteit van Europa. Zal de voorgestelde regulering betreffende het Digitale Dividend leiden hiertoe leiden?

8) Resumerend: Kunt u op een schaal van 1 tot 5 aangeven (1: oneens, 5: volledig mee eens) of de doelen bereikt zullen worden door het voorgestelde regelgevende kader?
   - Breedband voor iedereen 1 – 2 – 3 – 4 – 5
   - Verbeterde Europese coördinatie 1 – 2 – 3 – 4 – 5
   - Snelle zichtbare economische activiteit 1 – 2 – 3 – 4 – 5
   - Verdere ontwikkeling aardse omroep diensten 1 – 2 – 3 – 4 – 5
   - Flexibeler en efficiënter gebruik spectrum 1 – 2 – 3 – 4 – 5
   - Harmonisatie technische standaarden 1 – 2 – 3 – 4 – 5

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