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# Next Generation Network: How to Stimulate Investment While Maintaining a Competitive Market

High-speed communication networks are the basic infrastructure for a whole range of next generation communication services. They can induce a wave of innovations and eventually lead to growth and new employment. However, large investments will be needed to generate Next Generation Networks (NGN) and the risks for the investor will be substantial. On the other hand, investors can create monopolistic bottlenecks which prevent competitors from gaining access to essential infrastructure. As a consequence, uncompetitive markets will emerge. The following article proposes a regulatory system which creates incentives for investment while safeguarding competition.

Telecommunications are considered to be an important engine for the economy as a whole, having a large impact on efficiency in nearly all economic sectors and, therefore, greatly influencing GDP performance.

Consequently, big debates on the possibility of building the so-called Next Generation Network – a multi-service, very high speed, IP-based network – are still under way in many countries.

The recently approved Directive 2009/140/EC<sup>1</sup> expressly aims “to give appropriate incentives for investment in high-speed networks”, as these networks are considered fundamental in order to “support innovation in content-rich internet services and strengthen the international competitiveness of the European Union”. At the same time, the text specifies that the development of these new networks has to be promoted “while safeguarding competition and boosting consumer choice”. This means that the goal of NGN<sup>2</sup> investment promotion should simply be added to the old objectives without explicitly specifying a priority order. But investment incentives are not always in line with the objective of promoting competition, and the discussions over which of the two objectives should prevail have been very heated: an example here is the German debate over a “regulatory holiday”, which implicitly assumes that investment stimulus must take priority over the promotion of competition, while the European Commission stresses the im-

portance of increasing consumer welfare via competition, which will drive investments.

Thus, the key question is how to stimulate investments while maintaining a competitive market.<sup>3</sup>

## When and Why Is an Incentive Policy Really Necessary?

Before attempting to reconcile the objectives of promoting competition and stimulating investment, a preliminary issue must first be addressed: when and why to introduce an incentive for building a new fixed network in a specific country, given that broadband service is already supplied with a fixed line.

As will be made clear, it is also important to emphasise that the exact wording of the approved Directive 2009/140/EC is as follows: “It is therefore vital to promote sustainable investment in the development of these new networks.”<sup>4</sup> This does not mean that an active incentive policy is always needed, but rather that an environment favourable to investments has to be in place. In the absence of such an

1 See Directive 2009/140/EC, No. 1211/2009, (8).

2 In this paper, we will use NGN and NGA (the part of the network requiring high and dedicated investments) as synonyms, always indicating the access part of the Next Generation Network.

3 In this paper, we don't address the problem of including broadband services in the Universal Service Obligations (USO). The issue to promote the realisation of a modern, multi-service network able to carry services requiring a very large bandwidth in a future-proof way is essentially an economic issue, while the second target (USO) is mainly a social one, aiming at making available, even in the most isolated areas, a minimum level of bandwidth, compatible with offering basic services to all, thus avoiding social exclusion.

4 Directive 2009/140/EC, No. 1211/2009, (8).

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environment, industrial policy has to intervene to create it, whereas if the environment is already favourable, regulation must assure that it can act optimally.

Excluding the digital divide areas (market failure areas) from the debate, Next Generation Networks – with focus on the access component – will:

- be realised in areas which are or can become profitable;
- be able to supply more innovative services, which probably will give a higher ARPU<sup>5</sup> than the current ones;
- allow considerable savings of operating costs (less maintenance, greatly reduced number of sites, etc.).

As a consequence, why should we worry about the idea of incentivising (or not disincentivising) these investments?

As a general rule, investments should be tied to market rules: if the market exists, someone will invest. The need for an incentive, then, arises only when the following conditions are present:

- the investments have very long payback periods;
- future demand is uncertain;
- the current competition level is not strong enough to push innovative investments;
- the investments are considered to be a need for the country.

Looking into these requirements in more depth, we observe that the first two conditions are structurally present in the case of NGN built (at least in part) with fibre, as it requires extremely high investments and the level of demand for innovative services is not really predictable (no “killer application” has emerged thus far), while the last two conditions can vary in different countries.

As for the third condition, we observe that if the access segment is already competitive (e.g. cable TV operators are also quite strong in the telecommunications market), it is likely that the telecoms access operator will be motivated to complete its own Next Generation Access (NGA) to reduce the risk of being overtaken by a competitor using coaxial cable, which often performs better than copper line. This is exactly the conclusion reached in the report commissioned by the UK government and published in September 2008<sup>6</sup>, whose main recommendation is to wait and see before introducing public incentives, as it is likely that British Telecom will carry out the investments itself even in the absence of incentives.

<sup>5</sup> Average Revenue per Unit.

<sup>6</sup> F. Caio: The Next Phase of Broadband UK: Action now for long term competitiveness, Review of Barriers to Investment in Next Generation Access, September 2008.

Finally, the last condition is a prerequisite for any active incentive policy: if such investments are not crucial for a country, why should they be supported at a level higher than the one fixed by the market? The telecommunications sector has a strong impact on the entire economy, positively affecting the efficiency of firms and of public administration, not to mention its impact on the lifestyle of individuals, but we must ask ourselves if it is really necessary to create a new NGN to reach such objectives or whether the existing network is sufficient (perhaps with some less expensive innovation/maintenance activity).

In order to answer this question, we have to analyse the circumstances of networks in each particular country carefully. In other words, a real need to define incentives to speed up the creation of the new network comes only if the existing network is unlikely to bear (from a quantitative and qualitative point of view) the impact of the foreseen increase in broadband demand with ordinary maintenance activity alone. Obviously the likelihood of such a negative event has to be carefully evaluated since if the existing network reveals itself to be insufficient, the risk is a nearly complete paralysis of the country, a danger which is not acceptable and must be accounted for.

Some studies<sup>7</sup> have examined exactly this situation, and Figure 1 shows the anticipated results:

- the core part of the network (optical capacity in the backbone, connectivity and core switching capacity) will have no problems;
- the demand for Internet and IP services will grow exponentially after 2010;
- investments in the access network will progress linearly (or less than linearly).

If Figure 1 is correct, the current access network will not be adequate in the future, thus creating a problem of bandwidth insufficiency.<sup>8</sup>

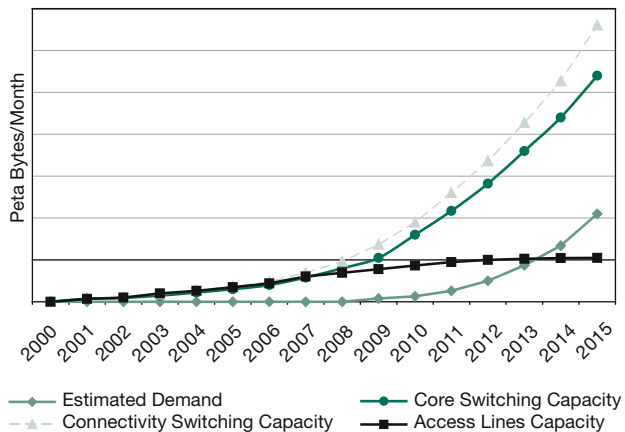
In the medium term, there are other qualitative parameters negatively influencing the ability of the current copper access network to handle the increasing demand. These include:

- an increased fault rate with the increase of broadband supply;

<sup>7</sup> See Nemertes Research: Internet Interrupted: Why Architectural Limitations Will Fracture the ‘Net, at [www.nemertes.com](http://www.nemertes.com), 2007.

<sup>8</sup> F. Caio: Portare l’Italia verso la leadership europea nella banda larga: Considerazioni sulle opzioni di politica industriale, Research project for Ministero dello Sviluppo Economico – Comunicazioni, March 2009. Caio speaks about “osteoporosis”: underinvestment in network infrastructure will erode the competitiveness of the country day by day and without perceptible breaches. The analysis of bandwidth insufficiency considers both network capacity and network efficiency.

Figure 1  
Global Capacity versus Demand



Source: Nemertes Research: Internet Interrupted: Why Architectural Limitations Will Fracture the 'Net, at [www.nemertes.com](http://www.nemertes.com), 2007.

- reduced bandwidth availability in relation to the length of access copper line to reach the customer;
- higher interference with increased customer density;
- obsolescence;
- quality instability in some areas related to weather conditions.

To sum up, positive incentives for building a new Next Generation Network are only needed when there is a risk that the old network will not bear the increase of broadband demand or when there are no or few incentives for private operators to invest on their own.

These two conditions will be present in only a few countries, while private investors can often find adequate stimuli for creating the infrastructure by themselves. Thus, in the latter situation the issue is not about finding a way to incentivise network creation but rather about using industrial and regulatory policy to create an environment which does not discourage such creation.

In the remainder of this paper, we concentrate on the case of a country (or part of it) where the two conditions mentioned above are currently met, which is the only situation in which positive incentives can be asked for. In particular, we assume that the absence of incentives for private operators becomes relevant when the risk of broadband insufficiency can only be overcome by building a new fibre network.

### How to Stimulate Investment While Maintaining a Competitive Market

In order to better answer this question, we will begin by analysing the possible incentives for NGN implementation

that are available to governments (or other public bodies). We will then concentrate on the regulatory measures able to support (not to discourage) investment. In both cases, our main question remains how to incentivise (or avoid disincentivising) investments without retreating from supporting competition and consumer choice.

### Viability Incentive Models

In the past, the current copper telecommunication network was achieved mainly (if not entirely) with public funds, generally through the public property of the monopolist operator. This means that public funds were directed towards an activity considered to have social relevance but without any negative impact on competitors, as the TLC industry was a monopoly. Furthermore, these public payments were not without a return, as the company receiving funds and building the infrastructure contextually increased its value, thus also increasing the value of the public participation in the company.

Nowadays, however, the market is competitive. Therefore, any public contribution to a single operator in the absence of appropriate guarantees and procedures would represent a transfer of public money for the main benefit of the company's shareholders and, as such, would be considered a state aid and would be subject to sanctions under European law. Therefore, it is crucial to identify a viable incentive model that is respectful of public interest and competition.

The possible incentive schemes differ in many ways. Table 1 attempts to group them according to their impact (supply or demand), type of transfer (direct/indirect) and instrument chosen.

This paper does not examine the issue of demand incentives. They are important and effective but, given the large investments required by an NGN, demand incentives would not be sufficient. In the situation described above, direct supply incentives are needed. Viable incentive schemes include:

- non-refundable public funds – this type of intervention must ensure that all the companies operate on a level playing-field (i.e. it must be compatible with the general EU prohibition of state aid) and also poses the problem of politically justifying the funds transfer to a specific activity, which is currently unappealing to the general population;
- facilitated loans – this solution minimises the political problems, but it requires a clear definition of the requirements to enter the scheme in order to make the procedure competitive;

**Table 1**  
**Different Incentive Schemes**

Supply/ demand	Direct/ indirect	Instruments	Options
1) supply side	a) direct incentives	direct funding of infrastructural investments	– PPP (public-private partnership) – funding or facilitated loans
			– non-refundable public funds
	b) indirect incentives	fiscal instruments	– tax credits
		competition promotion through regula- tory measures	– ladder of investments and technological neutrality <sup>1</sup> – auctions <sup>2</sup>
2) demand side	a) direct incentives	vouchers	– for general users – for particular user categories
		fiscal instruments	– for general users – for particular user categories
	b) indirect incentives	support for the development of broadband applications	– e-government, e-health, e-learning, e-business – alphabetisation programmes
		instruments for value creation	(e.g.: cyber building certificate in Korea)

<sup>1</sup> Competition in the market.

<sup>2</sup> Competition for the market.

- a public-private partnership (PPP) – generally, this involves the allotment of a company equity share to a public body; this solution minimises the political problem of justifying the support (if the activity is profitable<sup>9</sup>, the taxpayers will get an economic return), and the risk of incurring sanctions for granting state aid is also reduced, though caution here is still necessary.

Fibre NGA has some natural monopoly features, as the investment is too large to be borne by more than one operator. Additionally, in many countries there is a single operator – the former monopolist – who can benefit from relevant synergies in building the new NGA through the exploitation of the already existing ducts. Therefore, only one network can be financed in each area, and in an attempt to avoid state aid problems, we must either adopt multi-operator initiatives (which encourage the participation of different operators in the NGA implementation) or split the territory

<sup>9</sup> Obviously, there would be problems if the activity proved to be not profitable.

into different areas where different operators can apply for funds.

Furthermore, the model should create profit for the administration in order to ensure that public funds are not used for the primary benefit of the companies' shareholders.

The main viable model that would allow direct incentives and include the features defined above is the creation of a separate company to build a fibre NGN, open to all market players on a voluntary basis and therefore able to receive public funds without encountering state aid problems.

This model can consider separating the incumbent's entire network (copper + fibre) or only the fibre network, and in either situation, a national or a local approach could be applied. A national approach for the entire network foresees the creation of a new company originated from the incumbent network and open to other investors. A national approach for a fibre NGN could encompass either a company that derives from the separation of the incumbent fibre network or a completely new company. A local approach envisions the same steps as the national one but at the municipal level.<sup>10</sup> Table 2 shows the main options of the model.

Looking into the pros and cons of the different options, granting public incentives to a company created by the vertical separation of the incumbent's entire network (both copper and fibre) has the following positive elements:

- it maximises the synergies and efficiencies of investment, management and migration from copper to fibre;
- it guarantees more stable and predictable cash flow from the beginning;
- once started, the process is less complex.

On the other hand, we note the following negative features:

- high complexity in the initial definition and implementation;
- higher initial investments compared to other options.

As for the second option – the creation of a new company exclusively for the fibre network (regardless of whether it was created through the vertical separation of the incumbent fibre network) – we observe some positive elements:

- less need for public investment;
- no need to touch the incumbent traditional network.

<sup>10</sup> We have no knowledge of cases of municipal networks built in copper; therefore, in practice, only the cases indicated in the second column are likely to exist.

**Table 2**  
**Viable Options for Granting Incentives for NGN Building**

	Entire network (copper + fibre)	Only fibre network
National approach (vertical separation)	– company created by the separation of the incumbent network, the capital of which is open to other shareholders	– company created by the separation of the incumbent fibre network, the capital of which is open to others, or  – creation of a new company for the new fibre network
Local approach (horizontal separation)	– municipal networks (if local copper networks exist <sup>1</sup> )	– municipal networks

<sup>1</sup> Quite unlikely.

On the other hand, we see a number of negative outcomes:

- a considerable measure of synergies would be lost due to a lack of joint operational management of the copper and fibre networks; furthermore, the re-use of the existing ducts would not be granted (this should be imposed by regulation, which is more complex than authorisation granted from within the same company);
- less certainty of a return on the fibre investment due to the competition from the copper network. In particular, there can be an important conflict of interest if the incumbent becomes a shareholder of the new company;
- the problem of migrating competitors from copper local loop unbundling (LLU) to analogue wholesale services on fibre (supplier changes could be necessary);
- the need for more stringent regulatory rules.

Finally, adopting a local approach to the fibre network creation (regardless of whether or not it was created via the horizontal separation of the incumbent network) will lead to positive outcomes such as:

- a reduced need for public investments and a greater chance to graduate them over time;
- a higher possibility of involving local authorities;
- less operational complexity.

On the negative side, a local approach is likely to result in:

- the loss of a considerable measure of synergies due to a lack of joint operational management of the copper and fibre networks; furthermore, re-use of ducts would not be granted (again, this should be imposed by regulation, which is more complex than authorisation granted from within the same company);

**Table 3**  
**Evaluation of the Different Options**

	Entire network (copper + fibre)	Only fibre network
National approach	– effectiveness: maximum	– effectiveness: medium
	– complexity: high	– complexity: simple start, but very complex migration process
	– financial resources: high	– financial resources: medium/high
	– impact on competition: positive (level playing field), reduced need for regulation	– impact on competition: high regulation level required
Local approach	not relevant	– effectiveness: impact more limited than in other solutions
		– complexity: need to coordinate intervention in different areas
		– financial resources: possibility of starting with low investment and then increasing; it can also stimulate local operators
		– impact on competition: positive in interested areas, but regulation is necessary

- the return on the fibre investment is less certain due to the competition from the copper network; nevertheless, due to the reduced dimensions of the network company in this situation, it is likely to have fewer conflicts of interest with the incumbent than in the previous solution;
- the problem of migrating competitors from copper LLU to analogue wholesale services on fibre (supplier changes could be necessary);
- the need for stringent regulatory rules.

Therefore, the viable options previously described can be synthetically evaluated as follows:

If public funds are awarded to only one company under a national approach, then it is necessary to open the capital to other investors (public property could also be foreseen) to avoid state aid problems. If a local approach is chosen, it is also possible to adopt an auction mechanism in each local area.

In addition, in order to preserve competition and consumer choice, all operators supplying services on the market must have access to the new network. The access segment of the network has natural monopoly characteristics, and thus competition at the service level is not possible if access is not available to all on equal terms. On the other hand, in order not to discourage investments in the new network, it will be necessary to fine-tune wholesale tariffs in order to get a

fair rate of return on capital. Regulation must be able to reconcile these two aspects, as will be further discussed below.

Other problems will also arise during the migration period from the current copper network to the new one (e.g. the problem of competition from the old network, which can provide the same services up to a certain amount of bandwidth). Solutions to these problems must be considered in regulators' agendas.

### The Role of Regulation

The role of regulation seems to be easier to discuss, as both the European 2002 regulatory package<sup>11</sup> and the recently approved one are based on clear and technologically neutral principles, implying that a network change is not going to weaken the regulatory pillars. But as detailed above, some non-trivial implementation issues remain to be solved.

A first issue relates to the definition of a "right" rate of return for a network which implies high and risky investments in the short term with a long recovery plan. To preserve competition and consumer choice, the access network must be open to all; therefore, it is necessary to determine a fair price for wholesale services. This price needs to be fixed at a level that is not too low, in order not to deter investments in the new network, but also not too high, in order to avoid excessive prices for consumers.

Obviously, the path for setting a price that complies with such conflicting characteristics is very narrow, and a number of studies have investigated the matter. In general, there is agreement among all the operators (with and without infrastructures) that a higher rate of return can be awarded for NGA investments (higher than for investments in the current copper network)<sup>12</sup>, and in setting the level of return, the requisite large sunk investments along with the significant demand side risk must be taken into consideration.

Another issue, highly related to the previous one<sup>13</sup>, is the choice of the charging principle for IP interconnection. The contemporaneous presence of data and voice networks, the increasing possibility of supplying services on both networks and the trend towards a sole multi-service network will make it infeasible to maintain a double regime for interconnection: the Calling Party Network Pays (CPNP) principle, typical for voice interconnection, and the Bill & Keep (B&K) principle, used for Internet peering.

11 See Dir. 2002/19/EC, Dir. 2002/20/EC, Dir. 2002/21/EC, Dir. 2002/22/EC and Dir. 2009/140/EC.

12 See P. Cullham: Lessons from the Telecoms Sector, paper presented at the Conference After RPI-X: What next?, London, 5 March 2008.

13 But this issue will also arise in the absence of NGA implementation.

The current trend in favour of a B&K model, in which every operator bears the costs of terminating the call on its own network, would make it more difficult to apply a higher rate of return on new NGA networks, as a share of the current wholesale revenues would be erased, thus comparatively favouring old, non-capillary networks. Therefore, if a regulatory incentive policy for NGA has to be adopted, an intermediate scenario such as a B&K without any constraint on quality and premium tariffs for better quality should probably be adopted.<sup>14</sup>

Another regulatory issue relates to the definition of the retail prices for the services included in the Universal Service Obligations. If the new network is to substitute for the current one, should universal service users pay more for the same service?<sup>15</sup> Or should we cross-subsidise these services with higher prices to obtain more advanced services? How should possible cross-subsidisation in a competitive context be managed? Nowadays, this topic seems to be the least explored in both theoretical and applied works.

Last but not least, a very important regulatory issue concerns the period of migration from the current network to the new one. The contemporaneous presence of both networks has many serious drawbacks, both for the company making the investment and for its competitors.

Regarding the first aspect, if we adopt a model in which the new fibre network is built by a different company than the one that owns the copper network (either totally different shareholders or shareholders that only partially overlap), it is likely that the copper network will compete with the new network, thus making it more difficult for the new company to recover its investment. This type of competition can be particularly effective, as the fixed costs of the copper network are more or less written off, and in the short to medium term it will be possible to deliver the majority of services on both networks.

The situation could be even worse if the copper company is allowed to build its own fibre network (in competition with the new investors), with the likely result that the new company would face fierce competition in profitable areas. This competition would make it more difficult to recover its investment and to build the new network in less affluent areas.

Moreover, amongst the competition problems arising during the migration, the available wholesale products represent a

14 See E. Gallo: Is There a "Right" Charging Principle with the NGN Advent?, in: Communications & Strategies, Vol. 1, No. 72, 2008.

15 This assumes that the new network will be more expensive in the short term (although this hypothesis has yet to be verified). According to the most astute analysis, the new network will have more depreciation than the old one but lower operating costs, which will probably result in higher costs in the short to medium term.

serious issue, as it is necessary to define the last step of the ladder of investments or, in other words, which service will take the place of the unbundling of the local loop used now. In particular, co-location will be a crucial matter to be solved, as the new network will require fewer sites than the copper one (this feature is one of the main causes of the envisioned operational cost savings versus the copper network). As competitors have invested large amounts in site preparation and regulation had pushed towards scaling the ladder of investments, we can imagine that competitors will resist closing current co-located sites in order to open new ones in the new network, thus increasing the problem of competition between the old and the new networks. The issue of stranded costs would likely arise.

### Conclusions

The paper states that NGN investments require direct public incentives only when there is both the need to speed up NGN and no or few incentives exist for private operators to invest on their own.

If neither condition is met, which is probably the general case, the market will provide for the development of Next Generation Networks by itself. In this situation, our basic question (how to stimulate investments without hampering competition) can simply be answered through regulation, the main components of which would be:

- to safeguard competition guaranteeing equality of access;
- not to deter investments, for example by setting wholesale rates to guarantee a return on investment that is able to take the additional risk into account;
- to choose the appropriate pricing criteria and carefully manage the migration period.

On the other hand, if the two initial conditions are met and a direct public investment is therefore deemed necessary, it is important that the chosen model avoid state aid problems, which are particularly serious given that building the fibre NGA is considered to be a natural monopoly. If a national approach is adopted, the new fibre company can avoid state aid problems by opening the capital share to other investors. Public-private partnerships could be foreseen here. If a local approach is chosen, the possibility of adopting an auction mechanism in each local area can be added to the previous solution. In order to preserve competition (and customer choice), the new fibre company must grant access to the new network to all operators in the market.

As a general rule, we would prefer a model able to create profit for the administration (PPP or loans) in order to ensure that public funds are not used for the primary benefit of companies' shareholders.