Bandwidth demand is growing fast and starting to exceed the physical limits of legacy access networks. The roll-out of next generation access networks (NGA) with a focus on fiber-to-the-home requires massive investment with long pay-back periods. The telecom industry will not show positive returns on investment in rural areas for many years. However, studies suggest that the external effects of broadband investments on GDP growth and employment exceed the direct benefits to the telecom industry by far. As a result many countries have started to develop broadband strategies including industrial policy support, subsidies and direct state investments in NGAs. The national broadband strategy in Germany has set ambitious targets but has insufficient measures and low budgets. There is a need for a more investment friendly regulatory framework and restrictive but clearly defined industrial policy measures.
Initial Developments

The trend for growing bandwidth demand is unbroken. Wide use of multi-room HDTV, cloud computing, high-end gaming, and picture & video intensive social networks are driving data rates per household well beyond the physical limits of legacy copper access networks. All major fixed line operators are now starting to install fiber in the local loop, either as “fiber-to-the-curb” (FTTC), “fiber-to-the-building/home” (FTTB/H) or “hybrid fiber-coax” (HFC) in the case of CATV operators. Wireless and mobile solutions can complement fiber networks, but they offer lower speed and quality.

A modern broadband telecommunications infrastructure is particularly important for the competitiveness of knowledge-based economies. In 2009 the German government announced its ambitious “Broadband Strategy” which determines that 100% of households should have access to a DSL line with at least 1 Mb/s bandwidth in 2010. By 2014 75% of households should have access to transmission rates of at least 50 Mb/s, and in the longer run this speed should be accessible to every home.

The economic impact of investment into broadband networks in line with this strategy has recently been evaluated\(^1\). The required investments of about 35bn€ are expected to create nearly 1 million jobs and 170bn€ GDP. However, 137bn€ of this positive GDP growth is expected outside the telecom industry, i.e. investors will not be the main beneficiaries.

Challenges

On the basis of financial viability it will take operators decades to achieve nationwide coverage with fiber access networks, much longer than governments would like for reasons of economic recovery and national competitiveness.

The blended ARPU of German customers for broadband access is currently about 35€, with little regional variation. In contrast the investment per home passed decreases strongly with population density. A study for ECTA\(^2\) shows that a fiber-to-the-curb connection requires investments of about 130€ in urban areas, in rural areas it is 2.000€. For the fiber-to-the-building (FTTB) access networks the investment is between 600€ and 4.500€. It is worth noting that more than 60% of the German population lives in “dense rural” and “rural” areas - where fiber network coverage is extremely costly.

Consequently the operators have little interest in investing in fiber infrastructure outside urban areas. Studies suggest that under current ARPU and cost conditions fiber-to-the-building (FTTB) networks would only be profitable for about 25% of German households, while the more basic fiber-to-the-curb (VDSL) networks could serve slightly above 70% profitably. However, only for a very small percentage of all homes in the FTTB case is the market share needed to achieve a positive return on investment below 50%. In other words, even in viable regions investments for the majority of homes are only profitable under monopolistic conditions. This is a major challenge to the existing regulatory system with its basic idea to solve sector problems through liberalization and privatization.

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\(^1\) Prof. Katz, Raul L. et al. (2009): The effect of broadband expansion on employment and the German economy, Polynomics Olten (CH)

\(^2\) WIK, (2009): The Economics of Next Generation Access study for ECTA
International race for government investments

Many countries have focused their industrial policy on ICT, but the volume and form of government investments in NGA development vary tremendously. While New Zealand, Australia and Singapore have opted for structural separation of a NetCo, financed with direct state investments of about 110-150€ per capita, most other governments are investing a fraction of this – around 18€ in the US for example, and 1.50€ in Germany. The focus is on financing areas where private investment is unprofitable using direct subsidies, tax reductions, auction revenues, public-private partnerships, or preferential financing. Some governments are changing the course of deregulation more seriously by taking a direct role as investor and operator. A good example here is Australia with its objective to serve 90% of the population with 12-100Mb/s by 2018. The state wants to separate the incumbent's access network operations and to invest about 14.5bn€ into building and operating an access network itself. This would potentially lead to average costs per served household of more than 5.300€, well above all other countries’ estimates. Further countries, mainly in the Middle East, are thinking along the same lines but with more cautious approaches restricting state investments to non-served areas and to passive infrastructure.

Required changes in the regulatory system

While regulators previously saw the restriction of the incumbent’s market power and the support of service competition as their main task, their focus is now shifting to fostering investments in broadband access networks. This demands adapted and new regulation.

Regional differentiated regulation

In Germany the entire area of jurisdiction is treated as a uniform regulatory region with the same remedies applied in cities and the countryside, even if the competitive situation is very different. The increasing “digital divide” between urban centers and rural areas demands a new approach to define relevant regional markets, determine significant market power for each sub-market, and to define remedies or industrial policy measures for each sub-market. In principle three types of regions can be determined:

- **Dense urban city centers** where more than one fiber access network is viable and can compete with interactive CATV networks and future wireless solutions. In these areas non-regulated infrastructure competition could be an efficient solution requiring only clear standards for interoperability and symmetric access obligations.

- **In smaller cities and suburban areas** where only one fiber network has limited competition from CATV networks, regulated access to monopolistic NGAs and investment-friendly regulatory remedies would suffice. The comparatively high risks faced by the infrastructure investor should also be reflected in regulated wholesale prices allowing either risk sharing by price structures that reward long term rental and high capacity commitments and/or higher accepted WACC.
In rural areas where fiber networks are not viable the only market solution could be new LTE offers, but service quality will be well below the broadband strategy’s 50Mb/s target. Here the regulator needs to develop new instruments. A start-up solution could be to allow (or force) pooling of the LTE spectrum to be auctioned in rural areas so that operators can offer higher bandwidth. The current practice of subsidizing local community fiber network developments definitely needs more clear standardization to ensure interoperability of the individual networks. Further support would be provided by developing viable PPP-models and clarifying which type of operator co-operations are allowed i.e. not regarded as cartels. Universal service fund models developed for emerging markets could also be adapted to deal with profitability gap problems in NGA investments.

Figure 1: Overview of efficiency of regional regulatory measures
New regulatory tasks

Several issues connected to NGA investments and affecting all regions have not been clarified by the regulators yet. Many of these could significantly reduce either the cost or the risks of private investments in NGAs and thus enlarge the profitable investment areas.

An important issue is the **bottleneck investment “inhouse wiring”**. While some countries like Switzerland and France have obliged the first investor to install multiple fibers and to leave households the technical choice between different operators, the issue is completely open in Germany. Particularly the long term contracts between tenants and CATV companies may be a major barrier to other operators wishing to connect customers. The latest EU proposal to guarantee free access to inhouse wiring independent of SMP has not be included into German legislation, yet.

Another challenge is the **access to existing ducts** for fiber networks. In Germany the old PSTN cables between 300,000 distribution points and 42 million buildings are mainly earth-cables without ducts. Civil works account for about 75% of a fiber network’s CAPEX. Using existing ducts would reduce these significantly. The broadband strategy foresees an “infrastructure atlas” and a database of all public road buildings, but this is not sufficient. The BNetzA should follow a **cross-industry regulatory approach** and oblige all owners to grant NGA investors access to existing ducts (potentially at regulated prices). This would significantly expand the viable areas for private investments.
Conclusion & recommendations

- The German broadband strategy targets will not be achieved within the desired timeframe if the catalogue of implementation measures is not extended significantly. The socially desired “affordable” price for which customers should get a high-speed broadband connection should be included, along with a determination of the gap between commercial roll-out and politically desired roll-out (e.g. because of external effects on GDP growth and employment).

- There should be more implementation support from the government to realize the broadband targets in Germany. This should include stronger state financial support on the demand and supply side, adaptation of the existing regulatory framework, and solutions to the new regulatory challenges arising from NGAs investments.

- With respect to larger subsidies Australia, Singapore and New Zealand’s strategic approach of structurally separating a nationwide NGA operator in public ownership is not recommended. Public investment in NGAs should follow a strict subsidiary approach with respect to private investments.

- A regionally differentiated regulatory approach for broadband access markets in Germany with no subsidies in dense city centers and suburban regions is recommended. In urban centers regulation could be reduced to pure infrastructure competition, in suburban areas a regulatory approach similar to the existing one, but with improved investment friendly instruments reflecting the higher risks of infrastructure investors, would be appropriate. The inclusion of CATV operators in the regulatory analysis will become inevitable.

- In rural areas subsidies may be adequate to close the proven gap between politically and economically desired penetration and the private service offers. Universal service methodologies could help speed up investments, as could partial or full public ownership of access networks. It is however recommended that public operators concentrate on offering passive infrastructure (ducts and dark fiber) only and leave private service providers to compete with one another.

- A regulatory framework allowing the pooling of wireless and LTE spectrum in rural areas would provide the technical basis needed to offer high access speeds similar to those in urban areas.

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