

Stratix

**Netherlands FTTH
1Q2009**

By Stratix Consulting BV

Hilversum, June '09

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1 The Netherlands: FTTH deployment overview March 2009

The Netherlands is currently one of the very few countries in Europe where genuine Fibre-to-the-Home is installed at a serious scale alongside Fibre-to-the-Building and Fibre-to-the-Curb. In comparison with our March 2008 overview, the number of homes (households) passed has grown from 188 thousand in the first quarter of 2008 to 349 thousand in the first quarter of 2009, an increase of 85%.

From these 349 thousand homes passed, about 62% or 216 thousand homes are actually homes connected (fibre brought into the meter cupboard¹, ready-for-service), a growth of near 52% compared to 142 thousand homes connected in March 2008.

Until recently, most FTTH-providers, mainly non-listed companies, were quite secretive on the actual subscribers. Nonetheless, Stratix Consulting has been able to uncover actual service subscriber numbers for nearly all projects using local press and other public sources. From these data we can state with confidence that the number of active subscribers has grown from at least 84 thousand in the first quarter of 2008 to 139 thousand in the first quarter of 2009, an annual increase of 65%.

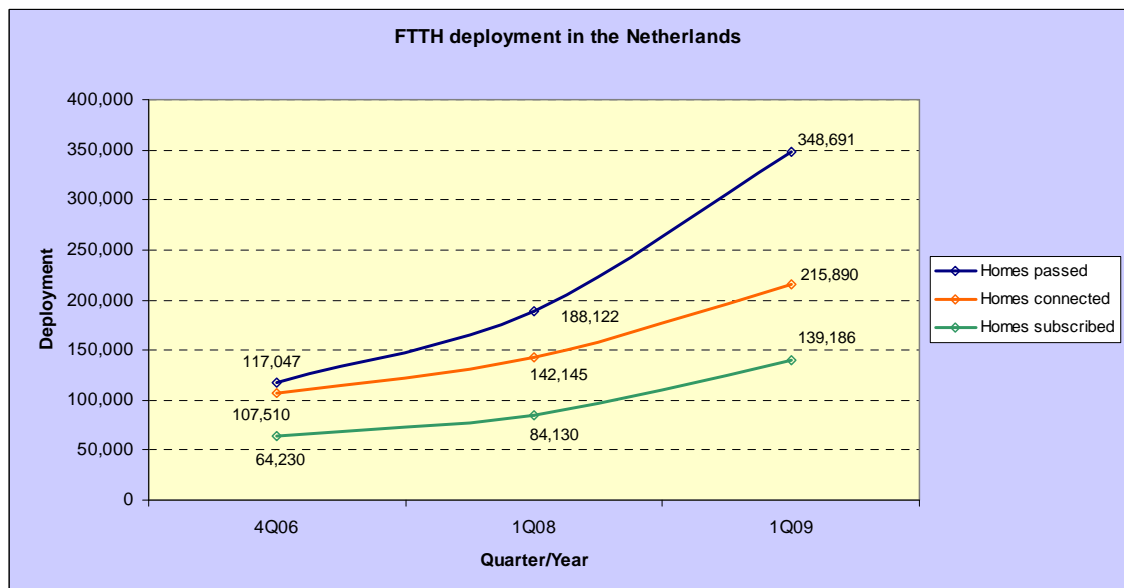


Figure 1: FTTH deployment trend shows increasing year-on-year roll out pace as well as subscribers' growth

In this detailed report we present our general analysis of the FTTH market as well as the data on the various projects in the Netherlands.

¹ In the Netherlands meter cupboards are located inside the home.

1.1 Sources and methodology

Stratix Consulting BV has compiled this overview from public sources:

- announcements and press releases by organisations that develop Fibre-to-the-Home projects
- FTTH project websites
- (Local) press coverage
- Municipal lists on home densities / neighbourhoods
- Activated and routed IP address blocks (when directly linked to FTTH)

We list comparisons with earlier reports that provided data for December 2006 and March 2008. Because certain networks came to our knowledge after publication of the older reports, we have made minor revisions to the 1Q2008 figures in this report...

To give a more in-depth overview of the current status of FTTH deployment in the Netherlands, we have made some extensive changes in the structure of our database. We have collected detailed information on household numbers at neighbourhood levels, along with data on fibre deployment in those neighbourhoods. In addition we have built-in various search options and the ability to generate visual maps of fibreed areas.

Moreover, we brought our terminology around FTTH/B in line with the terms defined by the FTTH Council². Thereby indicating new market realities, where in several cases fibre has been pre-installed up to the doorstep, but not yet brought into a home's meter cupboard. Last year we merely used the terms 'homes connected' and 'homes served' to define the number of homes where fibre was rolled out to the premises and inside the house respectively.

As from now, we will use the term 'homes passed' to indicate the potential number of premises to which an operator has capability to connect in a service area (but the premises may or may not be connected to the network) and the term 'homes connected' to indicate the number of premises which are connected to an FTTH/B-network. The term 'homes subscribed' indicates the number of premises that are both connected to a FTTH/B-network and at least one service on this connection is in use under a commercial contract.

The multiyear prognosis for 2009-2012 is based on current market parties' announcements on roll out schedules in various areas and communities. It is not (yet) a prognosis model and thus does not account for FTTH-project delays, additional housing developments in fibreed areas and assessments on the feasibility of additional projects.

This report focuses solely on residential area projects and does not list fibre City-rings and business parks.

² http://www.ftthcouncil.eu/documents/studies/FTTH-Definitions-Revision_January_2009.pdf

1.2 Disclaimer

This report represents our current knowledge on the state of FTTH in the Netherlands. We could however have missed some projects that should have been included in the multiyear prognosis. If you want to inform us about overlooked projects, please mail to ftth@stratix.nl.

Due to our various business relations with market parties we are frequently aware of company data on lines and active subscriptions on a confidential basis. We do not publish them here, only those data are presented that we could attain via public sources, except for some occasions where market parties have informed us about their progress and gave permission for inclusion.

2 Overview of Dutch market developments

FTTH roll out in the Netherlands has changed face in 2008 and early 2009. Initially roll out consisted of a mixture of community driven demand aggregation projects to projects initiated by housing corporations (some with municipal involvement) or incumbent telecom and cable operators. The acquisition of a 41% stake by KPN in fibre local loop constructor Reggefiber and the recent approval of this joint venture by the Dutch Competition Authority (Nederlandse Mededingingsautoriteit), have changed the competitive landscape. It has both lead to scaling up efforts in the construction industry and to large scale redesigns of processes into a standardised approach,.

From an industrial perspective, construction and engineering firms are in a steep learning curve, making roll out more efficient. Site preparation for a fibre optic distribution node serving several thousands of lines, has gone down from 21 days installation time to 1 day.

Open access to unbundled fibre loops constructed by the Reggefiber joint venture as well as to Glasvezelnet Amsterdam is available against a rather low monthly rental price of between €12 and €15 per month for a fibre pair, well within reach of many DSL platform owners.

Except for some smaller cable operators, which decided to replace their current cable network with future FTTH, the large cable operators have chosen to launch DOCSIS 3.0 services. At the moment of writing, UPC has already started rolling out their new services, while Ziggo plans to start in the next quarter of 2009.

As Reggefiber itself was also an assembly of various projects and businesses a rather eclectic mix has evolved. This report mainly focuses on the state-of-the-market but gives also a birds-eye view on the new developments.

2.1 Policy and regulation on FTTH from zero to full force in a year's time

From a policy and regulatory perspective the year 2008 had been very eventful for FTTH in the Netherlands. The proposed joint-venture between Reggeborgh Beheer and KPN in May 2008, called Reggefiber, required approval from the Dutch Competition Authorities. KPN acquired a 41% stake with an option to expand its share to 60%. To be able to expand their shares and change control from Reggeborgh Beheer to KPN, KPN has to meet certain performance criteria related to service uptake.

While the Competition Authorities started probing the Reggefiber joint venture from May 2008 to December 2008, OPTA published their draft 2008 Market Analysis on Unbundled Local Loops in June 2008. The regulation stated an extension of wholesale access obligation from copper to fibre pairs owned by KPN. Since KPN had only minor involvement in FTTH, and the joint venture with Reggefiber comprised a minority share, it provoked a peculiar intervention. OPTA decided to apply all unbundling obligations, which spoke to KPN, to all firms where KPN holds a minority stake. It remains to be seen whether this decision will hold up in Court.

Glasvezelnet Amsterdam (GNA) already announced in their September 2008 response on the draft Market Analysis to challenge this intervention as a firm that is not under control by KPN. Stratix foresees that several other minority shareholders in fibre optic loop networks, like the housing corporations in the Almere Fiber Consortium, might join GNA in this challenge.

The Dutch government's policy efforts with respect to FTTH have been reduced since 2007. The project group of civil servants directly responsible for policy development has been dissolved.

Aided by a central government subsidy there has been some effort by regional governments and municipal authorities to stimulate the availability of local or regional Metro-Ethernet services for the businesses segment, by facilitating demand aggregation and conducting a few joint tenders. While direct market provisioning is taking up, results for government-sponsored demand aggregation are still lacklustre.

While original goals in numbers of Metro-Ethernet customers under these projects have not yet been met, projects are merged and expanded to other geographic areas in order to meet the original targets. Exemplary is the surprise announcement by State Secretary of Economic Affairs Frank Heemskerk to expand "business demand aggregation" to the entire nation³.

Stratix Consulting questions whether the Dutch government should sponsor a nationwide demand aggregation drive for the business market. If such a scale is considered necessary it would indicate market failure or inadequacy of the current business models for Metro-Ethernet. With respect to the business market for high-speed leased lines and datacom services, OPTA has changed its 2005 course, where it declared the market for 2 Mbit/s lines and above competitive and now assigns significant market power to KPN. A decision welcomed by international network operators, but opposed by CLECs operating SDSL or Metro-Ethernet networks.

The remaining policy attention had focussed on application development, in which case the various governmental authorities primarily mind their own business:

- improving government websites and e-services
- ICT-innovation in the non-governmental sectors of Dutch society burdened by government regulation and financial dependency, e.g. health-care and education

2.2 Cable operators now also engage in very local marketing efforts

In 2008 KPN has started to apply similar marketing efforts like Reggefiber, in particular the local community drivers to gather a sufficiently large penetration above a threshold of 40-50% of households in an area. This resulted in information evenings often attended by hundreds of people from involved neighbourhoods.

³ Speech by Frank Heemskerk at 'Light my Fibre' conference in Almere, 4 March 2009
(<http://www.lightmyfibre.nl/images/stories/LightmyFibreConferentie/frankheemskerk.pdf>)

After the launch of its DOCSIS3.0 service, cable operator UPC has opted for a similar local campaign style, organising evenings to promote their new services and network capabilities.

All other companies which now contemplate to become service providers on FTTH networks are changing their marketing approach. This has led to a shift from national campaigns with TV-advertisements to local campaigns with temporary shops and promotion teams going door-to-door.

In 2008 their local campaigning efforts proved to be successful for Reggefiber in a few cities, like Deventer and in particular in the Eindhoven area. At the end of 2008 KPN operating over Reggefiber loops with an asymmetric Internet access offering, has seen uptakes of 30% in the first areas they launched and a FTTH ARPU of €58 (excluding VAT).

In other cities cable operators were better able to fend off FTTH operators. UPC focused its initial promotional efforts of DOCSIS3.0 to towns and cities with FTTH-projects looming.

Massive price cuts by cable operators, possibly due to their freedom of unregulated retail pricing, are gradually becoming passé. This approach proved successful in some cases, but did not stop large scale deflection towards the new infrastructure in all areas. The cable operators now promote more advanced higher bitrate DOCSIS3.0 based services and HDTV.

2.3 FTTH roll out concentrated in a few provinces

The FTTH-projects in the Netherlands installed and under construction in 2008 are unevenly dispersed over the various provinces. The table shows the distribution per province.

Table 1: Overview homes passed per province shows concentration in a few provinces

Province	Homes/households province	Homes passed 1Q09	Homes passed 1Q08	Homes passed 4Q06
Drenthe	206.146	0	0	0
Flevoland	151.830	48,627	13,220	3,700
Friesland	277.053	u.c.	0	0
Gelderland	839.842	24,812	21,181	14,912
Groningen	272.445	1,013	1,013	1,013
Limburg	497.564	400	400	0
Noord Brabant	1.036.823	73,329	24,615	17,032
Noord Holland	1.232.261	64,726	49,786	20,704
Overijssel	468.097	59,180	15,050	11,900
Utrecht	532.036	39,414	27,894	16,424
Zeeland	165.569	0	0	0
Zuid Holland	1.562.536	37,190	34,963	31,362
Total Netherlands	7.242.202	348,691	188,122	117,047

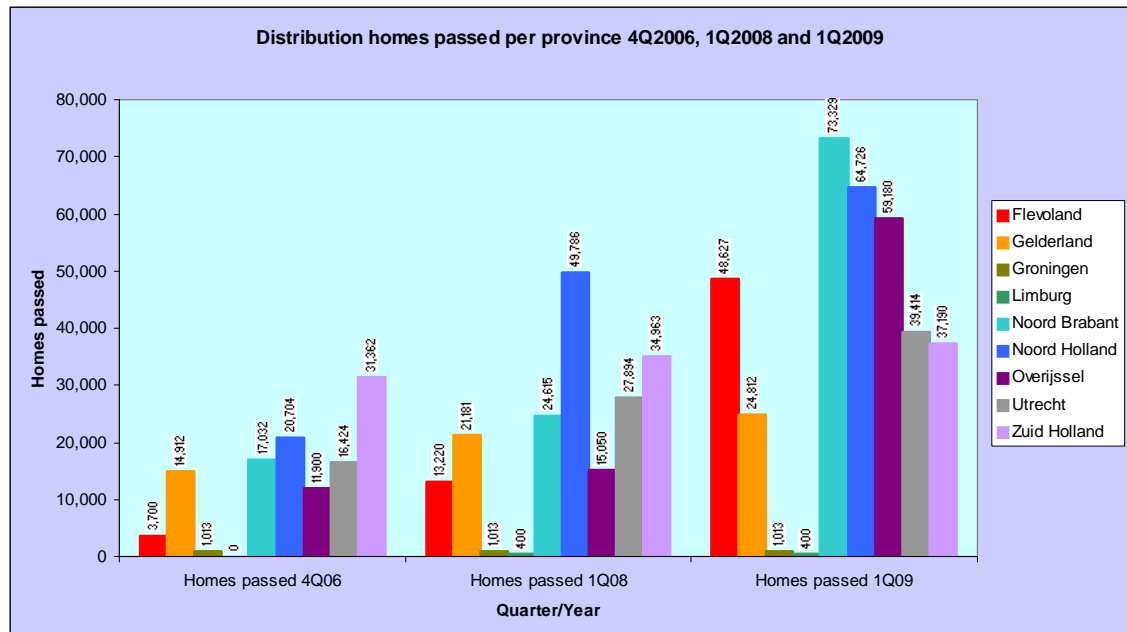


Figure 2: Distribution of homes passed per province

The major FTTH projects are in the Eindhoven region and the provinces of Noord-Holland, Flevoland, Gelderland and Overijssel. In Rotterdam, despite regular announcement of planned expansion by the city's development bureau, their real emphasis is on fibre deployment in the harbour and FTTH-plans have completely stalled. What is in place often attracts a very limited group of users. The Hague and Utrecht have also terminated efforts, a very different situation of FTTH-deployment in comparison to Amsterdam and Almere. Similar to previous years, the Northern provinces, Zeeland (South-West) and Limburg (South) are still not showing substantive activity with FTTH in residential areas.

2.4 Penetration per municipality strongly diverges

Table 2 provides a detailed overview of the data we found per municipality on homes passed, connected and subscribed to FTTH or FTTB. This data is quite revealing on the state of roll out per municipality as well as the very different penetration levels.

For instance, our data on the town of Almere shows that this is indeed a large project, but it is mainly under development. Many homes are already passed, but the directional drilling of connections under the gardens and into the metering cupboard has only been finished for about 10 thousand homes. Lighting of the installed optical fibres has just started.

The largest successes with FTTH penetration have until 2009 appeared in the smaller provincial towns with more close knit communities. The most challenging local markets must be looked for under the large cities.

Table 2: Overview at municipal level of FTTH/FTTB homes passed, connected and subscribed 1Q2009

Province	Municipality	Homes/households in municipality	Homes passed municipality	Homes connected municipality	Homes subscribed municipality
Flevoland	Almere	74,110	48,627	10,507	127
Flevoland	Dronten	15,770	u.c.	u.c.	u.c.
Flevoland	Lelystad	31,150	0	0	0
Flevoland	Zeewolde	7,470	u.c.	u.c.	u.c.
Friesland	Dongeradeel	10,160	u.c.	u.c.	u.c.
Gelderland	Arnhem	72,180	4,528	4,528	1,267
Gelderland	Druten	6,880	0	0	0
Gelderland	Elburg	8,350	u.c.	u.c.	u.c.
Gelderland	Heumen	6,620	0	0	0
Gelderland	Lochem	13,540	u.c.	u.c.	u.c.
Gelderland	Nijkerk	15,070	u.c.	u.c.	u.c.
Gelderland	Nijmegen	85,520	17,008	17,008	6,127
Gelderland	Wageningen	20,420	3,276	3,276	3,276
Gelderland	West Maas en Waal	7,230	0	0	0
Gelderland	Wijchen	15,880	inv.	inv.	inv.
Groningen	Groningen	106,510	1,013	1,013	1,013
Limburg	Beesel	5,610	400	400	400
Noord Brabant	Best	11,570	3,570	2,142	2,142
Noord Brabant	Eindhoven	104,800	15,422	13,377	9,567
Noord Brabant	Etten-Leur	16,910	320	320	n.a.
Noord Brabant	Geldrop-Mierlo	16,310	16,300	10,597	10,000
Noord Brabant	Helmond	37,210	2,510	1,633	1,633
Noord Brabant	Laarbeek	8,530	u.c.	u.c.	u.c.
Noord Brabant	Nuenen, Gerwen en Nederwetten	9,170	8,600	8,600	7,310
Noord Brabant	Oss	32,130	0	0	0
Noord Brabant	Schijndel	9,010	u.c.	u.c.	u.c.
Noord Brabant	Sint-Oedenrode	6,820	u.c.	u.c.	u.c.
Noord Brabant	Son en Breugel	6,280	u.c.	u.c.	u.c.
Noord Brabant	Tilburg	96,230	1,387	1,387	1,387
Noord Brabant	Uden	16,500	10,950	3,210	3,210
Noord Brabant	Valkenswaard	13,560	12,730	7,944	7,944
Noord Brabant	Veghel	14,590	inv.	inv.	inv.
Noord Brabant	Veldhoven	18,020	1,540	924	554

Province	Municipality	Homes/households in municipality	Homes passed municipality	Homes connected municipality	Homes subscribed municipality
Noord Holland	Amstelveen	38,520	3,000	3,000	3,000
Noord Holland	Amsterdam	411,528	46,087	13,807	8,307
Noord Holland	Bussum	14,840	2,009	1,607	1,607
Noord Holland	Diemen	11,390	1,268	1,268	1,268
Noord Holland	Haarlem	72,230	622	622	622
Noord Holland	Hilversum	39,710	3,833	3,066	3,066
Noord Holland	Naarden	7,230	907	907	726
Noord Holland	Others	7,000	7,000	7,000	7,000
Overijssel	Deventer	43,830	22,650	10,000	10,000
Overijssel	Dinkelland	9,470	3,200	n.a.	n.a.
Overijssel	Enschede	74,600	20,920	10,800	3,400
Overijssel	Haaksbergen	9,650	500	n.a.	n.a.
Overijssel	Rijssen-Holten	13,090	11,910	5,630	5,630
Utrecht	Amersfoort	60,890	11,060	7,420	3,080
Utrecht	Breukelen	6,160	400	400	400
Utrecht	Soest	19,830	3,300	3,300	924
Utrecht	Utrecht	155,150	23,854	23,807	9,767
Utrecht	Veenendaal	24,660	inv.	inv.	inv.
Utrecht	Zeist	155,150	800	800	800
Zuid Holland	's-Gravenhage	236,950	326	326	326
Zuid Holland	Delft	51,550	5,011	5,011	5,011
Zuid Holland	Dordrecht	53,560	u.c.	u.c.	u.c.
Zuid Holland	Hillegom	8,620	7,431	7,431	5,575
Zuid Holland	Lansingerland	18,560	1,600	u.c.	u.c.
Zuid Holland	Leiden	61,460	11,297	11,297	5,590
Zuid Holland	Oegstgeest	9,610	540	540	540
Zuid Holland	Rotterdam	293,150	10,445	10,445	6,590
Zuid Holland	Westland	38,670	540	540	n.a.
Total		2,867,168	348,691	215,890	139,186
Netherlands					

u.c. = under construction

inv. = inventarisation

n.a. = not available

3 Supply side developments

3.1 Difficult first year for Glasvezelnet Amsterdam

In line with our last year's expectations, Glasvezelnet Amsterdam has rolled out to several areas in Amsterdam for a total of 43,000 homes passed. However, entering the multi-storey, multi-tenant buildings to connect the city apartments proved cumbersome. Connecting a certain apartment from street level required frequent access to neighbours' facilities on floors in between. The result is that 8,000 homes/apartments are actually connected with fibre and 3,000 actually subscribed.

It is now seen as a genuine marketing error to strictly pursue the principle of GNA being a passive provider installing fibre and BBned delivering the Network Termination Units (NTU's). This regularly resulted in scheduling problems.

The announced expansion plans for another 100,000 homes, after Reggefiber expanded its shareholding in GNA to 70%, will consist of a model where equipment including NTU's will be installed into the meter cupboards inside the homes at construction time.

Amsterdam will now be the first city with multiple operators over an unbundled fibre optic loop plant. Whether increased marketing power of KPN with its many ISPs will fire up demand in Amsterdam remains to be seen. However, expectations are high that all major DSL platform owners will seek access to GNA.

3.2 Social housing subscribers slowly picking up

One of the results of our 2008 report was a disclosure of the relatively low number of FTTH subscribers in the projects of Reggefiber with housing corporations Portaal, de Alliantie and Dudok Wonen by analysing IP-address block registrations of service provider XMS. Table 3 shows the 2009 data.

Table 3: FTTH activity by Reggefiber/XMS for social housing corporations in 2009

Province	Municipality	Initiator	Operator	Passed	Connected	Subscribed
Utrecht	Bussum	Dudok Wonen	GNEM	2,009	1,607	1,607
Noord Holland	Hilversum	Dudok Wonen	GNEM	3,833	3,066	3,066
Noord Holland	Naarden	Dudok Wonen	GNEM	907	907	726
Utrecht	Amersfoort	Portaal	GNEM	6,000	6,000	1,680*
Zuid Holland	Leiden	Portaal	GNEM	7,849	7,849	2,197*
Gelderland	Arnhem	Portaal	GNEM	4,528	4,528	1,267*
Gelderland	Nijmegen	Portaal	GNEM	10,000	10,000	2,800*
Utrecht	Soest	Portaal	GNEM	3,300	3,300	924*
Utrecht	Utrecht	Portaal	GNEM	17,000	17,000	4,760*
Total				55,426	54,257	19,027

* estimation

As Reggefiber/XMS expanded to the more affluent neighbourhoods surrounding those areas, XMS' subscriber numbers for their "homes connected" have been picking up. Where last year we reported at most 8192 in the social housing projects and a few thousand in areas like Vathorst, XMS surpassed 20,000 subscribers in the autumn of 2008.

The removal of visually disturbing dishes was an initial argument for the landlords of the housing corporations to participate in rolling out FTTH. However, many of their tenants' favourite satellite TV-stations lack distribution rights for the cable in Europe. Only direct satellite reception via a so-called Common Satellite Receiver (GSO in Dutch) for a block of apartments is permitted under the Treaty of Rome. This resulted in reduced service uptake, as the TV-component is not appealing in those markets.

Despite the fact that it is now obvious that deployment of an FTTH network will not remove the antenna dishes from the balconies, there still is significant participation of housing corporations as junior-investment partner in various local fibre developments. There is primarily a case in the student segment and the more expensive homes, where a fibre connection is considered an improvement in the attractiveness for leasing the properties.

In cities like Amsterdam social housing corporations control the majority of the homes due to historic causes. Nevertheless, their co-operation as an investor did not turn out to be effective in providing installation crews with access to rented homes. The problems with accessing meter cupboards on different apartment floors remained loaded with scheduling problems.

3.3 Larger scale roll out is coming on steam

In our December 2006 report on FTTH we presented rollout projections, based on what has turned out overoptimistic paced investment plans for several projects. Operational realities during 2007 have delayed the Amsterdam GNA project's completion date with 6 months. In 2008 the pace of roll out gradually picked up again. In particular around Eindhoven a fast roll out was made. In Almere construction was completed in the first areas and the number of connecting subscribers effectively took off in the last months of 2008. This explains the still limited number of actual subscribers found for KPN as a service provider.

Most of the success with active subscribers for either Reggefiber's own operator as well as KPN is in Eindhoven and the eastern part of the province of Noord-Brabant.

The general picture shows that FTTH construction is effectively scaling up, adjusting projects towards more successful deployments or pruning them. Figure 3 provides the revised prognosis of FTTH-homes passed in 2012.

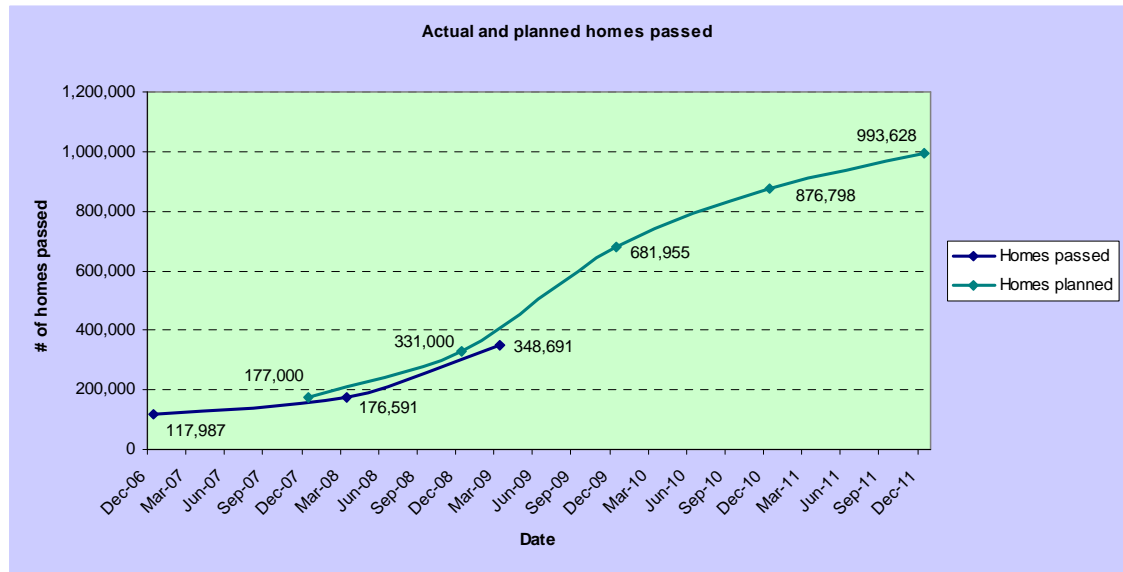


Figure 3 Current project plans shows a growth path to 1 million homes in December 2011

3.4 Municipal scramble for attracting projects via MEIP-rules

While the industry is obviously scaling up the number of FTTH access lines they produce, the municipalities are in a different position. Observing FTTH projects starting in other towns, or having some issues with KPN classifying them as a "VDSL2-town" instead of an FTTH-town, some have restarted the discussion about public investment in local loops. When community drives in some neighbourhoods failed to surpass the 40% threshold for fibre enrolment, some aldermen were again warming up to the idea of investing in fibre.

This idea got a remarkable boost when State Secretary Frank Heemskerk called upon municipalities to explore their options on March 4th, 2009. Around the same time Member of Parliament Jos Hessels (Christian Democrats) seemed to push aside his own 2006 Telecom Act amendment that prohibited any municipal investment in networks⁴.

On this subject current Dutch telecommunications law (Aptroot-Hessels amendment) is much stricter than the EU state-aid principles. This became clear when the City of Amsterdam passed the EU state-aid muster in Brussels by investing according to the Market Economy Investor Principle (MEIP). It is possible under EU regulation to invest in FTTH plants, as long as the municipality takes an equal position to any normal business investor in that project. Thus without preferred shares or without clauses that shifts the risk burden onto them.

As the economic decline is reducing the pressure of resource limitations in construction firms, the actual situation is still such that a considerable amount of training is needed to get skilled staff and a lot of production units are attracted from various countries in Europe. Therefore, the increase of power on the supply side for FTTH, its ability to pick and choose projects and avoid "cumbersome towns and areas", brings renewed municipal involvement.

⁴ http://www.trouw.nl/achtergrond/deverdieping/article2038565.ecce/Supersnel_internet_ook_op_afgelegen_plaatsen_.html

4 Competitive dynamics and financing FTTH roll out

The competitive dynamics on the Dutch market up to 2008 has mainly consisted of direct competition between an overbuilt network⁵ and the two incumbent infrastructures on multi-play bundles, offering Internet, voice-telephony and video as main services. This three-way competition between infrastructures tends to turn rapidly into very unequal cost burdens when market shares only slightly diverge. The main effect is that one or two of the other networks will not be able to recoup amortisation or even most of depreciation. As is visualised in the figure, this kind of competition tends to weigh in heavily on the local loop network.

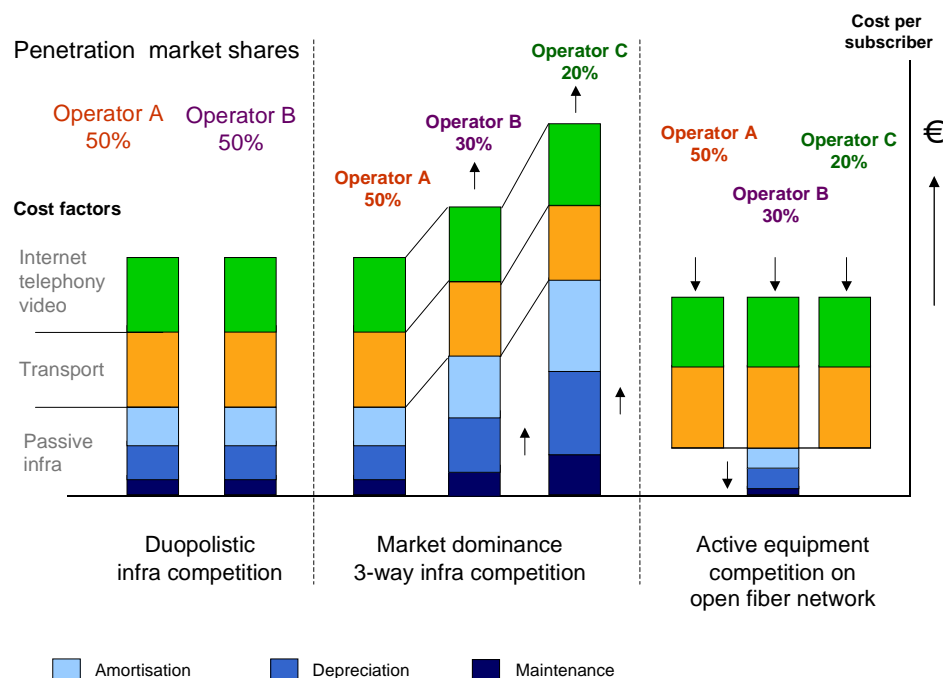


Figure 4 Infrastructure competition is extremely unstable with 3 parties

From the exhibit above it becomes obvious that the third model, competitive operators with active equipment on a joint (open) passive fibre plant, has its attractions. Most of the recent competitive dynamics has been about the establishment of such a model, either by entry of a new group of financiers or an end-user initiative. The main event in the Dutch market in 2008 was the demonstration of the inherent instability of a Schumpeterian-style entry by vertically integrated 'overbuilders': KPN acquiring a 41% share in Reggefiber-to-the-Home.

4.1 To regulate or not to regulate?

The Dutch regulator (OPTA) and the Dutch Competition Authority (NMa) have had severe difficulty handling the new reality of a third market party who is not the incumbent and

⁵ An overbuilt network in this case is called so because it is deployed in a community already served by cable operator(s) and incumbent telecom operator(s)

provides the passive fibre loops. Leasing fibre loops to other firms is a service in any normal economic meaning of the word, but it is not a telecommunications service under the current law and therefore escapes telecoms regulation. With the acquisition of a minority share in Reggefiber, KPN effectively hit the weak spot in the current European Regulatory Framework for electronic communications services.

The response of OPTA in their draft market analysis in 2008 was to extend the unbundled access regime it had developed for KPN's own new fibre optic local loop plants, to any firm in which it holds minority shares. However, that decision also expropriates any other majority shareholders in local loop plants in cases where Reggefiber held a (minority) share. Examples are the Amsterdam GNA network and the Almere Fiber Consortium.

The application of standard competition law does not allow Reggefiber to be subject to any regulation as long as KPN retains a minority share. Only a change of control would empower OPTA to regulate wholesale local loop fibre leases. Therefore a decision by the NMa to allow the joint venture and only impose some non-discriminatory conduct rules regarding leasing fibre optic loops would sideline OPTA for probably many years to come.

KPN holds an option to acquire more shares in Reggefiber after certain performance requirements are met in terms of roll out and subscriber growth onto the new local loop plants. The result of this option for change of control implies that it is within KPN's discretion whether or not to exercise their option or to extend its holdings later to a 50% minus one share. Not changing control would mean that Reggefiber remained unregulated for many years under competition law.

A go solely under competition law for the joint venture, would have implied that KPN itself would hold the keys to decide whether the exploitation of fibre optic loops would be under regulatory oversight. This has caused a rather complex regulatory trajectory in the second half of 2008.

In the responses to the market analysis by OPTA a remark of GNA is listed, claiming that OPTA effectively oversteps its authority to extend regulation to local loop plants where KPN is a minority shareholder.

Many CLECs, but even several cable operators have now engaged in a court appeal against the NMa decision and it remains to be seen whether the OPTA decision to extend regulation of KPN to non-controlled minority shares in other firms will hold in court. In particular it is interesting to see what happens when other shareholders in local loop networks will challenge it. The expansion of Reggefiber's share in GNA and the current evaluation of that transaction by the NMa complicate legal trajectories even further.

As the competitive dynamics have now reached the courtroom, the 2009 outcome transforms in a tombola. Chances are not zero that the end result of the appeals at the court might be that OPTA is even forced to withdraw their decision to regulate Reggefiber.

Stratix Consulting believes that policy makers should reassess their assumptions to what constitutes an electronic communications service. This is needed to address the peculiar situation that leased dark fibre, although a specific asset, usable only for telecoms, is not considered part of the market while leased local loops are considered a wholesale service.

4.2 Pension funds financing independent infrastructure facility providers

Similar to independent Tower companies for mobile service providers and neutral data centre and telehouse facility owners, the development of FTTH in the Netherlands has shown the arrival of a new kind of market entrant: Real Estate financiers investing in local loop networks with a long run view on returns.

The first entrant **ING Real Estate**, who, together with Reggefiber, 5 housing corporations and the municipality of Amsterdam, invested in Glasvezelnetwerk Amsterdam (GNA), withdrew from the market. Another player **Bouwfonds Real Estate Investment Management**, the real estate division of Rabobank, established a fund named 'Rabo Bouwfond Dutch Communication Infrastructure Fund' (RBCIF). This player became active by acquiring the outside plant of CAI Westland early 2008 from the municipal owners. It had voluntarily made a structural separation of the company in a local loop owner and a facilities manager, while the commercial services and network operations part was acquired through a management buy-out.

The arrival of Real Estate financiers with patient capital from pension funds, have rapidly gained relevance during 2008 and early 2009. Not only are they investing for the long run, they also require open access for operators to infrastructure facilities like towers, collocation buildings and local loops, as a prerequisite since openness reduces operator default risks.

Pension funds have recently warmed up to the idea of investing in these facilities with the advancement of the financial crisis. Fibre optical infrastructure investments have their own risk profile. Duplication of fibre optic local loop plants for the sake of infrastructure competition is not to be expected. Market entry by constructing a passive optical plant with competing active equipment operators has an entirely different economic risk-reward outlook, in particular when the presence of anchor tenants justifies the investment.

The recent announcement by Dick Sluimers, CEO of APG, the manager of the largest Dutch retirement fund ABP with € 175 billion of assets, to redirect more of his funds towards infrastructure investments, is a clear sign of change in financial climate. Banks have indicated to be very cautious with taking on new loans. Other routes that are being discussed are bond placements directly from infrastructure owners to pension funds. One might even expect bond floating directly on the market to private individuals, a financing method that was far more common in the 19th century, during the industrial revolution.

When KPN released its quarterly figures in April 2009, a slide was provided on the financing of Reggefiber, despite only holding a minority share. The slide showed that the current

capitalisation of Reggefiber amounts to EUR 600 million, with EUR 500 million in assets and EUR 100 million in loans and bonds. This is a level of gearing that is typical for a patient capital investment and a far cry from infrastructure financing via Leveraged Buy Out schemes.

4.3 KPN's All-IP plan with FTTCurb / VDSL has seen a slow take off

KPN is still evaluating its pilots for FTTCurb / VDSL2, which it launched in 5 pilot cities. The reorientation on FTTH in 2008 caused this approach to fall a bit back. A recent report by credit agency Fitch Ratings of London strongly questions the economic wisdom of engaging in FTTC by incumbent operators that face fierce competition of DOCSIS 3.0.

Having read the Fitch report we observed that they were overly extending their case for the English market to the Dutch market and entirely neglected the shift to FTTH. We strongly hold the belief that KPN is already shifting away from FTTC/VDSL as the disadvantages of having equipment installed in street cabinets vis-à-vis a passive plant in neighbourhoods is becoming more obvious.

Not only are VDSL2-based street cabinets more vulnerable and accident prone than equipment in the current local exchange buildings, they also require power and maintenance and cannot be backed up with diesel power supplies, due to municipal regulations that forbid those in residential areas.

Also, the cost of rewiring copper cables to the new street cabinets had shown to be rather expensive. Finally FTTC/VDSL2 also has a strong effect on reducing economies of scale for competitors, and sub-loop unbundling of copper wires looks more and more a regulatory delusion. A further large-scale advance of All-IP with VDSL2 becomes more and more unlikely, in particular as TV-over-IP did not become a success in those markets where cable-TV networks are already entrenched.

Stratix Consulting expects that FTTC/VDSL2 will be rolled out to the more sparsely populated areas and may be deployed as an interim solution. KPN has stated repeatedly that they will evaluate the FTTC and the FTTH trials. Our expectation is that a successful take up of FTTH in the trial cities will result in a decision to scale down the FTTC efforts.

4.4 Cable operators launch DOCSIS 3.0 to counter FTTH entry

UPC has launched DOCSIS 3.0 in 2008, initially in Amsterdam and Almere, two key cities with FTTH-deployment. It later expanded into its other franchise areas. UPC decided to market this as "Fiber Power", a clear indication that they position it against the FTTH roll out. Like FTTH-operators, UPC now engages in local marketing efforts and convening subscribers in local venues to explain their new offerings. Ziggo, the largest cable operator has announced DOCSIS 3.0 roll out for 2009.

We expect that the large cable operators will look into 2010 how well their new portfolio with DOCSIS 3.0 holds out against the FTTH competition. When they start losing large numbers of

subscribers to FTTH providers, they will have to face tough strategic investment decisions. Meanwhile their main concern is to address the new regulation instituted by OPTA to engage in analogue TV wholesale.

Certain cable operators are installing FTTH. While Casema (Ziggo) and CAIW have already installed trial networks in 2006, in 2008 a smaller independent cable operator, KabelTV Brabant-Gelderland (KBG), announced to install Fibre-to-the-Home in a new housing development project in their franchise area. Early 2009 we saw a similar announcement to change to FTTH by Kabel-Noord.

4.5 Local and regional demand aggregation for FTTOffice

According to press releases about two hundred business parks and industrial areas were retrofitted with a fibre optic outside plant in 2008. The actual situation however seems to be that operators mainly constructed duct rings and are connected to only 10-20% of the businesses in those areas with actual fibre optic service.

This low figure for service take-up requires a serious change in the business model and approach to fibre construction in those areas before one will observe much further effort. The current vertically integrated approach, where an active equipment operator provides an exclusive service over a fibre plant in a business park, is up for serious rethinking.

Chances for a different model in those areas too, based on open access to fibres for multiple active equipment operators, are becoming higher. In particular when operators start to grasp that fibre offers the ability to place active equipment at far longer distances, going passive to business parks with CWDM or DWDM-PONs and thus reap economies of scale. Unet, a business-oriented Ethernet provider in Almere, has announced deployment of proprietary DWDM-PON equipment manufactured by LG-Nortel.

Although some local authorities envision that their city rings will also provide the first step backbone for FTTH and although such demand aggregation projects cross the residential neighbourhoods, we still do not list them in our overviews.

These business user-oriented projects merely list several dozens to a hundred connections per town or region. They are business oriented in service level and bandwidth services are priced at business market levels of at least € 250 pro month to connect schools, hospitals, medical practices, the local fire arms buildings etc. aside from business parks

5 Our expectations

2009 will not only be the year where the Dutch telecoms market will learn how well an FTTH offering competes with a DOCSIS 3.0 upgraded CATV network, we will also learn whether the Reggefiber-KPN joint venture and the NMa-OPTA devised regulatory framework will be upheld in courts.

Regarding operations, we observe a scaling up of the FTTH roll-out. In particular Reggefiber is expanding, but we also see activity from CAIW and some smaller cable operators. This will result in nearly a doubling of the FTTH homes passed in the forthcoming year.

One of the key issues for the next years will be the position of investment funds in financing FTTH-projects. While 2009 projects are fully financed, the discussion how this will develop from 2010 onwards will take a major place. Will investment funds extend their role as active investors in FTTH, applying the real estate models recently developed, or will they assume a passive role buying bonds issued by infrastructure owners.

The heightened interest, expressed by the CEO of APG in diverting more funds toward infrastructure investment, suggests that the attitude to financing FTTH is changing.

As was discussed in chapter 4, local loop economics indicates no more than a single network per area to be feasible, in particular under the open network business models. This in combination with the apparent supply constraints will increase the pressure on municipalities and provinces to lure the projects to their area first.

When discussion arose in the first months of 2009 about a few neighbourhoods not surpassing the 40% uptake threshold, we saw renewed willingness by municipalities to engage in co-financing FTTH roll out, in order to ensure citywide coverage. However, we do not expect genuine municipal involvement during 2009, merely ongoing policy discussion.

6 Glossary

CLEC	(Competitive Local Exchange Carrier) A telecom provider that competes with other, already established carriers (usually the incumbent carrier).
CWDM	(Coarse Wavelength Division Multiplexing) A method of transmitting several connections parallel over one fibre optic line. Transmission works over different wavelengths (colors) on the same fibre, which do not influence each other. As opposed to DWDM, a relatively wide channel spacing is used, which leads to a more cost-saving technology, because temperature stabilized components are not needed. CWDM has been specified for use on distances up to 50 km.
DOCSIS	(Data Over Cable Service Interface Specification) A standard for delivering data over cable TV infrastructure, typically for subscriber Internet access services. DOCSIS 3.0, the most recent standard, will allow cable operators to provide (shared) data rates in the hundreds of Megabit/s.
DWDM	(Dense Wavelength Division Multiplexing) A method of transmitting many connections parallel over one fibre optic line. Transmission works over different wavelengths (colors) on the same fibre, which are very close together on DWDM. Because of this, highly precise and temperature stabilized laser transmitters must be used. On the other hand, when using DWDM a distance of several hundred km can be covered.
FTTB	(Fibre-to-the-Building) Communications architecture in which the final connection to the subscriber's premises is a communication medium other than fibre. The fibre optic communications path is terminated on the premises for the purpose of carrying communications to a single building with potentially multiple subscribers.
FTTC	(Fibre-to-the-Curb) Communications architecture in which the final connection to the subscriber's premises is a communication medium other than fibre. The fibre optic communications path is terminated on the curb side for the purpose of carrying communications to potentially multiple buildings with potentially multiple subscribers.
FTTH	(Fibre-to-the-Home) Communications architecture in which the final connection to the subscriber's premises is Optical Fibre. The fibre optic communications path is terminated in or on the premises for the purpose of carrying communications to a single subscriber.
NTU	(Network Terminating Unit) Equipment at the customer premises which terminates a network access interface.
Overbuilder	A company that overbuilds an incumbent telecommunications operator's network (which includes telco and cable networks) and offers customers a competitive alternative. This is generally associated with highly advanced fibre-optic networks.
PON	(Passive Optical Network) A point-to-multipoint, fibre to the premises network architecture in which unpowered optical splitters are used to enable a single optical fibre to serve multiple premises, typically 32-128. A PON configuration reduces the amount of fibre and central office equipment required compared with point to point architectures.
SDSL	(Symetric Digital Subscriber Line) A collection of Internet access technologies based on DSL that offer symmetric bandwidth upstream and downstream.

7 Contact us for access to our database

Stratix Consulting has compiled an extensive database with details down to neighbourhood levels. Interested parties can send a request to ftth@stratix.nl and discuss with us how to get access.

7.1 A preview of our database at Neighbourhood level

The screenshot shows a web application window titled "BRON 2006 2008 2009" with a "Refresh the Form" button. The main heading is "FTTH per Neighbourhood".

Filters:

- Neighbourhood: Heijendaal
- District: Nijmegen-Midden
- Municipality: Nijmegen
- Province: Gelderland
- Initiator: SSHN (student housing)/Glazenlamp
- Operator: UCI-KLIN/Glashart

Summary Statistics:

- Homes in neighbourhood: 1360
- Homes in district: 9500
- Homes in municipality: 85520
- Homes in province: 839842
- Technology: FTTBH
- Speed: 100/100 Mbps

Quarterly Data:

Quarter	Homes passed	Homes connected	Homes subscribed
Q4 2006	781	781	781
Q1 2008	781	781	781
Q1 2009	1131	1131	n.a.

Remarks: 781 households (student dorms) connected by SSHN, approx. 350 households connected by Glazenlamp

Planned:

Year	Planned
2009	1131
2010	1131
2011	1131

Buttons: "Show neighbourhood on Google maps", "Stratix" logo.

Footer: Record: 14 of 1 (Filtered)

Our database allows for aggregation at the neighbourhood, district, municipal and provincial level. We also included a link from the database to a Google maps mash-up.

7.2 Selected map view for the city of Nijmegen

We provide an online exemplary page of the mapview on our website, which can be accessed at: <http://www.stratix.nl/ftth/geovoorbeeld.php>

Voorbeeld geografische representatie Nijmegen FTTH

Hazenkamp

Kaart		Satelliet	Beide
Neighbourhood:	Hazenkamp		
District:	Nijmegen-Midden		
Municipality:	Nijmegen		
Province:	Gelderland		
Initiator:	Glaszart		
Operator:	2230		
Homes in neighbourhood(s):	2230		
Homes passed 2006:	28		
Homes connected 2006:	28		
Homes subscribed 2006:	28		
Homes passed 2008:	28		
Homes connected 2008:	28		
Homes subscribed 2008:	28		
Homes passed 2009:	2000		
Homes connected 2009:	2000		
Homes subscribed 2009:	n.a.		
Planned 2009:	2000		
Planned 2010:	2000		
Planned 2011:	2000		

CBS Gemeenten

- Benedenstad
- Stadscentrum
- Bottendaal
- Galgenveld
- Altrade
- Hunnerberg
- Hengstdal
- Kwakkenberg
- Groenewoud
- Ooyse Schependom
- Biezen
- Wolfskuil
- Hees
- Heseveld
- Neerbosch-Oost
- Haven- en industrieterrein
- Nije Veld
- Hazenkamp
- Goffert
- St. Anna
- Heijendaal
- Hatertse Hei
- Grootstal
- Hatert

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