

Sector update

## Western Europe

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# European telecoms

## CityNet Amsterdam: Fibre-to-the-home is becoming a reality

### Telecommunication services

24 February 2006

**Fibre-to-the-home (FTTH) is finally becoming a reality in Europe, starting with CityNet Amsterdam in 2H06. This trend has significant implications for Europe's incumbents, which could accelerate obsolescence of copper networks.**

**Amsterdam is about to embark on a major fibre-to-the-home (FTTH) project** – potentially the largest in Europe – that could reach 420,000 homes and businesses by 2013 at a cost of €300m. CityNet Amsterdam plans to start the first phase of the project in 2H06 to connect 40,000 homes.

**Regulatory problems unlikely for independent FTTH rollouts.** Europe is lagging behind major economies like Japan, the US and South Korea. The European Commission is anxious to see Europe stay competitive and therefore we do not foresee major regulatory problems for open-access fibre rollouts in European cities by municipalities and other players.

**The impact on European incumbents is clearly negative.** Fixed-line incumbents at the moment are trying to extend the life of their existing physical assets – their copper networks – by investing in ADSL technology. If they do nothing, incumbents could lose up to 30-60% of their current lines in areas where there is competing fibre network deployments. Overall impact on revenue and profitability would depend on how widespread independent fibre deployments are – due to cost reasons, these are likely to be limited to dense urban areas.

**KPN is probably the most exposed incumbent to FTTH.** A successful launch by CityNet Amsterdam could trigger numerous fibre deployments in other Dutch cities, highlighting the continued challenges KPN is facing in its domestic fixed-line business. However, we believe the stock could be supported by potential M&A prospects, hence our Hold recommendation and €9.0 target.

#### Summary of recommendations

Company	Rec	Price	Target
<b>Incumbents</b>			
Belgacom	HOLD	€26.39	€30.0
BT Group	HOLD	209p	220p
Deutsche Telekom	HOLD	€13.36	€14.80
France Telecom	BUY	€18.63	€22.30
KPN	HOLD	€8.95	€9.0
OTE	BUY	€18.68	€21.50
Portugal Telecom	HOLD	€9.72	€9.50
Swisscom	HOLD	SFr396	SFr413
TDC	HOLD	DKr386	DKr382
Telecom Italia (Ord)	HOLD	€2.30	€2.50
Telefonica	HOLD	€12.87	€13.50
Telenor	BUY	NKr71.3	NKr75.0
TeliaSonera	HOLD	SKr42.7	SKr42.5
<b>Mobile</b>			
Cosmote	BUY	€19.26	€20.50
O2	HOLD	199.5p	200p
Mobistar	HOLD	€61.1	€70.0
Tele2 'B'	BUY	SKr86.0	SKr98.0
Telefonica Moviles	HOLD	€9.72	€9.0
Vodafone	BUY	117.3p	160p
<b>Alt Nets</b>			
Telenet	BUY	€16.98	€19.50

Closing prices as of 23 Feb 2006

All recommendations and target prices are unchanged

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# Summary

Fibre deployment (FTTx) in the access network is finally becoming a reality in Europe, with significant implications for the fixed-line incumbents. While there were only around 646,600 FTTx subscribers in Western Europe and roughly 2.51m homes passed in June 2005, there are ambitious plans for big networks in Amsterdam, Paris, Vienna, Catalonia as well as many smaller initiatives.

## **Amsterdam –one of the biggest European FTTH rollouts**

Amsterdam is about to start on a major fibre-to-the-home (FTTH) project – potentially the largest in Europe – that could reach 420,000 homes and businesses by 2013 at a cost of €300m. CityNet Amsterdam plans to start the first phase of the project in 2H06 to connect 40,000 homes. The fibre network will be run on open-access network principles, stimulate services innovation and give greater choice to consumers.

## **Culture clash – internet versus telcos**

Municipalities and energy utilities building FTTH are mainly deploying open-access networks, building on the model created by the open internet. A clash of cultures is emerging, with vertically integrated triple-play (or quadruple-play) services of the telco world coming up against the free-choice ethos of the internet.

## **Regulatory problems unlikely for independent FTTH**

Europe is lagging behind major economies like Japan, the US and South Korea. The European Commission is anxious to see Europe stay competitive and therefore we do not foresee major regulatory problems for open-access fibre rollouts in other European cities by municipalities and other players. Local governments in 32 European countries have called for widescale deployment of independent fibre-optic networks, which would boost economic development and promote social inclusion.

## **Incumbents challenged by accelerating obsolescence**

The impact on European incumbents is clearly negative. Fixed-line incumbents at the moment are trying to extend the life of their existing physical assets – their copper networks – by investing in ADSL technology. They have little incentive to accelerate the obsolescence of their existing networks by upgrading their local network connections with fibre. If they do nothing, incumbents could lose up to 30-60% of their current lines in areas where there are competing fibre network deployments. Overall impact on revenue and profitability would depend on how widespread independent fibre deployments are – for cost reasons, these are likely to be limited to dense urban areas. Where competition is increasing from other infrastructure-based players (mainly cable TV networks), incumbents are considering deploying fibre closer to their customers, enabling them to offer higher broadband speeds using VDSL technology.

## **KPN most affected by FTTH newsflow**

A successful launch by CityNet could trigger numerous other fibre deployments in other Dutch cities. The value impact from the potential loss of revenue is small but this trend highlights the continued challenges KPN is facing in its domestic fixed-line business. However, we believe the stock could be supported by potential M&A prospects, hence our Hold recommendation.

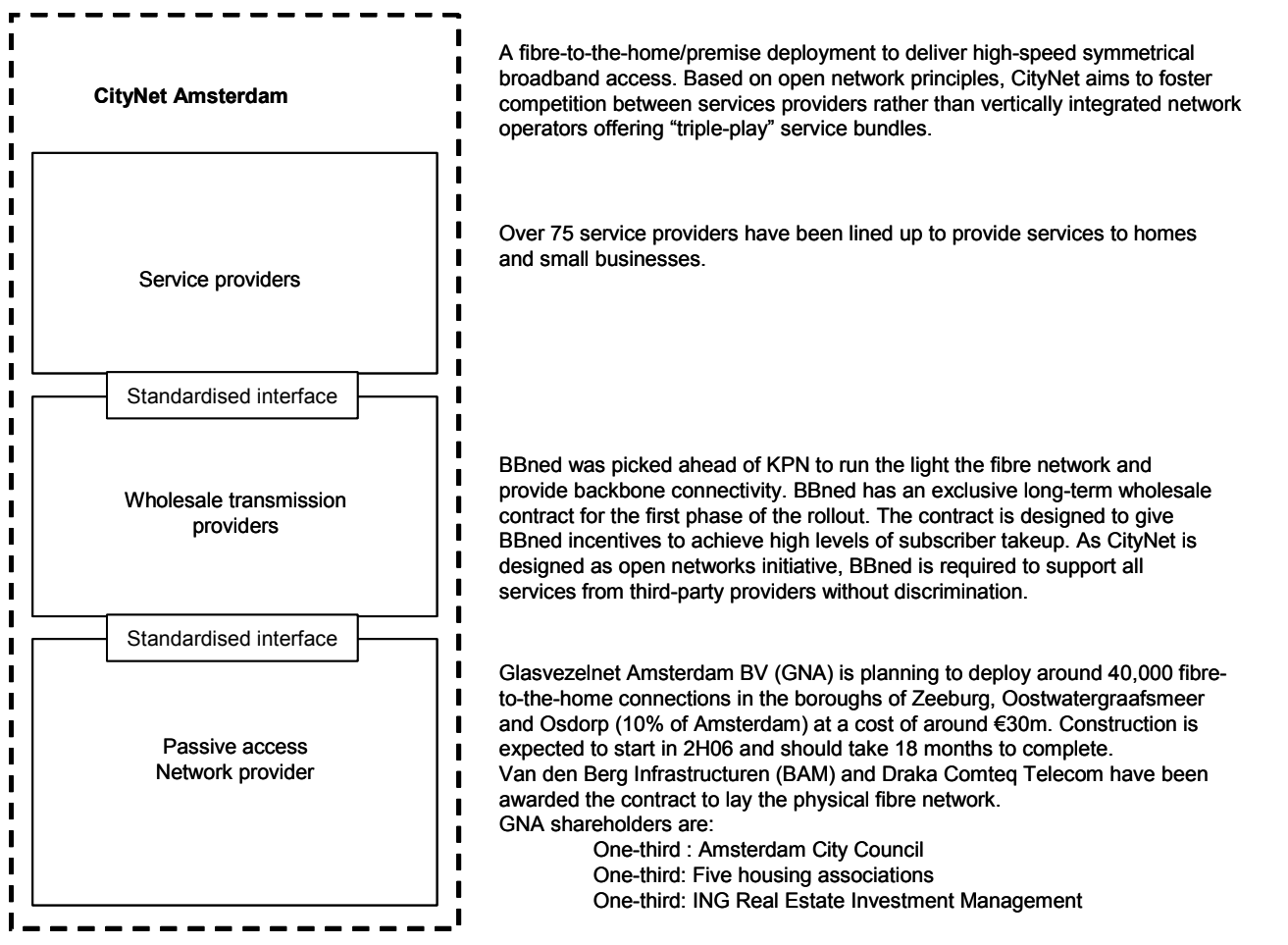
# CityNet Amsterdam

**Amsterdam is about to start deploying a large FTTH network**

Amsterdam is about to start deploying a major fibre-to-the-home (FTTH) project – potentially the largest in Europe – that could reach 420,000 homes and businesses by 2013 at a cost of €300m. The fibre network will be run on open network principles, promoting services competition by giving any services provider fair and equal access to a high-speed broadband infrastructure (see Figure 1).

On 23 December 2005, Amsterdam’s City Council voted unanimously on the deployment of the first phase of the CityNet project. The legal entity to build the network is Glasvezelnet Amsterdam BV (GNA), which is one-third owned Amsterdam’s City Council, one-third by five large Amsterdam housing corporations and one-third by ING Real Estate Investment Management, all invested on an equal basis. Shareholders are currently finalising the shareholder agreement. Construction work on the first phase of the project to connect 40,000 homes costing around €30m should begin in 2H06 after a six-month planning phase.

**Fig 1 CityNet Amsterdam – overview**



Source: ING

The construction of the network (digging trenches and laying the fibre) in Phase 1 has been awarded to Van den Berg Infrastructuur (BAM) and Draka Comteq Telecom. BBned, a subsidiary of Telecom Italia, was picked ahead of KPN to operate the network (eg, light the fibre, provide backbone connectivity) in this first phase. The

exclusive long-term wholesale contract is designed to give BBned incentives to achieve high levels of subscriber take-up. As CityNet is designed as an open networks initiative, BBned is required to support all services from third-party providers without discrimination. (See Appendix for the basics of FTTx.)

## The rationale behind CityNet

*CityNet is deploying a fibre network to enable Amsterdam to compete with other European cities*

The stakeholders in CityNet want to deploy a fibre-to-the-home network to enable Amsterdam to compete with other European cities. In the words of Amsterdam's Deputy Mayor, Mark van der Horst, 'The fibre network delivers to Amsterdam an innovative and freely accessible infrastructure, suitable to support growth in demand for the next 30 years or more'. By building the network, it will 'ensure a wide open marketplace for innovative service-providers and economic growth, as well as a fast track for the smarter and cheaper delivery of care, education and other public services'.

Besides delivering high-speed broadband access, fibre also provides symmetrical connectivity with upload speeds matching download speeds. This encourages content creation and more exchange of information, especially in the local community.

These stakeholders are tied to Amsterdam or committed to the city for the long term. In terms of investing, this has implications for their risk/reward profile and investment horizon – they are able to take a longer-term view on the health and competitiveness of Amsterdam as a place to live and work. Communications, as well as more traditional transport infrastructure, are important for a location's economic competitiveness.

By building an 'open' fibre-to-the-home network, CityNet Amsterdam address three major issues:

- The continued demand for faster broadband connectivity.
- Bypassing the bottleneck in the local loop.
- Overcoming the short-term view of current infrastructure owners to invest in network upgrades.

## The demand for broadband connectivity

**Fig 2 Amsterdam Internet Exchange: Accumulated traffic over all customer ports (Terabytes per month)**



Source: Amsterdam Internet Exchange, ING

### ***Demand for broadband services continues to grow in the Netherlands***

Demand for broadband services continues to grow in the Netherlands. According to OECD data, the Netherlands has the second-highest broadband penetration in the OECD at 22.5 connections per 100 inhabitants, behind South Korea with 25.5. The Dutch are among the most computer-literate in the world. In a recent survey commissioned by Pew Charitable Trusts, 82% of Dutch residents said they used a computer at least occasionally at home or work, and 72% use the internet. In Canada, the respective numbers were 79% and 71% and in the US 76% and 70%.

In Amsterdam, growing internet usage is clearly demonstrated by increased traffic passing through the Amsterdam Internet Exchange (see Figure 2) with cumulative monthly traffic increasing 134% in January 2006 compared with January 2005.

## **Bypassing the local loop bottleneck**

The problem with telecom networks is that access to the customer is a natural monopoly, just like the distribution networks of water, electricity and gas. Owners of the vital piece of infrastructure have a profit-maximising incentive to lock in the customer with vertically integrated services. Witness the incumbents' efforts to deploy triple-play bundled packages and efforts by the regulators to open up the local loop.

Proponents of the open network concept believe that the wider economy would benefit from faster-access networks. 'Dumb pipes' would encourage faster innovation of services. This has been clearly demonstrated in the internet era over the past few years by the continuous innovation at Google and Yahoo!.

## **Overcoming the short-term view of traditional telecom providers**

Deploying a fibre network is not a simple task. Reaching the 420,000 homes and businesses in Amsterdam by digging up the streets will take until 2013 – the better part of seven years. But, with the continued advancement in multimedia services, the limitations of current broadband technology (ie, ADSL and cable TV networks) will be reached within years. To have fibre networks in place to meet this demand, and so as not to hold back wider economic growth, investments in these networks have to start now. This is recognised by the European Commission, which launched the i2010 initiative in June 2005, but is still late compared with the earlier decisions taken by the Japanese and South Korean governments.

## **Technology advances and the open network concept**

Previously, fibre-to-the-home deployments were prohibitively expensive. But these investments have now come into the realms of the feasible for several reasons:

- According to Corning, the fibre optic manufacturer, FTTH installed costs have been reduced from around US\$4,000 per subscriber in 2001 to <US\$1,500 per subscriber in 2005. Fibre cables are now more robust and easier (and cheaper) to deploy and can be done without highly skilled personnel. Fibre can also be deployed using robotic means in previously hard-to-reach places (eg, sewers and other utility ducts).
- Network standardisation at each layer of a telecoms network removes the need for vertical integration. Physically laying the fibre amounts mainly to construction work (ie, digging a trench), which is a separate task from running the network. The open-

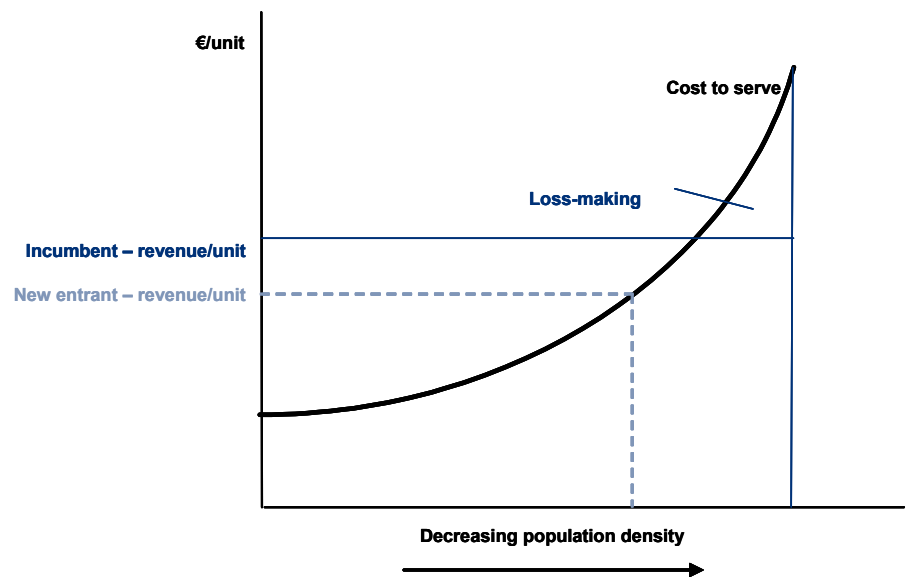
### ***Advancements in fibre optic technology has lowered deployment costs***

access network concept means each layer of the network can be built and run by companies utilising their separate core competencies.

- Future-proofing. The underlying fibre network is virtually future-proof. For the foreseeable future, nothing is faster than a fibre network (except possibly more fibre). Transmission speeds of 10-100Mbps are achievable using current electronics and standards, with the physical fibre able to support transmission speeds up to 1Gigabit/s with future upgrade in electronics.

### ‘Cherry-picking’

**Fig 3 Cherry-picking – the business model for alternative networks**



Source: ING

Figure 3 illustrates the business case for the deployment of alternative infrastructure. Incumbents are hampered by the fact they cannot price services geographically. This provides new entrants with opportunities to pick off the best customers in areas that they can profitably serve with the latest technology, unencumbered by legacy investments.

### Regulatory and competition issues

One area of concern surrounding fibre deployments by local governments and municipalities (especially in the US) is the issue of state subsidies. We do not believe that CityNet’s investments will be blocked by the regulatory or competition authorities for several reasons:

*We do not expect CityNet to be blocked by regulators*

- The shareholders of Glasvezernet Amsterdam BV (GNA) have all invested under the same conditions in a profitable business with an acceptable risk/reward. Amsterdam’s City Council has been careful to abide by the Market Economy Investors Principle. From our conversations with CityNet, we understand CityNet has had informal conversations with the European Commission on various issues and they have been fully audited.
- CityNet has structured the operation of its network using the ‘open network’ concept. BBned, the wholesale operator selected to run the fibre network, was selected by competitive tender, and the wholesale contract specifies that all service

providers must be able to purchase transport capacity on non-discriminatory conditions. Other telecom operators can also use CityNet's fibre network to offer their own services.

## CityNet's fibre investment – do the financials stack up?

One of the key determinants of the viability of CityNet's fibre investments is the long-term view CityNet's financial backers are willing to take. Note that the legal entity Glasvezernet Amsterdam BV (GNA) is laying the dark fibre with the operational and execution risk carried by the wholesale operator BBned and the service providers. By viewing the fibre investment as more akin to real estate than telecoms and the strategic importance of this investment, we estimate GNA's shareholders would be satisfied with achieving a return of 8-10% on equity as a minimum.

The key drivers of value in this project are the subscriber take-up and the revenue generated per subscriber. We believe maintenance capex and operating expenditure should be fairly low. High churn would be a problem but as the speeds provided by FTTH are unmatched by other current technologies, we do not believe this would be a significant issue.

In Figure 8, we assess the minimum level of take-up and revenue GNA would need to achieve to cover its cost of capital. Our analysis reveals that, based on conservative assumptions, GNA is viable with a 40% subscriber take-up and while generating monthly wholesale revenue of €25 per connection, assuming that the fibre investment has a 30-year life span. We note that press reports have stated that CityNet expects to see subscriber take-up of around 50% with each customer spending around €50 per month, implying a monthly gross contribution of €25 per customer for BBned and the service providers.

We conclude that GNA and the overall CityNet project can succeed, although there are start-up risks. Careful consideration must be given to the contractual incentives put in place for the network operator, BBned, and the numerous service providers, so that they maximise subscriber take-up within a set time frame.

### Subscriber take-up and capex

Subscriber take-up is critical in reducing capex per connected subscriber. We believe a good rule-of-thumb for quantifying the total cost of the rollout is €500 of capex for the fibre dug past each home, plus an additional €250 of success-based capex for each home connected. Clearly, if there was 100% take-up, average capex per home connected would be €750. If subscriber take-up was 20%, capex per home would be €2,750. By comparison, Verizon should spend around US\$10bn on passing 18m homes in its five-year rollout plan. This implies capex of US\$550 per home passed, plus success-based capex of around US\$500-600 per home connected.

*Subscriber take-up is critical in reducing capex per connected subscriber*

**Fig 4 FTTH penetration – subscriber/homes passed (%)**

Sweden	47.4
Italy	13.6
Denmark	62.1
US	15.1

Note: European data as at June 2005, US data as at Jan 2006

Source: IDATE, TIA

Figure 4 shows the subscriber take-up rates of various FTTH projects in selected countries. There is a huge variation in take-up depending on the kind of business model used. On average, we believe where operators are offering mainly triple-play services – what FASTWEB in Italy and Verizon in the US with its FiOS network are doing – take-up is lower than in the cases where provision is done on an ‘open-network’ basis. Incidentally, FTTH take-up in the US peaked in March 2004 at 41.3% before a surge in FTTH deployment brought the average down to around 15% as the numbers of homes passed grew faster than homes connected.

Verizon indicates that internet penetration of its FiOS-available households is approximately 30% and it expects video penetration to reach 20% over the next few years (a level already achieved in Keller, Texas – the first area it launched its services on 22 September 2005).

More appropriate for CityNet is the experience from Nuenen, a small town in the Netherlands that has deployed an FTTH network as part of the Kenniswijk Project – an initiative of the Dutch General Directorate of Telecommunication and Post. 8,000 homes there have been connected with FTTH since March 2005, serving around 15,000 residents. Initially, 99% of homes were connected and given free internet access of 10 Mbit/s. On 1 January 2006, users had to start paying for services, but they were also able to subscribe to digital radio and TV, as well as telephony services. In the end 80% of homes stayed connected to the fibre network despite the marketing efforts of both KPN and UPC, the latter of which also cut triple-play pricing to respond to the fibre threat.

Our model conservatively assumes 5% of subscriber churn after the first year of operation. In reality, we believe churn rates could be lower as subscribers may switch service providers but they are unlikely to stop using the fibre connection after signing up. In our model, we assume that any subscriber that churns off the fibre network implies that the €250 capex needed to connect that home is wasted.

## Revenue per user

We believe our wholesale revenue per user assumption of €25 for our CityNet analysis leaves enough margin for BBned and the service providers still to make profit after operating costs and marketing to promote take-up.

As CityNet is in the business of providing dark fibre to whole operators, the correct price point for comparing CityNet’s offering is KPN’s €9.59 per month charge for a fully unbundled local copper loop. Tele2 (who has recently bought Versatel) is charging €19.95 and €24.95 per month, respectively, for its 2Mbit/s and 4Mbit/s DSL packages (see Figure 5). This means Tele2 has around €10-15 of monthly gross contribution per customer after paying KPN’s local loop unbundling charge.

Current FTTH offerings in the Netherlands range from €35.95/month for the standard 10Mbit/s internet package in Nuenen to €59/month for the 10Mbit/s triple-play package in Rotterdam (see Figure 5). The FTTH project in Rotterdam is relatively small, with 1,500 homes connected, but it has a similar open network model to the one CityNet intends to implement. According to press reports, BBned says that the Rotterdam project shows the open network model is working. Assuming similar wholesale charges in Rotterdam and Nuenen to our €25/month assumption, gross contribution for a 10Mbit/s customer would range from €11 to €34 per month, which is not too dissimilar to what Tele2 is generating from its current DSL offering.

Revenue per customer could be higher depending on the amount of businesses in the customer mix. FASTWEB in Italy aims to achieve revenue of around €900/year from its double- and triple-play customers, while targeting €2,000/year and €8,000/year from small business and SME customers, respectively.

**Fig 5 Comparison of selected broadband tariffs in the Netherlands**

Company	Tech	Package	Speed (up/download)	Price per month (€)	Price per Mbit/s (€)	Data limit	Comment
KPN	DSL	Direct ADSL Go	1.5Mbit/256Kbit	21.95	14.6	None	Free connection, modem
		Direct ADSL Lite	3Mbit/512Kbit	29.95	10.0	None	Free connection, modem
		Direct ADSL Basic	6Mbit/768Kbit	49.95	8.3	None	Free connection, modem
		Direct ADSL Extra	12Mbit/1Mbit	74.95	6.2	None	Free connection, modem
		XS4ALL ADSL Ultra	20Mbit/1Mbit	99.95	5.0	None	Free connection, modem, spamfilter, anti-virus and firewall
Tele2	DSL	Basis	2Mbit/512kib	19.95	10.0	None	
		Plus	4Mbit/1Mbit	24.95	6.2	None	
		Compleet Voetbal	20Mbit/1Mbit	49.95	na	None	Includes telephony and digital TV football package
UPC	Cable	chello starter	384Kbit/128Kbit	14.95	39.9	500Mb	
		chello easy	1Mbit/256Kbit	22.95	23.0	1Gb	
		chello light	3Mbit/1Mbit	32.95	11.0	None	
		chello classic	8Mbit/1Mbit	49.95	6.2	None	
		chello extreme	20Mbit/2Mbit	59.95	3.0	None	
Unet (Almere, Rotterdam)	FTTH	Triple play Easy	10Mbit/10Mbit	59.00	na	None	Includes 40 TV channels and basic telephony
		Triple play Elite	30Mbit/30Mbit	79.00	na	None	Includes 40 TV channels, telephony with free fixed national calls
OnsNet (Nuenen)	FTTH	Standard	10Mbit/10Mbit	35.95	3.6	None	Radio and TV costs an additional €13.95, telephony additional €9.95
		Extra	100Mbit/100Mbit	59.95	0.6	None	Radio and TV costs an additional €13.95, telephony additional €9.95

Source: Company data

## EBITDA margin

Operating expenses for GNA should be fairly limited. Operational staff should be minimal as the network build is effectively outsourced to the construction company. Maintenance costs should be fairly limited, mainly repairing any damage or cuts to the fibre network, and some of these costs can be managed with insurance.

## Cost of capital

We understand that the shareholders in GNA will contribute €18m in equity, with the remaining €12m for the first phase provided by debt financing. We assume a cost of equity of 9% and a pre-tax cost of debt of 5%, with debt making up 40% of the company's enterprise value. We use a tax rate of 30%, giving us an after-tax weighted average cost of capital of 6.8%. Despite the start-up risks, the cost of debt should not be high as the downside risk for GNA is limited. If CityNet fails, there should be buyers for the fibre network assets, which should allow banks to recover their loans.

## Terminal value

Conservatively, we assume the fibre network deployed has a life of 30 years, after which it has no value. Our forecasts do not assume any maintenance capex after the initial rollout. During the 30-year life of the project, we assume revenue per customer stays constant, ie, no growth.

## Sensitivity analysis

Figures 6 and 7 illustrate the sensitivity of the NPV of Glasvezernet Amsterdam BV to various operational and financial drivers.

**Fig 6 Sensitivity of NPV to revenue per user and take-up rates (€m)**

		Monthly revenue per user				
		€18	€20	€22	€24	€26
<b>Subscriber take-up rate</b>	<b>30%</b>	-10,226	-8,155	-6,097	-4,040	-1,982
	<b>35%</b>	-7,828	-5,427	-3,026	-626	1,775
	<b>40%</b>	-5,442	-2,699	45	2,788	5,532
	<b>45%</b>	-3,057	29	3,116	6,203	9,289
	<b>50%</b>	-672	2,757	6,187	9,617	13,046

Source: ING estimates

**Fig 7 Sensitivity of NPV to cost of capital and terminal growth rates (€m)**

		Terminal growth rate				
		-2.0%	-1.0%	0.0%	1.0%	2.0%
<b>After tax cost of capital</b>	<b>7.8%</b>	-4,747	-3,420	-1,902	-158	1,852
	<b>7.3%</b>	-4,059	-2,622	-973	925	3,118
	<b>6.8%</b>	-3,308	-1,748	45	2,114	4,510
	<b>6.3%</b>	-2,487	-792	1,161	3,419	6,040
	<b>5.8%</b>	-1,588	256	2,386	4,855	7,726

Source: ING estimates

**Fig 8 CityNet Amsterdam phase 1: breakeven investment case for Glasvezelnet Amsterdam BV (€m)**

Yr to Dec	Comments	2007F	2008F	2009F
Homes passed	Rollout to start end 2006	26,667	40,000	40,000
Increase in homes passed		26,667	13,333	0
Homes connected		10,667	16,733	16,933
Increase in homes connected		10,667	16,733	200
<i>Subscriber take-up (%)</i>		40	40	40
Subscribers		10,667	16,000	16,000
Net adds		10,667	5,333	0
<i>Churn – annualised (%)</i>		0.0	5.0	5.0
Leavers		0	733	200
Gross adds		10,667	6,067	200
Average subscribers for the period		5,333	14,667	16,000
Revenue per subscriber (€/sub/month)		22	22	22
Revenue (€000)		1,408	3,872	4,224
Cash operating expenses (€000)		(416)	(581)	(634)
EBITDA (€000)		992	3,291	3,590
<i>EBITDA margin (%)</i>		70.4	85.0	85.0
Depreciation		(533)	(834)	(834)
EBIT		458	2,457	2,756
Tax paid		(138)	(737)	(827)
<i>Tax rate (%)</i>		30.0	30.0	30
Operating profit after tax		321	1,720	1,930
<b>Capex</b>				
Per home passed (€/home passed)		500	500	500
Per subscriber connected (€/sub)		250	250	250
Rollout		13,333	6,667	0
Connection		2,667	1,517	50
Total capex (€000)		16,000	8,183	50
Cummulative capex (€000)		16,000	24,183	24,233
Cum capex/home passed (€)		600	605	606
Cum capex/home connected (€)		1,500	1,445	1,431
Cum capex/subscriber (€)		1,500	1,511	1,515
<b>Post-tax unlevered cash flow</b>				
After tax cost of capital (%)		6.8	6.8	6.8
Discount factor	PV at end 2006	0.936	0.877	0.821
<b>PV of cash flow</b>		<b>(18,804)</b>	<b>(14,681)</b>	<b>1,543</b>
<b>Terminal value assumptions</b>				
Life of project		30 years		
Terminal growth rate (%)		0		
Terminal value	Value at end 2009	22,962		
<b>PV of terminal value</b>	<b>PV at end 2006</b>	<b>18,849</b>		
<b>NPV</b>		<b>45</b>		

Source: ING estimates

# Europe is falling behind in broadband

According to the EC, information and communication(s) technology (ICT) represents a modest but growing 6% of the EU economy, but generates 25% of the EU's growth and 40% of its productivity gains.

*From the European Commission's press release, 1 June 2005:*

The European Commission adopted the initiative 'i2010: European Information Society 2010' to foster growth and jobs in the information society and media industries. i2010 is a comprehensive strategy for modernising and deploying all EU policy instruments to encourage the development of the digital economy: regulatory instruments, research and partnerships with industry. *The Commission will in particular promote high-speed and secure broadband networks offering rich and diverse content in Europe (our italics).*

The European Commissioner for Information Society and Media, Viviane Reding, has hinted in a recent speech that she is ready to change the European regulatory framework if current rules are holding back construction of higher-speed broadband networks.

In October 2005, EUROCITIES, the organisation of major European cities, including local governments of 123 large cities in 32 European countries, released a broadband manifesto calling for widescale deployment of independent fibre optic networks, which would boost the development of knowledge-based economies and connect all citizens, preventing a 'digital divide'.

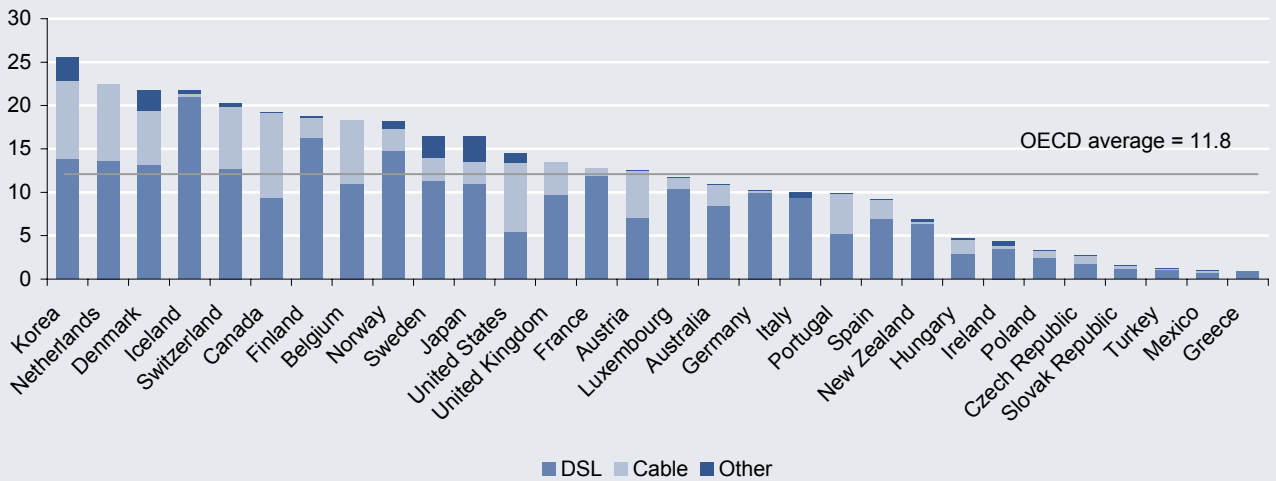
Against this backdrop at the European and local government level, we believe municipalities and other players like CityNet that choose to deploy open-access networks are unlikely to be hindered by regulators.

## Competitive reasons

Viviane Reding said in a speech earlier this year, 'Broadband is the infrastructure of the high speed economy'. Europe is falling behind other advanced economies like the US, Japan and South Korea. According to OECD data, the five largest European countries as of June 2005 had lower broadband penetration than the US, Japan and South Korea (see Figure 9).

Even while Europe is increasing broadband penetration with strong growth in DSL subscribers, the US, Japan and South Korea are seeing significant deployment of fibre network.

**Fig 9 OECD broadband subscribers per 100 inhabitants, by technology, June 2005**



Source: OECD

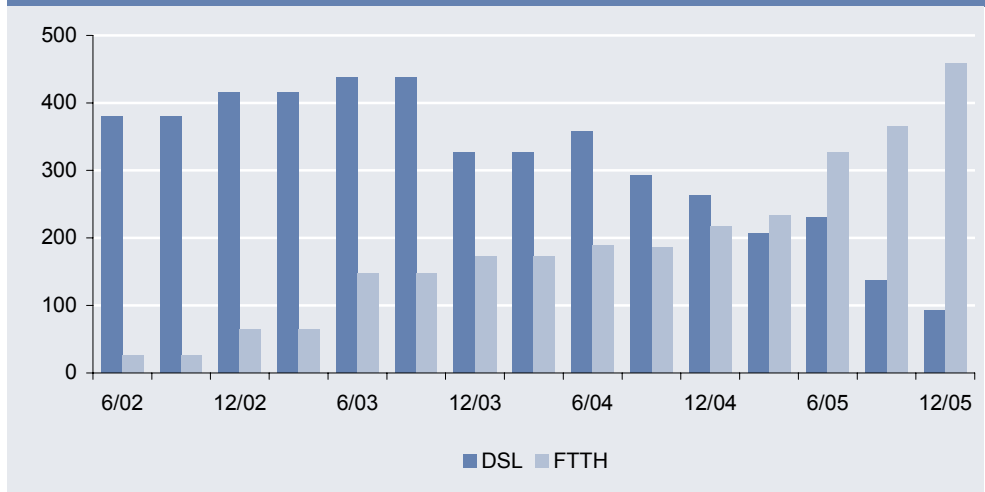
### South Korea

South Korea is entering its second broadband wave as ADSL and cable modem have hit saturation levels. The country with the highest broadband penetration in the world is now aggressively rolling out higher-speed services. South Korea’s ministry of information and communication (MIC) announced it will promote the deployment of broadband convergence networks, the next-generation network with quality broadband multimedia services. It is targeting 100Mbit/s service to 5m subscribers by 2007 and 10m subscribers by 2010. MIC considers FTTH to be the ultimate fixed-line solution.

### Japan

The Japanese government with its eJapan initiative in 2001 set itself a target of being the most advanced IT nation by 2006. It is now the world leader in FTTH deployment with 3.4m subscribers as of June 2005. Interestingly, in 1Q05 NTT’s FTTH net adds exceeded DSL for the first time.

**Fig 10 NTT Group: Net adds – DSL vs FTTH**



Source: NTT, ING

In December 2004, the Japanese Ministry of Internal Affairs and Communications set a target a target of making Japan the leading ICT nation by 2010. As part of this goal, the government wants 100% of the population to have high-speed or ultra-high-speed

internet access by 2010. NTT is currently spending ¥5tr (€36bn) through 2010 to upgrade 30m homes and businesses with fibre.

## US

In the US, competition with the cable TV companies has spurred the regional Bell operating companies (BellSouth, AT&T and Verizon) to invest significantly in rolling out fibre networks (see Figure 11). The US regulator, the Federal Communications Commission, has provided some clarity by ruling that RBOCs do not have to share their FTTH network in new builds.

**Fig 11 FTTx deployment by US regional Bell operating companies**

Operator	Type	Coverage and cost	Launch
BellSouth	FTTC plus ADSL2+, designed to accommodate VDSL	5.2m miles of fibre already laid, 1.1m homes passed, adding 150,000-200,000 homes annually	2005
AT&T	FTTN plus ADSL2+ and VDSL	18m homes passed by mid-2008 (half of homes serviced); US\$4-6bn on networks over five years; US\$200-300 per home passed	Early 2006 rollout depending on stability of vendor system
Verizon	FTTP using passive optical network (PON); RF overall for broadcast channels; VoD using IP	3m homes by 1H06 (9% of residential subscribers) costing US\$3bn; average cost of US\$1,000 per home passed plus US\$500-600 success-based capex per subscriber connected. Verizon plans to reach 18m homes over a five-year rollout.	3Q05

Source: ING, press reports

## Why ADSL is not fast enough

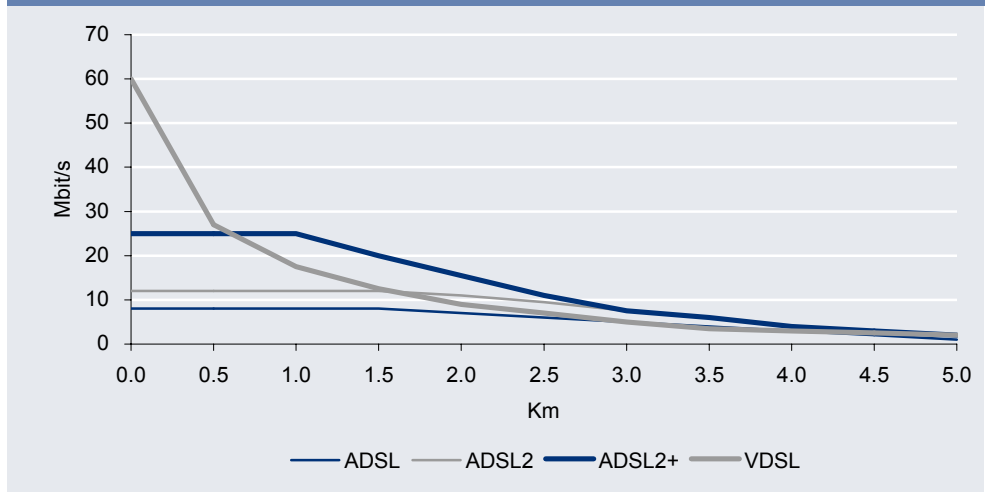
The reason Japan, South Korea and the US are seeing such significant investment in FTTx deployments is because ADSL does not meet connectivity requirements for the digital home of the future. ADSL2+ can support only around 25Mbit/s compared with 35Mbit/s or more that future homes would require (see Figure 12 and 13). This means either VDSL deployment (with further fibre investment to push fibre to the kerb) or FTTH will be required.

**Fig 12 Typical bandwidth requirements for future homes**

Service	Bandwidth required
2 MPEG-4 HDTV streams	24Mbit/s
Internet	8Mbit/s
Voice	0.25Mbit/s
Video telephony	5Mbit/s (duplex)
<b>Total</b>	<b>37.25 Mbit/s</b>

Source: ING

**Fig 13 Comparison of xDSL technologies**



Source: ING

## FTTH developments in Europe

**Fig 14 Western Europe: FTTH subscribers**

	2004	2005F	2006F	2007F	2008F
Sweden	250,000	384,625	539,705	703,793	865,851
Italy	199,513	311,568	442,354	582,175	721,391
Netherlands	65,000	115,371	181,149	257,977	339,973
UK	1,800	2,000	30,000	108,543	296,191
France	1,000	30,000	60,000	134,345	258,388
Germany	200	400	40,000	111,177	254,828
Spain	3,000	4,000	30,000	80,056	177,531

Source: IDATE

According to IDATE, the telecoms consultancy, at the end of June 2005 there were around 646,570 FTTx subscribers in Western Europe and around 2.51m homes and buildings passed by fibre networks, giving a take-up rate of 25.8%. This represents growth of 18% for subscribers and 28% for homes and buildings passed. Nearly 97% of European FTTx subscribers are concentrated in Sweden, Italy, Denmark, the Netherlands and Norway. Although current fibre subscribers are low, there are ambitious plans for big networks in Amsterdam, Paris, Vienna, Catalonia as well as many smaller initiatives. We expect faster subscriber take-up in the coming years (see Figure 14).

**Fig 15 Selected FTTH deployments in Western Europe**

Country	Company (Location)	Comment
<b>Austria</b>	Vienna	Plan to cover all 960,000 households and around 70,000 SMEs in Vienna. Construction work for a 50,000-home pilot project could start in 1Q06 with the first households connected in June.
<b>Denmark</b>	Electricity companies	The Danish competition authority gave clearance for local electricity companies to proceed with their €1.3bn investment in FTTH to cover around 40% of all Danish homes.
<b>France</b>	City of Pau CiteFibre (Paris)	Network build started in Aug 2005. Up to 70,000 FTTx connections once 3-year rollout complete. Start-up founded in 2004 with fibre deployed through the Paris sewage system to pass 20,000 homes by end-2006.
	Erenis (Paris)	Fibre optics laid in Paris sewage system. FTTB + VDSL inside the building to serve customers. 85,000 homes to be passed by end-2006, with target of 1m homes passed by 2010.
	France Telecom (Paris)	FTTH pilot launch in thousands of homes. Before summer 2006, the company will begin testing optical fibre deployments in six districts in Paris and six cities in Hauts-de-Seine to deliver high-definition TV, unlimited telephony, and very high speed internet. France Telecom claims its DSL network is sufficient in the near term, but intends to invest in higher-performance technologies in preparation for the future.
<b>Germany</b>	Noos-UPC (Paris)	Trial project to deploy FTTH to provide 100Mbit/s connectivity.
	NetCologne (Cologne)	€200m to be invested over the next five years starting in April or May 2006 to deploy FTTH to all homes in the city of Cologne, providing connection speeds of up to 100Mbit/s.
<b>Italy</b>	FASTWEB (Milan + other cities)	One of the more established FTTH operators in Europe but not deploying fibre any more; instead choosing to use DSL. FASTWEB had 644,000 customers at end of September 2005.
<b>Netherlands</b>	Rotterdam	1,500 homes connected by FTTH in a trial.
	CityNet (Amsterdam)	FTTH project to cover 420,000 homes and businesses in Amsterdam at a cost of €300m
	OnsNet (Nuenen)	FTTH network passing 8,000 homes with 80% subscriber take-up rate
	Portaal (5 cities)	Portaal, the Dutch social housing association plans to deploy FTTH to over 55,000 homes in five cities
<b>Norway</b>	Lyse Tele	Lyse Tele is a subsidiary of Lyse, the Norwegian electric utility. Lyse Tele currently has over 25,000 subscribers located throughout Norway and plans to increase this to 200,000 in the next five years.
	Troms Kraft	This Norwegian utility announced in February 2006 it intends to create an open-access FTTH network to reach 20,000 homes and 2,000 businesses within the next three years
<b>Spain</b>	Astauria	Alcatel has been selected by the Principality of Asturias, Spain, to deploy an FTTH network in the mining valley of Asturias. Alcatel is the turnkey provider of this €19m project.
	Catalonia	The Government of Catalonia and Localret (a consortium of 782 municipalities) plans to cover multiple cities throughout the entire province of Catalonia with multiple fibre rings at a cost of around €500m
<b>Sweden</b>	Bredbandsbolaget	Owned by Telenor, B2's footprint covers 53 cities, reaching one-third of the Swedish population, 1.4m homes passed (DSL & FTTH).
	Bostream	Bostream's FTTH network had 20,000 subscribers in June 2004. Its services are only available in 80 locations, including Umea, Stockholm, Gothenburg and Malmö.
	Malarenergi Stadsnat	FTTH network operated by Malarenergi, the community-owned power utility of the city of Vasteras. It reaches over 30,000 homes and 1,800 businesses with plans by early 2007 to connect over 50,00 residential and 5,000 business customers
	Stokab (Stockholm)	Stokab is ultimately owned by the City of Stockholm. Stokab deploys fibre infrastructure to promote economic growth and thereby stimulate the telecom market and IT development in the Stockholm region.
<b>UK</b>	Geo (London)	Geo, a Hutchison Whampoa subsidiary, has acquired 60km of fibre in London from Thames Water to extend its network. The acquisition includes the rights to run new fibre through Thames Water's sewers.

Source: Company data, press reports, ING

# Impact on incumbents

The impact of competing FTTH rollouts on European incumbents is clearly negative.

## *Incumbents are trying to extend the life of their copper networks*

Fixed-line incumbents at the moment are trying to extend the life of their existing physical assets – their copper networks – by investing in ADSL technology. They have little incentive to accelerate the obsolescence of their existing networks by upgrading their local network connections with fibre. If they do nothing, incumbents could lose up to 30-60% of their current lines in areas where there is competing fibre network deployments.

Overall impact on revenue and profitability would depend on how widespread independent fibre deployments are – for cost reasons, these are likely to be limited to dense urban areas. Where competition is increasing from other infrastructure-based players (mainly cable TV networks), incumbents are considering deploying fibre closer to their customers, enabling them to offer higher broadband speeds using VDSL technology.

## **KPN's price to be most affected by FTTH**

CityNet Amsterdam could trigger numerous other fibre deployments in other Dutch cities leading to a further decline of PSTN lines at KPN. Fixed-line fundamentals at KPN are likely to remain challenging in 2006, although the stock could be supported by potential M&A prospects.

The impact on KPN's revenue is clearly going to depend on the number of municipal fibre deployments as other Dutch cities follow the CityNet Amsterdam example. Most of the threat from independent fibre rollouts will be to KPN's consumer revenue, as independent FTTH players service mainly residential customers, and small business customers to a lesser extent.

**Fig 16 KPN's fixed-line business, 2005 (€m)**

	Consumer	Business	Wholesale	Other	Total fixed
Access lines (000)	4,999	1,908			6,907
DSL connections (000)	1,740		2,551		
External revenue	2,365	2,493	1,445	7	6,310
Net sales	2,384	2,647	4,941	(3,144)	6,828
Operating revenue	2,384	2,653	4,985	(3,139)	6,883
EBITDA	380	358	2,038	16	2,792
EBITDA/op revenue (%)	15.9	13.5	40.9	-0.5	40.6
EBITDA/external revenue (%)	16.1	14.4	141.0	228.6	44.2

Source: Company data

As a rough estimate, 1m homes passed by fibre networks with a 40% take-up rate would see KPN lose 400,000 lines out of 5m consumer PSTN connections, or 8% (see Figure 16). 8% of KPN's consumer external fixed-line revenue is around €190m, or 3% of all KPN's external fixed revenue. Assuming a similar impact on fixed EBITDA and value, this would imply a 1.4% negative impact on KPN's total enterprise value.

These are clearly small numbers, but the impact of CityNet Amsterdam deploying its fibre network highlights the continued challenges KPN is facing in its domestic fixed-line business over the medium term.

# Appendix: The basics of FTTx

The 'x' in FTTx can stand for a lot of things, often not very different, but for practical purposes they can all be grouped in any of three basic approaches:

## 1 Fibre all the way to the residential or business customer by using passive optical networks (PON) or ethernet.

These are:

- Fibre to the home (FTTH)
- Fibre to the building (FTTB)

The distinction is basically between single homes or apartments and businesses.

## 2 Fibre all the way to the customer by using passive optical networks only.

This is:

- Fibre to the premises (FTTP)

## 3 Fibre partial.

These all use copper from the partial point on to the customer:

- Fibre to the neighbourhood (FTTN)
- Fibre to the node (also FTTN)
- Fibre to the curb (FTTC, also FTTK for those who spell, usefully, curb as kerb)
- Fibre to the cabinet (FTTCab)

Fibre partial means fibre goes to some point near to the customer, and then another mechanism (usually copper pairs supporting ADSL or VDSL) takes over for the final link to the customer.

The two FTTNs – FTTNeighbourhood and FTTNode – mean basically the same thing: fibre is run out to a point close to the customer. Typically in North America this is a node in a remote terminal, or even closer to the customer in a cross-connect or similar box. The main deployments in North America for FTTN usually have a node that can handle 400-600 customers or homes.

FTTCabinet is pretty similar to the FTTNs, and FTTCurb refers to fibre deployments that go even closer to the customer, and usually serve 8-24 customer drops (copper).

The big attractions for telcos in deploying PONs as the basis of a mass-market fibre rollout are:

- All-optical passive loop plant
- Significantly reduced central office wiring and space requirements
- Reduced plant operational expenditures
- Easy upgrades and long plant life.

Source: *Light Reading*

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