ARTHUR D LITTLE

REPORT
2025

OPEN ACCESS FIBER IN THE NORDICS

Lessons learned

CONTENT

AGRON LASKU
Partner, Telecommunications, Information Technology, Media & Electronics (TIME)
Stockholm

DANIEL GRANATH
Consultant, TIME
Stockholm

LARS LIND
Principal, TIME
Gothenburg

INTRODUCTION

This report explores the open access model in fiber networks, unpacks its benefits, and examines real-world outcomes in four Nordic markets. It is intended for anyone interested in how digital infrastructure shapes modern society — whether you are a fiber-connected consumer, an industry decision maker, a fiber network owner, or someone who works in the public sector. The report zooms in on the Nordic countries of Finland, Sweden, Norway, and Denmark to illustrate and investigate how structural choices and open access networks created different outcomes in each country. It was independently prepared by Arthur D. Little (ADL), in collaboration with fiber company Valokuitunen; information is based on public sources, expert interviews, and documented case studies.

EXECUTIVE SUMMARY

This report explores the open wholesale access model, its benefits, and how it differs from other network models. In an open access network, many Internet service providers (ISPs) can serve the same household over a shared cable connection operating under equal, nondiscriminatory terms. Typically, this is enabled by separating the fiber cables and the electronics used to operate them from Internet service delivery — much like airlines compete for travelers at a regional or national airport rather than each building its own. In this model, the network owner voluntarily provides wholesale access to ISPs equally, allowing them to offer services directly to households.

This contrasts with a regulated wholesale model, which relies on access mandated by a national regulator. Such access may, but does not necessarily, follow similar open terms and may also be accompanied by complex compliance requirements. Additionally, the network owners can enter individually negotiated commercial agreements with ISPs, but they do not necessarily follow the principle of nondiscriminatory access.

Some network owners choose not to provide access to other ISPs, so consumers can only purchase Internet services from them. This setup is commonly referred to as a retail offering in a closed network model. These models have different structural challenges, serve distinct purposes, and provide varying advantages. This report focuses on the open access model and the closed network model.

The open access model offers benefits to a variety of stakeholders. For consumers, it creates a competitive marketplace where many companies battle to win the household's business, which forces them to compete on price, service, and offerings. For ISPs, open access means reaching new consumers without investing in cables and entering new markets quickly on fair terms. For network owners, the key benefit is lower investment risk from higher network utilization, as more ISPs on the network means more consumers will likely be attracted to fiber offerings and change from other broadband technologies.

For the public, open access can yield value for communities from public funds and create fewer disruptive street-level projects.

Here's an interesting example. When a local network in Denmark transitioned from a closed to an open access model, its weekly sales increased by more than 410%. Out of this increase, around 380 percentage points were from new market entrants; the remaining 30% came from the network owner's own ISP. Thus, consumers gained attractive fiber offerings, new companies quickly gained customers, and the established ISP that owned the network gained sales and a more utilized network (more households began to subscribe).

This report focuses on Finland, Sweden, Norway, and Denmark, each illustrating distinct dynamics around openness and why it matters. It examines how each country reached its current state and highlights how ownership and access decisions influence pricing, consumer choice, utilization, and investment.

Finland, an early mover in mobile connectivity, delayed its fiber rollout but is now closing the gap with its Nordic peers. The market is shifting from a first-mover race in each area to a landscape of both open and closed networks. Finland demonstrates how open access can drive network deployment from an investment standpoint.

Finland's fiber build-out is accelerating. Investor-backed open access companies show that the model is commercially viable and can quickly bring a broad menu of ISPs to new areas. At the same time, several companies continue to expand their closed networks, making the market a tight contest between open and closed networks for the remaining untapped areas.

Sweden was a pioneer in open access fiber networks, thanks to the development of local networks owned by municipalities using this model. There are around 170 city networks today; alongside them are fiber networks run by national telecom operators.

Sweden demonstrates that publicly owned open infrastructure can help Internet competition flourish at scale, mainly because the threshold to enter a market and compete is lower.

Norway's fiber market is mostly characterized by regional companies that cater to their own area, originating from local utility companies and municipalities starting to build their own fiber networks. Norway's networks are closed, apart from the national telecom operator Telenor, which was ordered to open its networks. Because of regulatory pressures based on high prices and services that are underdeveloped compared to other Nordic countries, several network owners banded together in spring 2025 to form a common platform. Norway shows how a market can proactively respond to guidance from a regulator and initiate open solutions.

Denmark arrived later to fiber than Sweden and Norway but caught up fast. Its fiber landscape comprises strong regional utility companies alongside large telecom operators. The industry has come to embrace open access, albeit via a gentle regulatory push, and most companies have opened their networks to invite competitors alongside their own ISP service, as they gain from higher cable utilization. Key to this shift has been aggregator platforms, which are neutral hubs acting as facilitators between network owners and ISPs. Denmark demonstrates how aggregator platforms can stitch together many networks into large markets to better serve consumers.

1. WHAT IS THE OPEN ACCESS MODEL?

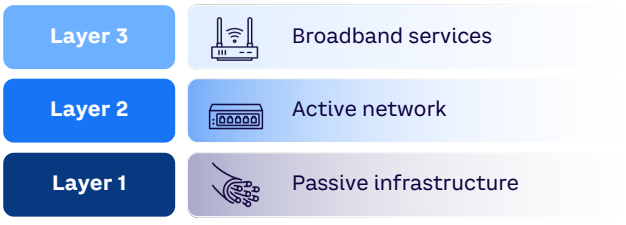
Most people think of speed or price when they hear about broadband competition, but true competition starts deeper. It begins with the structure of the network itself.

A fiber network has three layers (see Figure 1):

- **Layer 1** — physical cables and ducts in the ground (passive fiber infrastructure). This is also referred to as "dark fiber," as the fiber optic cables are not yet activated or "lit."
- **Layer 2** — electronics that light up and operate the network, such as switches and nodes that transmit the signals (active infrastructure).
- **Layer 3** — broadband service delivered as the optical signals (light pulses) pass through the cables via the electronics. This is where ISPs deliver the Internet to consumers.

The way a fiber network is built and operated can determine the pricing, customer experience, availability of service choices, and how new services are introduced to consumers. In the most common network structure, a single company owns and controls all three layers; that company is typically the sole provider of Internet services to consumers. This is a closed model: the company sells directly to consumers. When a network owner allows other ISPs to access parts of its network, it is offering wholesale access.

Figure 1. The three layers of fiber infrastructure



Source: Arthur D. Little

Generally, this occurs in one of three ways (the second two are open access models):

1. The network owner enters into individually negotiated commercial agreements with ISPs, applying distinct terms and conditions to each.
2. The network owner has commercial agreements but voluntarily applies equal, transparent, nondiscriminatory terms across all ISPs.
3. The network owner is mandated by a national regulator to provide access, resulting in a regulated wholesale model. This may be accompanied by requirements for similar equal, transparent, nondiscriminatory terms but may also introduce complexities in compliance.

In an open access model, the three layers can be owned and/or operated by different players. Companies can own and control different parts within the layers. For example, the owner of a network builds and operates the infrastructure (layer 1) and lets other companies handle the process to light up the fiber with electronics (layer 2). The last layer (layer 3) can then be handled by separate companies (ISPs) that sell and deliver broadband service to the consumer.

You could think of this model as an airport. The runway, terminals, and air traffic systems are shared infrastructure, built and maintained by one entity (the network owner). Airlines are the ISPs, competing to offer travelers the best prices, destinations, and service experiences via shared airports. It would be costly and inefficient for every airline to build its own airports, just as it would for every ISP to build its own fiber network to reach consumers.

In an open network, many ISPs can offer services on the same fiber. In a closed network, only one provider is available — typically the company that owns the fiber cables.

2. OPEN ACCESS AS A WAY TO ACHIEVE EU GOALS

A reliable Internet connection is a requirement for modern life. Work, school, healthcare, banking, media, and public services all depend on a fast, stable connection, and this dependency will increase as we move toward an even more digital future. Interestingly, about 4 million European households (out of 202 million total) were without any type of home Internet connection in 2024, according to Eurostat, creating a gap between those with the skills to use digital tools and the ability to connect to the Internet and those without. The European Commission has stated that closing this gap is a priority.[1]

The European Commission has set out clear, ambitious goals. By 2030, every household in the EU should have access to high-speed Internet, with speeds of at least 100 Mbps and the potential to scale up to 1 Gbps. These goals apply to both cities and rural communities. Importantly, the commission also wants networks to be affordable. The reasoning is clear: if everyone is going to be part of the digital economy, the infrastructure must be built in a way that works for all, ensuring affordable prices and a reasonable number of choices. To reach these goals, the commission has set expectations for how networks should be built and shared. In some regions, it is too costly to deploy fiber and provide affordable prices for consumers without public funding.

THE COMMISSION HAS SET EXPECTATIONS FOR HOW NETWORKS SHOULD BE BUILT AND SHARED

Therefore, the commission designed funding rules that require networks to provide wholesale access to other ISPs if they want to receive public funding, so as not to distort the market.

In addition to creating better market conditions for consumers and bridging the digital divide, open access supports the EU's climate targets. Building several overlapping fiber networks in the same area is costly, disruptive in terms of traffic and noise, and a waste of resources. The EU's Green Deal says digital infrastructure must play an active role in the green transition; it outlines that Europe needs a digital sector that puts sustainability at the fore, and that these technologies must help accelerate climate policy across sectors.[2] With open access, one fiber network can host many ISPs, eliminating the need to dig multiple times on the same street.

How are EU countries putting this into practice? Four Nordic countries (Finland, Sweden, Norway, and Denmark) show how open access models can work. Each country took a different approach, shaped by context, institutions, and market conditions (see Figure 2):

- **Finland** is transitioning from an expansion phase to a mature one. Investment rationale is the main driver behind building fiber infrastructure, including open networks. Financially backed companies are bringing open networks to areas that have traditionally been dominated by only a few telecom operators.
- **Sweden** was an early pioneer of open networks and has built one of the most open fiber markets in the world, mainly through municipality-owned networks.
- **Norway's** regulator stepped in to push dominant players to open their networks for competition in the service layer.

IN ADDITION TO CREATING BETTER MARKET CONDITIONS FOR CONSUMERS AND BRIDGING THE DIGITAL DIVIDE, OPEN ACCESS SUPPORTS THE EU'S CLIMATE TARGETS

- **Denmark** is following a market-led model, with innovative aggregator companies acting as platforms to make it easier for ISPs to reach new customers across a variety of networks.

These countries show how the open access model can take different forms, including investor-driven, municipal-driven, regulator-driven, and aggregator-enabled.

Figure 2. The state of open access in four Nordic countries

	FINLAND INVESTOR-DRIVEN	SWEDEN MUNICIPALITY-DRIVEN	NORWAY REGULATORY-DRIVEN	DENMARK AGGREGATOR-ENABLED
Phase	Moving from expansion to mature	Mature	Mature	Mature
Fiber history	Mobile-first for many years before focusing on fiber, now seeing a strong expansion	Municipalities started to build fiber because national telecom operator was slow to invest	Fiber originated in the 1990s from oil & gas industry	Expansion began in the 2000s
Network model	Has mostly been closed, but open networks are becoming common	Largely open	Mainly closed but moving toward openness via regulatory push	Began with closed networks but has embraced openness
Unique trait	Strong competition between open & closed network companies	Municipalities built their own networks with open access as a model	Utility companies & municipalities became the largest category of network owner	Closed networks have opened via aggregator platforms
Estimated open access % of total network	**~30%**	**~90%**	**~30%** (based on Telenor's network with mandatory wholesale access)	**~100%** (includes access via aggregator platforms)

Source: Arthur D. Little

3. THE VALUE OF OPEN ACCESS

Markets work best when consumers have a variety of options, and companies must compete to win their trust. In broadband, the open access model is one way to create this type of competition, as multiple ISPs can reach the same homes through a shared cable. Instead of building parallel fiber networks, ISPs focus on competing on price, quality, and service — not on who owns the cable in the ground.

This chapter explains how open access networks can contribute to creating a better society by benefiting consumers, ISPs, network owners, and the public.

BENEFITS FOR CONSUMERS

More choice

In an open network, switching ISPs is simple. Several ISPs offer services over the same fiber cable, so consumers can compare prices, speeds, and service packages. Switching between them is usually a matter of logging in to a portal or making a phone call. The fiber cable stays, but the ISP changes. Having multiple options on the same cable also boosts resilience, letting consumers quickly switch if their ISP exits the market, changes terms, or suffers a disruption.

In closed networks, assuming wholesale access is not used, consumers have limited choice. When a single company owns the fiber to the house and there are no other network providers in the area, the consumer is forced to buy Internet from that company, regardless of price or quality. To switch providers, consumers must wait for another company to physically build a street-level network (or move to mobile broadband or another type of fixed technology).

Lower costs, better service

The freedom to choose does more than improve convenience: it puts pressure on ISPs to deliver value for consumers. When customers can easily leave, ISPs must compete every day to retain them, which results in better service, lower prices, and more innovative services.

Markets with open access networks tend to have better pricing, as a natural effect of intensified competition for the same address. There are also lower building costs (e.g., no overbuild in which each company must spike its prices to get back its investment). The lower cost of network expansion tends to flow to consumers as lower prices. For example, Norway's Ministry of Digitalization and Public Administration released a commissioned report in 2024 highlighting that the country's broadband prices are much higher than its Nordic peers; the main explanation was that Norway does not have the open access model as part of its market dynamic.[3] Sweden has several innovative third-party websites[4] designed to benchmark broadband offers and present them in a simple way to consumers in each postal area, making it easy to find the best deal.

In markets with open networks, consumers are more likely to be offered bundles and mix-and-match services. For example, as a consumer, you might want ultra-fast broadband from one provider and a separate TV package. Offers can be tailored to each household's desires and setup, empowering consumers and encouraging ISP innovation. The open access model also increases customer satisfaction levels, since ISPs compete to deliver a better experience. One example is Ownit in Sweden, which sells only on open fiber.

> IT IS IMPORTANT THAT ONCE A NETWORK IS BUILT, IT IS USED AS EFFICIENTLY AS POSSIBLE

Ownit has been ranked number one in household broadband by the Swedish Quality Index (SKI) for many years, and ISPs Bahnhof and Bredband2 placed second and third, ahead of the large telecom operators that own closed networks.[5] In closed networks, companies have all the power and are thus less affected by complaints, making problems more likely to persist and harder to escalate. With no alternative, poor service tends to become the norm.

BENEFITS FOR NEW ISPs

Consumer reach

Open access creates a level playing field and lowers barriers to market entry, with all providers operating on nondiscriminatory terms. A new local or regional ISP can plug into an existing network and reach millions of homes overnight, then compete by offering a unique consumer proposition. In a closed network, that ISP must commit to costly overbuild or acquire the cables to each house, which requires (1) extensive coordination with authorities and (2) onboarding high-cost personnel with technical knowledge. This slows entries to new markets and ties up capital. With the open access model, cost per reached consumer goes down significantly, and expansion potential improves dramatically.

Able to compete on value rather than infrastructure

In open access networks, ISPs win by focusing on what's important to consumers: price, service, reliability, bundles, and niche propositions. Companies use their resources to create lower-cost offers rather than to dig new trenches, helping small challengers compete. In closed networks, rivalry tends to skew toward costly buildouts and lock-ins.

BENEFITS FOR NETWORK OWNERS

Lower investment risk

Building a fiber network takes time and is capital-intensive, with long-term investment horizons for network owners and investors. Therefore, it is important that once a network is built, it is used as efficiently as possible. An open access model lowers a network owner's ability to charge high consumer prices as a way to recover costs, but there's a case to be made for focusing on higher volume.

Closed networks commonly concentrate on a single ISP, which introduces risks associated with customer churn. Open networks introduce stability by not tying revenue to the success of a single ISP. Diversifying across many tenants can mean more traffic on the same fiber and more revenue potential for the network owner. For example, if one ISP loses a consumer, another may gain it, and the network itself remains in use. This reduces risk and fosters more predictable income. Network owners may be companies building and managing fiber or investors such as pension funds, private equity firms, or institutional asset managers.

Access to public funding

Open networks qualify for public grants, reducing an owner's up-front investment. This turns marginal areas into more attractive business cases — the public is willing to subsidize the owner to build there.

BENEFITS FOR THE PUBLIC

More value for communities

Governments play a critical role in expanding broadband access, and openness is a beneficial way to use public funds. Instead of funding overlapping infrastructure, regulators can focus on filling coverage gaps and ensuring that shared networks are open to everyone. This logic is reflected in the EU's rules, as projects seeking public funding must use principles of openness.

It is also enforced on the national level by regulators using public money to promote competition. Support of closed networks could fund local monopolies, indirectly encouraging higher prices. When public funds are involved, it is critical that the infrastructure aims to deliver long-term value for the community.

Open networks also play a role in ensuring that everyone can participate in the digital society. Without a fiber connection, many are locked out of opportunities, resulting in barriers to inclusion and economic development. Allowing ISPs to share infrastructure makes it more financially viable to build fiber in areas where a single provider could not profitably do so. Owners of closed networks are prone to leaving these hard-to-reach areas behind, lacking a clear business case. This occurs in small towns, rural villages, and low-density regions, with commercial builds often delayed or skipped altogether, widening the digital divide.

Networks with competing ISPs increase the likelihood that prices will be affordable for more consumers. Lower consumer prices help close the digital divide, with more able to afford fiber. This type of digital inclusivity creates ripple effects that tend to boost the local economy. In small communities, access to fast, reliable broadband can enable remote work, digital education, and better access to public services such as healthcare. Similarly, businesses can grow without relocating to a city, and families can more easily and affordably stay connected.

WHEN PUBLIC FUNDS ARE INVOLVED, IT IS CRITICAL THAT THE INFRASTRUCTURE AIMS TO DELIVER LONG-TERM VALUE FOR THE COMMUNITY

The public sector itself also gains from open networks. Public authorities such as municipalities, schools, and hospitals can negotiate better prices, often leveraging their size to receive better offers (a more effective use of taxes). Giving municipalities more options also reduces the likelihood they will become "locked" into a single ISP.

Less construction, easier permitting

Municipalities and authorities benefit from having only one network owner digging in the area rather than multiple companies. This means fewer permits to handle, less construction to coordinate, and fewer complaints from residents, letting local authorities focus on other priorities.

4. OPEN FIBER ACCESS IN THE NORDICS

The Nordic countries offer four paths toward broadband openness, ranging from city-led models to commercial companies building their own networks to regulatory reforms. By comparing how Finland, Sweden, Norway, and Denmark approached fiber deployment and competition, we can better understand how structural choices shape outcomes for consumers and society. This chapter examines what regulators and companies have done and reports on what those decisions have meant in practice.

Fiber coverage, which is the share of households that have access to fiber even if they are not connected to it, is nearing completion in most of the four countries. Sweden, Norway, and Denmark had a nationwide household coverage of 87%-90% in 2024, while Finland lags with 68% (see Figure 3). The take-up rate measures how much deployed fiber is actually used, calculated as the share of households with both fiber access and a fiber subscription. Norway and Sweden have high take-up rates (75% and 82%, respectively); Denmark and Finland have lower levels (56% and 66%, respectively).

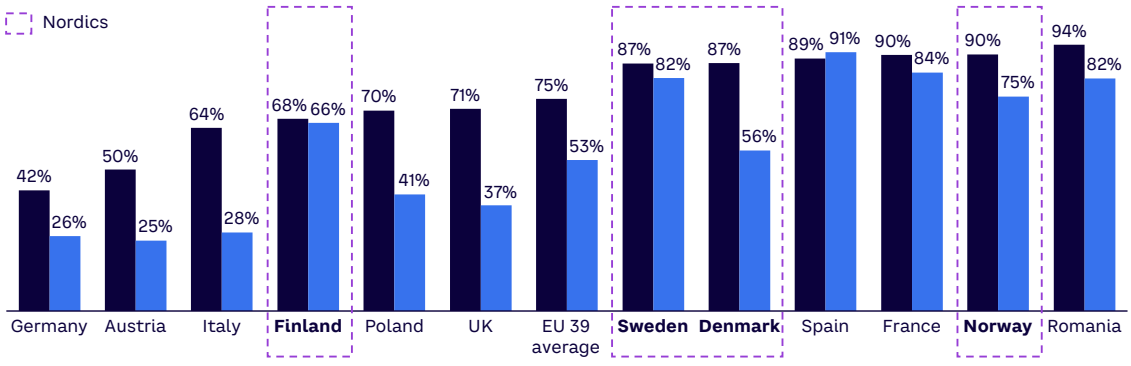
Higher take-up rates can indicate healthy competition in fiber that benefits the consumer, and more utilized networks are beneficial for the network owners. However, take-up rates depend on other factors as well, including competition from other technologies.

FINLAND

Finland is known for early and broad mobile connectivity. In 2024, around 95% of the country had 5G coverage. This mobile-first perspective contributed to holding back spending on fixed Internet during the 2010s, as Finland was early with unlimited data plans for mobile phones. That picture is changing quickly. By the end of September 2024, fiber network connections were available to 68% of all households, of which 75% had access to gigabit speed.[6] This has triggered a strong push to build fiber in cities, suburbs, and rural areas.

The market is transitioning from a phase in which fiber builders raced to be first into each area to a focus on optimizing networks.

Figure 3. Fiber coverage and take-up in selected European countries, 2024



Source: Arthur D. Little, FTTH Council Europe

Competition has become especially intense in suburban markets, where both the locally dominant company in each area and newcomers are rapidly signing up neighborhoods. A sharp rise in investments, up 88% between 2022–2023, underlines this momentum.[7] The companies that own consumer fiber networks are two of Finland's three national telecom operators (Elisa and DNA), which have long held dominating positions in broadband. Alongside them is a broad base of smaller local networks and organizations (around 120), including cooperatives and municipalities. Many smaller players are part of the fiber association Finnet, which competes with the large telecom operators.

Finland can be described as a fiber market driven by investment. The two companies that build open networks in Finland are Valokuitunen and GlobalConnect. Alongside Valoo, Lounea, and MPY, they form a group backed by private financial backers for further expansion and represent a majority of connected households.

Finland's ambition for fiber aligns with the EU's targets, and Finland has allocated public funding to support network expansions. Policy supports a shift toward open fiber, as networks built with aid must be open, in accordance with EU regulations. According to the European Commission, more than €550 million in public support, including parts of the EU recovery grant, were allocated to expand broadband (including fiber).[8] This has led to more construction in suburbs and rural communities.

Even though Finland has done an excellent job catching up with its neighbors, it will be challenging for it to reach the EU's goals. In its 2025 market review, Traficom said fiber is unlikely to cover Finland nationwide and estimates that coverage will most likely end up below 90%.[9]

It is important to consider that more than 95% of the population resides in the southern half of the country, meaning that building fiber to many of the remaining households involves running fiber over vast areas to cover Lapland in the north and hard-to-reach areas in the south. Public funds needed to accomplish this have not yet been committed.

Open access expanding in Finland

The open access model is still new in Finland and is being contested, as every local area is a potential competition between open and closed networks (see Figure 4), and companies are racing to sign up households. The open access model is championed by Valokuitunen (with around 25% market share) and GlobalConnect (with around 5% market share). The closed networks are used by two of the telecom operators, Elisa and DNA, along with several newcomers (e.g., Valoo, Lounea, BLC, and MPY). The third telecom operator, Telia, had open fiber networks via its old initiative Avoin Kuitu, which is now mostly integrated under Valokuitunen.

With closed networks dominating, Finland remains behind Sweden and Denmark in terms of open fiber. Traficom keeps an eye on the market and has imposed market-dominating remedies on several occasions to allow access on fair terms for other companies over their network.

In its 2025 market review, Traficom reported that there were 16 companies with a dominating position in at least one of 118 markets, out of Finland's total 309 municipalities. It also noted that because of new fiber entrants, increased network supply and competition for households is emerging at the tendering stage (before building).[10]

Figure 4. Select fiber network competitors in Finland

	Valokuitunen	elisa	DNA	Lounea	Valoo	GlobalConnect	BLC	MPY
Owns infrastructure (layer 1)	✓	✓	✓	✓	✓	✓	✓	✓
Has ISP business (layer 3)	–	✓	✓	✓	✓	✓	✓	✓
Main network model	**Open**	Closed	Closed	Closed	Closed	**Open**	Closed	Closed
Number of ISP choices on its fiber	~15	1	1	1	1	5	1	1

Note: Telia delivers to consumers via Valokuitunen's network and additionally mainly to businesses and multi-dwelling households via its own network
Source: Arthur D. Little

Valokuitunen: Finland's main network builder for open fiber

Valokuitunen was founded in 2020 as a joint venture between Telia and CapMan Infra, a Nordic infrastructure fund. The company owns the fiber and rents out cable space to Telia, which has commercial deals with other ISPs. It grew quickly, with its cables covering around 400,000 homes by 2024. A major boost came when it bought Telia's remaining household fiber networks in September 2024, adding more than 31,000 homes passed with a fiber connection from 72 municipalities. This signaled that Telia is stepping back so Valokuitunen can take a larger role in serving consumers.

When Valokuitunen comes to a town, households can pick from 15 ISPs on the same network without having to change equipment. Some of the ISPs offer bundled services, such as TV subscriptions or data security, as promotions. Healthy competition is evidenced by the fact that Valokuitunen ISPs experience around 20% churn every year, indicating that consumers feel comfortable switching. This encourages ISPs to lower prices and increase service quality.

SWEDEN

Sweden was a pioneer in fiber networks, and much of its success is owed to choices made decades ago. In the mid-1990s, Sweden's national telecom operator, Telia, was dominant in telephony and slow to invest in high-speed Internet, with many using technologies such as dial-up connections. Swedish municipalities were forced to take matters into their own hands. Local communities and utility companies across Sweden began building city networks based on the open access principle. The most notable of these is Stokab, the city network of Stockholm, which owns fiber cables connecting more than 90% of households in the greater Stockholm area.

Local city networks spread quickly across the country. Today, there are around 170, accounting for half of Sweden's fiber coverage to both homes and businesses; 90% are still owned by their municipality. The city networks are an important reason why Sweden has more than 600 registered fiber networks.[11]

Alongside the city network footprint, national operators such as Telia and Tele2, as well as network owner GlobalConnect, run large fiber networks (see Figure 5). Importantly, even these large private owners have leaned into openness as a profitable business model. A notable example is Telia's Öppen Fiber (Open Fiber), which is positioned as an open network with multiple ISPs. One reason is that even if Telia tried to shut out competitors, consumers would have other city networks as strong alternatives. Telenor has taken a step back from network owning in Sweden and now focuses on competing as an ISP, having sold its fiber network to GlobalConnect in 2022.

Sweden has shifted from a decade of heavy building to a mature phase focused on upgrades and selective consolidation. The remaining gaps are mainly in remote rural areas and are being addressed through public funding. In 2022 and 2023, an additional €275 million was earmarked for these areas.[12] Sweden is in a good position to reach overall EU gigabit targets for broadband coverage, although digging fiber to the final few houses will be disproportionately costly.

Figure 5. Select fiber network competitors in Sweden

	Telia	TELE2	GlobalConnect	open infra	~170 city networks
Owns infrastructure (layer 1)	✓	✓	✓	✓	✓
Has ISP business (layer 3)	✓	✓	–	–	–
Main network model	**Open**	Closed	**Open**	**Open**	**Open**
Number of ISP choices on its fiber	~20	1	>20	~20	~100

Note: Telia and Telenor offer fiber to apartment households through both closed and open networks; Telenor is now a minor network owner after it sold its single-dwelling household business to GlobalConnect in 2022
Source: Arthur D. Little

Open access brought high customer satisfaction levels

The Swedish Post and Telecom Authority (PTS), Sweden's regulator, has been supportive of open access, and its director highlighted how PTS's policy ensured digital access on fair terms to all ISPs.[13] It has also overseen the market closely and advocated measures to boost competition.[14] For example, PTS suggested in 2007 that Telia should separate its network ownership and ISP businesses to improve competition levels.[15] There have also been instances in which PTS intended to impose price regulation on some local fiber areas, but the European Commission blocked this because it thought PTS should not treat fiber in Sweden as one national market and that there are areas of good competition in the country.[16]

> **NETWORKS FOCUSING ON LEASING FIBER AND ENABLING ISP COMPETITION HAVE BEEN A COMPLEMENTARY FORCE**

City networks' investments and open fiber provision have been a positive development for consumers and network owners. Tele2 said networks focusing on leasing fiber and enabling ISP competition have been a complementary force and a good alternative to squeezing out private network builds.[17]

City-owned neutral infrastructure enabled ISP competition in Stockholm

Stokab, Stockholm's own fiber company, was founded in 1994 with unanimous political support. The idea was simple: in the interest of Stockholm's residents and all its businesses, the city would build a fiber network and lease dark fiber to anyone who needed it. Stokab customers take ownership of lighting the fiber and, in many cases, act as an ISP. Stokab stays out of the consumer business (layer 3) and the electronics (layer 2). The city network has more than 2 million km of fiber around the greater Stockholm region and has been referred to as a global benchmark for municipality ownership and open access fiber networks.

The network is designed to be expanded when there is a paying customer and a sound business case. To allow for future consumer needs, whenever Stokab digs, it lays extra cables in the ground (beyond the planned project number). This ensures that there is abundant capacity and has proven a successful strategy, ensuring Stokab is ready to quickly deliver to new customers and saving street-level construction costs. Moreover, by taking on digging costs, Stokab removes the main barrier to entry for newcomers.

Companies can instantly plug into existing fiber rather than fund excavations, accelerating time to market, reducing risk, and intensifying service-layer competition.

Stokab's neutrality created a large ecosystem, with more than 100 companies buying access to its dark fiber. Major players like Telia, Telenor, and Tele2 lease capacity from Stokab instead of burying their own cables. Broadcasters, data center operators, and property owners do the same. Stokab also played a supporting part in adapting to new technologies. For example, during the 5G buildout in Stockholm (2018–2020), mobile operators leased additional fiber to reach antennas quickly, instead of starting from zero. The business model has been quite profitable. In 2024, Stokab reported about €80 million in revenue, with a €35 million contribution going back to the municipality — a direct financial return to the city on top of indirect connectivity benefits. Stokab shows how open infrastructure can lower entry barriers for ISPs, preempt the need for overbuilding, generate stable returns for the local community, and enable competition to benefit consumers.

NORWAY

The demand for high-speed Internet in Norway first came from oil & gas companies operating around Stavanger in the late 1990s. A local utility company in the area, Lyse, started to supply fiber for the industry and later began expanding to households. Many local utility companies and municipalities began jumping on this opportunity in the early 2000s and built fiber networks in their own regions. In 2004, many of these organizations banded together under the brand Altibox, which is now the largest broadband provider in the country, with more than a third of all subscriptions (including fixed and wireless broadband).[18]

In contrast, telecom incumbent Telenor first focused on building a national copper network, then moved its focus to fiber as that technology became more popular. Telia also has a sizeable share of the market, mainly in cities and connecting enterprises. The only fiber network in Norway that gives access to other ISPs is Telenor, due to a mandate from Norway's regulator Nkom (the Norwegian Communications Authority). Telenor announced in mid-2025 that it is acquiring GlobalConnect's consumer fiber network, increasing its market share from around 22% to 29%.[19]

Norway's Internet access goals are in line with the EU's. The aim for 2025 is for every household to have a connection (any technology) of at least 100 Mbps. By 2024, Norway had reached 99%, and for fiber alone, the coverage was more than 90%. The target for 2030 is complete national coverage of at least 1 Gbps. This demonstrates the degree to which fiber has become the most popular technology in the broadband market.

Figure 6. Select fiber network competitors in Norway

	altibox	telenor	Telia	TAFJORD
Owns infrastructure (layer 1)	✓	✓	✓	✓
Has ISP business (layer 3)	✓	✓	✓	–
Main network model	Closed	**Open**	Closed	Closed
Number of ISP choices on its fiber	1	>5	1	1

Source: Arthur D. Little

The Norwegian government saw the value of widespread Internet adoption early on and has been supportive of digital infrastructure expansion. From 1999 to 2005, it set aside NOK 400 million to fund 400 projects, although this was mostly aimed at developing applications used with a broadband connection (e.g., an e-service for a municipality). Only a few of the funded projects were about building physical networks. Local counties later added NOK 750 million between 2007–2012 to support network builds in areas with difficult terrain. However, these networks were not explicitly required to be open, as the focus was to expand the reach of broadband (including fiber).[20]

Most of the remaining households to cover are in remote areas that will require additional funding. In 2025, the state allocated NOK 415 million to help close this gap. However, Nkom estimates that meeting the national target with fiber-only would require around NOK 12 billion.

Regulatory push triggered industry initiative toward open access

Norway's broadband market shifted from one large national copper network owned by Telenor, which was obliged to lease space to others, to 22 regional markets centered around fiber (see Figure 6).[21] In 2023, an Nkom analysis found that nine companies in 12 of the 22 regions had monopolistic market shares and indicated that they could be required to open their networks.[22] Additionally, the Ministry of Digitalization and Public Administration reported in 2024 that Norway's fixed broadband prices are higher than in Sweden, Denmark, and Finland, citing the lack of open access fiber as a key driver. The broadband price difference ranged between NOK 270 to 750 (EUR 23 to 64) more than the other countries.[23] Choice is limited in many regions: Nkom reports only around 4% of fiber-connected households have more than three ISPs to choose from.

Under pressure from new regulations, more broadband providers take a positive stance toward voluntary opening, according to Nkom.[24] In January 2025, Nkom reported that an opening on fair terms could avoid interventions, provided there is evidence of real competition.[25] As a result, major fiber network owners banded together in spring 2025 to form Fiberhub, a neutral platform to open their networks using a standard agreement. This is a major step toward a more open market.

Fiberhub helps open fiber take shape in Norway

Owned by Lyse, Altibox is one of Norway's leading fiber brands. Through a partnership with around 40 local companies across the country, it delivers Internet, TV, and telephony. This model has allowed Altibox to connect more than 750,000 fiber customers, a number comparable to Telenor's footprint. For many years, Alitbox's regional partners operated closed networks. In several regions, the local Altibox partner was essentially the only option.

In 2023, Altibox announced it would open its fiber networks to other ISPs, a step welcomed by Nkom. Altibox's decision was driven both by consumer demand and a proactive policy response. In 2024, Altibox (through Lyse Fiber) joined with other regional network owners to create Fiberhub.

The platform is set to launch in spring 2026 as a marketplace where network owners can open their networks to any ISP on standard terms. Eight large regional fiber networks have announced their involvement (Altifiber, Lyse Fiber, Eidsiva Bredbånd, Enivest, Haugaland Kraft Bredbånd, NTE Telekom, Signal Bredbånd, and Viken Fiber), and five are expected to launch in 2026 (NTE Telekom, Lyse Fiber, Eidsiva Bredbånd, Haugaland Kraft, and Enivest). Nkom expects that when Fiberhub is operational (assuming Telenor's network remains open), about two-thirds of consumer fiber subscriptions will be on open access networks. This marks a shift away from Altibox's partner model toward a more open way of working. The net effect is that open fiber, once rare in Norway, is set to increase dramatically, providing more choice for consumers.

DENMARK

Denmark arrived later to fiber than Sweden and Norway, but it has caught up fast. In the 2000s, broadband was delivered mainly via copper from incumbent telecom TDC. In the following years, a group of regional electricity and utility companies emerged; many were cooperatives or had links to a municipality and started building fiber as a natural extension of their grid.

Seeing utility networks start to win customers, in 2010, TDC shifted its investment toward fiber. By 2024, about 88% of households had fiber access, a dramatic upswing compared to 45% in 2016. Consolidation played a part: in 2019, two large Jutland utilities (SE and Eniig) merged to form Norlys, which is now Denmark's largest fiber owner with more than 900,000 households. The target for 2025 is to provide all households with broadband of at least 100 Mbps, with 98% having gigabit speeds.

Denmark's fiber landscape has become a patchwork of regional companies alongside large private networks. The utility companies were often the only builder in their area, so they held strong local positions.

In 2019, incumbent private telecom TDC split into TDC NET, a business focused on leasing fiber space at wholesale to other ISPs, and Nuuday, an ISP focused on consumers (through brands such as YouSee and Hiper). This split indicated a shift toward separating infrastructure from services. In June 2025, Norlys similarly divided itself into an infrastructure unit that runs the network (rebranded Sinal), with Norlys as the ISP business.

Many utilities began by owning the fiber and selling the Internet on top, but most network owners now rent access to external ISPs, often alongside their own ISP. Denmark now relies on standardized wholesale (layer 2) and centralized interfaces, such as OpenNet, that connect many networks and ISPs. Providers increasingly share one fiber in a village instead of laying parallel networks.

As of 2025, Denmark has high fiber coverage, with ongoing build in the remaining rural pockets. Expansion is mainly fueled by private investments from companies such as TDC NET and regional utilities companies. This is further supported by the state-owned National Broadband Fund, which supported hard-to-reach areas with a €10 million investment in 2024.[26]

Open access now the de facto model

Denmark's fiber market has come to embrace open access, although via a gentle regulatory push. In effect, most of Denmark's households benefit from the openness that allows aggregator platforms. These platforms act as facilitators between a network owner and ISPs to foster openness and let ISPs compete for customers across networks. For example, a customer in Aalborg can choose between a fiber subscription from the local provider and other ISPs. Telecom operators such as Telenor, Telia, and Orange face off against smaller challengers such as Fastspeed, Kviknet, and Hiper.

Three aggregator platforms have partnerships with networks across Denmark: OpenNet, TDC NET, and Fiberportal. Norlys, the largest network owner, has been a major driver of aggregator platforms. Since it opened its network in 2019, it has allowed more than a dozen ISPs to sell over its network through its independently managed platform company, OpenNet. TDC NET has its own platform and provides access to ISPs Telenor and Fastspeed. The third aggregator, Fiberportal, is Fibia's aggregator model, which has three network owners (see Figure 7).

Network owners benefit, too. When Energi Fyn opened its network in 2021, take-up rose, and the network quickly went from one to 10 ISPs, including all the large national brands; many consumers signed up who would not have otherwise.[27]

DENMARK'S FIBER MARKET HAS COME TO EMBRACE OPEN ACCESS, ALTHOUGH VIA A GENTLE REGULATORY PUSH

This logic of increased use is echoed by Norlys, which says consumers should be able to select between a wide range of quality providers to keep them interested in using fiber rather than other technologies.[28]

The regulator, Erhvervsstyrelsen (Danish Business Authority), has used open access as a competition lever, starting in 2009 by mandating the opening of TDC's cable broadband networks. This was approved by the EU, which noted that Denmark was in a unique situation because TDC controlled both the telecoms and large parts of the cable network.[29] In recent years, as Norlys launched its OpenNet initiative, Erhvervsstyrelsen kept an eye on the market to steer it toward openness. In a market analysis from 2021, it noted there were 21 geographic markets in Denmark and that 14 operators had a monopolistic position in 17 of the markets.[30] Later, after commitments from Norlys and Fibia to open their markets and pushback from the European Commission about sufficient competition in many markets, it applied mandates to only a handful of companies.[31]

Figure 7. Select fiber network competitors in Denmark

	NORLYS	tdc net	Fibia	GlobalConnect	EWII	nord energi	AURA energi
Owns infrastructure (layer 1)	✓	✓	✓	✓	✓	✓	✓
Has ISP business (layer 3)	✓	✓	✓	-	✓	-	✓
Main network model	Open	Open	Open	Open	Open	Open	Open
Number of ISP choices on its fiber	>10	>10	~10	~10	~10	~15	<5

Source: Arthur D. Little

OpenNet pushed market access to 1 million households

OpenNet went live in 2019 as a Danish platform to enable ISP access to other companies' fiber networks. OpenNet is an independent company owned by Norlys and operates as a neutral hub. Its purpose was to pre-empt possible regulations and start an industry initiative to make it easy for network owners and ISPs to work together on equal terms. In the beginning, there were nine partners; there are now 26, covering more than 1 million addresses nationwide. The OpenNet platform sits between network owners and ISPs as a neutral facilitator. It enforces nondiscrimination between the partners and offers a standardized package (technical, commercial, and processual), so partners can connect once and serve many. Retail pricing and offers are set independently by each ISP. The result is faster ISP entry, less admin for network owners, and more choice for consumers.

Case studies shared with ADL by OpenNet in September 2025 show that local markets with a closed network experienced an increase of more than 410% in weekly orders when the network opened access via OpenNet, with 380% coming from challengers and 30% coming from the network owner's ISP. This demonstrates that even a local company can increase sales by opening markets, as the marketing around fiber boosts all ISPs. Another example of enabled competition was the entry of the first foreign ISP in Denmark (Bahnhof in 2024). Overnight, the Swedish ISP gained access to more than 1 million potential customers in OpenNet's partner networks. OpenNet shows how open access can be delivered on a national scale: large owners partner and commit their networks to openness, a neutral platform standardizes the access, and consumers gain freedom of choice.

CONCLUSION — 4 PATHS TO OPEN ACCESS

Sweden, Finland, Norway, and Denmark took different paths to the same destination. The common factors among all are neutral infrastructure, simple ways to connect, and credible rules that keep access fair:

- **Finland** demonstrates that the open access model is investable and scalable, with two major companies going this route. At the same time, closed networks continue to be built, keeping Finland as a majority closed network market.
- **Sweden** proves that combining publicly owned city networks with large, private sector open initiatives can help competition flourish at scale on layers 2 and 3. When the foundational infrastructure is open, companies have a lower threshold to enter a market and compete for customers.
- **Norway** shows us that a market can proactively respond to guidance from a regulator and initiate solutions for openness, given a gentle push from regulators.
- **Denmark** demonstrates how an aggregator can stitch together many regional networks into larger markets to open up the market for consumers. It is proof that splitting network from service can be commercially viable and that being a market pioneer for openness can create scalable advantages.

The open access model addresses several structural market challenges. It focuses on introducing competition for the benefit of consumers, using existing networks efficiently to make every invested euro more valuable, and enabling virtually everyone to be digitally connected.

ENDNOTES

1 European Commission. "Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 Establishing the Digital Decade Policy Programme 2030." EUR-Lex, 14 December 2022.
2 European Commission. "The European Green Deal." EUR-Lex, 11 December 2019.
3 "Norway Has the Highest Mobile and Broadband Prices in the Nordic Countries — Asks Nkom to Consider New Measures." Press release, Norwegian government, 18 November 2024.
4 Examples include bredbandsval.se and bredband.se.
5 SKI website, 2024.
6 "Fibre Optic Connections Available to Nearly 2 Million Households." Traficom (Finnish Transport and Communications Agency), 14 February 2025.
7 "Investments by Telecommunications Operators in Fixed Networks Increased Significantly." Traficom, 25 September 2024.
8 "Broadband Aid Has Accelerated the Availability of High-Speed Connections in Finland — Nearly 30,000 Kilometres of Optical Fibre, EUR 60 Million of State Aid." Traficom, 17 May 2022.
9 "Market Analysis of Retail and Wholesale Markets for Data Transmission Services in Fixed Networks." Traficom, 22 March 2024.
10 Ibid.
11 "BGP Toolkit." Hurricane Electric Internet Services, accessed 2025.
12 "The Swedish City Networks: A Wholesale Success Story." Netadmin, 4 April 2024.
13 "Good Broadband Coverage in Sweden — Challenges Remain in Sparsely Populated Areas." PTS, 11 April 2025.
14 Blondeel, Yves. "Sweden: PTS Puts Forward New Broadband Strategy, Advocates Functional Separation and Fibre Access." T-Regs, 8 June 2021.
15 "Bill 2007/08:73: Functional Separation for Better Broadband Competition." Swedish government, 13 March 2008.
16 "Commission Blocks Swedish Regulation of Fibre Networks, Requesting Detailed Analysis of Geographic Markets." European Commission, 10 February 2020.
17 "Statement on Questions about Today's and Future Challenges in the Field of Connectivity." Swedish government, 21 August 2023.
18 Jungermann, Fredrik. "Assessment of Norwegian Fixed Broadband Pricing in a Nordic Context — 2024." Tefficient, 18 November 2024.
19 "Norwegian and Swedish Broadband Initiatives, 1999–2005." Høykom (The Research Council of Norway), September 2005.
20 "Results of Work with Broadband in the County Municipalities." Nexia International, February 2013.
21 "The Authorities Believe You Are Paying Too Much for the Internet — Changes Are Now Being Announced." Nkom, 15 June 2023.
22 "Analysis of the Wholesale Market for Access to Fixed Networks." Nkom, 14 June 2023.
23 "Norway Has the Highest Mobile and Broadband Prices in the Nordic countries — Asks Nkom to Consider New Measures." Norwegian government, 18 November 2024.
24 "The Broadband Regulation May Be Moving Toward a Shift." Nkom, 23 January 2025.
25 "New Analyses of the Broadband Market." Nkom, 12 February 2025.
26 "Denmark's Strategy for Nationwide High-Speed Broadband by 2025." Telecom Review Europe, 26 September 2024.
27 "CASE: Open Access Fiber Network Increased Energi Fyn's Take-Up Rate." Icotera, 8 March 2023.
28 Dux, Simon. "Swedish Bahnhof Enters Danish Broadband Market with Norlys." Mobile Europe, 4 September 2024.
29 "Telecoms: Commission Endorses New Danish Rules to Open Wholesale Access to Cable Broadband." European Commission, 12 March 2009.
30 "End of the In-Depth Investigation into the Proposed Regulation of Some Regional Fibre Networks in Denmark." European Commission, 2 February 2022.
31 "Overview of Decisions in the Wholesale Broadband Market 2021/2022." Erhvervsstyrelsen, October 2023.

ARTHUR D LITTLE

Arthur D. Little has been at the forefront of innovation since 1886. We are an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients to build innovation capabilities and transform their organizations.

Our consultants have strong practical industry experience combined with excellent knowledge of key trends and dynamics. ADL is present in the most important business centers around the world. We are proud to serve most of the Fortune 1000 companies, in addition to other leading firms and public sector organizations.

For further information, please visit www.adlittle.com.