How utilities are powering Denmark's digital revolution

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Denmark today is one of the world's leading digital societies. It's gone from being a country with 98% DSL internet access in 2000 to leading in fiber broadband in 2021, benefitting from all the advanced services and opportunities fiber brings. Denmark's utility companies must take the credit for wisely investing heavily in fiber at the start of the 21st century. As a result, broadband is now as important and profitable to them as their energy operations. Read on to see how this success story happened.

Digital Denmark's rapid rise

The fundamental enabler of a digital economy is, of course, connectivity and Denmark not only leads Europe but is also one of the best-connected nations in the world. It ranks third in the EU for digital competitiveness, according to the European Commission's latest Digital Economy and Society Index (DESI)[1].

So how did Denmark become so enviably well-connected? Their digital development strategy is a shining example of what's possible when utilities are encouraged to compete in the connectivity space. Today, 99% of all homes and businesses in Denmark have a fixed broadband connection. 94% have access to download speeds of 100 Mb/s, with a remarkable 72% being served by fiber broadband[2]. It's all a far cry from where Denmark began its digital revolution.

Electrifying the broadband market

Denmark's digital revolution began in the early 2000s when the Danish government made the decision to liberalize the energy market. Regional utility companies were required to privatize electricity production and separate it from distribution activities, delivering a huge €10 billion windfall for the utilities.

Most chose to use this capital to invest in fiber. As 98% of the market at that time was DSL, there was a significant opportunity to create new revenues through consumer, business and wholesale fiber broadband services.

Point-to-point (P2P) fiber technology was initially most favored because it was familiar to utility company engineers used to managing LAN and WAN networks. Alcatel (now Nokia) was one of the first technology suppliers to partner with Denmark's utilities. However, as demand for fiber broadband grew, the limitations of P2P began to show. The high performance it delivered was outweighed by the high cost-to-connect and its limited ability to scale.

Utilities began to switch to GPON in 2009; the business case for it in a growing market was undeniable, delivering 20% lower CAPEX, half the OPEX and the ability to connect 40 times more subscribers per node. Before long, all utilities had made the switch with Nokia becoming the majority provider of GPON technology in Denmark.

[1] Source: European Commission, **The Digital Economy and Society Index (DESI) 2020**

[2] Source: **The Danish Energy Agency**

Table 1: Comparison of GPON and P2P fiber (source: Waoo, 2019)

	GPON	P2P
CAPEX per subscriber port	45 DKK	300 DKK
OPEX	50%	100%
Max. # subscribers per shelf	16,384	400
Max. # subscribers per rack	49,152	1,600
Power cost per subscriber per year for a node with 1,600 subscribers	4.12 DKK	61.53 DKK
Reach	18-60 km	10-20 km
Relative number of active ports	1	4

Over time, the utilities' investment in fiber also stimulated incumbents to invest. Fiber deployment to homes in Denmark grew from over 54% in 2015 to over 70% in 2019. That's remarkable given the physical challenges presented by Denmark's geology. Even more remarkable is that half of that coverage is enabled by utilities.

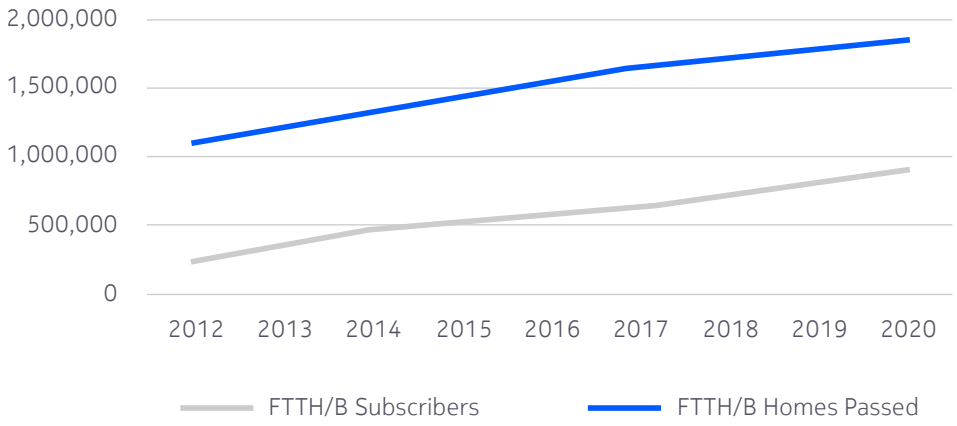
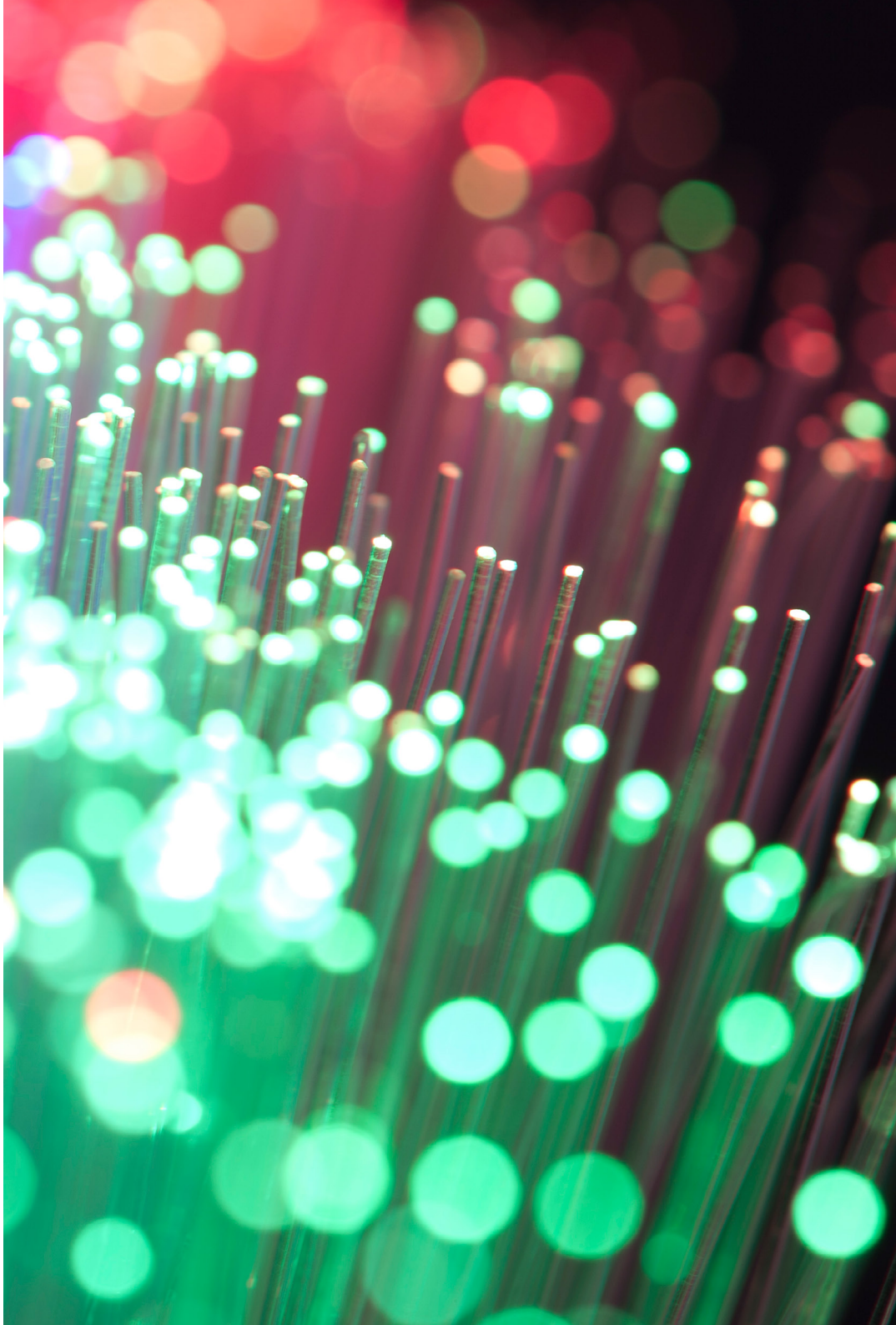


Figure 1: Denmark FTTB/H market landscape (source: IDATE 2021)



Reshaping the business of broadband

In 2010, 15 of Denmark's regional utilities joined forces to create Waoo. This product and marketing organization was designed to provide broadband, IPTV and telephony services over the utility companies' fiber networks.

The creation of Waoo has both supply-side and service-side advantages. It's a customer-facing brand, providing over-the-top services to subscribers while paying the utilities for physical connectivity. Working through a single organization gives utility companies greater purchasing power for television and video rights, significantly improving their IPTV offer to customers, at a considerably reduced cost. Having a single brand dedicated to selling and marketing services for all utilities makes attracting and retaining customers much easier too.

Waoo currently has half of the Denmark fiber market and includes energy companies: NEF, Energi Fyn, Sydfyns Elforsyning, Bredband Nord, FIBIA Vest, AURA Fiber, EnergiMidt, TREFOR, FIBIA Ost, and TDC Fiberne.

In 2017, some of the bigger Danish utilities created another organization called OpenNet, in order to sell wholesale fiber connectivity to other service providers. This increased the penetration and usage of existing infrastructure, increasing ROI while enabling service providers to reach new subscribers without the significant investment of deploying their own connectivity.

The acceptance of this kind of business model, which separates network infrastructure and provision of service, has grown. After all, the most financially stable and lucrative part of broadband provisioning comes not from the competing subscribership services whose appeal and profitability continuously fluctuate, but from the underlying customer connectivity supporting and enabling it.

No wonder the utilities have enjoyed such good business results, often generating higher revenues and profits from broadband than electricity distribution. It's the first investor to provide a fiber connection to a customer that owns the infrastructure and makes a strong and stable return on their investment, deterring others. Making a return on deploying a second connection is so much harder.

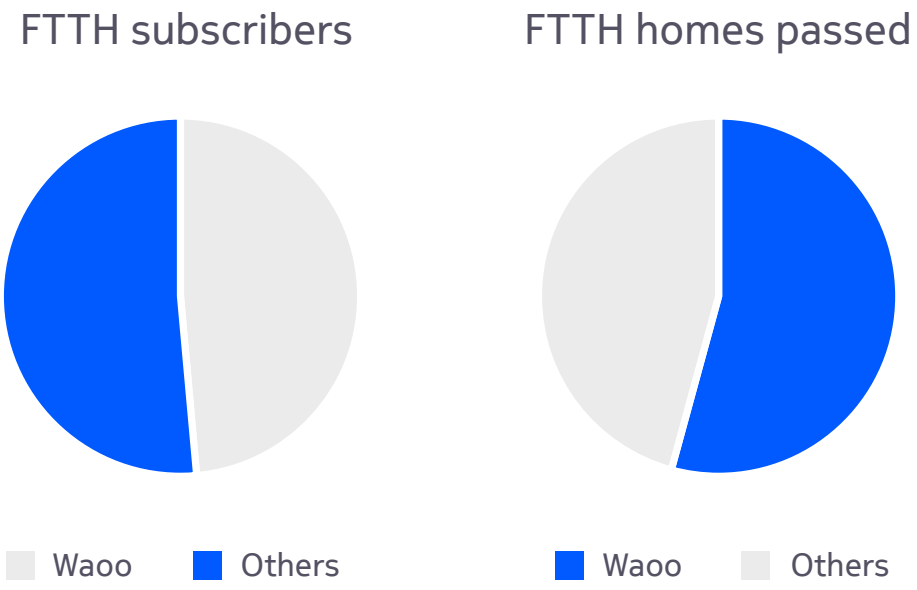


Figure 2: Waoo's position in Denmark FTTH market (source: IDATE 2021)

Allowing alternative operators is the smart way forward

The profound influence of utilities in this Danish digital story provides a textbook example of the benefits of allowing alternative operators into a market.

- **Accelerated fiber penetration**. The utility companies' decision to invest in fiber broadband was the catalyst for a huge surge in fiber penetration across the country, with incumbent operators also increasing their investments in response.
- **Technology agility and fit**. Having started with P2P fiber, the speed at which utilities scaled and switched to the business benefits of GPON set a good technology direction for the market.
- **Monetizing with new business models**. Danish utilities have consistently demonstrated new ways to monetize their network assets and shape the business of broadband, for example separating network infrastructure from service provision with Waoo and providing wholesale fiber to other operators.
- **Customer choice**. These innovative business choices have increased competition and given customers rapidly increasing bandwidth and a far greater choice of services, for a lower cost.
- **Socio-economic benefits**. The utilities' decision to invest in fiber broadband was the starting point for Denmark becoming one of the world's leading digital societies, with all the wealth and opportunity that reliable connectivity brings.
- **Support in the pandemic**. Broadband proved to be essential for keeping work, shopping, education, healthcare and much more going during the lockdowns.

The next normal should have fewer digital divides

As much of the world enters a new 'post pandemic' phase, government regulators are being encouraged to structure their broadband market and new funding so power utilities can assume a greater role in reducing the digital divide. Everyone deserves next generation access – and fiber connectivity for a smarter, more efficient automated grid also delivers the safe, reliable high-quality power and decarbonization the world needs.

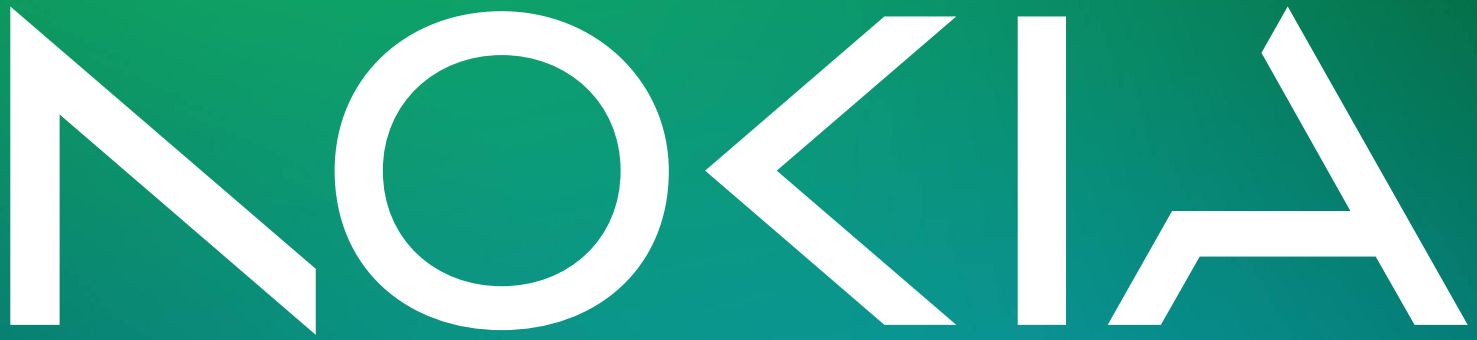
Right now, Denmark is really showing the world what's possible when utilities focus on further enriching the lives, competitiveness and future of their existing electric customers through broadband.

Nokia OYJ
Karakaari 7
02610 Espoo
Finland

Tel. +358 (0) 10 44 88 000

CID: 210542

nokia.com



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