

Telecoms answer the call for a sustainable business model

Our economy can become more sustainable if we lower our electricity consumption. KPN and Telecom Italia show the way forward with a substantial reduction in electricity use. Telefonica and BT are less successful. In this article, we describe the transition to renewable electricity use and energy-saving options in both fixed and mobile networks



Telecom operators use electricity but aim to lower its consumption

While we enjoy the benefits of being able to make an instant connection to others, we seldom realise that this is facilitated through networks that are almost always switched on. And these networks need to be powered with electricity. According to the GSMA (an industry trade body for mobile network operators), 2-3% of the global energy consumption comes from the telecoms industry. The telecom sector uses this energy mainly to run its telecom networks. As we show below, there is a willingness within the telecom industry to reduce its carbon footprint.

This is also important because telecom providers are a provider of services to most other

industries. Since an increasing number of industries disclose their climate footprint, they look to lower their emissions. They can do so through procuring services from energy-efficient companies or companies that procure renewable energy, which does not emit greenhouse gases. Customers searching for suppliers with a relatively small climate footprint are an opportunity for telecom operators. Nevertheless, there is also a financial benefit from reduced spending on energy, albeit small. We have previously estimated that energy costs for the sector were a relatively small part of the overall cost base, which includes depreciations. Around 2% of the total cost was energy-related, [according to our earlier estimates](#). Finally, we also expect that green credentials could also benefit the brand, as consumers are likely sensitive to sustainability efforts. According to PwC's 2021 Consumer Intelligence Survey, 76% of respondents expect they will search for alternatives when companies neglect the environment, employees, or the community in which they operate.

Many telecom operators have renewable electricity targets

As a start, many telecom operators that saw the need to lower their ecological footprint, began reporting on their energy consumption. Already in 2019, the GMSA announced that many mobile telecom operators would start disclosing their climate impacts. They have also started consuming renewable energy years ago for some of their operations, to reduce the emissions coming from their energy consumption. According to the European Telecommunications Network Operators' Association (ETNO), many European telecom operators target to reach their net-zero goal by 2030 for their Scope 1 and 2 emissions and 2040 for their Scope 3 emissions, as can be seen in the table below. Also, many green bonds have been issued throughout the last years. The proceeds of these notes are ear-marked for investment projects that increase their energy efficiency. Examples of companies issuing green bonds are Vodafone, KPN, Proximus, Telefonica and Orange.

Many telecom companies aim to have net-zero emissions

	Scope 1 and 2	Scope 3
BT	2031	2041
Deutsche Telekom	2025	2040
KPN	2030	2040
Orange	2040	2040
TDC	2028	2030
Telefónica	2040	2040
Telenor	2030	2045
Telia Company	2030	2040
TIM Group	2030	2040

Source: ETNO (2024)

Note: These are company target dates. The Science Based Targets initiative (SBTi) website provides current information whether the SBTi has validated the net-zero target.

Telecom networks drive energy consumption of telecom operators

The energy consumption of communication networks is the main driver of the overall energy consumption of telecom network operators. KPN reports that 95% of its electricity consumption is used for its mobile and fixed networks. There are a few other domains where they can save energy, such as the cost of heating and transportation, but this will have a relatively small effect, given the limited contribution to the overall number. In the following sections we'll dive into the energy consumption of fixed and mobile networks and will touch upon the energy efficiency of

data centres and other energy uses.

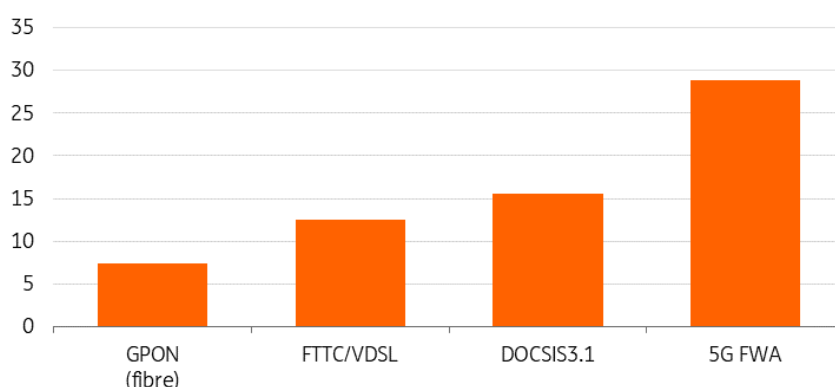
Fixed networks can become more energy efficient

The employment of fibre technologies has enabled a major improvement in the energy efficiency of fixed networks. Legacy technologies, such as full copper networks, are much less energy efficient. However, fibre investments only help to reduce the overall electricity consumption when legacy (copper) networks will be switched-off. Interestingly, fibre networks also offer other important benefits, such as much higher speeds and a high reliability. Fibre connections can reach speeds of 1Gb/s to 10Gb/s, whereas speeds of xDSL solutions (a family of copper/fibre solutions) are limited to tens or sometimes a few hundred Mb/s. This derives from the fact that a data signal can travel over longer distances through a fibre cable than through copper without amplification, while a signal over a fibre cable is not prone to magnetic interference. These characteristics imply lower maintenance costs and few repairs, which also helps to lower the environmental footprint because maintenance workers do not have to travel.

As research by consultant Analysis Mason shows, a fibre line based on GPON technology requires about half the energy as a Docsis3.1 based network, while a GPON line requires c.42% less energy than a VDSL-based network. An upgrade to networks based on fibre technologies therefore also lower the CO2 emissions. Telefonica was one of the first companies to recognise the benefits of lower power consumption of fibre solutions and rolled out a vast fibre network throughout Spain. Contrary to our expectations, we did not find an overall reduction in electricity use for Telefonica Spain, as we will show below. Causes are related to a delayed copper switch-off and Telefonica's own objectives. However, another company investing heavily in its fibre grid KPN does report a lower overall electricity consumption.

Fibre provides an energy efficient fixed broadband connection (Watts per line)

Power consumption of network and customer premises equipment per line at full usage



Source: Analysys Mason

Mobile networks can become more energy efficient

When evaluating the energy uses of mobile telecom companies, the Radio Access Network (RAN) stands out. The RAN is the key enabler of mobile communication as it connects users to the core network. Three main components can be distinguished: antennas, radio equipment and baseband

units. The baseband units are essential pieces of equipment to process and manage data traffic exchanged between the customer and the core network. Most of the energy utilised by a mobile site is being used by the RAN, about 60% according to McKinsey. Many innovations have taken place throughout time to enhance the efficiency of the RAN equipment. For example, an innovation by Ericsson reduced the energy consumption of a 5G radio by 40%. The triple-band, tri-sector radio replaces nine legacy radios. Energy use can also be reduced through shared use of RAN equipment. Orange argues that a RAN sharing agreement can reduce energy consumption by 20%-30%. In Poland, Orange shares its RAN with T-Mobile. This has led to increase in the energy consumption per site by 14.5%, but the number of sites has been reduced by 20%. Also, the number of sites should have been doubled to reach a similar quality of service as without the RAN sharing.

Other ways to reduce energy consumption of mobile equipment are antennas exhibiting a traffic-dependent energy use, more efficient cooling, and an improved support for optimised energy consumption in line with varying data traffic. However, as 5G uses more frequency bands and needs more sites, this may offset the benefits from energy conservation measures. There are therefore two views on the electricity needs of future mobile networks, as also articulated by the GSMA. Electricity consumption could go down because of more efficient equipment. However, the opposing view is that consumption goes up, because of better mobile coverage (a higher network density) at multiple frequency bands. We will show below that we also find opposing patterns in the data, with BT showing an increase in electricity consumption, while KPN brings its electricity needs down. Nevertheless, it is clear that more efficient equipment is key to lower electricity consumption.

Other services also require energy

The other uses of energy by telecom operators are mainly data centres, transportation services and buildings. Data centres are an important feature of telecom networks, but not the component requiring most energy. Note that the large data centres are mostly operated by technology companies, telecom companies have often sold them. For now, we suffice by stating that telecom operators should employ data centres with a high energy efficiency, as the procured services are included in the Scope 3 emissions of telecom operators. We have provided a more elaborate discussion around data centres in a [previous article](#). Other ways a telecom operator can save energy are through the use of energy-efficient buildings and an efficient use of transportation.

Reducing electricity consumption is clearly possible as KPN and Telecom Italia show

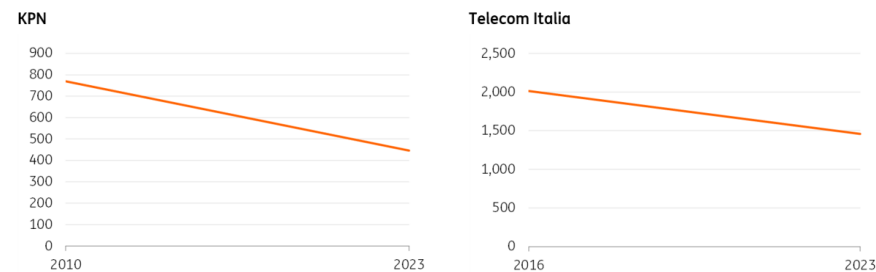
Some companies, like KPN and Telecom Italia managed to get their energy consumption down, despite increasing traffic. The energy consumption of KPN is 42% lower than in 2010. Note that KPN only procures green electricity coming from local and European wind farms. 95% of KPN's electricity consumption is consumed in the mobile and fixed networks. The 7% lower electricity consumption in 2023 mainly came from improved energy efficiency of networks. In 2022, consumption was 5% lower, while in 2021 KPN reported a 12% decline in electricity consumption related to the phasing out of a legacy (TDM/PSTN) telephone network and the migration from a site in Amsterdam to other sites. However, now that KPN will activate additional 5G spectrum, we expect that it will become more difficult for KPN to save energy going forward, especially with a strong increase in mobile data traffic and potentially new 5G services. Although we do expect KPN to meet its 2030 energy reduction target target, it will be interesting to see how it manages the

future capacity growth of its mobile networks.

In Italy, Telecom Italia uses 28% less energy than in 2016, while 65% of its Italian electricity consumption was based on renewable energy. Telecom Italia works to increase the efficiency of its infrastructure through eco-efficient technologies and site decommissioning. It has reduced its energy consumption by 28 GWh through the decommissioning of 56 fixed network exchanges. It has also decommissioned c.19,000 mobile network sites leading to savings of c.117 GWh. Also, over 13,000 public telephone cabins are no longer in use. The decommissioning of sites, therefore, has saved 145 GWh of energy consumption. A further 50 GWh was saved due to energy efficiency measures. This shows the way forward for other companies, as not all companies are there yet.

KPN and Telecom Italia did manage to lower their electricity consumption

(Gwh)



Source: Company data

Electricity consumption is not down everywhere, just look at Telefonica and BT

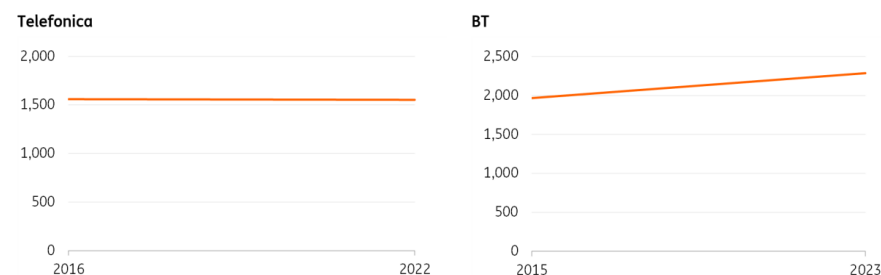
Contrary to the excellent initiatives at some of the leading companies, energy consumption has not been reduced at some other companies. Despite rolling out energy efficient fibre, Telefonica did not manage to get its domestic electricity use down – it has remained at the 2016 level. The more positive news is that 50% of Telefonica’s power use for its technical buildings is from renewable power. More strikingly, BT reported a 16% increase in electricity consumption in the UK since 2015. The good news is that almost 100% of its domestic electricity consumption is from renewable energy sources. To us, it is not immediately clear why BT is using more electricity and why Telefonica did not manage to get its power consumption down. BT reports that its main focus is to lower emissions through purchasing renewable energy and it is making good progress in that regards.

With respect to electricity consumption, BT does mention that it is constructing more energy-efficient fixed and 4G/5G networks, while switching off legacy ones, but it does not seem to provide more detail on its efficiency progress. Telefonica aims for a stable electricity consumption in Spain while growing its data traffic. As the full copper switch-off is happening in 2024, the improved energy efficiency due to the copper switch-off is not yet in the data. Also, it is likely that an improved coverage for 5G is increasing Telefonica’s electricity consumption. Decommissioning legacy sites and legacy infrastructure is sometimes difficult because of competition regulations. It is also possible that the companies are rolling out additional mobile sites to increase 5G coverage or are not using the most efficient equipment. However, as industry leaders are steering the way

forward, this indicates to us that the lagging companies can also step-up their game and become less energy intensive.

Telefonica and BT did not manage to lower their electricity consumption

(Gwh)



Source: Company data

Author

Jan Frederik Slijkerman

Senior Sector Strategist, TMT

jan.frederik.slijkerman@ing.com

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