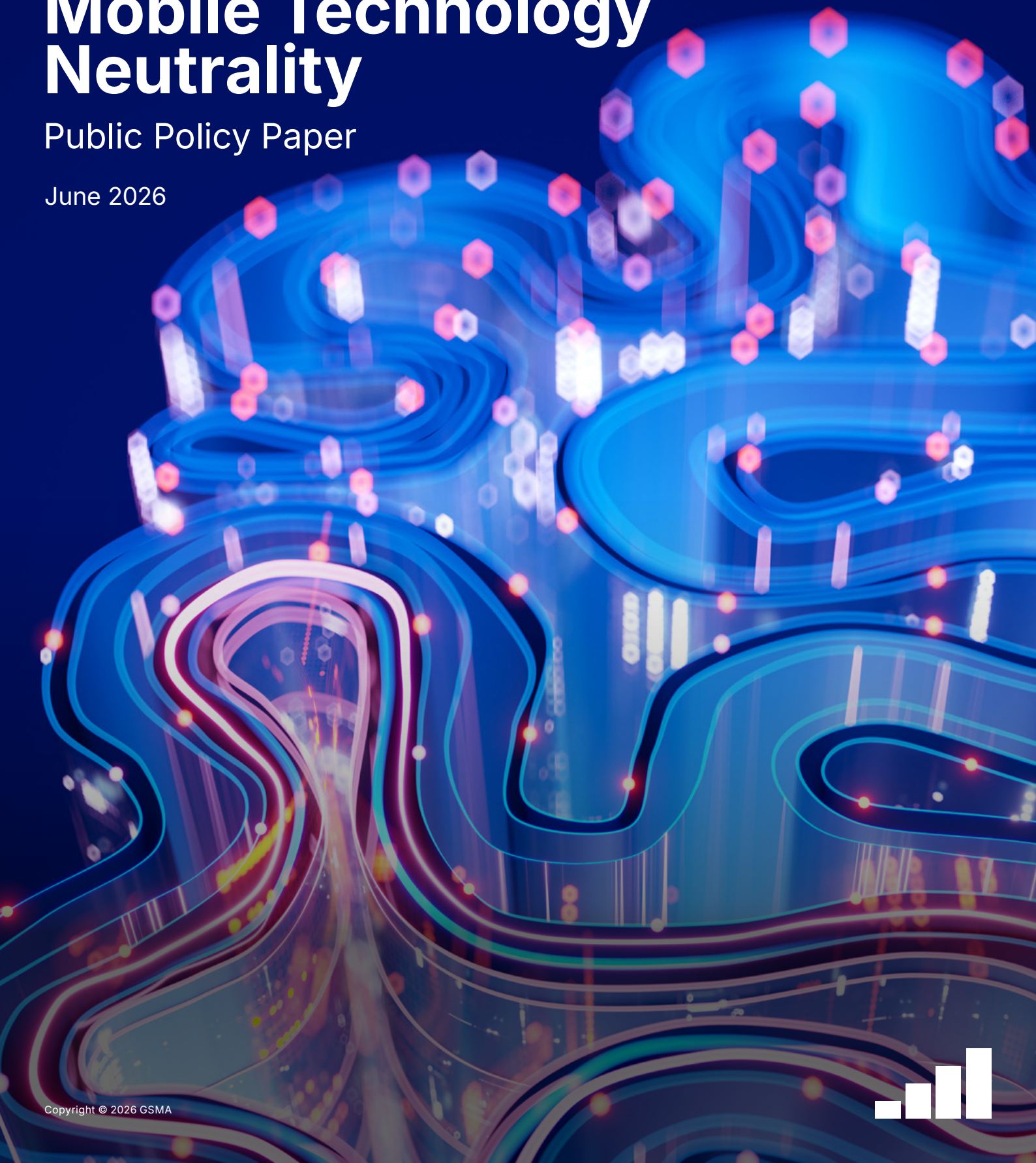
GSMA

Mobile Technology Neutrality

Public Policy Paper

June 2026



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GSMA™

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

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Executive Summary

Technology neutrality enables mobile network operators to refarm existing bands to the newest technologies at a pace driven by market demand, providing flexibility and technology choice in mobile networks. This flexibility ensures efficient spectrum use and delivers benefits to consumers through better coverage and higher speeds. By allowing operators to upgrade networks without technology mandates and regulatory delays, countries can unlock productivity gains and socio-economic benefits including GDP growth and a reduction in carbon emissions associated with newer mobile technologies.

Policy positions

1. **Mobile technology neutrality enables efficient spectrum use**: upgrading to newer mobile technologies brings significant improvements in spectral efficiency, reduces cost of delivery per bit, enables better quality of service, improved coverage and better supports potential spectrum trades.
2. **Mobile network sunsets are delivered by technology neutrality**: technology-neutral licensing enables operators to refarm spectrum from legacy 2G/3G networks to newer technologies like 4G and 5G, driving efficient spectrum use, cost savings, and improved connectivity through well-planned, market-led sunsets.
3. **Spectrum refarming advances technology and improves user experience**: refarming spectrum for newer mobile technologies benefits both individual and enterprise users through enhanced networking capabilities that support the latest applications, allowing for continuous innovation and investment.
4. **Service neutrality in mobile networks is essential for technology neutrality**: to fully realise the benefits of technology-neutral licensing, regulators must also make licences service-neutral, removing restrictions on which specific services a mobile network operator may provide.
5. **Unified service licences in mobile networks are best practice**: licences for mobile services should be technology and service neutral, or unified licences. This unification should also be facilitated without fees to encourage re-use of spectrum and long-term investment. Selective technology/service neutrality should not be used as a mechanism to regulate competition.



Background

Every day, people rely on mobile networks across the world for services and applications that are delivered through spectrum. However, spectrum is a scarce resource which requires efficient management. Encouraging its effective use is important, and one component of this is enabling technology neutrality in mobile spectrum licensing.

Technology neutrality is a fundamental spectrum management policy. It allows regulators to assign spectrum to mobile network operators (MNOs) without specifying the technology (e.g. 4G or 5G networks) and facilitates MNOs flexibility to deploy the latest technologies using the same spectrum licence according to their network needs and market demand.

Adoption of technology-neutral policies is widespread, and implementing them in mobile bands benefit governments, industry, mobile data subscribers, and operators. Allowing operators to deploy the most appropriate technology throughout their spectrum portfolio helps efficient network planning and traffic management. Newer generations of technologies are also more spectrum and energy efficient. As a result, technology neutrality is an important aspect of spectrum management and can help maximise societal benefits from a nation's spectrum assets.

The initial rollout of 4G in many pioneer markets was based on technology neutrality and spectrum refarming. Technology neutrality is also enabling mobile operators to use spectrum refarming in legacy bands to support 5G deployments. The same is expected as technology evolves to the next generation.

Policy in Practice

Technology-neutral spectrum licensing has become an increasingly common feature of modern spectrum policy frameworks. The following case studies highlight how different countries have implemented technology-neutral policies and the impact.

Rwanda

In 2022, Rwanda reversed its decision to depend on a single wholesale network for 4G, 5G and future technologies. In doing so, the National Broadband Policy and Strategy paved the way for better 4G penetration in all parts of the country and the launch of 5G. Mobile technology neutrality was reintroduced as a policy to enhance competition on infrastructure and liberalise technology deployments. The adoption of 4G services increased significantly post-2022, creating a dynamic competitive environment. Rwanda's mobile broadband adoption rates began climbing to meet regional averages, indicating clear demand for affordable 4G services in the market. Technology neutrality has proven effective in driving down prices, improving service quality, and expanding access, resulting in Rwanda's significant connectivity development.

Japan

Japan has consistently been a global leader in rolling out new networking technologies, from being the very first country to deploy 3G to being a leader in subsequent generations. Japan implemented technology-neutral licensing in 2007 and has since adopted a Frequency Reorganisation Action Plan which captures the country's commitment to reallocating bands for higher-efficiency uses. In support of its 5G rollout, Japan's technology neutral approach enabled it to refarm the 1.5 GHz band from 4G to 5G along with several other mid-bands to support rapid deployment.

Colombia

Colombia introduced technology neutrality in 2009. The purpose was to "promote the efficient provision of services, content and applications [...] and guarantee free and fair competition, [...] harmonious with sustainable environmental development." The policy is also nestled within the country's Modernisation Law which emphasises how technology neutrality can be a mechanism for investment in infrastructure and maximises social welfare. Colombia's spectrum policies have helped achieve significant advances in mobile connectivity. As of 2025, 98% of the population is covered by mobile broadband and the percentage of mobile subscribers using 5G networks is growing.

India

All mobile spectrum assigned through auctions in India since 2010 is technology neutral, enabling operators to deploy the most appropriate technologies in response to market demand. Spectrum assigned administratively in the 800 MHz, 900 MHz and 1800 MHz bands, prior to the auction regime introduced in 2010, was originally linked to specific technologies. Over time, India has enabled the migration of these bands to newer technologies, supporting network modernisation and improved service delivery. The rapid rollout of 5G across India and proactive planning for 6G has been supported by technology neutrality, which allows operators to deploy any generation of technology based on market demand.

United States

In the US, the Federal Communications Commission refers to technology neutrality as flexible use. Under flexible-use policies, "operators can make decisions that allow them to continuously improve the efficiency of their own systems and make choices as to the value of additional spectrum to enhance these services". The US started to take a flexible-use licensing approach for assigning spectrum in the late 1990s, however the adoption of flexible-use rules in a report and order publication was made in 2002 for AWS-1 (Advanced Wireless Services). The principle has remained in further orders for AWS-H, AWS-3 and AWS-4, as well as other spectrum auctions to date.

European Union

Technology neutrality is a core principle in the European Union's regulatory framework. Regulators in the EU should avoid mandating a specific technology and instead regulate based on objectives and market outcomes, allowing competing technologies to evolve on their own. The principle was introduced in the EU telecom framework in 2002, reinforced in the 2009 revisions with the digital dividend, after which spectrum licences in Europe were expected to be technology neutral. The Radio Spectrum Policy Group "encourages the promotion of competition and innovation in the provision of wireless services to society by the application of technology and service neutrality principles and the potential benefits of an EU coordinated approach".

01. Mobile technology neutrality enables efficient spectrum use

Technology-neutral licences allow MNOs to offer the latest mobile technologies such as 5G or, in the future, 6G, without requiring new or amended Licences. Technology neutrality:

- Allows bands to be used by any mobile technology
- Makes spectrum more cost-effective by enabling operators to refarm existing spectrum holdings for newer technologies at market-driven speeds, thereby lowering the delivery cost per bit
- Maximises spectral efficiency (bits per Hz) through use of the latest technologies
- Enables better quality of service and improved coverage
- Makes spectrum more attractive for any potential trading
- Advances service delivery, contributing to broader economic activity and increased revenues from digital services.

Spectral efficiency has improved significantly in each generation. The 3GPP path has evolved from 3G (Release 8) to 4G (Release 10) with MIMO techniques and spatial multiplexing, to 5G (Release 15 onwards) with massive MIMO and beamforming developments. Consequently, operators have been able to boost throughput.[1, 2, 3]

A critical aspect impacting spectrum efficiency in 5G has been precisely the design and evolution of massive MIMO, which has also enhanced the coverage and reliability aspects in radio access networks (RAN). This can be seen in massive MIMO features from 3GPP Release 15 towards 18, that is improved with a better and narrower beamforming, reducing overhead information, richer and more precise channel state information (CSI), and multi-user spatial multiplexing, resulting in more data transmitted by hertz.

02. Mobile network sunsets are delivered by technology neutrality

2G and 3G networks have been crucial in developing mobile, but as technologies evolve, the spectrum that powered these services can be used to support newer technologies. Technology-neutral licensing is essential for network sunsets to allow mobile operators to reuse their spectrum at a pace driven by market demand.

The 900 MHz and 1800 MHz bands are the most commonly refarmed following 2G sunsets, while 900 MHz and 2.1 GHz have often been refarmed following 3G sunsets.

Mobile networks are maturing as 2025 had a record number of planned network sunsets and even more are expected in the coming years. A phased refarming through sunsets helps spectrum resources be used more efficiently to meet the growing demand for mobile broadband.

The advantages to sunsetting legacy networks include:

- Refarming spectrum for technology upgrades
- Optimising network operations and improved energy efficiency
- Diverting capital expenditure to rollout newer technologies faster
- Streamlining device portfolios
- Minimising risks associated with legacy equipment.

Network sunsets can allow operators to use spectrum more efficiently and enhance user experience but require careful planning to overcome delays and ensure continuous connectivity. For example, some countries may rely on 2G/3G networks for critical services (e.g., e-call or SOS) or public utilities (e.g., meters and elevators) that are still configured to these networks. For legacy handset users, affordability of 4G/5G devices is crucial for lessening the usage gap and digital inequality.

1 MIMO, or multiple-input multiple-output (MIMO), refers to a collection of signal processing techniques that have been developed to enhance the performance of wireless communication systems using multiple antennas at the transmitter and the receiver, improving coverage, spectral efficiency, and reliability.

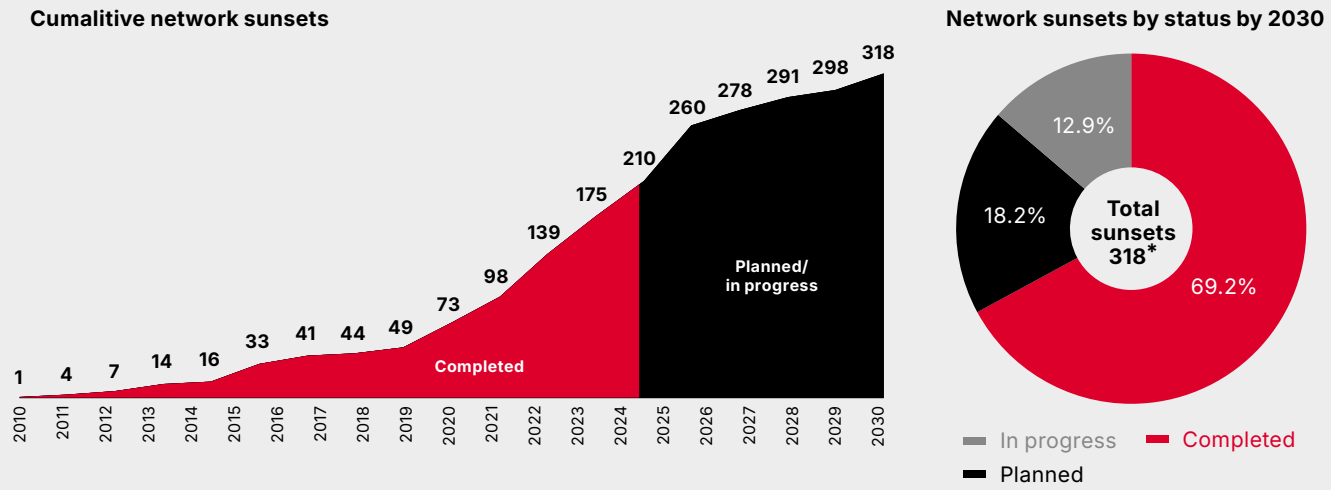
2 Spatial multiplexing is a MIMO technique that increases the data rate by transmitting different data streams simultaneously from multiple transmit antennas to multiple receive antennas.

3 Beamforming is a signal processing technique to steer, shape, and focus an electromagnetic (EM) wave using an array of sensors toward a desired direction.

Technology neutrality does not mandate or predetermine the timing of legacy network shutdowns. Decisions regarding 2G or 3G sunset remains market-led and aligned with connectivity realities, including device penetration levels, affordability considerations, rural coverage dependencies, and the reliance of critical services on legacy networks.

To address these issues, regulators should support the industry in aligning to a planned sunset. Successful network sunsets require a well-planned roadmap to phase out network and mobile devices and address the usage gap (those that live within the footprint of a mobile network but do not use mobile broadband) allowing operators to migrate consumers and businesses to 4G or 5G devices. Based on announced plans, more than 100 additional networks will be shut down globally by 2030.

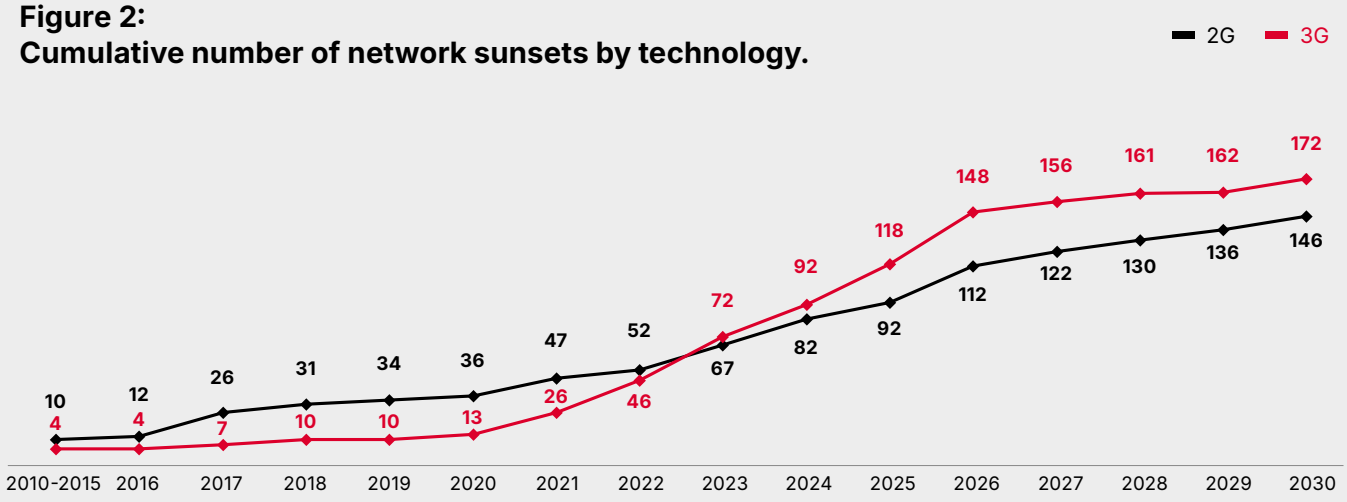
Figure 1:
Cumulative network sunsets and network sunsets by status by 2030.



Data correct to 31 March 2026
Source: GSMA Intelligence

* Including planned and in progress

Figure 2:
Cumulative number of network sunsets by technology.



Data correct to 31 March 2026
Source: GSMA Intelligence

With that in place, countries can gradually migrate services to 4G and 5G networks and take advantage of the latest technologies using existing frequency bands. This can be done geographically or by frequency band to ensure that no one gets left behind. For operators, a sunset cycle (the time between starting to sunset the network and finally shutting down the last connection on the network) can range from two to five years. Sunsets should be market-led to ensure that users, operators, and governments can coordinate a smooth transition.

03. Spectrum refarming advances technology and improves user experience

The need for additional spectrum to meet coverage and capacity expectations for 5G and future 6G services is growing and can be supported by refarming. Once legacy networks are shut down, MNOs with technology-neutral spectrum licences can refarm their spectrum for newer technologies to help support capacity needs.

Refarming spectrum has many benefits for individual users and enterprise customers.

User experience

Each network generation has brought improved quality of service, higher speeds and capacity, that can today support applications like VoLTE (Voice over Lont-Term Evolution), enhanced mobile broadband (eMBB), fixed wireless access (FWA), internet-of-things (IoT), and AI-powered apps and devices. Refarming spectrum from 4G to 5G services has enabled the development of use cases such as eMBB by supporting the higher spectral efficiency required for high traffic density in congested urban areas.

Enterprise digitalisation

Refarming spectrum also creates opportunities for enhancing enterprise digitalisation. Countries that have adopted technology-neutral policies enable MNOs to have greater control of their licensed spectrum which leads to improved services for enterprise and public service users. The latest generation of 5G services are transforming how industries harness technology to provide goods and services more efficiently and creatively. These services are increasingly provided by newer networks that can digitalise industries, for example, ultra-reliable low-latency communications (URLLC) to power smart grids and remote operations or high-capacity networks to connect remote-controlled industrial robotics.

04. Service neutrality in mobile networks is essential for technology neutrality

Regulators seeking to maximise the impact of technology-neutral licensing must also make them service neutral. This means that the licence does not specify a particular type of service that may be provided by the mobile network operator. Removing restrictions on which specific services a mobile operator may provide is essential.

Where technology neutrality exists but not service neutrality, operators are still restricted in their ability to refarm their spectrum holdings for newer technologies and other types of service in a way that maximises the efficient use of spectrum and meets market demand for new services. They may be able, for example, to connect eMBB but not offer IoT or FWA services.

The enablement of emerging technologies typically deployed as part of network upgrades, such as network slicing and FWA results in benefits for end users. When offered together, these approaches create a more flexible and competitive telecommunications environment that allows for efficient spectrum use. For example, an operator can use their spectrum to provide both mobile and FWA services to consumers, maximising efficiency, and providing more ways for users to be connected.

05. Unified service licences in mobile networks are best practice

The way licences are defined have an impact on the effectiveness of technology neutrality. Best practice should start with a licence that is technology and service neutral, or a unified licence. By having a unified licence, regulators can allow operators flexibility to deploy different mobile technologies within their allocated bands without externalities, such as having to issue a new licence.

Historically, some regulators have charged MNOs to switch to technology-neutral licences. Charging the MNO to remove restrictions, or requiring a new licence, can delay the introduction of new mobile services in response to market demand and ultimately push back the benefits of new technologies for end users.

Avoiding additional fees for changing licences also assures MNOs that they will maintain their licences for longer, encouraging network investments. Ultimately, users will benefit from better mobile broadband coverage, higher data speeds and lower mobile data prices if MNOs are not charged twice for the same spectrum.

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