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A Generational Shift: international lessons from 2G network sunsetting

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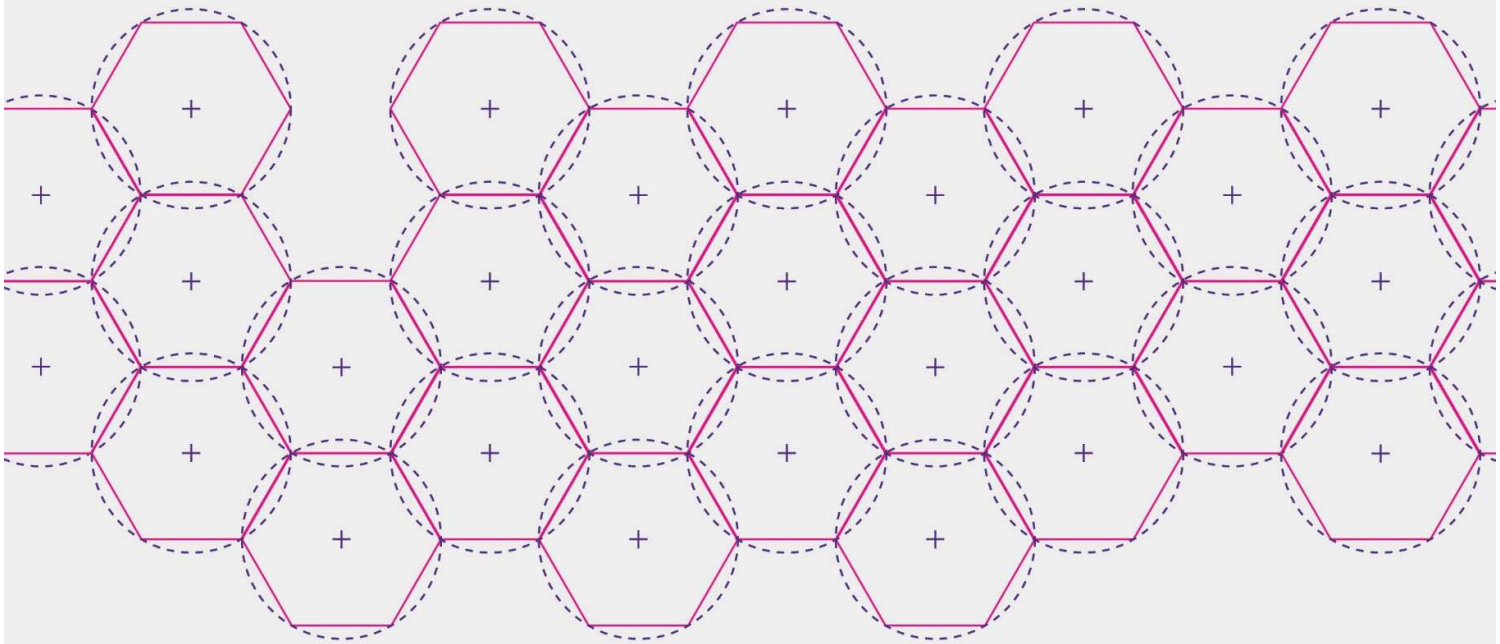

About Plum

Plum is an independent consulting firm, focused on the telecommunications, media, technology, and adjacent sectors. We apply extensive industry knowledge, consulting experience, and rigorous analysis to address challenges and opportunities across regulatory, radio spectrum, economic, commercial, and technology domains.

About this study

This study for the DCF has been carried out to examine lessons that may be learnt from 2G network switch-off in other countries, and the regulatory decisions behind this. It looks at the 2G sunsetting process in a number of countries, both where it has already occurred and where it has been delayed, to identify if there is a best practice which the UK should follow.

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Summary

Since their launch in the early 1990s, 2G technologies have been a crucial part of mobile network infrastructure. However, as newer technologies[1] have emerged, along with services that require more capable and reliable data connections, the reliance on 2G has fallen, and now there is very little traffic carried over this legacy network. Given this, the question has arisen as to when and how the network can be switched off and removed, reducing mobile operator costs and freeing up useful spectrum. In the UK, the mobile service providers and Government issued a joint statement in 2021 committing that there would be no 2G service after 2033.

This is not only a question faced by the UK regulator and operators. Countries around the world have been considering whether there continues to be a role for 2G and 3G systems, and some operators have already started to shut these networks down – a process known as sunset. As of December 2025, 19 countries worldwide have turned off all 2G services, with a slightly greater number removing 3G networks. However, there are a number of issues associated with network switch-off, particularly for 2G since there are some important uses for the network which have not yet been fully replicated on newer technologies. No matter how much action is taken, experience has shown that during any technology decommissioning, any migration programmes will inevitably not result in 100% of customers being moved (so there will never be no subscribers still on the legacy system through voluntary engagement). Ahead of sunset, therefore, regulators and operators have carried out extensive work to understand the likely impact of withdrawing service.

This report considers the lessons learnt from this work, and looks at the outcomes of where networks have already been sunset as well as examples where operators have decided to keep operating 2G technologies for the immediate future.

Uses of 2G networks

Our first analysis is of how 2G networks are used, so we can understand the issues that may arise from them being switched off. We note that networks are used both by ordinary consumers, and by enterprises with specialised equipment. The very varied use cases of modern 2G networks mean that there are many different replacement network specifications needed.

- 2G networks are still used as a vital fallback option for voice and SMS services, in areas where LTE or 5G networks lack coverage or capacity. This provides important connectivity for emergency service contacts or other consumer connections. 2G is also used as a primary voice option where consumers have non-LTE compatible equipment.

- Smart meters across the South of the UK use 2G to report meter readings; this is an issue in other countries as well. The upgrade to LTE in this case is not problematic due to the network availability (although there may be some premises currently not adequately covered by LTE service), but rather in terms of physically upgrading equipment at each customer location. A migration programme is already underway, but there are concerns over the availability of metering equipment, and the sheer number of meter upgrades needed.

- Vehicle-based systems, such as eCall, require high reliability and ubiquitous coverage. Without retrofitting, many existing eCall units will stop functioning once 2G is switched off. Updated EU regulation now requires new vehicles' emergency call systems to operate over 4G or 5G packet-switched networks from 1 January 2026, and the UK is pursuing equivalent measures. Beyond eCall, other vehicle-

[1] An overview of technologies and definitions can be found in Section 2.1.

based systems such as tracking and telemetry services will also fail without upgrade. Fleet users must additionally account for international roaming, as 2G switch-off varies by country.

- Personal alarm devices (for elderly users, vulnerable people, or personnel exposed to security risks) also frequently rely on 2G or 3G. Multiple service providers and MVNO arrangements complicate migration, and action is required where devices support safety-critical functions.

- Agricultural IoT applications – including weather, soil moisture, livestock tracking and asset monitoring – tend to operate in remote locations and depend on long-life, low-maintenance devices. Many of these are still 2G-based, and the sector involves numerous providers and device categories. Migration for these devices will likely require improvements to LTE coverage in the most rural areas as well as a device upgrade programme.

- Other industrial applications, particularly in rural or critical infrastructure contexts, also depend on 2G for monitoring, control and reliable fallback voice communication. These systems are used by water utilities, energy companies and railways.

Work is already underway to provide alternative connectivity in these services, with expanded coverage on LTE, replacement programmes for IoT devices, and enhanced reliability through a combination of LTE and 5G connectivity.

Considerations with switching off networks

There are multiple benefits which operators hope to realise by turning off legacy networks. These include:

- Cost savings – through reduced maintenance (especially specialised maintenance for older networking equipment), lower operating costs, and lower power costs;

- Access to refarmed spectrum – particularly in the UHF bands, which can be used to improve rural capacity for LTE or 5G;

- Increased spectrum efficiency – allowing for a more contiguous band plan, or more efficient services on the same spectrum;

- Better network security – given the improved features of 5G and LTE, removing 2G (especially) will improve overall security; and

- Lower environmental impacts.

However, in order for these to materialise, there are a number of issues to be overcome. These include a number of customers and devices which will be cut off from service – either entirely, or partially due to incompatibilities with VoLTE and national roaming. Loss of service will not only apply to consumer devices, but also to many industrial and agricultural IoT devices which also still rely on 2G connections. As well as a focus on devices, operators will need to consider how connectivity can be continued for a range of vulnerable users, who may not afford or be able to use a smartphone (or other LTE-enabled phone), or who may have separate connected devices such as personal alarms. There are also large-scale users of 2G, such as the utility companies and emergency services, who need to be engaged with regarding the possibility of service migration and potential timescales.

There is no single issue that would prevent 2G sunset, but we have identified some countries (such as France and Iceland) who have chosen to delay the date of decommissioning since it was not realistic to mitigate adverse impacts before the original deadlines.

International best practice

Having reviewed this issue across a number of countries, it is clear that there is no single best practice on how to achieve legacy network sunset, and instead actions are driven from political and operational decisions.

International case studies on 2G network sunsets do, however, reveal common themes centred on market monitoring, regulatory intervention, equipment management, and extensive stakeholder coordination. Regulators and national governments universally take a strong role in monitoring 2G usage, looking at both consumer devices and, crucially, industrial IoT applications like lifts and cars. Data has been gathered from network operators, though this is often insufficient to give a comprehensive picture of the size of the market due to generic chipsets and roaming agreements. Therefore, direct engagement with heavy-user industries and telecommunications resellers is vital to accurately assess the scale and urgency of the issue and to understand the evolving alternative technologies, facilitating successful upgrade pathways (for example, Arcep has been tracking 2G-only and 3G-only SIM cards and liaising with industry over their use).

While the actual 2G switch-off is generally viewed as a commercially led decision, some regulatory input is common for defining the necessary outcomes and consumer protections. Some regulators have employed an outcomes-focused approach by altering licenses to ensure technology-neutral coverage and service quality is maintained, often requiring the rollout of modern alternatives like VoLTE (for example, the regulator in Iceland requires no reduction in service quality at the time of network switch-off). Governments may also play a role through funding schemes to subsidise network upgrades in public benefit areas or offer subsidies for end-user devices, such as the subsidy programme in Hungary for replacing outdated handsets with 4G VoLTE-capable devices. Furthermore, regulators have an active role in protecting consumer rights, ensuring service continuity, mobile number portability, and uninterrupted access to emergency services, while also participating in industry groups to facilitate the development of new standards (such as eCall replacements).

Two other significant areas are managing equipment approval and disposal, and ensuring comprehensive coordination and communication. Regulators must first prevent the sale of new devices dependent solely on 2G, as seen in Singapore's 2G equipment approval cutoff, although this must be timed appropriately to the sunset date. Effective coordination requires very long-term communication plans, often spanning many years, to give industrial users adequate time to upgrade large-scale systems (for example, Swisscom informed lift operators in 2015 of the need for upgrades, ahead of a 2021 sunset). Countries with shorter notice periods, like Taiwan, often had many users still on 2G at the switch-off time. Extensive communication campaigns are essential, with a specific focus on vulnerable customers (like telecare users in Switzerland) and large-scale IoT enterprises (such as industrial use in Canada); these are often run in partnership between service providers and regulatory bodies. Finally, mitigation plans have been developed between stakeholders and regulators, including providing incentives for consumers to migrate (such as free or discounted devices in Australia, provided by network operators) and, in critical cases, temporarily extending the 2G network for essential applications to ensure a smooth transition, as Vodafone Germany plans to do for critical IoT until 2030.

Conclusions for the UK

Based on the current situation in the UK, and the lessons learnt from international experience, we have developed a set of recommendations for Ofcom and UK network operators, to ensure that network sunset is as uncomplicated as possible. These are summarised below, and set out in detail in Section 8.

Figure 1: Recommendations for the UK

Recommendations for Ofcom, DSIT and Government

Ofcom and DSIT should help operators understand the scale of potential issues. Other regulators and government should inform their industries and consumers of potential impacts.

Ofcom should also continue to participate in extensive engagement with stakeholders to examine whether there are uses or requirements which are unfulfilled by the planned network upgrades.

There may be a need for investigation whether funds are needed to assist with migration, and if so how these can be absorbed without impacting consumers.

There may be a role for Ofcom to consider consumer contractual rights and ensure that service quality is not adversely affected.

Recommendations for operators

Communication with all stakeholders is vital, and timetables should be set well in advance.

The industry should look at international standardisation and harmonisation activities which may replace existing 2G uses, such as NG eCall.

Operators should consider whether there is a need for a single wholesale network, or assistance with providing private networks if users are all located in small areas.

Operators should work with charities and consumer groups to identify and contact the most vulnerable users who will be affected by network switch-off.

Once it has been identified that 2G traffic has dropped to a suitable level, operators should not delay in switching off the 2G network.

Recommendations for service providers and users

Service providers must stop providing devices which rely on 2G networks, and move to other connectivity options.

Service providers and users should liaise with network operators to identify areas with no LTE or 5G coverage in which 2G connections are currently used.

Service providers should examine all supply chains and connectivity services to identify current 2G use cases, and start to migrate these.

1 Introduction

The first 2G network, representing a move from analogue to digital mobile technologies, was switched on in Finland on 1 July 1991; this network, launched by Radiolinja, was based on the GSM standard which went on to become the dominant digital mobile technology across the 1990s. Its capabilities expanded over time to include data transmission with GPRS[2] and EDGE[3]. The first 2G network in the UK[4] was launched by Vodafone (using 900 MHz spectrum) in July 1992, with Mercury One2One launching on the 1800 MHz band in September 1993. Cellnet and Orange launched in turn in December 1993 and April 1994. The significantly lower costs, both for network equipment and for handsets, as well as increased reliability and coverage, meant that growth in subscribers was rapid, firmly establishing mobile communications as an everyday technology.

Towards the end of the 1990s and the start of the 2000s, demand for mobile data increased. The introduction of 3G focussed on provision of improved data transmission, and this rapidly became the main way in which mobile data was provided for consumers. However, 2G continued to be used, both as a fallback for data services, and as the primary network for voice calls in many countries. Even as late as 2007, the first Apple iPhone, which was sold as an Internet connectivity terminal, did not include 3G and instead relied on 2G EDGE connections for mobile access. 3G networks remained costly and, in many countries, had a limited coverage footprint due to the spectrum used – the most common spectrum band awarded for 3G use was at 2100 MHz, which had a significantly smaller cell radius that 900 MHz or even 1800 MHz spectrum.

With the rollout of LTE in the early 2010s, as well as the expansion of 3G into refarmed 900 MHz spectrum, the use of data connectivity on 2G reduced significantly, particularly since GPRS and EDGE connections were insufficient to run the more dynamic Internet experiences that consumers demanded. However, 2G networks remained in use, providing a vital carrier for voice calls – relieving congestion on 3G networks, and especially complementing LTE networks which did not provide a switched voice service at all – as well as SMS and other service messages. This has continued to the present day, with the deployment of 5G, although increasingly Voice over LTE (VoLTE) is used to provide voice connectivity.

In recent years, with increased LTE coverage and ever greater reliance on data networks, even for voice calls (which are not only carried over VoLTE, but also are increasingly carried over proprietary platforms such as WhatsApp, Zoom or FaceTime), mobile operators have expressed their preference to turn off legacy networks, including both the 2G and 3G, in order to reduce operating costs. In many cases 3G is being turned off first, since it is directly replaced by LTE. 2G, on the other hand, is still relied on for voice calls, backup data transmission, and many other devices which continue to operate both in consumer and enterprise markets. Turning off 2G may be problematic for several reasons and may require users to take action, but this action is not restricted to end-users. Experience on other networks, particularly the sunsetting of 3G and PSTN, has shown that migration programmes will inevitably not result in 100% of customers moving from the legacy network (so at the time of shut down, there will never be zero subscribers remaining). It is important to understand how these users will be affected and if there are any schemes to mitigate harm.

The Digital Connectivity Forum (DCF) has asked Plum to examine how 2G network sunsetting has been handled in other countries, both in countries which have already achieved switch-off and also in countries where this is still in progress. This report considers experience in a number of countries worldwide to see if there is a consensus over best practice for 2G switch-off, and if there are lessons that can be learnt. We consider the UK context to identify the most important factors for examination, but our aim is not to provide a comprehensive overview of the situation in the UK.

[2] GPRS – General Packet Radio Service is a mobile data standard developed for 2G networks. Sometimes referred to as 2.5G. GPRS supported typical data rates of 56-114 kbps.
[3] EDGE – Enhanced Data rates for GSM Evolution. An upgrade to GPRS sometimes referred to as 2.75G. EDGE supported up to 384 kbps.
[4] See Salford University (2015)

2 A global overview of 2G sunsetting

Mobile services including phone calls (voice), text messages (SMS) and Internet (data) are delivered via an interconnected network of mobile telephone masts. Mobile networks delivering these services have evolved over the past four decades.

2.1 Evolution of mobile technologies

2G[5] mobile networks emerged in the 1990s. There were several competing technologies including digital AMPS (D-AMPS), Personal Digital Cellular (PDC), Code Division Multiple Access (cdmaOne) and the Global System for Mobile Communications (GSM), which was initially deployed in Europe and over time largely adopted worldwide. 2G networks use digital transmission methods, enabling greater spectrum efficiency and data capacity. 2G networks introduced SMS which became a popular cost-effective method of communication, together with GPRS and EDGE for data transmission. Factors such as the reduction in the physical size of user terminals, increasing implementation of international roaming and cost reductions led to increasing demand for mobile services.

In the early 2000s, 3G was introduced. The main 3G technologies were Wideband Code Division Multiple Access (W-CDMA), often referred to as Universal Mobile Telecommunications System (UMTS), and CDMA2000. Both technologies were based on IMT-2000 specifications. 3G networks provided a reliable data service which enabled users to browse the web, send emails and access multimedia content on their handsets. Enhanced W-CDMA networks, introduced later in the 2000s, included High Speed Downlink Packet Access (with a peak data rate of 14.4 Mbps) and High Speed Uplink Packet Access (with a peak data rate of 5.76 Mbps).

4G networks started to be deployed in the 2010s. They provided increased data speeds and reduced latency. These features have enabled a range of mobile applications for productivity, entertainment and social networking. The improved capabilities of 4G networks have also resulted in the widescale deployment of Internet of Things (IoT) devices and applications. Lower latency and higher bandwidth have allowed for real-time data exchange between connected devices, creating opportunities for smart homes, wearables, and other IoT innovations. 4G network technical characteristics include a peak data rate of 1 Gbps, user experienced data rate of 10 Mbps or more, a latency figure of 20 ms, and spectrum efficiency of around 1.5 bps/Hz.[6] Long-Term Evolution (LTE) is the core technology used in 4G networks[7]. LTE utilises advance modulation (Orthogonal Frequency Division Multiplexing, OFDM) and Multiple Input Multiple Output (MIMO) techniques that reduce interference, improve signal quality and increase data throughput.

The 2020s have witnessed the rollout of 5G mobile networks which are designed for enabling massive IoT connectivity, mission critical applications, enhanced mobile experience, and energy efficiency and sustainability. They offer greater data rates, lower latency and improved reliability and security as well as support for a wide range of devices and data intensive applications (such as AR and VR, and autonomous IoT) in different sectors including healthcare, manufacturing, transport and entertainment. Key features of the 5G physical layer includes OFDM, MIMO, antenna beamforming for improved signal strength and reduced interference, flexible frame structures to support a wide range of applications, advanced channel coding and modulation techniques to improve efficient use of assigned frequencies, carrier aggregation to improve capacity, time division duplex to

[5] The first generation of mobile technologies (1G) were based on the use of analogue signals for voice calls in the early 1980s. Examples included Advanced Mobile Phone System (AMPS) and Nordic Mobile Telephone System (NMTS). 1G networks used Frequency Division Multiple Access (FDMA) to support a maximum transmission rate of 2.4 kbps.

[6] Typically with 2x2 MIMO. Use of higher order MIMO can result in spectral efficiency of >2 bits/s/Hz.

[7] Initially, LTE did not meet the ITU's definition for 4G, which required 100 Mbps peak download speed for high mobility situations, and 1 Gbps peak download speed for low-mobility scenarios; LTE was able to offer only peak speeds of 100 Mbps with actual experiences generally in the region of 40 Mbps. However, LTE was a significant improvement over 3G, and MNOs used the term "4G" in marketing and communications, leading to the ITU revising its definition. The initial 4G specification was met with the release of LTE-Advanced, which was specified in 3GPP Release 10.

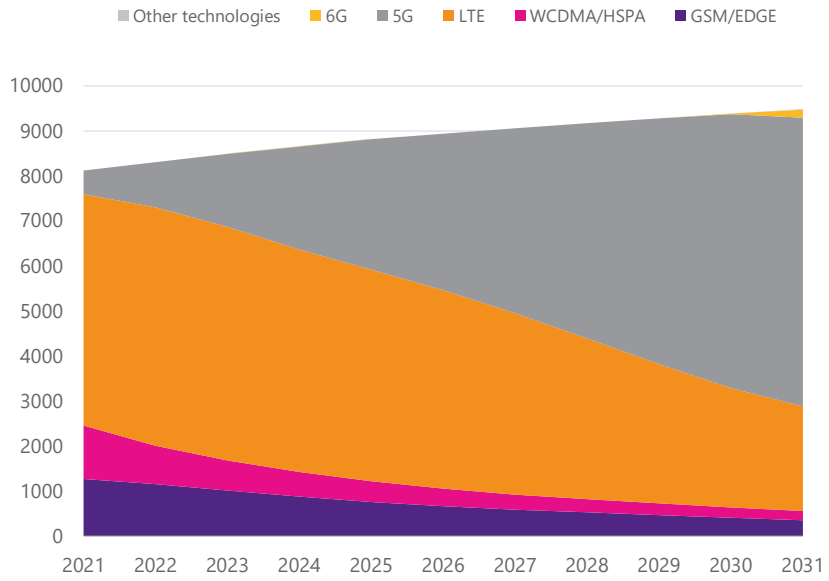
allow dynamic adjustment of uplink and downlink transmissions, improved encryption for security, and artificial intelligence for enhancement in functions including channel prediction, device positioning, beamforming and dynamic bandwidth allocation.

The sixth generation of mobile networks is expected to be ready for commercial applications in the early 2030s. There are many ideas being developed for 6G and these include integrated sensing and communication; AI-based network sensing; synchronised distributed massive MIMO; integrated ground, air and satellite coverage; and support for use cases such as massive digital twinning, autonomous mobility, simultaneous location and mapping services, and wide area mixed reality[8].

2.2 Mobile subscriptions

According to the Ericsson Mobility Report[9], 5G subscriptions[10] account for one-third of global mobile subscriptions in 2025. This number is expected to rise two thirds at the end of 2031. The number of global 2G, 3G and 4G subscriptions are in decline. 2G and 3G network sunsetting continues around the world. The 3G network shut down is expected to be implemented more quickly than that of 2G. The following figure shows the variation in mobile subscriptions by technology.

Figure 2.1: Mobile subscriptions by technology (millions)[11]



As can be seen, 2G subscriptions (represented by GSM) are expected to continue declining over the forecast period. The table below provides yearly global GSM and CDMA subscriptions[12]; CDMA does not appear on the graph above as the subscriber numbers are too small.

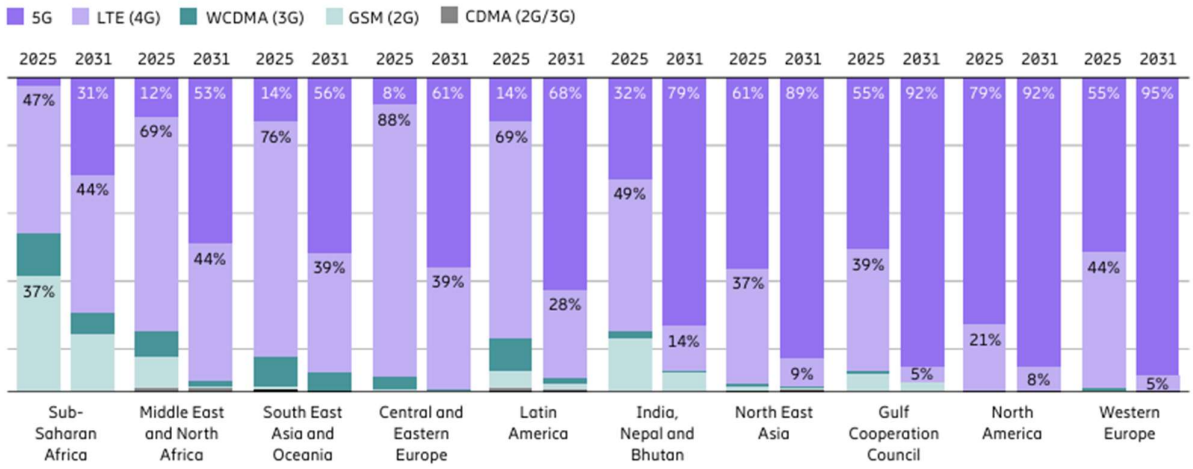
[8] Ericsson (2025a)
[9] Ericsson (2025b) – published November 2025.
[10] Having a 5G subscription will include access to 4G networks when 5G is not available; a 5G subscription should therefore be considered access to everything up to and including 5G. While there is an overall increase in the total population of subscriptions, there is also substitution taking place between people with 4G subscriptions moving to 5G subscriptions as they upgrade.
[11] Source: Ericsson (2025b)
[12] Ericsson (2025c)

Figure 2.2: GSM subscriptions (Source: Ericsson)

Year	Number of GSM subscriptions (billion)	Number of CDMA subscriptions (billion)
2021	1.2680	0.0267
2022	1.1549	0.0173
2023	1.0089	0.0151
2024	0.8734	0.0136
2025	0.7583	0.0128
2026	0.6651	0.0127
2027	0.5895	0.0126
2028	0.5265	0.0130
2029	0.4663	0.0134
2030	0.4049	0.0138
2031	0.3518	0.0139

Although almost every country[13] has seen a fall in 2G use over time, the extent to which LTE and other newer technologies have replaced it varies considerably. The variation in subscriber numbers across different regions is illustrated below, and it is important to note how 2G remains an important technology mainly in regions which contain less developed countries.

Figure 2.3: Mobile subscriptions by region[14]



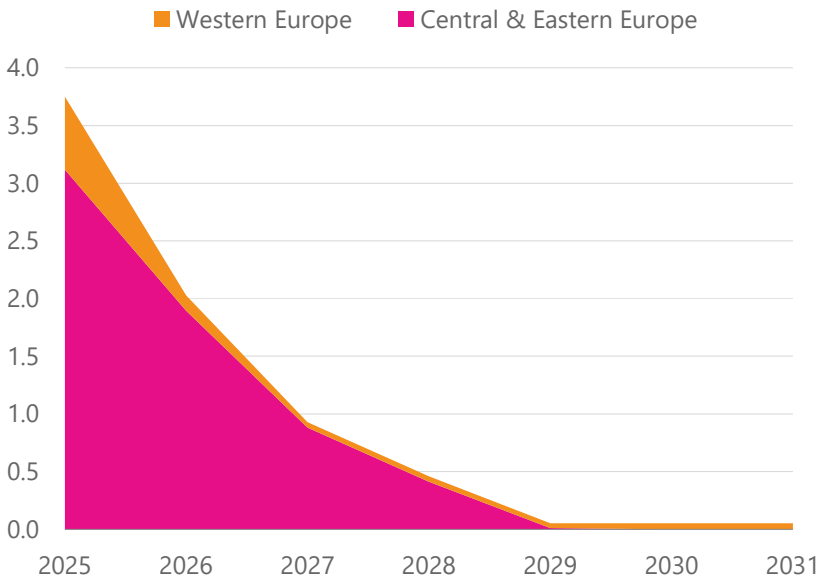
Note: All Middle East and North Africa figures include GCC countries. Currently, 6G subscriptions are not published on a regional level, but included in 5G figures in regions where 6G is expected to launch early.

[13] The only exceptions to this are countries where LTE is not available, usually due to political or economic reasons. Djibouti, Eritrea, Mauritania, South Sudan and Western Sahara all rely on 3G networks, for example, with extensive use of 2G voice and data. A number of small island territories have not found an economic case for LTE upgrades. Cuba, North Korea, and Palestine have limited or no LTE coverage for political reasons; Gaza has only a 2G network due to restrictions on technology and spectrum.

[14] Source: Ericsson (2025d)

In Western Europe, the percentage of 2G (GSM) subscriptions in 2025 is 0.11% and this number is expected to reduce to 0.01% in 2031[15]. The percentage of CDMA subscriptions is 0% for both 2025 and 2031. The following figure shows GSM subscription estimates in Europe.

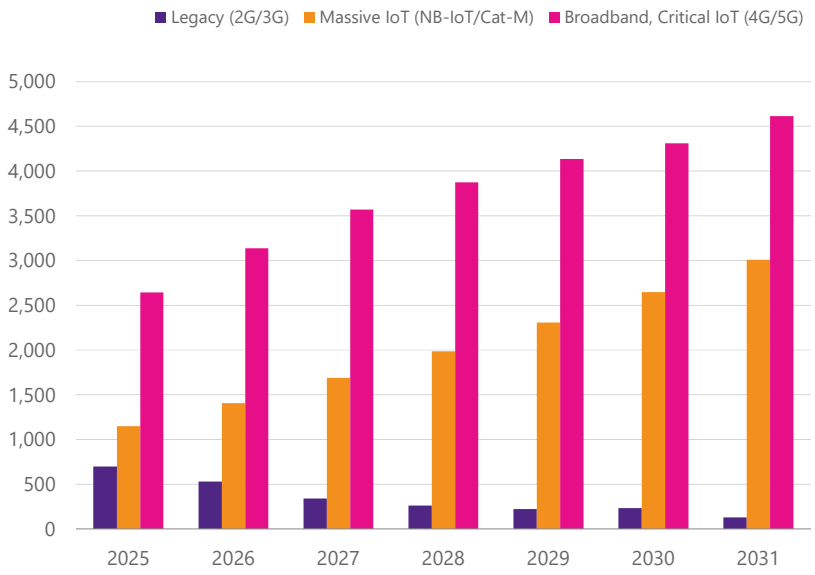
Figure 2.4: GSM subscription estimates (in millions) in Europe[16]



In terms of cellular IoT applications, the total number of global connections is expected to be approximately 4.5 billion at the end of 2025. The number is expected to approach 8 billion by the year 2031. The following figure shows IoT connections by technology[17].

[15] Ericsson (2025d)
[16] Source: Ericsson (2025e)
[17] Ericsson (2025e)

Figure 2.5: Cellular IoT connections by technology (Source: Ericsson)



As can be seen, the legacy use covering 2G and 3G technologies is expected to continue declining until 2031. The table below provides yearly global 2G and 3G subscription estimates.

Figure 2.6: 2G and 3G cellular IoT subscriptions (Source: Ericsson)

Year	Cellular IoT subscriptions
2025	15.6% (700 million out of 4491 million)
2026	10.5% (531 million out of 5077 million)
2027	6.1% (343 million out of 5601 million)
2028	4.3% (262 million out of 6123 million)
2029	3.3% (223 million out of 6665 million)
2030	3.3% (235 million out of 7193 million)
2031	1.7% (131 million out of 7751 million)

2.3 Varied uses of 2G networks

Voice and text messaging capabilities on mobile phones have used 2G networks for many years. Today, for those with devices not supporting 4G or 5G, 2G is imperative for voice and text, and it continues to provide a fallback for voice and messaging for more advanced devices when 4G coverage is not available. 2G is also critical for the support of emergency calls where no other mobile network option is available (for example in some rural areas).

In addition to voice and text messaging, 2G networks support many IoT applications. The characteristics of these are sending and receiving small amounts of data and, in some cases, long installed operational lifecycles (often up to 10 years). 2G IoT has two operational modes:

- Use of SMS for transmission of data to and from a device. This might be used for reporting certain operating conditions or thresholds and to provide commands to perform functions. An example is water level detection where if the level exceeds a predefined limit, an SMS message is transmitted with device information (from which location can be derived) and an indication of an alarm condition. Similarly, a device on a sluice gate might receive a text that says to close or open the gate and send a text when the operation is complete.

- Use of GPRS or EDGE to support low-rate data streams to and from a device. These capabilities provide more flexibility given their greater (but still relatively limited) data transmission and reception capability and can be used to support more demanding applications and workflows. Depending on application, they may, however, be more power hungry and therefore not used as much in remote low duty cycle applications.

Often, these 2G IoT devices perform critical functions, have robust form factors, are relatively simple, have long battery lifetimes and minimal maintenance requirements. They are key to many operational and critical workflows.

Newer IoT devices most likely support 4G and can offer more versatile capabilities (some now support 5G). However, there is a significant population of 2G IoT devices deployed (driven, for example, by uses like smart metering and vehicle-based applications), although determining the precise number in use can be difficult. Other use examples include static and handheld Point of Sale (PoS) devices, remote safety monitoring, alarm systems, and equipment and process status and malfunction devices. Examples are highlighted below.

Smart meters

Smart meters have been deployed for around 15 years and many early deployments used 2G. These devices are intended to deliver benefits for consumers, suppliers and networks including the ability to provide energy usage information in near real time (for example, every 30 minutes), increase accuracy of bills and enable modification of consumption behaviour. They also reduce or eliminate site visits to read meters. For networks, smart meters could facilitate a smarter grid, and the real-time data supplied by smart meters could assist with balancing the power grid.

Many energy providers are now engaged in planning for 2G or 3G switch off and updating their smart meter fleet to operate with more advanced mobile network and other technologies. Electricity and gas network operators should have data on where meters are located and the type of meter (that is, whether it is wholly reliant on 2G). Changing out meters in a network with wide deployment could take several years (due to supply chain and labour constraints).

Vehicle based systems

The most critical vehicle system deployed with 2G dependency is eCall, which notifies emergency services in the event of an accident. In Europe and the UK, eCall network capability has been provided since 2017 and eCall has been mandatory on all new vehicles sold since April 2018.[18] Without retrofit, many eCall systems will cease to function when 2G networks are ultimately switched off. The legal basis for eCall has been updated for new vehicles through an amendment to Regulation (EU) 2015/758, which requires emergency call systems to conform to the newest 4G or 5G packet-switched communication networks. From 1 January 2026, national

[18] See European Union (2014) and European Union (2015)

authorities will no longer grant new type approvals or extensions for existing approvals to vehicles that do not comply.[19] The UK has also initiated action on this change.[20]

In addition to eCall, other vehicle-based systems include tracking and telemetry systems. Again, these will cease to function when 2G is eventually switched off if devices are not upgraded to 4G or 5G or an alternative technology. When these devices are used with truck fleets or similar applications, consideration must be given to roaming and the implications for international vehicle movements in countries with either partial or full 2G shutdown.

Personal alarms

These are devices that use a mobile network to alert emergency or security contacts, and they will often have a button for manual SOS and automatic fall detection, for example, when being used by the elderly. Many devices in use today are based on 2G or 3G technology. They are supplied by a range of service providers who source devices and establish network capability to provide the alarm service. They may be single or multi-SIM devices and may be supported on a multi-operator MVNO. While many providers are reacting to 2G or 3G switch off and upgrading their devices and systems, action is required for all devices used in critical settings. In addition to use by the elderly and vulnerable, these sorts of devices can be used by personnel in settings where they may at personal security risk.

A key issue for these devices and services is the number of service providers potentially involved.

Agricultural IoT

There are many agricultural IoT applications including localised weather monitoring, remote soil moisture monitoring, livestock tracking and asset management. The applications supported by agricultural IoT have been used to increase efficiency, improve yields and support smart farming innovation. The nature of many of the devices and their locations is that they operate remotely with long battery and long maintenance life cycles. As in the case above, there will be wide range of applications and service providers involved.

Other industrial uses of 2G IoT

There are many other industrial uses of 2G IoT, especially in rural areas and for provision of low intensity but important or critical applications. In addition to the water example mentioned above, 2G is used by energy utilities and the railways for a variety of monitoring and control purposes. It also plays a vital role when voice communication is required in challenging or emergency industrial or critical infrastructure situations.

[19] See European Union (2024) amending European Union (2015)
[20] See Department of Transport (2024)

3 Benefits of switching off 2G networks

Several benefits related to increased spectrum efficiency, improved connectivity and security, cost savings, better quality of service and energy efficiency can be associated with 2G network switch off[21].

3.1 More capable and efficient solutions

The use of newer technologies (4G or 5G) offer opportunities for more capable and efficient solutions. The end-user benefits include, for example, faster data connections, higher video streaming and voice quality, increased reliability and reduced latency.

In the context of IoT, migrating to LTE-M offers low latency and enhanced mobility support making this technology better suited for applications such as vehicle trackers and wearables. Similarly, NB-IoT offers opportunity for optimised massive static and autonomous devices which do not require much human intervention during their life cycle and can be deployed in challenging locations such as deep inside buildings. The use of embedded Universal Integrated Circuit Card (eUICC) capability in IoT devices allows network profiles to be downloaded and switched over-the-air remotely eliminating the need to physically swap SIM cards. This provides flexibility for businesses to change connectivity providers in response to, for example, coverage issues and commercial changes.

3.2 Spectrum efficiency

Refarming of 2G spectrum enables the deployment of more spectrally efficient technologies. For example, the GSMA states that, 2G networks carry 0.1 bps/Hz downlink data while 4G networks can carry up to 2.4 bps/Hz downlink data, and 4G networks reduce capital intensity (defined as CAPEX divided by revenue).

3.3 Network management

Each mobile generation comes with its own set of equipment, procedures and management systems maintained by trained specialists in network operation centres. Switching off the 2G network will reduce the complexity of network management across parallel running mobile technologies, reducing costs and allowing redeployment of resources.

3.4 Cost benefits from decommissioning of legacy networks

Decommissioning of ageing equipment results in cost benefits. Key points to consider include the following.

- Reduced network management costs as the complexity of network management is reduced due to the removal of maintaining 2G in parallel with 4G and 5G technologies.
- Avoidance of increased procurement costs associated with 2G network equipment and spare parts resulting from production by fewer vendors.
- A reduction in power consumption reduces energy costs.

[21] GSMA (2019); P1 Security (2024); Market Reports World (2025)

- Reduced need for skilled technicians familiar with legacy network structures.

It is also worth noting that decreasing maintenance capabilities and increasing maintenance costs may reach a point where no vendor support is available. Revenue generated by 2G networks is unlikely to recover the running costs of these networks as consumer and business demand for 2G connectivity is in decline.

3.5 Energy efficiency

New technologies tend to be more energy efficient and physical space occupied by sites could be reduced and optimised. According to a Swedish information campaign organised by the Swedish mobile industry, 4G and 5G networks can be up to five times more climate friendly compared to 2G or 3G networks[22]. This reduced environmental impact is an important outcome, particularly with the increased use of networks and higher energy use of other technology services.

3.6 Network security

Many legacy devices operate with outdated and no longer maintained software. This, coupled with outdated encryption methods, makes 2G networks vulnerable for eavesdropping and unauthorised access. 4G and 5G technologies offer better, up-to-date network security. In the context of UK telecoms security legislation and regulation, legacy networks are not disregarded. However, where there is a plan for removal of equipment and the costs of meeting the Telecoms Security Act Code would be disproportionate, risk-based approaches to network security may be considered.

3.7 Social benefits

Better network and service capabilities offered by 4G and 5G provide improved connectivity for society, for example in health, commerce and education. This creates a positive return in terms of national economic growth.

[22] Bytnätnu (2025)

4 Difficulties with network switch-off

The 2G switch off involves a range of stakeholders including users, network operators, device manufacturers, network equipment vendors, regulators and standardisation bodies. Challenges faced by these stakeholders are summarised below[23]. Where relevant we have included some specific outputs from our international research; this is described in more detail in Section 6 and individual country appendices.

4.1 Mobile handsets

As shown in Section 2.2, there are millions of mobile devices still relying on 2G technologies which offer:

- basic mobile services, such as voice calls, SMS and data services with low data volumes;
- fallback for emergency calls with devices that do not support VoLTE or VoNR or in areas where 4G or 5G coverage is not available; and
- reliable coverage for deep indoors and rural areas with fewer base stations.

With 2G switch off, 2G handsets will have to be upgraded and, for some customers, affordability of new handsets will need to be considered. In some cases, the provision of heavily discounted replacement devices or at no cost to consumer upgrade options may be appropriate. In cases where old SIM cards are not provisioned for 4G and 5G networks, at no cost to consumer replacement SIM cards may be necessary to ensure service continuity.

Mobile network service providers need to give sufficient notice to customers who may need to upgrade their handsets and inform them regarding low-cost options and technical support available. In Hungary, for example, the regulatory authority implemented a subsidy programme for residential users to replace their old handsets with new ones capable of, at least, 4G VoLTE. In Singapore, operators ensured that a range of affordable handsets were available and these included basic models priced below US$35.

It is important for service providers to maintain a comprehensive database of subscriber device information to facilitate the upgrade process (one way to achieve this is capturing the IMEI of subscribers, mapping IMEIs to corresponding device models and maintaining an accurate device map that outlines capabilities of different device models). A challenge in achieving this arises where network operators do not have complete records of devices connected to their networks; this is the case, for example, for some telecare devices connected using third party SIM cards.

It is also important to limit the procurement of devices that support 2G networks only and ensure that multimode handsets are configured such that preference is on next generation networks. In Singapore, for example, the national regulator ceased to type-approve 2G only handsets 18 months before the 2G shut down to prevent increase of 2G only devices in the market.

[23] Clark (2024); GSMA (2019); BEREC (2023); Hemade (2025); ComReg (2024)

4.2 IoT devices

IoT communications networks that partly or fully rely on 2G (for example smart energy meters, payment terminals, remote monitoring and personal medical alert devices, fleet management and asset tracking telematics) need to be upgraded to 4G or 5G ahead of 2G switch off.

Current IoT technology offers include the following.

- LTE-M: Ideal for mobile, low-power devices such as asset trackers, wearables, and logistics systems.
- NB-IoT: Designed for static, long-life deployments like smart meters and environmental sensors, especially where deep indoor penetration is needed.
- 4G and 5G: Suitable for high-data use cases and latency-sensitive applications such as video, autonomous systems, and complex industrial deployments.

The physical replacement of IoT modules may require an engineer visit, potentially to a remote location, a home, or a business to install a compatible module. For example, in the UK, it is estimated that 7 million energy meters will be affected by the switch off which may involve installing new meters, as the radio unit in many cases is an integral part of the meter and cannot be replaced separately. Some IoT equipment using 2G services may be difficult to locate and access (such as pipelines and dark underground tunnels) and others may be used in safety situations and health monitoring where disruption to the service provision is not possible, and mitigations need to be preplanned.

A comprehensive assessment and audit of IoT devices may be needed. Service providers may need to reach out to industry bodies and other user groups to identify end users of services from re-sellers that would know location, function and scheduled end of life of connected IoT devices that may need to be migrated to 4G or 5G networks. It may be efficient to work directly with large business customers (like banks for payment terminals or lift companies) to coordinate the replacement of IoT modules that rely on 2G technologies. In cases where IoT devices use roaming SIMs, it may be difficult to identify these devices. These efforts will need to be supplemented through general publicity in business and other media channels.

The cost and complexity of replacing IoT devices need to be taken into consideration. The process will involve migration planning and execution as well as testing, validation and deployment of new hardware and connectivity solutions. Proactive planning is therefore essential and sufficient transition time needs to be provided. An option might be that operators choose to establish a joint venture to consolidate and operate existing 2G services in a small portion of the 2G spectrum in the short term to achieve cost efficiency until new solutions (such as NB-IoT or LTE-M) can be implemented. This approach could free up 2G spectrum for use by 4G or 5G networks.

Example applications relying on 2G networks are provided below.

Figure 4.1: Example IoT applications

Application Category	Description	Rationale for using 2G
Smart meters	Electricity, gas, and water meters that send consumption data remotely to utility companies	Good propagation characteristics enabling indoor deployments.

Application Category	Description	Rationale for using 2G
eCall	The automatic emergency call system installed in new cars sold in the EU since 2018.	Wide area coverage offered by 2G networks to enable emergency calls in Europe. eCall EU standard was based on 2G or 3G circuit switched technology.
Payment terminals (Point of Sale devices)	Wireless card readers	These terminals require a reliable, simple connection to process small, critical transactions. 2G is often kept as a default fallback or primary connection because it is highly stable for brief data bursts.
Security and telecare devices	Home security alarm systems and personal medical alert devices	These devices need to operate for long periods on a battery (telecare devices) or simply send an alert signal (alarms). 2G's efficiency for low-power, simple data makes it the most cost-effective and longest-lasting option.
Asset Tracking & Logistics	Tracking devices in vehicle fleets, shipping containers, and valuable non-powered assets.	Required intermittent reporting of location data (which is very low data). 2G modules were cheap, small, and consumed little power, extending battery life significantly (critical for remote assets).
Remote Monitoring or SCADA	Supervisory Control and Data Acquisition (SCADA) systems, primarily used in remote utility and industrial settings.	Used for monitoring status of remote infrastructure like pump stations, water level sensors, traffic lights, and environmental sensors in agriculture and mining. Low data, high reliability requirements.
Vending Machines and Kiosks	Used for remote inventory reporting and enabling cashless payment on the machine itself.	Low data usage for inventory checks and status reports. 2G was a simple, cost-effective way to establish a backhaul connection.
Fleet Management and Telematics	Basic vehicle telematics systems for logging mileage, engine diagnostics, and basic GPS location for transport companies.	Reliable connection for small, regular data packets. Some older emergency-call-equipped vehicles also relied on 2G or 3G for their mandatory emergency connectivity.
Simple Data Logging and Control	Agricultural equipment, weather stations, and simple remote control mechanisms (such as opening gates, turning off irrigation).	Often only needed to send a single SMS command or a small data packet for control or status, which is perfectly suited to 2G's core capabilities.

The common factor for these applications is their low data usage and the need for ubiquitous and reliable coverage, which the 2G network, especially the 900MHz frequency, historically provided across wide geographic areas including remote and indoor deployment scenarios.

From the implementation point of view, the high number of IoT devices involved in some applications relying on 2G networks require a coordinated, gradual phase-out to avoid widespread service disruption. Smart meters and IoT devices deployed in lifts are two examples. For example, in France, nearly half of all lifts (around 290,000 systems) use 2G or 3G emergency call systems and the shutdown process has a major impact on operations. A

delay was requested by lift manufacturers but the mobile operators have not changed their timelines, instead urging equipment manufacturers to modernise their equipment to fit with the existing shutdown schedule. In Iceland, the Icelandic Tourist Board has urged businesses in the tourism industry to pay special attention to the upcoming changes, noting that payment terminals and other transaction systems that operate via 2G or 3G will stop working.

4.3 Coverage

It is important to ensure that switching off 2G networks will not result in coverage gaps leading to customers left with no mobile service. This can be an issue in remote areas in particular. In the UK, initiatives such as the Shared Rural Network (SRN) programme aim to expand 4G coverage in rural areas. In Australia, a mix of spectrum refarming, government funding and user equipment upgrades was used to ensure that there were no mobile black spots due to the 2G and 3G switch off. 2G tower sites were used for 4G base stations to fill coverage holes and provide additional data capacity. The Australian government's Mobile Black Spot Program provided funding for the operators to fill the remaining black spots by building new 4G towers. In some fringe areas, user devices with 'blue tick' certification[24] were used for improved rural and remote area performance. In Germany where 2G networks are still operational and no switch-off is expected for at least two years, figures published in October 2024 show that the 2G coverage is approximately 10% better than the 4G coverage for all three network operators[25].

Mobile network operators are expected to provide information about the switch off in their online coverage checkers. National regulators may require coverage matching what was offered by legacy networks. For example, in France, coverage improvements have been implemented in rural areas to ensure that the level of 2G coverage in these areas is achieved by 4G or 5G networks. In Iceland, according to license conditions, mobile operators need to ensure equivalent coverage when they shutdown 2G and 3G services and deploy 4G and 5G technologies.

4.4 Customer contracts

Customers must be made aware of contractual implications of 2G switch-off. If customers enter into a contract with a device capable of only 2G service, they need to be told when the device will not function due to 2G switch-off and that they need to upgrade to 4G or 5G capable devices. Customers who are already entered into a contract will need to be notified well in advance and they may have a right to exit their contract without any penalty fee.

In-store advice and online instruction videos on new devices (for example, smartphone instructions for the benefit of 2G phone subscribers) could be offered. Enterprise customers are likely to need a dedicated team to manage VPN solutions and other enterprise-specific issues, such as legacy IoT devices.

In Singapore, for example, migrating 2G customers were allowed to retain their mobile numbers and subscription plans on new networks at no extra cost and with no re-contract. In Taiwan, when 2G networks were shut down in June 2017, there were estimated 88,000 2G subscribers, and operators reserved their numbers until the end of December 2017 in case they chose to upgrade to 4G[26]. Also in Taiwan, the regulator mandated that service providers offer service contracts that would allow 2G users to seamlessly migrate to 3G or 4G. These plans were required to be similar to or better than what they had before, with options for call-only, text-only, or combined services. In Australia, Telstra, one of the operators, announced its December 2016 shutdown in 2014,

[24] Selectra (2025)
[25] Bundesnetzagentur (2024)
[26] Bushell-Embling (2017)

providing two years' notice for its customers. This long lead time was essential for major migration efforts, for example, involving large IoT deployments.

4.5 Vulnerable customers

Service providers need to have policies to help vulnerable customers to mitigate the impact of 2G switch off. In the UK, EE offered a free 4G handset for vulnerable customers at the time of 3G switch-off. In Singapore, the regulator encouraged senior citizens to attend courses on using smartphones at senior-friendly IT learning hubs. In Germany, devices with buttons and without a touchscreen that support VoLTE have been made available.

The level of support to vulnerable customers is likely to depend to some extent on the timing and speed of switch off. For example, the switch off in Singapore took place in 2017 when smartphone adoption and familiarity was less well established.

As with other services and features, operators may wish to explore collaborative actions to leverage economies of scale to develop low cost devices and solutions for the benefit of vulnerable customers. This can be helpful where there is not sufficient demand for services to make them commercially attractive to a single operator, but there is a need for specialist solutions to support small numbers of vulnerable customers.[27]

4.6 Access to emergency services

Uninterrupted access to the emergency services needs to be ensured which implies transition from 2G circuit switched to 4G or 5G IP-based (packet switched) telephony, for example by using VoLTE and VoNR technologies, to preserve service availability for emergency calls.

2G and 3G network specifications allow for a limited-service state (LSS) to be provided to a mobile device for the sole purpose of making an emergency call. When an end-user does not have access to their service provider's network or the network of one of their roaming partners, an "emergency calls only" message appears at the top of their screen. When this happens, any available network can be used to make an emergency call. LSS also works in some countries when using a device which does not have a SIM card. This is a safety net for mobile users[28]. Mobile network operators, therefore, need to enable emergency calling and national roaming via 4G and 5G networks before the 2G network is switched off.

The process of ensuring availability of VoLTE or VoNR call capability is complex and involves addressing potential interoperability issues associated with hardware and firmware, operating system, SIM and subscription related settings. For example, when roaming abroad without 2G or 3G fallback users may find that although the device has coverage and an IP connection is present, it does not always support initiating or receiving voice calls due to failure in aligning network and handset roaming settings[29]. The key issue is that VoLTE is implemented in different ways on different networks with variations between handsets, chipsets and software versions, leading to compatibility and interoperability issues between networks and handsets. Main causes include

- incorrect interpretation or implementation of technical standards for VoLTE;
- varying degrees of capability of chipsets installed in handsets;
- interoperability issues between networks and handsets for support of different IP versions; and

[27] For example, relay services which are mandated by Ofcom.
[28] McBride and van der Berg (2022)
[29] Lumbreras (2025)

- limited implementation of VoLTE roaming agreements between network operators internationally.

Particular attention should be given to devices which may support 4G, but not VoLTE, as these might not support emergency calling[30] and this may not be known to the user until a critical moment. Such devices need to be detected, and the user concerned may need to be individually contacted by the MNO.

Interoperability problems may also have implications in internet services requiring multi-factor authentication (such as e-banking) where SMS codes sent to the user cannot delivered. It is therefore important to set and implement profile alignments in VoLTE and VoNR standards to overcome interoperability issues. This process should not be discriminatory against small mobile network operators and mobile virtual network operators.

It is important to note that those travelling to any country that is well advanced in switching off 2G or 3G legacy services could be advised by their service provider to purchase a separate device or SIM card to ensure that they have access to a voice service. They could also be advised to manually select an alternative roaming partner that still offers a 2G or 3G service although this option depends on the extent of the roaming agreements in place by the end-users home service provider and visited networks.

A more harmonised implementation of the VoLTE technical specifications that is compatible and interoperable between all networks and handsets is essential. A report from the European Commission (published in April 2024)[31] states that '*the technical specifications of the cellular network are developed by 3GPP, a global partnership in which ETSI participates. ETSI has presented a report which concludes that this issue is mainly due to the lack of commercial agreements between network operators, which in turn prevents the VoLTE service from being fully operational*'.

The importance of this issue has been highlighted in a number of cases internationally.

- Following the 3G sunset in Australia, there was recently at least one unfortunate example of an individual being unable to access the emergency services (on 000) through their older Samsung device[32], and as a result dying; this individual was using the Lebara MVNO service and the handset was incompatible with the VoLTE service, and was unable to roam onto any other service.

- In Sweden PTS has explicitly identified mobile phones that, after 2G and 3G shutdown, will not be able to reach 112 even though they may make ordinary calls[33]. Operators are being required to block such phones because they pose a safety risk. These phones can still make network calls but cannot route emergency calls correctly on 4G because they lack the capability (VoLTE or equivalent) to do so.

4.7 Network infrastructure equipment

Nokia and Ericsson are the major network equipment suppliers in Europe. Switching off legacy 2G networks is likely to make it easier for new suppliers to enter the market as their products will not need to be compatible with this technology. For example, the 2G switch off will reduce the complexity of Open RAN technology as the operation of legacy mobile network technologies alongside newer ones results in network operation complexity in terms of managing multiple RAN layers and interfaces. Network operations will be streamlined after sunsetting of legacy networks. It is also worth noting that Open RAN vendor support for legacy technologies is unlikely to be available.

[30] 4G devices that do not support VoLTE fall back to a 2G/3G network when making or receiving a voice call.
[31] European Commission (2024)
[32] Lipscombe (2025a), Taylor (2025)
[33] PTS (2025)

There may be an issue of network equipment spare part unavailability for existing 2G networks. Recycling of a large number of withdrawn user equipment may also need a coordinated action.

4.8 Regulatory clearance

The refarming of spectrum used by 2G networks for 4G or 5G networks requires careful planning and execution, and may require regulatory clearance from the national regulators. In many cases existing licences are technology neutral and licensees are free to operate any mobile network technology generation on the licensed spectrum so long as technically compatible. However, licence conditions are likely to require the licensee to notify the regulator well in advance before the cessation of network operation the licence relates to and minimise the impact caused by the cessation on end users.

For example, in Ireland, the regulator (ComReg) published '2G/3G Switch off Guidance for Mobile Network Operators' in July 2024[34]. The Guidance sets out general principles to guide mobile network operators in seeking to meet their licence obligation requiring them to take all reasonable endeavours to minimise the adverse effects of any cessation of use of 2G and 3G networks. ComReg requires that it needs to be notified at least 6 months prior to the cessation of any terrestrial system to which the licence relates. The Guidance summarises ComReg's expectations under several categories including notification and preparation; communication; network, coverage and service principles; and end-user rights. These are provided in Appendix G.

It is worth noting that, in general, the 2G shutdown is mainly driven by commercial and technological factors (such as uneconomically low traffic volume, limited availability of user and network infrastructure equipment, and efficiency offered by 4G and 5G technologies) rather than a mandate issued by the national government or regulator .However, it is reasonably common for regulators to be involved in 2G shutdown initiatives in some capacity. For example, in Singapore, all three mobile operators (Singtel, StarHub and M1) requested an approval from IMDA to switch off their 2G networks in 2015 primarily to ensure that freed spectrum was assigned to more capable networks to meet increasing data demand. The shut down was completed in April 2017.

4.9 Stakeholder coordination

The 2G switch off involves a range of stakeholders and needs to be coordinated. The national regulator may need to take a lead and hold regular meetings with mobile network operators and industry associations to discuss phasing out activities. For example:

- The French regulator ARCEP has adopted a quarterly reporting system to track the number of SIM cards in devices compatible only with 2G or 3G. The regulator hosts meetings with mobile network operators and trade associations representing IoT equipment users to address the impending shutdown. Furthermore, ARCEP created a Mobile Technical Experts Committee that includes operators and suppliers to assess the carbon footprint of shutting down 2G and 3G networks.

- The Italian regulator (AGCOM) appears to be focused more on monitoring and data collection on coverage and affected users rather than directly mandating the commercial timelines or specific preparatory analyses. The analysis of technical implications relies on the individual operators to perform to ensure they comply with network licence obligations and service continuity requirements.

- In Sweden, the regulator, PTS, was tasked by the government to oversee provision of information by the operators, and replacement solutions offered to customers. PTS works closely with the operators,

[34] ComReg (2024)

meeting quarterly and organising public events. PTS also delivers its own consumer information facilities and campaigns.

- In Switzerland, a decentralised operator-led approach was implemented where mobile operators conducted direct consultations with affected industries and stakeholders rather than through a single government-led public consultation.

In the context of stakeholder coordination, MNOs need to consider MVNOs that provide service on a network which is subject to switch off and any impacts that switch off can have for MVNO's users.

The switch off timelines need to reflect the required planning. In Iceland, for example, an open consultation was launched in early 2023 to inform the public about the upcoming changes and to ensure that sufficient time was available to replace or upgrade essential equipment before the networks were shutdown. In response to consultation feedback, the regulator postponed the shutdown (which is to be completed in 2026) to give network operators adequate time to upgrade their infrastructure and ensure a smoother transition for users to 4G and 5G services. In particular, the delay has provided an opportunity for businesses relying on 2G IoT connectivity to upgrade their devices to support 4G and 5G technologies like LTE-M and NB-IoT.

4.10 Public engagement

Public engagement may be necessary in the form of

- direct contact (for example, letters, emails, and targeted SMS messages sent directly to the phones identified as 2G-only),
- public announcements (for example, media releases, website notices, and social media campaigns such as webinars and live webchats for questions),
- in-store support (for example, dedicated staff and resources provided in retail stores to check a customer's device compatibility and facilitate upgrades or SIM swaps),
- public consultations launched by the regulator or operators,
- FAQ websites published by the regulator or operators,
- provision of tools for self-checking (for example, online tools or SMS services enabling device model or IMEI number check to determine if the user handset would be affected and an upgrade is needed), and
- establishing dedicated customer support lines to assist users in understanding the change and determining the best course of action (for example, getting a new SIM, buying a new phone, or checking network coverage in their specific area).

As well as a general engagement programme, vulnerable consumers (as discussed in Section 4.5) may need additional assistance to understand the impact of network sunset on their devices.

Consumer agencies, local authorities and other agencies (for example, transport agency for eCall systems) could also be contacted by the national regulator to ensure their inputs are incorporated into the switch off process.

In Taiwan, mobile network operators executed substantial campaigns to reach out to their remaining 2G subscribers including corporate and government clients (such as smart meters, city bus systems) to ensure a timely upgrade. The campaign included text messages, hosting information sessions (including 1,535 sessions for

individuals and visits to 375 remote villages), promotional packages to encourage switch to new technologies, and TV commercials. A switch off information campaign organised by the Swedish mobile industry also appears to be a good example[35].

[35] Bytnätnu (2025)

5 Status of 2G in the UK

This report is not intended to give a thorough overview of all aspects of 2G switch-off in the UK. However, in order to focus research on other countries, this Section considers the main issues which have been raised regarding the topic on network sunsetting, and the outcomes of our discussions with key UK stakeholders. In preparing this report we have gathered data on 2G use from mobile operators, and discussed the current situation with stakeholders across the telecommunications and a wide variety of other industries. This Section should not be considered as a comprehensive report of these discussions but instead notes areas of particular concern and uses these as a focus for our analysis.

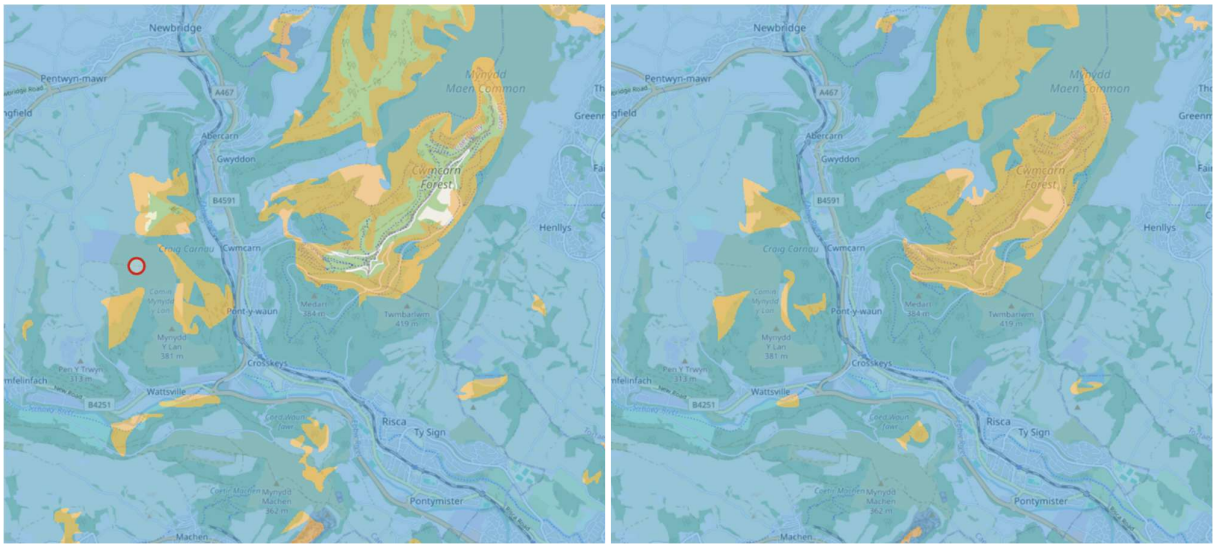
5.1 Current use of 2G networks

Across the UK, mobile networks continue to operate 2G as part of the overall connectivity portfolio. While 5G coverage maintains a steady roll out, LTE networks are mature and are the primary connectivity technology. Nevertheless, due to coverage or capacity restrictions, there are situations in which users fall back to 2G.

5.1.1 Provision of coverage

The issue of coverage is particularly important in rural areas. Figure 5.1 shows current coverage maps for the O2 network using LTE[36] and 2G technologies, in an area of South Wales. Within the Cwmcarn Forest, there is some 2G signal, but no connection to LTE at all (represented by areas coloured white in the map shown below on the left). Other areas (to the West of Machen, for example) have a poor LTE connection but good quality 2G access (this is represented by areas which are coloured yellow in the map shown below on the left, and green in the map shown below on the right). While the population density in these areas is likely to be low, the importance of access to a connection will mean that the 2G network currently continues to be used.

Figure 5.1: O2 coverage near Newport on LTE (left) and 2G (right)[37]



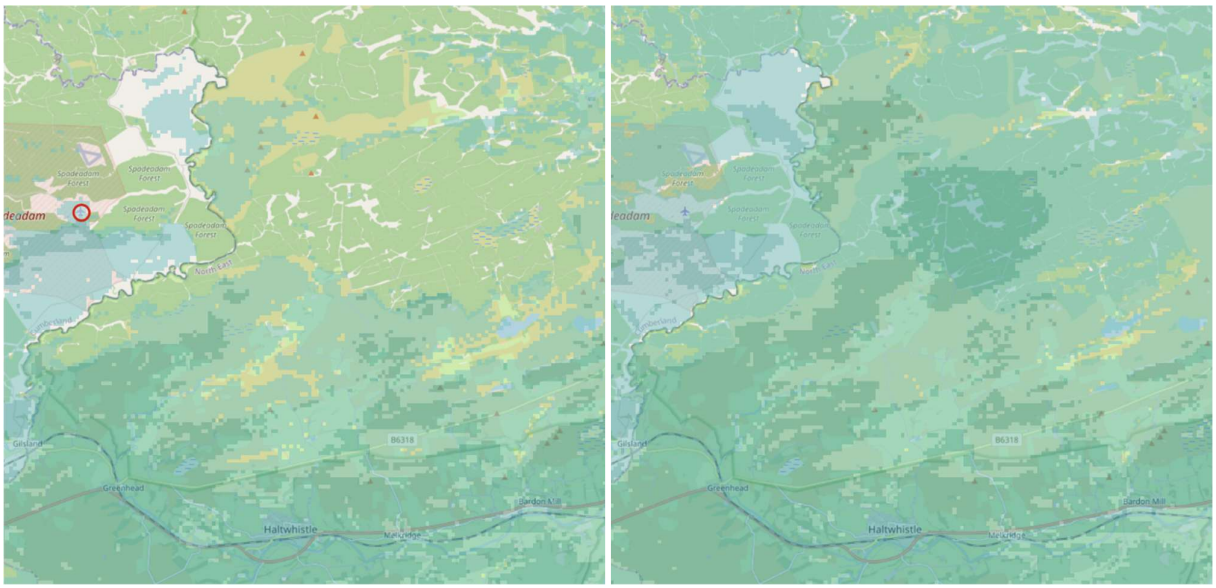
[36] While it is possible, with the rollout of 5G Standalone, that there could be areas in which there is 5G coverage but no LTE coverage, in reality current 5G coverage lags behind LTE and in all cases shown here there was no additional coverage offered by 5G.
[37] Source: https://mastdatabase.co.uk/gb/coverage/split-screen/

It is noted, from examination of the mast database, that there are no additional base stations being used by 2G in this area. The poor coverage is due to LTE signals' inferior propagation characteristics, and this leads to a lower quality of signal at cell edges.

This analysis considers the current coverage of networks, as at November 2025, and it is likely that some of these specific uncovered areas will see further investment in the next few years, ahead of 2G sunsetting. Mobile operators will need to focus investment in these areas if there is to be no loss of coverage, and this will need to take the form of network densification, or the rollout of lower frequency spectrum (for example, using the 700 MHz band for LTE or 5G coverage).

2G use is not restricted to small areas. Figure 5.2 shows LTE and 2G coverage on EE's network in the North of England. As can be seen from the map shown below on the left, coverage on LTE is patchy (poor coverage is represented by white coloured areas). 2G coverage is, on the other hand, more widespread and robust (represented by darker green on the map shown below on the right). Around RAF Spadeadam, indicated by the red circle, it is likely that any users will roll back to 2G networks on a regular basis, and indeed there are large areas where 2G is the only technology available.

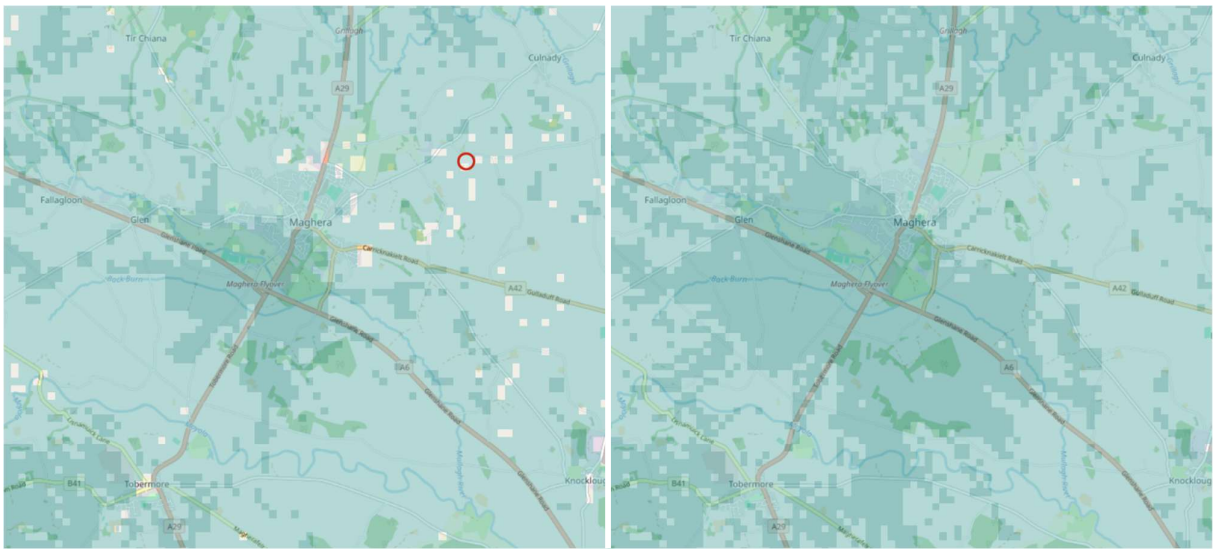
Figure 5.2: EE coverage near Hadrian's Wall on LTE (left) and 2G (right)[38]



This difference in coverage is even more pronounced when looking at the availability of a substitute to 2G voice. Figure 5.3 shows two coverage maps for EE's LTE network in Northern Ireland, but there are limits to where the signal is adequate for VoLTE. In areas Northeast of Maghera, there are a number of places (represented by white coloured areas in the map shown below on the left) where mobile handsets will be able to receive an LTE signal, but any voice calls would need to revert to 2G (termed as "LTE non-VoLTE" below). Again, future investment in the LTE network may overcome this current shortfall, but it requires network operators to identify the areas and focus their network improvements in those areas.

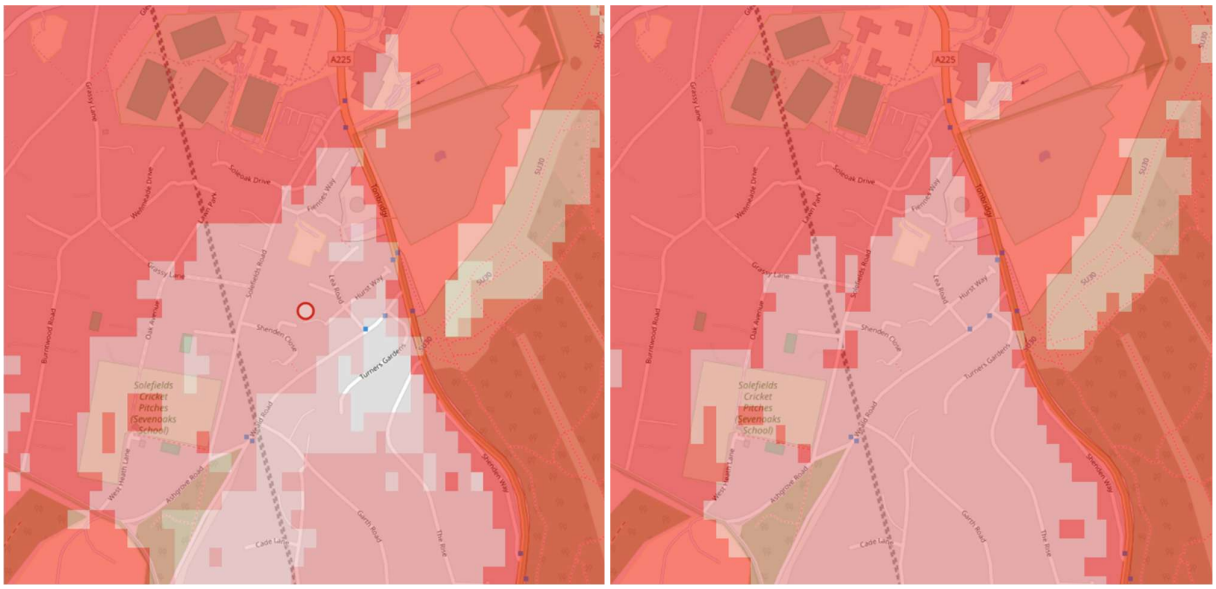
[38] Source: https://mastdatabase.co.uk/gb/coverage/split-screen/

Figure 5.3: EE coverage near Maghera on LTE (left) and LTE non-VoLTE (right)[39]



Finally, this situation is not restricted to rural areas. On the South side of Sevenoaks, a major town on the Southeast edge of London, there are significant areas in which LTE signals are unreliable or unavailable. Figure 5.4 shows Vodafone's coverage of this area, and while handsets may indicate reasonable LTE signal, in fact the network quality is not sufficient to maintain a data connection[40]. Again, voice calls revert to 2G, and it is possible to download some data by switching LTE and 5G networks off on the handset and reverting to EDGE connections.

Figure 5.4: Vodafone coverage near Sevenoaks on LTE (left) and 2G (right)[41]



[39] Source: https://mastdatabase.co.uk/gb/coverage/split-screen/

[40] A device showing an indication of good signal strength (4 or 5 bars) does not always guarantee fast data speeds or reliable capacity. There are many factors aside from signal strength that determine the quality and capability of a network connection including the use environment, transient radio propagation effects and congestion in the RAN or other network elements.

[41] Source: https://mastdatabase.co.uk/gb/coverage/split-screen/ – note that this coverage map dates to before the merger between Vodafone and Three.

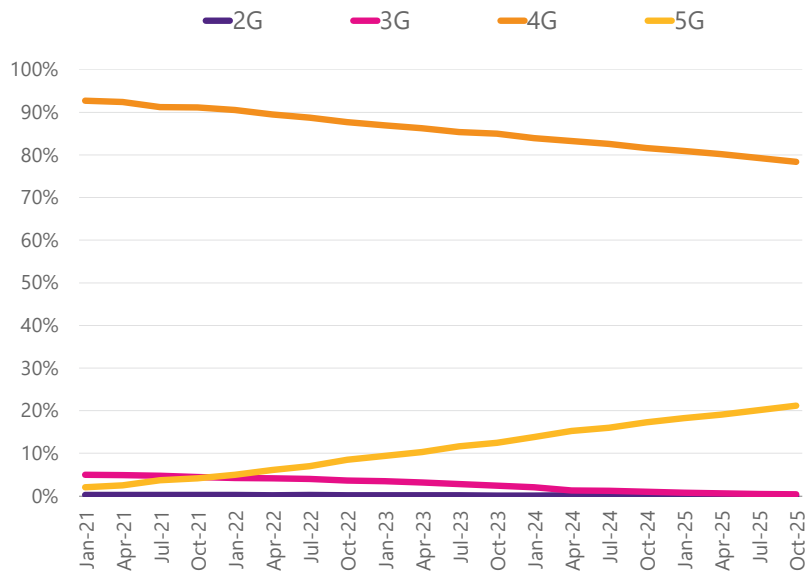
Currently, therefore, 2G networks are still used in many areas, both to provide basic service coverage and also as a fallback for voice in cases where networks are at capacity or are unreliable. It is important to note that 2G networks often result in better propagation coverage than that achieved by LTE and this, for example, ensures more reliable service availability at the cell edge.

5.1.2 Impact of 3G sunsetting

The use of 2G networks has become even more important with the switching off of 3G technologies. As noted in Section 2.2, in many countries 3G networks are being switched off before their 2G equivalents, since 3G services are more directly replaced by LTE and 5G. This is the case in the UK as well, with Three, Vodafone, and EE already having switched off 3G, and O2 committing to do so by the end of 2025.

When looking at total data traffic, the switch-off of the 3G network was anticipated a few years before the deadline was set. Operators had steadily been migrating data customers over to the new LTE and 5G networks, particularly because it represented significant cost savings per data transferred. 3G data use was therefore in steady decline, and there was minimal use before operators switched off their networks. It is worth noting that 2G data use was minimal over the entire period.

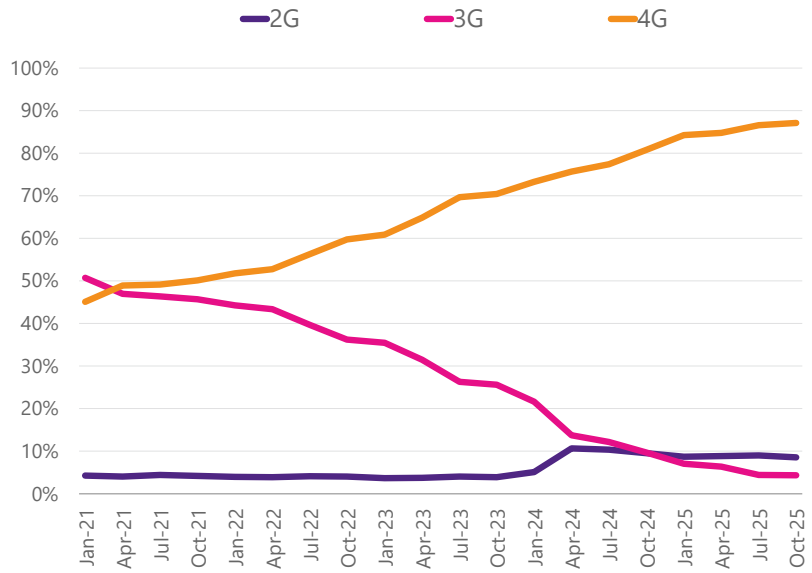
Figure 5.5: Estimated technology shares for data traffic in the UK mobile market[42]



However, when looking at voice, as shown below, the switch-off of 3G actually seems to have led to a significant uptick in 2G traffic. Note that both Vodafone and EE completed the switch-off of their 3G networks in February 2024; at this point the proportion of voice carried on 2G increased significantly, and continues at this higher level to the present. While there was a steady migration of 3G voice over to LTE ahead of network sunsetting, there were a significant number of calls which reverted to 2G technologies at the point of switch-off. A similar impact may be seen with the switch-off of O2's network in December 2025, and the switch-off of ThreeUK's 3G network in November 2025 – although it is unclear whether existing Three UK customers (from before the merger with Vodafone) will be able to roam onto Vodafone's 2G network.

[42] Source: estimated totals based on anonymised operator submissions and internal reports

Figure 5.6: Estimated technology shares for voice traffic in the UK mobile market[43]



Therefore, there remains a significant role for 2G technologies, replacing 3G after switch-off in areas where LTE is not available. This is particularly important for voice calls, given the limited availability of VoLTE connectivity.

5.1.3 Use by MVNOs

The analysis above looks at the total traffic carried by mobile network operators, but it is important to note that all users of networks are not affected in the same way. In Sections 2.3 and 4 we identified a number of different services using mobile networks, and as well as these it is important to consider the variations between retail and wholesale consumer services. All MNOs carry some traffic on a wholesale basis on behalf of MVNOs, and these MVNOs are often aimed at lower income households, more budget sensitive customers or specific communities.

As part of our data collection exercise, we asked mobile operators to provide us with some information regarding what proportion of MVNO traffic utilises the 2G network. Exact figures are confidential, but surprisingly it appears that MVNO customers tend to use 2G for voice less often then MNO direct customers, particularly since the switch-off of 3G technologies by Vodafone and EE. This suggests that any sunsetting of the 2G network would therefore affect MVNO users less than other consumers.

5.2 UK services and stakeholders using 2G networks

As discussed in previous sections, mobile broadband and consumer voice are not the only services which make use of 2G technologies. There are many IoT and other devices which operate on the 2G network, and these will all need to be reconfigured before the networks are sunset if there is to be no loss of service.

In order to understand the scale of this issue, and to ensure that we have looked at international experience which is directly relevant to the UK market, we have spoken to stakeholders across both the telecommunications industry, and representative users of telecommunications services. In particular, we have held meetings with:

[43] Source: estimated totals based on anonymised operator submissions and internal reports

- Representatives of utility companies, including water and energy markets;
- Local government bodies; and
- Consumer bodies, both general and representing specific vulnerable groups.

Our aim with these meetings was to understand how 2G is currently used, plans for migration away from 2G, and key issues which may constrain network switch-off in the UK. Many stakeholders noted that there have been similar issues raised with the switch-off of the PSTN network, and lessons from that process can be applied in some cases to 2G. Others noted that PSTN use was more extensive for critical usage, since 2G networks do not have power autonomy and are inherently less reliable.

The rest of this section highlights a few specific use cases that were raised in our meetings and interviews.

5.2.1 Energy metering systems

In the UK, smart metering systems are delivered using two different technologies – a proprietary system using 450 MHz spectrum by Arqiva across the North of the country, and an IoT 2G system run by VMO2 across the South. This latter system is currently undergoing a migration to Vodafone, and with this there will be an upgrade to LTE technologies. However, this transition is taking a significant time.

DCC, the provider of smart metering equipment, has noted that there are millions of smart meters that will need to be upgraded, but there is limited capacity for providing the equipment; energy sector representatives note that the logistical challenge of accessing properties to upgrade 2G technologies means that even a 2033 network sunset date is an ambitious target.

Although important for modern infrastructure, it is not critical that every 2G meter is replaced before network switch-off. In the majority of cases the connectivity is used only to report daily meter readings. Whilst it would not be a good solution from the perspective of consumer experience, and could lead to issues with reading accuracy, users could instead revert to less frequent manual submission of readings if 2G connectivity is no longer supported. However, for customers who make full use of smart network facilities, such as energy storage, home generation, or smart vehicle charging, the lack of connectivity could have a more serious use.

5.2.2 Water quality monitoring

Throughout the UK, 2G connectivity is used for several pieces of equipment in the water network, including water data loggers, remote terminal units controlling pumps and valves, and leakage monitors. These have been used in rural areas where there is no PSTN network, and extensively in more urban areas to reduce cost of deployment. For the water and sewage system to continue to operate effectively, it is vital that these pieces of equipment continue to function.

Water companies have started migration to alternative technologies, assisted in some cases by funding from Ofwat for asset enhancement. However, this funding does not cover the full cost of replacements, and much of the equipment is not due for replacement until beyond 2033, meaning there will be a significant impact on balance sheets; one water company indicated that they would face an additional £150million of capital cost over the usual replacement cycle. Further, as with electricity and gas metering, there is a supply issue in terms of replacement equipment – not only is old equipment needing to be replaced, but water companies have an obligation to increase monitoring of waterway quality.

Water companies are therefore very concerned over the speed at which it is possible to rollout upgrades on their networks, and believe that a 2033 deadline is barely possible – they state that any attempts to roll that deadline forwards would mean the migration would not be achievable.

5.2.3 Telecare devices

A telecare device is a piece of technology that allows people to live independently and safely in their own homes by connecting them to a monitoring centre. These are used by elderly or disabled people to send alerts when assistance is urgently required, and can take the form of a watch, necklace, or other type of device. Some devices are linked directly to the fixed line phone network, while others are more mobile. Due to the nature of the service it is vital that connections are reliable and resilient, and there may be multiple connectivity options built into a device.

AgeUK has carried out work advising users how current telecare devices linked to analogue fixed lines are likely to stop working when the PSTN network is switched off. This has been in the form of direct contact to registered users, as well as more general information and marketing campaigns. The AgeUK website states:

> **"The switch to digital landlines may affect telecare devices and other equipment such as personal alarms and security alarms if they're connected to your phone line. You should contact your device supplier to check if your device will work with the new system or whether any equipment will need to be upgraded.**
>
> **Although your landline telephone provider will contact you before the switch takes place, you should let them know about any telecare devices that you have in advance.**
>
> **If you're buying a new device that's linked to the phone system, you should also check with the seller or manufacturer that this will be compatible."**

Some users have migrated from PSTN-compatible equipment to devices that use 2G technology. In some cases, 2G is included as a backup to another primary technology (such as LTE, or sometimes WiFi); in other cases it is the primary connection itself. AgeUK still sells devices which use the 2G networks, such as the Personal Alarm Watch[44], designed to connect via 2G voice services if the user requires help. Research from Digital Scotland indicated that until 2022, 2G connections may have been dominant, meaning there are many still in operation.

The loss of 2G networks could have a significant impact on individuals who rely on connected telecare devices. Unfortunately, mobile network operators are not able to directly identify where these devices are being used, or rather, which of the existing 2G connections are made by these devices. One operator noted:

> **"For care devices specifically, we note that some providers use global SIMs that roam onto our and other networks. We do not see the end device, just the chipset used so we cannot definitively say what the end application is. An example is the Sierra Wireless chip set, which offers a cheap chip that is then integrated into a wide range of applications as diverse as vehicle tracking and water station monitoring. We cannot identify the service; all we see connected is the chipset, and not what the device has been integrated into."**

This highlights an important contractual point. In order to ensure the best possible coverage, some service providers, including but not restricted to the telecare industry, have made use of global or international SIMs which are registered overseas and which then roam onto each of the UK networks. This means there is a further

[44] See AgeUK (2024a)

level of separation between the network operators and the end users, again complicating communication between the two parties.

These roaming arrangements have been changing over the past few years, with 3G networks being turned off in the UK and O2 recently withdrawing international roaming on its 2G layer for most foreign network operators. Age UK now notes that its Personal Alarm Watch will operate "where there is a Vodafone or EE 2G cellular network to communicate". Analysis carried out in Scotland indicates that O2's withdrawal from these roaming agreements will have a marginal impact on general coverage – less than 1% of the population was only covered by O2 without any other coverage from another operator – but it has a major impact on resilience, since around 10% of the population will have gone from having two potential connections to just one. There would be further risks of service compromise and reduced resilience if other MNOs also withdraw from national roaming.

Some bodies such as the Digital Poverty Alliance and the Communications Consumer Panel have examined the need for advertising campaigns to advise users on ensuring their devices will continue to operate. The CCP noted that unfortunately those who are most in need of advice are those targeted by scams, and there is therefore a trust issue in communicating effectively. There are also affordability questions around the replacement of devices which are still otherwise working.

5.2.4 Emergency services

In general, emergency services in the UK use a dedicated communications network, TETRA, although a migration is underway to an LTE-based system operating on the Emergency Services Network (ESN). This should therefore mean that 2G sunsetting will not affect these services.

However, there are some marginal areas in which 2G is used. We understand that 2G connections are occasionally used when sending data between services, especially when other networks are congested. 2G voice is sometimes used by coastguards where it is the most reliable network. Switching off 2G networks may have a small impact, therefore, in the effectiveness of emergency service provision.

2G is also currently used in the most rural areas to call emergency services, and any reduction in coverage with the move to VoLTE may impact on the ability of people to contact the services; the issue of coverage is covered in Section 4.3. There is an associated issue to be resolved that customers may be using handsets which are not compatible with VoLTE, and it is crucial that operators are able to inform any users of these handsets of the issue ahead of switch-off.

There is a further risk that if 2G connectivity is no longer available , this could compromise calls to emergency services for visitors to the UK using roaming services. Other countries have experienced difficulties with voice calls to emergency services by roaming customers after 2G was switched off because of compatibility issues between VoLTE services and some devices.

5.2.5 Transport communications

While train communications across the UK use a separate 2G-based network, GSM-R, which will not be closed at the same time as public mobile networks, it is likely that the cost of maintenance of this system will increase as parts become less available and engineering knowledge becomes rarer. However, this will not be an immediate impact of 2G sunsetting; indeed, it may be that decommissioned equipment from public mobile networks can be used within the GSM-R system. Further, Network Rail is already working on a transition to FRMCS, which is based on 5G and LTE technologies.

Elsewhere in transport, there are likely to be limited uses of 2G connectivity. For critical systems such as remote roadside systems or level crossings, there may have been some justification in the past for installing a 2G system, but in the majority of cases these will be connected via fixed telecommunication lines. Nevertheless, it is crucial that such important connections are not removed with the sunsetting of the 2G network.

5.3 Regulatory decisions and recommendations

While Ofcom has not yet made any firm regulations regarding the switch-off of mobile networks, it has produced information ahead of network sunsetting, which includes existing relevant regulatory obligations and commitments that providers will need to meet during the switch-off process. This has been consolidated in a document "3G and 2G switch-off: Our expectations of mobile providers"[45], which was published in February 2023. The document considers how network switch-off impacts on consumers, and how network operators and other mobile providers should ensure that they can continue to access services they need. Ofcom has also published information and advice for consumers on 2G and 3G switch off[46].

While Ofcom considers the network switch-off to be an industry-led process, setting out these expectations indicates how mobile operators should make adjustments in line with existing obligations and commitments.

The four key areas of expectation (often grouped together for the 2G and 3G switch-offs) are as shown below.

Figure 5.7: Ofcom's expectations of mobile operators

Area	Expectation	Action
Minimising Coverage Impact	MNOs should ensure that the switch-off does not result in a reduction of mobile coverage	Operators should commit to offering a broadly equivalent level of 4G coverage in areas currently relying on 2G or 3G before the switch-off happens. They should also undertake detailed coverage analysis.
Contractual Information	Mobile providers are expected to give customers clear and transparent information about how the switch-off affects their contract and devices	For new contracts involving devices that are not 4G-capable, customers should be informed the date when the device will no longer function on the 2G or 3G networks (if known), and that they will need to upgrade to a 4G-capable device to continue accessing services from that date.
Communication and Customer Support	MNOs should clearly communicate the change and provide support, especially to vulnerable customers.	Customers who need to replace their handset should be given a minimum of three to six months' notice. All communications must be clear, timely, and accessible. Vulnerable customers (including those struggling financially) are expected to be given additional support, which could include offering discounts on replacement handsets.
Other Services Reliant on Mobile Networks	MNOs should identify and raise awareness about other critical devices that rely on 2G or 3G, such as telecare alarms, security alarms, and payment terminals.	Providers are expected to make every effort to identify these services, share knowledge across the industry, and give third-party suppliers sufficient time to update their devices so consumers do not lose access to vital services.

Ofcom's expectations are therefore very much focussed on consumer outcomes, aiming for a result where no user is worse off. This is further illustrated by Ofcom's own advice for consumers, and further advice for IoT and

[45] Ofcom (2023)
[46] Ofcom (2024a)

third-party device suppliers[47]. Ofcom notes that service providers that rely on 2G or 3G networks (such as telecare) are responsible for ensuring the continuity of service after 2G and 3G networks are switched off. This responsibility might be part of contractual obligations they have with their customers, as well as any regulatory requirements that already exist.

Aligned with the industry-led approach, Ofcom is not responsible for determining a date for 2G switch-off. However, all MNOs have committed to switch off their 2G and 3G networks by 2033 at the latest, as set out in the joint statement from the Government together with UK MNOs in December 2021[48]:

> **"The mobile network operators have confirmed that they do not intend to offer 2G and 3G mobile networks past 2033 at the latest. We welcome that some individual operators will switch off their networks, particularly their 3G networks, earlier than this date, and will announce their own plans about when and how they intend to do this."**

This date has also been cited by DSIT[49]. However, all network operators and service providers are responsible for their own overall timetable within this framework. EE have confirmed that they intend to switch off their 2G network in 2029, and Vodafone have indicated a planned sunset date of 2030.

It is not clear that this flexibility in sunset date is clear to users, with many industries and spectrum users citing the date of 2033 as when they expect the 2G network to be switched off. AgeUK, for example, states[50] that:

> **"The 2G mobile network will remain available for many years to come, with mobile operators working closely with the government to plan a gradual phase-out by 2033."**

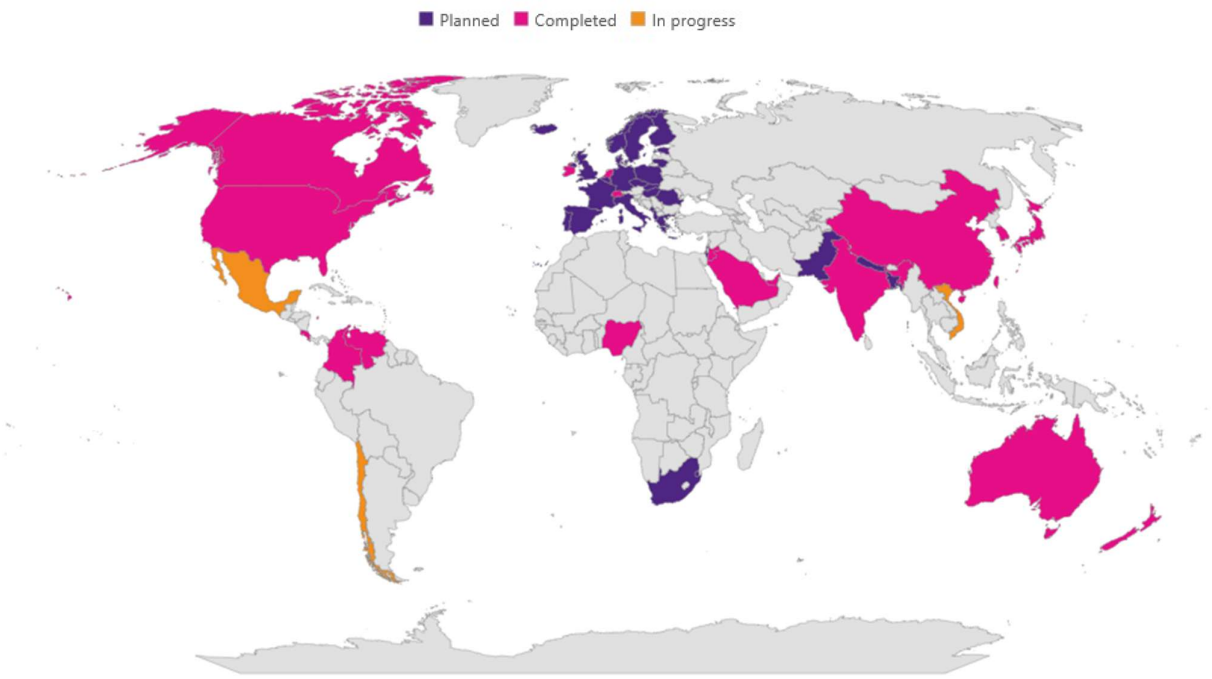
Further, O2's withdrawal from certain international roaming agreements on 2G as of October 2025 has reduced the quality of service available already for any services that continue to use these international contracts as a means of enabling national roaming[51].

[47] Ofcom (2024b)
[48] DCMS (2021)
[49] DSIT (2025), DCMS (2021)
[50] See AgeUK (2024b)
[51] For example, we were made aware of one industry using international SIMs in their monitoring systems, which were therefore able to connect to the strongest 2G signal available. Despite O2's announcements on the discontinuation of service, and its migration awareness campaign, this legacy system is still being used. Therefore there are some of these systems which are no longer able to connect to the O2 network and are therefore either disconnected entirely, or are now reliant on a single provider with no resilience backup.

6 Status of 2G worldwide

As described in Section 2.1, several competing 2G technologies were implemented around the world during the 1980s and 1990s. As of November 2025, nineteen countries had turned off all their 2G networks: Japan, Macau, Tuvalu, Singapore, Taiwan, Cocos Islands, Australia, Sint Maarten, American Samoa, South Korea, Brunei, Canada[52], Switzerland, United Arab Emirates, Antigua and Barbuda, Vietnam, Trinidad and Tobago, Monaco, and Jamaica. However, since in most cases the shutting down of networks was not mandated by regulators but instead was left to commercial decision, there are many more countries where some, but not all, operators have commenced or completed their 2G network sunset. Figure 6.1 shows countries with such operators.

Figure 6.1: Countries with operators that have completed or planned 2G sunsets[53]



It is clear from this map that countries which have commenced 2G sunsetting tend to be those that are most advanced with the rollout of 5G technologies, and have comprehensive LTE networks. However, even these countries may have difficulties with 2G switch-off. For example, in South Africa the target was originally set for 2G networks to be retired in 2025. However, due to the need for affordable handsets, analysis indicated that such a move would disconnect around 20 million consumers[54]. Despite LTE networks having good coverage, a large number of devices would still be cut off. Instead, operators are now planning a more gradual process whereby support is given for users to upgrade, and deadlines have been extended.

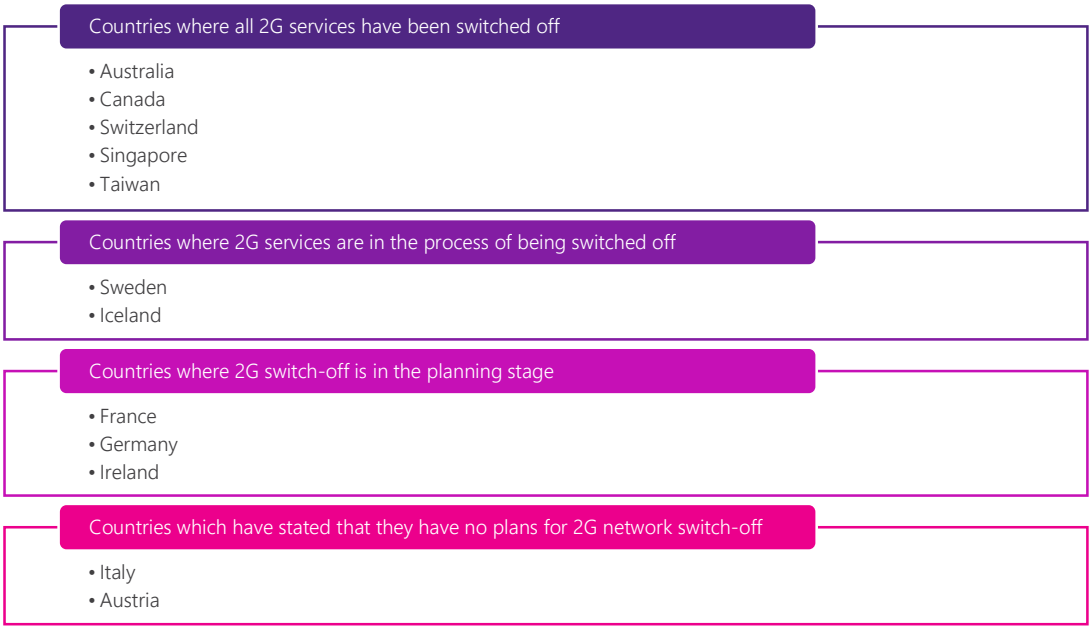
6.1 Selection of countries for analysis

For the purposes of this report, we consider that it is important not only to look at countries where 2G has already been switched off, but also countries where it hasn't – where it may have been delayed, where

[52] Rogers maintains a very limited 2G network on the 850 MHz band for remote areas outside the 3G network footprint.
[53] Source: GSA (2025)
[54] TechCentral (2024)

regulators have mandated that it remain available, or where operators do not consider that traffic is low enough. Our research has focussed on the countries listed in Figure 6.2.

Figure 6.2: List of primary research countries



In these countries we have looked in detail at regulatory statements, information from operators' annual reports and other press releases, consultations, and news reports. Our findings are described in appendices to this report. As well as these detailed country analyses, we have looked at reports from a number of international bodies which identify issues that must be overcome with 2G sunsetting, and potential mitigations. The lessons we can learn from the experience in these other countries is included in the next Section.

However, it is important to note that there is no consensus worldwide on how 2G network switch-off should be implemented. In some cases the closure of 2G has been driven by the end of licences; in others it has been a significant reduction in traffic. Some countries have carried out extensive impact assessments to ensure that consumers feel no impacts of network sunsetting; others have carried out switch-off even with thousands of users still trying to connect. To some extent the closure of 2G is influenced by a country's politics as well as commercial realities.

6.2 Comparisons to the UK

The aim of this study is to consider lessons that can be learnt from international experience, which can be applied to the UK when considering how best to approach 2G network switch-off. As such, it is important that our analysis considers issues which have been raised in the UK, and examines how the relationship between regulators and operators works.

In most countries examined, regulators declined to mandate a defined switch-off date, preferring instead to allow operators to make a commercial decision over when would be an appropriate time for 2G sunset. However, regulators did intervene in cases where significant harm would be done to consumers in the event of many disconnections, loss of critical services, or unrealistic migration deadlines.

Further, the services impacted in many countries do not align to those that have been highlighted in the UK. Other regulators have had greater concern over lift monitoring and car safety systems, while few have noted issues with water monitoring systems and emergency services. Telecare and smart meters are more universal. These differences may reflect variations in national politics, or legacy technology. In any case, this means that interpretation of the lessons to be learnt must be made carefully.

7 International best practice

Following our research into international case studies, as set out in this report's appendices, there are a number of common themes and lessons which can be drawn together. In this Section we set out these themes, and consider some specific case studies.

7.1 Market monitoring

A common theme across all countries is that regulators or national governments[55] took on a strong role in monitoring the scale of use of 2G networks, looking both at consumer devices and also industrial use. This is vital to understand the size of the issue to be resolved, but also to focus any mitigation efforts on those users that are likely to be most affected.

Data for this monitoring come from a number of sources. By carrying out direct monitoring, network operators can generally give a high level indication of the traffic on their network, as well as locations. For some devices, the type of connection can also be established – especially for mobile handsets – but for others a generic chipset means that it can only be established that the network user is an IoT device, without any sense of urgency of use. Network operators can also provide information on the number of subscribers, and this may include information over the use for IoT devices (particularly in the case of large-scale deployments of a certain IoT system), but this is not always guaranteed – further, the existence of national roaming agreements, where some devices will connect to whichever network is strongest, means that mobile network operators may be hosting a large number of devices which cannot be automatically identified – or even who their consumers are.

Therefore regulators cannot rely solely on mobile network operators when looking to understand the usage of 2G, and in addition they must engage directly with industries – both telecommunications resellers, and also the industries of heavy users. In this report we have identified lifts and cars where the essential safety systems have replied on 2G for a number of years; regulators will need to liaise with other sector groups as well.

As well as monitoring the number of users and size of traffic, regulators must also understand how technologies are evolving in each of the target areas. In order to propose and facilitate changes away from 2G technologies, it is vital that the alternative technologies are understood. Regulators can play a crucial role in identifying the needs of 2G network users, and identifying the most suitable upgrade. Associated with the theme described in Section 7.2 below, regulators can work with industry groups who have specific needs to develop upgrade pathways – for example, for payment terminals, or lift safety equipment.

A good example of this monitoring is seen in France. Arcep uses a quarterly reporting system to track the number of SIM cards in devices that are only compatible with 2G and 3G. It hosts meetings with mobile network operators (MNOs) and trade associations (especially those representing IoT users) and has formed a Mobile Technical Experts Committee to address the shutdown's impacts. A priority is ensuring uninterrupted access to emergency calls, which must be migrated to modern technologies like VoLTE or maintained via network roaming. MNOs are communicating specific shutdown plans and offering support to both individual and business customers, including guidance for device upgrades and extensive assistance for businesses with IoT systems.

[55] The interaction between regulators and governments varies by country. Monitoring of this type is usually carried out by regulators, but on more political issues such as this the national governments may wish to take a more involved stance.

7.2 Direct regulatory intervention

A common view across all case studies is that the decision to switch off 2G networks must be commercially led, and regulatory intervention should be minimised. This is consistent with general trends in mobile network licencing, where spectrum and operating licences are increasingly technology neutral, with network operators free to operate any technology provided it meets defined service quality standards.

Network coverage maintenance

Instead of determining exactly how 2G sunsetting is to occur, therefore, regulators have generally considered an outcomes-focussed approach, with renewed obligations on coverage or access to networks. Licences can be altered to ensure that there is an appropriate coverage level, including the rollout of VoLTE.

In Austria, network operators are not required to maintain any specific technologies. For licencing purposes, they must meet certain coverage obligations, but these are generally defined in a technology-neutral way. As a result, mobile network operators can largely choose which technologies to use with their allocated frequencies. All providers must carry out any switch-off in compliance with contractual requirements, and these contracts must be examined in detail to understand if any require maintaining 2G networks.

The Icelandic regulator, ECOI has included specific requirements in operators' spectrum licenses to ensure that the shutdown of 2G and 3G networks would not reduce service quality or coverage. Coverage obligations are defined as a percentage of the population. Mobile users are encouraged to submit feedback through the website if they experience reduced service quality; all submissions are thoroughly reviewed and, where appropriate, shared with the relevant operator.

Funding schemes

Regulators and governments may also have a role to play in the funding for network upgrades. Where there is a public benefit to maintaining 2G network operation – for example, where the 2G networks are used by emergency services, public transportation, or education – it may be that governments agree to subsidise the continuation of a network until upgrades can be completed. Alternatively, funding can be supplied to move to newer technologies in areas that would benefit from it (but where operators would find it unprofitable to do so) – there can be national funding schemes to ensure universal service or to fill in coverage holes.

On a related note, end-user devices (be they mobile handsets, or IoT devices), can also be subsidised by government if there is a good case for doing so. This may be directly through reducing the prices of existing equipment, or through enabling the development of lower-cost alternatives.

In Hungary, for instance, the regulatory authority introduced a subsidy programme to help residential users replace outdated handsets with devices supporting at least 4G VoLTE. In Singapore, operators ensured the availability of affordable handset options, including basic models priced below US$35.

Consumer protections

Regulators must act to ensure that consumer rights are protected – contracts should inform users about their rights, and consumers should not be left worse off from the switch-off. There are a range of regulatory actions which are related here: there must be mobile number portability to new contracts and new technologies; any low-cost mobile contracts should continue to be available; and there must be a right to cancel if service quality is suitably adversely affected.

The regulation should also ensure uninterrupted access to emergency services, and ensure operators address interoperability issues associated with VoLTE and VoNR.

Participation in industry groups

Regulators should also take part in industry groups and consultations to facilitate the development of new upgrades. This includes input to industry forums which are developing new standards (such as replacements for eCall or lift safety systems).

7.3 Equipment approvals and disposal

An important first step in network sunsetting is to stop selling new devices which depend on the deprecated technology. At present, it is still possible to buy new IoT devices which only operate on a 2G network, since this is still considered to be the more reliable technology. These devices may have a theoretical useful life of five years, but this means that they are assuming a network sunset in 2030 at the earliest.

In Singapore, IMDA stopped 2G equipment approvals in September 2015, meaning that both networks and devices had to be compatible with newer technologies. However, this was relatively late, given the proposed switch-off date of 2017. As a result of this, there were still a large number of 2G-only devices in operation by the time of network sunsetting.

Regulators should also advise operators on the appropriate disposal of 2G network equipment, and end users on the disposal of devices. With a global move away from 2G, there is little opportunity to resell or redeploy 2G networking assets, but many parts of the network can be upgraded. There is also the potential for private networks to run over 2G, if transmission equipment was disposed of at a low enough price and there was spectrum availability.

Finally, as well as preventing the approval of 2G network equipment, regulators can consider if there is a benefit to reevaluating the certification of high-performance user devices for fringe area deployments, where previously 2G networks covered but LTE networks do not have a sufficiently reliable propagation. Allowing these marginal areas to operate on higher LTE power levels (subject to base station power safety limits), for example, can provide a suitable upgrade path.

7.4 Coordination within the industry and users

In many countries there have been very long-term communication plans within the industry, so that all stakeholders were aware of the timeframes to be followed and aware of what actions needed to be taken when. Given the scale of upgrades needed, particularly in utilities and industrial deployment, details of the upgrade timelines need to be given many years in advance.

In Switzerland, Swisscom contacted lift operators in 2015 to inform them of the need to upgrade, with the aim of all modifications being made by the time of 2G sunsetting in 2021. Other countries saw less notice for users. In Taiwan, the NCC only announced in September 2016 that licences would not be renewed, with an expiration date of 30 June 2017, giving a six-month period for users to transition. For countries with shorter notice periods, there were often many users still using the networks at time of sunset, such as in Taiwan or in Singapore. In general, a notice period of around two years seems reasonable based on international experience, but there may be industries or spectrum users who would find such a timetable challenging if they do not start to migrate their usage before the notice is given. There is no singular 'best practice' in terms of notice period.

In Iceland, operators originally intended to close networks in 2024, and announced plans through a consultation in the previous year, giving users around 18 months to upgrade. Following the consultation, a decision was made to keep the networks open for an additional year, giving network operators time to roll out further upgrades to the mobile network, and giving IoT users enough time to upgrade devices. However, this was only possible due to a relatively limited use of these devices across the country.

Any changes in timeline like this need to be communicated to users in plenty of time, as soon as the decision is made, to enable upgrade roadmaps to be adjusted.

Communication to users

In most countries there have been extensive communication plans to consumers, so that they were made aware of the need for device upgrades.

In Sweden, TechSverige has organised an information campaign called Byt Nät Nu (Change Network Now). This campaign aims to provide information to consumers and businesses regarding upgrade of 4G and 5G devices, SIMs and mobile plans prior to the switch off. In Australia, notice of network switch-off was delivered through direct contact with subscribers (letters, emails, and targeted SMS messages sent directly to the phones identified as 2G-only), public announcements (media releases, website notices, and social media campaigns), and in-store support (dedicated staff and resources were provided in retail stores to check a customer's device compatibility and facilitate upgrades or SIM swaps). In Austria, all mobile phone providers accompanied the network switch-off with information campaigns so that users were prepared for the upcoming changes. This communicated contact points within the operators themselves, but also with the regulator.

As well as general communication campaigns, there have been targeted campaigns aimed at specific groups. In Switzerland, for vulnerable customers using telecare, a managed and prioritised upgrade process ensured safety and continuity of service – providers of these services communicated directly with customers about the necessary upgrades. It is particularly important to focus on these users, since many are technologically challenged and may be the most wary due to the prevalence of scams; also, these users may have the most to lose through losing connectivity.

Finally, due to the specialised nature of the services, there have often been dedicated help teams within operators or the regulator for large scale IoT users. This more focused assistance was designed to look at the specific needs of industry and identify appropriate upgrades. In Canada, for enterprises who had large scale IoT deployments on 2G technology, the service providers contacted them directly to inform them of the upcoming shutdown. They were offered the option to migrate to new IoT networks with accompanying new products and services for future proofing their operations

7.5 Mitigation plans

Having identified the user groups most affected by network switch-off, many regulators have helped to develop plans to mitigate the worst impacts. These have included the following.

- Provision of incentives for consumers to migrate – through lower prices for handsets or contracts.
- Removal of technology barriers, with lessons on smartphone use, workshops, and development of VoLTE feature phones.
- Testing, validation and deployment of new hardware and connectivity solutions, to ensure they meet the needs of users.

- Development of coverage and capacity maps, so that users can identify if they will have an issue following upgrade.
- Provision of single wholesale 2G networks on an extended timeline, or extended provision of existing networks.

In Australia, mobile operators analysed their network data to identify customers primarily connecting to the 2G network and, for these customers provided incentives and sometimes free or heavily discounted replacement devices, especially the elderly or those in remote areas.

In Germany, Vodafone will nominally shut down its 2G network by September 2028. However, the network will remain open for particularly critical IoT applications (such as networked elevator systems, emergency call technology (such as eCall) or alarm systems) until the end of 2030 to ensure a smooth transition to new technologies.

8 Conclusions and recommendations

There have been many varied experiences of 2G network switch-off, with some countries delaying the sunset date and other moving ahead very quickly. Of the countries examined for this study, we have found that many have been more aggressive in their approach to network switch-off than the UK so far, with varied results. In some countries there has been some evidence of harms arising from this accelerated timetable; in others this has provided a solid basis for future network growth.

There is no set best practice in dealing with network sunsetting, either from a regulator or operator point of view. However, by considering the UK context alongside experience from around the world, we have identified a number of recommendations.

8.1 Recommendations for Ofcom, DSIT and other Government

Ofcom and DSIT should help operators understand the scale of potential issues. This would involve continuing to collect data from operators (and summarising, anonymising, and aggregating it) on the number of users and level of traffic, as well as liaison with industry groups over the relative importance of uses. This monitoring builds on the statistics published in the context of network switch-off in Ofcom's Connected Nations report[56]. It is important that other regulators and government bodies are also involved in this process, so that users in other industries are kept informed on the impact of network switch-off.

This analysis would also need to consider work that has already been undertaken such as the changes in national and international roaming agreements, and any efforts driven by the replacement of 3G equipment. At the same time, regulators should examine the extent to which issues will have been naturally resolved by the time of sunset, given the increasing prevalence of smartphones and 4G and 5G coverage.

Ofcom should also continue to hold extensive engagement with stakeholders as the 2G switch-off approaches. This is more important for 2G sunsets than for 3G, given the lack of suitable alternatives for some 2G services. We note that neither Ofcom nor the network operators themselves have direct contact with all 2G service users, or even have information about all use cases for 2G devices. Therefore, Ofcom and the industry should also liaise with large scale industry groups[57], who can represent these users, to make sure that the switch-off date and process is realistic. This will involve a joint effort of engagement – including Ofcom, government bodies, industry, trade bodies, consumer groups and other relevant stakeholders – to help raise awareness of the upcoming switch-offs and actions that may need to be taken. In some sectors it may be necessary for DSIT and Ofcom to lead efforts to address some of the transition requirements, as has been seen with telecare during the PSTN switch-off process.

Ofcom and DSIT should also ensure that there are sufficient consumer awareness programmes in place, learning from the recent PSTN switch-off process, amplifying the industry's own efforts to publicise the transition. Although there is an end date of 2033 for 2G sunset as agreed between service providers and the Government[58], we understand some industry stakeholders may prefer an earlier date; this engagement will minimise undue harm whichever date is set.

[56] See Ofcom (2025) and associated reports at https://www.ofcom.org.uk/phones-and-broadband/coverage-and-speeds/infrastructure-research
[57] For example, as cited in Ofcom (2025), Virgin Media O2 worked with the telecare industry, together with Government and Ofcom, ahead of its withdrawal of inbound roaming on its 2G network.
[58] DCMS (2021)

Governmental bodies should consider if there is a need for funding to assist with migration – either in terms of network upgrades, or in terms of consumer equipment replacement. If additional funding is required, government should examine the most appropriate and proportionate source.

There may be a role for Ofcom to consider consumer contractual rights and ensure that service quality is not adversely affected. However, Ofcom already has rule about, and has explicitly defined its expectations over consumer contracts, including on transparency of contracts and customer rights to exit, and it should use these when reviewing any complaints or concerns. Ofcom should work with service providers to facilitate and support a customer-focussed, industry-led decommissioning of 2G networks. with reference to the principles already established in its 2023 expectations document.

8.2 Recommendations for operators

Communication with all stakeholders is vital, and timetables should be set well in advance. Any changes to the timetable – such as bringing the sunset date forward, or alternatively providing extra time for migration – must also be communicated well in advance. All operators should set out a clear roadmap that covers 2G sunset operations, with firm dates for interim measures, including operational aspects like O2's withdrawal from international 2G roaming agreements. This will enable 2G users to plan their migrations and understand the impacts on users – and how best to mitigate these.

The industry should look at international standardisation and harmonisation activities which may replace existing 2G uses, such as NG eCall. Interacting with these early enough will ensure that upgraded networks are designed to handle these, and there will be no delay in migrating to the newer technologies.

If there are significant numbers or types of users identified who will be unable to migrate before the proposed switch-off date, operators should consider whether there is a need for a single wholesale network, or assistance with providing private networks if users are all located in small areas.

Operators should work with charities and consumer groups to identify and contact the most vulnerable users who will be affected by network switch-off.

Once it has been identified that 2G traffic has dropped to a suitable level (both in terms of the total quantum of traffic, but also considering the types of traffic), operators should not delay in switching off the 2G network, to ensure that benefits can be accrued as quickly as possible.

8.3 Recommendations for users and service providers

There is an important role for service providers to play in preparing end-users for network switch-off, since mobile network operators often do not have direct communication with these users.

The most immediate action is for service providers to stop selling devices which rely on 2G networks for connectivity. Instead, new equipment and devices which use LTE or 5G should be sourced. Where records allow, service providers should contact customers who have purchased 2G-only devices and inform them of the loss of service at 2G switch-off.

Service providers should examine and audit all supply chains and connectivity services to identify current 2G use cases, and start to migrate these to newer connectivity options. This will require a detailed knowledge of the equipment sold and sourced.

Service providers and users should liaise with network operators to identify areas with no LTE or 5G coverage in which 2G connections are currently used. This is particularly important for devices which are rarely used, such as monitoring sensors, where network operators may be unaware of equipment since it is only used and connected when a certain event occurs.

8.4 Summary of recommendations

These recommendations are summarised below.

Figure 8.1: Recommendations for the UK

Recommendations for Ofcom, DSIT and Government

- Ofcom and DSIT should help operators understand the scale of potential issues. Other regulators and government should inform their industries and consumers of potential impacts.
- Ofcom should also continue to participate in extensive engagement with stakeholders to examine whether there are uses or requirements which are unfulfilled by the planned network upgrades.
- Ofcom shlould amplify the industry's communications to users and service providers.
- There may be a need for investigation whether funds are needed to assist with migration, and if so how these can be absorbed without impacting consumers.
- There may be a role for Ofcom to consider consumer contractual rights and ensure that service quality is not adversely affected.

Recommendations for operators

- Communication with all stakeholders is vital, and timetables should be set well in advance.
- The industry should look at international standardisation and harmonisation activities which may replace existing 2G uses, such as NG eCall.
- Operators should consider whether there is a need for a single wholesale network, or assistance with providing private networks if users are all located in small areas.
- Operators should work with charities and consumer groups to identify and contact the most vulnerable users who will be affected by network switch-off.
- Once it has been identified that 2G traffic has dropped to a suitable level, operators should not delay in switching off the 2G network.

Recommendations for service providers and users

- Service providers must stop providing devices which rely on 2G networks, and move to other connectivity options.
- Service providers and users should liaise with network operators to identify areas with no LTE or 5G coverage in which 2G connections are currently used.
- Service providers should examine all supply chains and connectivity services to identify current 2G use cases, and start to migrate these.

Appendix A Australia

In Australia, 2G shutdown was completed in 2018[59]. Telstra closed its 2G operations in December 2016; Optus shut down in August 2017; and Vodafone ceased its operations in June 2018.

Commercial and technological factors were the main reason for the shutdown rather than a regulatory mandate. These factors included the following.

- Traffic volume – the amount of data and voice traffic being carried over the 2G network dropped to an extremely low, uneconomical level (often less than 1% of total traffic).
- 2G devices – mobile operators monitored the number of active 2G-only devices on their network. Once this number was considered small enough to manage through communication, device offers, or migration programs, the commercial risk of a shutdown was deemed acceptable.
- Readiness of 4G and 5G technologies – the successful build-out and stability of 4G and 5G networks ensured that the vast majority of customers would not experience a loss of service. 4G and 5G networks offered higher data speeds and clearer voice calls through VoLTE or VoNR.

A.1 Affected groups

There were two consumer groups identified by ACMA, the regulator, that faced significant issues associated with the shutdown. The first affected consumer group was those with 2G-only devices (such as very old mobile phones (like classic Nokia models), older IoT devices such as legacy Electronic Funds Transfer at Point of Sale (EFTPOS) terminals, remote monitoring equipment, and some vehicle trackers). These devices became completely unusable for voice, text, and data on the network once the 2G network was decommissioned. The second affected consumer group was those with feature phones or very early smartphones that used 3G for data and voice but relied on the 2G network for a critical function 'coverage fallback' in deep rural or remote areas. When 2G was shut down, these areas effectively became 'no service' zones for these users until 4G and 5G was rolled out.

A.2 Mobile operator's approaches

To address the issues faced by both consumer groups, the mobile operators analysed their network data to identify customers primarily connecting to the 2G network and, for these customers:

- provided incentives and sometimes free or heavily discounted replacement devices, especially the elderly or those in remote areas; and
- provided free replacement SIM cards to ensure compatibility in cases where old SIM cards were not provisioned for newer networks.

Operators also worked directly with large business customers (like banks for EFTPOS terminals, or alarm companies) to coordinate the replacement of IoT modules that relied on 2G.

Approaches used to inform and support users included the following.

[59] Streetwave (2025)

- The operators gave significant advance notice of the shutdown dates. Telstra, for example, announced its December 2016 shutdown in 2014, providing two years' notice. This long lead time was essential for major migration efforts.

- The notice was delivered through various channels to maximise reach. This included direct contact (letters, emails, and targeted SMS messages sent directly to the phones identified as 2G-only), public announcements (media releases, website notices, and social media campaigns), in-store support (dedicated staff and resources were provided in retail stores to check a customer's device compatibility and facilitate upgrades or SIM swaps).

- Clear tools were provided for self-checking. For example, online tools or SMS services were available for customers who could enter their device model or IMEI number to instantly check if their phone would be affected and if they needed an upgrade.

- Dedicated customer support lines were set up to assist users in understanding the change and determining the best course of action (for example, getting a new SIM, buying a new phone, or checking network coverage in their specific area).

A.3 IoT devices

During the implementation of 2G switch off, one of the key challenges was the physical replacement of IoT modules, which often required an engineer to visit a remote location, a home, or a business to install a 3G or 4G compatible module. Australia had one of the highest penetrations of point-of-sale (POS) devices globally, with over 900,000 EFTPOS terminals active during the 2016-2017 timeframe. Furthermore, the largest rollout of smart meters in Australia was mandated in Victoria, where millions of meters were installed between 2009 and 2014. The Australian rollout generally favoured newer technologies, but a portion of older deployments or niche utility applications were on 2G networks and still needed migration. The plans for service continuity focused heavily on device replacement and migrating to newer technologies. The effort to transition these millions of IoT devices was a primary driver for the complexity and long lead times associated with the 2G shutdown.

The core of the IoT service continuity strategy was the mandatory upgrade of hardware to devices that could operate on the more advanced 3G and 4G networks. Since the shutdowns occurred relatively early (before 2018), the industry focused on utilising the established 3G and growing 4G infrastructure as summarised below.

Figure 8.2: Continuity plans in Australia

Device	Continuity plan	Alternative technologies
Payment terminals (EFTPOS)	Retailers were required to replace their 2G-only EFTPOS terminals with units that supported 3G or 4G LTE connectivity. Payment terminal providers and operators communicated with businesses to ensure the replacement process was completed before the deadline to avoid transaction failures.	3G[60] 4G Fixed broadband Wi-Fi
Smart meters	For existing meters, the 2G communication module needed to be replaced or upgraded to support newer networks. All new smart meter deployments were mandated to use modern, future-proof connectivity standards.	3G 4G LPWAN (NB-IoT, LTE-M)[61]

[60] Australia is also phasing out 3G, and this leads to a second wave of mandatory upgrades to 4G or 5G.
[61] Australian operators actively developed and promoted LPWAN networks for mass IoT deployments following the 2G sunset.

Device	Continuity plan	Alternative technologies
Telecare devices (personal alarms)	All 2G-only personal alarms, medical alerts, and telecare systems needed to be replaced with digital devices capable of connecting to 3G or 4G. To ensure emergency voice calls could function reliably on the 4G network (without needing to fall back to the 2G or 3G), devices needed to support VoLTE. Service providers were responsible for communicating the risk to vulnerable customers and assisting with the urgent replacement of obsolete devices.	4G (with VoLTE support) Digital fixed line[62]

A.4 Coverage challenge

In terms of coverage challenges, the 2G switch-off caused a short-term disruption in the fringe areas where mobile black spots occurred. The solution adopted was a mix of spectrum refarming, government funding and user equipment upgrades. The 2G spectrum was re-used by 4G networks on the old 2G tower sites. This helped to fill coverage holes and provide additional data capacity. The government's Mobile Black Spot Program provided funding for the operators to fill the remaining black spots by building new 4G towers. In some fringe areas, user devices with 'blue tick' certification were used for improved rural or remote area performance, and high gain external antennas were deployed for fixed applications (for example, on farms).

A.5 Impact on MVNOs

The switch-off had a cascading effect on Mobile Virtual Network Operators (MVNOs) who had to mitigate issues, similar to those faced by the host MNO's own customers, within timelines set by their host MNO. The two-year notice provided by the MNOs was crucial, allowing MVNOs time to plan their own campaigns.

A.6 Benefits

The key benefits of the 2G shutdown were as follows.

- Re-allocation of spectrum for 4G and 5G networks to make more efficient use. 2G spectrum offered good coverage and building penetration, and reallocating this spectrum to more efficient technologies optimised the use of valuable resource.
- Operational costs were reduced as maintaining and powering legacy 2G infrastructure, which was carrying an ever-decreasing amount of customer traffic, became an unnecessary financial burden.
- Decommissioning of the old equipment enabled operators to simplify their network operations, reduce maintenance effort, and focus resources on their 4G and 5G networks.
- 4G and 5G network components are significantly more energy-efficient than the older 2G equipment, contributing to a lower overall environmental footprint and operational cost.

[62] Parallel to the mobile network sunset, the national migration from the copper network (PSTN) to the NBN (a mix of fibre and fixed wireless) also required telecare devices to be replaced with NBN-compatible or mobile-only models.

Appendix B Austria

All major Austrian operators (A1 Telekom Austria, Magenta Telekom, and 3 Austria) have kept their 2G (GSM) networks active to date and currently have no concrete plans for a shutdown until at least 2030.

2G serves as a basic or access network for elementary mobile services, such as voice calls, SMS and data services with low data volumes as well as fallback for emergency calls with devices that do not support VoLTE, support for IoT connectivity (covering applications such as smart meters, eCall, payment terminals, home security alarms, and personal medical alert devices), and ensuring reliable coverage for deep indoors and rural areas with fewer base stations. Magenta Telekom stated that its 2G network will remain active until at least 2030. Similarly, the 2G network will also remain active at A1 Telekom Austria until further notice[63].

It should be noted that 3G is being gradually phased out in Austria, and the full switch off is expected by the end of 2025.

B.1 Approach

The Austrian regulator (RTR) notes the following in the context of 2G and 3G shutdown[64].

- Providers are not obliged to maintain certain technologies. In the mobile communications sector, providers are subject to certain coverage requirements, but these are generally formulated in a technology-neutral manner. Mobile network providers can therefore basically decide for themselves which technology they use the frequencies allocated to them. All providers are required to carry out the switch-off in accordance with contractual law.

- All mobile phone providers are accompanying the 2G and 3G switch-off with information campaigns so that users are prepared for the upcoming changes. If problems do occur, the customer's own mobile service provider is the first point of contact. RTR assumes that problems that may occur occasionally will be solved proactively and in a customer-centred manner by the respective providers. If this is not possible, the RTR conciliation body will provide support.

- The simultaneous operation of 2G, 3G, 4G and 5G represents an additional expense for mobile providers, as different technologies have to be maintained in parallel. From this perspective, the simultaneous operation of old radio standards appears increasingly uneconomical.

- The switch-off of old technologies will free up spectrum that can be then used for 4G and 5G. These modern radio standards utilise the available spectrum more efficiently. It is therefore possible to provide users with more bandwidth with 4G and 5G.

- 2G continues to be of particular importance, especially for voice telephony in Austria. This is the main reason why 2G will still be available in Austria for several years to come. While alternatives of VoLTE and VoNR make it possible to make carry calls via 4G or 5G, these are not yet widespread. Modern handsets are VoLTE-capable, but problems can still occasionally occur when interacting with the individual mobile networks. In such cases, the cause may be, for example, missing network parameters entered on the mobile phone. The 2G voice service as a fallback is therefore important.

[63] Lorenz (2025)
[64] RTR (2023)

- Many of the affected devices need to be replaced anyway for security reasons because they are being operated with outdated and no longer maintained software. However, this takes some time and some IoT devices have a long asset life.

Appendix C Canada

2G networks have been turned off in Canada. Shutdown dates were as follows[65].

- Telus – Closed in May 2017
- SaskTel – Closed in July 2017
- Bell – Closed in April 2019
- Rogers – Closed in December 2021

C.1 Approach

The decision to shut down was made by the network providers themselves. The shut down process was driven by business decisions, with consultation limited to informing customers rather than seeking public input.

For business and enterprise customers who had large scale IoT deployments on 2G technology, the service providers contacted them directly to inform them of the upcoming shutdown. They were offered the option to migrate to new IoT networks with accompanying new products and services for future proofing their operations. For individual customers, websites, press releases, and customer support channels were used for informing the public on the shutdown.

Alternative IoT technology offers included the following.

- LTE-M: Ideal for mobile, low-power devices such as asset trackers, wearables, and logistics systems.
- NB-IoT: Designed for static, long-life deployments like smart meters and environmental sensors, especially where deep indoor penetration is needed.
- 4G and 5G: Suitable for high-data use cases and latency-sensitive applications such as video, autonomous systems, and complex industrial deployments.

C.2 Impact of 2G shutdown

The main impact of the 2G shutdown was not widespread blackouts (as alternative 3G or 4G coverage was available in most areas), but rather a loss of service for specific devices that could only connect to the 2G network (including old mobile phones, smart meters, fleet tracking, home security, vehicular applications or point-of-sale systems).

Some owners of obsolete equipment did voice frustration regarding the 2G network switch-off in Canada, particularly those with specialised or expensive IoT devices (such as fleet tracking systems, point-of-sale terminals, and smart meters) due to costs involved. However, this pushback did not amount to any large-scale, coordinated consumer or regulatory resistance that altered the MNOs business decisions. The regulator did not consider there were grounds for intervention given the alternatives available.

[65] Worth (2019)

Appendix D France

SFR has set the date for its 2G closure as December 31, 2026, and 3G closure as December 31, 2028. Bouygues announced its 2G closure on December 31, 2026, and 3G closure on December 31, 2029[66]. Orange announced its 2G network would be phased out starting in 2026, with the full shutdown planned for the end of that year.

The reasons that operators have given for shutting down 2G networks include high running costs, inefficient spectrum use, low consumer demand, and inferior security, quality of service and energy efficiency[67].

D.1 Approach

The regulator ARCEP is involved in monitoring and mitigating the impacts of 2G network closure. There is a quarterly reporting system in place to track the number of SIM cards in devices compatible only with 2G or 3G. The regulator hosts meetings with mobile network operators and trade associations representing IoT equipment users to address the impending shutdown. Furthermore, ARCEP created a Mobile Technical Experts Committee that includes operators and suppliers to assess the carbon footprint of shutting down 2G and 3G networks. ARCEP is aiming to ensure that uninterrupted access to emergency services, including ensuring emergency calls can be made via VoLTE or by roaming onto another available network. Operators have been communicating their specific shutdown plans where support and migration plans for both individual and business customers are considered. Actions undertaken include direct communications with individual and business customers, guidance and support for device upgrade, and extensive support for businesses using IoT systems.

D.2 Affected user groups

Lift manufacturers noted that nearly half of France's lifts (around 290,000 systems) use 2G or 3G emergency call systems. The shutdown process will have a major impact on their operations and a delay was requested – operators have not changed their timelines, urging affected sectors to modernise their equipment in a timely manner.

Makers of European cars with mandatory eCall emergency systems, many of which use hard-wired 2G, also face challenges and replacement costs. Manufacturers of affected vehicles are working on solutions, though for some older models, a technical upgrade to 4G or 5G connectivity is currently unfeasible. The European Commission has adopted new regulations to ensure next-generation eCall (NG eCall) systems use 4G or 5G technology for new vehicles, a mandate that will take effect in January 2026. For existing vehicles, service continuity may be at risk in areas where 2G or 3G is no longer available.

Further applications affected include payment terminals, smart meters, security alarms, telecare and personal alarms, remote controls, smart vending machines, and environmental sensors.

The high number of devices involved in particularly elevators and smart meters require a coordinated, gradual phase-out to avoid widespread service disruption. The French Elevator Federation (FAS) has been actively engaged in finding solutions. The primary plan involves replacing the existing 2G or 3G communication modules with 4G-compatible systems. For smart meters, payment terminals, alarms, and telecare, the main plan is to replace or upgrade old 2G or 3G-only modems with units that support 4G or 5G, or LPWAN technologies. LTE-M and NB-IoT are the recommended alternatives for IoT devices due to their low power consumption, good coverage (including indoors), and long battery life. Device manufacturers and resellers are expected to stop

[66] Transatel (2024)
[67] Arcep (2025a)

selling non-4G compatible equipment to naturally transition the market to newer technologies. Some IoT devices may use roaming SIMs and the shutdown of a specific French MNO's 2G network could affect these devices.

D.3 Current 2G use

Arcep published the number of SIM cards in the devices with those compatible only with 2G or with 2G and 3G, belonging to the subscribers of French operators Bouygues Telecom, Free Mobile, Orange and SFR[68]. Two categories of terminals were considered:

- terminals for voice, SMS, mobile internet services (in particular mobile phones and tablets); and
- terminals for machine-to-machine services (connected alarm and remote monitoring systems, remote assistance systems for people – excluding SIM cards fitted by car manufacturers in vehicles).

The number of SIM cards in terminals for voice, SMS and mobile internet services compatible only with 2G and 3G technologies was 2.7 million units at the end of June 2025, which was 3.4% of the number of active SIM cards in this type of terminal. Nearly 60% of SIM cards are used in devices that are only compatible with 2G, and 40% with 3G and 2G.

The number of SIM cards in terminals for machine-to-machine services compatible only with 2G and 3G technologies was 3.2 million units at the end of June 2025, or 13.1% of the number of SIM cards in this type of device. 37.5% of SIMs are used in devices that are only compatible with 2G and 62.5% with 3G and 2G.

Figure D.1: Total number of 2G SIMs as of June 2025

	Voice, SMS, mobile internet	Machine-to-machine services
2G	1.6	1.2
2G and 3G	1.1	2.0
Total	**2.7**	**3.2**

[68] Arcep (2025b)

Appendix E Germany

Germany's 2G networks are still operational, and no switch-off is expected for at least two years.

Deutsche Telekom's 2G network is expected to be completely switched off by June 30, 2028. Areas that have so far only been covered by 2G, but not by 4G, will receive 4G or 5G coverage as part of the ongoing network modernisation before the 2G network is switched off. After the 2G shutdown, the freed-up frequencies in the 900 MHz band will be used for new mobile technologies. The current mobile devices use VoLTE (Voice over LTE) or 5G VoNR (5G Voice over New Radio) technology for calls in the 4G and 5G networks. These provide better voice quality, many devices automatically reducing background noise in loud environments for example on the train or on the street. In addition to smartphones, there are also devices with buttons and without a touchscreen that support VoLTE. When purchasing or regularly replacing devices and services, it is important to ensure support for current technologies such as LTE and 5G, or for IoT applications, Narrowband-IoT (NB-IoT) and LTE-M[69].

Deutsche Telekom has promised as part of the overhaul to extend 4G and 5G to any 2G-only communities that still exist. It will do this after freeing up a 30MHz tranche of 900MHz spectrum previously dedicated to the 2G technology. This spectrum will be cleared and made available for use with the 4G and 5G networks. By the end of 2025, before the 2G shut down, Deutsche Telekom reckons 5G will reach 99% of people. Starting in mid-2028, Deutsche Telekom will be able to dedicate 370 MHz spanning the 700MHz to 3.5GHz ranges entirely to 4G and 5G[70].

Vodafone Germany has confirmed that it will shut down its 2G network by September 2028. The 2G service for traditional voice calls will be discontinued, and phone calls will then only be possible via 4G (VoLTE) or 5G (VoNR). The carrier noted that its 2G network will remain open for particularly critical IoT applications (such as networked elevator systems, emergency call technology (such as eCall) or alarm systems) until the end of 2030 to ensure a smooth transition to new technologies. The complete dismantling of the 2G infrastructure will begin in January 2031[71]. According to Vodafone, the frequencies used for its 2G network will be repurposed for its LTE and 5G networks. The available bandwidth from the freed-up 2G spectrum will provide a capacity gain of around ten percent. Vodafone stated that the last remaining network areas only covered by 2G will receive 4G or 5G coverage before the 2G network is phased out[72].

The third operator (Telefonica O2) has not announced the switch off date[73].

In Germany, all mobile network operators (Deutsche Telekom, Vodafone and O2) have already implemented the 3G switch-off in 2021. Since then, access via UMTS is no longer possible.

E.1 2G data

According to the latest annual market survey by regulator Bundesnetzagentur (BNetzA), the majority (88%) of data traffic via mobile networks was carried out via LTE, while only ten percent of data traffic was carried out via 5G and two percent of data traffic was carried out via the GSM network (2G)[74]. The number of base stations as of October 2024[75] were as follows.

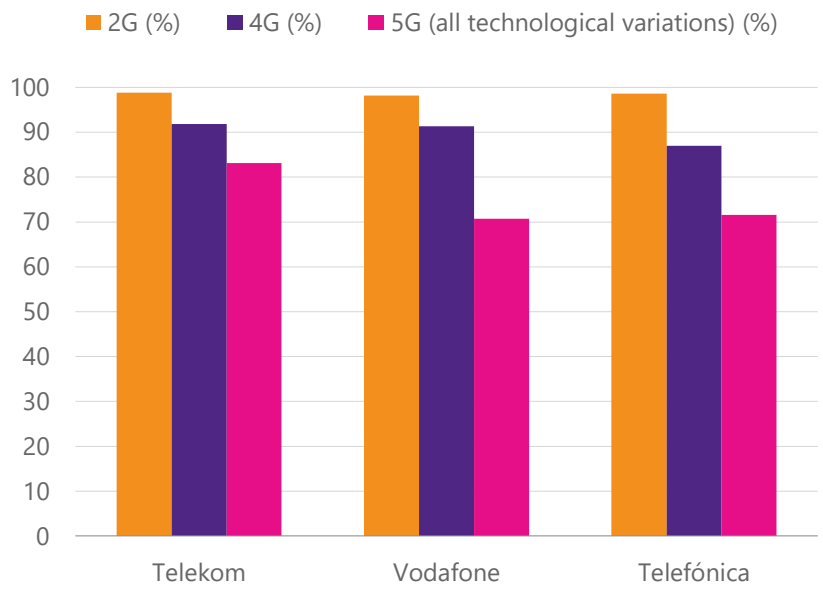
[69] Hafenrichter (2024)
[70] Morris (2024)
[71] Wherever SIM (2025)
[72] Lipscombe (2025b)
[73] INSYS (2025)
[74] Dux (2025); Bundesnetzagentur (2025)
[75] Bundesnetzagentur (2024)

Figure E.1: Base stations by technology

Technology	2022	2022 (%)	2023	2023 (%)	2024	2024 (%)
5G	41,945	21	49,571	23	56,558	25
LTE 4G	85,054	42	87,905	41	88,373	40
UMTS 3G	111	0	0	0	-	-
GSM 2G	76,131	37	77,201	36	77,543	35
Total	**203,241**	**100**	**214,677**	**100**	**222,474**	**100**

Despite a higher number of base stations, the choice of spectrum and the propagation characteristics of LTE networks meant that coverage from newer technologies was lower. The mobile coverage figures as of Oct 2024 by technology were as follows.

Figure E.2: Technology coverage of mobile network operators (in percent)



Appendix F Iceland

Iceland will complete the shutdown of its 2G and 3G mobile networks in 2026. The country's telecommunications operators, including Nove, Siminn and Sýn (Vodafone), have been gradually phasing out their networks. Originally, the plan was to switch off 2G networks in 2024 but this was postponed[76].

As of the end of October 2025, Nova and Sýn (Vodafone) have already completed the phase-out of their 2G networks and are nearing completion of the 3G shutdown. The national regulator Electronic Communications Office of Iceland (ECOI) has received very few comments or complaints regarding service quality from customers of these two companies, indicating that the services provided through their 4G and 5G networks are comparable or better than to those offered by the older systems.

The regulator informs that Síminn is at an earlier stage in its phase-out process, and therefore fewer changes have occurred within its network so far. The final months of this year will see increased activity as Síminn proceeds with its shutdown plans. ECOI has no reason to expect different results from Síminn than from Nova and Sýn, as all three companies have invested significant effort in preparation and customer communication. However, as with any large-scale technical transition, some issues may arise during the final stages[77].

F.1 Approach

As outlined above, the regulator ECOI has been monitoring the ongoing phase-out of 2G and 3G networks. It states that the older systems have become obsolete, and manufacturers are discontinuing support for the equipment. This alone poses potential long-term security risks for electronic communications.

ECOI has been involved in the shutdown process with a focus on safeguarding the interests of mobile service consumers since 2022. An open consultation was launched in early 2023 to inform users about the upcoming changes and to ensure that sufficient time was available to replace or upgrade essential equipment before the networks were shutdown. In response to consultation feedback, the regulator postponed the shutdown date to give network operators adequate time to upgrade their infrastructure and ensure a smoother transition for users to 4G and 5G services. In particular, the delay has provided an opportunity for businesses relying on 2G IoT connectivity to upgrade their devices to support 4G and 5G technologies like LTE-M and NB-IoT.

ECOI also included specific requirements in the spectrum licenses of the operators to ensure that the shutdown of 2G and 3G networks would not result in reduced service quality or coverage. Coverage obligations are based on a defined percentage of the population. In addition, ECOI has issued several public announcements to keep consumers informed and to provide guidance on how to prepare for the transition. For example, a dedicated website has been set up to collect feedback and complaints, as well as to offer instructions on how users, independently or in cooperation with their service providers, can improve their mobile signal reception, both indoors and outdoors[78]. Mobile users are encouraged to use the dedicated website to submit feedback or complaints if they experience reduced service quality. All reports are carefully reviewed and communicated to the relevant operator as appropriate.

The dedicated website states that as a result of the shutdown process

- phones and devices that only support 2G or 3G will stop working;

[76] Adamsdóttir (2025); Telecompaper (2025)
[77] ECOI (2025)
[78] ECOI (2024)

- phones that do not support VoLTE or have not activated that feature will stop working for calls; and
- various monitoring, measuring, and control devices that rely solely on 2G or 3G will also stop functioning.

ECOI has is stated that the shutdown should not reduce mobile coverage. According to license conditions, telecommunications companies must ensure equivalent coverage using 4G and 5G technologies.

The Icelandic Tourist Board has urged businesses in the tourism industry to pay special attention to the upcoming changes. Payment terminals and other transaction systems that operate via 2G or 3G will stop working. Some safety devices, rescue equipment, and GPS systems may also need updates[79].

It is noted that each operator has a webpage informing their customers regarding the ongoing shutdown process. They also provide handset offers at various discounted prices[80].

[79] Adamsdóttir (2025)
[80] See https://www.syn.is/vid-kvedjum-2g-og-3g, https://www.nova.is/netid/bless-3g, https://www.siminn.is/frettir/lokun-2g-og-3g

Appendix G Ireland

2G networks have not yet been switched off in Ireland, but Vodafone has set 31 December 2025 as the switch-off date for their network. Eir and Three in Ireland have not announced a date yet for 2G shutdown, and given this it is likely that the 2G network is expected to continue past 2026. Operators have, informally, indicated that the networks are likely to continue operating for a few years, and will then be phased out, probably as early as 2028, but at the latest 2033[81].

G.1 ComReg's guidance

The Irish regulator ComReg published '2G/3G Switch off Guidance for Mobile Network Operators' in July 2024[82]. The Guidance sets out general principles to guide mobile network operators in seeking to meet their licence obligation requiring them to take all reasonable endeavours to minimise the adverse effects of any cessation of use of 2G and 3G networks. ComReg requires that it needs to be notified at least 6 months prior to the cessation of any terrestrial system to which the licence relates. Summary of 'Guidance on Reasonable Endeavours' to minimise adverse effects before network switch off is provided below.

Figure G.1: ComReg's guidance for switch-off

Topic	Summary
Notification and Preparation	The 6-month period to notify ComReg of a network cessation, as specified in the spectrum license conditions should be treated as a minimum. The notification should be provided sooner where possible to ensure that adverse effects on users are minimised. It is essential for MNOs to share their cessation plans with any hosted MVNOs as early as is practical and support any resulting planning activities with those MVNOs. A gradual, step-by-step cessation process should be pursued, with careful analysis of customer feedback and experience, and network impacts at each step.

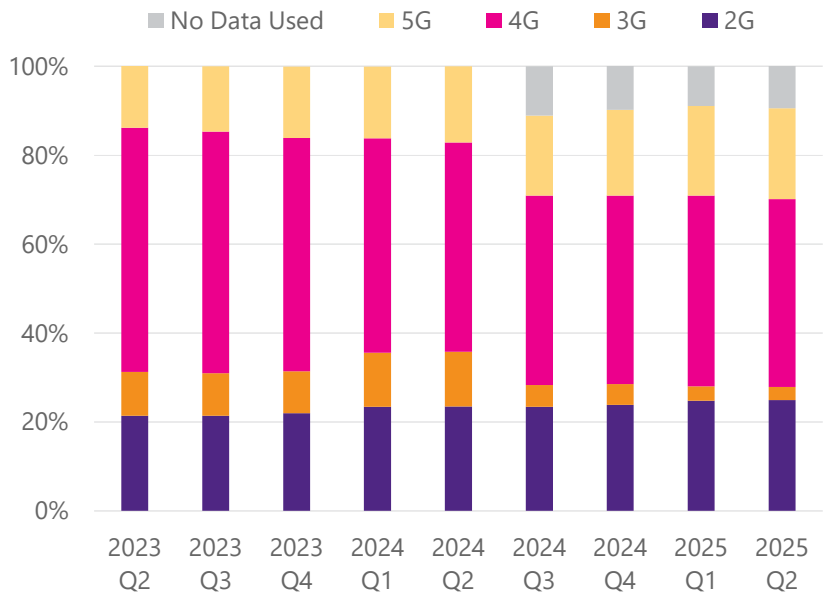
[81] Mahony (2023), Hayes (2025)
[82] ComReg (2024)

Topic	Summary
Communication	Timely publication of actual or specific cessation plans should be issued via appropriate media (both national and local) as well as online and via targeted communications channels. A blend of public communications channels and direct contact should be used by the MNO concerned to reach affected users. MNOs should proactively contact their customers who may be impacted by switch off. Users that will be affected by slowed data rates as a result of cessation should be informed. MNOs should make particular efforts to ascertain which subscriptions are used for M2M communications where the device will no longer function after cessation and inform affected owners. MNOs should engage with ComReg at an early stage, and throughout the process, to provide details on progress and planning. MNOs should inform inbound roamers of any service limitations.
Network, Coverage and Service Principles	The VoLTE or VoNR service should be enabled for customers with supporting 4G or 5G devices. 4G and 5G coverage should be available in a given area before or immediately following the cessation of a 2G or 3G network, with minimal delay in equivalence being reached where the new coverage relies on newly released spectrum. Adequate network capacity should be made available or retained on the remaining 2G (or 3G) network to cater for users of devices only able to access the remaining 2G or 3G network. Continuation of the SMS service via any supported network should be ensured. For Emergency Communications, implementation of VoLTE or VoNR interconnection to Emergency Call Answering Service should be implemented as part of the cessation. Particular attention should be paid to devices which cannot make an emergency call as a result of the switch off of both 2G and 3G. These devices should be detected, and the user concerned individually contacted by the MNO. Coverage maps provided by MNOs should make it clear that coverage is diminishing on the network which is subject to cessation.
End-User Rights	New customers of the MNO (or existing customers renewing contracts) should be informed of the planned switch off and any adverse impacts of same in advance of concluding a new contract. Users that experience a degradation in overall service as a result of a network cessation cannot be held to any minimum contract period and must be afforded a right of exit.

G.2 2G data

The latest Quarterly Key Data Report (published in September 2025) on Irish Communications Market includes the following figure[83].

Figure G.2: Mobile subscriptions by technology used[84]



The report states that there were 2,629,193 2G (24.89%), 313,867 3G (2.97%), 4,451,712 4G (42.15%) and 2,160,513 5G (20.46%) mobile subscriptions in Q2 2025. These figures include IoT subscriptions. It is stated that 1,006,016 (9.5%) mobile subscriptions did not record any use of data in Q2 2025.

[83] ComReg (2025)
[84] Source: ComReg (2025)

Appendix H Italy

According to a recent GSA report (published in July 2025)[85], TIM completed its 3G shut down in October 2022 and the planned shut down for its 2G network is December 2029. Vodafone turned off 3G network in February 2021 and its planned shut down for the 2G network is 2025. Windtre is shutting down its 3G network in December 2025, and it is maintaining its 2G network for now.

2G networks provide voice services where VoLTE is not supported due to a non-compatible device, poor signal, or a network issue; ensure basic coverage for deep indoor and rural area connectivity; and support emergency calls and IoT connectivity, for example, for smart meters, eCall systems, and GSM-R for railways (where the 900 MHz 2G public network is used as a fallback).

Since the phasing out of 3G is well underway in Italy, the main fallback for voice calls is shifting directly from 4G or 5G, to 2G. Therefore, 2G remains a crucial part of their guaranteed basic service provision.

H.1 Approach

The national regulator AGCOM's role in the 2G switch-off in Italy appears to be focused more on monitoring and data collection on coverage and affected users rather than directly mandating the commercial timelines or specific preparatory analyses. The process is therefore largely operator driven. The analysis of technical implications relies on the individual operators to perform to ensure they comply with network licence obligations and service continuity requirements.

[85] GSA (2025)

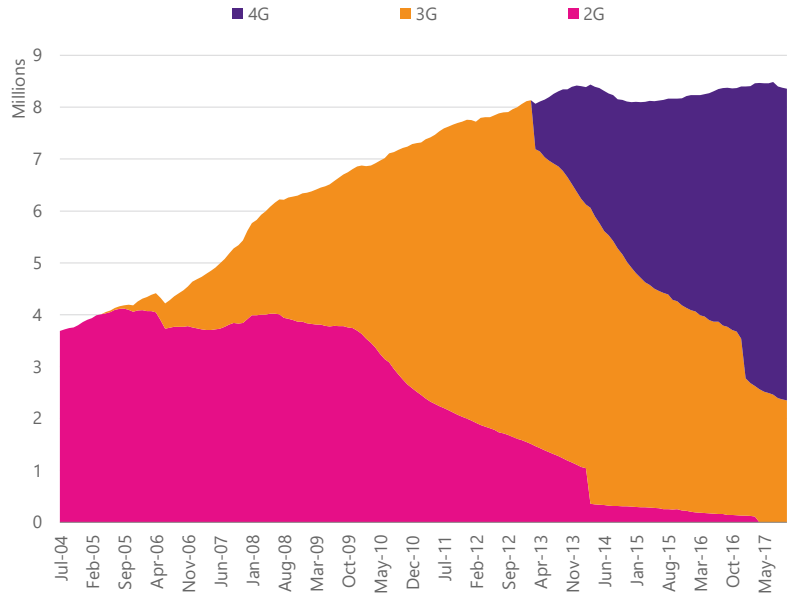
Appendix I Singapore

IMDA announced in 2015 that it had approved the request by all three Singapore operators (Singtel, StarHub and M1) to switch off their 2G networks. The shut down was completed in April 2017. The available spectrum was reallocated to mobile operators for 4G services.

I.1 IMDA's approach

IMDA stopped 2G equipment approvals in September 2015. Despite this, as of December 2016, there were still 132,300 users of 2G services – about 1.6% of all mobile subscribers.

Figure I.1: Technology shares for subscribers in Singapore



2G users were able to retain their numbers and subscription plan after migrating to 4G networks at no additional cost and with no re-contract.

IMDA encouraged seniors to sign up for courses on how to use smartphones at senior-friendly IT learning hubs located across Singapore. The country's significant migrant worker population was another affected group. These groups were particularly affected because of the timing of Singapore's migration, with a lower proportion of the population being familiar with smartphones and with an associated high cost.

IMDA also partnered the mobile operators to ensure a range of handset models was available to meet various customer needs, ranging from basic models costing below S$50 (US$36) to feature-rich smartphones. Handsets with simple features similar to 2G phones that users were familiar with were also available[86].

[86] Samena (2017)

I.2 Lessons learned

Key lessons learned include the following.

- Proactive planning and early warning – IMDA and mobile operators began their migration campaigns in 2015, two years before the final shutdown on April 2017, allowing users and businesses to transition.
- Regulatory support – IMDA stopped 2G only mobile equipment approvals and prevented sales guiding consumers to new technologies.
- Clear incentives – users were allowed to retain their mobile numbers and subscription plans on new networks at no extra cost and with no re-contract.
- Affordable alternatives – mobile operators ensured a range of handsets were available including basic models below S$50 to encourage low-income users to switch.
- Targeted support for vulnerable users – IMDA encouraged elderly users to attend courses on using smartphones at senior-friendly IT learning hubs.
- Spectrum reallocation – freed spectrum was assigned to more capable networks to meet increasing data demand.

For IoT business applications, important issues were time required to test and replace existing devices without causing service disruptions and future proofing by means of adoption of IoT devices with multi-radio access type connectivity to avoid reliance on single technology.

Appendix J Sweden

There are three operators with 2G networks. Tele2 and Telenor plan to shut down their 2G networks by December 2025. Telia aims to stop providing 2G service by the end of 2027 to provide a smoother transition for mainly business customers (providing services such as alarm and heating systems, elevator phones, connected electricity meters, and tracking devices). Further affected users include farmers operating equipment such as milking robots, irrigation systems, and tractor controls. All operators plan to complete the shutdown of 3G networks by December 2025.

The primary triggers for the shutdown are the need to reallocate radio spectrum for more efficient technologies, reduce operating costs, achieve greater energy efficiency, and keep pace with evolving consumer demand (as of 2024, more than 40% of mobile subscriptions in Sweden were already 5G, and 5G accounted for a large portion of mobile data traffic).

J.1 Campaign

The Swedish technology industry and employers' organisation (TechSverige), together with mobile operators, ran an information campaign called Byt Nät Nu (Change Network Now). This campaign aims to achieve a coordinated network shutdown, and provides information to consumers and businesses regarding upgrade of 4G and 5G devices, SIMs and mobile plans prior to the switch off[87].

The campaign website states that the decommissioning of 2G and 3G networks is done to:

- enable 4G or 5G technologies with faster and stable connections;
- achieve more secure and robust connectivity;
- make more efficient use of 2G and 3G spectrum by 4G or 5G networks;
- contribute to climate friendly society – through the deployment of five times more energy efficient networks; and
- take account of decrease in demand for 2G and 3G services and lack of new equipment and spare part production for 2G and 3G user devices and network infrastructure.

J.2 Regulatory involvement

The regulator, PTS, was assigned by the government to oversee and coordinate some aspects of 2G switch off (together also with the phasing out of the 3G and copper PSTN networks).

PTS's primary role is to monitor the sunset process. While the network operators (Telia, Tele2, Telenor, and Tre) ultimately decide their timelines for shutting down their networks (with most aiming for late 2025 or early 2026), PTS ensures they comply with their licensing conditions. This involves the following

- Mandating transition: PTS, through the mobile licencing framework, mandates the overall direction of the shift towards modern, more secure 4G and 5G networks, which will mean allowing operators to

[87] Bytnätnu (2025)

reuse the radio spectrum currently occupied by 2G and 3G. This is partially done through coverage and quality of service obligations.

- Data Gathering: The authority has actively conducted surveys and engaged with key stakeholders, such as municipalities, to assess how society's critical functions and connected devices (like alarms, utility meters, and elevator phones) are affected, pushing for timely upgrades.

- Ensuring Information: PTS monitors the information campaigns carried out by the operators and industry groups (like the Byt Nät Nu initiative) to ensure that businesses and consumers are adequately informed about the need to replace or upgrade older equipment.

Where needed, PTS has also evaluated the steps taken by operators to mitigate issues from the transition, such as reviewing the consumer information provided to customers, and checking the suitability of replacement solutions. PTS has held quarterly meetings with operators ahead of network sunsets.

J.3 Emergency services

PTS has undertaken crucial measures to ensure continuous access to the emergency number 112, following decommissioning of 2G and 3G networks. The core issue identified by PTS is that some older 4G-enabled mobile phones, while capable of making regular calls using VoLTE, do not adequately support making emergency calls over VoLTE through their operator's own network. Initially, some operators (Tre, Telenor, and Tele2) relied on an emergency-roaming solution to Telia's remaining 2G network for these specific devices, but PTS ruled that this fallback was not a sufficiently secure or reliable long-term solution.

To address this public safety risk, PTS has mandated that the affected mobile network operators must actively identify and block these incompatible phone models from their networks. This directive requires operators to immediately inform all affected customers and begin blocking the devices – first for those needing a special action (like SIM card removal) to connect to Telia's network, and then for all remaining non-compliant 4G phones by 2 February 2 2026. PTS acknowledges the inconvenience this causes, but stresses that the action is necessary to prevent users from believing they have a functioning service, only to find they cannot reach emergency services when they need it most. This ensures that only phones capable of reliably connecting to 112 via VoLTE or remaining legacy networks (like Telia's 2G until 2027) are permitted on the operators' systems.

Appendix K Switzerland

2G networks were shut down at the beginning of 2023. The process was started in 2021 by Swisscom and completed by Sunrise in 2023.

K.1 Approach

Operators conducted direct consultations with affected industries and stakeholders rather than through a single government-led public consultation. Each provider handled the communication and shutdown of its own network. For example, Swisscom announced its 2G shutdown and advised customers to replace 2G-only devices in late 2020. They offered resources to help subscribers check if their devices would be affected. The Swiss operators also informed customers well in advance; encouraged and assisted them with upgrading to modern devices; and collaborated with affected industries.

The decentralised operator-led approach was effective for several reasons:

- Swiss operators have long been leaders in upgrading to newer mobile generations. This allowed them to repurpose spectrum for more efficient technologies.
- The need for an expensive, government-mandated process was reduced due to consumer demand shifting to 4G and 5G.
- The remaining devices relying on 2G were primarily from specific industries, allowing for direct, focused outreach rather than a broad public campaign.

The Swiss operators specifically cited extremely low customer usage, the need to reallocate spectrum to newer technologies, and greater operational efficiency as the key reasons for the 2G switch-off. The shift towards data intensive applications on smartphones made the 2G network obsolete. For example, Swisscom's 2G network carried less than 0.03% of mobile traffic by the end of 2020, and this made the continued operation economically unviable. The 2G switch off allowed relocation of the freed-up spectrum to more efficient 4G and 5G networks. Similarly, advanced IoT technologies adopted for 4G or 5G offered more effective solutions.

K.2 Affected stakeholders

The lift sector was one of the worst affected user communities. They had a lengthy period to prepare for the conversion of the emergency call systems. The biggest provider, Swisscom, contacted operators in 2015, with the intention of allowing sufficient time for transitioning. An estimated 100,000 out of 250,000 lifts in Switzerland were affected by the 2G switch-off[88].

Older energy smart meters relying on 2G connectivity were migrated to alternative cellular networks, such as LTE-M or NB-IoT, or replaced with devices using a wired internet connection.

Manufacturers of point-of-sale systems offered module upgrades or sold new terminals that were compatible with 4G networks. Service providers like Rosenberger Telematics started offering 4G-compatible devices well before the shutdown, actively encouraging customers to upgrade.

[88] Lorenz (2025)

For vulnerable customers using telecare, a managed and prioritised upgrade process ensured safety and continuity of service. Providers of critical services communicated directly with their customers about the necessary upgrades, outlining the risks of continuing to rely on legacy networks.

A further example is a fleet management system where the operator enabled its customers with equipment capable of connecting both 2G and 4G networks[89] in advance of the shutdown to prevent service disruptions.

For emergency services, in remote areas where an individual operator might have had limited 4G coverage, emergency calls were automatically roamed onto any other available network. The regulator OFCOM[90] liaised with operators to ensure that there were no areas in which coverage was lost.

K.3 Impact on MVNOs

The main network operators provided their MVNO partners with detailed information on the shutdown timelines and technical requirements. This allowed MVNOs to prepare their own communication and migration plans. The overall process (including communication and support campaigns for customers) was a collaborative effort involving both MNOs and their virtual partners.

[89] FleetGo (2023)
[90] Note that this is the Swiss regulator OFCOM, which should not be confused with the UK regulator Ofcom.

Appendix L Taiwan

Taiwan shut down its 2G networks in 2017 and 3G networks in 2018. According to the Taiwanese regulator (National Communications Commission, NCC), the key driver for the 2G shut down was the licence expiry date of 30 June 2017. The refarmed spectrum is now used by 4G and 5G networks.

L.1 2G data

In March 2017, there were 133,000 customers using 2G SIM cards on 2G handsets. Three main mobile operators (Chunghwa Telecom, Far EasTone Telecommunications and Taiwan Mobile) did not take the offer of a shared voice communication service network to serve their remaining 2G users, which Asia Pacific-Telecom (3G network operator in Taiwan) volunteered to provide.

At the time of switch off in June 2017, there were an estimated 60,000 2G subscribers on Chunghwa Telecom, 20,000 on Taiwan Mobile and 8,000 on Far EasTone. These subscribers' numbers were reserved until the end of December 2017 (that is, six months grace period) in case they chose to upgrade to 4G[91].

L.2 Approach

The NCC and mobile service providers carried out extensive campaigns to consult with and migrate remaining users. The consultation process involved the following actions.

- **Announcement of the switch off plan**: In September 2016, the NCC officially announced that 2G licenses would expire on June 30, 2017, with a six-month grace period for users to transition to 3G or 4G services. The NCC also established a 24/7 hotline to address any issues that arose immediately after the network was shut down.
- **Categorisation of users**: The NCC analysed the habits of remaining 2G users and identified five main types to focus on: users of text-only plans, prepaid card users, those with low monthly subscription fees, users of push-button phones, and voice-only users.
- **Mandating new plans**: The NCC mandated that service providers offer service contracts that would allow 2G users to seamlessly migrate to 3G or 4G. These plans were required to be similar to or better than what they had before, with options for call-only, text-only, or combined services.
- **Discussing network sharing**: The NCC asked Chunghwa, Far EasTone, and Taiwan Mobile if they would be willing to use Asia-Pacific Telecom's shared voice network for remaining 2G users. However, none of the three major carriers indicated they would participate.
- **Prevention of new 2G devices**: The NCC considered cancelling the certification for new 2G-only devices to prevent new users from adopting outdated technology.

Mobile network operators executed substantial campaigns to reach out their remaining 2G subscribers including corporate and government clients to ensure a timely upgrade. The campaign included text messages, hosting information sessions (including 1,535 sessions for individuals and visits to 375 remote villages), promotional packages to encourage switch to new technologies, and TV commercials.

[91] Bushell-Embling (2017)

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