



5G COUNTRY PROFILE



SWITZERLAND

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Version 1.1

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Note: Version 1.1 of this document is an advanced draft for possible additional inputs, comments, feedback. The final version of the document is planned to be released after the ITU Regional Forum for Europe.

1. ICT background and current status of broadband

Switzerland is a leading country in ICT development and benefits from one of the most sophisticated ICT sectors in the world. The country possesses high-quality mobile phone services as well as significant broadband penetration, with average speeds well above the European average. In terms of fixed-broadband, the country has a universal Digital Subscriber Line (DSL) infrastructure and an expansive optical fibre broadband network characterized by cross-platform competition.¹ Operators in Switzerland are among the biggest investor in telecommunication networks in Europe, and telecom services are affordable for Swiss customers.² More recently, fibre has increased rapidly in the country and now at least one-third of Swiss households are directly connected by a fibre-optic connection (FTTH).³ From the perspective of mobile, despite market liberalization occurred in 1998 with the entry of numerous alternative operators, Switzerland has on one of the least competitive markets in Europe.⁴ In the 2017 ITU ICT Development Index, Switzerland ranks 3rd out of 176 countries.⁵

The first national strategy for the digitalization of Switzerland was published in 1998 and revised several times. While Switzerland has aligned some of its policies with those of the European Union, its telecommunication policies are yet to be harmonized. In 2016, the country adopted the “Digital Switzerland” strategy, which contained four key objectives: innovation; growth and prosperity in the digital world; equal opportunities and the participation of all; transparency and security; and contribution to sustainable development.⁶ Many other ICT policies have been implemented ever since, with a particular focus on e-government, e-health, and digital transformation.⁷

In September 2020, the Swiss Federal Council adopted the “Digital Switzerland” Strategy for the 2020-2022 period.⁸ As a joint task of authorities at all levels of the state, the economy, science, civil society and politics, the strategy provides the guidelines for government action and indicates where and how authorities, academia, the private sector, civil society and politics must work together in order to shape the transformation process for the benefit of everyone in Switzerland.⁹

The strategy is structured in a way that aims to centre Swiss people at the forefront while facilitating structural change. Furthermore, the strategy focuses on five key objectives: I) Enabling equal participation for all and strengthening solidarity; II) Guaranteeing security, trust and transparency; III) Continuing to strengthen people's digital empowerment and self-determination; IV) Ensuring value creation, growth and prosperity; and V) Reducing the environmental footprint and energy consumption.¹⁰

¹ See: <https://www.budde.com.au/Research/Switzerland-Telecoms-Mobile-and-Broadband-Statistics-and-Analyses>

² See: <https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf>

³ See: <https://www.comcom.admin.ch/comcom/en/Homepage/documentation/activity-report.html>

⁴ See: <https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf>

⁵ See: <https://www.itu.int/net4/ITU-D/idi/2017/index.html>

⁶ See: <https://www.bakom.admin.ch/bakom/en/homepage/digital-switzerland-and-internet/strategie-digitale-schweiz/strategy.html>

⁷ See: https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Government_Factsheets_Switzerland_2019.pdf

⁸ See: <https://www.digitaldialog.swiss/>

⁹ See: <https://www.bakom.admin.ch/bakom/en/homepage/digital-switzerland-and-internet/strategie-digitale-schweiz.html>

¹⁰ See: <https://www.digitaldialog.swiss/en/key-objectives>

Based on the key objectives, the “Digital Switzerland” strategy focuses on the following fields of actions and respective vision/goals as well as measures and key documents related to them:¹¹

- Education, research, and innovation;
- Infrastructure;
- Security;
- Environmental protection, natural resources and energy;
- Political participation and e-government;
- The economy;
- Data, digital content and Artificial Intelligence;
- Social Affairs, Healthcare and culture; and
- International Commitment.

The strategy also contains information on how each broader fields of action contribute to the United Nation’s Sustainable Development Goals. Under each wider fields of actions described in the strategy, there are a series of goals and a list of key documents related to each goal, as well as a few indicators to measure their progress.

Accompanying the strategy and its goals, there is an action plan whereby for each project, there is a short description, a status of the measure, and the responsible stakeholder so that stakeholders can monitor the accomplishment of the broader objectives laid out on the document.¹² The “Digital Switzerland” office within the OFCOM decides on the inclusion of measures undertaken by participants outside the federal administration in the action plan by arrangement with the respective competent specialist agencies of the federal administration.¹³

Concerning broadband in underserved areas, private stakeholders are heavily investing on the deployment of telecommunication infrastructure¹⁴ and, more recently, they have also engaged on joint venture strategies to maximize FTTH services as well as Wi-Fi technology¹⁵ throughout Switzerland.¹⁶

2. Broadband and mobile telecommunication sectors data

ITU data shows that 93.15% of individuals had access to the Internet in 2019 in Switzerland.¹⁷ In 2010, the ITU data for the country was 83.90% and, in 2000, 47.10%. In 2019, the number of fixed-broadband subscriptions per 100 inhabitants was 45.21.¹⁸ DSL/FTTx providers are still way ahead of optical fibre network operators when it comes to Internet access, though DSL has been decreasing each year. At the end of 2019, just over 71% of users were connected via a telecom’s operator (2,838,000 connections), while 29% were connected via a cable operator (1,157,000 connections). When it comes to the customers

¹¹ See: <https://www.digitaldialog.swiss/en/fields-of-action/>

¹² See: <https://www.digitaldialog.swiss/en/actionplan>

¹³ See: www.digitaldialog.swiss

¹⁴ See: <https://www.swisscom.ch/en/about/company/portrait/network/fibre-optics-network-expansion-map.html>

¹⁵ See: https://www.salt.ch/media/press/files/2020/6/29/6c76f4de-240a-403c-b26b-18fd0169f196/451/20200629_PR_100k_Fiber_customers_EN.pdf

¹⁶ See: <https://www.nasdaq.com/articles/switzerlands-sunrise-french-owned-salt-link-up-in-%243.1-bln-broadband-jv-2020-05-19>

¹⁷ See: World Telecommunication/ICT Indicators Database online (2020): <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator “i99H”)

¹⁸ See: World Telecommunication/ICT Indicators Database online (2020): <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator “i992b”)

who are supplied via an FTTH/B connection as well as via hybrid fibre and copper technologies (FTTC and FTTS), the alternative telecom providers play a critical role in Switzerland and, when combined, they had a market share of about 20.2% of the broadband connections in the country in 2019.¹⁹ Most of the broadband internet users in Switzerland enjoy a downlink transfer rate between 30 and 100 Mbps²⁰ with a registered record of averaging 61 Mbps in 2019, compared with 44 Mbps in 2018.²¹

Moreover, as a result of DSL and CATV subscribers migrating to fibre-optic technology (FTTH + FTTB), significant growth in the fibre sector has been noted particularly since 2010.²² By the end of 2019, about 21% of all broadband subscribers in Switzerland (about 850,000 users) were using a fibre-optic connection.²³ In 2017, about 15% were subscribers of fibre-optic connection in Switzerland.²⁴ From the regional perspective, Europe's average fixed-broadband basket cost was 1.5 per cent of the GNI per capita in 2019, while Switzerland's corresponded to 1.0 per cent for an unlimited data package per month in 2019.²⁵

In 2019, the number of active mobile-cellular subscriptions per 100 inhabitants was of 127.19,²⁶ while active mobile-broadband subscription per 100 inhabitants was of 99.05.²⁷ In addition to a small number of mobile virtual network operators (MVNO), there are three major mobile network operators (MNOs) that dominate the market in Switzerland: Swisscom, Sunrise, and Salt (formerly Orange). Between 2010 and 2017, the number of mobile users who signed up for Internet data plans rose from 3.4 million to 8.4 million.²⁸ In 2019, there were 5.3 million online shoppers, a significant increase in the number of users engaging with e-commerce.²⁹ The country's mobile-data basket cost corresponded to 0.7 per cent of the GNI per capita in 2019 for a monthly allowance of 30 Gb, while the European region's average was 0.8 per cent in 2019.³⁰ 3G as well as LTE/4G and 4G+ covers practically the entire population of Switzerland,³¹ with

¹⁹ See: <https://www.comcom.admin.ch/comcom/en/Homepage/documentation/facts-and-figures/broadband/market-share.html>

²⁰ See: <https://www.bakom.admin.ch/bakom/en/homepage/telecommunication/facts-and-figures/statistical-observatory/internet-service-provider.html>

²¹ See: <https://www.bakom.admin.ch/bakom/en/homepage/telecommunication/facts-and-figures/statistical-observatory/prices/broadband-services.html>

²² See: <https://www.bakom.admin.ch/bakom/en/homepage/telecommunication/facts-and-figures/statistical-observatory/broadband/breitbandinfrastruktur.html>

²³ See: <https://www.comcom.admin.ch/comcom/en/Homepage/documentation/facts-and-figures/broadband/glasfaser.html>

²⁴ See: <https://www.comcom.admin.ch/dam/comcom/en/dokumente/Statistik/oecd-breitband-penetration-2019/December-2019/Percentage%20of%20fibre%20connections%20in%20total%20fixed%20broadband,%202017-2019.xlsx.download.xlsx/Percentage%20of%20fibre%20connections%20in%20total%20fixed%20broadband,%202017-2019.xlsx>

²⁵ See: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2019/ITU_ICTpriceTrends_2019.pdf

²⁶ See: ITU World Telecommunication/ICT Indicators Database online (2020): <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator "i911")

²⁷ See: ITU World Telecommunication/ICT Indicators Database online (2020): <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator "i911mw")

²⁸ See: <https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-2-E.pdf>

²⁹ See: <https://www.swissstats.bfs.admin.ch/collection/ch.admin.bfs.swissstat.en.issue20000252000/article/issue20000252000-20>

³⁰ See: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2019/ITU_ICTpriceTrends_2019.pdf

³¹ See:

<https://www.bakom.admin.ch/dam/bakom/en/dokumente/bakom/telekommunikation/Zahlen%20und%20Fakten/Sammlung%20statistischer%20Daten/Infrastruktur/Terrestrial%20mobile%20network%20infrastructures.xlsx.download.xlsx/Terrestrial%20mobile%20network%20infrastructures.xlsx>

official ITU data standing at 99% for 4G/LTE and 100% for 3G in 2019.³² ITU data for the same year also show that the mobile-broadband Internet traffic within Switzerland corresponded to 0.85 exabytes.³³

3. Current progress on 5G: consultations and national strategies

The Swiss government anticipates that 5G is set to significantly impact the delivery of services such related to the following: broadband mobile radio network; mobility, transport and logistics; Public security; Production; Energy; and Health.

The country started discussing 5G frequency allocation as early as 2017, with the Federal Council reserving the frequency bands (700MHz and 3.5GHz) for mobile communications. This strategy involved conducting changes to the National Frequency Allocation Plan (NFAP),³⁴ which was approved by the Federal Council in November 2017. Moreover, the Federal Council agreed to lower the license fees for mobile spectrum in the 3GHz range from January 2018 onwards. The move aimed to take into account the less favourable propagation characteristics of the higher frequency bands, and thus facilitate the development of 5G in Switzerland.³⁵

In February 2018, the Swiss parliament's Commission for Transport and Telecommunications (Kommissionen Fur Verkehr Fernmeldewesen, KVF) has called for a revision of the nation's regulations regarding non-ionising radiation, claiming that the existing rules hinder necessary mobile network expansion works, particularly with regards to 5G.³⁶

Between January and February 2019, on behalf of Federal Communications Commission (ComCom), the Federal Office of Communications (OFCOM) conducted a frequency auction for 5G, auctioning off an extensive bundle of mobile frequencies and thus creating the conditions for 5G development in Switzerland.³⁷ By incorporating bidding restrictions and consultations with private stakeholders, the frequency licenses for 5G were acquired by the country's three MNOs for the following auction prices: Salt (88 million EUR), Sunrise (83.1 million EUR), and Swisscom (182 million EUR).

In January 2020, OFCOM posted a 5G fact sheet with an introductory overview of Switzerland's stands on 5G development. No comprehensive authorisation by a central authority is necessary for the introduction of 5G in Switzerland. However, like all other radio technologies operating in the country, 5G deployment must meet the conditions concerning regulations for mobile radio antennas, the appropriate frequency use band, and the conditions laid down in the licenses.³⁸

³² See: ITU World Telecommunication/ICT Indicators Database online (2020): <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator "i271G and i271GA")

³³ See: ITU World Telecommunication/ICT Indicators Database online (2020): <http://handle.itu.int/11.1002/pub/81550f97-en> (indicator "i136mwi")

³⁴ See: <https://www.bakom.admin.ch/bakom/en/homepage/frequencies-and-antennas/national-frequency-allocation-plan.html>

³⁵ See: <https://www.commsupdate.com/articles/2017/11/09/switzerland-lines-up-5g-spectrum-auction-for-h2-2018/>

³⁶ See: <https://www.commsupdate.com/articles/2018/02/01/kvf-calls-for-federal-council-to-clear-path-for-5g/>

³⁷ See: <https://www.bakom.admin.ch/bakom/en/homepage/frequencies-and-antennas/award-of-mobile-telephony-frequencies/starting-signal-for-new-award-of-mobile-radio-frequencies.html>

³⁸ See: <https://www.bakom.admin.ch/bakom/en/homepage/telecommunication/technology/mobile-communications-evolution-towards-5G/5g-faq.html#931839373>

OFCOM also maintains an interactive website containing information on the geographic distribution of 5G antenna locations so the public can follow the development of 5G in the country, which is based on the data provided by operators. Information on 4G, 3G, 2G, radio, TV broadcasters, as well as microwave links, are available.³⁹

As of October 2020, Switzerland has no national strategy for 5G development but continues to be among the European pioneers on the new-network deployment.

4. Spectrum assignment for 5G & market development

In Switzerland, the mobile telephony frequencies are licensed in a technology-neutral manner, which gives operators the freedom to choose the technology that provides mobile telecommunications services⁴⁰. The 800 MHz, 900 MHz, 1800 MHz, 2100 MHz and 2600 MHz bands were auctioned off for in 2012, while the 2019 auction encompassed a wide range of additional mobile radio frequencies (700 MHz, 1400 MHz and 3500 MHz), more relevant to 5G, and generated about 353.9 million EUR from the private operators.⁴¹ Using the frequency bands below 6 GHz, as are currently licensed in Switzerland, a maximum data rate of 3 Gbit/s is expected.⁴²

The auction's result for 2019 spectrum is reflected below according to each MNO:⁴³

- Swisscom: 2×15MHz (three 2×5MHz blocks) in the 700MHz band and 120MHz of unpaired spectrum in the 3500MHz range, as well as 50MHz of supplementary downlink (SDL) frequencies in the 1400MHz band;
- Salt: 2×10MHz in the 700MHz band, 80MHz in the 3500MHz band and 10MHz of SDL 1400MHz frequencies; and
- Sunrise: Sunrise was awarded 2×5MHz of paired spectrum and 1×10MHz of SDL airwaves in the 700MHz range, as well as 100MHz of 3500MHz frequencies and 15MHz of SDL spectrum in the 1400MHz band.

Five frequency blocks of 5 MHz in the 2600 MHz band and the 700 MHz and 1400 MHz ranges were not sold. The frequencies that have not been awarded will remain with the Confederation and put out for tender again at a later date. According to the auction, the frequencies were assigned for 15 years, whereby giving the operators long-term planning security to develop their networks. Licences are granted with coverage obligations. By 2024, licenses have to cover 50% of the Swiss population with 700 MHz spectrum and 25% with other frequencies.⁴⁴

³⁹ See: https://map.geo.admin.ch/?topic=funksender&lang=en&bgLayer=ch.swisstopo.pixelkarte-farbe&layers=ch.bakom.mobil-antennenstandorte-5g,ch.bakom.radio-fernsehsender,ch.bakom.mobil-antennenstandorte-gsm,ch.bakom.mobil-antennenstandorte-umts,ch.bakom.mobil-antennenstandorte-lte&catalogNodes=403,408&layers_visibility=true,false,false,false,false&E=2634483.08&N=1162301.89&zoom=7

⁴⁰ See: https://www.bakom.admin.ch/dam/bakom/en/dokumente/faktenblatt_5g.pdf.download.pdf/factsheet_5g.pdf

⁴¹ See: <https://www.comcom.admin.ch/comcom/en/Homepage/documentation/media-information.msg-id-73916.html>

⁴² See: <https://www.bakom.admin.ch/bakom/en/homepage/telecommunication/technology/mobile-communications-evolution-towards-5g/5g-faq.html#931839373>

⁴³ See: <https://www.news.admin.ch/newsd/message/attachments/55585.pdf>

⁴⁴ See: <https://5gobservatory.eu/5g-spectrum/national-5g-spectrum-assignment/#1563958389100-0edfce99-fd41>

5. Electromagnetic fields levels and the implementation dynamics

Switzerland applies precautionary principles regarding EMF admitted from mobile communications installations. The relevant sources of EMF regulation in the country stem from the “Ordinance relating Protection from Non-Ionising Radiation” (NISV; RS 81.710)⁴⁵, which is technological-neutral and applies regardless of 3G, 4G, or 5G. In the ordinance, the Federal Council set two types of limit values for mobile phone radiation, the emission limit values⁴⁶ and the installation limit values, which include in particular apartments, schools, kindergartens, hospitals, permanent workplaces and children’s playgrounds.

The document was prepared in 1999 and enacted in February 2000⁴⁷ by the Federal Office for the Environment (FOEN) of Switzerland.⁴⁸ The document was later adapted in 2008 and 2013, when a component of technology neutrality was applied. NISV mandates the exposure limits for EMF emission as recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the World Health Organisation (WHO) and the European Union. This includes:

- Emission Limit Values (ELV): In the area of mobile radio frequencies, the limit is between 41 and 61 volts per meter (V / m); and
- Installation limit values (LFV): These so-called “plant limit values” are around 10 times lower than the emission limit values for mobile phone radiation (4 to 6 V / m). They do not have to be adhered to everywhere, only in the places with sensitive use.

In November 2019, Switzerland’s Department for the Environment, Transport, Energy, and Communication (DETEC) published a report titled “Mobile Communications and Radiation,”⁴⁹ which is a result for a previous working group on the topic from the previous year.⁵⁰ This working group was made up of representatives from research and technology, the medical profession, the telecommunications industry, interest groups and municipal, cantonal and federal authorities. Overall, this report provides information on the existing mobile phone networks and the necessary expansion steps to support the data transfer demand in the country. It also summarizes the knowledge on the current and forecasts future radiation exposure to the population, as well as the current understanding and gaps in the subject. In five steps, the report presents the measures with which the necessary expansion steps could be made possible, what costs would arise, what additional infrastructure would be required and how the limit values for cell phone antennas would have to be adjusted.⁵¹

⁴⁵ See: <https://www.admin.ch/opc/fr/classified-compilation/19996141/index.html>

⁴⁶ Here the distinction between immission and emission limits is important, because also in Switzerland the immission limit is still at 100 µT.

⁴⁷ See: https://www.who.int/docstore/peh-emf/EMFStandards/who-0102/Europe/Switzerland_files/table_sz.htm

⁴⁸ See: <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2017/EMF/Switzerland%20EMF-5G%20Case%20FINAL.pdf>

⁴⁹ See: https://www.bafu.admin.ch/dam/bafu/de/dokumente/elektrosmog/fachinfo-daten/bericht-mobilfunk-und-strahlung.pdf.download.pdf/Bericht_MobilfunkStrahlung.pdf

⁵⁰ See: <https://www.bafu.admin.ch/bafu/de/home/themen/elektrosmog/dossiers/bericht-arbeitsgruppe-mobilfunk-und-strahlung.html>

⁵¹ See: https://www.bafu.admin.ch/dam/bafu/en/dokumente/elektrosmog/fachinfo-daten/bericht-mobilfunk-und-strahlung.pdf.download.pdf/Report_MobileRadio-Radiation.pdf

Based on this report, the Federal Council decided on further actions concerning EMF and 5G, which focused on the following:⁵²

- Implementation aid for adaptive antennas: The federal government is in the process of developing an implementation guide for dealing with the new adaptive antennas. This means that all mobile phone antennas must comply with the provisions of the Ordinance on Protection against Non-Ionizing Radiation. Adaptive antennas, which are a fundamental component of 5G, can focus the radiated power specifically on individual users. This means that a higher power is emitted in the direction of the user, but the radiation is much lower in all other directions. The exposure with adaptive antennas is therefore usage dependent.
- Implementation of the accompanying measures: The accompanying measures according to the report of the “Mobile Communications and Radiation” working group from November 2019 will be implemented with the involvement of relevant departments, interested stakeholders and the cantons within the scope of the existing resources while maintaining the existing responsibilities.
- Sustainable cellular network: With the report on the postulate Häberli-Koller 19.4043 “Sustainable mobile radio network”, a better basis for decision-making for future mobile radio technologies is to be created to counteract a renewed polarization of opinions.

In addition to the FOEN and the work done by the Federal Office of Public Health (FOPH), the cantonal environmental protection offices are responsible for the compliance with the limits for non-ionising radiation laid down in the ordinance. They examine operators’ calculations on the radiation intensity of every antenna. The consents for the construction of new antennas or the modification of existing antennas are available in the FOEN explanations.⁵³ Additionally, a series of fact sheets for various appliances producing non-ionizing radiation (NIR) is available on the FOPH’s website.⁵⁴

While the EMF limits are much more strictly limited in Switzerland than in most European countries, recent attempts to change the legislation have occurred⁵⁵, as anticipated in section 3. For instance, a parliamentary motion⁵⁶ pushing potential relaxation for the limit values for EMF exposure in the country was rejected by the Swiss Parliament amid safety concerns.⁵⁷ The basis for that is largely due to the precautionary principle of the Environmental Protection Act⁵⁸, which states that emissions are to be limited to the extent that this is technically and operationally possible and economically viable.⁵⁹

⁵² See: <https://www.bafu.admin.ch/bafu/de/home/themen/elektrosmog/dossiers/bericht-arbeitsgruppe-mobilfunk-und-strahlung.html>

⁵³ See: <https://www.bafu.admin.ch/bafu/de/home/themen/elektrosmog/dossiers/bericht-arbeitsgruppe-mobilfunk-und-strahlung.html#1502548024>

⁵⁴ See: <https://www.bag.admin.ch/bag/en/home/gesund-leben/umwelt-und-gesundheit/strahlung-radioaktivitaet-schall/elektromagnetische-felder-emf-uv-laser-licht/emf.html>

⁵⁵ See: <https://ehtrust.org/switzerland-policy-recommendations-cell-phones-wireless-radiation-health/>

⁵⁶ See: https://www.who.int/peh-emf/project/mapnatreps/switzerland_2018.pdf?ua=1

⁵⁷ See: <https://www.reuters.com/article/us-swiss-5g/swiss-maintain-5g-emission-standards-amid-safety-concerns-idUSKCN22420H>

⁵⁸ See: <https://www.admin.ch/opc/en/classified-compilation/19830267/index.html>

⁵⁹ See: <https://www.bafu.admin.ch/bafu/de/home/themen/elektrosmog/dossiers/bericht-arbeitsgruppe-mobilfunk-und-strahlung.html#78916420>

In addition to the 2019 civic pressure from opponents of 5G in Switzerland,⁶⁰ in February 2020, local press reported that Swiss regions have responded to locals urging for “5G-free zones” and suggested that they temporarily suspended the use of new mobile sites constructed for 5G and requested the regulator to provide more scientific and technical information proving that 5G presents no health hazard.⁶¹ However, other news media reports later reported that the FOEN only submitted an information letter to the cantons, some of which imposed moratoria on 5G planning permission.⁶²

6. 5G Commercial launches: announcements, trail cities, and digital cross-border corridors

One of the earliest commercial announcements related to 5G took place in June 2016, when Swisscom announced a partnership with Ericsson to launch the “5G for Switzerland” programme in collaboration with the Ecole Polytechnique Federale de Lausanne (EPFL). “5G for Switzerland” is part of the Ericsson “5G for Europe” program, announced in 2015.⁶³ Under the collaboration in Switzerland, Swisscom, Ericsson and the EPFL announced they planned to address challenges such as smart transportation, autonomous driving, automated traffic control systems, smart grid and Internet of Things (IoT).⁶⁴

In May 2017, Swisscom introduced Network Function Virtualisation (NFV) and launched 5G tests at its shops in Switzerland, allowing customers to experience an Internet speed of 800 Mbps.⁶⁵ In June 2017, Swisscom and Ericsson demonstrated applications based on 5G network slicing and NB-IoT.⁶⁶ In July 2017, the operator carried out field tests in Zurich of an Ericsson-built 5G system. The test used a single base station and two-terminal devices and achieved peak download speeds of 10Gbps.⁶⁷ On that occasion, the operator expressed interests in developing IoT-related services in Switzerland.

Within the Ericsson-Swisscom partnership, the operator announced in November 2017 that it was upgrading Swisscom’s LTE networks to revamp data traffic speeds. They also announced that had plans to rely on Ericsson’s full Transformation includes the deployment of Ericsson’s full-stack telecom cloud solution with network slicing technologies, and 5G portfolio offering with Massive Multiple-input and multiple-output (MIMO).⁶⁸ Moreover, Swisscom’s industrial partner, Ypsomed, has used 5G applications in the Industry 4.0 sector.⁶⁹ In a pilot project, Ypsomed created a 5G test network and digitised the entire process chain, from the delivery of raw materials and product manufacture and through to provisioning and supply.⁷⁰

⁶⁰ See: https://www.swissinfo.ch/eng/radiation-fears_several-thousand-protest-against-5g-in-swiss-capital/45246224

⁶¹ See: <https://www.techradar.com/news/swiss-cantons-halt-use-of-new-5g-masts-due-to-health-concerns#:~:text=Networking-,Swiss%20cantons%20halt%20use%20of%20new%205G,masts%20due%20to%20health%20concerns&text=Some%20Swiss%20regions%20hav,e%20suspended,to%20launch%20next%2Dgeneration%20networks.>

⁶² See: <https://www.mobileworldlive.com/featured-content/top-three/switzerland-denies-halting-5g-rollouts>

⁶³ See: <https://www.ericsson.com/en/press-releases/2015/9/ericsson-launches-5g-for-europe-program-with-academic-research-and-industry-partners>

⁶⁴ See: <https://www.ericsson.com/en/news/2016/6/swisscom-and-ericsson-launch-5g-for-switzerland>

⁶⁵ See: <https://www.swisscom.ch/en/about/news/2017/06/20170628-mm-5g-speed.html>

⁶⁶ See: <https://www.swisscom.ch/en/about/news/2017/06/20170628-mm-5g-speed.html>

⁶⁷ See: <https://www.commsupdate.com/articles/2017/07/07/swisscom-tests-10gbps-5g-prototype/>

⁶⁸ See: <https://www.ericsson.com/en/press-releases/2017/11/swisscom-selects-ericsson-as-strategic-supplier-for-gigabit-lte-and-5g>

⁶⁹ See: <https://www.swisscom.ch/en/business/enterprise/themen/connectivity/5g-applications-ypsomed.html>

⁷⁰ See: <http://5gobservatory.eu/5g-trial/major-european-5g-trials-and-pilots/>

In January 2018, Salt and Nokia demonstrated 5G 3.5GHz network performance in Salt's headquarters in the municipality of Renens under a temporary license from OFCOM. The demonstration involved a 5G antenna with 8x8 MIMO technology supporting end-to-end applications, which included: 4.5Gbps mobile data downloads; virtual reality applications showcasing ultra-fast network latency (in the range of 1 millisecond) under 'real conditions'; and 360-degree live video transmitted from secondary locations, further highlighting the ultra-fast latency and capacity of the 5G network configuration.⁷¹

In June 2018, Sunrise commissioned its first 5G cell tower in Switzerland and took the opportunity to announce that its plans to launch "5G for People" (or the so-called "fibre-optics over the air") for 2019. In addition to boosting mobile data services, Sunrise intends to use 5G to offer residential broadband with data transfer rates of up to 1Gbps in areas where customers do not have access to fibre networks. In other words, the operator suggests that 5G could be used as a replacement for ADSL/VDSL connections, especially outside high-population areas, as these locations are typically lower-priority for fibre deployments and have greater potential to upgrade existing mobile networks without exceeding the current radiation limits.

In July 2018, Swisscom began the 5G trials in Guttannen, a remote mountain village of 200 km² in the Bernese Oberland with about 300 inhabitants, to test how the platform could improve connectivity in remote areas.⁷² Based on this trial, the operator suggested that 5G technology could be used in combination with the fixed-network infrastructure, improving the availability of ultra-fast broadband as a result.⁷³

One of Switzerland's biggest milestones in 5G was announced in September 2018, when Ericsson and Swisscom claimed that they accomplished Europe's first end-to-end, multivendor Non-Standalone (NSA) data call on 3.5 GHz band in the Swiss city of Burgdorf. Data transmissions were carried out using Intel's Mobile Trial Platform (MTP) device and Swisscom's 5G-subscribed SIM card.⁷⁴ A few weeks later the Swiss operator informed that it had expanded the number of 5G test locations to other areas of the country. Furthermore, it announced that it connected to its test system, for the first time, a smartphone prototype equipped with a Qualcomm 5G mid-band modem⁷⁵ and a Wistron NeWeb Corporation (WNC) hotspot.⁷⁶

Within the framework of its plan of "5G for People," Sunrise deployed the first end-to-end 5G network in November 2018, when it activated its 5G network at the LAAX ski resort on Crap Sogn Gion, becoming the world's first standardized 5G network at a ski resort.⁷⁷ On this occasion, the operator informed that its system was capable of providing download speeds of up to 300Mbps and utilises 8x8 MIMO technology and 3.5GHz spectrum.

⁷¹ See: https://www.salt.ch/media/press/files/2018/1/25/fa5ff6bc-9c08-4713-b69c-a19d2e43c21c/309/Salt_5G%20-%20Salt%20and%20Nokia%20showcase%20mobile%20network%20of%20the%20future.pdf

⁷² See: <https://www.swisscom.ch/en/about/medien/aktuell/5g-test-guttannen.html>

⁷³ See: <https://www.swisscom.ch/en/about/medien/aktuell/5g-test-guttannen.html>

⁷⁴ See: <https://www.ericsson.com/en/press-releases/2018/9/ericsson-and-swisscom-get-5g-ready-for-business>

⁷⁵ See: <https://www.qualcomm.com/news/releases/2018/11/08/qualcomm-swisscom-wnc-and-ericsson-successfully-achieve-worlds-first-5g-nr>

⁷⁶ See: <https://www.swisscom.ch/en/about/news/2018/11/20181108-mm-5g-smartphone-prototyp.html>

⁷⁷ See: <https://www.sunrise.ch/en/medium-and-large-enterprises/home/sunrise-mit-5g-netz-in-laax.html>

In January 2019, Salt has signed a Letter of Intent (LoI) with Nokia to upgrade the operator's radio and mobile core network, thus improving its existing 3G and 4G platforms for more efficient launch of 5G services.⁷⁸ In February 2019, Sunrise has announced plans for a limited 5G trial for around 100 selected residential and business customers using its "Sunrise Internet Box 5G."⁷⁹ The operator's initial expectation was to launch commercial 5G in the first half of 2020, though that has been delayed.

In April 2019, the operator confirmed that its new 5G network was turned on, with initial network coverage of 150 towns, villages, and cities. In August 2019, Sunrise expanded its network coverage in 262 cities, towns, and villages across the country, though it was not until September 2019 that the operator opens its services to the general public.⁸⁰ In November 2019, Sunrise announced that its 5G network was then live on 309 town, which was almost double the coverage provided by the other competitive provider. The company stated that its 5G services were able to provide a top speed of up to 2 Gbps to at least 80% of the population. With Huawei's "LampSites" solution, Sunrise is ensuring powerful 5G coverage inside buildings.⁸¹ Instead of relying on the millimetre wave (mmWave) frequencies being used to support 5G in other markets, Sunrise confirmed that its 5G networks utilise spectrum in the 700MHz and 2.4GHz-2.5GHz bands.⁸²

In April 2019, Swisscom activated its 5G network in 102 locations in the first 54 towns—including Basel, Bern, Chur, Davos, Geneva, Lausanne and Zurich. Alongside the upgrade for mobile users, and amid the charged debates over EMF limits and health around the same time, Swisscom announced its plans to use the 5G network to provide broadband connections for customers outside of its fibre footprint.⁸³ Swisscom also announced plans to use dynamic spectrum sharing (DSS) to offer 5G coverage to the rest of the population.⁸⁴

In October 2019, Sunrise partnered with Huawei to boost the maximum download speeds of 3.67Gbps in a Zurich-based 5G trial. The trial utilised a 100MHz block of C-band (3.3GHz-4.2GHz) spectrum, alongside commercial network equipment fully conforming to 3GPP standards.⁸⁵

In August 2020, after a months-long pause on commercial 5G announcements in Switzerland amid the COVID-19 pandemic, Sunrise deployed a Nokia's cloud-native converged charging software to drive 5G monetization. According to Ericsson, such a solution enables the operator to more rapidly package, price and promote a wide range of consumer and business services. As such, Nokia notes that Sunrise will be

⁷⁸ See: <https://www.sdxcentral.com/articles/news/switzerlands-salt-picks-nokia-for-5g/2019/01/>

⁷⁹ See: <https://www.lteto5g.com/sunrise-targets-5g-network-coverage-in-150-cities-and-villages-by-march-2019/>

⁸⁰ See: <https://www.commsupdate.com/articles/2019/09/19/sunrise-opens-5g-service-to-public-upc-to-offer-1gbps-nationwide/>

⁸¹ See: <https://5gobservatory.eu/switzerlands-sunrise-expands-5g-coverage-to-80-of-population/>

⁸² See: <https://5gobservatory.eu/switzerlands-sunrise-expands-5g-coverage-to-80-of-population/>

⁸³ See: <https://www.swisscom.ch/en/about/news/2019/04/17-erstes-5g-netz-live.html>

⁸⁴ See: https://www.rcrwireless.com/20191203/5g/dss-5g-switzerland-australia?utm_campaign=20191203%20RCRenewsTues&utm_medium=email&utm_source=Eloqua

⁸⁵ See: <https://www.commsupdate.com/articles/2019/10/10/sunrise-huawei-notch-3-67gbps-in-zurich-5g-trial/>

able to quickly create differentiated offers for even the most complex IoT use cases and services enabled by 5G network slicing.⁸⁶

Although Switzerland has a dynamic commercial sector for 5G tests and deployment, 4G plays a significant role as the early 5G still rely on 4G connections to operate because they use 5G non-standalone access.⁸⁷

⁸⁶ See: <https://www.nokia.com/about-us/news/releases/2020/08/18/sunrise-deploys-nokias-converged-charging-software-to-drive-5g-monetization/>

⁸⁷ See: <https://www.opensignal.com/reports/2020/05/switzerland/mobile-network-experience>