

Telecommunications Regulatory Affairs Advisory Committee

Development of Broadband Infrastructure

Introduction

This paper provides Members with an update of the development of the broadband infrastructure and services in Hong Kong and other advanced economies.

2. Paragraphs 3 to 12 below give an account of the initiatives of the Government over the last two years in promoting and enhancing the development of broadband infrastructure and services in Hong Kong, while the rest of the document will survey the progress in other advanced economies and the more recent initiatives that they have undertaken in this respect.

On-Going Development of Broadband Infrastructure in Hong Kong

4G development

3. In order to support the rapid development of mobile broadband services in Hong Kong, the Government has been mindful of making available the appropriate radio spectrum and releasing it to the market in a timely manner. In February 2012, the Government released a total of 90 MHz of radio spectrum in the 2.3 GHz band (2300 - 2390 MHz band) by way of an open auction. The said spectrum, which could be used to deploy Time Division (TD-) Long Term Evolution (LTE) technology for the provision of 4G services, was successfully assigned to two incumbent mobile network operators (MNOs) and a new entrant.¹

4. Following a public consultation, the auction of an additional 50 MHz of radio spectrum in the 2.6 GHz band (2515 - 2540 MHz band

¹ See <http://tel.archives.ofca.gov.hk/en/industry/2.3GHz/main.html>.

paired with 2635 - 2660 MHz band) for wireless broadband services was held in March 2013. The radio spectrum was successfully assigned to four incumbent MNOs². The said spectrum could be used to deploy Frequency Division (FD-) LTE technology for the provision of 4G services.

Digital Dividend

5. The International Telecommunication Union (ITU) has adopted a frequency plan for IMT2000 in the band 698 - 806 MHz, which is currently allocated to television broadcasting service worldwide. Meanwhile, Hong Kong has commenced digital terrestrial television (DTT) broadcasting since end 2007 and the working target of the Government is to switch off the analogue television service (ASO) by end 2015. In August 2012, Hong Kong and the Mainland authorities have set up an expert group regarding the frequency coordination for ASO. The technical feasibility of using the vacated spectrum in the television broadcasting band after ASO for new services is being examined by the expert group.

Facilitating the deployment of femtocell

6. Femtocell is a low power equipment designed for use in a home or small business environment to improve indoor coverage of mobile services and reception of radio signals within buildings. In order to facilitate MNOs to deploy femtocell, the former Telecommunications Authority (TA) relaxed the relevant regulatory requirements after an industry consultation³. Interested MNOs may seek to revise their licences before deploying femtocells, which would not be considered as a base station for the purpose of licence fee calculation. In addition, the requirements for the prior approval of the Communications Authority (CA) for individual femtocell installation and provision of detailed information of femtocells under the licences are also dispensed with.

² See http://www.ofca.gov.hk/filemanager/ofca/en/content_810/20130318.pdf.

³ See http://tel_archives.ofca.gov.hk/en/consultations/circulardoc/femtocell_deployment.html.

Next Generation Network (NGN)

7. OFCA commissioned a consultancy study on NGN in May 2011 to holistically review the implications of NGN development relating to the existing regulatory framework and to identify the necessary changes to the framework for the NGN era. The study reviewed a wide range of issues in the telecommunications regulatory framework, including interconnection, next generation access, network security and emergency call service. The consultancy study was completed in January 2012, and the recommendations made by the consultant was presented in January 2012 to the former Regulatory Affairs Advisory Committee vide RAAC Paper 1/2012⁴.

8. Following the consultant's recommendations and the discussion in the TRAAC in its first meeting held in July 2012, OFCA reconvened in the same month the NGN Working Group to follow up the various aspects, including NGN interconnection architecture and interconnection trials among operators, migration of number portability from existing networks to an IP-based NGN environment, and indicators to help reflect the NGN development status.

Registration scheme for buildings with optical fibre-based access networks

9. In November 2010, OFCA launched a voluntary registration scheme for buildings with optical fibre access networks to cover residential buildings with a view to arousing public awareness on the importance of fibre-based access facilities. The scheme also aims to stimulate and promote further development of the fixed broadband infrastructure in Hong Kong. As of April 2013, about 15,100 buildings were registered with the scheme. OFCA has announced on 5 April 2013 the extension of the scheme to cover also non-residential buildings as the second stage implementation.

⁴ See <http://tel.archives.ofca.gov.hk/en/ad-comm/raac/minutes/ram10.pdf>.

Next Generation Government Wi-Fi (GovWiFi) Programme

10. GovWiFi is one of the major initiatives under the “2008 Digital 21 Strategy” undertaken by the Office of the Government Chief Information Officer (OGCIO), which aims to build Hong Kong as an advanced wireless city. It aims to provide free wireless Internet access services to all citizens by installing Wi-Fi facilities at designated government premises. The programme started installing Wi-Fi facilities since early 2008 at various government premises in all 18 districts. As at December of 2012, GovWiFi service has been rolled out to around 400 premises.⁵

11. “The Next Generation GovWiFi Programme” succeeded the initial programme after the expiry of its service contract in December 2012. Enhancements will be made in the following aspects –

- (a) Extension of service scope to about 40 more premises, where there is strong public demand for GovWiFi service;
- (b) Adoption of Wi-Fi technology standard (IEEE 802.11n), which provides better signal coverage, enables faster data transfer and reduces signal interference;
- (c) Support of the latest Internet communication protocol (IPv6) for accessing web sites and Internet services delivered through IPv6; and
- (d) Enhancement of the GovWiFi captive portal to facilitate the provision of more tailored and a greater number of e-government services and contents to the public.

IPv6 Development

12. The Government has been monitoring closely the IPv4 address exhaustion status and keeps in view the IPv6 development in the Asia Pacific region. It also takes a lead in the deployment of IPv6 in Hong Kong. The Government’s central infrastructure, including the backbone network, central Internet services, and the e-Government infrastructure service, supports IPv6 and over 200 Government web-sites can now be accessed via IPv6. In March 2012, the OGCIO sponsored the Internet

⁵ A list of premises is available at <http://www.gov.hk/en/theme/wifi/location>.

Society Hong Kong to organise the "IPv6 in Action!" project, aiming to equip businesses and Internet users with the knowledge for migration to IPv6. Besides, an "IPv6 Consumer Guide" that provides guidelines on how to enable IPv6 in home and business networks was published on 6 June 2012. The web sites of the former OFTA as well as that of the CA and OFCA have enabled IPv6 access since February 2010 and April 2012 respectively and they were awarded the "IPv6 Enabled web site Logo" by the IPv6 Forum.

Recent Development of Broadband Infrastructure in Mainland China and Other Overseas Economies

Mainland China

13. China has the world's biggest broadband market. The Ministry of Industry and Information Technology (MIIT) formulated the national broadband development plan, which formed part of China's "12th Five-Year Plan (2011-15)". It aimed to raise the country's average wireline broadband speed to 20 Mbps in urban areas and 4 Mbps in rural areas by the end of 2015 and to improve broadband coverage over the next five years.

14. According to "The 30th Survey Report"⁶ published by China Internet Network Information Centre (CNNIC)⁷ in September 2012, there were a total of 538 million individual Internet users, equivalent to an Internet population penetration rate of 39.9%, by the end of June 2012. The figure provided by the MIIT showed that there were approximately 174 million subscribers⁸ to broadband Internet services in China by the end November of 2012. On 31 December 2012, the MIIT promulgated a new government policy that with effect from 1 April 2013, all newly built residences have to be equipped with fibre network connections if a

⁶ "The 30th Survey Report" is available at http://www1.cnnic.cn/IDR/ReportDownloads/201209/t20120928_36586.htm.

⁷ CNNIC is the administrative agency responsible for Internet affairs under the MIIT of the People's Republic of China.

⁸ The figure provided by MIIT is available at <http://www.miit.gov.cn/n11293472/n11293832/n11294132/n12858447/15074245.html>.

public fibre optic telecommunications network is available there. The policy also requires new residences to offer equal connections to services from various telecommunications companies, allowing customers to choose which service providers they want. New residences and buildings shall be built together with the communications facilities including underground ducts, telecommunications rooms, equipment rooms etc.⁹

15. China Telecom and China Unicom dominate the retail broadband Internet market with a total market share of 95% in 2011. Both China Telecom and China Unicom are committed to increasing fixed broadband network investment over the next three to five years. Early in 2011, China Telecom launched a programme known as “Broadband China, Fibre Cities”, which aimed to build new fibre networks and upgrade existing xDSL network to offer high-speed Internet access across major cities. At the end of 2011, China Telecom announced that its FTTH/FTTB network covered 70% of urban areas in 21 provinces in southern China with 20 Mbps bandwidth access. The company planned to invest RMB150 billion from 2011 to 2015 to reach 100 million household with 100 Mbps FTTH/FTTB access. China Unicom also started its own FTTH/FTTB construction programme, and invested approximately RMB50 billion in its fixed broadband network in 2012. China Mobile (CM) has not been awarded a fixed licence but it has been working with cable operators and its subsidiary company, China Railcom, to offer broadband services in some provinces.

16. On mobile broadband, according to the press release¹⁰ issued by CM on 26 February 2013, TD-LTE trial networks had been set up in 15 Chinese cities in 2012. By 2013, trial networks would be expanded to cover 100 Chinese cities. CM is carrying out trials using radio spectrum in the 1880 - 1900 MHz band and 2575 - 2615 MHz band for outdoor, and 2320 - 2370 MHz band for indoor applications.¹¹ MIIT is also considering other bands for LTE services, including the 700 MHz and 3.5 GHz bands.

⁹ The official press release by the MIIT in Chinese on 31 December 2012 is available at <http://www.miit.gov.cn/n11293472/n11293832/n11293907/n11368223/15101432.html>.

¹⁰ The press release in Chinese is available at http://www.10086.cn/aboutus/news/GroupNews/201302/t20130226_41955.htm.

¹¹ See <http://www.chinamobileltd.com/en/business/networks.php>.

United States (US)

17. Federal Communications Commission (FCC), the independent communications regulatory agency of the US government, enacted the “National Broadband Plan (NBP)”¹² in March 2010 with a view to enabling at least 100 million US homes to have affordable access to Internet speeds of 100 Mbps by 2020. NBP is a detailed plan for achieving affordability and maximizing use of broadband to advance “consumer welfare, civic participation, public safety and homeland security, community development, health care delivery, energy independence and efficiency, education, employee training, private sector investment, entrepreneurial activity, job creation and economic growth, and other national purposes.” Recognising broadband as critical infrastructure, some US cities, such as Portland, have devised their own broadband strategic plans with a view to positively affecting how broadband infrastructure and service is likely to develop in the city. Various funds have been established to finance the implementation of the NBP. The new “Connect America Fund” (CAF) was established in April 2012 by revamping the Universal Service Fund in order to assist in bringing high-speed Internet access to millions of un-served people in the rural areas. A Mobility Fund was also established by the US government in October 2012 to subsidize the rollout of mobile broadband infrastructure by operators in areas currently underserved. The fund awarded US\$300 million in one-off support in 2012 and US\$500 million per year in ongoing support.

18. In the private sector, AT&T announced “Project Velocity IP Plan”¹³ in November 2012 to invest US\$14 billion during the next three years to significantly expand wireless and wireline Broadband Networks and to support future IP data growth and new services. The plan is targeted at the expansion of 4G LTE wireless service to 300 million people by 2014, an expansion that targets 50 million more people than the firm’s existing 2013 goal. The investment also includes expansion of

¹² The information of US’s National Broadband Plan is available at <http://www.broadband.gov>.

¹³ The press release is available at <http://www.att.com/gen/press-room?pid=23506&cdvn=news&newsarticleid=35661>.

AT&T's high-speed U-verse platform¹⁴, increasing access speeds of DSL to 75 Mbps, approximately three times faster than what AT&T currently offers. In addition to the expansion on U-verse, AT&T plans to build out FTTB to 1 million locations.

19. In July 2011, the Institute of Electrical and Electronics Engineers (IEEE) published a new IEEE 802.22 standard for Wireless Regional Area Networks (WRANs).¹⁵ The new standard takes advantage of the favourable transmission characteristics of the VHF and UHF TV bands to provide broadband wireless access over a large area up to 100 km from the transmitter. Each WRAN will deliver up to 22 Mbps per channel without interfering with the reception of existing broadcast stations, using the white space between the occupied TV channels. Subsequent to FCC's approval of the related regulatory framework, an operator has launched a commercial white space broadband wireless network in VHF (54 – 216 MHz) and UHF (470 – 698 MHz) bands for video security surveillance applications and traffic surveillance in Wilmington, North Carolina in January 2012. A real time database was established storing the locations and emission characteristics of broadcasting transmitters. Master white space devices must first query the database that returns the frequencies they can use at its current location.

European Union (EU)

20. In May 2010, the European Commission (EC)¹⁶ launched the "Digital Agenda for Europe" (DAE)¹⁷, which required all Member States to devise and make operational by 2012 national broadband plans that would foster the deployment of Next Generation Access (NGA)

¹⁴ U-verse is an integrated IPTV, Voice and Internet service provided by AT&T, using a fiber-to-the-node (FTTN) or fiber-to-the-premises (FTTP) communications network.

¹⁵ The press release is available at <http://standards.ieee.org/news/2011/802.22.html>.

¹⁶ The EC is the executive body of the EU responsible for proposing legislation, implementing decisions, upholding the Union's treaties and day-to-day running of the EU. EU consists of 27 Member States.

¹⁷ The EC released a paper entitled "*Digital Agenda: Commission Outlines Action Plan to Boost Europe's prosperity and Well-being*" on 19 May 2010 in addressing the issue of increasing European's access to fast and ultra-fast Internet. Details are available at http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=5826.

networks¹⁸ and enable the EU to meet the broadband targets for Europe by 2020. Those targets are –

- (a) Basic broadband (512 kbps to 4 Mbps) for all by 2013;
- (b) Fast broadband by 2020: broadband coverage at 30 Mbps or more for 100% of EU citizens; and
- (c) Ultra-fast broadband by 2020: 50% of European households should have subscriptions above 100 Mbps.

21. In March 2012, the EC released the annual progress report on the implementation of the national broadband plans in the EU's 27 countries, along with Croatia, Norway and Switzerland. The measuring attributes of the national broadband plans includes NGA Speed, NGA Coverage and NGA target completion date. The report stated that 22 Member States have national broadband plans, with the remainder either in review or in the drafting process. The majority of Member States will support 100% basic broadband by 2013, with the exceptions of Bulgaria and Romania, which have set 2015 as their target date. 21 Member States have defined quantitative coverage for NGA with downstream speeds ranging from 25 Mbps (United Kingdom) to 1 Gbps (Luxembourg), and 8 of them have subscribed to full DAE targets. The report adds that EU would continue to take a technology neutral approach towards NGA, such that its does not specify a technology, rather leaving that to individual operators to determine the best possible solution based on various local factors.

22. The EU has been making endeavour to facilitate the development of broadband infrastructure by the Member States. In September 2011, the EU published the guide entitled "*Guide to broadband investment*"¹⁹, setting out best practice examples in planning investment of public funds in broadband infrastructures. On 15 February 2012, "Radio Spectrum Policy Programme" (RSPP)²⁰ was approved by European Parliament²¹.

¹⁸ NGA networks are (i) fibre-based access network, (ii) advanced upgraded cable networks, and (iii) advanced wireless access networks capable of delivering reliable high-speeds per subscriber, according to the guideline entitled "*EU Guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks*".

¹⁹ The guide is available at http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=7630.

²⁰ The storyboard of RSPP is available at <http://www.hlspectrumreview.com/tags/radio-spectrum-policy-programm/>.

²¹ The European Parliament is the directly elected parliamentary institution of the EU and has the legislative power.

The RSPP outlines at a strategic level how the use of radio spectrum can contribute to the objectives of the DAE. Recently, the EU announced “Create a new and stable broadband regulatory environment” as the first digital priority for 2013-2014. A package of actions in 2013 includes recommendations on stronger non-discriminatory network access and new costing methodology for wholesale access to broadband networks, net neutrality, universal service and mechanisms for costs of broadband roll-out.

United Kingdom (UK)

23. The UK telecommunications market was among the first liberalised in the world²² and is one of the most competitive markets in Europe nowadays. The Office of Communications (Ofcom) set out its priorities for 2012/13 in its annual plan, which included promoting competition and investment in the delivery of superfast broadband, and auctioning off the 800 MHz and 2.6 GHz spectrum bands.

24. Ofcom announced on 6 January 2011 that operators could begin refarming of their spectrum using 900 MHz and 1800MHz frequencies for 3G services. On 13 March 2012, Ofcom opened a consultation following Everything Everywhere Limited’s²³ application to use its existing 1800 MHz spectrum for 4G services. On 21 August 2012, Ofcom approved the said company to utilise its surplus capacity to launch 4G services within the UK.

25. In September 2009, Ofcom published a consultation document on proposals to streamline the spectrum trading process to make the spectrum market more dynamic and efficient. In December 2011, Ofcom issued a guideline titled “Trading Guidance Notes” to provide a guide to spectrum trading and Ofcom’s spectrum trading processes.²⁴

²² In 1984, British Telecom was privatised and the former regulator the Office of Telecommunications (OFTEL) was set up, which are the key milestones of the journey of telecommunications liberalisation in UK. Later, liberalisation spread globally.

²³ Everything Everywhere Limited (EE) is the largest mobile network operator in the UK. It operates under the EE, Orange and T-Mobile brands and currently only offers its services within the UK.

²⁴ See <http://stakeholders.ofcom.org.uk/spectrum/spectrum-trading>.

Until March 2013, there have been two applications for spectrum trades. The auction of the 800 MHz and 2.6 GHz spectrum bands took place in March 2013, with operators able to launch 4G services toward the end of 2013. Five licensees have won spectrum.²⁵

26. Broadband Delivery UK (BDUK), a unit established in December 2010 within the Department of Culture, Media, and Sport (DCMS) of Government of the UK, is responsible for managing the Government's broadband funding. It is intended to be a delivery vehicle for the government's policies on broadband, which aim to provide the UK with "the best superfast broadband network in Europe" by 2015²⁶. BDUK manages the spending of the £1 billion "Next-Generation Fund", and aims to deliver next generation broadband to 90% of all UK premises by 2017. By August 2012, 99.98% of UK households were able to receive ADSL broadband services, while connections of 24 Mbps or faster were available to 58% of households.

Finland

27. The Finnish Government formulated in December 2008, a national broadband action plan for 2009 to 2015 called "Broadband 2015". One of the objectives of the national broadband strategy²⁷ is the provision of super-high-speed in 100 Mbps broadband access infrastructure available to all no further than two kilometres from fibre-optic or cable network by 2015. Consumers may at their own cost obtain the connection from a telecom operator providing subscription. Telecom operators will cover at least 34% of the costs, whereas the rest will be divided among the state, municipalities and the EU. As of the end of 2010, the Finnish Government has budgeted EUR\$66 million for the support over the period of 2009-2015. In addition, EUR\$ 24.6

²⁵ The auction result is available at <http://consumers.ofcom.org.uk/4g-auction>.

²⁶ Further information is available at <http://www.parliament.uk/business/committees/committees-a-z/lords-select/communications-committee/inquiries/parliament-2010/superfast-broadband1/>.

²⁷ Finland has become the first country in the world to make broadband a legal right for all its citizens, entitling them to a 1Mbps broadband connection now, with a 100 Mbps connection to become a right by the end of 2015.

million has been targeted to the project via EU's Rural Development Fund.²⁸

28. In October 2011, the Finnish Government formulated "Strategy 2020", which extends the strategy of development of broadband market to the year 2020 and enhances the use of fast broadband connection.²⁹ In particular, the Finnish Government aims at the introduction of new wireless technologies and improving spectrum efficiency during construction of fast broadband infrastructure.

29. Finland was among the first countries to deploy commercial mobile broadband making use of LTE technology in 2.6 GHz spectrum band, which was launched at the end of 2010. As the 800 MHz band (790 – 862 MHz) was not used for TV prior to the ASO, trial of mobile broadband was conducted in late 2011 by transferring frequencies bands from TV to mobile broadband use. Licences for the 800 MHz mobile networks were auctioned in January 2013 and it is expected that 99% of population will be served in five years.

Sweden

30. The government of Sweden published in November 2009 a national strategy for broadband development titled Broadband Strategy for Sweden (BSS).³⁰ According to the BSS, to meet the challenges in the shape of increased globalisation, climate change and an ageing population in a scarcely populated country, it is essential to have access to high-speed broadband throughout the country. The overall objective is to have world-class broadband. The specified goal is to enable 40% of all households and businesses having access to broadband at a minimum speed of 100 Mbps by 2015, and 90% at the same minimum speed by 2020. The approach is that the market players will be responsible for the investments in infrastructure, while the government task is to create

²⁸ The detail is available at the page 24 at http://www.mmm.fi/attachments/maaseutu/maaseudunkehittamisohjelmat/ohjelmatkaudelle20072013/5jIWPIU4F/strategy_13102009.pdf.

²⁹ The details of the strategy are available at http://www.ficora.fi/attachments/englantiav/strategy/65Po2mOrO/Vivin_strategia_2020_EN.pdf.

³⁰ See <http://www.government.se/content/1/c6/13/49/80/112394be.pdf>

well functioning markets and foster good business conditions for market players through suitable regulation.

31. According to the BSS, the goal of enabling 40% of all households and businesses having access to broadband at a minimum speed of 100 Mbps by 2015 would primarily depend on future investments in the fixed networks by upgrades of cable networks and deployment of fibre-LANs. The goal of enabling a predominant proportion accessing at a minimum speed of 100 Mbps by 2020 would be based on market investments being made in both fixed networks (fibre-based networks and cable networks) and in wireless networks. Deployment of the wireless networks with new technologies would be crucial in achieving the access to broadband indicated by the target. The use of frequency bands such as 800 MHz and 2.6 GHz would be promoted to enable the wireless networks to deliver higher speeds.

32. The principal role of the government of Sweden is to make the market work efficiently and to provide the market players with good conditions in which to operate. To promote local investments in infrastructure, the BSS included major initiatives as follows –

- (a) Home improvement tax allowance for connection of broadband cable;
- (b) Support for broadband deployment in the rural development programme;
- (c) Increased access to broadband through spectrum allocation;
- (d) Broadband forum for collaboration between private-sector and public-sector players; and
- (e) Monitoring the development of access to broadband.

33. Sweden's Post & Telecom Agency (PTS) has established the rural broadband fund to enable homes and businesses in rural areas to subscribe to high speed fibre access services. In 2012, PTS granted SEK80 million (US\$ 12.25 million) for the fund. In December 2012, PTS announced that grants totalling SEK160 million (US\$ 24.5 million) are available in 2013 for rural fibre broadband network services.³¹

³¹ See

<http://www.telegeography.com/products/commsupdate/articles/2012/12/21/pts-offers-usd24-5m-rur>

34. In mobile broadband, following the world-first launch of LTE service by TeliaSonera in December 2009, three mobile operators launched LTE service in November 2010. Sweden's target of enabling 40% of households and businesses with access to 100 Mbps broadband by 2015 was already achieved by March 2011³², with 44% of households and businesses already served.

Japan

35. In March 2011, Japan suffered the most powerful earthquake in its history, measuring 9.0 on the Richter scale. From the telecommunications perspective, damage from the earthquake and subsequent tsunami saw NTT East³³ losing service for up to 500,000 of its FTTH broadband connections. In order to help prompt recovery after the earthquake, the Ministry of Internal Affairs and Communications (MIC)³⁴ has established the "Project Promoting Computerisation in Disaster Region" to provide partial subsidization to costs required for projects for the use of Information and Communications Technology (ICT) in the disaster regions. In particular, projects for re-development of broadband infrastructure in disaster region were subsidised.

36. In April 2011, the MIC set up a task force to analyse issues relating to securing communication methods in the event of major natural disasters. In December 2011, the task force published a report which focused on the following issues –

- (a) How to address congestion of communications infrastructure in case of emergency;
- (b) How to secure communications methods if base stations and relay stations are damaged;

[al-fibre-broadband-grants-in-2013](#)

³² See

<http://www.telegeography.com/products/commsupdate/articles/2013/01/16/utility-transport-companies-fibre-network-capacity-to-be-made-available-this-year>.

³³ NTT East, subsidiary of Nippon Telegraph and Telephone Corporation (NTT Group), mainly provides a variety of telecommunications services, such as fixed-line telephone and broadband services in eastern Japan.

³⁴ The MIC is the Japanese national regulatory authority responsible for the regulatory supervision and policy-making functions of the Japanese telecoms industry.

- (c) The future of network infrastructure based on experience of this disaster; and
- (d) The utilisation of the Internet based on experiences of this disaster.

37. In July 2009, the MIC launched “i-Japan Strategy 2015”³⁵ with the vision to fully roll out 1 Gbps for fixed broadband and 100 Mbps for mobile broadband by 2015 to allow everyone to easily obtain and exchange information from anywhere at any time. To implement this strategy, various initiatives have been taken, including building optical fibre broadband connections to all premises, construction of optical fibre infrastructure for quality and reliability mobile access, and adoption of the IPv6 protocol. In August 2010, the MIC further formulated the “Path of Light Strategy”. To promote broadband services and ICT utilization, it offered financial support for municipalities to develop broadband facility for ICT in areas such as medical care, education, and administration. The MIC also conducted a review of the regulatory framework for fair competition and realignment of frequency for wireless broadband. In the mobile market, Japanese mobile operator Softbank Mobile launched the first TD-LTE network in Asia in February 2012 and targeted to reach 92% of the population by 2013.

South Korea

38. The Korea Communications Commission announced in 2006 the U-Korea Master Plan in two phases: Establishment Phase 2006-2010 and Stabilisation Phase 2011-2015. The establishment phase aims to build a ubiquitous social infrastructure by 2010 through improving network technologies and consolidating relevant legal systems. The stabilisation phase aims to build upon the completed infrastructure to provide ubiquitous services across all social sectors by 2015.

39. In the second phase of the U-Korea Master Plan, the major initiative is to deploy an Ultra Broadband Convergence Network (UBCN) which aims at providing up to 1 Gbps wireline Internet services to

³⁵ See http://www.kantei.go.jp/foreign/policy/it/i-JapanStrategy2015_summary.pdf.

subscribers with ultra broadband technologies by 2013. The backbone segment of the UBCN has a speed of 40 – 400 Gbps and the metro segment has a speed of 10 – 100 Gbps. The fund includes contributions from both the government and the private sector, through spectrum licensing fees, revenue-based contributions from operators and earnings from the operation of the fund, including loans.³⁶

40. In mobile broadband market, SK telecom and LG Uplus launched LTE service in the frequency band 800 MHz in 2011. KTF Corp also launched LTE service in the frequency band 1800 MHz in January 2012. SK telecom has planned to launch the LTE Advanced³⁷ service in 2013 at maximum downlink speeds of 100 Mbps in the wide area with high mobility and 1 Gbps in low-mobility scenarios.

Australia

41. The Australian government announced in early 2009 that it would invest A\$43 billion for eight years to build and operate a National Broadband Network (NBN).³⁸ NBN is comprised of three technologies – optic fibre, fixed wireless and satellite. Outlined by the three year rollout plan released on 29 March 2012 through June 2015, NBN targets to ultimately cover 3.5 million premises, 93% of which will have access to the NBN through optic fibre at the speed of up to 1 Gbps and 7% of which will have access through next-generation fixed wireless and satellite technology providing peak speeds of 12 Mbps. On 8 August 2012, NBN Co's Corporate Plan 2012-15 confirmed the total capital expenditure for the project is estimated to be A\$37.4 billion, less than the government's original A\$43 billion estimate. The government expects to contribute A\$30.4 billion in equity for the rollout.

³⁶ See <http://unpan1.un.org/intradoc/groups/public/documents/ungc/unpan047290.pdf>.

³⁷ LTE Advanced is the next-generation version of LTE from the 3GPP and is the official technology name of LTE Release 10 and beyond.

³⁸ In 2009, the Australian government established NBN Co Limited (NBN Co) to build and operate NBN. NBN Co will remain in full government ownership until the network is built and fully operational. Future privatisation of NBN Co will be subject to the decision of the Australian Parliament.

42. On 1 July 2011, NBN Co launched the NBN Interim Satellite Service (ISS), providing eligible rural and regional Australians with immediate access to better broadband services to assist the transition from the former “Australian Broadband Guarantee” (ABG)³⁹ program to the long term NBN satellite service. This interim service offers users the peak download speeds of 6 Mbps. The interim service is scheduled to run until 2015 when NBN Co will deploy two next-generation high-capacity satellites and associated tracking, telemetry and control systems. The new satellites will provide services at the speeds of 25 Mbps download and 5 Mbps upload in rural and remote areas.⁴⁰ As of October 2012, there are more than 17,900 users connected via ISS.

43. The Australian government also invested A\$250 million in the “Regional Backbone Blackspots Program” (RBBP)⁴¹ to improve the supply of backbone transmission links to regional centres where there is a lack of competitive backbone infrastructure. RBBP aimed to address backbone blackspots throughout regional Australia. In December 2011, the entire network construction has been completed and the RBBP has now delivered over 6,000 kilometres of fibre backbone across regional Australia, benefiting around 400,000 people and more than 100 regional locations. Remarkably, the RBBP formed part of the building blocks for the NBN in regional Australia.

44. In May 2011, the Australian government launched the “National Digital Economy Strategy”, setting out a vision for Australia to realise the benefits of the NBN and position Australia as a leading digital economy by 2020. To measure the progress in realising the vision by 2020, the Australian Government has set “Digital Economy Goals” (DEG). Major goals are listed below –

³⁹ In 2007, the Australian Government introduced the ABG program, which enables any standard household to purchase satellite service at an affordable price for a peak data speed of at least 512/128 kbps. ABG program ended on 30 June 2011.

⁴⁰ The latest development is available at <http://www.nbn.gov.au/2013/03/04/nbn-satellite-launch-contract-signed>.

⁴¹ The information is available at http://www.dbcde.gov.au/funding_and_programs/national_broadband_network/national_broadband_network_Regional_Backbone_Blackspots_Program.

- (a) Australia ranks in the top five Organisation for Economic Co-operation and Development (OECD) countries in the portion of households that connect to broadband at home;
- (b) Australia ranks in the top five OECD countries in relation to the percentage of businesses, and not for profit organisations, using online opportunities to drive productivity improvements, expand their customer base and enable jobs growth; and
- (c) The majority of Australian households, businesses and other organisations will have access to smart technology to better manage their energy use.

45. To advance the DEG, the Australian government undertakes a number of major initiatives –

- (a) Digital Hub is established in the communities with the investment of A\$23.8 million over three years to allow local residents to experience the NBN and receive training to develop the digital skill;
- (b) The Australian government provides A\$10.4 million over four years from July 2011 to promote “Broadband for Seniors” programme to ensure older Australians have the skills to participate in digital economy; and
- (c) “Digital Enterprise” initiative provides A\$12.4 million over three years to provide advice and support services to small and medium enterprises and not-for-profit organisations.

46. Nevertheless, the NBN project remains vulnerable to political change. The opposition parties are opposed to the current approach and using public investment to build the NBN. Instead, an approach based more on wireless technologies and a mix of fixed technologies over existing copper and cable infrastructure is to be preferred. The national election due in September 2013 introduces significant uncertainty to the whole plan. If the political landscape in Australia changes, it may result in a large scale modification or contraction in the scale of the deployment of the NBN.

New Zealand

47. The New Zealand government has put in place two initiatives to improve broadband infrastructure in September 2009 - the “Ultra-Fast Broadband Initiative”⁴² in urban areas and the “Rural Broadband Initiative” (RBI) in rural areas. Together, the new broadband programmes will bring faster broadband to 97.8% of population.

48. Crown Fibre Holdings Limited (CFH) was established by the New Zealand government in October 2009. CFH leads the rollout of Ultra-Fast Broadband (UFB) to 75% of population by 2019 and manages the NZ\$1.5 billion investment⁴³ in UFB infrastructure with responsibility for running tender processes for the selection of private investment partners. The fibre footprint known as the FTTP network with speeds at least 100 Mbps was divided into 33 areas⁴⁴ to be separately tendered. The final tender results were announced in May 2011, with Chorus Limited⁴⁵ winning 24 of the 33 areas. The remaining areas were won by Local Fibre Companies, which are the joint venture companies between CFH on behalf of the government and other partners. In August 2012, the government announced that progress of UFB exceeded the target of year one where UFB deployment has started in 24 areas. In November 2012, 16 months after the project started, the government reported that a good progress continued to be made. UFB rollout have commenced in 32 areas throughout New Zealand. More than 100,000 end users in urban areas are able to connect to the UFB network.

49. The New Zealand government has a separate RBI which aims to improve broadband services in rural areas, which comprise of the 25% of the market outside the footprint of the UFB programme. In February 2011, this NZ\$300 million project had led to two contracts, one with

⁴² See

<http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/ultra-fast-broadband-initiative>.

⁴³ The New Zealand government contributed NZ\$1.35 billion to the initiative with further investment by the government’s UFB partners.

⁴⁴ The UFB tenders specified UFB would target the 75% of New Zealand’s population living in the largest 33 towns and cities, based on projections for their population for 2021. This is approximately the end of the UFB deployment period.

⁴⁵ Chorus Limited is a provider of telecommunications infrastructure throughout New Zealand, formerly the network arm of Telecom New Zealand. The company was spun off from Telecom New Zealand in 2011.

Chorus to deploy fibre to regional and rural schools, and another with Vodafone to build a number of new mobile towers to enable improved mobile broadband services. Pursuant to the last updated figures released by the New Zealand government on 27 April 2012, it will deliver mobile broadband peak speeds of at least 5 Mbps to 86% of rural homes and businesses and at least 100 Mbps to 95% of rural schools.

Singapore

50. Intelligent Nation 2015 (iN2015) is the master plan of Info-communications Development Authority of Singapore (IDA) to transform Singapore into an intelligent nation and global city. Singapore's nationwide all-fibre network, the "Next Generation Nationwide Broadband Network" (Next Gen NBN)⁴⁶ is a project under iN2015. Singapore's government committed to invest up to S\$ 1 billion (US\$ 800 million) to develop Next Gen NBN. Next Gen NBN comprises three distinct industry layers –

- (a) The Network Company (NetCo), which operates at the first layer, is responsible for the design, build and operation of the passive infrastructure, which includes the dark-fibre network and ducts;
- (b) The Operating Company (OpCo), which operates at the second layer, will provide wholesale network services over the active infrastructure, comprising switches and transmission equipment; and
- (c) The Retail Service Providers (RSPs), which form the third layer, will offer services over the Next Gen NBN to end-users, including businesses and consumers.

51. The structurally separated model adopted by Singapore is designed to sidestep the potential competition problems caused by monopoly ownership of the access network. Both NetCo and OpCo bidders were required to produce and comply with an Interconnection

⁴⁶ The relevant information is available at http://www.itu.int/wsis/stocktaking/docs/activities/1291981845/Towards%20a%20Next%20Generation%20Connected%20Nation_Singapore.pdf and <http://www.ida.gov.sg/Infocomm%20Landscape/Infrastructure/Wired>.

Offer (ICO) which will be enforced by the iDA. The access network is required to reach at least 60% of business premises and households by 2010, and 95% by 2012. NetCo has to shoulder universal service obligations starting from January 2013.

52. Nucleus Connect launched commercial services in August 2010, offering full fibre services to homes and businesses in Singapore. Since launch, over 18 RSPs offer a wide range of broadband services and applications to consumers, enterprises and Government agencies. As of August 2012, NBN subscribers reached 200,000, and the current demand is 10,000 new connections per month.

53. Singapore is at the early stages of transitioning to 4G mobile services. As of September 2012, the three mobile operators in Singapore (SingTel Mobile, M1 and StarHub Mobile) have all deployed LTE services. Currently, M1 has deployed nationwide (95% coverage) services while SingTel Mobile and StarHub Mobile have deployed more limited services and are progressively expanding their coverage. In April 2012, recognising the growing need for radio spectrum by mobile operators, iDA conducted a public consultation on the framework for the proposed allocation of spectrum in the 1800 MHz, 2.3 GHz and 2.5 GHz bands for 4G services with a view to finalising the allocation framework and conducting the allocation exercise in 2013. On 16 January 2013, iDA announced that it has decided to allocate the new spectrum rights in the 1800 MHz and 2.5 GHz band for 4G telecommunication systems and services via auction, and 2.3 GHz band would be reserved.⁴⁷

Israel

54. In Israel, the household penetration of fixed broadband services (DSL and cable combined) reaches 80%. The incumbent major market

⁴⁷ Further detail is available at <http://www.ida.gov.sg/Policies-and-Regulations/Consultation-Papers-and-Decisions/Store/Public-Consultation-on-proposed-framework-for-the-reallocation-of-spectrum-for-4G-telecommunication-systems-and-services.aspx>.

players are Bezeq⁴⁸ and HOT Telecommunication Systems⁴⁹. Although Israel is a leading country in Passive Optical Network (PON) technologies, the fibre-to-the-x (FTTx)⁵⁰ household penetration is less than 1% as of July 2011.

55. In early 2012, the Israel's communication regulator Ministry of Communications (MOC) granted a licence to Israel Electric Corporation (IEC) to build a fibre-based communications network throughout Israel, taking advantage of its existing electricity cables alongside of which fibre-optic cable can reside without causing interference. Approximately 65% of the population is expected to be able to access the internet speeds of 100 Mbps by 2018, with the remainder of the country receiving coverage by 2020.

56. In May 2012, the MOC enforced a new legislation requiring both Bezeq and HOT Telecommunication Systems to offer wholesales services to alternative operators to utilize their network to offer communications services ranging from Internet to TV. According to the Israeli minister of communications, market forces are allowed to decide the pricing agreements for wholesales access. Unless operators fail to reach a deal over prices, the MOC will not exercise its power to intervene. In August 2012, Bezeq announced that it has confirmed to deploy FTTH for all domestic customers over the next five to eight years. It is understood that Bezeq will connect residential consumers in apartment blocks to the new infrastructure, extending cabling to individual apartments as required.

57. Before 2011, there were three incumbent mobile operators⁵¹ providing 2G and 3G mobile services and attaining similar market shares, and thus the competition was weak. In 2011, the mobile market landscape was significantly changed with the entry of two new players, Hot Mobile (Mirs) and Golan Telecom, which won the tender for new

⁴⁸ Bezeq is Israel's largest and leading telecommunications group. The companies that make up the Bezeq Group offer the full range of telecom services – domestic and international, fixed and mobile, Internet, and transmission.

⁴⁹ HOT Telecommunication Systems is a company that provides cable television, last-mile Internet access, broadband and telecommunication services in Israel.

⁵⁰ Fiber-to-the-x (FTTx) is a generic term for any broadband network architecture using optical fiber to replace all or part of the traditional metal local loop used for last-mile telecommunications.

⁵¹ The three incumbent mobile operators are Pelephone, CellCom and Partner.

frequency bands for 3G services. To encourage competition in the private customer sector, the companies who won the tender could receive up to a full refund of the licences fees they undertook to pay under their bid offers. To entitle for the refund, the companies have to comply with the tender conditions and with the guarantee refund terms, among other things by reaching at least 7% of the private subscriber market within 5 years from the grant of the licence in terms of total number of subscribers, minutes and revenues⁵². For every 1%, the licensees will get one seventh of their licence fees back.⁵³

58. According to an annual report⁵⁴ entitled *Telecommunications in Israel 2012* published by the MoC, as of December 2012, there were nine mobile virtual network operators, three of which are already operating. Israel's mobile market has grown enough to ensure sufficient competition in the industry, resulting in substantially lower prices. The minister of communications indicated that the government is examining the licensing process for 4G services with a view to allowing operators to begin planning and establishing networks before the end of 2013.

United Nations

59. In May 2010, the ITU and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) announced the establishment of a top-level Broadband Commission for Digital Development (BCDD). Its purpose is to promote the deployment of high-speed, high-capacity broadband connections to the Internet as an essential part of modern infrastructure, and to define strategies for broadband rollout and applications. In October 2011, the BCDD has agreed on a set of four ambitious but achievable new targets that countries around the world should strive to meet in order to ensure their

⁵² The figure of 7% has to be seen in the proper context. As an existing cellular operator, Mirs has only a small market share of about 4%-5%. For this operator, the 7% market share requirement does not include the market share it already has. In other words, for Mirs, only new private subscribers of the company will be counted towards the refund.

⁵³ See http://www.moc.gov.il/sip_storage/FILES/9/2529.pdf and http://www.moc.gov.il/sip_storage/FILES/3/3153.pdf.

⁵⁴ The annual report is available at http://www.moc.gov.il/sip_storage/FILES/5/605.pdf

populations fully participate in tomorrow's emerging knowledge societies. The new targets cover broadband policy, affordability and uptake –

- (a) Making broadband policy universal. By 2015, all countries should have a national broadband plan or strategy or include broadband in their Universal Access / Service Definitions;
- (b) Making broadband affordable. By 2015, entry-level broadband services should be made affordable in developing countries through adequate regulation and market forces (for example, amount to less than 5% of average monthly income);
- (c) Connecting homes to broadband. By 2015, 40% of households in developing countries should have Internet access; and
- (d) Getting people online. By 2015, Internet user penetration should reach 60% worldwide, 50% in developing countries and 15% in Least Developed Countries (LDCs).

60. On 23 September 2012, BCDD has released its first-ever country-by-country snapshot of the state of broadband deployment worldwide. The report entitled “*The State of Broadband 2012: Achieving Digital Inclusion for All*”⁵⁵ evaluates the roll-out of broadband around the world and tracks progress towards achieving the four advocacy targets set by the Commission in 2011 for boosting broadband affordability and uptake. It provides country rankings across up to 177 economies based on economic impact, penetration, national broadband policy, and connecting people and dwellings, and offers recommendations and options for policy-makers to maximize the impact of broadband, to roll out the deployment of broadband networks and services and to position their country for future competitiveness in the growing digital economy. Hong Kong, China ranks 4th out of 127 economies in Percentage of Households with Internet (Developing Countries), and ranks 6th out of 132 economies in Percentage of Individuals using the Internet (Developing Countries).

61. Key attributes of the national broadband strategies / development of overseas economies are summarised in the **Annex**.

⁵⁵ The report is available at <http://www.broadbandcommission.org/Documents/bb-annualreport2012.pdf>.

Views Sought

62. Members are welcome to share the most up-to-date information on the broadband infrastructure development in other economies of which they have knowledge.

**Office of the Communications Authority
April 2013**

National Broadband Strategies / Development of Overseas Economies

Economy	Key Attributes of National Broadband Plan / 4G Development
Mainland China	<p><u>Part of the 12th Five-Year Plan(2011-15)</u></p> <ul style="list-style-type: none"> ■ Raise the country's average wireline broadband speed to 20 Mbps in urban areas and 4 Mbps in rural areas by the end of 2015 ■ All newly built residences should be equipped with fibre connections with effect from April 2013 <p><u>4G Trials</u></p> <ul style="list-style-type: none"> ■ TD-LTE trial networks had been set up in 15 Chinese cities in 2012 and would be expanded to cover 100 Chinese cities by 2013
United States	<p><u>National Broadband Plan (NBP)</u></p> <ul style="list-style-type: none"> ■ 100 Mbps to reach at least 100 million homes by 2020 <p><u>Operator's Plan on 4G</u></p> <ul style="list-style-type: none"> ■ An operator has planned for 4G LTE network expansion to cover 300 million people by end 2014
European Union (EU)	<p><u>Digital Agenda for Europe (DAE)</u></p> <ul style="list-style-type: none"> ■ Basic broadband (512 kbps to 4 Mbps) for all by 2013 ■ Fast broadband by 2020: broadband coverage at 30 Mbps or more for 100% of European Union citizens ■ Ultra-fast broadband by 2020: 50% of European households should have subscriptions above 100 Mbps

United Kingdom	<p><u>National Broadband Plan</u></p> <ul style="list-style-type: none"> ■ 90% coverage of next generation broadband for homes and businesses at speeds of 40 Mbps or more by 2017 <p><u>Auction</u></p> <ul style="list-style-type: none"> ■ Auction of the 800 MHz and 2.6 GHz bands for 4 G services took place in March 2013
Finland	<p><u>Broadband 2015</u></p> <ul style="list-style-type: none"> ■ Provision of high-speed in 100Mbps broadband access infrastructure available to all no further than two kilometres from the fibre-optic or cable network by 2015 ■ Licences for the 800 MHz mobile networks are auctioned in January 2013 and it is expected that 99% of population will be served in five years <p><u>Strategy 2020</u></p> <ul style="list-style-type: none"> ■ Extend the Broadband 2015 strategy to 2020 and enhance the use of fast broadband connection at 100 Mbps
Sweden	<p><u>Broadband Strategy for Sweden</u></p> <ul style="list-style-type: none"> ■ 40% of all households and businesses have access to broadband at a minimum speed of 100 Mbps by 2015 ■ 90% of all households and businesses at a minimum speed of 100 Mbps by 2020
Japan	<p><u>i-Japan Strategy 2015</u></p> <ul style="list-style-type: none"> ■ 1 Gbps fixed broadband for all by 2015 ■ 100 Mbps mobile broadband for all by 2015
South Korea	<p><u>U-Korea Master Plan</u></p> <ul style="list-style-type: none"> ■ Ultra Broadband Convergence Network at 1 Gbps wireline Internet services to subscribers by 2013. ■ Backbone segment at a speed of 40 – 400 Gbps and the metro segment at a speed of 10 – 100 Gbps <p><u>Operator’s Plan on 4G</u></p> <ul style="list-style-type: none"> ■ An operator has planned to launch LTE Advanced service in 2013 with a maximum speed of 1 Gbps
Australia	<p><u>National Broadband Network Roll-out Plan</u></p> <ul style="list-style-type: none"> ■ Up to 1 Gbps for 93% of homes, schools and business through fibre cables ■ Peak speed of 12 Mbps for the remaining 7% by wireless or satellite

New Zealand	<p><u>Ultra-fast broadband Initiative (UFB)</u></p> <ul style="list-style-type: none"> ■ Rollout FTTP network with at least 100 Mbps to 75% of population by 2019 <p><u>Rural Broadband Initiative</u></p> <ul style="list-style-type: none"> ■ Deliver mobile broadband with peak speeds of at least 5 Mbps to 86% of rural homes and businesses ■ Fibre connections of at least 100 Mbps to 95% rural schools
Singapore	<p><u>Next Gen NBN, Intelligent Nation 2015</u></p> <ul style="list-style-type: none"> ■ Up to 1 Gbps high speed connection to 95% business premises and households by 2012 ■ Universal broadband service obligation from 1 January 2013 <p><u>Auction</u></p> <ul style="list-style-type: none"> ■ iDA decided in January 2013 to allocate 1800 MHz and 2.5 GHz band for 4G systems and services via auction
Israel	<p><u>Plan for National Optical Fibre Broadband Network</u></p> <ul style="list-style-type: none"> ■ 65% population have access to the Internet at 100 Mbps by 2018, with full coverage by 2020 <p><u>4G Development</u></p> <ul style="list-style-type: none"> ■ Begin planning and establishing networks for 4G services before the end of 2013
United Nations	<p><u>Strategies defined by the Broadband Commission for Digital Development (BCDD)</u></p> <ul style="list-style-type: none"> ■ Universal broadband policy – All countries should have a national broadband plan or strategy or include broadband in their universal access/service definitions by 2015 ■ Entry-level broadband service made affordable in developing countries by 2015 ■ 40% of households in developing countries should have Internet access by 2015 ■ Internet user penetration should reach 60% worldwide, 50% in developing countries and 15% in Least Developed Countries by 2015

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