File Ref: CTB(CR) 9/1/9 (07) Pt. 24

LEGISLATIVE COUNCIL BRIEF

Implementation of Digital Terrestrial Television

PURPOSE

This paper informs Members of the Legislative Council of the progress of implementation of Digital Terrestrial Television (DTT) in Hong Kong with respect to the selection of transmission standard and other related issues.

BACKGROUND

2. DTT broadcasting, as compared with analogue broadcasting, brings major benefits in enhancing efficiency in utilising radio spectrum, a scarce public resource, and offers opportunities of new services including multi-channel broadcasting, standard definition television (SDTV)[1], high definition television (HDTV)[1], broadcasting with multi-viewing angles, interactive services, datacasting (e.g., financial quotes), etc. DTT broadcasting also resolves some reception problems including "ghosting" and "snowing". Most advanced economies such as the US, the UK and some other European countries, Japan, etc. have already launched DTT broadcasting, and some have also set a deadline for switching off analogue television broadcasting. The Netherlands switched off its analogue terrestrial television broadcasting in December 2006, whereas Sweden, Switzerland, Germany and Italy have switched off analogue broadcasting in some of their cities or regions.

[1] A picture on the television screen is formed by a large number of small dots called pixels. The higher the number of pixels, the better the resolution hence picture quality. Conventional analogue TV broadcasting provides a resolution of up to 720 (horizontal) × 576 (vertical) pixels, which is known as 576 lines.

Standard definition television (SDTV) broadcasting can be considered as the digitised version of the conventional analogue television broadcasting. However, SDTV pictures are free from reception problems including "ghosting" and "snowing", and thus have a picture quality similar to digital versatile disk (DVD)(typically having a resolution of 525 lines).

High definition television (HDTV) broadcasting, on the other hand, provides a picture resolution of at least 720 lines or up to 1080 lines and typically on a wide screen (with an aspect ratio, i.e., the ratio of picture width to height, of 16:9). Hence, HDTV provides a much better picture quality than analogue television and SDTV broadcasting and enables viewers at home to have the same experience as watching movies in a cinema.

3. Following two rounds of consultation in 2000 and 2003, the Secretary for Commerce, Industry and Technology (SCIT) announced the implementation framework for DTT broadcasting on 9 July 2004. The two domestic free television programmes service licensees, i.e., Asia Television Limited (ATV) and Television Broadcasts Limited (TVB), are required to launch DTT by 2007 and expand the digital coverage to at least 75% of Hong Kong by 2008. The two broadcasters are required to simulcast[2] their four existing analogue programme channels in digital format by sharing a newly assigned multiplex[3], and they are each assigned one additional multiplex for launching new services such as multiple SDTV channels, HDTV and interactive services, etc.

4. We issued a Legislative Council brief in March 2006 on the progress. The following highlights the latest development.

OVERALL PLANNING

5. With reference to overseas experience, the implementation of DTT broadcasting in Hong Kong can be broadly divided into the following three phases:

Phase 1 (2004 – 2008)	Realisation of DTT
Phase 2 (2009 – 2011)	Switchover to DTT
Phase 3 (2012 and beyond)	Analogue switch-off

6. We are now close to completion of Phase 1. The major tasks to accomplish in this phase include: securing the two licensees' commitments in rolling out the transmission network and services; choosing the appropriate technical standards; and promoting the DTT services and educating consumers within the community. The objective is to ensure that DTT services will be launched smoothly within this year and the digital coverage will be expanded to 75% within 2008.

[2] Simulcast means simultaneously broadcasting the same television programme services in both digital and analogue formats. It is a transitional arrangement during the migration from analogue to digital broadcasting. Simulcasting is necessary because it takes time for the network operator to roll out digital transmission network, and viewers to switch over to DTT services by buying necessary DTT receivers.

[3] A multiplex is a digital transmission frequency channel which combines television programme materials and other data in digital form for transmission via a frequency channel. The process of digital combination of the signals is called multiplexing.

TRANSMISSION NETWORK AND SERVICE ROLLOUT

7. The Telecommunications Authority (TA) and Broadcasting Authority (BA) earlier approved ATV and TVB's plans for rolling out their DTT network and services. Concerning the network rollout, ATV and TVB have already committed to providing a digital coverage comparable to the existing analogue one by 2011, with a view to meeting the target of analogue switch-off by 2012 the earliest set by the Government. To achieve this, ATV and TVB are building their transmission network in stages and will first construct a total of six main transmission stations to cover at least 75% of Hong Kong. According to the current schedule, the Temple Hill principal transmission station, which can serve up to 50% of Hong Kong in the south of Kowloon and north of the Hong Kong Island, will be ready by the fourth quarter of 2007. The construction of the remaining five main stations in other areas to cover another 25% of Hong Kong will be completed by 2008.

8. As for new DTT services, on top of the simulcast of existing four analogue programme channels in the shared multiplex, ATV will focus on multi-channel broadcasting by providing four SDTV channels for most of the time[4] on the additional multiplex assigned to it, whereas TVB will launch one enhanced Jade channel with over 80% HDTV content together with some programmes in new formats, e.g., programmes with multiple viewing angles.

CHOICE OF TECHNICAL STANDARDS

9. Implementation of DTT involves adoption of a new technical standard in Hong Kong for the transmission and reception of the new DTT services. According to the Telecommunications Ordinance (Cap. 106) and ATV and TVB's carrier licences issued under this Ordinance, the TA is the approving authority for DTT technical standards, including the transmission standard as well as the technical specifications to be adopted by the broadcasters.

(A) National Standard for Transmission

10. When we consulted the public and the industry on DTT policy in 2000 and 2003, ATV and TVB indicated that they preferred to wait for the

[4] ATV will provide 14 hours of HDTV content per week. The broadcast of the four SDTV channels will cease during these HDTV broadcasting hours.

promulgation of the national standard being developed by the Mainland, but they would choose the European Digital Video Broadcasting-Terrestrial (DVB-T) standard if the Mainland authorities had not announced the national standard by end 2006.

11. In August 2006, the Mainland authorities announced the national standard[5] for all Mainland terrestrial television stations which broadcast in digital format with effect from 1 August 2007. Subsequently, ATV and TVB had conducted comprehensive tests of the standard, including laboratory tests in Beijing and field trials in Hong Kong. ATV and TVB confirmed that the national standard meets their technical requirements and is suitable for application in Hong Kong. In end 2006, they formally submitted their proposals to the TA that Hong Kong should adopt the national standard.

(B) Compression and Coding Standards

12. DTT programmes have to be compressed and coded before transmission. Irrespective of the choice of transmission standard referred to in paragraphs 10-11 above, the broadcasters also need to choose which compression and coding technology to be adopted among the various technologies available on the market.

13. In April 2007, ATV and TVB submitted their proposals to the TA to adopt the commonly-used MPEG-2[6] compression and coding standard in respect of the shared multiplex for simulcast. For new services to be provided by the additional multiplex, ATV opted for MPEG-2 whereas TVB

[5] The national standard announced by the Standardisation Administration of China (國家標準化管理委員會) is known as "GB20600-2006: Framing Structure, Channel Coding and Modulation for DTT Broadcasting System". This standard would be officially implemented on 1 August 2007, one year before the 2008 Beijing Olympic Games. Broadcasters in the Mainland who are offering DTT services based on other transmission standards must switch to the national standard by this deadline. It is however not mandatory for broadcasters in the Hong Kong Special Administrative Region to adopt this standard.

[6] MPEG-2, the second set of standards for video compression and coding developed by an industry body Motion Pictures Expert Group (MPEG), is an international standard for the generic coding of moving pictures and associated audio information. It is widely used around the world to specify the format of the digital television signals that are broadcast by terrestrial, cable and satellite television systems. Currently, all the pay television and satellite television services in Hong Kong are already digitised, and they are all compressed and coded in MPEG-2 standard.

H.264, also known as MPEG-4 Part 10, is the newer generation video compression and coding technology written by MPEG together with the International Telecommunication Union Telecommunication Standardisation Sector (ITU-T) Video Coding Experts Group. It can match the best possible MPEG-2 quality by only half of the data transmission rate.

opted for H.264 [6], also known as MPEG-4 Part 10 [6]. H.264 is a more advanced version of compression and coding standard, which is more spectrum efficient and would allow spare spectrum capacity for other new services such as mobile television and interactive services. However, as compared with MPEG-2, H.264 is a technical standard not yet widely adopted in the industry and is thus less well proven in large-scale adoption in overseas jurisdictions.

(C) Reception

14. Television sets currently available in the market, including the older cathode ray tube television sets and the newer plasma or LCD flat-panel television sets, are not capable of decoding DTT signals. Viewers will need a digital set-top box to be connected to their existing television sets, or an integrated digital TV set with a built-in digital decoder for receiving DTT. Such DTT receivers have to be purpose-built based on the above transmission standard and compression and coding technologies.

15. Based on ATV and TVB's proposed technical standards on compression, coding and transmission as well as their committed service rollout plans, there would be likely two different tiers of set-top boxes available in the market to coincide with the launch of DTT[7]:

(a) **Basic tier** – These set-top boxes would be capable of decoding and receiving only SDTV programmes coded in MPEG-2 format, i.e., the four programme channels simulcast by ATV and TVB and the four new SDTV channels (but not the HDTV content) provided by ATV; and

(b) **Higher tier** – These set-top boxes would be capable of decoding and receiving both SDTV and HDTV programmes coded in either MPEG-2 or H.264 formats. They can receive all services received by the basic tier set-top boxes, as well as all other programmes (e.g., HDTV) provided by ATV and TVB.

16. The basic tier set-top boxes would provide SDTV programmes with some improvement in reception quality, e.g., no ghosting and snowing, and also additional channels offered by ATV. On the other hand, the higher tier boxes would be capable of receiving both SDTV and HDTV programmes, the latter with much better picture quality. The higher tier

[7] Integrated TV sets would require more time for development than set-top boxes, and would most probably focus on decoding and displaying, similar to higher tier set-top boxes, both HDTV and SDTV pictures provided by the two broadcasters.

boxes are likely to have some extra features for additional services such as electronic programme guides, interactive and datacasting services.

Evaluation of Proposals and Promulgation of Standards

17. The policy framework for DTT provides that the Government would adopt a market-led approach when choosing technical standard. The TA has assessed the proposals from ATV and TVB. The results of laboratory tests and field trials on the national standard for transmission show that its technical performance is generally on par with that of the European DVB-T standard, and performs satisfactorily in the Hong Kong environment. In relation to the compression and coding standard, the TA considers that MPEG-2 is a more mature standard suitable for all purposes, whereas H.264 is a more advanced technology and there are merits for TVB to adopt H.264 on the additional multiplex assigned to it for providing HDTV and new services. The combination of using MPEG-2 for simulcast of four existing programme channels and ATV's multi-channel service and H.264 for TVB's newer service would give ATV and TVB flexibility to test out different business models on the DTT platform, to provide more choices of new services to the public, and to enhance the efficiency in the use of spectrum.

18. As the national standard is a new standard, consumer products supporting it are not readily available in the market. ATV and TVB have been liaising closely with the consumer electronic manufacturers in the Mainland, Hong Kong and overseas, which have been investing substantially in developing consumer products compliant with the national standard. According to these manufacturers, they possess the manufacturing capability to commercially launch such products around three to six months once the receiver specification is available (paragraph 21 below). These products are therefore likely to be available by the last quarter of 2007, tallying with our milestone of launching DTT within 2007.

19. Based on the information provided by some consumer electronics manufacturers, there will be a variety of consumer products available in the market at different price levels. Lower end set-top boxes meeting the basic tier requirements and receiving only SDTV programmes, which are likely to resemble the standard version of set-top boxes to be used in the Mainland[8], should be available fairly quickly (within three months) at a competitive price. Higher tier receivers capable of receiving both SDTV and HDTV

[8] It is reported that the Mainland's DTT strategy is to focus on multi-channel SDTV broadcasting based on the national standard and MPEG-2.

programmes would be available within six months with a higher price at the initial stage, depending on their features and functionalities.

20. Against the above background, the TA is satisfied that the national standard should be adopted for DTT transmission. With regard to video compression and coding, the TA considers that MPEG-2 should be adopted for simulcast via the shared multiplex, whereas the two broadcasters would be allowed to choose between MPEG-2 or H.264 for new services via the two additional multiplexes. The TA promulgated these through a TA Statement[9] today, i.e., 4 June 2007, which is available on the website of the Office of the Telecommunications Authority (www.ofta.gov.hk).

21. Having adopted the above technical standards for compression, coding and transmission, the TA would also need to decide on, in the light of feedback from ATV and TVB and consumer electronic manufacturers, a set of technical specifications for DTT receivers (including set-top boxes and integrated television sets). This is not mandatory, but manufacturers can then produce DTT receivers for the Hong Kong market with reference to such receiver specifications. The TA is now consulting the consumer electronics industry and broadcasters on the specifications. The finalised specifications should be available before end June 2007.

EARLY ADOPTION

22. According to the implementation framework, ATV and TVB will commence their DTT services within this year. We expect they will kick-start DTT in the last quarter of 2007.

23. Hong Kong would likely be among the early adopters of the national standard. We will work closely with the consumer electronics industry on the supply of reliable service and products.

PROMOTION AND PUBLICITY

24. To disseminate information about DTT to the public and encourage DTT take-up, we need a comprehensive promotion and publicity strategy. In implementing this strategy, the Government would be assisted by ATV and TVB who are required by a condition in their domestic free television programme service licence to implement DTT. They have

[9] A TA Statement is a document of policy intention issued by the TA from time to time to provide guidance to the industry on how the TA intends to exercise his statutory power under the TO.

pledged to promote DTT take-up together with the Government. At the initial stage in 2007 and early 2008, the main objective of the Government's promotion campaign would be to raise public awareness of DTT with a focus on informing early adopting viewers about requirements for and availability of receiver products to enable them to make informed purchase choice. Since the two broadcasters are still maintaining their analogue services for at least five more years up to 2012, the public will also be fully informed that they can still receive the existing four free television programme channels in analogue format without changing or adding any equipment during the simulcast period[10]. Our publicity and promotion will be through a dedicated website[11], announcements of public interest on television and radio and information leaflets to building management companies, owners' corporation as well as households. The Government will co-ordinate our publicity with that of ATV and TVB to maximise the impact.

IMPLICATIONS

A & B

25. The implementation of DTT has financial and economic implications as set out at **Annexes A and B**. It is in conformity with the Basic Law, including the provisions concerning human rights. The upgrading of the broadcasting network entails civil engineering works at hilltop sites. Some of these sites have been confirmed to fall within country parks, Sites of Special Interest or conservation areas. The works on some of these sites are designated projects under the Environmental Impact Assessment Ordinance (Cap. 499) and will need to follow the statutory requirements of the Ordinance to avoid adverse environmental effects to the maximum practicable extent and to address any potential environmental impacts. The implementation of DTT has no significant sustainability implications.

PUBLIC CONSULTATION

26. Prior to deciding on the implementation framework for DTT, we conducted two rounds of consultation in 2000 and 2003 and briefed the Legislative Council Panel on Information Technology and Broadcasting.

[10] According to the implementation framework, subject to further market and technical studies, the Government aims to switch off analogue broadcasting five years within the launch of DTT, i.e., by 2012. In other words, ATV and TVB will simulcast their existing four television programme channels in both digital and analogue format from 2007 to 2012 or later.

[11] www.digitaltv.gov.hk

PUBLICITY

27. Our publicity plan is set out in paragraph 24 above. We will brief the Legislative Council Panel on Information Technology and Broadcasting on 11 June 2007.

ENQUIRIES

28. Enquiries about this brief can be directed to Mr Kevin Choi, Principal Assistant Secretary for Commerce, Industry & Technology (Communications and Technology) (telephone: 2189 2236; e-mail: kevinchoi@citb.gov.hk).

Communications and Technology Branch
Commerce, Industry and Technology Bureau

4 June 2007

Annex A

Financial Implications

The implementation of DTT will have implications on the gross carrier and television programme service licence fees paid by ATV and TVB, which are each holding a carrier licence issued under the TO and a domestic free television programme service licence issued under the BO. At present, ATV and TVB are each paying the Office of the Telecommunications Authority Trading Fund an annual carrier licence fee of about $9 million, comprising a fixed fee of $1 million and a variable spectrum utilisation fee of about $8 million. During the simulcast period, they will pay an additional spectrum utilisation fee of about $400,000 for each multiplex they operate. The annual additional carrier licence fee and spectrum utilisation fee to be collected are subject to the number of multiplexes to be assigned. After analogue switch-off, they will each pay $2.5 million spectrum utilisation fee less as a result of returning the spectrum used for analogue broadcasting to the Government.

2. Pursuant to the Broadcasting (Licence Fees) Regulation, each of ATV and TVB will continue to pay an annual domestic free television programme service licence fee of $7,152,100, comprising a fixed fee of $4,308,900 and a variable fee of $2,843,200 ($1,421,600 per programme channel). ATV and TVB have each been assigned one additional multiplex for broadcasting high-definition television programmes. This will give them flexibility to provide additional programme channels and they shall pay additional licence fee(s) for any additional channel(s) provided on these two multiplexes in accordance with the Broadcasting (Licence Fees) Regulation.

3. In addition, the total financial implications relating to licence fees will also depend on whether there are new multiplex operators and television service providers to enter the market and whether ATV and TVB will further expand their digital broadcasting services at a later stage.

4. Extra resources will be required for publicity and co-ordination with the industry on implementation details at different stages of the analogue-to-digital migration. The Commerce, Industry and Technology Bureau, together with the Office of the Telecommunications Authority and the Television and Entertainment Licensing Authority, will absorb the extra staffing and financial expenses.

Annex B

Economic Implications

The implementation of DTT will enhance the capacity of our broadcasting infrastructure for the provision of a variety of communications services to meet Hong Kong's future needs as a digital city, and maintain our position as a regional broadcasting hub. The approach to assigning multiplexes fulfils a dual objective of guaranteeing incumbent broadcasters sufficient transmission capacity for digital migration and new services, and of leaving an opening for new market entrants to enable more competition in the broadcasting industry.

2. The implementation of DTT has multifaceted economic implications. A cogent assessment will require a complicated model to analyse the quantifiable costs and benefits to different stakeholders. The major variables for the analysis will include the economic value of:

- the released spectrum after analogue switch-off;
- capital costs and savings arising from the analogue-to-digital migration;
- marketing cost for DTT services;
- spending on new consumer electronic products such as set-top boxes and better resolution television sets which is a cost to consumers but a benefit to consumer electronics manufacturers and retailers;
- improved reception quality and coverage; and
- investment in new or enhanced programme contents and innovative services on the digital transmission platforms.

3. In the UK where DTT broadcasting started in November 1998, the Department of Trade and Industry, the Department for Culture, Media and Sport, and the Radiocommunications Agency (now integrated with four other regulators into the Office of Communications) jointly conducted in 2003 a cost-benefit analysis to evaluate the economic benefits of a complete digital switchover from a simulcast situation. Having considered the major variables listed in paragraph 2 above, it was estimated that the economic benefits of achieving complete digital switchover were around £1.5-£2 billion in net present value terms, and any delay in switchover would reduce the economic benefits.

4. Given the similar television market structures of the UK and Hong Kong in terms of the mainstay status of free-to-air terrestrial television, by reference to the UK's cost-benefit analysis, the implementation of DTT in Hong Kong should also bring positive economic benefits to the territory.