Consultation Paper No. 1/2005

Telecom Regulatory Authority of India

Consultation Paper

On

Digitalisation of Cable Television

3rd January 2005

Consultation Paper on Digitalisation of Cable Television

Index

Preface

With the growth of cable television in the country the number of channels have rapidly multiplied. Although the capacity of the cable networks have also increased over time, increasingly the cable networks are not able to cope up with the demand for space from new channels. Digitalisation can provide a solution to this problem apart from providing a platform for new services. During the process of consultation on issues relating to Broadcasting and Distribution of TV Channels, broadcasters had raised issues relating to the problem of lack of capacity on Cable TV Networks and the associated issue of carriage charges. This issue in turn is linked to the problem of augmenting the carrying capacity of TV Channels through digitalisation of Cable TV Networks. In the recommendations sent to the Government on October 1st 2004 on this subject, it had been indicated that TRAI shall be bringing out a Consultation Paper on the subject. Accordingly this Consultation Paper has been prepared and it focuses on the various issues concerning digitalisation and related issues like must carry regulations and regulating carriage charges. The paper is divided into the following sections:

- Chapter-1 is the Introduction and sets out the broad contours as well as introduces the need for digitalisation. It also briefly sets out the major advantages and disadvantages of digitalisation.

- Chapter-2 raises issues relating to the time frame and phasing of the conversion of analogue to digital systems. The section also discusses the possible incentives to promote digitalisation including pricing and fiscal incentives in the form of import duty, entertainment tax and service tax.

- Chapter-3 discusses the issue of licensing for digital network and related issues like exclusivity, number of licenses per area, license fee and procedure for licensing.

- Chapter-4 deals with measures to promote competition including the introduction of must carry regulations for Cable Television. The question of regulation of carriage charges has also been discussed.

- Chapter-5 looks at the various alternatives available for digitalisation and gives some rough figures of the cost of these alternatives. This chapter also deals with issues relating to the modification in the existing standards. There is a large population of Black and white television sets in the country – the need for steps to increase the choice available for such consumers is also looked at.

The paper also sets out international experience whenever relevant. The issues on which consultation have been specifically requested have been put together for convenience in Chapter-6. Written comments on these issues may please be furnished to Secretary, TRAI by 31st January, 2005. The gist of the comments received will be posted on the TRAI's website (www.trai.gov.in).

For any further clarification on the matter, Secretary, TRAI or Adviser (B&CS) may be contacted at trai07@bol.net.in (Phone No. 26167448, Fax No. 26103294) and rkacker@trai.gov.in (Phone No. 26713291, Fax No. 26713442).

It is proposed to hold Open House Discussions on the subject in February 2005. Those interested in participating in the above discussions may please give their names at the above addresses by 31st January, 2005 along with contact details so that the Open House Discussions could be planned accordingly.

(Pradip Baijal)
Chairman, TRAI

Chapter 1: Introduction

Digitalisation of Cable Systems

1.1 The cable industry in India has developed in an unregulated manner. This environment also led to the enormous reach and success of the sector. The industry initially grew in size as more and more people set up networks. Some operators had subscriber bases as low as 50. Most of the networks could relay just 6 to 14 channels. Higher channel relaying capacity required heavy investments, which many cable operators were unwilling or incapable of making. At this stage many MSOs set up sophisticated head-ends capable of delivering 60 to 90 channels. These channels are delivered in an analogue mode. The existing capacity of cable systems is far less than the demand. As more channels are being launched, there is a need to upgrade the system through Digitalisation.

1.2 Digital transmission, offers a number of advantages over analogue broadcasting. These include better reception quality, increased channel carrying capacity, new features such as programme guides, multi view and interactive services, as well as potential to provide Triple play i.e. voice, video and data.

1.3 Much of television production and some distribution already uses digital technology. Satellite TV channels are beamed using digital technology. The DTH platform is also in digital format. In 2003 a mandate was given to introduce CAS in the four metros. This could have been done in analogue mode or in digital mode. A few operators decided to provide CAS through the digital mode. As a consequence in the metro areas of Delhi, Mumbai and Chennai, a few MSOs have already started providing many digital TV channels to their subscribers. Barring these few exceptions, all broadcast signals received by television viewers are in an analogue mode.

Purpose and scope of the Consultation Paper

1.4 This consultation paper discusses what actions should be taken in facilitating the wider introduction of digital services in the cable TV system. While the bulk of the actions would have to be taken by the private sector the Government and the Regulator can play a facilitating role, to bring about the desired change faster. A discussion on regulatory issues in relation to digitalisation, necessarily involves touching on issues that go further than digitalisation of cable system per se. There are important linkages between digitalisation and other policy and regulatory aspects like issues concerning taxation, FDI limits, licensing of the cable networks, non-discriminatory carriage of channels, promotion of competition, quality of service, competition with other platforms etc. Digitalisation of cable networks therefore needs to be viewed in a broad policy context. Almost all existing systems

require augmentation or replacement of network elements to support the digital broadcasts, requiring large capital investments. Therefore there is need to develop a digitalisation policy so that existing resources are utilised to their maximum.

Need for Digital Cable

1.5 Before going into the various policy and regulatory issues, the concept, benefits and disadvantages of the digitalisation have been discussed. Today, there are four ways consumers can receive television services:

- Terrestrial transmission
- Cable TV
- Direct-to-home (DTH) Satellite
- Digital Subscriber Line (DSL) or Ethernet borne broadband TV

1.6 As an underlying technology, digitalization is a growth driver, especially for cable & satellite, and now broadband TV operators. Digital brings with it the capability to continually enhance services provided to subscribers, both from a video perspective and from new applications. From a video perspective, the main advantages of digital services include a very large increase in the number of channels and enhanced quality of reception. From the new application perspective, this enables an increase in new services such as pay-per-view, video-on-demand, e-commerce and internet etc. as well as a large increase in the number of basic and premium channels on offer.

1.7 Digital services are significantly better than analogue due to superior picture and sound quality and the presence of services like an electronic programming guide (EPG) to facilitate channel navigation. Digitalisation can also lead to increase in ARPU, especially when bundled with other broadband services such as Internet access and telephony.

1.8 In India, DTH services would soon be competing directly with cable industry. The broadband based IPTV is also expected to enhance the level and extent of competition. These platforms are digital and have the capacity to provide new services along with better quality delivery of TV channels. To compete with these platforms there is a need for cable systems to upgrade through digitalisation. At present most cable systems have the capacity to carry around 60 to 90 channels without any reverse path. With digital techniques cable operators would be able to offer greater choice and quality than is possible with analogue television. With video compression techniques, it is possible to provide upto 12 digital TV channels in the bandwidth space occupied by one analogue channel. Thus compression can lead to a large increase in the number of channels seen by a consumer who has access to digital services.

1.9 Other benefit of digitalisation is the ability to create a two-way link with subscribers. The addition of a modem to a set-top box (STB) provides a range of interactive services, including email, betting, games, shopping, information and even Internet access. (Some of the interactive services are explained in the Text Box) Moreover, more advanced set top boxes have begun to support more personalized TV services or personal video recorders (PVRs). PVRs enable digital subscribers to store, archive and manipulate 40-80 hours of video content on a STB equipped with a hard disk drive. However, PVR-enabled STBs typically cost twice as much as an ordinary Digital STB.

What Are Interactive TV Services?

Digital Video Recorders (DVRs) – VCR-like devices that permit users to record, store and play back programming, using an internal hard drive for storage.

Video on Demand (VOD) – A form of pay-per-view programming service, which enables viewers to order and watch movies on demand.

Interactive Program Guides (IPGs) – Electronic program guides that permit customers to select and sort television programming by time, theme, channel and other criteria. IPGs also can provide supplemental information about programs and allow viewers to select a program to record.

Enhanced TV Services – Services that enable viewers to access further information about the television programs and advertising they're watching (including how to purchase an item). These services may also allow consumers to play along with game shows, participate in opinion polls and obtain latest news and weather.

1.10 With digitalisation it is also possible to provide programmes in High Definition Television (HDTV) format. HDTV provides for a wide screen presentation similar to what we see in movie theatres. The new screen has a width-to-height (or aspect) ratio of 16:9 compared to today's 4:3 width-to-height ratio on Standard definition TV (SD TV). HDTV also provides much higher resolution and improved sound. HDTV however needs higher bandwidth and special content, which are at present not available. It is expected that such services with associated products would be launched in the market with the advent of digital transmission.

1.11 As already discussed, the deployment of digital networks help to provide internet and broadband services. These networks have the potential to ultimately converge with the telecom networks. Many companies in USA and few other developed countries have started providing voice and internet services on these networks and are competing directly with the telecom companies.

Advantages and Disadvantages of Digital Transmission

1.12 The advantages and disadvantages of Digitalisation have been summarised below:

Advantages

- As signals are compressed with digitalisation, Cable Operators would be able to carry more channels on the cable systems. Cable operators would be able to expand the market by carrying niche channels to meet the multi ethnic tastes of the viewers.
- The additional availability of channels on cable systems would increase competition amongst broadcasters
- The quality of picture and audio would improve.
- The digital networks have the ability to create a two way link with subscribers which enables to provide interactive services.
- Possibility of upgrading networks to provide telecom services like VOIP, internet etc.

Disadvantages

- Huge capital investments in up-gradation of cable network.
- The subscriber would need investments for STBs or Digital Receivers. These are required to decode the digital signals and reconvert them into analogue mode, which are compatible with the standard television sets. Alternatively expensive digital TV sets would have to be bought which have these capabilities inbuilt – at present these digital TV sets are not made in the country.
- The transition from analogue to Digital networks is a long process. The operators have to simulcast (simultaneous transmission of analogue and digital signals) channels in the analogue and digital modes. Consequently during the transition period additional bandwidth is required to make space for both sets of channels

Conditional Access System (CAS) and Digitalisation

1.13 CAS is often mistaken as a component of digitalisation, though these have distinct functions. The conditional access system (CAS) is encryption and decryption of programme material to ensure that only the authorised subscriber receives the programme. Digital transmission on the other hand, interalia, squeezes more channels into the space previously occupied by a single analogue channel. However subscribers in both cases require special devices to decrypt/decode the signals so that these could be viewed on the conventional television set.

1.14 In the following matrix, the cable operators have been distributed based on the use of CAS and digital networks:

	Non CAS	**CAS**
Analogue	Most Cable Operators in India providing services in analogue mode without any addressability	Few Operators in Delhi and Kolkata were using Conditional Access in analogue mode in Delhi and Kolkata during the mandatory CAS Period.
Digital	A Cable Operator in Mumbai is providing Digital Services.	Most Operators in Delhi, Mumbai and Chennai used/ are using CAS on Digital Networks.

Present State of Cable Networks

1.15 The current state of the majority of cable infrastructure is not conducive to digital transmission and reliable high-speed bi-directional communication. For advances to occur investment in upgrading infrastructure and better organization of the industry need to be executed.

1.16 The network upgrade is an area of concern. The steps need to be taken to bring it to the required level for offering advanced services have been spelt out along with the associated costs. These have been discussed in greater detail in chapter 5.

Policy Issues

1.17 The need for digitalisation has been established in the preceding discussions. There are a number of issues involved in digitalisation. The key issues may be categorised into the following chapters:

- Chapter 2 : Time Frame and Phasing for conversion to digital mode for cable TV - The question of availability of digital signals raises issues whether the government should mandate any time framework for digitalisation of cable networks and should government announce a guiding framework within which digitalisation should be complete. Alternatively we can look at a time frame for start up with indicative targets for conversion of consumers from analogue to digital. There must be a business case and incentives for the operator for digitalisation. What should be the incentives and to what extent this can be part of the policy to promote digitalisation is also discussed in this chapter.

- Chapter 3: Licensing of Digital networks- At present Cable operators merely need registration to provide Cable TV services. After digitalisation, these operators would not only provide additional services but eventually converge and interconnect with Telecom Networks. There is a need to look into the licensing requirements to provide services over such networks. Provision of licenses could also simplify regulation as well as interconnection arrangements. The procedure for licensing, number of licensees per area, license fees etc. are all consequent issues, which need to be discussed. These issues are dealt with in Chapter 3.

- Chapter 4: Promotion of competition- After digitalisation, the cable operators would have more capacity to provide additional services and carry additional channels. At present channels are competing to obtain the space in prime bands of cable networks and it is reported that broadcasters pay large sum of money to obtain such space. To promote competition amongst broadcasters, there is need to look into the policy of 'must carry' of TV channels. The 'must carry' clauses must also provide incentives and not be a hindrance to Digitalisation. Such obligations are already in place for DTH operators. To what extent can these "must carry" obligations be introduced after digitalisation and how would carriage charges be regulated are the other issues discussed in this chapter.

- Chapter 5: Choice of technology - The major issues relate to the cost of a digital network, the cost of upgrading networks to receive digital facilities and the cost of the equipment at the customer's premises. These costs would vary depending on the density of the population, the kinds of services provided on the network. The question of viewer access to digital content raises issues such as: whether the Government should require "open access" or "interoperable" systems for access. These issues were also discussed in "the Recommendation on issues relating to broadcasting and distribution of TV channels" sent to the Government on October 1,

What is Plug and Play Digital TV?

A "plug-and-play" digital television is a television that can be plugged directly into the cable system and receive analog and most digital cable services without the need for a set-top box. To view scrambled channels a security card from the cable operator is required. The security card authorizes a viewer to watch scrambled channels, to which a viewer is subscribing.

The first generation Plug and Play Digital Televisions do not support all features of STBs like interactive services.

2004. There is need to revisit them in the context of digitalisation. Technologies like plug and play televisions have been developed in the USA to incorporate the digital receiver in the television. To what extent these solutions are relevant to India and what alternatives can we consider in the absence of CAS need to be looked at. Ultimately the success of introducing digitalisation would hinge on the benefits that the consumer perceives vis-à-vis the cost to the consumer for enjoying such enhanced services. Apart from consumers at the high end of the income scale there is also the issue of consumers at the lower end, many of whom have only black and white televisions. How can their choice and viewing be enhanced is a question that needs to be addressed along with the policies to promote digitalisation. There is also the issue of the existing standards and the need, if any, for revising them. This analysis is presented in Chapter-5 along with the various technical options and their respective cost implications.

1.18 These issues have been discussed at length in the relevant chapters. More specific questions within the scope of these general issues are set out in each chapter and also summarized in the last chapter.

Policy framework objective

1.19 In developing the policy to facilitate the digitalisation of Cable Networks, the Authority will be guided by the following objectives:

- Cable viewers should benefit from the technological advances to the fullest possible extent.
- There should be smooth transition from Analogue to Digital transmission recognising that analogue services will continue along with digital (at present only one city in the world- Berlin – is 100% digital) for several years.
- The policy should promote competition at all levels.
- The digitalisation policy should provide guidance to broadcasters, MSOs, cable operators and consumers concerning the adoption of new technology.

Chapter 2: Time frame for digitalization

2.1 In considering any policy framework for digitalisation it would be necessary to provide a time table for the switchover from analogue to digital. This would give certainty to the industry as well as to the consumers. This is necessary since both groups have to make considerable investments and bear additional costs. Internationally also many countries have adopted a time table for the conversion. These dates are summarized in Table 2.1 below:

Table 2.1

Market	Legislation	Launch	Conversion
Brazil	2002	2006	Not determined
China	2000	2003	2015
Hong Kong	2000, 2004	2001	2012
Germany	2002	2010	2010
Japan	1998	2011	2011
Korea	2000	2010	2010
Taiwan	1998	2002	2008
U.K.	1999	1998	2006 – 2012
U.S.	1996	1998	2009

2.2 The experience of the countries which have indicated a national timetable is briefly indicated below:

China

- Digital television production plans have been listed among China's 12 key projects for the 10th Five-Year Plan (2001-2005). The plan calls for the connection of all provincial or metropolitan cable TV networks to an optical two-way backbone network system that will enable the delivery of HDTV signals and data-broadcasting services.
- Digital cable TV broadcast trials began in 2001, and extended to 33 pilot cities in 2003, including the top tier cities of Beijing (2.4 million cable TV homes), Shanghai (3.5 million cable TV homes) and Guangzhou (3.1 million homes).
- The State Administration of Radio Film & TV (SARFT) has set itself ambitious targets: by 2005, it hopes to have 30 million digital cable or pay TV subscribers with cable operators in each of the 33 pilot cities scheduled to broadcast only in digital (i.e. analog to be shut down). Digital DTH satellite services are also scheduled to begin in 2005. By 2010, all TV stations and distribution networks (cable included) are scheduled to broadcast in digital. By 2015, all analog

broadcasts will cease.

Hong Kong

- The government has directed terrestrial broadcasters TVB and ATV to begin simulcast broadcasting of both analog and digital TV (HDTV) in 2007 at the latest and extend the coverage of their digital networks to 75% of Hong Kong by 2008.
- The government plans to switch off analog broadcasting 5 years (2012) after the commencement of simulcast although it states that this is "subject to further market and technical studies." The government is indirectly paying for digital transmission upgrade by abolishing the 10% royalty on terrestrial TV advertising revenues it collected until 2003.
- Regarding cable TV, the sole cable MSO i-CABLE made a pledge to the government that it would complete network digitalization over a period of 3 years, a pledge it has adhered to. The company committed to capital expenditure of US$60 million over the 3-year period (STBs costing US$90 initially and reducing to US$70-US$80 after volume deployment).
- i-CABLE began its digital rollout in 2001 when it had 561,000 analog pay TV subscribers, part of a bid to combat piracy. It completed the conversion in August 2004 when its subscriber base had grown to 685,000 – all digital customers

Germany

- In August 2003, the Berlin & Brandenburg Authority became the first city in the world to switch off analogue terrestrial transmissions in favor of fully digital transmissions. The switchover was eased by the dominance of cable reception in the German capital, where penetration is 84% plus (satellite at 7%). Other regions are expected to follow over the next few years ahead of a proposed digital switchover date of 2010.
- In Berlin, in August 2003, as part of the 100% digital conversion, each of the stations involved, which had been broadcasting a single programming service, started transmitting a "bouquet" or multiplex of digital services. Both before and after the transition, all of the services involved were in standard definition (SDTV) format. Unlike the situation in the United States, Japan, Korea and China, no transmission or reception of high definition (HDTV)content was involved.

Japan

- In 1998, the Ministry of Internal Affairs & Communications (MIC) issued its

timeframe and plan for national digitalization by 2010. With the market having begun digital communication satellite (CS) in 1996 and digital broadcast satellite (BS) services plus digital cable trials in 2000, the MIC focused on digital terrestrial with the emphasis on full digitalization of terrestrial by 2011, including reception of digital terrestrial over cable systems.

- The criteria for switching analog off has been set as equivalent coverage to analog; and 85% take up rate, including reception over cable TV systems. The aim is to achieve this by 2010 and progress will be reviewed area by area every three years.

Korea

- The Korean government is committed to building a national infrastructure by digitizing broadcast-related networks as well as information- and-communications-related networks. In terms of broadcast-related networks, the government plans to complete digital transition by 2010.
- For the cable TV industry, the government has urged service providers to take the initiative in converting to digital broadcasting technologies, as is the case in other countries. The government has looked for the cable industry to transition at least 6 million – 9 million subscribers to digital by 2008, implying a 50%-70% conversion rate, based on the Korea's existing analogue subscriber base.

Taiwan

- In November 1997, the National Information Infrastructure (NII) under the Executive Yuan unveiled its timetable and plans for digitalization of the Taiwan broadcasting industry. The plan dictates that digital migration will complete by January 2008. Technical standards have been chosen as DVB and DVB-C for terrestrial and cable TV respectively.
- Since both digital cable and terrestrial penetration remain low, the Government Information Office(GIO) also decided, in January 2004, to award a digital cable TV license to telecom giant CHT to enable it to launch digital services in Taipei City and Northern Taiwan. The coverage may be extended to island-wide Taiwan in 2005, pending the GIO's approval. As it is a cable TV licensee, the CHT service is also regulated by many of the restrictions that impact the cable MSO business. Due to low digital TV penetration, the GIO has been asked by the Executive Yuan to draft new laws by March 2005 to boost the island's digitalization plan.

U.K.

- In September 1999, the government announced its plans to achieve digital switchover. The Secretary of State said that digital switchover could start as early as 2006 and be completed by 2010 although the precise date would depend "on how the broadcasters, manufacturers and consumers behave".
- The Government further announced that switchover would not take place until the following conditions had been satisfied:

    - Everyone who could watch the main public service broadcasting channels in analogue form could receive them on digital systems. The condition applied to BBC 1 and 2, ITV 1, Channel 4/S4C and Five.

    - Switching to digital was an affordable option for the vast majority of people.

- In 2001, the Government launched the Digital TV Action Plan. The plan has successfully carried out a large number of measures in preparation for switchover and has coordinated the activities of the various parties involved, including Government departments, regulators, broadcasters, retailers, manufacturers and consumer groups. The objective of the Action Plan was not to implement switchover; instead, its aim has always been to make the necessary preparations to allow the Government to make a decision on the exact timing at a later date.

The Office of Communication (referred to as Ofcom) published a report on the U.K. switchover to digital in April 2004. The main contents of this report are as follows:

- 100% switchover is desirable and achievable; it would substantially improve the structure of the broadcasting market and benefit the wider economy. Less than six years since its launch, more than half of UK homes have digital TV. In areas where there is a choice between free-to-view and pay digital TV, take-up is around 60 %. Ofcom expects digital take-up to continue to grow strongly over the next two years. Thereafter, its growth is likely to slow. Ofcom's projections suggest that digital take-up will level off at around 80% of households.
- The market alone will not deliver switchover. The UK digital TV project must change gear and move from planning to implementation. Greater certainty over the timing of switchover would be an important step. A new implementation body should be established. It should have the necessary funding, remit, leadership, resources and sufficient independence to encourage greater take-up of digital TV and to manage the challenging process of full switchover in the near future.

According to Ofcom, specific obstacles to market-led digital adoption are:

- Consumer take-up. At present, some U.K. consumers do not value digital TV. Surveys show that in 2003, some households (5 %) said that they would be willing to live without TV rather than convert their sets to digital. Some more (15%) perceive little value in the greater choice digital TV offers. Only a minority currently support the policy of full switchover. In addition, consumers are considerably less interested in converting secondary TVs than their primary TV set. In the absence of further initiatives, there may be as many as 35 million TVs that will remain analogue-only at the end of 2010.
- Broadcaster incentives and obligations. The public service broadcasters will need to have a clear and unambiguous commercial incentive to drive switchover. Commercial analogue broadcasters would benefit from the elimination of expensive transmission of both analogue and digital signals and new opportunities to expand channels and services. But digital TV would also increase competition, reducing audiences and advertising revenues. The BBC has a different, but equally difficult trade-off. Switchover would reduce the BBC's transmission costs and extend coverage of its digital services to all households, but any net loss of viewers could reduce public support for the license fee.
- Free-to-view digital TV. Free-to-view digital terrestrial TV will be an important feature of the TV market for the foreseeable future, but its coverage will be far from universal before the signal can be boosted during switchover. Only about three-quarters of households are currently covered. Free-to-view satellite is not burdened by the coverage problems, but viewers cannot currently receive all the public service broadcasters on the satellite platform without a charge.

U. S. A.

- The Federal Communications Commission (FCC) has established a faster schedule for the introduction of digital TV than the rest of the world. According to this schedule, digital TV broadcasts were to begin 1998. Most Americans should have had some access to digital TV by 1999 and everyone in the U.S. should have had digital TV access (as opposed to direct reception) by 2002. At the same time, analog service will also continue until 2006. After the end of this transition period (December 31, 2006), broadcasters will transmit only digital TV.
- Starting April 1, 2003, broadcasters were required to simulcast at least 50% of their video programming on both analog and digital systems. The following year, the simulcast requirement was to climb to 75%. After April 1, 2005, the simulcast requirement will be 100%. After the transition period ends (31/12/2006), all analog broadcasts will end. However, this date (December 31, 2006) may be extended until most homes (85%) in a given area are able to

watch digital TV programmes. Until the transition is complete, television stations are required to broadcast on both their digital and analog channels.

- The Balanced Budget Act of 1997, passed by the U.S. Congress, includes provisions that would extend the continuation of analog service beyond the 2006 deadline if digital TV is implemented more slowly than expected. Specific conditions which would extend the transition period include the failure of one or more of the largest TV stations in a market to begin broadcasting digital TV signals through no fault of their own, or fewer than 85% of the TV households in a market being able to receive digital TV signals off the air, either with a digital TV set or with an analog set equipped with a converter box or by subscription to a cable-type service that carries the digital TV stations in the market.
- At end-September 2004, basic cable customers totaled 73.7 million, representing 68.1% of TV homes with premium cable subs at 51.9 million and digital subs at 23 million, 31% of total cable subs and 21% of total TVHH. U.S. cable platforms began digitalization at a time when five leading MSOs had just under 60% of total basic subscribers in the market in 1997, and each had ownership of the last mile. Having begun in 1995, the digital DTH market is thriving with more than 22.3 million customers as of end-Sept. 2004, 21% penetration of total TV homes.
- Broadband cable upgrade (to rollout both Internet and telephony) and digital cable rollout has been achieved at a cost over US$80 billion, spread over 6 years, funded by equity and debt. Investment components are discussed in detail later in this section. Cable operators had a total of 17.8 million Internet subs as of end-September 2004 while VOIP cable telephony users reached 2.9 million, a fast-growing market.

2.3 In considering the experience of different countries what is striking is that even in the most developed countries there has been no city that has been able to convert 100% to digitalisation- except Berlin. Thus an important issue for consideration is whether in India we should have a time frame at all or restrict it just to the process of starting digitalisation without specifying any target date for 100% conversion and switching off analogue transmission. In India today about 50% of the television homes have black and white televisions. Apart from them even those who have colour televisions but are at the lower end of the income scale may not be able to afford the additional costs of digitalisation (which have been worked out in Annexure 1 to Chapter 5). Thus for a long time it may be necessary to continue with simultaneous transmission of both analogue and digital transmission.

2.4 What this means for the consumer is that those who opt for digitalisation and buy a set top box/digital decoder will have access to all the analogue channels plus the channels that are available exclusively on digital. Typically an operator with 860 Mhz capacity (equivalent to about 90 analogue channels) may choose to retain 70 channels in analogue mode and use the spare capacity of these 20 analogue channels to carry upto 240 digital channels. The consumer who does not opt for

digital will continue to get the 70 analogue channels without having to pay more.

2.5 Thus with simultaneous transmission consumers will have the choice to either continue with analogue transmission at no extra cost or pay extra for the digital service and get the additional channels, plus the other benefits of digitalisation. Given this position the question that arises for consultation is whether we should set any target date for complete digitalisation or only for initialization of the process i.e. the date for making this choice available for the consumers.

2.6 Apart from this question the other important issue is to fix the cities in which this process is to be started and the criterion of the way in which these cities are chosen. One way is to have a target led approach in which a number of cities are targeted according to a well laid out timetable, using population as the criterion. The other option is to leave this open and allow, as many cities to be taken up as there are claimants for offering digital services. In case the target led approach is to be followed the following are the questions to be decided:

- Dates for giving licenses for the cities already covered
- Cities to be covered every year
- Number of years to be covered in the first Phase

2.7 Given the fact that the Commonwealth Games are scheduled to be held in Delhi in 2010 and the success in using the Asiad in 1982 to spur colour television growth it may be useful to set the first Phase till 2010 and take further action beyond 2010 after reviewing the progress in 2010. Time would also be required to put in place the licensing process (that is discussed in chapter 3) and for government to take a final decision. Thus the first Phase can cover the period 2006-2010 with an annual phasing for each of the five years. Annual reviews can be conducted and the targets recalibrated depending upon the response and the actual progress

2.8 After deciding the dates and the cities to be covered it would be necessary to decide whether the digitalisation plan should include a target of the number of subscribers or the percentage of subscribers to be covered each year. These numbers may not have any operational significance – they would not be "mandated" but would have some usefulness in informing the industry, advertisers and the consumers of the likely size of the market. The primary inputs for this exercise would have to come from the potential operators. The alternative is not to fix any targets as they could be misleading. Moreover international experience generally has been that these targets have been overambitious and have been scaled down in the face of consumer resistance.

2.9 From the foregoing the following issues arise for consultation:

- **The approach to digitalisation of Cable television internationally appears to favour the determination of a launch date and keeping the complete**

changeover flexible. Should a similar approach be followed in India and in which case what should be the launch date keeping in mind the necessary preparatory steps needed to do so?

- **Would it be desirable to have five year plan for the period 2006-10 with the termination coinciding with the Commonwealth Games?**
- **Whether an annual target of the number of cities should be laid down and if so what should be the cities to be covered in each year and what should be the criterion for such selection?**
- **Whether for each city an annual target should be laid down for the number of subscribers to be covered and if so how should this target be fixed?**

Incentives to promote Digitalisation

2.10 There are a number of ways in which digitalisation can be promoted. On the one hand there is need to provide incentives for broadcasters and operators to provide channels on a digital network. At the same time it is necessary to provide consumers incentives to go in for a digital service. At present there is a price freeze for old channels i.e. those that existed on 26.12.2003. Prices of new channels are also expected to be similar to these channels. On the other hand it is expected that prices would be deregulated once there is sufficient competition. Since those consumers who buy a digital service do so to watch additional channels and always have the option of going back to analogue, it may be desirable to allow complete price deregulation in the case of digital service. On the other hand if the consumer does not have the choice to return to analogue because of lack of an easy buy back scheme or rental scheme for the set top box/digital decoder there may be a case for price regulation till such choice is available to the consumers.

2.11 From the consumer perspective the digital service is going to be expensive. To induce consumers to go in for digital service, concessions may be considered for entertainment tax as well as service tax. These could be either a reduced rate or a waiver for a limited period of time. The other way of reducing the cost to the consumer is to bring down import duty on finished and intermediate products, which would be required either for the network or for consumer, premise equipment (set top box, digital decoder or digital TV).

2.12 International experience suggests that there a number of incentives that have been provided by the Government/Regulators. Some of these examples are:

- In **China**, more flexibility has been provided in the price regulation for major cities where digital service is being rolled out. In addition the Government has also pushed Banks to arrange loans for set top boxes while the local Governments have been directly subsidising the cost of set top boxes.
- The success in **Berlin** has been attributed to the subsidy mechanism provided by

the Government apart from an aggressive communications programme for the consumers.

- In **Korea**, the maximum ceiling for Cable TV services was $13 per month; in 2003 this cap was revised to $24 per month for digital networks. In addition the foreign channel quota was revised from 10% to 20% for digital networks.
- In **Taiwan**, the Government provided low interest loans to the countries digital content providers to supply mass market focused programmes for the digital terrestrial.

2.13 From the foregoing the following issues arise for consultation:

- **Should there be a differential pricing regime for digital networks and if so what should be this framework? Should prices be completely deregulated in a digital network?**
- **What fiscal incentives can be given to promote digitalisation? Should there be a differential rate for entertainment tax and service tax or should there be a waiver from these taxes for a limited period of time? Should there be any reduction in import duty and if so at what rate and on what components/products?**

Chapter 3: Licensing issues

Present Status

3.1 Since the cable industry had grown in an unregulated framework, there was no provision for licensing of the cable distribution business. The Cable Television Networks (Regulation) Act 1995 (hereafter referred as the Cable Act) also did not provide for any licensing. It only had a provision for compulsory registration. Clause-3 of the Cable Act is as follows:

> "No person shall operate a cable television network unless he is registered as a cable operator under this Act:
>
> Provided that a person operating a cable television network, immediately before the commencement of this Act, may continue to do so for a period of ninety days from such commencement; and if he has made an application for registration as a cable operator under section 4 within the said period, till he is registered under that section or the registering authority refuses to grant registration to him under that section".

3.2 The rules framed under the Cable Act provided that the registering authority shall issue a registration certificate to all those applicants who fulfill the provisions of the Cable Act. Since the Cable Act did not provide any specific requirements, the registration was almost automatic. The registering authority was separately notified to be the Head Post Master of the Head Post Office where the cable operator had his/her office. An annual fee of Rs.500/- was to be paid and the registration renewed every year.

3.3 TRAI has sent recommendations on Issues relating to Broadcasting and Distribution of TV Channels to the Government of India on October 1st, 2004. In these recommendations it had been suggested that the registration of Cable Operators should be done by Authorised Officer, under the Cable Act and not by the Head Post Master. It had also recommended that the Authorised Officer should have the power to revoke registration if a Cable Operator has convicted of any criminal offence involving imprisonment. It had been recommended that the Cable Act and the Rules under the Act should be amended for this purpose. These recommendations are being examined by the Government of India. Even if these recommendations are accepted there would still be no provision for licensing of Cable Operators. Given the fact that there are estimated to be over fifty thousand Cable Operators in the country, introduction of licensing at this stage for them does not appear to be feasible.

Need for Licensing

3.4 In the context of digitalisation, however, since there are very few players it may be possible to provide for a framework of licensing under the Cable Act. The advantages of providing for such a licensing framework are as follows:

i) It would provide the Government a framework to ensure that certain minimum conditions are met by the Operators

ii) It would provide the Operators a clear definition of their area and provide a basis for them to obtain finances from financial institutions

iii) It would also provide Broadcasters a clear picture of who is operating in which area

3.5 In this context the following issues arise:-

i) Should licensing be allowed on an automatic basis subject to minimum safeguards?

ii) What should be the annual fees and the entry fees?

iii) Alternatively should a limited number of licenses be issued for each area and if so what should this number be? A connected question would be the methodology for selection of the licensee.

iv) To what extent should foreign direct investment be permitted for such licenses?

v) To what extent should Broadcasters be allowed to hold equity in such licenses?

vi) Who should be the licensing authority?

Licensing Options

3.6 <u>Automatic Licensing</u>

One possibility is to provide licenses on an automatic basis to any one who applies provided certain minimum requirements are satisfied by the applicant. These requirements would correspond to minimum safeguards in the context of Security, Financial Capacity, and Managerial Capacity etc. The advantage of this system would be that a large number of people can enter and this would help competition. The disadvantage would be that since the number of players are not known, investment in improving the infrastructure may be slow.

3.7 Non Automatic Licensing

The alternative to this would be to give licenses to a specified minimum number of licenses in each area. This would give a degree of certainty to the Operators and at the same time provide for a limited degree of competition. The bidding could be on the basis of a onetime entry fee or on some other basis. It could be argued that under this regime the existing players who have already digitalized should get an automatic license.

3.8 License fees

At present there is no entry fees for a person desirous of putting up a cable network. In the case of DTH it is Rs.10 crores. However, there are obvious differences between DTH and cable in terms of reach. Moreover there is also the large cost of upgrading a cable network to digital. On the other hand there is need to provide, to the extent possible, a level playing field. DTH operators have to pay a annual 10% fees on gross revenue. TRAI has already recommended that this should be brought down to 8% and that this should be on adjusted gross revenue (i.e. gross revenue less pass through items). It needs to be determined whether cable operators offering digital networks should be subject to the same license fees regime.

3.9 Foreign Direct Investment

At present the limit on foreign direct investment for cable networks is 49%. This limit was fixed when digitalisation was not on the horizon. With digitalization, Cable TV networks will be able to provide triple play(voice, video and data) and would be in competition with telecom companies. At present with digitalisation as the technology of the future with its corresponding huge investments it needs to be examined whether there should be a review of this limit for digital networks. Apart from equity, restrictions on lending also need to be looked at.

3.10 Equity of Broadcasters

The need to limit equity holding by broadcasters arises from the potential of vertical integration being prejudicial to competition. In the case of DTH this limit has been placed at 20%. However, it must be recognized that equity holding is only one of the ways through which competition can be restricted. Restriction can also take place through financing of debt and the manner of providing content. For the latter an attempt has been made to promote competition through the regulation issued on Interconnection.

3.11 Licensing Authority

As has been noted in the section above, under the Cable Act the Head Post Master is the registration Authority. The recommendation made by TRAI is to replace this by the authorised officer under the Cable Act. However, for digitalisation the

number of players are likely to be much smaller. In this context the issue arises whether the licensing authority should be the authorised officer or the State Government or the Government of India.

3.12 Arising from the above, the following are the major issues for discussion**:**

- **Should licensing be automatic or should it be restricted to a limited number of players? If the latter is to be done, how many Operators should be permitted in each area and what should be the manner of selection?**
- **What should be the entry fees for Digital licenses and what should be the annual fees?**
- **What should be the limit on foreign direct investment for digital licenses? What should be the limits on foreign loans as well as on FII Investment?**
- **What should be the limits on investment by Broadcasters in a digital licensee both by way of equity as well as through loans?**
- **Should the licenses be given by the Government of India, the State Government or by the Authorised officers?**

International Experience

3.13 There is virtually no parallel to the case of India where there are such a large number of operators who have not been subject to a licensing process and where licenses are being sought to be given at the stage of digitalization. Globally, licensing provisions, already in place at the inception of the cable TV industry, have shifted to digital networks as and when required. In the UK, licenses were given by the Cable Authority (subsequently incorporated into the ITC, which has now been replaced by Ofcom) to a number of operators. Since this time, consolidation and digitalization has rationalized the market and resulted in only two operating cable MSOs, as of today. In the USA, licenses are issued by the local city council for a period of 15 years. This is done through a process of bidding and is restricted to one operator per city. Thus, a local monopoly in cable is officially recognized as being desirable. In the case of China, the cable industry has yet to be privatized and all major MSOs are local monopolies owned by various municipal authorities. In Taiwan, more than 60 systems have 9-year operating licenses to operate cable TV services in 51 franchise areas. The 3 major MSOs, who own over half of the cable systems in Taiwan, began to rollout digital services after October 2002 and were, as a natural extension of their original cable TV license, given approval by the Government Information Office (GIO) to offer digital channels.

Chapter 4: Promotion of Competition

4.1 The Authority in its recommendation on 'Issues relating to Broadcasting and Distribution of TV channels" had indicated that it will soon issue a regulation on Interconnection which would provide that the broadcasters 'must provide' signals of TV channels on request on a non-discriminatory basis to all distributors. This regulation was issued on December 10, 2004. On the issue of 'Must Carry" of TV channels on cable networks, the Authority had taken a view that there is capacity constraint on cable systems due to analogue transmission and as such no regulation on 'must carry' is required for the present stage. However as and when capacity is augmented, the 'must carry' regulation will be introduced.

4.2 As the channel carrying capacity on most cable systems is limited, new and upcoming channels are competing to get space on the cable spectrum. Generally these channels are not carried on the cable system or have to pay carriage fees to the cable operator. Therefore the capacity constraint has direct bearing on the competition amongst broadcasters. The Authority has also received number of complaints from subscriber that they do not get channels of their choice, especially if such channels are less popular or of regional languages.

4.3 The digitalization of TV channels would augment the channel carrying capacity but may not necessarily ensure the solution to the problems. The issue of 'must carry' is therefore relevant and discussed in this chapter.

"Must Carry" of TV Channels

4.4 "Must Carry" is an important regulatory issue. Although it promotes competition, yet it is closely linked to digitalization of Cable networks. The MSOs/cable operators would have incentive to digitalise in case 'must carry' obligations do not affect their business model. The arguments in favour and against the 'must carry' obligations are discussed below:

4.5 The programming and broadcasting industry is facing a growth constraint due to capacity limitation on cable networks. There is space for many niche and other channels in the market. Such channels would be launched in case they have an assurance that they would be carried on the cable networks. The 'must carry' obligations on Digital Cable Networks would provide such assurance and confidence to the industry. Presently most of the channels are being launched from already established players.

4.6 There are strong vertically integrated Broadcasters and MSOs in the industry. The 'must carry' regulation would ensure that refusing carriage of channels of rival broadcasters does not scuttle competition.

4.7 Competition amongst broadcasters would increase. The consumer would be a direct beneficiary in terms of quality of programming and perhaps pricing.

Arguments not in favour of 'must carry'

4.8 It has already been discussed in chapter 2 that many countries have adopted national plans to digitalise TV broadcasting. However complete digitalization remains a long drawn process. Even in the most developed countries there has been no city that has been able to convert 100% to digital transmission- except Berlin. Operators do simultaneous transmission in analogue and digital mode. Thus it is quite obvious that it would also take a considerable time for complete digitalization in India. Operators for a long period of time would have to transmit signals in both digital and analogue mode. Considerable bandwidth would be used to continue transmission of TV channels in an analogue mode and 'must carry' of all channels will be only restricted to these being carried in digital mode which will, at least to start with, have limited membership.

4.9 Digitalization is a capital intensive technology. Operators recoup this cost from various revenue streams like interactive services, internet services etc. Some bandwidth is also kept for the reverse path for such services. An operator may have a business plan to allocate more bandwidth for such services. Therefore considerable bandwidth would be required for analogue transmission and providing interactive services. The 'must carry' obligation may therefore act as a disincentive to digitalise networks. Further, at any point of time capacity even on a digital network will be limited. If more channels came up additional investment will have to be made and therefore the "must carry" obligation may not be able to be complied with immediately.

4.10 For DTH operators it is obligatory under license conditions to provide access to various content providers/channels on a non-discriminatory basis. For level playing field it may be argued that such condition should also applied on cable operators. However the two platforms may not be comparable as cable operators would have to simulcast i.e carry same channels in two modes - analogue and digital but DTH operators would transmit in digital mode only.

Carriage issues

4.11 The carriage of channels on cable networks depend on the commercial agreement between a broadcaster and MSO. The 'must carry' obligation would also require that certain broad principles be also specified to arrive at terms of agreement.

4.12 Many free to air TV channel broadcasters have suggested in the past that these channels should be carried without any charge as they are not pay channels. However due to increasing demand for carriage and limited space on cables, many of these channels are paying carriage fees. Pay channels, which are generally more

popular do not pay carriage fees or share margins with the MSOs/cable operators. The margins come from the declaration on number of subscribers.

4.13 Various options of regulating the carriage charges have been discussed below:

Option I

The carriage fee charged by the MSOs due to high demand for space on the prime band of analogue cable networks may prove to be a disincentive for operators to digitalise. The carriage fees on an analogue networks can be decided and regulated by the Authority on a cost basis demand as a national average since it is impossible to work out the cost on a network by network basis. These charges may be phased out over a period of time. However the digital networks may be given incentives by complete non-regulation of the carriage fees.

Option II

It should be mandatory to carry Free to Air channels without any carriage fees. The carriage cost shall be recoverable from subscribers only.

Option III

It may just be prescribed that the operators shall provide access to all TV channels broadcasters on a non-discriminatory basis. However the issue here is what terms should be considered as non-discriminatory. One argument could be that the same carriage charges from all channels ensure non-discrimination. The other difficulty is that this can only be prescribed for digital networks.

International Trends on 'Must Carry' Clause

4.14 The global trend is to mandate the 'must carry' of the terrestrial Free to Air channel, Digital terrestrial channels. These have been briefly discussed below for a few countries:

- **Brazil**: Laws drafted by ANATEL and the Ministry of Communications do not subject all pay TV providers to the same rules. This is particularly so with 'must-carry" legislation requiring cable operators, but not MMDS and DTH systems, to carry local terrestrial broadcasting. The rule benefits cable MSOs like NET because potential digital subscribers are likely to shy away from any pay TV service, which excludes basic mass-market popular programs. If the must-carry laws are revised, cable operators may lose market share to both DTH and MMDS.

- **China**- SARFT requires that 4 of state-owned broadcaster CCTV's channels (including the prime time CCTV-1) be carried on the basic FTA tier offered by cable networks while all municipal authorities require certain provincial and city channels to be carried on relevant cable networks.

  SARFT has also decreed that digital cable networks in Shanghai, Guizhou, Chongqing, Beijing and Sichuan must carry the CCTV package of six digital pay TV channels.

- **Germany**- In the analogue environment, the local media authority selected every one of the 30 or so channels that appeared in the big basic package as a must-carry. In the digital world, the cable operators have been free to make their own choices, but there are still more than two dozen "must-carry" channels.
- **Japan**- MIC requires that the major national digital terrestrial channels be carried by all digital cable networks. Cable operators actually want this to occur because terrestrial content is popular and subscriber generative. There is no regulation of carriage charges.
- **Korea**- The Broadcasting Law of 2000 requires cable, relay and satellite TV services to simultaneously retransmit FTA terrestrial TV channels but only within the areas in which they are mandated. These requirements also apply for digital cable networks, all of whom carry terrestrial TV channels as part of their basic tier.
- **Taiwan**- The government stipulates that cable operators must carry terrestrial channels but it has yet to provide regulation for must-carry of digital terrestrial channels on the digital cable network. This is being considered.
- **USA**- For digital terrestrial channels and digital cable networks, there are no must-carry rules as yet due to lack of agreement. Essentially, the 1992 Cable Act established new standards for analog terrestrial television broadcast station signal carriage on cable systems. Under these rules, each local commercial television broadcast station was given the option of selecting mandatory carriage ("must-carry") or retransmission consent ("may carry") for each cable system serving the same market as the commercial television station. Every three years, every local commercial television station has the right to elect either must-carry or retransmission consent. Generally, if a local commercial television station elects must-carry status, it is entitled to insist on cable carriage in its local market. Each cable system with more than 12 channels must set aside up to one-third of its channel capacity for must-carry stations. For example, if a cable system has 60 channels, it must set aside 20 of those channels for must-carry stations. If there are 25 stations in the market which elected must-carry, the cable operator may choose 20 to carry. On the other hand, if only 15 stations elected must-carry in the market, the cable system would have to carry all 15 of these stations. A must-carry station has a statutory right to a channel position, usually its over-the-air channel number, or another channel number on which it has historically been carried.

'Must Carry' Rules in India

4.15 As per section 8(1) of the Cable Television Network (Regulation) Act, 1995, Cable operators must carry 2 Doordarshan terrestrial channels and one regional channel of a state in the prime band. So far as DTH is concerned clause 7.6 of the DTH license says that the " The Licensee shall provide access to various content providers/channels on a non-discriminatory basis".

4.16 The Authority had earlier also recommended that there should be legislation on the lines of clause 31 of the Convergence Bill, according to which events of general public interest to be held in India will have to be carried on the network of the public service broadcaster.

4.17 From the foregoing the following issues arise for consultation:

- **Whether 'must carry' of TV channel be imposed on Digital Cable Networks? If so, what should be the terms of carriage of TV channels?**
- **What should be the principles of non –discriminatory carriage?**
- **Whether Authority should regulate carriage charges on digital and analogue cable networks? If so, on what Basis should this be done and how should carriage charges be calculated?**

Chapter 5: Upgrading Cable Networks & Technical Choices for Digital Cable TV

Status of Cable Networks

5.1 Most cable TV networks in India deliver only analog TV channels to the subscribers. Over a period of time, the channel providing capacity has been enhanced by extending the bandwidth of the cable TV distribution system. From a bandwidth of 225 MHz in the earliest days of cable TV, the networks progressively enhanced capacity to 300 MHz, 450 MHz, 550 MHz, 750 MHz and ultimately 860 MHz, which is the largest available CATV bandwidth worldwide. In the future this could get enhanced to 1000 Mhz. The bandwidth of cable systems and maximum possible channels on such systems are given in Table 5.1:

Table 5.1

Bandwidth[1]	Maximum Number of Channels
300 MHz	36
450 MHz	54
550 MHz	67
750 MHz	92
860 MHz	106

Few international manufacturers have now commenced offering CATV distribution equipment operating at 1000 MHz. The recent extension from 860 MHz to 1000 MHz will provide just 18 additional channels.

5.2 In the Metro cities most of the Cable TV homes receive 65 to 90 channels. Almost all networks in the Metro cities utilize a combination (Hybrid) of Optical fibre and coaxial cables. These Hybrid Fibre Coaxial cable (HFC) networks are increasingly deployed throughout the country. In fact most of the cities have HFC networks. The price of Optical Fibre Technology is falling rapidly, making it cheaper than deploying coaxial cable. As a result, fibre is penetrating deeper into cable networks, ultimately leaving only the last "Drop Cable" to the consumers' homes as a copper, RF coaxial cable.

5.3 Cable networks in the smaller towns typically provide upto 60 channels over a 550 MHz bandwidth. These networks often cater to typically 5000 customers per head end. The smallest cable networks in the country typically deliver upto 30 channels over a 300 MHz bandwidth.

[1] In this chapter, it is assumed that the forward path bandwidth starts from 47 MHz. The number of channels mentioned in the Table is the theoretical maximum – in practice the number is lower because of various factors that could vary from network to network.

Status of Digitalisation in India

5.4 After CAS was mandated in the 4 designated Metro cities of New Delhi, Mumbai, Chennai & Kolkata, most of the large MSO based cable networks decided to shift to digital addressable systems. This is in keeping with international trends. Typically advanced cable TV networks, provide a combination of analog and digital channels simultaneously. Few of the existing analog channels are vacated and their bandwidth allocated to carry digital channels. MPEG-2 compression technology provides upto 12 digital channels delivered per analog cable TV channel. Hence, if 15 analog channels are vacated, their bandwidth can support about 180 digital channels.

Reverse Path of Cable Networks

5.5 The Cable distribution plant can be uni-directional or bi-directional. A unidirectional system carries signals only from the Headend to the consumer. This path is also often referred to as the "down-stream path". Most types of Cable TV delivery require only a Downstream Path.

5.6 The bi-directional system carries signals both ways, i.e, from the Headend to the consumer, and back from the consumer to the Headend. The Consumer to the Headend path is often referred top as the "Reverse Path" or the "Upstream Path". The Reverse path is essential for interactive TV services, VOIP, internet etc.

5.7 Most Indian Cable TV network do not currently incorporate Reverse Path. They only deliver signals "downstream" i.e. from the head end to the customer. However few large networks in Mumbai, Delhi, Bhubneshwar, Cuttack, Chennai etc. have such capabilities.

Cost of Digitalisation of Cable Networks

5.8 Having talked about the present status of cable networks in the country, the cost of up-gradation and digitalisation is discussed in this section. For the purpose of cost estimates following three kind of distribution networks have been considered:

- Urban Vertical – These are large networks laid down for those urban areas which are densely populated. People live mostly in high rise buildings. These networks cater to large number of subscribers. The network layout in cities having high density of population is lower per subscriber. Mumbai is one example of such cities. In this exercise the costs have been estimated for subscriber base of 50,000 and 2,00,000 for these kind of networks.

- Urban Horizontal – These are large networks laid down for relatively lesser density of population. The cost per subscriber for

deploying such networks is comparatively higher than urban-vertical networks. In this exercise the costs have been estimated for subscriber base of 50,000 and 2,00,000 for these kind of networks.

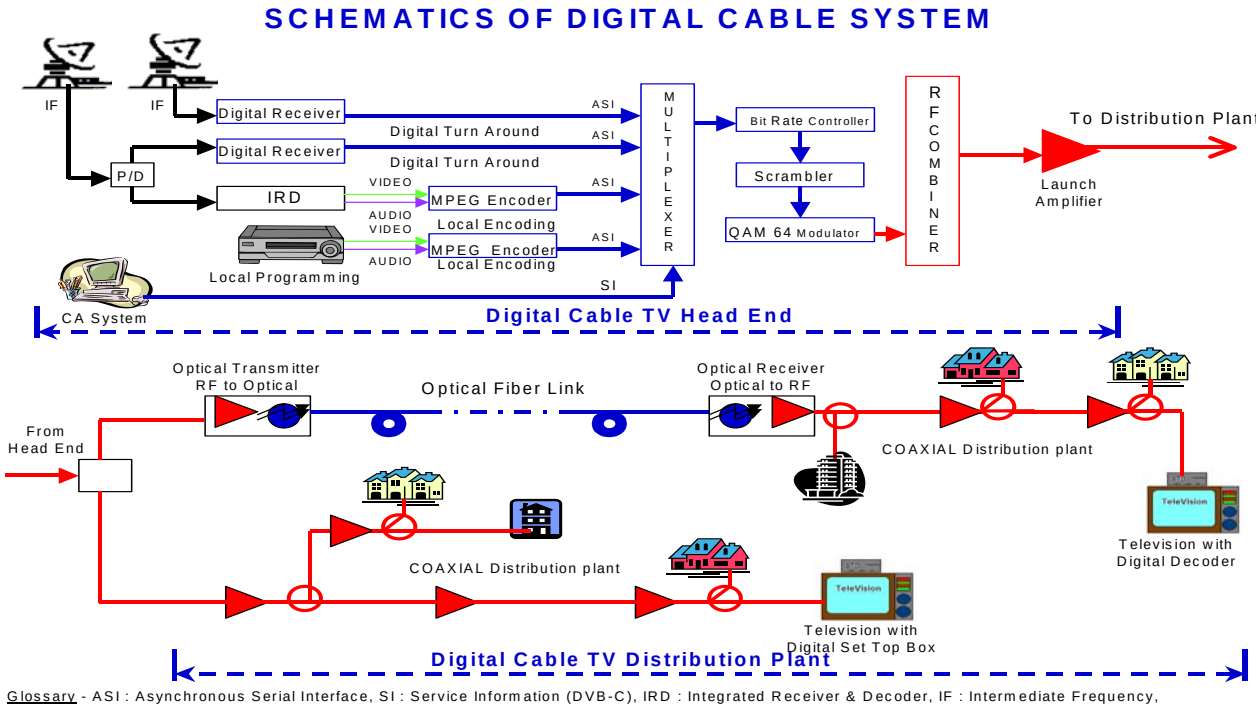
- Semi Urban- These are small networks for semi urban or rural areas. In this exercise the costs have been estimated for subscriber base of 500 and 5,000 for these kind of networks.

The costs have been estimated for 550 MHz, 750 MHz and 860 Mhz capacity. The cable network has been divided into following network elements and cost is estimated separately for each of them:

- Digital Head ends
- Distribution Network
- Customer Premises Equipment (CPE)

A block diagram of the digital cable TV system comprising of head end, distribution network and CPE is given in figure 5.1 below.

Fig 5.1



Glossary - ASI : Asynchronous Serial Interface, SI : Service Information (DVB-C), IRD : Integrated Receiver & Decoder, IF : Intermediate Frequency, QAM : Quardature Amplitude Modulation, P/D : Power Divider, RF : Radio Frequency

Cost of Digital Cable Service per consumer.

5.9 In annexure I to this chapter the capital cost estimates of head end, distribution plant have been given along with estimates of the customer premise equipment. The capital cost is recovered in installments called depreciation expense. Operators would use different life spans for Head end and cable distribution plant. In the present exercise it is assumed that the operators would use a life of 5 years. However, the actual useful life may be higher than this.

5.10 These would increase the cost of carriage. The incremental cost on a per subscriber basis has been attempted. The cost of digital services per consumer should also include cost of debt and profit margins for the operator's i.e the cost of capital. The cost of debt and equity are around 12% and 16% respectively. Considering the corporate tax rate of 35% and debt equity ratio of 1:1, the pre-tax cost of capital would be around 18.3% per year.

5.11 By assuming the useful life of equipment as 5 years, the cost of capital as 18.3% per year, the average cost of up-gradation of cable distribution plant from analogue to digital as 30% of the new plant costs estimated in Annexure 1 to this chapter, the incremental cost per subscriber for urban areas and semi urban/rural areas have been estimated and are given in tables 5.2 and table 5.3 respectively.

Table 5.2

Estimated monthly charges for Urban Area subscribers for using Digital Services

Rs

Network	Subscriber	860 Mhz	750 Mhz
Urban Vertical	2,00,000	62	61
	50,000	129	128
Urban Horizontal	2,00,000	74	73
	50,000	141	140

Table 5.3

Estimated monthly charges for Semi-Urban Area subscribers for using Digital Services

Rs

Network	Subscriber	750 Mhz	550 Mhz
Semi Urban	5.000	185	184
	500	1464	1463

It must be emphasised that these are not exact numbers and are only being given to

give some idea of the magnitudes of the investment required and the final impact on the subscribers.

5.12 The above cost estimates have been made on the basis of quoted prices by equipment vendors. However actual prices depend on the discounts offered by these vendors. It is likely that the entire or most of the Head end will be procured from a single vendor, in a single order. In such a case, a discount of 25 % to 30% could be leveraged from the supplier. In the case of distribution equipment, there will necessarily be multiple vendors. The company that offers Cables does not offer Amplifiers etc. Hence, typical order quantities are likely to be small, and discounts also proportionately lower. It would be around 15% for larger networks. Since smaller networks orders are comparatively smaller, will not be able to leverage large discounts. In case we assume discount of 30% on head end equipment and 15% discount on cable distribution network, the cost to customers of large urban networks would be as given in the table 5.4 below:

Table 5.4

Estimated monthly charges per subscriber for urban areas using Digital Services

Rs.

Network	Subscriber	860 Mhz	750 Mhz
Urban Vertical	2,00,000	53	51
	50,000	100	99
Urban Horizontal	2,00,000	63	62
	50,000	110	109

5.13 In case an operator continues to use unidirectional network and does not make additional investment on amplifiers etc to make the network bi-directional, the cost of distribution network would be around 30% less than the estimates. The overall impact on per subscriber cost would be between Rs.5 to Rs.10 per month.

5.14 The major cost of digitalization is for setting up new head ends. MSOs are setting up multiple head ends instead of linking through dedicated leased lines as these are expensive and it is economically more viable to have multiple head ends. In last few years, there is a significant decline in the cost of transmission equipment including optical fibre cable. Reflecting these developments, the prevailing tariff for domestic leased circuit is substantially below the ceiling tariff prescribed in Telecommunication Tariff Order, 1999. The Authority in its document, "Broadband India: Recommendations of Accelerating Growth of Internet and Broadband Penetration" (April, 2004) has identified the high prices of domestic leased circuits as one of the hurdle for growth of broadband and internet services. The Authority has already initiated consultation process to review the ceiling tariff for domestic leased circuits. Should prices come down over a period of time a single head end connecting different cities may be a more viable business model. In that case the cost of digitalization would come down substantially.

Conclusions

- **The digitalization cost per subscriber is lower for large networks in densely populated areas. The cost has been estimated with best professional grade equipment for a bi-directional cable network. It is likely to be much less in case negotiated prices of equipment are used in the costing. The actual life may be higher than that taken in the estimates. Therefore the actual cost may be even lower than the projected cost.**
- **The cost of digitalization would reduce by Rs.5 to Rs.10 per subscriber in case an operator does not upgrade the system for bi-directional to provide interactive TV services etc.**
- **This cost can be recovered from the consumers through a direct charge or through margins for distribution of pay channels or through charges for interactive services. These costs could also be recovered from broadcasters through carriage charges.**
- **The cost of digitalization is very high for smaller networks. Digitalisation of such networks would be difficult unless some kind of economies through subscriber base is achieved. Such networks may have to take digital feed from other large MSOs. Should there be a reduction of domestic leased circuit prices in future such arrangements may become possible across cities.**
- **There is no significant cost difference between 550 MHz, 750 MHz and 860 MHz equipment. It is expected 550 MHz and 750 MHz equipment may be phased out over a period of time and operators would have networks with 860 MHz bandwidth or 1000Mhz.**

Analogue and Digital CAS

5.15 BIS has set standards for both analogue and digital Set Top Boxes which implies that CAS can be implemented on digital as well as analogue cable system. However Analogue STB is cheaper than the digital STB as it does not include digital decoder. An analogue STB costs around Rs 2500.

5.16 An analogue conditional access encoder along with the corresponding subscriber management system cost varies significantly. The price of renowned brand of encoder is around Rs 50,000 per channel. Digital CAS on the other hand is comparatively expensive. Cost estimates vary significantly from vendor to vendor. Some vendors charge larger amount upfront and smaller amounts per incremental subscriber. This is ideal for large MSOs, typically catering to more than 1 million subscribers. On the other hand, some CAS providers charge small amount upfront and a larger fee per subscriber / set top box. Such a revenue model is better for smaller networks. A fair estimate would be US $ 1 million to US $ 1.5 million for digital CAS, for fairly large MSOs. However the Conditional Access hardware is

usually installed in one location physically and is then connected to digital head ends in other cities using leased lines.

5.17 Considering both the encoder system and decoder are much cheaper for analogue mode than the digital, many smaller cable systems may not like to invest in the digital platform. However digital system have the distinct advantage of offering more channels with better quality picture and sound and may prove to be a better option in the long run.

From the foregoing the following issues arise for consultation:

- **To promote digitalization, should CAS be implemented only on the digital platform in the future?**

Customer Premises Equipment

5.18 It has been discussed that the reception of digital TV requires a digital decoder which is generally embedded in the STB capable of decrypting the encrypted channels. This is because the existing TV receivers both Black and White and Colour are analog one and cannot decode the incoming digital TV signal. A digital decoder decodes the incoming digital signal and either again encode it into the analog format or to the audio / video base band which is acceptable to the analog TV receiver.

5.19 Existing Black and White Televisions receive few channels. With the digital decoders viewers would be able to receive many more channels on such TV sets. It has already been discussed that complete digitalization would be a slow process and therefore cable operators would have to carry channels in both the analogue mode and digital mode. Therefore subscribers having black and white or colour TV sets who are not willing to invest on digital decoders to receive digital services would continue to get the existing services.

5.20 It is expected that with the digitalization of Cable TV system in India, a combination of several Free To Air (FTA) and Pay digital TV channels will be offered to the viewers in addition to the existing analogue channels. The FTA and Pay digital channels can be received by digital decoder as long as there is no CAS. The cost of digital decoders would be much cheaper than the STBs with CAS facility. In US, M/s COMCAST has marketed a digital decoder which costs US$ 35. There could also be a possibility of plugging a CAM model or CAS Chip in a digital decoder in the event of CAS coming in later either through the market or through a government mandate.

5.21 In US, "Plug-and-Play" digital television receivers have been developed at the initiative of Federal Communication Commission (FCC) that can plug directly into cable TV system and receive analog and most digital cable services without the

need for a set-top-box or digital decoder. Essentially, this means embedding much of the cable STB including the tuner function inside the Digital TV Receiver. Many consumers may like the convenience of receiving cable programming without the need of a set-top-box/digital decoder. The viewers will be able to take their plug-and-play TV receiver set virtually anywhere in the country and know it will work on cable systems offering digital services. Plug and play will allow viewers to fully utilize the features and functions provided by the Television set that often are disabled when connected to a cable set-top-box. For digital Plug-and-Play TV, viewers in US need to get a smart card from local cable operator which will permit them to watch pay TV channels to which they have subscribed. The first generation of plug-and-play sets is able to receive one-way programming only. If viewers want to receive certain advanced digital cable services like video-on-demand, programme guide, or interactive television service, viewer use a set-top-box. Negotiations are underway between the cable and consumer electronics industries in USA to establish standards that would permit plug-and-play sets to provide advanced two-way interactive services as well.

5.22 In 2003, FCC decided to mandate integrated plug and play facility in all new 13"plus TV Receivers to be sold after 1 July. 2007.

From the foregoing the following issues arise for consultation:

- **Should development of digital decoders as well as plug and play digital TV Receivers be encouraged to promote digital cable TV industry in the country.**
- **Whether separate BIS standards are required for development of digital decoders in the country?**

Transmission Standard:

5.23 In the field of analog TV transmission, there are broadly three standards i.e. PAL, NTSC and SECAM. India has adopted ITU PAL 'B' and PAL 'G' analog TV transmission systems corresponding to VHF and UHF bands respectively. Consequently, all TV Receivers used in Indian homes are compatible to receive PAL transmissions. While NTSC is the industry standard in US and Japan, SECAM has been adopted in France. For a long time, these three systems were non inter-operable. However, nowadays reasonably priced TV receivers are available which can receive all the three systems.

5.24 In the field of Digital TV, presently, there are three international standards, namely, Digital Video Broadcasting (DVB), Advanced Television Systems Committee (ATSC) and Integrated Service Digital Broadcasting (ISDB).

5.25 DVB standard has been developed in Europe by the DVB Group which is a consortium of broadcasters, network operators, manufacturers etc. It has three

variants i.e. DVB-T, DVB-S and DVB-C corresponding to terrestrial, satellite and cable platforms. It is based on MPEG-2 transport stream. DVB-S has become almost an international standard for DTH transmission. DVB-C modulation system is based on **quadrature amplitude modulation (QAM)** rather than QPSK. The system is centered on 64-QAM, but lower-level systems, such as 16-QAM and 32-QAM can also be used. In each case, the data capacity of the system is traded against robustness of the data. Higher-level systems, such as 128-QAM and 256-QAM, may also become possible, but their use will depend on the capacity of the cable network to cope with the reduced decoding margin. In terms of capacity, an 8-MHz channel can accommodate a payload capacity of 38.5 Mbit/s if 64-QAM is used, without spill-over into adjacent channels. Thus about 12 numbers of digital TV channels with bit rates ranging between 2 to 4 Mbp/s can be delivered against one analog TV channel utilizing the same bandwidth. DVB system has been adopted by the European Telecommunications Standards Institute (ETSI) as a European Standard. Singapore, Taiwan, Australia and New Zealand have also adopted the system.

5.26 ATSC Digital TV standard has been developed in USA. It allows introduction of High Definition Television (HDTV), Standard Definition Television (SDTV), Data Broadcasting, Multi channel surround audio. It is based on MPEG-2 compression format. Apart from US, the ATSC standard has been adopted by South Korea and Mexico. Japan has adopted Integrated Service Digital Broadcasting (ISDB) which is close to DVB as the national standard which is intended to provide for the integrated transmission of a wide range of digital video, audio, data and interactive services. It is also based on MPEG-2 video compression technique.

5.27 In India, DVB-S has been adopted as the DTH transmission system as detailed in BIS standard No. IS 15377 : 2003. Though, formally no standard has been adopted for the Digital Terrestrial TV Broadcasting (DTTB) in the country, Doordarshan has set up experimental Digital Terrestrial TV transmitters in four metros following DVB-T standard. In the case of digital Cable TV, BIS standard No: IS 15245 published in 2002 recommends DVB-C as the technical standard. A list of BIS standards relevant for Digital TV is at Annexure I.

5.28 From the foregoing the following issues arise for consultation:

- **Whether the existing BIS standards for digital cable TV are adequate or there is a need to modify them or define new ones?**

Incentives to expand the Digital Cable TV Subscribers

5.29 As per the industry estimates, out of total population of about 90 million TV sets in the country, about 45 million sets are black and white. Thus the penetration level of black and white TVs is around 50%. In the year 2003, the production of black and white TV sets in the country was about 2.5 million units, which was around 25% of the production of colour TV sets.

5.30 Many of the black and white TV sets sold in the market today come with mechanical tuner which could receive only few channels as compared to the electronic tuner which can provide upto 100 TV channels. The cost of conversion from mechanical to electronic tuner works out to about Rs.500. The retail prices of a 14" black and white TV set range between Rs.1500 to Rs.2000. Presently the excise duty on these TV sets is 16% as compared to 4% in 2001.

5.31 The incremental cost for digital cable services would come down substantially with the increase of subscriber base. Many owners of black white TV sets may like to avail digital cable services when these services become more affordable. To increase the affordability and expand the digital market it may be desirable to give incentives for local production of digital decoders and black and white TV sets.

5.32 From the foregoing the following issues arise for consultation:

- **What incentives should be given to boost local production of digital decoders and make black and white TVs more affordable?**

Annexure-I to Chapter 5

Cost estimates for Digitalization

- **Digital Head End**

a. The Digital Cable TV head end is the key component of any digital cable TV network. Worldwide, this is a relatively new technology. As a result, equipment costs are high and generally professional grade equipment is available from handful of reputed manufacturers. Low grade equipment is also available which is much cheaper. There is however reluctance from established players to buy lower cost head end equipment.

b. While professional grade headends could be good solution for large headends catering to around 200000 or more subscribers, their cost is prohibitively expensive for smaller networks. Smaller networks can effectively digitalise their headends by selecting low cost equipment having limited features. Therefore the cost estimates for digital headends catering to bigger networks are based on professional grade equipment and independent networks having subscriber base of around 5000 have been calculated for low cost equipment.

c. The cost estimate for a 210 channel digital head end having the following specifications have been made.
   i. 30 analogue channels head end
   ii. 36 channels via digital local encoding
   iii. 144 channels through digital turnaround

d. The cost for digital headend having above-mentioned specifications for professional grade equipment is estimated to be Rs 13.93 crores. Similar digital head end with low cost equipment would cost around 2.23 crores. This cost does not include the cost of conditional access system.

e. The headend cost of Rs.13.93 crores has been used for urban networks with subscriber base of 50,000 or above. For smaller networks, which are mostly in semi-urban/rural areas, the cost has been taken as Rs.2.23 crores. The head-end capital cost per subscriber for various configurations is given in the Table A.1 below.

Table A.1
Head End Capital Cost

Cable Networks	**Urban Networks – Horizontal & Vertical**		**Semi Urban Cable Networks**	
No. of subscribers	50,000	2,00,000	500	5,000
Capital cost per subscriber (Rs)	2786	697	44450	4445

- **Cable Distribution Network**

f. About 5 years ago, a forward path bandwidth of 550 MHz was the state of the art worldwide. As technology progressed, amplifiers and distribution equipment were enabled to provide 750 Mhz connectivity 2 years ago. Today 850 MHz is more or less standard distribution equipment available in the international market. 550 Mhz equipment was phased out and replaced by 750 MHz equipment at approximately the same price. Subsequently 860 MHz equipment is now offered at only a small premium over the price of 750 MHz equipment. Today 550 MHz equipment have been phased out. Both 750 MHz and 860 MHz equipment are available though the price difference is narrowing down. A year from now 750 MHz equipment probably would be phased out, providing better economy of scale for the 860 MHz equipment.

g. Given the design complexities it is difficult to separately demarcate the additional cost of return path cable distribution system. However it would be reasonable to estimate that the return path plant will account for approximately 25% to 35% of the overall bi-directional distribution plant. For cost estimation for the present exercise it is taken as 30% i.e cost of unidirectional cable network would be about 30% less than the bi-directional cable networks.

h. Due to small sizes of networks in semi-urban areas, it seems unlikely in near future that cable modem, IP telephony and other interactive services are likely to be deployed on smaller cable networks. Therefore cost estimates of bi-directional cable system have been calculated for urban networks only. Semi-urban cable networks have been assumed to be Uni-directional. Further due to limited bandwidth requirement in the semi-urban cable networks, the cost estimates have been made for networks of bandwidth 550 MHz and 750 MHz. However for urban networks costs have been estimated for 750 MHz and 860 MHz networks.

i. The network is assumed to have full power backup. Cost of rights of way etc have also been taken into account besides usual other network element in cost estimates. The estimated capital cost for setting up a new distribution plant capable of delivering digital signals for urban networks is given in table A.2 and for semi urban/rural networks is given in table A.3.

Table A.2
Capital Cost of a New Urban Bi-directional Cable Distribution Plants

Rs Lakhs

Band width	**Area**	**Number of Subscribers**	
		50000	200000
860 MHz	Urban- Horizontal	1698.57	6685.02
	Urban Vertical	1052.09	4028.92
750 MHz	Urban- Horizontal	1027.25	6577.25
	Urban Vertical	1107.28	3972.69

Table A.3
Capital Cost of a New Semi Urban Unidirectional Cable Distribution Plants

Rs Lakhs

Band width	**Area**	**Number of Subscribers**	
		500	5000
750 MHz	Semi Urban	13.58	125.32
550 MHz	Semi Urban	13.58	125.14

- **Cost of Up-gradation of Distribution Network for Digital Transmission**

j. The cost estimates of setting up a new digital cable distribution plant is given in table A.2 & A.3. However the cost of up-gradation of network would be substantially lower than the cost of new equipment. The extent of upgrade necessary, varies from reconnecting cable joints, to replacing connectors and passive tap offs to more cost intensive measures of replacing cable or in extreme cases, sections of the distribution plant. It is estimated that the cost for up-gradation would be only around 30% of the new plants. An extensive test was carried out in one of the Pune network to cross verify the cost estimate of up-gradation of networks.

k. Pune was identified to represent a typical non-metro city, where digital services are likely to be rolled out in the second phase of digitisation i.e. after the metro cities. The tests in Pune checked 40 worst cases subscriber location along the network. These locations will provide a worst case scenario and most typical subscribers will receive better signal quality. The tests indicate that 25 out of a total of 40 worst case locations were able to receive satisfactory digital signals, without any modification. Fifteen worst case subscribers out of 40 did not receive satisfactory digital signals and their distribution plant needed an upgrade. This indicates that, in the Pune network, 63% of worst case subscriber did not require any upgrade what-so-ever. The figure concurs fairly well with the estimate that 30% of the cost for a new plant; is likely to be required to roll out digital STBs on existing cable TV networks, countrywide.

- **Cost of Customer Premises Equipment**

l. Existing TV sets are not compatible to receive/display digital Cable TV signals screens. The digital signals are to be decoded and converted into an analogue mode using a digital decoder to make them compatible with the existing TV sets. Generally these digital decoders are embedded in a Set Top Box having additional features like de-encrypting scrambled channels (using a CAS), provide interactive services etc. Simple decoders without additional features of a Set Top Box can be

made available in the market and would be much cheaper than the conventional STBs.

m. During CAS regime various models of digital STBs were launched. These were priced between Rs.3500 and Rs.5000. These STBs were also offered on rental schemes with monthly rental of Rs.30. The cost of a digital decoder is less than such Digital STBs as it does not include the capacity to decode encrypted channels. It has been discussed in para 5.20 of chapter-5 that cable companies like M/s Comcast have launched digital decoders for US$ 35. For the present exercise the monthly fees for digital decoder is taken as Rs.20 per month.

Annexure-II to Chapter 5

List of BIS Standards relevant to Digital Cable TV System

Sl. No.	Title of the BIS Standard	No. of BIS Standard
1	Cabled Distribution Systems For Television And Sound Signals (Part 1- Methods Of Measurement And System Performance)	IS 13420 (Part-1):2002
2	Cabled Distribution Systems For Television And Sound Signals Specification (Part 1- Safety Requirements)	IS 14231 (Part-1):1995
3	Cabled Distribution Systems For Television And Sound Signals Specification (Part 3- Active Coaxial Wideband Distribution Components)	IS 14231 (Part-3):1995
4	Cabled Distribution Systems For Television And Sound Signals Specification (Part 4 – Passive Coaxial Wideband Distribution Components)	IS 14231 (Part 4):1995
5	Cabled Distribution System For Television And Sound Signals Specification (Part 5- Headed)	1S 14231 (Part-5):1995
6	Cabled Distribution systems for Television and sound signal (Part 6 - Optical Equipment)	1S 14231 (Part 6)
7	Cabled Distribution Systems For Television And Sound Signals (Part 7-Electro Magnetic Compatibility For System And Components)	IS 14231 (Part 7):1999
8	Cabled Distribution Systems For Television And Sound Signals (Part 8- System Performance of Return Path)	IS 14231 (Part 8):2002
9	Cabled Distribution Systems For Television And Sound Signals (Part 9-Interfaces Of Cabled Distribution Systems For Digitally Modulated Signals	IS 14231 (Part 9):2002
10	C-Band Parabolic Dish Antenna-Specification	IS 14230: 1995
11	Satellite Signal Distribution On Cabled Distribution Systems- Specification	IS 14264: 1995
12	Digital Set Top Box – Specification	IS 15245: 2002

Chapter 6: Issues for Consultation

Chapter 2

(i) The approach to digitalisation of Cable television internationally appears to favour the determination of a launch date and keeping the complete changeover flexible. Should a similar approach be followed in India and in which case what should be the launch date keeping in mind the necessary preparatory steps needed to do so?

(ii) Would it be desirable to have five year plan for the period 2006-10 with the termination coinciding with the Commonwealth Games?

(iii) Whether an annual target of the number of cities should be laid down and if so what should be the cities to be covered in each year and what should be the criterion for such selection?

(iv) Whether for each city an annual target should be laid down for the number of subscribers to be covered and if so how should this target be fixed?

(v) Should there be a differential pricing regime for digital networks and if so what should be this framework? Should prices be completely deregulated in a digital network?

(vi) What fiscal incentives can be given to promote digitalisation? Should there be a differential rate for entertainment tax and service tax or should there be a waiver from these taxes for a limited period of time? Should there be any reduction in import duty and if so at what rate and on what components/products?

Chapter 3

(vii) Should licensing be automatic or should it be restricted to a limited number of players? If the latter is to be done, how many Operators should be permitted in each area and what should be the manner of selection?

(viii) What should be the entry fees for Digital licenses and what should be the annual fees?

(ix) What should be the limit on foreign direct investment for digital licenses? What should be the limits on foreign loans as well as on FII Investment?

(x) What should be the limits on investment by Broadcasters in a digital licensee both by way of equity as well as through loans?

(xi) Should the licenses be given by the Government of India, the State Government or by the Authorised officers?

Chapter 4

(xii) Whether 'must carry' of TV channel be imposed on Digital Cable Networks? If so, what should be the terms of carriage of TV channels?

(xiii) What should be the principles of non –discriminatory carriage?
(xiv) Whether Authority should regulate carriage charges on digital and analogue cable networks? If so, on what Basis should this be done and how should carriage charges be calculated?

Chapter 5

(xv) To promote digitalization, should CAS be implemented only on the digital platform in the future?
(xvi) Should development of digital decoders as well as plug and play digital TV Receivers be encouraged to promote digital cable TV industry in the country?
(xvii) Whether separate BIS standards are required for development of digital decoders in the country?
(xviii) Whether the existing BIS standards for digital cable TV are adequate or there is a need to modify them or define new ones?
(xix) What incentives should be given to boost local production of digital decoders and make black and white TVs more affordable?