

# Ciel Satellite Group



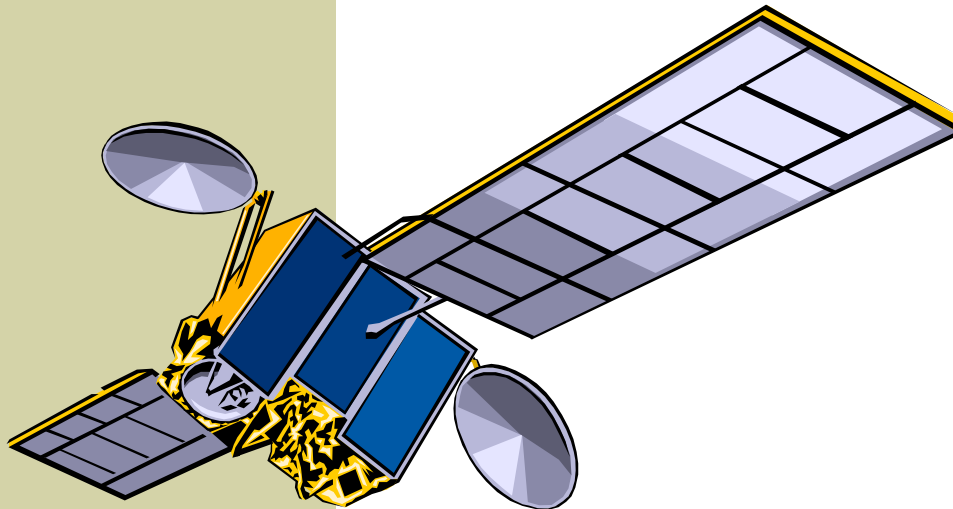
## Market Assessment of Broadcast Market for Satellite Services in Canada (Abridged)

by **Nordicity Group Ltd.**

Nov. 3<sup>rd</sup>, 2006



Nordicity Group Ltd.  
Le Groupe Nordicité Inc.



## Executive Summary

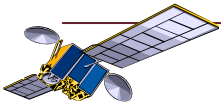
The demand for broadcast satellite bandwidth is beginning to outstrip current supply and capacity will be a bottleneck until new capacity becomes operational. By 2010, approximately 25% of current TV channels will have launched HD versions; by 2015 90%, and by 2020, 100%. However, existing SD services cannot be switched off and thus save capacity before 2020.

This HD conversion is driven by:

- An increase in consumer demand for HD, slightly lagging behind, but following the U.S.;
- Broadcaster demand for HD carriage in order to retain viewers and meet HD service competition;
- A likely analog switch-off date – enforced or targeted – of 2012;
- A reduction in transmission costs given MPEG-4 technology, although following a transition period.

By 2012 the total transponder demand for HD will have risen from 34 today to 83, and both DTH operators will need another satellite each.

By 2016 the demand for transponders for HD will have climbed to 191. By this time, both Star Choice and Bell ExpressVu will need an additional satellite.



# Introduction – Call for Applications and Objectives of this Report

## Context – call for applications

- In its call for applications to license satellite orbital positions (DGRB 001-06), Industry Canada stressed the need for applicants to demonstrate they were focusing on meeting the needs of Canadian users.
  - “...*applicants are ... required to provide their plans for providing capacity to satisfy Canadian requirements.*”
- The call reflected discussions that Industry Canada had held with industry, which had pressed the need for additional capacity, especially in broadcasting:
  - “...*(it is) clear that moving forward with HDTV, combined with the foreseen changes in the regulatory environment, will require significant new capacity.*”
- The call also emphasized that service to all parts of Canada, in particular to the underserved and un-served market, was expected of applicants.
  - “... *new satellite capacity...expected to be delivered to all parts of Canada to identify, address and satisfy foreseeable satellite capacity and service requirements.*”

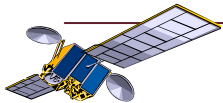
## Report: objective and focus

The objective of this report is to assess the market for two separate satellite applications – the demand from broadcasters and the market for broadband Internet ISPs now underserved, or not at all served, by operators of terrestrial high speed Internet networks.

The focus is on the Canadian market, although it recognized that the Americas represents the potential market for new satellite operators.

## Terms of reference

- **to demonstrate that there exists in Canada a need for satellite facilities for the future growth of broadcast services**, largely driven by the migration of television services to HD, but also including new channels, and new applications.

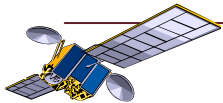


## Methodology for Assessing Broadcasting Demand

The overall approach for this market assessment is to start with the **existing demand** and generate forecasts of new demand for the planning horizon – set as 14 years, or until 2020.

Evidence was gathered through meetings with major broadcasting groups in Canada and through reviewing existing publicly available documentation. The project team then identified a series of key drivers which will ultimately determine the capacity demand. These drivers are:

- The **demand by DTH operators** for HD services, whether the over-the-air conventional broadcasters or the pay/specialty services;
- The cost and availability of **HD-related technologies** including broadcaster plant and operations, and the availability of DTH supply capacity, ultimately driven by the pace of adoption of MPEG-4 standard for video compression and its implementation by DTH operators and pay/specialty broadcasters; and the improvement in compression and modulation approaches to wring more throughput out of MPEG-4 and how long a transition period there would be from MPEG-2 to MPEG-4;
- The cost and availability of **satellite distribution capacity** including the transport charges that broadcasters have to pay for higher bandwidth to reach terrestrial BDUs;
- The **consumer take-up** of (i) HD ready TV sets, and (ii) HD digital set-top boxes, itself determined by TV set replacement cycles, consumer prices, and the amount of HD TV channels and programming that is available;
- The **availability of content by genre**, the increasing availability of programming in HD, taking into account that HD programming would be available in some genres (e.g. sports and movies) sooner than others (e.g. news operations, children's), which will in turn drive which channels are able to migrate to HD;
- **New channel launches**, derived from examining the past few years of net new diginets launched, broadcaster plans for future launches and whether they would be in SD or HD, and taking into account the growing accessibility of video programming on an on-demand basis;
- The **regulatory policy decisions** concerning the requirement as to:
  - OTA broadcasters: whether they had a deadline for conversion; whether they could limit conversion to large market transmitters only; whether BDUs would be obliged to carry all affiliates if in HD;
  - pay/specialties: whether they would lose regulatory protections if they did not convert, and whether the regulatory would intervene on their behalf regarding pricing of access to DTH operators.

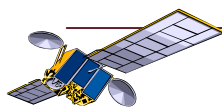
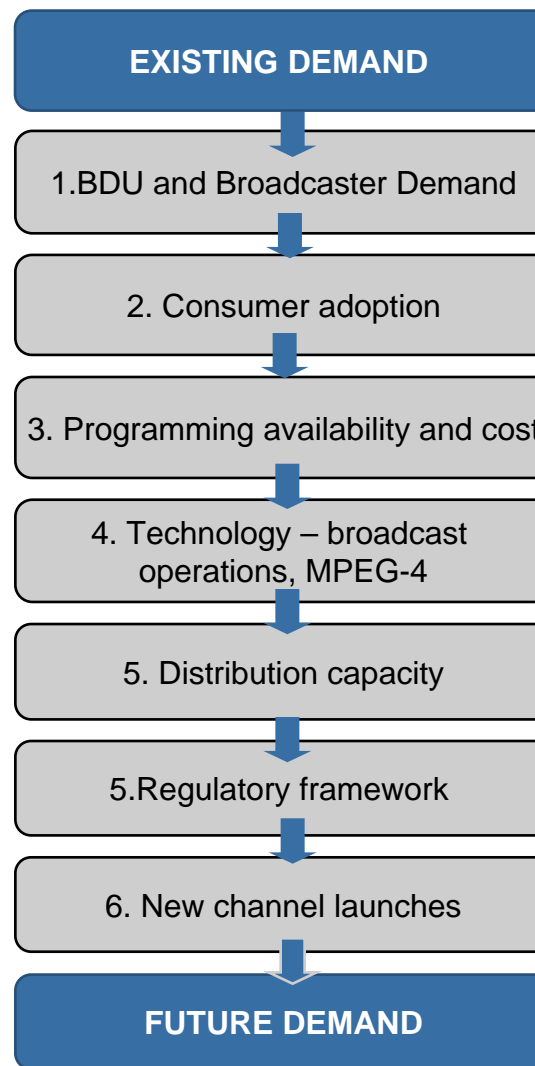


## Methodology for Assessing Broadcasting Demand

This report takes each market driver in turn (as outlined in the adjacent figure), offers several scenarios for consideration, and identifies how these drivers impact the broadcaster' decision-making process. The following questions are addressed:

- When should broadcasters launch an HD version of their channel or channels as a defensive measure to avoid losing audience vis-à-vis their competitors?
  - For conventional, how many owned and operated (“o and o”) stations should they provide in HD? One per time zone? For major markets only? For all local services?
  - For pay/specialty services, which one or ones should migrate to HD first and what would be the subsequent roll-out of the conversion to HD?
- Given that many TVHHs will be receiving TV in standard digital for many years to come, when can pay/specialties shut down their SD signals transmission?
- How much will conventional broadcasters have to invest in building an HD transmitter network, and how long will they need to maintain their analog over-the-air transmission?

While broadcasters decide which channels to launch in HD, absent regulatory stipulations mean that the BDUs remain the ultimate arbiters of which channels are offered to consumers. The difference in SD and HD carriage by the two major DTH BDUs in Canada shows how it operates in practice.



## Demand: Current SD Channels (2006)

Currently, Star Choice carries approximately 308 total Standard Definition (SD) signals. Bell ExpressVu carries approximately 373 SD channels. The main types are:

- Local/regional signals of **over-the-air (OTA)** CBC/SRC, Canadian private, and educational broadcasters;
- **Analog Specialty Channels:** Although transmitted by DTH operators as digital, and to cable head ends in digital, they are distributed by cable in analog to cable TV households not yet subscribing to digital cable.
- **Category 1 and Category 2 specialty digital** channels, which can only be distributed by cable as digital services; BDUs are required to carry cat. 1 services, which have more Canadian content obligations than cat. 2 services, which are optional to BDUs; many ethnic channels are cat. 2 licensees;
- Authorized **foreign specialty services** for distribution, some available in analog to non-digital cable subs, and typically distributed to cable head ends in Canada from U.S. satellites;
- **Pay-TV services:** premium linear channels, now being offered by cable in subscription video on demand (SVOD) format – primarily movie channels, with some drama series;
- **Pay-per-view channels**, channels with multiple program offerings, typically movies charged on a per viewing basis.

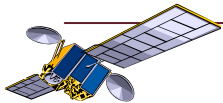
Note that Bell ExpressVu carries nearly 20% more channels overall, and nearly twice as many pay-per-view signals. Conversely, Star Choice carries significantly more U.S. networks.

**Table 20: Satellite BDU Offerings\***

	Bell ExpressVu	Star Choice
Digital specialty - Category 1	18	18
Digital specialty - Category 2	50	37
Authorized foreign specialty services	26	18
OTA educational	6	5
OTA private/CBC-SRC	81	75
Pay-TV	17	15
PPV**	95	55
Analog specialty	65	65
U.S. Network	15	24
<b>Grand Total</b>	<b>373</b>	<b>308</b>

\*Note: these figures do not include audio services, descriptive video, PPV preview channels, and barker channels.

\*\*Note: PPV offerings represents the number of PPV appearances on the program guide. The number of equivalent 24/7 full use channels is less – e.g. for Bell ExpressVu, approximately 50.



## Demand: Current HD Channels (2006)

Bell ExpressVu currently carries 47 HD channels. With less capacity, Star Choice carries only 18 HD channels.

The highest proportion of Bell ExpressVu's HD offering is comprised of pay-per-view channels, primarily sports, followed by U.S. network signals. Star Choice's offering is driven by numerous signals of the major U.S. networks as well.

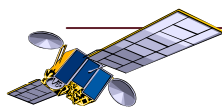
Both DTH providers carry two signals of some of the major U.S. networks. However, Star Choice carries only one of each Canadian network, whereas Bell ExpressVu carries two signals of each network.

Based on conversations with broadcasters, it is evident that the satellite BDUs develop their channel line-ups to be competitive with one another. Therefore, it is likely that both DTH providers will try to match HD offerings as capacity permits, thus adding pressure for adequate satellite capacity.

**Table 21: Satellite BDU offerings**

2006	Bell ExpressVu	Star Choice
Digital specialty - category 1	0	0
Digital specialty - category 2	6	0
Authorized foreign specialties	1	1
OTA educational	0	0
OTA private/CBC-SRC	7	3
Pay-TV	5	3
PPV*	14	0
Analog specialty	3	3
U.S. network	11	8
<b>Grand Total</b>	<b>47</b>	<b>18</b>

\*Note: PPV offerings represents the number of PPV appearances on the program guide. The number of equivalent 24/7 full use channels is less – e.g. for Bell ExpressVu, approximately 4.



## Demand: BDU's Offerings

BDUs have started to compete on the basis of how many HD services they offer – led by Rogers and Bell ExpressVu. This competition will inevitably lead to more demand for HD services and will drive HD PPV, HD specialties, and HD network affiliates/local OTA services.

### Pay Per View Offerings

Research indicates that on-demand, or near on-demand offerings, are growing in popularity. For example, 44% of digital cable subscribers have used VOD (Solutions Research Group (2006), *TechTrends*, Commissioned by the CRTC). Major multiple system operators (MSOs) in Canada have greatly expanded their VOD offerings.

While VOD is not yet HD-capable, all BDUs are offering HD PPV, and cable services will at some point offer VOD in HD. To compete, DTH operators are currently offering multiple HD PPV channels which consumers can store in HD PVRs.

Based on the assumption that cable over time moves to offer VOD in HD, it is likely that cable providers will reduce the number of PPV channels. However, to remain competitive, DTH operators will likely maintain, and if anything, increase their offering of PPV HD (+ HD PVR) to stay competitive with cable's move to HD VOD.

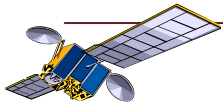
### Specialty-TV Offerings

HD versions of Canadian analog specialties and digital category 1 services that reach the required level of approximately 50% HD content must be carried by all BDUs. Thus, to some extent HD program availability will drive the migration of those channels to HD.

However, the carriage of category 2 services or foreign specialties converted to HD will be driven by what BDUs calculate they need to compete with other BDUs and what will drive HD box uptake. BDUs will not long be able to let their competitors get too far ahead in terms of carriage of HD services.

### Network Affiliate Offerings

Absent regulation stipulating what HD affiliate signals must be carried, BDUs will carefully select which stations are carried in order to appeal to consumers in different time zones and with different regional content requirements. No BDU carries more than one English CBC HD feed, although Ottawa, Toronto, Vancouver, and Hamilton are available. SRC is offered by both DTH BDUs.



## Broadcaster Demand: Consumer Take-up as a Key Driver

Ultimately, the reason that broadcasters are offering HD to maintain a competitive edge over other broadcasters is to ensure they remain front-of-mind. While consumer uptake of HD services is slow, broadcasters consider it important to be present in HD to ensure that the right viewing habits are formed. As viewer uptake grows, tuning habits will increasingly be driven by what is offered in HD and broadcasters must transition to prevent loss of viewership.

Today's low consumer take-up does not drive the conversion to HD in the short-term. However, understanding the likely trajectory of consumer uptake of both sets and receivers will drive the following events:

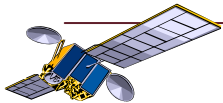
- When broadcasters will launch new services only in HD;
- When broadcasters will launch all existing services in HD;
- When ultimately they will shut down their SD signals.

Based on interviews, it appears that it will take a HD digital box penetration well over 50% before all three events will occur.

Specifically, based on interviews with broadcasters and secondary research, Nordicity developed a series of assumptions for the purposes of forecast modeling.

In order to determine when precisely these three events will occur, Nordicity developed an estimate of future consumer uptake based on the following indicators, outlined on subsequent slides:

- U.S. uptake
- Digital uptake in Canada
- Purchase of HD sets in Canada
- Number of receivers in households



## Consumer Adoption: Forecasted U.S. HDTV set uptake

The U.S. is significantly ahead of Canada in terms of HD set uptake – Screen Digest estimates current uptake of sets at approximately 19.5m households. Canada's uptake will lag the U.S., as a country which has not established an analog shut out deadline.

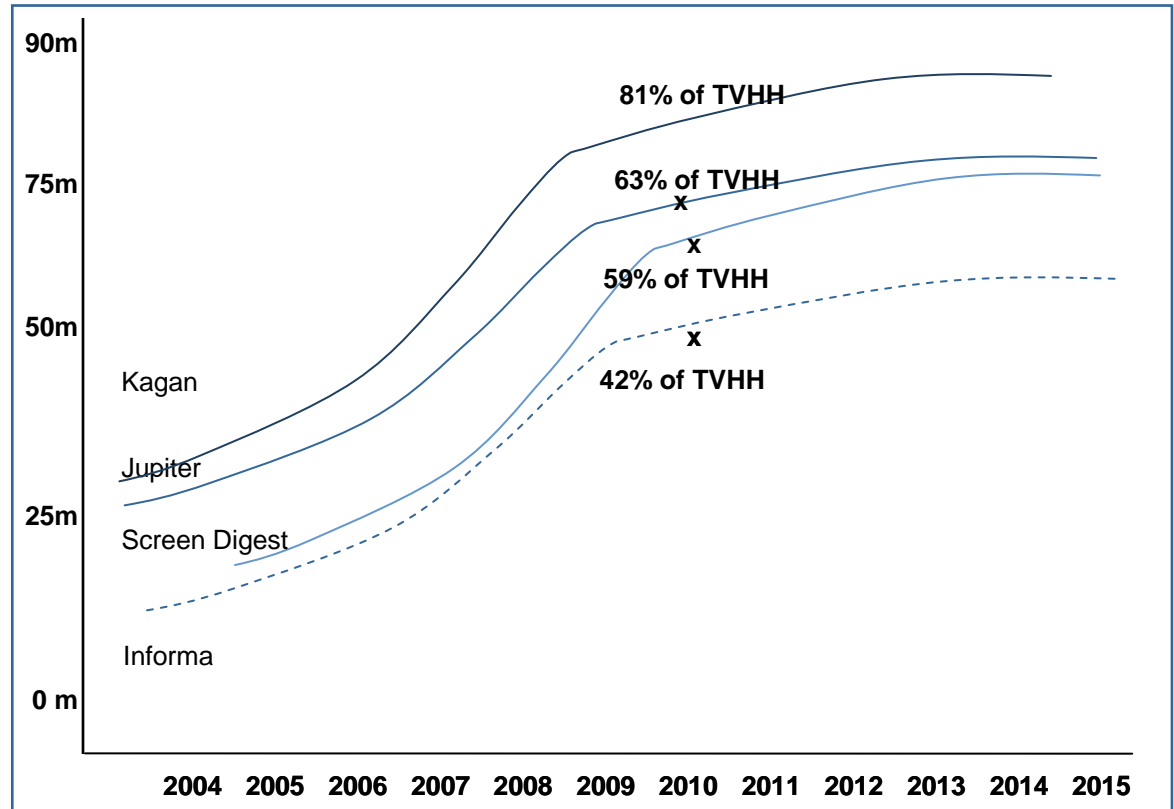
### HD TV Sets

In the U.S. by the end of 2004, HDTV sets made up 21% of overall TV sales, according to Jupiter Research. Sales have increased year-on-year dramatically since then. In 2004, Jupiter predicted that number will rise to 70% of overall TV sales by the end of 2010, and a Kagan forecast was even more bullish, predicting 84%. Screen Digest and Informa have both issued more conservative forecasts, demonstrating the disparity of views over the predicted roll-out of HD.

### HD Set-Top-Boxes

The critical statistic for the broadcasting industry, however, is those actually viewing HD broadcasts – currently, 60% of those with an HD set are watching HD broadcasts (Screen Digest). It will likely increase as more content becomes available, and tv households subscribe to HD digital services.

Table 22: U.S. Forecasts of HD set uptake



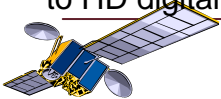
Sources:

<http://www.jupitermedia.com/corporate/releases/05.10.06-newjupresearch.html>;

<http://www.kagan.com/ContentDetail.aspx?id=244>

[http://www.screendigest.com/reports/mini/2004/hdtv\\_coming\\_of\\_age\\_in\\_the\\_usa/01-12-2004-10/view.html](http://www.screendigest.com/reports/mini/2004/hdtv_coming_of_age_in_the_usa/01-12-2004-10/view.html)

<http://www.dtg.org.uk/news/news.php?id=1131>



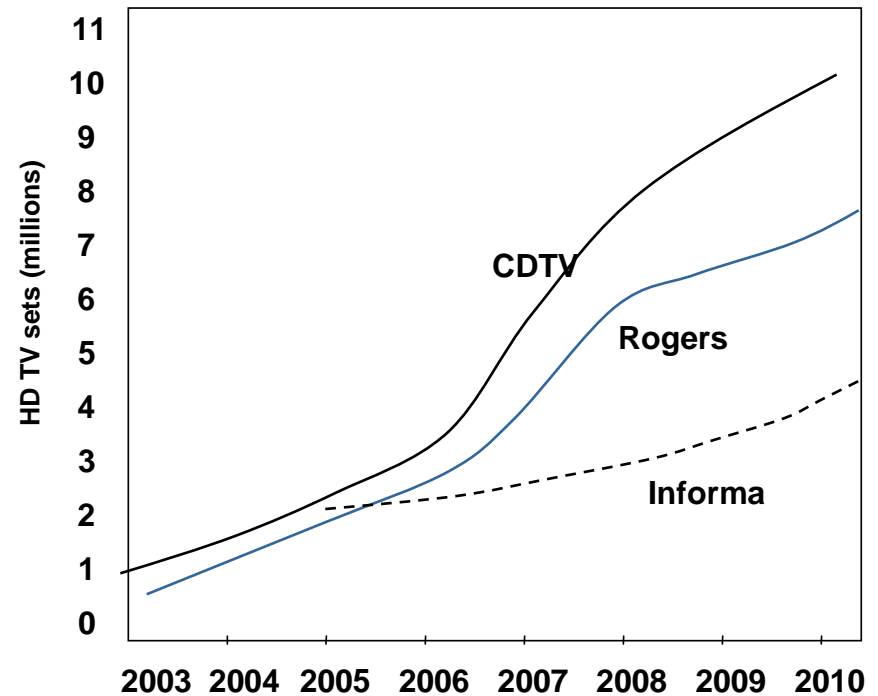
## Consumer Adoption: Forecasted Canadian HDTV set uptake

As is the case in the U.S., forecasts regarding Canadian households with HD displays vary significantly. The adjacent chart demonstrates three different views of the uptake rate of sets for HD displays.

The highest forecast – developed by the CDTV – forecasts almost 10 million HD TV sets by 2010. In response to *PN 2006-72* Rogers indicates that set uptake would reach nearly 63% of households in Canada by 2010. Considering that figure represents the more optimistic view in the U.S. where uptake is currently significantly ahead of Canada, the CDTV forecast is very high.

Informa Research group proposed in a worldwide HD study that uptake in Canada would reach 4.3m sets by 2010. Compared to the Rogers and CDTV forecasts, the Informa forecast appears to be fairly conservative.

Table 23: HD TV Sets in Canadian Households

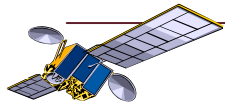


*Sources*

Rogers submission to CRTC BPN 2006-72, p. 31

Informa Research, <http://www.dtg.org.uk/news/news.php?id=1131>

CDTV Forecast (2003)



## Consumer Adoption: HDTV Set-Top Box Uptake

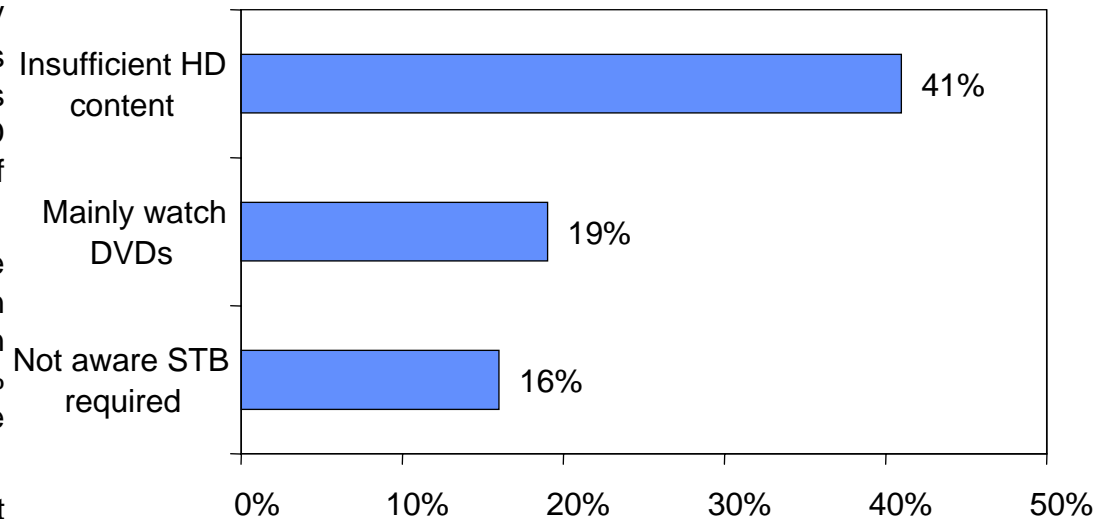
Even though the number of HD sets is growing in the market-place, a significant proportion of users are still not subscribing to HD set-top boxes.

In a survey cited by Rogers in their submission to CRTC PN 2006-72, the lack of HD content on TV is dampening the uptake of HDTV set-top boxes – see table 24 adjacent. However, as broadcasters flesh out their schedule with HD programming, and BDUs offer a fuller range of channels in HD, this gap narrow.

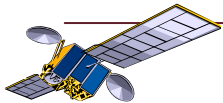
As the available content increases, and as the public becomes better educated, the proportion of consumers with HDTV sets subscribing to an HDTV set top box is forecast to reach about 70% in 2010. This estimate is based on the conversion of HDTV set owners as follows:

- Currently, 41% of set owners do not subscribe because there is not enough content, and 16% don't know they need an HD digital STB.
- If we project those percentages to the future set-owner base, but assume 30% change their mind about there not being enough content, and 10% learn they need a set-top box, 70% of all set owners would subscribe.

**Table 24: Reasons for Not Getting HDTV Set Top Box**



*Survey results reported by Ipsos-Reid, May 2, 2005; cited in Rogers Submission to CRTC Broadcasting Public Notice 2006-72, page 21, August 2006*



# Consumer Adoption: HDTV Set and Set-Top Box Uptake

Based on secondary research and on the forecasts of CDTV, PwC, and Rogers, the following logic was used to estimate the number of HDTV service subscribers in 2010:

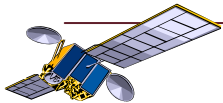
- PwC predicts that by 2010, there will be 9.3m digital TV households in Canada, approximately 72% of TV households;
- Rogers predicts that by 2010, there will be 7m HD sets\*;
- Michael McEwen (CDTV) estimated that there were 400,000 HD subscribers in 2005, at 30% of HDTV set households;
- Currently, 30% of HDTV set owners have access to HDTV programming through set-top box; it is estimated that this percentage could grow proportionally to nearly 70% by 2010 (see slide 39).
- Based on Roger’s 2010 projection for HDTV sets, it is estimated that by 2010 there will be almost 5m HD subscribers in 2010 – equating to 39% of TV households.

Once there is sufficient BDU capacity to accommodate all the HD channels beyond that period, most HD TVHHs would subscriber to a BDU’s HD digital set-top box and HD service. Once broadcasters started to phase out SD, that number should reach 90+%.

**Table 25: HDTV Households**

(millions)	2005	2010
<b>TV Households - total</b>	12.1	12.6
<b>Total DTV households</b>	5.3	9.3
Number of households with an HDTV set	2	7
<b>% of households with an HDTV set</b>	<b>17%</b>	<b>56%</b>
<b>% estimate of HDTV households with set-top box</b>	30%	70%
Total HD subscribers	0.4	5
<b>% estimate of households receiving HDTV broadcast services</b>	<b>3%</b>	<b>39%</b>

*Source: PWC Media and Entertainment Outlook 2005; Informa Media projections; Rogers CRTC Submission BPN 2006-72, August 31, 2002; Nordicity Estimates*



# Consumer Adoption: HDTV Set and Set-Top Box Uptake

Many Canadians replace their set after more than 10 years – 17% of Canadians have televisions that are 10 years old or over, and 30% between 5 and 10 years\*. Although replacement is expected to occur more rapidly as broadcasters convert to HD, 100% of penetration of HD sets will not likely happen until 5-10 years after the point when *only* HD TV sets are being sold. As such a point will not likely happen for at least another 3-4 years, a full HDTV set penetration is at least 10-14 years away.

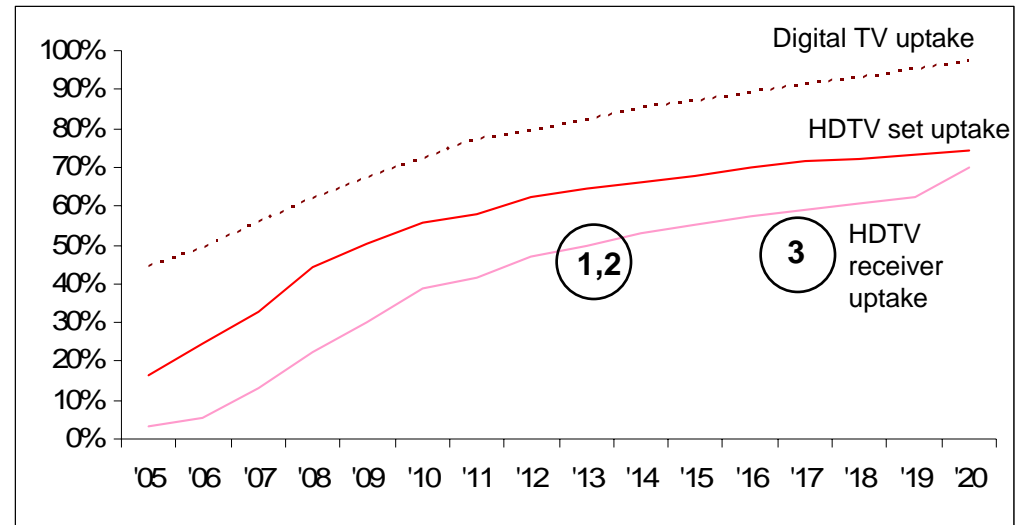
Based on forecasts and research on HD uptake available, long-term forecasts were made, taking account of key trigger points (see Table 27).

Since nearly ubiquitous HD uptake is a decade away, it is estimated that the majority of broadcasters will continue to need to transmit in SD as well as in HD until the end of the planning period.

*Note: while the 2010 forecasts are partly based on analyst forecasts, estimates beyond 2010 are rough estimates*

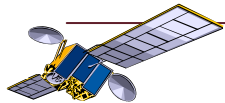
*\*Source: Fast Forward Trend Analysis, Prepared for the CRTC, Solutions Research Group*

**Table 26: Long-term HD Uptake Forecast**



**Table 27: Critical Consumer Uptake Points**

	Consumer Uptake Point	Year
(1) New services launch only in HD	50% of TV households can receive HD	2013
(2) Premium SD signals begin to shut down	50% of TV households receive HD	2013
(3) All services launch in HD	60% of TV households can receive HD	2018
(4) All SD signals shut down	90% of households can receive HD	Beyond 2020



## Programming: Migration to HD in U.S. Compared to Canada

As indicated earlier, the availability of HD programming is a key driver of subscriber uptake. In the U.S., and now in Canada, conversion to HD has been led by certain programming genres.

The U.S. experience can serve as a proxy for the migration from SD to HD in Canada, and in fact is already underway.

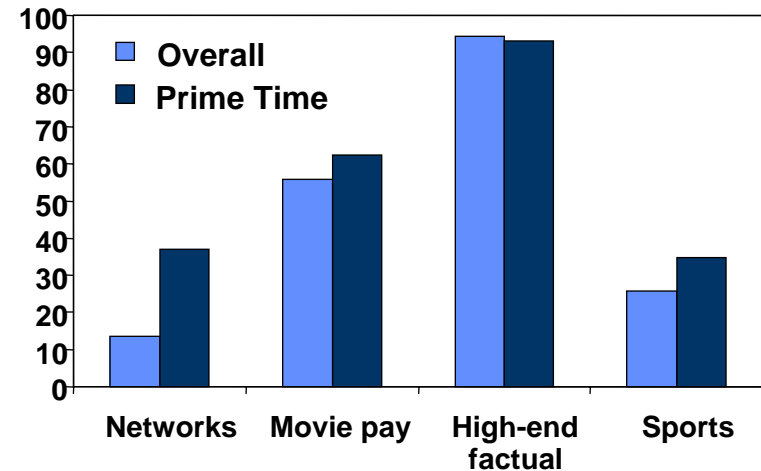
- In the U.S., the bulk of the programming that first went to HD was primarily movies, sports, and high-end factual (such as Nature) – see Table 28 at right);
- The high-end channels (such as Discovery) have the largest percentage of their schedules in HD.

In Canada, evidence demonstrates a similar trend. As seen in Table 29, the number of hours in the schedule in HD roughly reflects the make-up in the U.S.

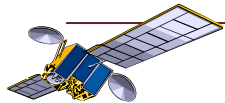
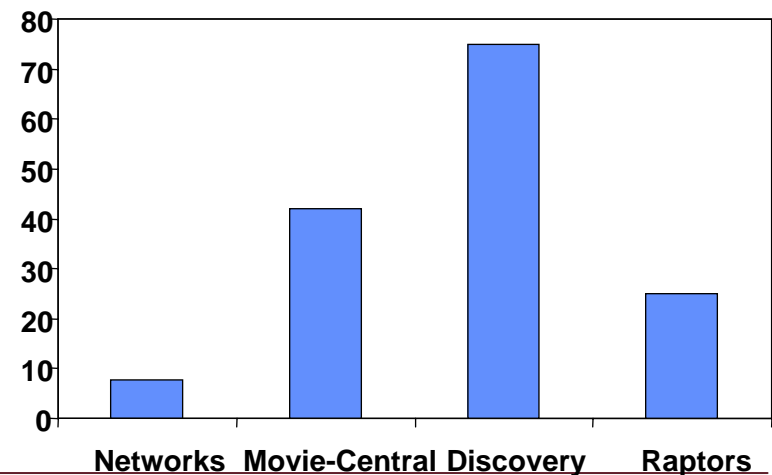
- Specialty channels in high-end factual and movies are far ahead of the conventional broadcast networks in terms of total HD hours in the schedule.

*U.S. Source: "The Availability of High-Definition Programming in the U.S.:", Armstrong Consulting (2005) Appendix 2, CAB Response to CRTC PNs 2004-58 and 2005-1..Canadian Source: CRTC Broadcast Monitoring Report, 2006, p. 77*

**Table 28: 2005: US, Percent of Total Schedule Hours in HD**



**Table 29: 2005: CA, Number of Total Schedule Hours in HD**



## Programming: CTF Production in HD by Genre

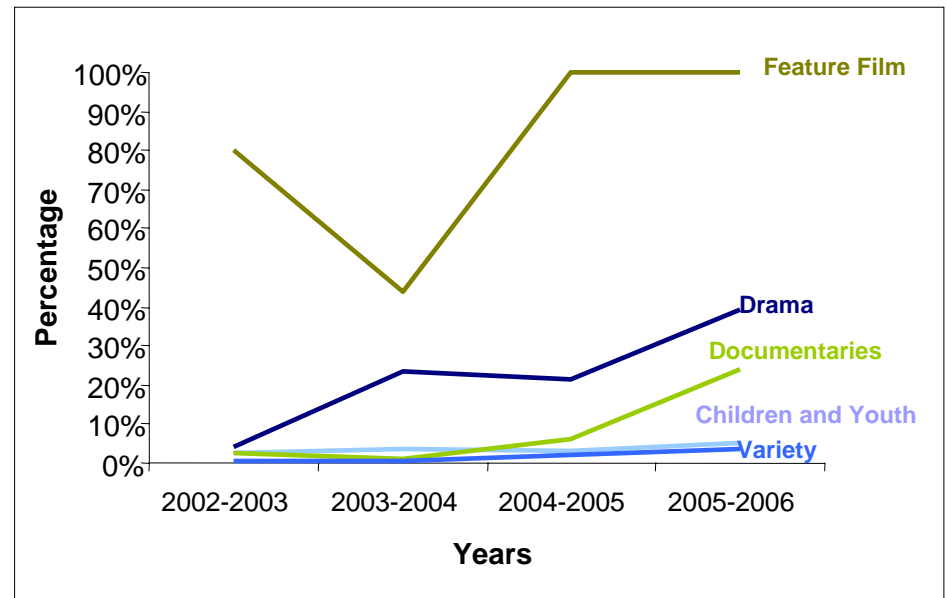
In Canada, broadcasters maintain that programming supply is a key consideration in the decision to launch in HD. If sufficient HD programming is not yet available, then broadcasters will wait.

As shown in Table 30 adjacent for Canadian Television Fund (CTF) projects, the availability of HD programming is higher in certain genres. It is increasing as the costs of production decline.

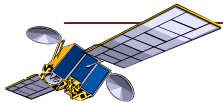
For some genres, the lack of programming material in HD (e.g. educational TV content) will impede conversion to HD. While this problem will attenuate over time, many specialty services and even over-the-air (OTA) broadcasters use library material to feed the schedule – and it will take several years before that library product is HD.

For the purposes of the forecast model, Nordicity assumes that channels will likely migrate in roughly the following order: premium movies, sports, high-end drama, high-end factual/documentary, lifestyle, news, children's, and variety and entertainment.

**Table 30: CTF-funded HD Production - Percentage of total hours funded per year**



Source: Canadian Television Fund Date, 2006



## Technology: Broadcaster Infrastructure and OTA Transmission

One of the key determinants in the drive to HD is the cost for broadcasters to upgrade their infrastructure to become HD-ready. This infrastructure includes broadcasting/editing plant, operations, and terrestrial transmission.

### Plant and programming operations

While the costs of upgrading broadcasting infrastructure to HD can be high, it is being done intelligently as broadcasters replace their plant. The HD premium on HD programming is still up to 15-20%, but it is declining; some believe it is already only about 5-10%. Thus, it is no longer a significant barrier for conversion to HD, except in operations of scale (e.g. buying new HD cameras for an extensive news service).

Once the initial upgrades are completed, the incremental cost of launching new HD channels decreases.

### Transmitters for over-the-air broadcasters

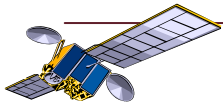
Upgrading transmitters for over-the-air broadcasting could be extremely expensive for those with extensive terrestrial networks. At present OTA broadcasters have replaced only those in the largest markets. Most of these broadcasters have been quite emphatic in pointing out the high cost in the context of the CRTC's current television policy review (PN 2005-06).

Broadcasters generally advocate that the CRTC should set a date for conversion (citing 2011-12 as possible shut-off dates.) The U.S. and most European countries have already instituted mandatory shut-off dates – in fact earlier than proposed for Canada.

Some broadcasters believe it is unlikely they will convert all their transmitters until the government offers subsidies offered to cover the cost. They point out that the population (largely urban at that) receives TV services over-the-air is only about 13% of the total, and that represents only 7% of total viewing (*Source: TechTrends 2006*).

Some broadcasters have estimated the costs of conversion, e.g.

- **CTV:** \$200 million + \$15 million annual operating;
- **APTN:** \$9 million for community transmitters
- **CanWest:** \$61 million + \$38 million in operating costs over ten years.
- **CBC:** no estimate, but proposed to upgrade to digital in core markets only – some 52 transmitters out of a total of 662 analog transmitters.



## Technology: Migration from MPEG-2 to MPEG-4 Compression Standard

The Moving Picture Experts Group (MPEG) standard is a compression standard used to encode moving images and audio. The first video compression standard was MPEG-1, and the second MPEG-2, which brought down the costs of satellite transmission to the present day levels. The new standard is MPEG-4, which effectively doubles the transmission capacity for terrestrial and satellite transmission. Advanced modulation techniques should eventually increase the capacity even more.

HD transmission requires about six times as much capacity as SD transmission, and only 2 HD services can fit on a single satellite transponder. Therefore, the MPEG-4 standard is viewed as a necessity in the economics of HD transmission. The problem is that there is already an infrastructure in place for MPEG-2 standard, including some 5 million digital set-top boxes.

Bell ExpressVu has indicated in its response to CRTC PN 2006-72, that it is focusing development on an advanced phase of MPEG-4, AVC (Advanced Video Coding). Once installed within its system, this standard will enable Bell ExpressVu to double the number of HD channels it can carry. However, as MPEG-2 digital boxes cannot decode MPEG-4, the DTH BDUs will have to swap the existing base of set-top boxes to MPEG-4 ready boxes. As a solution, Bell ExpressVu in its August 2006 submission to the CRTC indicated it intended to use both MPEG-2 and MPEG-4 for an extended period. The most logical solution is to use MPEG-4 for HD, and MPEG-2 for SD for the foreseeable future.

### CAB's Potential MPEG-4 Roll out Scenarios

#### 1. Optimistic

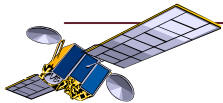
Each HD signal would require only 8.5 Mbps for MPEG-4 distribution to all customers.

This scenario assumes that all BDUs swap all MPEG-2 HD boxes for MPEG-4 capable boxes.

#### 2. Realistic

A more realistic scenario, in which MPEG-4 could be used for one set of signals, but not the other, which would still require MPEG-2 at 19 Mbps.

*\*Source: CAB, 2004, Appendix 3 – CAB response to PNs 2004-58 and 2005-1; Digital migration and HD framework proceedings, p. A3-4*



## Technology: Transition to MPEG-4

### Transition to MPEG-4 for DTH

Interviews and secondary research indicate that it is likely Bell ExpressVu will be the first out of the gate with MPEG-4, and that Star Choice will follow later. For planning purposes, 2007 and 2008 are the introduction dates for the two DTH operators respectively.

- MPEG-4 will allow Bell ExpressVu to move from a capacity of nearly 50 HD channels to 100 HD channels.
- Star Choice will be able to increase the number of channels from nearly 20 to 40.

It is unclear how the transition will be managed by the two DTH operators. It is possible that it will be staged so that some HD services will still be transmitted on MPEG-2, while others will be converted to MPEG-4. Therefore, the capacity increase may not be fully realized until between 2008 and 2010 – a 2-3 year conversion process - as the HD box swap will take some time. It does seem likely that MPEG-2 will remain as the standard for SD transmission.

### Complications for broadcasters, specialties, and cable

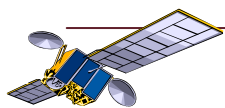
There are complications for cable and over-the-air (OTA) transmission with the introduction of the MPEG-4 standard. Such complications have cost implications though they will not impede the transition.

Complications include:

**OTA broadcasters:** The ATSC 4 standard used in over-the-air HD transmitters is in fact not compatible with the MPEG-4 standard. So, broadcasters would still need to distribute their signals in MPEG-2 to their new HD transmitters.

**Cable operators:** Cable companies use their own compression standard, and the cable head-end is only MPEG-2 compatible. Cable operators would need to invest in MPEG-4 decoders for retransmission of the HD signal from distant US and Canadian OTA stations. As well, cable operators will need to replace decoders at cable head-ends. In 1999, when Star Choice moved from MPEG-1 to MPEG-2, specialties subsidized the decoders at the cable head-ends to encourage the transition. The subsidy paid for itself over time, as less satellite capacity was needed for distribution, and distribution costs were reduced significantly. In this case, the change in technology will not reduce costs for the specialty – it will only keep costs for HD transport from being prohibitive.

**Specialty-TV services:** As well, specialty-TV services have traditionally paid for the cable head end decoders (for the conversion from analog to MPEG-1 and then MPEG-2), and would be expected to do so in the case of MPEG-4. Therefore, they will need to invest in MPEG-4 decoders for cable head ends, as they have done in previous compression upgrades. Most importantly for specialty-TV services, they will need to keep their SD service, so HD costs are all incremental.



## Technology: Transition to MPEG-4

According to conversations with broadcasters, Bell ExpressVu will likely begin a conversion to MPEG-4 within the next year. They will likely seek to deliver HD in MPEG-4, while continuing to deliver SD in MPEG-2. They will swap MPEG-2 HD boxes currently in the homes of consumers, and soon after, HD will be delivered via MPEG-4 into homes.

For the purposes of the market forecast, a 3 year conversion timeline is assumed – see Table 31 adjacent.

In addition, modulation technologies such as 8PSK could in fact compress the signal even further. However, as the roll-out for such technology is currently uncertain, for the purposes of forecast modeling, the study estimates that an HD signal remains at 7 Mbps for the forecast period following implementation of MPEG-4. This estimate is in line with the consensus reached by the CSUA (Canadian Satellite Users Association) that in 5 years but also in 10 years the bit rate for HD signals will be between 6 to 8 Mbps per second.

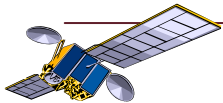
The study's assumption is that only HD boxes are MPEG-4 ready in the near future in the next few years, and not SD. Likely, SD signals will continued to be delivered in MPEG-2 for quite some time – at least in the foreseeable future. Swapping the larger base of SD MPEG-2 boxes would be logistically challenging and costly.

In the forecast modeling, therefore, the study assumes that SD signals remain at 2.2 Mbps per second for the period of the forecast, until 2020.

**Table 31: HD Bandwidth rates (Mbps)**

<i>HD Bandwidth rates (Mbps)</i>	2006	2007	2008	2009	2010	2011
<b>Star Choice</b>	14	14	12	10	8	7
<b>Bell ExpressVu</b>	14	12	10	8	7	7

These are the years in which Star Choice and Bell ExpressVu are in the midst of transitioning HD signals from MPEG-2 to MPEG-4.



## Distribution: Cost Structure of Uplink and Access

There are essentially two elements of a satellite undertaking's business model:

- As an SRDU (Satellite Relay Distribution Undertakings) – a satellite relays signals to a cable head-end in order for a cable operator to distribute to consumers;
- As a DTH BDU (Broadcast Distribution Undertaking) - a satellite relays signals directly to the consumer.

Currently, both Shaw (through Star Choice and CanCom) as well as Bell (through Bell ExpressVu) operate as both.

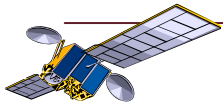
SRDU/DTH BDUs tend to pay the cost of uplink of and distribution of conventional broadcaster signals, although there are exceptions. However, the reverse is true for specialty channels, as they pay SRDUs/DTH BDUs for the uplink to reach their cable distributors.

Cancom/Star Choice and Bell ExpressVu charge specialties, then, for the uplink of a specialty in addition to a charge for distribution to cable head ends. Since in each case the satellite has to uplink the channel only once, so there should be a cost saving for the DTH operator as well as the specialty-TV service.

At the hearing on the renewal of Bell ExpressVu and Star Choice DTH licences, (CRTC PN 2004-19), Bell ExpressVu successfully argued that the ability of Cancom and Star Choice to utilize the same satellite facilities for SRDU and DTH undertaking without incurring additional costs placed Bell ExpressVu at a disadvantage. That is, specialty channels could pay Cancom for the uplink to cable head-ends, so that the Star Choice DTH distributor – being in the same corporate group – would not have to pay for the uplink of that service for its DTH service.

The CRTC ruled that Bell ExpressVu was entitled to charge specialty channels “the lesser of \$240,000 or the difference between \$240,000 and the fee which the service charges Star Choice DTH to use the direct-to-cable feed”.

Therefore, essentially, whatever extra specialty-TV services pay Cancom/Star Choice for access as well as the uplink to the cable head-end, they must also pay to Bell ExpressVu.



## Distribution: Cost Structure of Uplink and Access

Some broadcasters state categorically that an absence of uplink fee rate regulation is the primary barrier to launch in HD. Some prefer a regulated fee, based on the number of SRDU customers that actually utilize the uplink service (also proposed by Rogers).

However, the CRTC argued that it “does not consider it necessary or appropriate to intervene in current contractual provisions related to the uplink fees for specialty services” (paragraph 95 of Bell ExpressVu’s SRDU licence renewal).

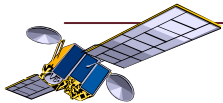
The access fee issue shows the price sensitivity of a number of broadcasters to the cost of transport as a barrier to launch HD. Unless the cost to the specialty services is priced aggressively, they claim that they will not be able to afford the uplink to reach cable head ends, and to pay access fees for the DTH uplink.

Heavy transport fees would lead to a slower launch of HD by specialties with relatively lower revenue bases; it could also lead to some of them to launch HD channels solely on cable and distribute their signals through terrestrial fibre networks.

It is likely that one of the following will occur, ultimately driving down the cost of uplink, so that the incremental cost of HD as compared to SD will be (only) twice as high compared to 4 times as high:

- The CRTC will intervene, and insist that uplink fees in addition to access fees only need to be paid proportional to when SRDU customers download signals from a particular SRDU;
- The satellite services will realize that HD channels are choosing to bypass launching on satellite and moving to cable only, particularly in areas where they can avoid uplink fees, and thus they are able to offer fewer HD channels;
- The availability of MPEG-4 and new satellite capacity ultimately drives down the cost of distribution.

For the market forecast, then, it is assumed that one or a combination of the above scenarios will prevail to ensure access to satellite transmission at tenable costs for the specialty services.



## Regulation: Digital Licensing Framework for HDTV

A number of key regulatory developments and frameworks impact upon how HD will roll-out in Canada. These frameworks include:

- Digital licensing framework for conventional broadcasters;
- The carriage of conventional signals;
- The setting of a mandatory analog switch-off date;
- HD and digital regulatory framework for pay and specialty.

While the CRTC has made successive regulatory decisions as to the framework for digital and HD migration, there remains some uncertainty with respect to HD transition – which could be clarified by the present TV policy review. Growing consternation from broadcasters, evidence of success from other jurisdictions, and the U.S. pending analog switch-off date will likely drive new regulatory developments in the coming year.

### Conventional Licensing Framework

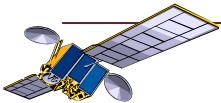
In Broadcasting Public Notice Public Notice CRTC 2002-31, the CRTC issued a new licensing policy governing the transition from analog to digital for conventional broadcasters .

In this policy, the CRTC requires that all of the unduplicated programming broadcast by a transitional digital television station, whether it is Canadian or non-Canadian, be in the HDTV format.

Consistent with a prior recommendation by the DTV Task Force, the Commission stated that it would encourage transitional DTV broadcasters to ensure that, by 31 December 2007, two thirds of each broadcaster's schedule is available in the HDTV format.

Some broadcasters have come close to this level of programming – such as CTV. However, news for example remains left to be converted.

This policy framework will continue to push conventional broadcasters' to fill their prime time schedules with HD.



## Regulation: Carriage of Conventional Signals

The conditions of licence for Bell ExpressVu and Star Choice Decision CRTC 99-552, 22 December 1999 state that “the licensee shall distribute the signals of all conventional, Canadian, French-language television services that purchase national program rights”.

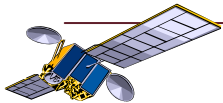
DTH providers must carry an equal number of CBC, CTV, CanWest Global, etc. local stations, e.g. if they carry ten local signals affiliated with one Canadian network, they must carry ten signals affiliated with every network.

However, such regulation does not hold true for HD signals. So, even though CBC currently offers more than 2 local stations in HD, the BDUs are currently only carrying an East and West feed. And while Star Choice is currently carrying two feeds each of the U.S. networks, it is only carrying one each of the Canadian networks – giving the U.S. networks an advantage in the West coast time zone.

While the cost of converting transmitters to HD is high, there is no guarantee that a local HD signal from a particular area, even if converted, will be carried by a DTH operator. Therefore, broadcasters would like to see the equivalency clause cited earlier inserted into the HD regime.

Market forces may push DTH operators to uplinking local/regional HD signals anyway. Once greater capacity becomes available and HD uptake reaches a greater proportion of the population, subscribers will expect to see local content on HD (and broadcasters will expect to insert local advertising). Thus, the DTH BDUs may introduce equivalency on their own accord for at least all time zones and major local/regional markets. One interviewee anticipated that the 2010 Olympics might increase the demand for greater number of HD time zone feeds.

For the purposes of this market forecast, it is assumed that carriage of more than 2 local stations of a conventional network will not occur until 2010. Star Choice will likely start carrying at least two only after it introduces MPEG-4 or acquires greater capacity.



## Regulation: Analog Switch-Off Date for OTA Broadcasters

Currently, Canada has decided not to set an analog switch-off date, and leave digital migration to market forces.

In several other countries, apart from the U.S., an analog switch-off date has been set – see Table 32. Such a clear date in these countries enables consumer device manufacturers, broadcasters, and the equivalent of BDUs to build their business plans based on a definite end-date for the analog signal.

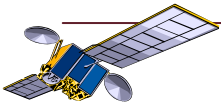
In Canada, however, conventional broadcasters are unable to plan how long they must to deliver in analog and digital. Most Canadian broadcasting groups advocate the creation of a switch-off date.

In light of the experience of other countries and a growing chorus toward a switch off date, it is assumed for forecasting purposes that Canada will decide on an ASO date and address the problems of viewers not receiving signals via BDUs.

**Table 32: Analog Switch-Off (ASO) Dates in Selected European countries**

Country	ASO deadline	Digital Penetration of total TV households
Germany	2008	50%
France	Jan. 1, 2011	27%
Italy	2012	18%
Spain	April, 2010	18%
United Kingdom	2012	70%
Portugal	2010	17%

Source: Michael McEwen (200^0l, A REPORT TO THE CRTC ON DIGITAL TRANSITION STRATEGIES IN A NUMBER OF DIFFERENT COUNTRIES;  
[http://www.gii.co.jp/press/fi23873\\_en.shtml](http://www.gii.co.jp/press/fi23873_en.shtml)



## Regulation: Current HD Regulatory Framework for Pay/specialty-TV Services

From 2002 to 2006, a number of CRTC decisions were reached to oversee the transition to digital. Included in this transition is a specific framework for specialty-TV services.

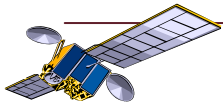
The **digital migration framework** (CRTC PN 2006-23) established a process and a timetable for cable operators to migrate analog specialties (analog from cable head end to the subscriber – which means the subscriber does not need a digital decoder).

- Although there is a dispute resolution process established to ensure that cable operators do not overly disadvantage analog specialties in this transition, it is expected that there will be a few specialty casualties in this process where market forces will re-establish wholesale rates and packaging.
- If these rates are highly unfavourable, it might jeopardize the viability of the specialty channel, resulting in some attrition of specialties.

In June, 2006, the CRTC issued an **HD distribution framework** for the licensing and distribution of high definition pay and specialty services.

- Essentially, new transitional HD licenses will be granted to HD versions of channels already carrying licenses;
- For Category 1 channels, the transitional HD licenses will only grant distribution rights to HD versions of Category 1 channels which have the following levels of HD programming:
  - English language: 50%HD in the evening period and 30% during the broadcast day;
  - French language: 30% HD in the evening period, and 20% during the broadcast day;
- Those Category 1 channels without the minimum will be subject to commercial negotiations for carriage as with Category 2 channels

As in the digital migration process, it is expected that there will be some attrition of specialties that will not be able to afford to convert to HD.



## Regulation: Possible Regulatory Scenarios

In addition to the regulatory framework already announced by the CRTC earlier in 2006, three scenarios were developed, which depend on the overall regulatory framework for migration to HD.

The first scenario will see a much faster transition to HD, with SD switch-off possible close to 2015. The second, a solely market-based approach, will see a long transition to HD, with no SD switch-off in sight.

According to interviews and evidence from recent CRTC rulings, a third scenario is the most likely to occur. In this scenario, OTA SD switch off will also occur in 2012, but broadcasters only have to cover larger markets – and some subsidy arrangement is developed to ensure all Canadians have access to HD.

For the purposes of the market forecast, scenario 3 is assumed as the most likely. While scenario 1 would see nearly 85% of channels launching on HD as soon as capacity becomes available, scenario 2 would see only about 30% of channels – well-funded, in the key HD genres, would go first, and smaller specialties would wait until consumer uptake reached critical mass.

Scenario 3 would see approximately 70% launching in HD by analog switch-off – 2012.

### Scenario 1: Intervention

- In 2007, an ASO date is set for 2012
- Equal carriage over-the-air for HD and SD signals is enforced
- CRTC threatens to cease genre protection unless channels launch in HD;
- SRDU uplink fees are regulated.

### Scenario 2: The Market

- No ASO date is set.
- The digital framework for pay and specialty channels remains the only regulatory intervention;
- The market moves to HD when it is ready.

### Scenario 3: Hybrid

- An ASO date of 2012 is set, but only the larger markets need to broadcast in HD.
- Incentives or subsidies are in place for local market signals to be carried via DTH.
- SRDU uplink fees are not regulated, but high capacity provides for reasonable pricing for specialties.



## New Channels: Recent Growth

In the late 1990s and early years of 2000, a spate of new channels were launched as digital distribution was introduced.

Since then, new channels have continued to emerge – albeit, at a much reduced rate compared to the early years, or the ‘big bang’ of diginets launched in 2001;

The number of new channels licensed has far outpaced those launched – while 75 Category 2’s have launched since 2003, 201 have actually been licensed.

The rate of new channels since 2003 gives us an indication of how many new channels might launch in future – while capacity is still restrictive, broadcasters who have reached break-even from existing diginets see the potential for even more in the future.

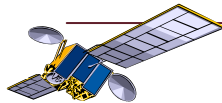
In the first wave of new diginets, most of the Category 2 channels were ethnic channels. However, as all new channels licensed now in Canada tend to be Category 2, Category 2 channels are comprised of a mix of genre, including ethnic but also music channels, film, and factual.

**Source:** CRTC Broadcast Monitoring Report, 2006

*\*NB: this number denotes PPV services, not channels - in fact, the channels have increased significantly.*

**Table 34: Number of Services Launched, Per-Year, Post ‘Big Bang’**

	2003	2006	Overall %	Average number of new services per year
Analog specialty	49	49	0%	0
Digital specialty – Cat. 1	15	18	20%	1
Digital Specialty – Cat. 2	41	75	83%	11.3
Pay-TV	6	12	100%	2.0
PPV /VOD*	12	11	-8%	-0.3
Foreign Services	93	134	44%	13.7



## New Channels: Estimated Growth

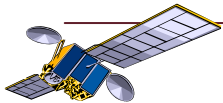
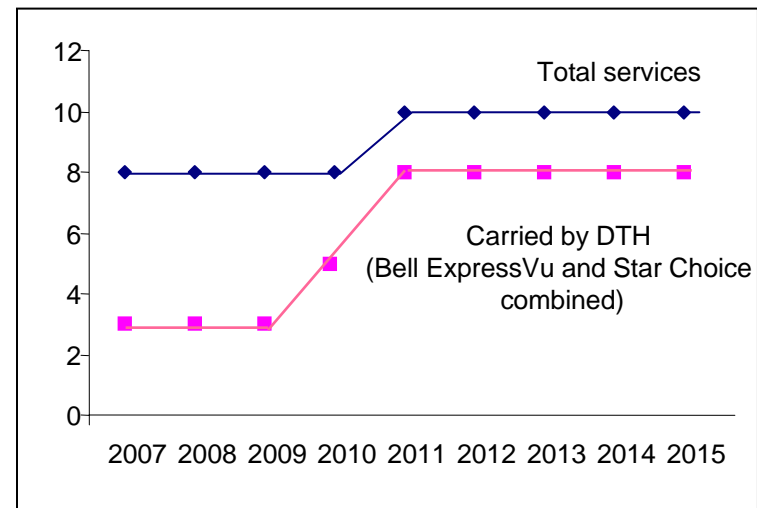
Based on historical trends which have typically seen 10 channels per year, Nordicity estimates the number of new channels carried by DTH BDUs until MPEG-4 and new satellite capacity is available will be limited to at most 1-3 per year.

Immediately following an increase of satellite capacity, the rate of new channels carried by DTH will initially rise to 3-5, then up to 8.

As discussed earlier, by 2014 all channels will launch solely on HD. While after 2010, most channels Some channels which target a higher socio-demographic and the 'early adopters' will choose to only go in HD even when HD adoption is low – as evidenced by High Fidelity TV's recent launch of four HD only channels on Bell ExpressVu. For forecasting purposes, the study assumes:

- Until 2010, 40% of new channels launch in both SD and HD, the remainder launch only in SD (note that the numbers could also reflect fewer SD channel launches overall, but several channels launching only in HD);
- In 2010, this number increases to 75%;
- By 2013, all new channels launch only in HD.

**Table 35: Estimated Number of New Channels per Annum, Total and Those Carried by DTH**



## Market Forecast: First Wave 2003 to 2005

Overall, the study envisages that there will be five waves of transition to HD. The subsequent charts outline which services are likely to be offered by which BDU in each wave.

The first phase of HD development occurred between 2003 and 2005 in Canada saw all of the BDUs launching a number of high definition services. By 2005, the BDUs were carrying up to 27 HD services. A high proportion of these services were U.S. network stations.

Bell ExpressVu and Rogers led the way with an offering of over 25 HD services.

Many of the Canadian services launched included at least one signal of the conventional networks, and some analog specialties such as Discovery and TSN, in line with the movement seen in the U.S. where sports and high-end factual specialties were also leading the specialty conversion.

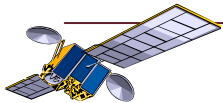
At this time, Canadian and U.S. networks began to load their prime time schedule with HD, primarily offering high-end drama, sport, and films in HD. While Canadian networks began showing U.S. dramas in HD, networks such as CTV began to offer most of their major Canadian dramas in HD as well.

**Table 36: Number of High Definition Services Offered by BDUs**

	Canadian Services	Foreign Services*	Total
Cogeco	10	9	19
Rogers	16	10	26
Shaw	5	5	10
Videotron	8	5	13
Bell ExpressVu	16	11	27
Star Choice	6	8	14

Source: Broadcast Monitoring Report, 2006, 2005 figures

\*Note: the categorization used here includes Networks. The category 'Foreign Services' on subsequent pages do not.



## Market Forecast: Second Wave 2006-2007

The second wave of development has seen a near 100% conversion of prime time schedules on the major networks, both U.S. and Canadian. News, however, remains in SD as the expense is high and Canadian audiences are not yet demanding it as HD uptake remains limited.

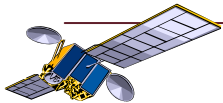
In the second wave, a number of Category 2s, particularly in sport and film, migrate. Bell ExpressVu also offers the first Canadian HD-only channels (Equator, Oasis, Treasure, and Rush). Bell ExpressVu also aggressively launches numerous pay-per-view channels, while Star Choice offers a number of premium payTV movie channels in HD.

At this point, both Bell ExpressVu and Star Choice are nearing maximum capacity – Star Choice at approximately 20 channels, and Bell ExpressVu at over 50.

However, towards the end of this wave Bell ExpressVu begins to roll-out MPEG-4 and swap its existing base of HD set top boxes. Such a move frees up an increased amount of capacity, and allows to nearly triple its HD offering comparative to Star Choice.

**Table 37: Market Forecast Second Wave 2006-2007**

<b>Total channels</b>	<b>Bell ExpressVu</b>	<b>Star Choice</b>
Digital specialty - category 1	0	0
Digital specialty - category 2	7	0
Authorized foreign specialties	1	1
OTA Education	0	0
OTA Private/CBC-SRC	7	3
Pay-TV	5	3
PPV	14	0
Specialty – Analog	6	3
U.S. Network	11	8
New HD services	1	0
<b>HD total</b>	<b>51</b>	<b>18</b>
New SD services	2	1
<b>SD total</b>	<b>375</b>	<b>309</b>



## Market Forecast: Third Wave 2008-2010

By the end of this phase, Bell ExpressVu has fully migrated to MPEG-4 freeing up an additional capacity of approximately 100 channels. Star Choice is nearing the end of its transition, and hence has also begun to release more channels in HD;

The first Category 1 launches on Bell ExpressVu as it reaches 50% eligible content to secure distribution rights. This channel is likely to be CTV Travel. Second tier major markets are launched and picked up by Bell ExpressVu, and some by Star Choice, in order to deliver the Olympics in local markets at a range of time zones. CityTV Toronto and Global Toronto are also picked up by Star Choice, as capacity on these channels expand.

Bell ExpressVu and Star Choice increases its Sports and Movies on PPV. Bell ExpressVu launches a number of Specialty Analog and Category 2s in HD. As the U.S. moves increasingly to HD, foreign services – particularly those carried by Bell ExpressVu – are launched in HD, including News channels.

HD subscribers are still the minority; therefore, the number of SD signals continue to increase, although at a reduced rate.

The CSUA estimated that 75% of existing channels would launch in HD by this time – while this may be true in that more channels may launch in HD, capacity constraints limit the number that BDUs can carry during this wave.

**Table 38: Market Forecast: Third Wave – 2008-2010**

<i>Increase in HD channels</i>	<b>Bell ExpressVu</b>	<b>Star Choice</b>
Digital specialty - category 1	+2	+2
Digital specialty - category 2	+5	0
Authorized foreign specialties	+4	0
OTA Education	0	0
OTA Private/CBC-SRC	+2	+5
Pay-TV	+5	+1
PPV	+12	+10
Specialty – Analog	+12	+1
U.S. Network	0	0
HD New Services	+6	3
<b>HD Total Services</b>	<b>100</b>	<b>37</b>
SD New services	+7	+3
<b>SD total</b>	<b>382</b>	<b>312</b>



## Market Forecast: Fourth Wave 2011-12

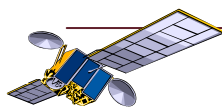
Nearly all of the Category 1's move into HD, as they have met the HD content quota requirement to secure distribution rights. Bell ExpressVu picks up numerous OTA private signals in Canada, serving local markets. Over time, Bell ExpressVu will likely migrate these signals to more of a pay-per-view or on-demand type offering, to allow greater localization and time-shifting of content.

In fact, the market orientation toward increased on-demand television could change the strategy of DTH operators, e.g. to substitute more local programming via a quasi on-demand service as opposed to carriage of the complete local/regional service. While DTH operators might not carry as many local signals, they would be replaced by on-demand programming designed to compete with terrestrial VOD offerings.

Bell ExpressVu and Star Choice continue to increase their Pay-TV and PPV offerings, and convert nearly all of them to HD as they prepare to cease the SD signals for some of the premium services in the next wave. With an increase in capacity available for both DTH BDUs, Star Choice catches up with Bell ExpressVu and offers several signals of the U.S. networks. It also begin to add the Category 2's that were offered by Bell ExpressVu in the previous wave.

**Table 39: Market Forecast: Fourth Wave – 2011-2012**

<i>Increase in HD channels</i>	Bell ExpressVu	Star Choice
Digital specialty - category 1	+12	+12
Digital specialty - category 2	+7	+27
Authorized foreign specialties	+10	+12
OTA Education	+1	+1
OTA Private/CBC-SRC	+46	+17
Pay-TV	+7	+10
PPV	+44	+14
Specialty – Analog	+35	+39
U.S. Network	+4	+12
HD New Services	+5	+2
<b>Total HD</b>	<b>271</b>	<b>183</b>
SD New Services	+6	+3
<b>Total SD</b>	<b>388</b>	<b>315</b>



## Market Forecast: Fifth Wave – 2013 to 2015

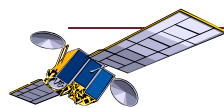
The fifth wave is characterized by continued migration of most signals to HD, but it is also when both Bell ExpressVu and Star Choice begins to shut down certain SD signals. Primarily, both BDUs shut down the Pay-TV and pay-per view signals, as they initially began offering HD in these services. Premium subscribers also tend to be early-adopters of television services and technologies; therefore, it is reasonable to assume that the target audience for these services is primarily HD-converted.

A second tier of major markets open up for broadcasters signals, and Star Choice adds significantly more local stations to catch up with Bell ExpressVu.

New services are now launching only in HD, so no new SD services are added. StarChoice still has fewer overall services than Bell ExpressVu, as is the case today.

**Table 40: Market Forecast: Fifth Wave – 2013-2015**

	Bell ExpressVu	Star Choice
Digital specialty - category 1	+4	+4
Digital specialty - category 2	+34	+12
Authorized foreign specialties	+9	+4
OTA Education	+5	+4
OTA Private/CBC-SRC	+24	+44
Pay-TV	0	+1
PPV	+25	+21
Specialty – Analog	+10	+13
U.S. Network	0	+4
HD New Services	15	14
<b>HD Total</b>	<b>397</b>	<b>302</b>
SD new services	0	0
SD reductions	-23	-27
<b>SD total</b>	<b>365</b>	<b>288</b>



## Market Forecast: Final Conversion 2016 to 2020

Final conversion occurs when all existing channels and signals are converted to HD. This wave, however, does not anticipate a SD switch-off. Such a switch-off will happen after 2020, when at least 90% of the population subscribes to HD services. By the end of 2020, it is unclear whether this market penetration will have occurred.

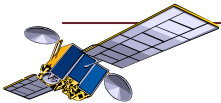
In this wave, however, there is significant shut-down of certain SD signals. Primarily, all U.S. services are no longer offered in HD. In addition, the majority of premium services – pay-TV and pay-per-view – are now offered solely in HD.

The shutting down of SD signals will in turn continue to drive a further uptake of HDTV penetration among households.

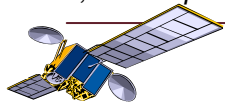
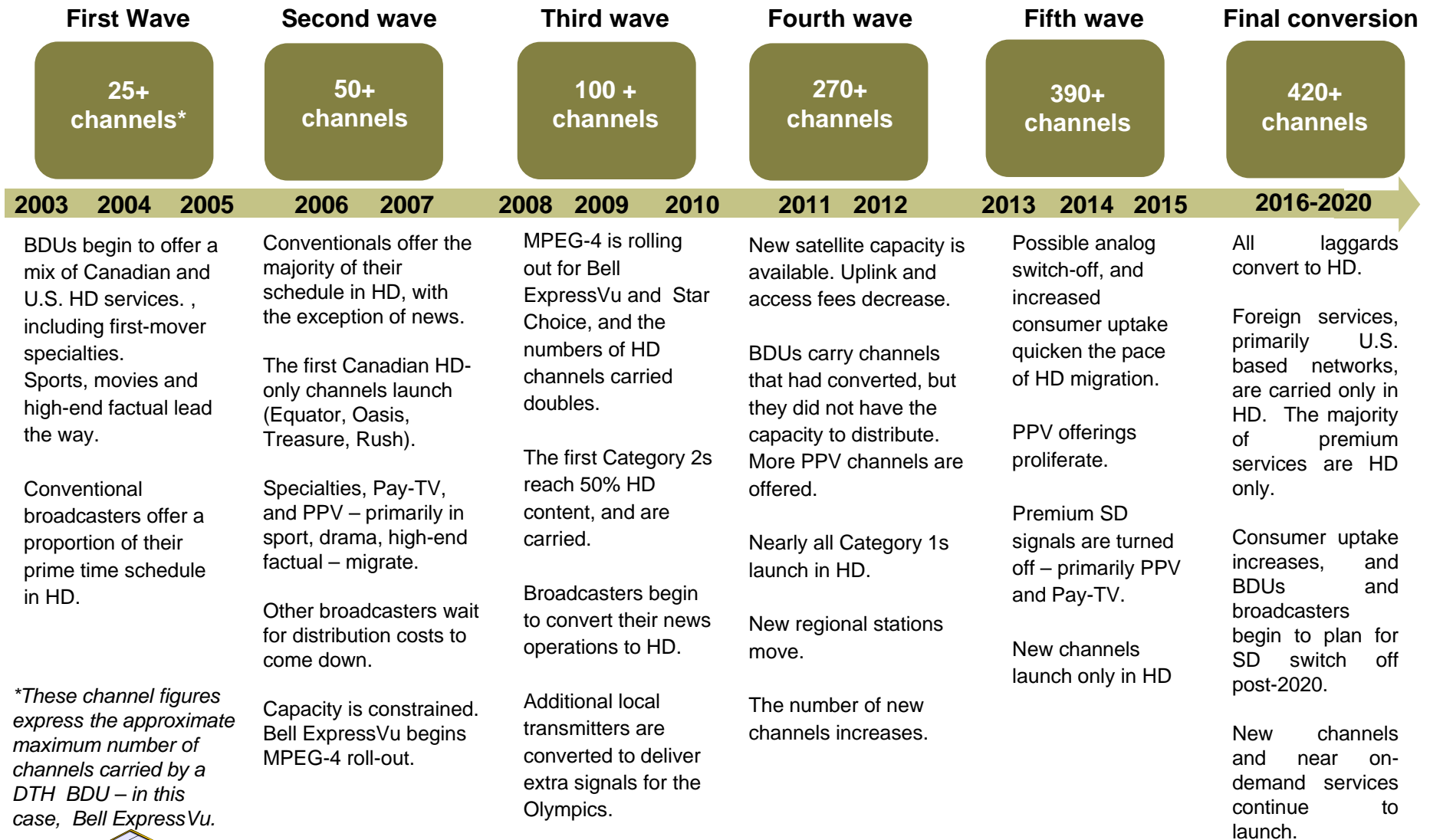
Star Choice also seeks to catch up with Bell ExpressVu in its total number of offerings, and launches a significant number of pay-per-view offerings.

**Table 41: Market Forecast: Final Conversion – 2016-2020**

	Bell ExpressVu	Star Choice
Digital specialty - category 1	0	0
Digital specialty - category 2	1	0
Authorized foreign specialties	+2	+1
OTA Education	+0	0
OTA Private/CBC-SRC	+3	+5
Pay-TV	0	0
PPV	0	+33
Specialty – Analog	+2	+7
U.S. Network	0	0
HD New Services	+20	+20
<b>HD Total</b>	<b>425</b>	<b>368</b>
SD reductions	-75	-68
<b>SD total</b>	<b>290</b>	<b>220</b>



# Market Forecast: Estimated conversion to HD by broadcasters, conventional and specialty (per BDU\*)



## Market Forecast: Estimated Satellite Bandwidth Demand

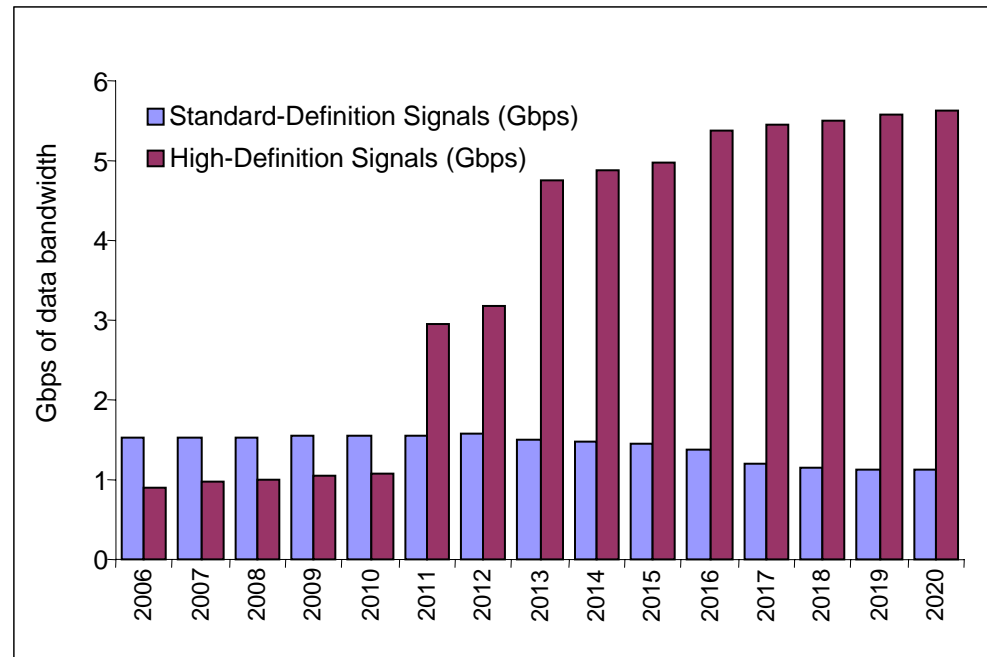
Overall, the market forecast demonstrated in the waves on page 61 translate into significant demand for satellite bandwidth.

As detailed in previous, the bandwidth demand created by high definition signals increases significantly when new satellites appear.

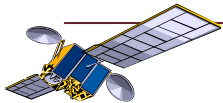
As discussed earlier, a bit rate of 7 Mbps per HD signal was assumed from 2011 (2010 for Bell ExpressVu), and 2.2 Mbps per SD signal as MPEG-4 will not be applied to SD signals in the medium future, as a box swap for the subscriber base would be a costly and logistically challenging exercise.

The demand impact of the opening up of new supply in 2011 demonstrates the true supply constraints that are currently stymieing HD growth in Canada.

**Table 42: Total Demand for Satellite Bandwidth for HD and SD Channels 2005-2015\***



\*Note: these figures do not include audio services, descriptive video, ppv preview channels, and barker channels.



## Market Forecast: Bell ExpressVu Satellite Demand Forecast

Overall, the demand within these waves translates into substantial growth in the demand for satellite transponders, and hence satellites for Bell ExpressVu, seen particularly in years 2011 and beyond. Table 43 calculates the number of channels in each Wave. An additional 10% is added to capacity needs in SD, to include promotional channels, audio, and administrative capacity and 5% on HD for promotional channels only. The mbps requirements are then translated into total transponders, and subsequently satellites.

Demand jumps from 29 transponders of HD delivered in 2010 to 78 in the final transition phase ending in 2020, even with improved compression through MPEG-4. The number of HD transponders needed by 2020 translates into a need for 2.4 total satellites, at 32 transponders per satellite. As 1 is currently in operation that can be utilized for these signals, this figure represents the need for an increase of 2 new satellites by this time. It is likely that while Bell ExpressVu might only need 0.4 of the second satellite at this time, they will grow their HD offering beyond 2020 in line with the trend from 2010, and fill this satellite further. Note that after the transition to MPEG-4, the technology allows for the number of mbps per transponder to increase to 40, as well as a reduction of mbps per signal.

**Table 43: Total Satellite Demand: Bell ExpressVu**

<i>Satellite Demand</i>	<b>Wave 3 – 2008-2010</b> (post-MPEG-4, pre-new satellite launch)		<b>Final Conversion</b> <b>2016-2020</b>	
	<b>SD</b>	<b>HD</b>	<b>SD</b>	<b>HD</b>
<b>Channels</b>	382	100	290	425
<b>Additional (10% SD/5% HD)</b>	420	105	319	446
<b>Mbps per signal</b>	2.2	7	2.2	7
<b>Total mbps</b>	925	737	702	3122
<b>Mbps per transponder</b>	27	27	27	40
<b>Total transponders</b>	34	27	26	78
<b>Transponders per satellite</b>	32	32	32	32
<b>Satellite space needed*</b>	1.1	0.9	0.8	2.4
<b>Existing satellites</b>	1	1	1	1
<b>New satellites needed (rounded up to nearest 1)*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>

\*Note: this is an estimate only. Some satellites mix HD and SD.



## Market Forecast: Star Choice Transponder and Satellite Demand Forecast

Overall, the demand within these waves translates into substantial growth in the demand for satellite transponders, and hence satellites for Star Choice. Table 43 calculates the number of channels in each Wave. An additional 10% is added to capacity needs on SD, to include promotional channels, audio, and administrative capacity, and 5% on HD for promotional channels only. The mbps requirements are then translated into total transponders, and subsequently satellites.

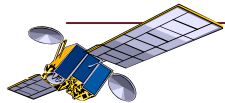
Demand for transponders increases from 13 transponders of HD delivered in 2010 to 71 in the final transition phase. The number of HD transponders needed by 2020 translates into a need for 2.2 total satellites, calculated at 32 transponders per satellite. As .5 of a satellite is currently in operation that can be utilized for these signals, this figure represents the need for an increase of 2 new satellites by the final transition.

Note that after the transition to MPEG-4, the technology allows for the number of mbps per transponder to increase to 40, as well as a reduction of mbps per signal.

Table 43: Total Satellite Demand: Star Choice

<i>Satellite Demand</i>	<b>Wave 3 – 2008-2010</b> (mid-MPEG-4 roll-out, pre-new satellite launch)		<b>Final Conversion</b> <b>2016-2020</b>	
	SD	HD	SD	HD
<b>Channels</b>	312	40	220	368
<b>Additional (10% SD/5% HD)</b>	343	42	242	386
<i>Mbps per signal</i>	2.2	8	2.2	7
<b>Total mbps</b>	755	333	533	2703
<i>mbps per transponder</i>	27	27	27	40
<b>Total transponders</b>	28	12	20	68
<i>Transponders per satellite</i>	32	32	32	32
<b>Satellite space needed*</b>	0.87	0.4	0.62	2.1
<b>Existing satellites</b>	1	.5	1	.5
<b>New satellites needed (rounded up to nearest 1)*</b>	0	0	0	2

\*Note: this is an estimate. Some satellites mix HD and SD.



## Conclusions: Broadcast Market Forecast

Overall, the research demonstrates that the demand for broadcast satellite bandwidth is outstripping the supply. Currently, channels are not launching in HD due to a satellite supply constraint. Other factors are slowing the move, primarily significant dual uplink and access fees for specialties in the current MPEG 2 environment. Further barriers include uncertainty about when OTA broadcasters have to switch off their analog signal, and in some genres, a limited supply of HD programming, and a low consumer base. However, going forward the study considers that a number of developments in the industry will greatly stimulate increased demand for satellite broadcast capacity:

- MPEG-4 will be rolled out, first for HD signals, allowing the carriage of greater HD signals per transponder. MPEG-4 effectively lowers the transport cost of channels, so that channels which have not launched in HD will feel less of a cost barrier to convert, and thus avoid being left behind;
- As new content becomes available, consumers will increasingly take up HDTV sets and HD enabled set-top boxes – by the time new satellites are operational in 2011, consumer uptake of set-top boxes will likely have reached about 42% penetration of TV households..
- The CRTC will likely impose – or target – an analog switch-off date, likely 2012. By this time, broadcasters are working towards an analog switch-off and can plan on switching off at least their analog terrestrial signals

In turn, the study forecast the number of channels in HD and SD by 2020, based on the following assumptions:

- By 2010, approximately 25% of channels have launched HD versions; by 2015 90%, and by 2020, 100%;
- First-mover HD converters (namely, premium services) begin to drop their SD signals from 2013;
- All U.S. services are carried only in HD by the final conversion, from 2016;
- From 2013, new channels launch only in HD.

According to these estimates, the total number of channels carried in HD by 2015 will reach up to over 425 channels on Bell ExpressVu, and almost 368 for Star Choice. Then;

- By 2011, both Bell ExpressVu and Star Choice are carrying HD signals at 7 Mbps per second, and SD signals at 2.2 Mbps. Until 2011, approximately 27 Mbps are carried per transponder;
- **The number of transponders for Bell ExpressVu needed by 2020 for HD signals is 78 – at 32 transponders per satellite, this represents approximately 3 satellites for HD carriage only, 4 including one SD legacy satellite. Therefore, they will need 2 new in addition to their current 2**
- **The number of transponders for Star Choice needed by 2020 for HD signals is 68. This number represents a need for a total of 2.1 satellites for HD signals, in addition to a legacy 1 for SD, they will need a total of 3.1, i.e., 2 above their existing 1.5**

