Lemay-Yates Associates Inc.

Canadian and US Mobile Spectrum Holdings

Report prepared for:

Mobilexchange Ltd.

Lemay-Yates Associates Inc.
2075 University Street, Suite 1000, Montreal H3A 2L1 CANADA
Tel 514-288-6555 Fax 514-288-6527 Email LYA@LYA.com

May 25, 2007

Background

- The purpose of this report is to provide an overview of the spectrum holdings of major carriers in Canada and the US focusing on key urban markets
- The report is based on the research and analysis of Lemay-Yates Associates Inc. (LYA) using publicly available sources of information on licensing from Industry Canada and the FCC.
- The report is focused on key mobile bands of interest – cellular (800 MHz), PCS (1.9 GHz), ESMR (800-900 MHz) and AWS (1.7/2.1 GHz)
- AWS (Advanced Wireless Services) spectrum was awarded by auction in the US in September 2006. A similar auction process is planned in Canada for early 2008, initiated by Industry Canada in DGTP-002-07

Amount of spectrum issued

- Cellular, PCS and ESMR licenses have been issued in both Canada and the US. The same amount of spectrum has been licensed in both countries:
  - Cellular = 50 MHz (two licenses of 25 MHz)
  - PCS = 120 MHz (six licenses – three of 30 MHz, three of 10 MHz)
  - ESMR = approximately 13 MHz, variable by market
- AWS licenses were auctioned in the US in September 2006 – 90 MHz in total made up of six licenses
  - three of 20 MHz and three of 10 MHz each
  - Canada has proposed same total spectrum, but using five licenses instead of six – auction in Canada slated for early 2008
  - Industry Canada has also proposed including PCS Expansion spectrum (10 MHz) in the same "AWS" auction as well as 5 MHz in the 1670-1675 MHz range

Licensing processes

- Canadian cellular licensing in 1983 and PCS licensing in 1995 both resulted in national license footprints for the carriers. In 2001 Industry Canada auctioned “additional” PCS spectrum divided into 14 license regions (“Tier 2” areas).
- All of the spectrum from Canadian awards is now held by Rogers, Bell and Telus
  - In addition Telus holds ESMR “Mike” service spectrum assumed to be 10 MHz per market on average
- US licensing is a far more complex patchwork, resulting from auctions which began with PCS in early 1995. Some licensing has been done on “localized” areas and some on larger regions.
  - In the US, Sprint Nextel operates ESMR – the 800 MHz portion has been re-banded to provide 10 MHz in 1900 MHz band across the US; the 900 MHz portion remains in place

Note

- The following tables illustrate the mobile spectrum licensed by major market
- **The amount of spectrum licensed does not indicate whether or not the carrier is actually using the spectrum capacity**
- In most cases, licenses cover broader areas than the specific major markets identified – e.g. in Canada one Tier 2 license covers all of Southern Ontario, within which there is Toronto; in the US one large regional license covers the entire Northeast, including New York and Boston. Hence the spectrum per major market reflects these broader holdings covering the markets in question. It does not necessarily indicate that the carriers had targeted specific markets.
- US markets have been chosen to provide illustration of large markets that are comparable on a population basis in most cases to Canadian markets – NY, LA and Chicago are considerably larger than any Canadian city, and not overly comparable, but are shown for reference
  - Populations shown are the metropolitan area census figures and not licensed pops
- Carriers also often hold other spectrum licenses – e.g. MCS (Inukshuk) and 2.3/3.5 GHz held by Rogers/Bell or in the US MMDS by Sprint, 2.3 GHz by AT&T, etc. These are generally for “fixed” service although future mobile applications (e.g. WiMAX) are possible in some cases – spectrum associated with these fixed holdings are excluded from the present report

Canadian mobile spectrum by market (before AWS)

		Cellular/PCS/ESMR MHz per market		
	Population	Rogers	Bell	Telus *
Toronto	4,883,800	75	55	50
Montreal	3,507,400	85	45	50
Vancouver	2,076,100	85	40	55
Ottawa-Gatineau	1,102,900	85	45	50
Calgary	976,800	85	40	55
Edmonton	961,500	85	40	55

** Note - Telus holdings assumes 10 MHz of ESMR in each market*

US mobile spectrum per market (excluding AWS)

Excluding AWS		Licensed Mobile MHz per market (cellular, PCS, ESMR)				
	Population	AT&T	Verizon	Sprint Nextel	T Mobile	Others
New York	18,747,320	55	65	43	20	0
Los Angeles	12,923,547	65	45	43	20	10
Chicago	9,443,356	65	35	33	30	20
Atlanta	4,917,717	65	35	33	30	20
Boston	4,411,835	65	55	43	20	0
Seattle	3,203,314	65	45	43	30	0
Minneapolis	3,142,779	45	45	43	40	10
Tampa	2,647,658	65	30	28	25	35
Denver	2,359,994	45	45	43	40	10
Sacramento	2,042,283	60	25	43	25	30
Albany NY	848,879	65	45	43	30	0
Albuquerque	797,940	45	35	33	30	40

Note - Sprint Nextel includes typically 13 MHz ESMR per market

US AWS auction

- Auction resulted in sale of 1,082 licenses for US$13.7 billion or $0.5357 per MHz/pop
  - Six licenses per market covering entire US – three 20 MHz licenses, three 10 MHz licenses
  - Total of 1,122 licenses on offer – 40 remained unsold at the end
- 93% of bidding accounted for by six operators
  - T Mobile ($4.2B), Verizon ($2.8B), Cableco consortium (SpectrumCo) with Sprint Nextel ($2.4B), MetroPCS ($1.4B), Cingular/AT&T ($1.3B) and Cricket/Leap ($0.7B)
- Largest bidders:
  - Two types of incumbent – large national players (T Mobile, Verizon, AT&T) and regional players expanding footprint (MetroPCS and Leap/Cricket)
  - Sprint Nextel – did not participate but holds 5% of SpectrumCo
  - SpectrumCo – Comcast-led consortium of cable companies – typically acquired 20 MHz per market
- Comparison – the following table provides a comparison of spectrum holdings per market for the largest carriers
  - Sprint Nextel is combined with SpectrumCo given their relationship and joint market activities

US mobile spectrum per market (including AWS)

Including AWS		Licensed Mobile MHz per market (cellular, PCS, ESMR, AWS)						
	Population	AT&T	Verizon	Sprint/SpectCo	T Mobile	MetroPCS	Leap/Cricket	*Others*
New York	18,747,320	55	85	63	50	20	0	*0*
Los Angeles	12,923,547	95	45	63	50	20	0	*0*
Chicago	9,443,356	75	55	53	60	0	10	*20*
Atlanta	4,917,717	75	55	53	70	20	0	*0*
Boston	4,411,835	75	75	63	50	10	0	*0*
Seattle	3,203,314	75	45	63	60	10	20	*0*
Minneapolis	3,142,779	55	65	63	50	0	30	*10*
Tampa	2,647,658	75	50	48	65	10	0	*25*
Denver	2,359,994	65	45	63	60	0	30	*10*
Sacramento	2,042,283	70	25	63	45	40	0	*30*
Albany NY	848,879	65	65	63	40	10	0	*30*
Albuquerque	797,940	45	35	53	70	0	30	*40*

Note - Sprint/SpectrumCo combines holdings of Sprint Nextel (including 13 MHz ESMR) with AWS licenses of SpectrumCo in which it has a 5% interest

Holdings by market – comparison

		Licensed mobile MHz of three national carriers (pre-AWS)					Licensed Mobile MHz per market of four national carries (cellular, PCS, ESMR, AWS)							
							AT&T		Verizon		Sprint/SpectrumCo		T Mobile	
Canadian city	Population	Rogers	Bell	Telus	US city	Population	PreAWS	Added	PreAWS	Added	PreAWS	Added	PreAWS	Added
Toronto	4,883,800	75	55	50	Atlanta	4,917,717	65	10	35	20	33	20	30	40
Montreal	3,507,400	85	45	50	Seattle	3,203,314	65	10	45	0	43	20	30	30
Vancouver	2,076,100	85	40	55	Denver	2,359,994	45	20	45	0	43	20	40	20
Ottawa-Gatineau	1,102,900	85	45	50	Sacramento	2,042,283	60	10	25	0	43	20	25	20
Calgary	976,800	85	40	55	Albany NY	848,879	65	0	45	20	43	20	30	10
Edmonton	961,500	85	40	55	Albuquerque	797,940	45	0	35	0	33	20	30	40

Note: Markets in the US shown based on comparable population only without detailed study of demographic or other differences

- Bell and Telus pre-AWS have similar amounts of spectrum per market to Verizon and Sprint/SpectrumCo including AWS
  - Sprint/SpectrumCo figure refer to Sprint Nextel holdings Pre-AWS and 20 MHz added by SpectrumCo
- Rogers pre-AWS typically has more than AT&T post-AWS
- T Mobile is the largest overall AWS winner, now at licensed capacity more comparable to Verizon and Sprint/SpectrumCo (but still less than AT&T)

Observations

- Rogers is in a unique position having up to 85 MHz in many markets – due to the combination with Microcell which increased its holdings by 30 MHz nationally
  - In Toronto, Rogers has 10 MHz less than elsewhere since it only acquired one 10 MHz license in the 2001 auction for Southern Ontario compared to two in many other markets
- Bell has typically more spectrum (45-55 MHz) in its eastern ILEC territories than it does in the west (40 MHz)
  - Rogers/Bell via Inukshuk also have extensive fixed spectrum holdings across Canada
- Telus is more uniform across the country – when it acquired Clearnet (30 MHz) it was required to divest some spectrum in ILEC territories to meet the cap then in place (55 MHz combining cellular, PCS and ESMR)
  - Telus has fixed holdings in some markets as well

Observations – Canada vs. US

- Pre-AWS the same amount of spectrum capacity has been licensed in Canada as in the US
  - Cellular/PCS = 170 MHz plus ESMR
- In Canada there is less facilities-based competition… typically three carriers per market in Canada, compared to 5 to 7 per market in the US.
- There is more spectrum capacity licensed per carrier in Canada compared to the US. US carriers often serve much larger and more dense markets with less spectrum than their Canadian counterparts.
  - There was a relative lack of spectrum pre-AWS for certain carriers in the US – e.g. T Mobile with 20 MHz covering NYC, Verizon with 35 MHz covering Chicago, etc.
  - Pre-AWS Canadian carriers are typically much “richer” in spectrum assets – e.g. Rogers with 75 MHz covering Toronto, Telus with 55 MHz covering Vancouver, etc.
- Post-AWS in the US – per-carrier spectrum holdings are comparable to the Canadian levels pre-AWS
  - Rogers pre-AWS has more MHz in most markets than AT&T or relative to T Mobile anywhere including AWS
  - Bell and Telus pre-AWS each have comparable holdings to Verizon including AWS
  - SpectrumCo on a standalone basis has much less than any Canadian carrier – but assumed to operate with Sprint Nextel giving it typically more than Bell or Telus per market
  - Considering comparably sized markets, Canadian carriers pre-AWS have at least as much spectrum as US carriers post-AWS… e.g. Bell 55 MHz pre-AWS for Toronto vs. Verizon 55 MHz for Atlanta including AWS, Rogers 85 MHz pre-AWS for Ottawa compared to AT&T 70 MHz covering Sacramento including AWS.