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Before the
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In the Matter of	)	
Adjustment of Rates and Terms for Preexisting Subscription and Satellite Digital Audio Radio Services	)	**Docket No. 2006-1 CRB DSTRA**

WITNESS TESTIMONY AND EXHIBITS JOINTLY SUBMITTED BY SIRIUS SATELLITE RADIO INC. AND XM SATELLITE RADIO INC.

VOLUME 1 OF 1

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DIRECT TESTIMONY OF ROGER J. RUSCH
(ON BEHALF OF XM SATELLITE RADIO INC. AND SIRIUS SATELLITE RADIO INC.)

Introduction

1. I have been retained by the law firms Constantine Cannon, P.C. and Wiley Rein & Fielding LLP on behalf of XM Satellite Radio Inc. (XM) and Sirius Satellite Radio Inc. (Sirius). I have been asked to give expert opinions and testimony in the Copyright Royalty Board proceeding to determine the royalty payable by Satellite Digital Audio Radio Services. I was retained to provide expert opinions on the following issues:

- The types and levels of risk in starting and operating a satellite-based communications business.
- The types, nature, and amount of investment required to make a satellite enterprise viable.
- The anticipated returns necessary to attract investment required to launch, operate, and maintain a satellite business at various stages.
- How changes in operating cost and revenues would affect the business.

- How these considerations apply to Sirius and XM.

Qualifications

2. I am the President of TelAstra, Inc., a technical and management-consulting firm located in Palos Verdes Estates, California. My firm advises prospective investors in space-based systems. In this capacity I have reviewed many business plans and have monitored the progress of new satellite enterprises. **Exhibit 1** is my detailed resume, documenting the details of my 44 years of experience in the area of satellite communications. It also lists all my publications within the last 10 years and selected relevant publications in earlier years.

3. In summary, I have been active in the management and design of communications and broadcasting satellite systems since 1965 starting with INTELSAT III at TRW (now Northrop Grumman), INTELSAT IV at Hughes Aircraft Company (now Boeing Space Systems), and INTELSAT V at Ford Aerospace (now Space Systems/Loral). I have held responsible positions on a wide variety of communication satellites and have been involved with radio broadcasting satellites since 1983.

4. I served on a panel of the National Academy of Sciences to review early studies concerning the use of direct radio broadcasting satellites for the Voice of America. I wrote an early paper on the use of S-band frequencies for radio broadcasting in 1986[1] that was published in 1990. I was a member of the U.S. delegation to the International Telecommunications Union (ITU) World Administrative

[1] The first paper was incorporated in the 1986 National Academy of Sciences report to the Voice of America and subsequently published: R. J. Rusch et al, "Design and Price of Audio Broadcasting Satellites", Symposium on Digital Audio Broadcasting, Washington, March 1990.

Radiocommunication Conferences in 1992 (WARC'92) and 1995 (WRC-95) that dealt with all aspects of radio frequency spectrum allocation including the assignment of spectrum for radio broadcasting. I supported the U.S. Department of Justice in defending the United States from litigation proposed by the satellite television broadcasters. I have provided expert opinions to the Federal Communications Commission relative to satellite broadcasting policy.

5. Under my supervision TelAstra, Inc. has prepared satellite system appraisals and due diligence reports for mergers and acquisitions, litigation and bankruptcy proceedings. I have lectured extensively in North and South America, Europe, Asia, Australia, and Africa on the business and financial aspects of communication satellites.

Previous Experience as an Expert Witness or Consultant

6. I have been retained as a consultant in legal actions including the following:

- Expert witness for Lockheed Martin in a dispute over prices of Proton launch vehicles in February 1998. Prepared expert report for Epstein, Becker & Green, February 1998.
- Expert witness for the partners of Cellularvision in a dispute over ownership rights to the Visionstar satellite system in July 2000. Retained by Robson, Ferber, Frost, and Chan. Testified in court as an expert for both sides of the dispute.
- Expert witness for the U.S. Department of Justice in defense of the Satellite Home Viewer Improvement Act (SHVIA) starting in April 2001. Prepared expert witness report and a deposition.

- Expert witness for the International Family Channel to retain broadcasting rights on the Echostar system starting in December 2001. Prepared expert witness report.

- Expert witness for Pegasus Satellite Television, Inc. and Golden Sky Systems, Inc., to give expert opinions and testimony in a legal action regarding the DIRECTV satellite broadcasting system. I also testified on behalf of the National Rural Telecommunications Cooperative (NRTC) and the plaintiffs in the related class action. This activity extended from January 2001 to March 2004.

- Expert consultant for both the debt and equity holders in the Loral Space and Communications Ltd. bankruptcy proceedings during the period from December 2004 to July 2005.

Summary of Conclusions

7. My conclusions are as follows:

(1) Satellite communications is an inherently risky business because of the nature of space technology.

(2) New satellite ventures embody a great deal of uncertainty during start-up. Investing in a new satellite service is extremely risky.

(3) Because of the high risk, equity investors, venture capitalists and other banking institutions expect high returns.

(4) Founding a new satellite venture requires many things to be done perfectly and almost nothing can go wrong.

(5) After the initial phase of a satellite service company, the risks remain high.

(6) Unanticipated costs and delays can burden the enterprise.

(7) Affordability is a key issue. Many satellite services have failed because the service and equipment prices are set too high.

(8) It takes a long time to earn revenue, become cash flow positive and eventually profitable. The satellite radio broadcasting industry faces significant risks before - and even after - it becomes a viable business.

(9) Customer value including quality of service and customer satisfaction must be balanced against costs.

(10) Driving up the costs of operation could impair profitability, reduce access to financing, and have a disruptive impact on the enterprise.

8. The principal of free enterprise is to balance the investment risk and rewards. Investors must be able to realize a profit on successful businesses. If government policy deprives investors of expected returns it will be difficult to finance future innovation.

9. Satellite radio is an innately risky space-based service. Not only was this industry subject to uncertainty during start-up but also there are ongoing risks since the service became operational. Satellite radio is not yet a profitable business and it faces competitive threats from terrestrial broadcasting services and new technologies. There is pervasive pressure to reduce costs and prices to grow the businesses. Raising royalty rates would clearly place satellite radio at a greater disadvantage.

Risk versus reward assessment for satellite radio broadcasting

An account of the changing perception of risk

10. Practical satellite communications started more than 40 years ago. Some of the basic policy and technical issues have been resolved[2] but many business risks remain. Although satellite communication is a glamorous and exciting industry, developing a new satellite service is still a risky undertaking and must be evaluated as a serious financial proposition.

11. The theoretical roots of satellite communications go back to 1895 when a Russian visionary realized that artificial satellites could be placed in stationary orbits[3]. The earliest tests of satellite communications were sponsored by civil and military organizations. Financial skepticism was widespread at that time because of the high cost of space technology. The risks of a commercial space business were high. Consequently, the U.S. Congress passed the 1962 COMSAT Act to protect this nascent industry. Many of the practical technical issues were resolved in 1963 when NASA launched Syncom II, the first successful synchronous satellite. Nonetheless, as additional protection to offset business uncertainties, an international governmental organization was created for communications satellite services. An international treaty created an international service monopoly. Furthermore, risk was syndicated with several national telecommunications operators investing in the institution that became INTELSAT.

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[2] Von Karman Lecture: "The Rocky Road to Communication Satellites" by Dr. A.D. Wheelon, Hughes Aircraft Company, AIAA 24th Aerospace Sciences Meeting, January 6-8, 1986, Reno, Nevada.

[3] The Russian pioneer, Konstantin Tsiolkovsky observed that a geostationary satellite could be orbited to provide a stationary "star".

12. Several national systems were founded to provide domestic services in the 1970s. A great deal of transmission capacity was leased to distribute television programs to network affiliates and to "cable-heads" for terrestrial distribution. In subsequent decades the commercial viability of Fixed Satellite Service (FSS) communications led to the formation of regional satellite operators and international competitors. The international monopolies were dissolved. Today INTELSAT and some other companies in the FSS industry are profitable.

13. In 1979 another international organization, Inmarsat, was formed for Mobile Satellite Services (MSS). Although the frequency band was new, COMSAT, the European Space Agency and INTELSAT agreed to provide capacity with small satellites and "piggyback" payloads to start the new business. Inmarsat leased capacity from these other operators. Since Inmarsat did not have to make a large up-front capital investment, it became profitable in a relatively short span. For many years Inmarsat subscribers used suitcase or laptop size terminals. Space-based domestic and international cellular *telephone* service was introduced between 1995 and 1999 by competitors to Inmarsat. These included American Mobile Satellite Corporation (now Motient), Telesat Mobile Incorporated, Iridium, ICO Global, and Globalstar. While these companies were struggling to become established the addressable market changed. Terrestrial cellular service expanded and airtime charges dropped. The space-based costs were so high that service charges were prohibitive to most prospective users. These new satellite competitors were business failures and most of them declared bankruptcy. These MSS companies failed because the market did not materialize. It was the first time that satellite business aspirations had outstripped market demand.

14. Initially, FSS satellites connected to terrestrial networks through ground stations, called a gateways or teleports, that had large antennas. By the early 1980s, a few individual users started to install large (8 to 10 feet diameter) antennas to receive television programs directly from satellites. Satellite technologies continued to improve over time. Satellites became more powerful with larger antennas. Ground antennas could be much smaller. Consequently, strong interest developed in broadcasting television and radio directly to end users rather than passing through a gateway. Satellite television broadcasting started in Europe during the 1980s. The first successful Direct Broadcasting Service (DBS) in the United States, DIRECTV, was introduced in 1994. Echostar followed a year later. Almost 10 years passed before these companies became profitable.

15. Starting in 1995, hundreds of broadband satellite networks were proposed to provide global high-speed Internet access. Several of these concepts were licensed and funded with billions of investment dollars. Collapse of the telecommunications and Internet bubble dried up funding for most of these initiatives. Nearly all of these systems were terminated during the recession. Today only WildBlue and vestiges of Spaceway survive. The long-term prospects for this service remain in doubt.

16. Worldspace pioneered satellite radio broadcasting[4] in Africa and East Asia in 1999 and 2000. Today Worldspace is widely considered to be a business failure. Satellite radio broadcasting started later in the United States. Sirius[5], first called CD

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[4] Satellite radio broadcasting received a frequency allocation at World Administrative Radiocommunications Conference 1992 (WARC'92) in Torremolenos, Spain.

[5] "United States Satellite Digital Audio Radio Service"; Robert D. Briskman, Satellite CD Radio, Inc.; Pacific Telecommunications Conference Record; Honolulu, Hawaii; January 1993; Pages 511-518

Radio, Inc. and XM, originally called American Mobile Radio Corp., and developed business plans starting in the 1990s and received FCC construction permits in 1997. XM and Sirius commenced commercial service in late 2001 and early 2002 respectively. These U.S. satellite-radio broadcasters are gaining acceptance but are not yet profitable businesses.

17. I have provided a brief business summary of these companies and a discussion of some of the risks still facing these companies below. The following are several conclusions that I have drawn from my experience.

Conclusion 1: Satellite communications is an inherently risky business because of the nature of space technology.

18. Satellites are highly sophisticated facilities that must be entirely self-contained. Every aspect needed for operation and survival must be incorporated into the space vehicle. Satellites are designed and tested on the ground but experience the unique space environment for the first time after launch. Any design deficiency could lead to degraded performance or failure. High-energy rockets can destroy the precise electronic machinery of a satellite. Even if the launch is benign the rocket trajectory could be misaligned and render the satellite unusable. Once a satellite is placed in orbit it cannot be repaired physically, corrective actions from the ground are extremely limited. It is completely impractical to send a technician into orbit to make repairs. The cost of taking corrective action is greater than building a replacement satellite.

19. Terrestrial systems are not subject to the same deployment and operational risks and can be repaired or replaced readily. Terrestrial communication networks can be

built and rolled-out in small steps without requiring deployment of the entire infrastructure. Service revenue can be used to fund network expansion. The rate of investment can be adjusted to match customer demand more closely.

Conclusion 2: New satellite ventures embody a great deal of uncertainty during start-up. Investing in a new satellite service is extremely risky.

20. Funding a new satellite service is an enormously risky undertaking because space-based services have distinctive characteristics. Satellite signals travel longer distances and are often weaker than signals from terrestrial transmitters. The higher frequencies used by satellites are more easily attenuated by vegetation, buildings, or adverse weather conditions. Customer acceptance of satellite service can only be demonstrated after the entire system is placed into service. It requires the entire capital investment up front and many years before there is any revenue. Terrestrial communication systems can be funded incrementally with phased capital investment and earlier revenue. Recovery of the investment on a successful satellite enterprise requires significantly longer than most business projects. For example, deployment of the satellite radio broadcasting constellations required three to four years from the satellite contract awards to launch of the last satellites. Many aspects of the business can change during business development.

Conclusion 3: Because of the high risk, equity investors, venture capitalists and other banking institutions expect high returns

21. Early equity investors demand[6] 30% to 40% Internal Rate of Return (IRR) and debt for these enterprises carries "junk bond" interest rates of 10% to 14% today. Although these rates seem extremely high, investors require these returns on new satellite investments because of the extraordinary risks involved.

22. From an investment perspective the capital required is large, the payback time is long, and the technical and other risks are significant.

Conclusion 4: Founding a new satellite venture requires many things to be done perfectly and almost nothing can go wrong.

23. **The technical approach must be sound.** There cannot be any weak aspect that is ignored. Many projects are adored for technical splendor, but are not practical or feasible or will not satisfy consumer needs. Sometimes a fatal flaw or "show-stopper" is ignored. When momentum has set in, the participants are reluctant to turn back. Denial sets in. Low Earth Orbit (LEO) constellations for satellite cellular service created great excitement, but the phones did not work inside of buildings. Similarly LEO broadband satellite services like Teledesic and Skybridge were not successful because the infrastructure was extremely expensive to build and operate and required an extremely expensive user terminal that tracked the satellites.

24. **The business people are crucial.** The founders must have enormous energy, enthusiasm, and stamina. Preferably, the initiative would be backed by a large

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[6] Investors are unwilling to fund high risk investments unless the business plan shows the potential for high returns. In this sense the investor return-threshold is a requirement or "demand."

institution with large reserves of wealth, technical talent, and management resources. This is an endeavor that demands high levels of drive and commitment. Many great ideas have failed for lack of support. Highly experienced managers are required to ensure success. These executives command and deserve high levels of compensation.

25. **Investment must provide a secure foundation for launching the business.** Capital must be provided through private equity, debt, and public stock sales. The funding must be firm and long term so that the company can survive delays and economic issues that might reduce income.

26. **The business plan must be realistic.** Since investors expect large returns, the plans frequently minimize capital costs and have an optimistic view of the ramp up in revenues. Investors expect a certain amount of optimism in these plans, but they have to pass a "reality screen." Fundraising is typically started early in the business development process. There is a risk that an overly optimistic plan may not be realized and that investors will be reluctant to sustain an enterprise that does not meet expectations. Seven years ago the satellite radio companies anticipated that they would become profitable sooner. There have been substantial shortfalls of revenues and the cash flows turned out to be less than expected.

27. **The first major milestone is obtaining market access through regulatory approvals.** The company must be authorized by a sovereign government to launch a satellite and to provide communications services. If the service is new and requires changes to radio frequency spectrum allocations, it may be necessary to obtain international approval through the ITU, which only meets at multiple-year intervals. After there is international agreement, the FCC or other national agency must adopt the

new radio regulations and issue a license to the applicant. This process requires a minimum of two to five years. It is important to remember that all radio spectrum is being used and that a new license requires reassignment.

28. **The product must be introduced when the market and technology are ready, not too early and not too late.** There are examples of services that were introduced before the technology was mature and failed because of inadequacies. For example, the earliest DBS companies, called USSI and Satellite Television Corporation (STC), failed in the early 1980s partly because the number of video programs was limited and the installation time was long. In other cases new services have been late to market and other terrestrial alternatives have grabbed the market. Space-based services have a disadvantage relative to terrestrial services in this regard. Since the implementation spans of satellite projects are long, there could be changes in technology or consumer tastes that would affect service acceptance.

29. **A satellite operator must have strong patents.** Competitors or "patent trolls" could assert patent rights to the selected technical approach. Therefore, the company must have a solid position to preclude or defend against challengers. In the early days of satellite radio there were patent issues between Sirius and XM that have been resolved.

30. **Reliable satellites must be designed, built, and launched.** Many companies focus primary attention on this aspect of the business because the space segment is sophisticated and highly risky. Placing a satellite into service carries a huge risk because a defective launch can destroy the satellite. The substantive test of a satellite is operation in the space environment. Insurance premiums for the launch phase of 15%

to 25% reflect the degree of risk. If a satellite is lost at launch it can take two or three years to replace.

31. **Satellites must function properly in orbit.** Perfect operation is essential since there is no practical or cost-effective way to repair a high-altitude satellite in orbit. Performance anomalies and wear-out mechanisms can degrade the quality of service or require early replacement of the satellites. Usually satellite defects are revealed within a few weeks or months, but sometimes, satellite problems have remained hidden for six to eight years before becoming apparent. In recent years there have been several examples of solar array problems that have lowered the available electrical power, reduced the capability of satellites, and lead to early replacement. The impact of the defective Hubble Space Telescope mirror is well known. Several years, two missions, and enormous cost were required to repair the manufacturing defect. In the case of geostationary or highly elliptical orbits that are used for satellite-radio broadcasting, the cost of similar repairs is prohibitive.

Conclusion 5: After the initial phase of a satellite service company, the risks remain high.

32. In addition to the continuous technical risks of satellite failures or equipment problems there can be other business or commercial risks.

33. When established terrestrial operators oppose satellite service the situation can be difficult for satellite service. Both satellite and terrestrial competitors can introduce regulatory and legal obstacles. In some cases legislators have targeted satellite service providers to obtain tax revenues or preferential treatment for terrestrial competitors.

34. User equipment must be well designed, meet production rates, and perform reliability. There have been cases where the hardware or software does not function as expected when introduced. Ground hardware or software problems have contributed delays of a year or more before a service could be introduced. Sometimes the manufacturer has not been able to produce satisfactory hardware as fast as needed thereby limiting the number of subscribers. User terminal problems with receivers or transceivers can also create a bad impression of the service. The equipment must be easy-to-use and simple to operate.

35. The business must have effective distribution channels. Retail outlets provide access to the end user. The distributor provides installation, servicing, and initial registration for the product. Typically the operator negotiates a fee or cost sharing arrangement with the distributor. In some cases the distributor may be a major company like an automobile manufacturer. If the distributor is not motivated and enthusiastic the service will not be promoted to the prospective subscriber.

36. There are overriding market risks related to consumer acceptance. User decisions are based on the perceived value, quality, and cost of the service. Customer decisions are also affected by economic conditions. If income is low or job security is tenuous prospective subscribers are reluctant to make long term commitments. When the automobile industry goes through periodic production slumps fewer new cars are built and, therefore, fewer new satellite radio receivers are installed. Automobile cycles may not be correlated to economic level in a simple way.

Conclusion 6: Unanticipated costs and delays can burden the enterprise.

37. The satellite communications business is replete with examples of unexpected costs. Insurance rates can soar due to satellite failures on other programs. Launch prices can increase due to economic conditions in another country. Users may expect additional service features or programming. In the case of satellite radio broadcasting, listeners were found to be interested in non-music content including talk shows and sports coverage that was not originally anticipated. Sirius and XM found it necessary to pay for branded proprietary content. DBS companies discovered that prospective subscribers wanted to receive local television broadcasting stations. Set-top box designs required revisions to reduce widespread signal pirating.

Conclusion 7: Affordability is a key issue. Many satellite services have failed because the service and equipment prices are set too high.

38. Satellite systems are inherently expensive because of the sophisticated nature of the transmission system. Satellites and launch vehicles are extremely expensive. Every possible measure must be considered to reduce costs and extract maximum value from the service. In the last decade satellite manufacturers became enamored with LEO satellite constellations that were extremely expensive to build and operate. The ultimate cost of these systems was not revealed until major financial commitments were made. Consequently, the necessary airtime fees established for the service (up to $6 per minute) were considered to be unaffordable by most prospective users.

39. **Worldspace failed as a radio broadcaster because its service was not affordable.** Worldspace was described at the World Summit for Satellite Financing (held in Paris, September, 2006) as a business failure because it has not attracted a significant

number of listeners. It has not developed an income stream to repay its operating costs let alone its initial capital investment after seven years of operation. Worldspace satellites were stationed in orbit positions to serve Africa and Central/Eastern Asia. These regions desperately need good communications services but are inhabited by populations with extremely low-income levels. Most of the prospective audience cannot afford a satellite radio receiver and cannot pay a modest subscription fee. Nevertheless, Worldspace was able to raise $250 million though an IPO in 2005[7]. The shares were priced at $21 and crested at $24 on the first day. Subsequently, the stock price fell to 10% of its original value ($2 per share) and it now resides at $3 per share.

40. **Iridium and Globalstar failed because their services were too costly for a large market.** Inmarsat started service in 1980 for ships at sea, but only had 12,000 subscribers by 1991. The cost of MSS was between $6 to $10 per minute at the time. Satellite cellular telephone service created a sensation in the early 1990s when the cost of cellular service was much higher than today and when the coverage areas were limited. Iridium and Globalstar designed extravagant satellite networks for personal telephone service. The capital cost for each of these systems was over $5 billion each. The cost of service was several dollars per minute. Satellite telephones cost $1500. Many people wanted to have service anytime, anyplace but were unwilling to pay these prices for satellite service.

41. **Connexion-by-Boeing was too expensive.** Boeing developed a high-speed Internet service for commercial aviation called Connexion. In a fashion similar to

[7] WORLDSPACE, INC. AMENDMENT NO. 7 TO SEC FORM S-1 REGISTRATION STATEMENT July 20, 2005.

satellite phones many people liked the idea of the service but were not willing to pay the price. Few passengers used it and Boeing plans to terminate the Connexion service. Once again the financial community regards this as a failed service because it was too expensive.

Conclusion 8: It takes a long time to earn revenue, become cash flow positive and eventually profitable. The satellite radio broadcasting industry faces significant risks before - and even after - it becomes a viable business.

42. Up-front capital costs are extremely high. No revenues can be obtained until the entire space and supporting infrastructure are prepared. Broadcast facilities and program operations for hundreds of channels must be planned and operational before service can begin. After the facilities are in place and service is introduced subscribers must be enrolled. Customer acquisition requires advertising and promotion. Receivers are costly so the satellite operator often must finance user equipment. A distribution network, including automotive original equipment manufacturers (OEM) and after-market retail outlets, must recruit individual users and provide an income stream. Dealers are paid for customer acquisition. Customer servicing, information call centers, billing, and collection are additional functions that add to operating costs. Securing a sufficient number of subscribers to pay the operating costs often requires several years. Paying back the capital investment requires several more years.

Conclusion 9: Customer value including quality of service and customer satisfaction must be balanced against costs.

43. Constructing a business that offers desirable customer benefits is an art that requires considerable skill. There have been a number of services that market surveys showed would have great promise. For example, prospective subscribers were asked: "Would you like to have telephone service on an airplane?" The overwhelming response was "yes" before the service was introduced in 1982. 18-years later Boeing received similar positive feedback when Connexion-by-Boeing was being planned. In both cases the actual use was far less than had been expected. Consumers were interested in these services, but not at the prices that permitted the operators to make a profit. In these cases the quality of service was probably not the major issue.

44. The business case for satellite radio is much more sophisticated. This is a new subscription service that must compete with free over-the-air services as well as emerging technologies. Furthermore, satellite radio planners know that listeners to "pay-radio" prefer to avoid commercials. Both infrastructure and content are cost elements that affect business performance and profitability.

Conclusion 10: Driving up the costs of operation could impair profitability, reduce access to financing, and have a disruptive impact on the enterprise.

45. When a satellite operator encounters higher costs the company comes under profit pressure. Ideally, any added-cost element would provide tangible customer benefits. In turn an improvement would attract more customers who are willing to pay higher prices or accept smaller discounts. Subscription costs could be raised, but this might choke off subscriptions. Net revenues could drop if prices are raised.

46. Alternatively, the operator could absorb higher costs and defer the date when the service become profitable. Investors and bankers might not have patience for this approach. The stock price would be under pressure and bond-rating services might lower credit ratings. Under these circumstances it would be more difficult to secure additional funding.

47. Another risk is higher payments for programming content. Royalties have a significant effect on operating costs. Higher costs may lead to higher usage fees. The consequence of higher prices is lower public acceptance, reduced profitability and weaker investor sentiment. In setting royalty policy, decision-makers need to take into consideration the impact that rates have on the overall business including financial returns and the need for future investment.

Sirius and XM Business Summaries

48. Satellite television broadcasting directly into homes started in 1994 and attracted millions of subscribers within a few years. Consequently, satellite radio broadcasting also seemed to be a "natural" application of space technology. Market studies[8] indicated that commuters would be willing to pay for clear, dependable radio services, but much less than they would pay for television. Analysis and tests showed that satellites could transmit more than 100 digital radio programs simultaneously. The service could be priced at affordable rates to the end user.

[8] Study by **Strategic Marketing and Research Techniques**, XM SEC 1999 annual Form 10K, p. 3.

49. The following table shows some key events identified in SEC filings.

Date	Sirius Satellite Radio	XM Satellite Radio
18-May-90	Initial FCC filing	
3-Mar-97	FCC rules for radio broadcasting	FCC rules for radio broadcasting
2-Apr-97	Won FCC spectrum auction $83million	Won FCC spectrum auction $89 million
15-Jun-97	SS/L signs contract for 3 satellites	
10-Oct-97	FCC license to build satellites	
16-Oct-97		FCC license to build satellites
15-Mar-98		Hughes contract for 2 satellites
20-Nov-98		Distribution deal - General Motors
11-Dec-98	Modified FCC application - elliptical orbits	
15-May-99	SS/L contract for Sirius 4 satellite	
28-Jun-99	Ford Deal To Install Receivers in Cars	
27-Sep-99		IPO 10 million shares
15-Nov-99	Completed Construction of National Broadcast Studio	
28-Jan-00	Agreement with Daimler Chrysler	
16-Feb-00	Agreement to develop a unified standard for satellite radios	Agreement to develop a unified standard for satellite radios
16-Jun-00	Agreement with BMW	
		Distribution deals - Freightliner, Peterbilt, Winnebago
30-Jun-00	Sirius SR1 Satellite launched	
5-Sep-00	Sirius SR2 Satellite launched	
30-Nov-00	Sirius SR3 Satellite launched	
	Increased fee from $10 to $13 Monthly	
15-Feb-01	Planned service start date	
18-Mar-01		XM Radio 2 "Rock" launched
8-May-01		XM Radio 1 "Roll" launched
15-May-01		Planned service start date
15-Sep-01		Commenced commercial service
14-Feb-02	Commenced service selected markets	
1-Jul-02	Commenced service nationwide	
5-Mar-03	Creditors approve plan to pull company out of debt (financial restructuring)	
1-Mar-05		XM Radio 3 "Rhythm" launched
4-Apr-05		Increased fee from $10 to $13 Monthly
15-Jun-05		SS/L contact for XM 5 satellite
15-Jun-06	SS/L contract for Sirius 5 satellite	
30-Oct-06		XM Radio 4 “Blues” planned launch date
4Q-08	Sirius SR5 Satellite Launch date	

Regulatory Delays

50. Although CD Radio, the predecessor to Sirius, submitted its initial filing in 1990, the FCC did not process licenses until 1997. During this long delay founding investors waited for authority to proceed. They were subject to the continuing risk of changing market conditions that could have significantly undermined the business proposition. In the music industry recordings transitioned from LP vinyl records, to CDs to MP3 files within few years. Video content quickly moved from tape recordings to DVD to video-on-demand and HD-DVD/Blue Ray. The cellular industry rapidly grew from a luxury item to a business tool to an almost universal gadget. The Internet exploded in size and transitioned from a government network to dial-up telephone service to broadband to wireless service. Overall there has been a consolidation within the media industries including music, television, broadcasting, and cable services. Sometimes being late to market means that alternative solutions will capture a consumer market. Recovery from this situation means that consumers must alter their behavior patterns. The migration of a consumer from one solution to another is a time-consuming and costly process.

Technology Issues

51. XM and Sirius each use distinct radio spectrum and cannot lease incremental capacity from established operators. Satellites for radio broadcasting have large antennas and have high electrical power requirements. Therefore, a "piggyback" payload is not practical and a dedicated satellite is needed.

52. Most of the satellite television subscribers use a fixed or rigid ground antenna that receives satellite signals along an unobstructed path. Automobile commuters are a major and distinctive market for satellite radio. Since this is a mobile application there are significant transmission challenges. Cars move so there will not always be a clear path from the satellite to the user antenna. Special techniques are required to avoid the loss of signals.

53. XM uses high power geostationary satellites with a larger number of terrestrial repeaters. Sirius redesigned its space segment from a geostationary orbit to a constellation in elliptical orbits. The Sirius approach provides higher viewing angles that are less susceptible to obstructions. This space segment revision required the construction of a third operational satellite, which was an unplanned expense. Although the Sirius orbital architecture was changed to accommodate lower power satellites with fewer ground repeaters, there have been no fundamental design flaws. Both the Sirius and XM space architectures are technically adequate.

54. Both systems use terrestrial repeaters to augment service in urban areas and overcome the blockage of tall buildings. There was a significant risk that the system would not produce a satisfactory quality of service for the prospective subscriber. Processing of the satellite and terrestrial signals requires sophisticated receivers in the user terminals. Sirius contracted with Lucent Technologies to build the chip set, but there were significant design problems that delayed the introduction of service for more than one year.

Launch Success but in-orbit difficulties

55. Six satellite radio broadcasting satellites were launched without failure. There have been a few in-orbit problems, however. High power satellite transmitters are needed to ensure that there will be a strong signal that will not fade due to reflections and ground scatter. Both Sirius and XM selected satellites with large solar arrays to power the satellite transmitters. Both companies encountered difficulties with the satellite solar panels. The XM solar arrays degraded so severely that two satellites had to be replaced early. Insurance did not fully cover the replacement cost of these satellites.

Slower Subscriber Growth

56. The number of satellite radio subscribers has been growing, but the growth rate has been dropping. The following assessment is based on public data provided by the satellite radio broadcasting companies. In each case I have provided linear and logarithmic displays of the data. Linear graphs are suitable when there are relatively small changes, but logarithmic plots provide more useful information when there are changes of more than a factor of 10. A logarithmic graph has the distinctive property that a straight line represents a constant rate of growth or decay. **Figure 1** (Exhibit 2) shows that growth rate is falling off. The logarithmic scale (Version 1B) indicates that the rate of decay in growth rate is almost constant. Version 1B can be used to estimate the growth rate in one or two years. **Figure 2** (Exhibit 3) shows the number of U.S. satellite radio subscribers. It also shows that market analysts expected a much larger number of subscribers[9]. Here again the logarithmic graph shows that the growth rate is slowing. If the growth rate were constant the number of subscribers would increase along a straight

[9] These forecasts were published prior to service launch.

line. Since the growth curve is bending the growth rate is declining. Satellite radio companies have concluded that music offerings are not sufficient to attract subscribers for satellite radio. There is interest in new forms of content. Sirius and XM have added local reports of weather and traffic conditions, sports programming and talk shows.

Investment Challenges

57. The middle to late 1990s was an era when investors were receptive to new technologies. Fortunately, Sirius and XM were able to raise initial funds during this period. Before the satellites were launched the telecommunications bubble had burst. Sirius signed a satellite construction contract in June 1997 and XM ordered satellites in March 1998. Before the systems were built and placed in commercial service the financial environment had changed dramatically and they faced tough times to keep the enterprises alive. Investors were willing to fund established and proven companies during the period from 2001 to 2003, but new companies struggled.

58. The initial business plans were based on a success scenario. The budgets did not include funds for additional satellites. There were implementation delays as mentioned above. Customer acquisition costs are higher than originally expected. In 2000 (for Sirius) and 2005 (for XM) it became necessary for the satellite radio companies to increase basic subscription rates from $9.95 to $12.95 per month. Raising the price was a risky decision because higher prices tend to depress subscriber growth. Some observers think that there will be pressure to decrease satellite radio prices because of competition from alternative sources like recorded music or WiFi / WiMax coupled to Internet Radio.

59. This is a relatively early time in the life of these businesses. There could be needs for additional funding to grow the businesses until satellite radio becomes

profitable. Financial uncertainties affect the perceived investment risk. Both bankers and equity investors expect higher returns for higher risk investments. Consequently the prices of stocks and bonds drop when unexpected problems arise. Higher interest rates are an additional financial burden. Over the past two years the stock prices for Sirius and XM have been depressed and have fallen to 30% to 50% of earlier values.

Prevailing Risks facing Satellite Radio

60. All satellite services must live with technology risks including premature satellite mortality or launch failures. Other risks are derived from regulatory processes. Competitors try to use governmental policy as a weapon to weaken or defeat a challenger. Incumbent service providers, like terrestrial radio broadcasting stations, prefer to eliminate space-based solutions.

61. We live in a dynamic world where new alternatives are presented every day. Satellite radio is one of the choices that have been presented to consumers over the past five years. New technologies and services including iPODs and wireless Internet radio are alternatives that are sweeping the country. The ultimate growth of satellite radio requires nurturing in this highly competitive environment.

62. Neither Sirius nor XM has achieved a financial "break-even" situation. This means that revenue is less than the cost to operate the service. If costs increase additional funding may be needed to sustain these novel services.

Conclusions

63. The principal of free enterprise is to balance the investment risk and rewards. Investors must be able to realize a profit on successful businesses. Founding investors should be compensated for high risks early in the process. Subsequent investors

should also receive a reasonable return. If government policy deprives investors of expected returns it will be difficult to finance future innovation. Higher royalties, for example, would discourage investors and drive up the cost to obtain financing. Satellite radio offers a wider variety of programming and provides more universal public access to creative works than is possible in most regions of the country. Few urban regions, let alone rural areas, are able to provide the full range of styles and textures that satellite radio provides. It is in the public interest to preserve and continue these innovative services that are presently delivering service to more than 12 million subscribers.

64. Satellite radio is an innately risky space-based service. Not only was this industry subject to uncertainty during start-up but also there are ongoing risks since the service became operational. Satellite radio is not yet a profitable business and it faces competitive threats from terrestrial broadcasting services and new technologies. There is pervasive pressure to reduce costs and prices to grow the businesses.

Certification

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information and belief.

Dated: Palos Verdes, CA
October 30, 2006

Roger J. Rusch
President, TelAstra, Inc.

Index of Exhibits for Roger J. Rusch

Ex. No.	Sponsored By:	Description
SDARS-Rusch Ex. 1	Roger J. Rusch	Resume of Roger J. Rusch
SDARS-Rusch Ex. 2	Roger J. Rusch	Satellite Radio Growth Rates
SDARS-Rusch Ex. 3	Roger J. Rusch	Satellite Radio Subscriber Growth

Resume of Roger J. Rusch

EDUCATION

BS - Physics, Iowa State University. Electricity and magnetism, orbital mechanics, astronomy, optics, thermodynamics.

MS - Mechanical Engineering, University of Southern California Control systems, fluid mechanics, nucleonics, & heat transfer.

MS - Electrical Engineering, University of Southern California. Communication theory, random processes, & microwaves.

Post Graduate courses in business, finance, and management.

EXPERIENCE

TelAstra, Inc., President, Palos Verdes, CA 1996-present

Founder of TelAstra Inc., an objective management and engineering consulting firm dedicated to universal communications service. The company counsels service investors, operators, and system producers in business and financial aspects of the telecommunications industry. The firm has provided studies for more than 100 major space companies worldwide. Clients include U.S. Navy, NASA, U.S. Department of Justice, European Space Agency, COM DEV Ltd., Telespazio, Raytheon E-Systems, Mitsubishi Electric, Daimler Benz Aerospace, Astrium Space, Orbcomm, Lockheed Martin, and Alcatel Espace.

Assisted debt holders in bankruptcies of ICO Global and Loral Space and Communications. Provided expert witness testimony on Direct Broadcasting Satellites, valuation of orbit slots, and insurance disputes.

Prepared business and financial appraisals of satellite systems including Investing in Mobile Satellite Services, Investing in Broadband Satellite Services, Investing in DARS, Investing in Launch Vehicle Services. More than 200 copies of these reports have been sold to members of the space community.

Compiled comprehensive data on satellite cost, schedule, anomalies and failures. Published standard reference works including COMMUNICATION SATELLITE DATABASES, for 21 years. These data provide comprehensive records of the cost, schedule, technical, and operational performance of all the communications satellites, under contract, built or launched.

Participant in advisory panels including the National Academy of Sciences, keynote speaker for several major industry conferences, author of numerous papers on satellite communications, and regular columnist for Satellite News.

Director on the Board of COM DEV International, a Canadian company since 2000.

TRW Space & Defense, Redondo Beach, CA 1985-1996

Odyssey Vice President, Systems Engineering and Deputy Managing Director. Creator and architect of the medium Earth orbit concept for satellite based personal communications. Recipient of several patents for inventions in the field of space communications. The Odyssey patents were sold to ICO Global for US$150 M. Managed preparation of FCC application, led WARC'92 & WRC-95 regulatory staff, promoted the Odyssey concept throughout the world, convinced Inmarsat to select MEO as the baseline for I-CO Global. Persuaded Teleglobe to become a strategic partner in the Odyssey program. Assembled international team of subcontractors. Advanced Systems Manager: Evaluated all U.S. Domestic and International Communications Satellite new business opportunities. Catalyst for TRW cost reduction studies; explored all opportunities for reducing the cost of doing business. Deep Space Relay Satellite Study. Proposal Manager for AMSC/MSAT.

Systems Engineering and Integration Manager, Director of Systems Engineering and Integration for the TRW Federal Systems Division which managed the NASA programs including TDRSS. Grew the engineering staff by 50%. Developed a better-trained and educated system engineering staff through a series of career development seminars. Expanded the usage of personal computers. Cut the average labor rate by 5% in one year while reducing the average staff age by 3 years. Increased the burdenable labor while reducing the overhead budget. Managed the division IR&D program and obtained the highest review scores in 8 years.

Ford Aerospace, Palo Alto, CA 1975-1985

Program Management (INTELSAT V, FORDSAT, SUPERBIRD)

First program manager and Technical Director for the highly reliable INTELSAT V series of satellites (included in Key Personnel Clause, IS 796). These satellites were first launched in 1980 and were the workhorses of the fleet for more than 15 years. Integrated all engineering activities on the program. Managed technical interfaces between Ford subsystems, six international subcontractors and numerous domestic subcontractors. Directed all system level analyses including structural dynamics, thermal, attitude control dynamics, mission operations, and mass properties. Controlled launch vehicle interface for Ariane, Atlas-Centaur and Shuttle. "By any criterion, the entire INTELSAT V fleet has demonstrated extraordinarily high levels of in-service reliability."- John L. Stevenson and Robert Strauss, AIAA-92-1947-CP.

Served as INTELSAT VI Program Manager during the proposal and head start phases. Achieved a superior proposal evaluation for the technical and management aspects of the program. Responsible for the SUPERBIRD program. Created and managed the company funded project to develop the next generation communications satellite. Shaped the

program plan and made the day to day decisions. Annual budget was $15M. FORDSAT Program Manager.

Systems Engineering Management

Established and strengthened the Systems Engineering Activity (120 Professionals, 65 Technicians) which included Advanced Systems, Systems Analysis, Program Engineering, Systems Test, and Launch Systems Departments. Organized a series of weekly seminars for continuous training of systems engineers. Reduced operating costs by $2M and developed a $1M reserve through streamlined organization and 4-day/40 hour workweek. Allocated and controlled an annual budget for Independent Research and Development and Special Projects of $10M per year. Held direct budget responsibility for $12M/year.

Business Development

Served as a founding Director of the Direct Broadcasting Satellite Association from 1984 to 1985. He also designed TV broadcasting satellites for DBSC, one of the original winners of an FCC license. Responsible for marketing and sales of new satellite programs. Managed the current programs for international cooperative ventures. Developed and negotiated new agreements with European and Japanese team members. Directed proposals for new business. Controlled and allocated resources for new business expenditures. Prepared annual long range Strategic Business Plan.

Persuaded Ford Aerospace to bid on INTELSAT V. Established the international strategy, designed the spacecraft, directed technical proposal preparation, and wrote the management proposal for INTELSAT V. Designed and sold the Maritime package for INTELSAT V. Devised the domestic service feature for INTELSAT VA. Developed the strategy that avoided a "Hybrid" satellite competition and led to a sole source award of INTELSAT VA. Total award value $636M.

Headed the Review Team for the GOES I, J, K proposal. Managed technical proposal efforts for Telstar 3 and Palapa B. Reviewed the FCC filings for Land Mobile Satellite Service and Radio-determination Satellite System.

Hughes Aircraft Company, El Segundo, CA 1969-1975

Chief Systems Engineer (COMSTAR I)

Negotiated technical specifications and comprehensive test plan. Directed research with polarization grating for antennas. Prepared subsystem specifications. Chaired design reviews. Negotiated technical contract changes. Delivered written and oral quarterly progress reports. Prepared Satellite Operating Procedures. Edited and published Systems Summary.

Spacecraft Manager (INTELSAT IV)

Managed the construction and launch of INTELSAT IV satellites, including the satellite that was used to relay the first television pictures of President Nixon's visit to China in 1972. Led the manufacturing and test activities for three flight spacecraft. Expedited schedules to ensure delivery in record time. Staffed system test team. Directed spacecraft operations at Cape Canaveral. Presented Launch Readiness Review. Prepared despin test plan and despin test facility. Programmed HP 2100 computer to perform automated tests of spacecraft. Prepared telemetry calibrations. Participated in control center tests of all spacecraft subsystems. Contributed to communications receiver tests in Andover, Maine. Tracked investigations of receiver gain reduction.

TRW Space Vehicles Division, Redondo Beach, CA 1965-1969

Member of the Technical Staff. Contributed to the testing of all TRW spacecraft including special government programs. Invented, developed, and patented Krypton-85 Radiotracer Leak Detector for measuring small spacecraft leak rates in ambient pressure enclosure. Project manager for Zero Gravity Propellant Gauge sponsored by U.S. Atomic Energy Commission. Designed propellant gauge used on Naval Research Laboratory Explorer Satellites. Contributed to the DSCS II proposal.

U.S. Air Force Rocket Propulsion Laboratories, Edwards, CA 1962-1965

1st Lieutenant. Procurement and management of Research and Development programs.

PROFESSIONAL ACTIVITIES

Member of the COM DEV International Board of Directors (2000 to present)

Delivered workshops on Broadband and Mobile Communications Investment for ACT Conferences and IIR Ltd. In Washington, Paris, London, and San Diego (1998 to present)

Member of the FCC "Big LEO" and Ka-band Negotiated Rule Making Committees (1993/4)

U.S. Delegate to WARC '92 in Torremolenos, Spain (1992) and WRC-95 in Geneva (1995).

Affirmative Action Program Manager, TRW Federal Systems Division (1987-1988)

National Academy of Sciences: Satellite Committee Chairman, Panel for Voice of America use of space for broadcasting (1985-1986)

Advisory Panel for NASA Office of Aeronautics and Space Technology (1985)

Director, Direct Broadcast Satellite Association. (1984-1985)

Professional lecturer for TMSA "Systems Engineering, Advanced Techniques", presented in California and Europe. (1983)

Steering Committee for Ford Aerospace Employee Involvement Program.

TECHNICAL PAPERS (for the past 15 years)

1) "Broadband Satellite Service Demand – A New Forecast", 12th Ka-band Conference, Naples, Italy 29 September 2006.
2) Notes from 10th Satellite Finance Conference, Paris, 11 Sept. 2006.
3) "North American Commercial Satellite Business with Opportunities for Finnish Industry", Helsinki, Finland, 4 April 2006.
4) Notes from Satellite 2006, Washington, DC, February 6-9, 2006
5) "Ka-band: The Industry's Next Wave Continues", Satellite 2006, Washington DC, February 9, 2006.
6) " Preparing for the Future of Satellite Communications", 11th Ka-band and Broadband Communications Conference, Rome, Italy, 26-28 Sept. 2005.
7) Notes from 9th World Summit for Satellite Financing, Paris Intercontinental Hotel, September 5 - 8, 2005
8) "Trends that Foreshadow the Future of Satellite Communications"
9) 3rd World Symposium on Market Forecasts, Paris, September 5, 2005
10) "Satellite Communications Industry Status", Aerospace Corporation, El Segundo 28 April 2005
11) "Invisible Highways: Transporting Video From Media Sources to Viewers", Satellite 2005, Washington, D.C. 24 March 2005
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14) "Predictions for the Next 20 years of Satellite Communications", 10th Ka-band Conference, Vincenza, Italy, October 2, 2004.
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16) "Satellite Services for Remote Communities", Satellite News, July 19, 2004, vol. 27, No. 28.
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28) "The Illusory ATC Opportunity", Satellite News, June 16, 2003, Vol. 26, No. 24, page 2.

29) "Spot Beam Satellites for Broadcasting Television", 21st AIAA ICSSC, Yokohama, Japan, April 17, 2003.

30) "Launch Demand Forecasts Skew Upward", Satellite News, March 24, 2003, Vol. 26, No. 12, page 2.

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32) "2003: A Satellite Industry Odyssey", Satellite News, February 17, 2003, Vol. 26, No. 7, page 2.

33) "Rockin' From Space... A Satellite Radio Update", Satellite 2003, Washington, February 27, 2003

34) Introduction to Session 8 - Satellite Manufacturers, Palais des Congrès – Paris, France, December 12, 2002

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2000.

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93) "Growth Statistics", Satellite 2000, Washington Convention Center, February 2, 2000.

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95) "Will LEO Constellations Survive?" Launchspace magazine, February 2000.

96) "Investing in Satellite Communications, Exploring the Business Case", AIC Workshop, Millennium Chelsea, London, November 3, 1999.

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European Space Agency, November 15, 1999.

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104) "Alternatives for the Next Generation of MSS", IMSC #5, Ottawa, Canada, June 17, 1999.

105) "Appraisal of Tangible & In-kind Assets for Andesat SA", Miami Radisson Mart Plaza, November 13, 1998.

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107) "Evaluation of the New Broadband Satellite Systems", Study Report for the European Space Agency, June 1998.

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MTT-S International Microwave Symposium, Orlando, Florida, May 15-19, 1995.

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Radiotracer Leak Detector, U.S. Patent 3,597,611, Aug 3, 1971

Exhibit 2: Figure 1. Satellite Radio Growth Rates
Version 1A – Linear Scale

Satellite Radio Annual Growth Rate

Satellite Radio Annual Growth Rate

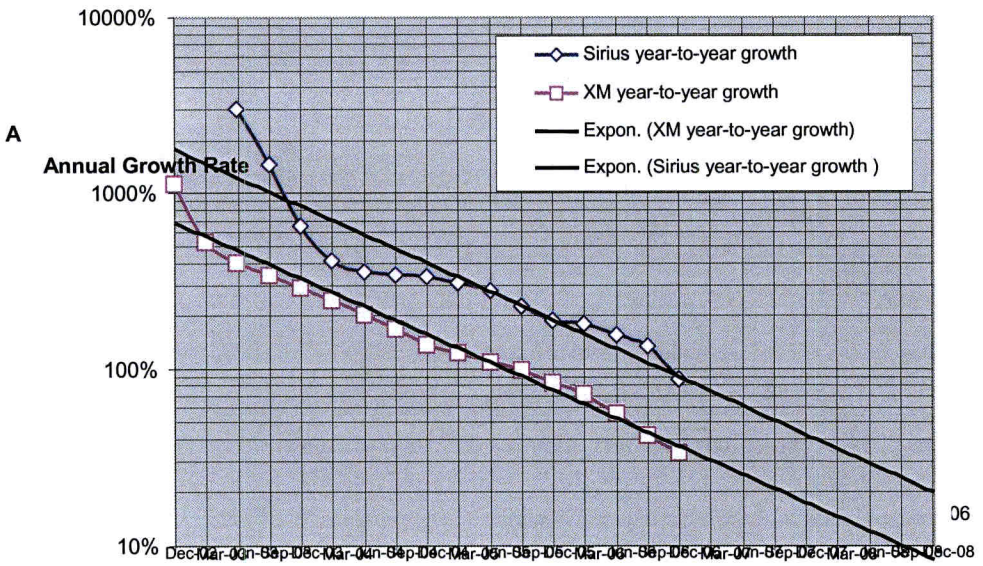
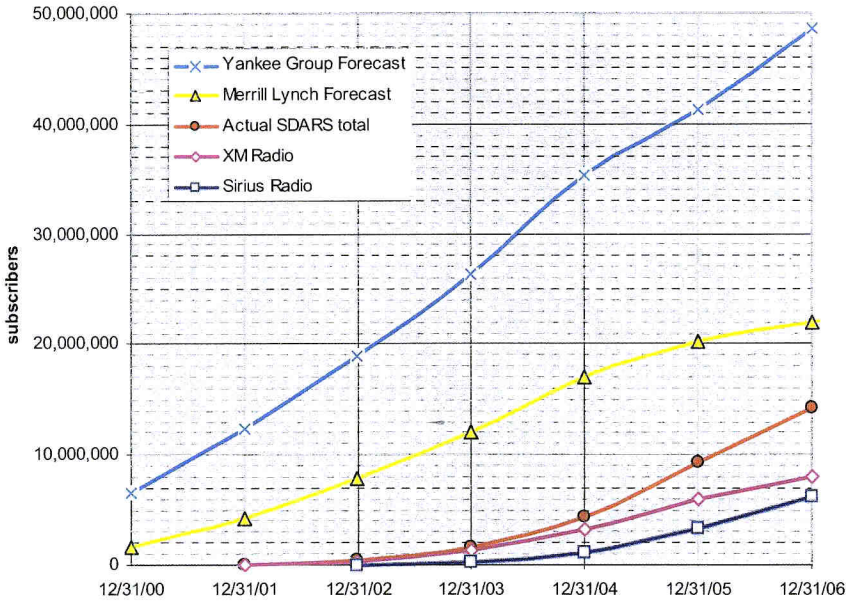
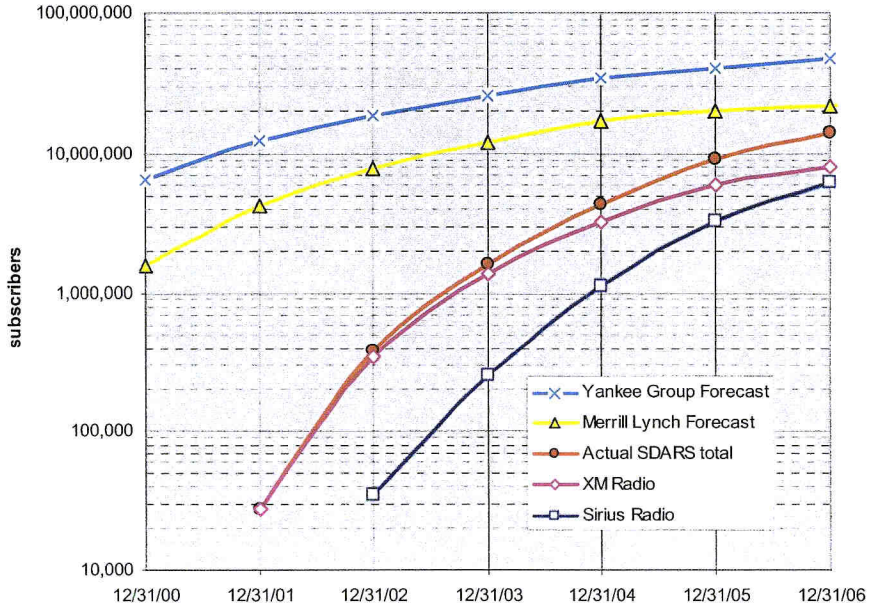


Figure 2. Satellite Radio Subscriber Growth



Version 2A – Linear Scale



Version 2B – Logarithmic Scale

Before the
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LIBRARY OF CONGRESS
Washington, D.C.

In the Matter of	)	
Adjustment of Rates and Terms for Preexisting Subscription and Satellite Digital Audio Radio Services	)	Docket No. 2006-1 CRB DSTRA

DIRECT TESTIMONY OF J. ARMAND MUSEY
(ON BEHALF OF XM SATELLITE RADIO INC. AND SIRIUS SATELLITE RADIO INC.)

Qualifications

1. I am the President and a senior member of Near Earth LLC, a specialty investment banking firm based in New York, NY that focuses on the satellite industry and related telecom and media sectors. The firm is an NASD registered broker dealer and provides a range of services including private capital raising, merger and acquisition advisory services and strategic and financial consulting. I hold a bachelors degree from the University of Chicago and am a graduate of the Kellogg Graduate School of Management at Northwestern University. I am also a chartered financial analyst (CFA).

2. Prior to joining Near Earth LLC, I was head of satellite equity research at Salomon Smith Barney and prior to that I held similar positions at other brokerage firms including Banc of America and C.E. Unterberg Towbin. I held a more junior role in the satellite research group at Merrill Lynch. In each case, my role was to provide analytical support to institutional investors considering investments in the satellite communications industry. This involved evaluating the

strategies, managements and financial positions of the firms I covered. I was responsible for writing research reports, building financial models, issuing buy and sell recommendations and issuing earning estimate projections as well as conducting one-on-one meetings with investors. Prior to working in research, I spent two years in investment banking immediately after graduating from business school.

3. In 2000, I was ranked the number one analyst covering the satellite communications industry by the Greenwich Associates survey and ranked third by the Institutional Investor survey for the satellite sector. In 2000, I was also rated a top stock picker in the Wall Street Journal's "All Star" Analyst survey. In 2001, I was a runner-up in the Institutional Investor survey and was ranked third in 2002, the last year for which a satellite communications category was included in the poll.

4. Additionally, I am quoted regularly in both trade publications and national and international publications, I have appeared on national television including Bloomberg, Fox and CNN numerous times as an expert in business issues related to satellite communications and I am frequently asked to speak at major industry conferences. My curriculum vitae is attached as Musey Exhibit 1.

5. Previous experience as an expert witness. I have provided expert witness testimony on one other occasion. The case was *Gross v. SES*.

6. Objective. I have been hired to analyze the potential effect of changing the royalty payments which satellite radio companies pay to sound recordings copyright holders from a capital markets perspective.

7. Materials Considered. (in table form in Musey Exhibit 2) In order to complete my analysis, I have reviewed publicly available documents relating to the historical and projected

financial performance of Sirius Satellite Radio and XM Satellite Radio. A list of the materials I reviewed is included in the appendix. I also rely on my general knowledge of and experience with the satellite industry, including Sirius and XM.

8. Compensation. I am being compensated at a rate of $400 per hour, plus reasonable expenses. My compensation is in no way dependent upon the testimony I offer in this case. Other members of Near Earth LLC have assisted me in preparing this report and our firm will also be compensated at the $400 per hour rate for senior professionals' time and $200 per hour for junior professionals' time.

Summary

9. After analysis of both Sirius and XM's financial history and Wall Street's projected performance, I believe that increases in the current royalty payment structure would have significant adverse effects on the satellite radio industry ranging from lower stock prices to higher costs of borrowing, which both hurt investors. My key conclusions are as follows:

- As of June 2006, Sirius and XM have accumulated $3.4 billion and $3.2 billion in losses, respectively.
- Sirius and XM have also invested over $2.6 billion for space and ground assets just to commence their commercial services.
- These large investments were made over a period of time commencing in 1994 for Sirius and in 1997 for XM.
- Under the "Wall Street baseline" scenario which I will outline herein, the current capital positions of Sirius and XM should be sufficient for them to reach sustainable Earnings Before Interest, Tax, Depreciation and Amortization (EBITDA) and Free Cash Flow (FCF)

breakeven sometime in 2008. This is an up to 11 year period for investors in XM and an up to 14 year period for investors in Sirius.

- Because the companies raised substantial fractions of their early stage capital during more "exuberant" times (1997-2001), there is some question whether it would even be possible to finance a satellite radio company in today's financing environment as the appetite for major telecom infrastructure investments with such long periods of negative cash flow has declined.
- Despite analysts' expectations that common stock investors would require annual returns on their investments in excess of the anticipated weighted average cost of capital (including debt and preferred stock) during this period of 20% to 25%, the aggregate average returns to the common stock investors is negative to date for XM shareholders and negative for Sirius' common shareholders before the 2003 debt restructuring, and only 4.6% for all of Sirius' common shareholders.
- Even assuming analysts' expected 12 to 18 month price targets for these stocks are achieved, investors in the common stock of Sirius and XM will on average still have either negative returns on their capital or, in the case of Sirius, low double digit returns well below the rates of returns normally required by investors for such high levels of risk.
- Our sensitivity analysis shows that a change in royalty payments from the actual current level (whatever that level may be) can significantly change Wall Street expectations of each company's stock price.
- The change in stock price due to changes in the royalty rate is at least equal to or exceeds the change in stock price when other key drivers such as subscriber growth, ARPU, churn rate and SAC are changed by the same percentage amounts.

- For example, if royalty as a percent of revenue increased by 1% in the Sirius case, this would represent a decrease to $5.91 from analysts' average 12 to 18 month target stock price of $6.20. To get back to the $6.20 target price, Sirius would have to increase net subscriber additions by an additional approximately 4% over current analyst projections (without incurring any additional subscriber acquisition costs).
- Both XM and Sirius have seen their stocks trade down materially over the last 12 months. If either Sirius or XM's royalty rates are increased and as a result, their EBITDA and cash flow break-even points are delayed, their perceived growth rates, momentum and progress toward maturity will decrease. This would put further short and intermediate term downward pressure on the stocks until investors who were seeking a higher risk investment moved into the stock and prices reached a point where investors thought they were getting a reasonable price for the new lower level of growth.

10. One of the main reasons for such conclusions is the simple fact that increased royalties provide no benefits to subscribers and as a result have to be 100% absorbed by the companies. In contrast, increases in other costs such as adding exclusive proprietary content or new services like traffic and weather can make the service more attractive to consumers. With a more attractive service offering, the companies can attract additional subscribers and also consider raising subscription fees, in either case offsetting such additional content costs and hopefully increasing profits. In the event that royalty payments were increased to the detriment of the satellite radio industry and its investors, I expect the development of new technologies in the media industry would face greater skepticism amongst future investors. This skepticism may lead to a lack of financing for future technologies that could bring additional media services to the public.

11. Satellite radio service providers, Sirius and XM, were founded on the premise that a service that provides listeners with a differentiated music experience combining high quality digital sound with nationwide service and a hundred channels of mostly ad free music and other content would be able to command a subscription fee from a traditionally free radio audience, and thus, generate returns to investors proportionate to the many risks they would be taking.

12. Since the start of these investments, the competitive landscape of the portable, digital audio world has changed, with the proliferation of the iPOD, HD radio, and internet radio to the extent that satellite radio services have changed their focus from music to acquiring the rights to exclusive (largely non-music) content to justify their subscription fees. Furthermore, as proprietary content increases, I expect new subscribers to be attracted, and thus, revenues to increase as a direct result. Since royalties are calculated as a percentage of total revenue, as more proprietary and non-music content is added by Sirius and XM to drive subscriber growth, the amount of royalties paid will increase despite music not adding additional value. In other words, the total value added by music becomes diluted as more proprietary and non-music content is added. Thus, even maintaining the current levels of royalty rates has an actual effect of increasing them from a relative standpoint given the addition of other content over time and industry expected revenue growth. From an investor's point of view, given the new industry realities and challenges, increasing royalty rates over and above this implicit increase would be wholly unjustified.

Overview of the Satellite Radio Business Model

(a) Investment To-Date

13. In addition to billions of dollars spent on subscriber acquisition, marketing and corporate overhead, Sirius and XM have invested over $2.6 billion for space and ground assets

over the last ten years. These assets include licenses, satellites, terrestrial repeaters, uplink facilities/centers, broadcasting studios and other related infrastructure. In the future, Sirius and XM will need to make similar investments to replace satellites, provide for satellite spares, maintain their network and upgrade their existing systems. As of June 2006, Sirius and XM have accumulated $3.4 billion and $3.2 billion in losses respectively (including depreciation). Investors were willing to fund this large investment on the expectation that a new form of digital, multi-channel and ubiquitous audio distribution would cure many of the dissatisfactions listeners had expressed over AM/FM's lack of quality, choice and convenience; like cable did for broadcast TV. In return for bringing radio into the 21st century, investors expected large returns for the many risks they were taking. This new form of radio is known as Satellite Digital Audio Radio Services (SDARS).

14. Space Segment Costs. The space segment has been and will continue to be the largest capital expenditures for the satellite radio companies. Space segment costs include satellite manufacturing, launch costs, launch and in-orbit insurance and in-orbit performance incentives to the satellite manufacturer. Currently, Sirius has three Loral FS 1300 satellites while XM has three Boeing 702 satellites in service. These satellites typically have a design life of 15 years, but occasionally satellites incur damage while in orbit, reducing this expectancy. In fact, both types of satellites used by Sirius and XM are known to have problems with their solar array cells. In the case of XM, it has already paid for the construction and launch of two replacement satellites one of which is now in orbit and the other is in preparation for launch. Insurance proceeds will cover a portion of the loss in satellite capacity. Sirius also has a spare satellite already constructed and both companies have contracts to build an additional satellite each. They will also need to order additional replacement satellites in years to come as they plan for the eventual

replenishment of their respective fleets. According to the FY2005 financial statements, the gross book value of Sirius and XM's combined space segments is approximately $1,850 million.

Represents book value of assets	**Sirius**	**XM**	**Combined**
# of satellites in orbit	3	3	
Manufacturer / Bus	SS/L FS1300	Boeing 702	
In orbit assets	$950 million	$650 million	
Construction in progress	$30 million	$220 million	
Total space segment cost	$980 million	$870 million	$1,850 million

Source: Company financial reports

15. Ground Segment Costs. Sirius and XM have also incurred and continue to incur significant costs to build out and maintain the ground segments that include terrestrial repeaters, ground stations, broadcast facilities, and various customer service and billing systems. To date, Sirius and XM have spent approximately $780 million in the aggregate on their ground segments. Although most of these items should not need to be replaced in the near term, the capital expenditures to maintain the ground segment can be significant.

Represents book value of assets	**Sirius**	**XM**	**Combined**
Approx. # of terrestrial repeaters	140	800	
Cost of terrestrial repeaters	$75 million	$260 million	
Cost of ground station	$20 million	$40 million	
Cost of broadcast studios	$60 million	$60 million	
Systems and other assets	75 million	$190 million	
Total ground segment cost	$230 million	$550 million	$780 million

Source: Company financial reports

(b) Current Capital Structure

16. To help fund their $2.6 billion investment in space and ground assets as well as day to day operations (combined operating losses of $6.6 billion), Sirius and XM have accessed the public and private capital markets on numerous occasions since the 1990's. There have been significant investments made by both financial and strategic investors over the years, in addition to numerous individual public investors. Currently, Sirius and XM stock trade on NASDAQ under the ticker symbols SIRI and XMSR, respectively.

17. At the end of the second quarter in 2006, Sirius had $1.1 billion in debt with $550 million in cash resulting in $550 million in net debt. XM had $1.35 billion in debt with $431 million in cash resulting in $924 million in net debt. I believe that under the "Wall Street baseline" scenario which I will outline in the following section, the current capital positions of Sirius and XM should be sufficient to reach Earnings Before Interest, Tax, Depreciation and Amortization (EBITDA) and Free Cash Flow breakeven (see table below). Despite having large cash balances, Sirius and XM still generate negative EBITDA and Free Cash Flow.

End of Q2 2006	**Sirius**	**XM**
Cash	$535 million	$431 million
Total Debt	$1,084 million	$1,355.1 million
Net Debt	$549 million	$924.1
Shareholders' Equity	$(57) million	$(185.9) million
Total Capitalization	$1,027 million	$1,169.2 million
Debt/Capitalization	106%	116%

Source: Company financial reports

(c) Historical Risk Profile with Expected Rates of Return at the Time

18. I evaluated the historical risk profiles for Sirius and XM by using the weighted average cost of capital (WACC) over time. When evaluating what returns investors demand for putting their capital at risk, investors balance the magnitude of potential returns with the risk to those returns by adjusting the rate of return they would demand. Thus, as the SDARS companies have successfully conquered the risks associated with financing, launching, and selling their systems, the rate of return that investors have demanded from them has generally declined over time but still remains high compared to typical publicly traded companies. In addition to these internal risks, the rate of return demanded by investors has also been affected by external factors, such as the overall conditions of the financial markets and the projected returns available from competing investments.

19. Theoretical Background. Overall, this phenomenon can be described through the Capital Asset Pricing Model, where the cost of capital is expressed through the formula

$$E(R_i) = R_f + \beta_{im}(E(R_m) - R_f).$$

Where:

- $E(R_i)$ is the expected return on the capital asset or company in this case
- R_f is the risk-free rate of interest
- β_{im} (the beta coefficient) the sensitivity of the asset returns to market returns, or also

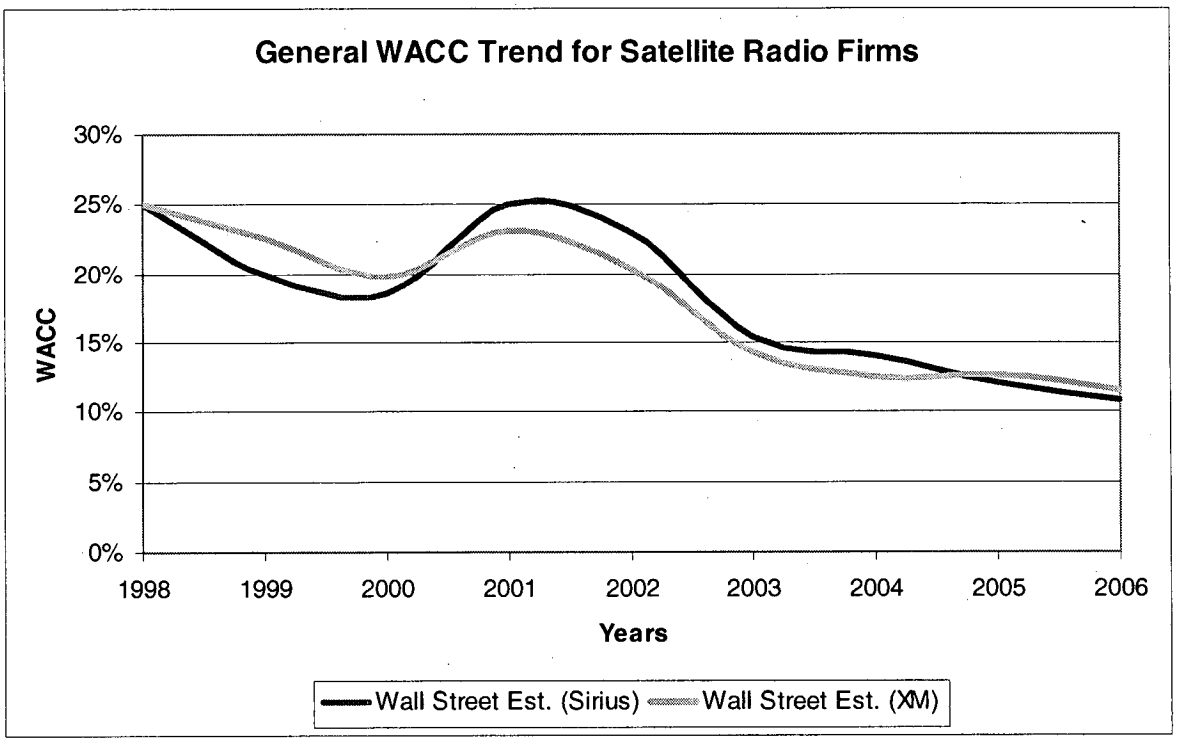
$$\beta_{im} = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)}$$

- $E(R_m)$ is the expected return of the market

β_{im} captures the internal risks associated with the satellite radio companies, while the remaining terms capture external market conditions. Because the satellite radio firms both raised substantial fractions of their early stage capital needs (where β_{im} was at its peak) during "exuberant" times (to quote Alan Greenspan) when $E(R_m)$ was depressed, there is some question whether it would even be possible to finance a SDARS company in today's financing environment.

20. Implications for Cost of Capital. I have researched historical Wall Street analyst reports to find analyst's cost of capital assumptions. In the graph below, I plot the weighted average cost of capital (WACC) assumptions used by Wall Street in each year to graph a general trend line between the years 1998-2006. The weighting takes into account the expected investor return requirements for both debt and equity capital weighted by the projected mix of such capital. The graph should not be used as an exact indication of the SDARS companies' WACC at that time since a consensus WACC is extremely difficult to track as analysts do not always publish their figures, however, one can use this graph to see a general trend among past

investors' perceived risk and their required rates of return. Recently, WACC has been declining to approximately 11% for the SDARS companies which reflect a combination of changes in investors' risk, β_{im}, $E(R_m)$, and interest rates. This level of risk is still much greater than terrestrial radio which has WACC estimates of approximately 8.5% - 9.5%, which implies that satellite radio is a riskier investment than terrestrial radio. Because substantial ongoing risks still exist (as compared to lower risk investments such as Treasury bills, investment grade bonds and stocks of more mature and profitable businesses), and because market conditions have become less "exuberant" since the market peak in 2000, it is unlikely that the cost of capital for the SDARS companies will decline materially in the near term unless the companies reach or exceed analyst projections and until cash flow breakeven is reached. These events would reduce risk justifying investors lowering their return requirements. However, I have noticed in a few analysts reports that WACC assumptions have actually increased in 2006.



Source: Wall Street analysts' reports

21. Internal Rate of Return (IRR) to Common Equity Investors. By taking into account all the common equity that investors have invested in Sirius and XM (not including convertible securities and options), and using the companies' current and projected future market values, I calculated the internal rate of return on the aggregate common equity investment for each firm. This analysis demonstrates that the common equity holders, who have taken on the most risk, have not realized adequate returns relative to the risks they assumed when making their investments.

22. To perform this analysis, I evaluated each common equity security offering for both Sirius and XM since their inceptions. Each offering size and date was placed on a timeline and compared to the aggregate equity holdings of those investors based on today's market value and on the price targets of Wall Street analysts 12 to 18 months from now. Using an internal rate of return calculation (IRR), I can determine the average annual return to the common equity investors weighted by time and size of their investment. I only looked at the returns to common equity holders for several reasons. They suffer losses before other classes of investors take a loss. Because the common equity holders take the greatest risk in a company, they consequently demand the highest returns. There have been no debt defaults or failures to redeem preferred stock, so debt holders and preferred stock holders have at least been made whole, although many preferred stock holders have also received below market returns. It is not, therefore, necessary to analyze the returns to debt holders as their returns can generally be characterized as fair. It is also critical that the common equity holders get a fair return because it makes the more (protected) senior investment possible. If they are not allowed a fair return, investor enthusiasm for investing in common equity will diminish and make it more difficult to finance innovative projects in the

future. The results of our IRR analysis is summarized in the table below which shows returns to common equity holders as of today's market price and also assuming the companies reach Wall Street 12-18 month price targets in 12 months and after 18 months.

Internal Rate of Return (IRR) for Common Equity Investors*

	Current	12 Months	18 Months
IRR (Sirius overall)	4.6%	12.1%	11.2%
IRR (Sirius Original Common Equity Investors prior to 2003)	-36.6%	-23.3%	-21.5%
IRR (XM overall)	-5.2%	4.1%	3.8%

* Does not include Warrants, Preferred Stock or other Convertible Securities

Source: Near Earth LLC analysis and Company financial reports

23. As the above table shows, both firms' return on common equity is lower than their historical WACCs and in the case of XM, common equity holders have currently experienced a negative return to date. As the WACC represents a blended average return expectation of all investors (debt and equity), the expected returns required by common equity holders must be much higher than the WACC, as they take a greater share of risk. Clearly, equity investors as a whole, have not yet received an appropriate return on their investment for the risk they assumed, nor do current Wall Street price targets suggest they will in the next 12 to 18 months. It should also be noted that the Sirius figures are somewhat skewed as additional common equity was issued in conjunction with the recapitalization in March 2003 when the stock was trading close to $1.00 per share. As a result, common equity investors from 1994 to 2003 have experienced large losses whereas more recent investors have, in the aggregate, experienced gains.

(d) Fixed Costs

24. The two main fixed costs for both companies are (1) satellite and transmission, and (2) general and administrative.

- Satellite and transmission costs – These expenses consist of costs associated with the operation and maintenance of the satellites, satellite insurance, terrestrial repeater network, satellite uplink facilities and broadcast studios.

- General and administrative costs – These expenses include rent and occupancy, finance, legal, human resources, information technology, and investor relations costs.

(e) Semi-Fixed Costs

25. Semi-fixed costs are expenses that remain fixed over the course of a year or two. These costs have some components that make them vary over a longer period of time, but not on a per capita subscriber basis. These expenses include general sales and marketing, engineering R&D costs, major content agreements and other programming and content expenses. I discuss each in turn:

- Sales and marketing costs – These expenses include costs for advertising, media and production, including promotional events and sponsorships; cooperative marketing; and customer retention.

- Engineering, design and development costs – These expenses include costs to develop future generations of chip sets and new products and costs associated with the incorporation of new radios into vehicles manufactured by automakers.

- Major content agreements – Satellite radio companies have entered into several exclusive programming contracts, including Howard Stern ($80 million per year in cash plus additional equity), the NFL ($27 million per year in cash plus additional equity), NASCAR ($21.5 million per year), and Martha Stewart ($7.5 million per year) for Sirius; and Major League Baseball ($60 million per year) and Oprah ($18 million per year) for XM. In addition to the fixed payments, certain multi-year contracts also may require the satellite radio companies to pay license fees, share advertising revenue, purchase advertising on media properties owned or controlled by the licensor, and pay other guaranteed amounts. Other semi-fixed programming and content expenses include costs to acquire, create and produce content.

(f) Variable Costs

26. Variable costs change with the number of subscribers and typically include subscriber acquisition costs, customer service and support expenses, and royalty payments.

- Subscriber acquisition costs – These costs consist of hardware subsidies paid to radio manufacturers, distributors and automakers; subsidies paid to chip set manufacturers; and commissions paid to retailers and automakers.

- Loyalty payments and revenue share costs – Loyalty payments to distributors and dealers are payments made after subscribers added as a result of such distributor's or dealer's efforts have remained subscribers for a specified amount of time. Revenue share payments to automakers, retailers and content providers are contractual payments made on a multi-period basis. Both of these costs are included in the sales and marketing expense in the case of Sirius. For XM, revenue share is a separate line item that is included with royalty payments.

- Customer service and support expenses – These expenses include costs associated with the operation of the customer service centers and subscriber management systems.

- Royalty payments – Satellite radio companies have royalty arrangements with two sets of rights holders: 1) holders of copyrights in musical works, or songs, and 2) holders of copyrights in sound recordings—records, cassettes, compact discs and audio files. Musical works rights holders, generally songwriters and music publishers, are represented by performing rights organizations such as the American Society of Composers, Authors and Publishers, or ASCAP, Broadcast Music, Inc., or BMI, and SESAC, Inc. Sound recording rights holders, typically large record companies, are primarily represented by SoundExchange. These organizations seek to establish fees with copyright users, collect royalties and distribute them to the rights holders.

(g) Revenue

27. There are two primary sources of income for satellite radio companies: 1) recurring subscription fees (with one-time activation fees) and 2) advertising revenue. Over 90% of revenues come from subscription fees while only 2-3% is from advertising revenue. Currently, advertising spots are sold primarily on the non-music channels (e.g. news, talk, sports, comedy) so the revenue potential is fairly limited. However, most analysts expect advertising revenue to increase to roughly 10%-15% of total revenue by 2011 as advertisers continue to seek alternative means of reaching targeted niche audiences and the absolute number of non-music listeners climbs. Sirius has also publicly indicated a goal of reaching 10% of revenue generated through advertising.

28. Typically, subscribers purchase their satellite radios either when they purchase an automotive vehicle or from one of several retail channels (e.g. consumer electronics chains, major discount retailers, after-market auto parts stores). Both Sirius and XM have exclusive factory installation relationships with the major automakers as shown below:

XM	Sirius
GM	Ford
Toyota	DaimlerChrysler
Honda	Audi/Volkswagen
Nissan	BMW
Hyundai	Kia
Suzuki	Mitsubishi

Source: Company financial reports

Valuation Methodologies Used by Wall Street analysts

29. An explanation of various valuation methods used by Wall Street analysts are presented below. I believe that this is the best proxy for how investors view and analyze the companies:

(a) Subscriber Economic Models

30. Fixed Cost. The investment case for the satellite radio companies is the combination of the net present value of their subscribers (and the subscribers they are going to get) minus the net present value of the remaining expenses of the enterprise that are not associated with the individual subscribers such as fixed costs. These expenses include:

- Satellite launch and operations
- Terrestrial repeater construction and operation
- Equipment and chipset design subsidies
- Content expenses that are not charged on a per subscriber basis (e.g. NFL, Howard Stern, MLB, Oprah, etc.)
- Corporate G&A
- Automaker distribution agreements and other fixed expenses

31. Since the fixed expenses are very considerable, the value of the business is negative until enough subscribers have been accumulated so that they, in the aggregate, provide an adequate return to compensate for these fixed expenses. Once this level of operations has been achieved, adding new customers creates value in essentially a linear fashion (i.e. twice as many new customers means twice as much created value; see sample calculation below).

32. Sample Illustrative Calculation:

	Per Subscriber	Break-Even	+ 5 subs	+ 10 subs
# of subscribers	1	5	10	15
Revenue per Subscriber	$5	$5	$5	$5
Variable Cost per Subscriber	$3	$3	$3	$3
Gross Profit per Subscriber	$2	$2	$2	$2
Total Gross Profit	$2	$10	$20	$30
Fixed and Semi-Fixed Costs	$10	$10	$10	$10
Operating Profit	($8)	$0	$10	$20

Source: Near Earth LLC

33. Variable Cost. The valuation for the satellite radio companies is directly related to the subscriber economics at the unit level (i.e. per subscriber). This valuation technique examines the costs and benefits from the operator's perspective for each of their subscribers. These costs and benefits can be further subdivided into categories of "one time" vs. "recurring." When summed together, these cash flows can then be valued to project cash flows from a companywide perspective. Only variable costs are included when valuing an incremental subscriber as fixed costs are incurred regardless of the number of subscribers, and thus, have no bearing on the value of each additional subscriber. Fixed costs must, however, be included when valuing the company as a whole.

34. Thus, for each subscriber, the operator benefits from the following recurring income streams:

- Subscription revenues
- Advertising revenues

While incurring the following expense streams:

- Subscriber Acquisition Costs
  - Equipment subsidies
  - Auto manufacturer incentives
  - Dealer incentives (sales commissions)
- Dealer/distributor revenue-sharing payments

- Sales and Marketing
    - Advertising
- Performance royalty payments
- Customer Service and Billing

35. Both companies also provide internet streaming of their content, but currently this represents a relatively small fraction of total revenue and costs. I have decided to ignore it in my analysis as most analysts seem to have as well.

36. Valuing a subscriber also requires some knowledge (or at least a projection) of the tendency of a customer to remain a customer (customer life) and the effect this has on recurring cash flows over time. Generally speaking, the customer life is measured through analysis of churn, which is the fraction of the subscriber base that is lost in any given period (usually expressed as a monthly percentage). Customer life is the inverse of the churn level (i.e. a 1% monthly churn implies a $^{1}/_{.01}$ or 100 month subscriber life). The revenue portion of the cash flow streams is described using the term ARPU (Average Revenue per User), which varies according to inflation, customer demand and other factors. The royalty payments also vary as the ARPU varies.

37. Finally, the individual subscriber analysis must account for the timing of these cash flows. Because of the time value of money, future expenses and revenues must be discounted to the present at a rate that reflects the cost of capital for the firms. Because the expenses from Subscriber Acquisition Costs are front loaded (and as such, are *not* discounted), they play a major role in determining the lifetime subscriber value for a customer. The valuation is also sensitive to the discount rate itself, which has a considerable effect on the value of the future cash flows. Higher discount rates depress the present value of these net cash flows to a greater extent and reduce the overall net value of each customer.

(b) Discounted Cash Flow (DCF) Analyses

38. In addition to valuing the SDARS enterprises on a per subscriber basis, it is common for analysts to project cash flows on an enterprise (company wide) basis for some length of time, typically 5 to 7 years. Then, using the projected cash flows through the end of such projection period, the terminal date, combined with an estimate of the firm wide value on that terminal date, it is possible to estimate the cash flows and value available for distribution to investors. Adjustment for the timing and quantity of cash flows and terminal value is done by discounting them to the present using a projected cost of capital (e.g. 11% per year).

39. In the case of the satellite radio companies, this discount rate reflects the market perception of the uncertainty of these projected cash flows. There are several factors that affect this:

- Changing satellite reliability/lifetime projections
- Changing terrestrial repeater network reliability/lifetime
- Competitive threats
    - Competition between the satellite radio firms
    - Competition between the satellite radio industry and competing technologies (e.g. terrestrial radio, HD radio, iPod, broadband programming services, etc.)
- Regulatory issues
    - Political risks associated with laws being rewritten to favor the NAB or copyright owners
- Macroeconomic environment
- Financing risks (i.e. access to capital and changing interest rates)
- Distribution risks (e.g. GM's shrinking market share)
- Taxation risks
- Potential for Increasing costs
    - Content costs
    - Programming royalties
    - Broadcast facilities
    - Other unexpected events

(c) Forward Trading Multiples

40. While they are not commonly employed at this stage of an industry's maturity, some analysts (and thus presumably some investors) model the future financial behavior of the satellite

radio companies and then determine the future value of the firms using current or expected future trading multiples of comparable companies applied to one or more financial metrics. Commonly used financial metrics include Earnings Before Interest, Tax, Depreciation and Amortization (EBITDA), Free Cash Flow and GAAP (Generally Accepted Accounting Principles) earnings. For example, an investor or analyst may decide the equity of a company should be worth 25.0 times 2008 earnings, a price/earnings multiple of 25.0, or that the enterprise value of a company in 2008 should be worth 10.0 times EBITDA, an EBITDA multiple of 10.0. Investors and analysts choose comparable companies based on the degree to which their businesses match that of the firm to be valued in terms of industry participation, products and services offered, revenue model, capital structure growth rates, size and profitability. These comparable-based valuations at some future time (combined with interim cash flows through the projection date) can then be discounted back to the present to derive a target price. Given that any change in an anticipated underlying financial metric is then multiplied by a factor (e.g. price/earnings multiple or EBITDA multiple) which amplifies such change, valuations using this method can be very sensitive to variations in costs, revenues or other projections. For example, Wall Street analysts value Sirius at 17 times 2010 EBITDA. A $1.00 increase in royalty payment would reduce EBITDA by $1.00 and reduce the valuation by $17.00. The change in valuation would affect only the equity value of the company since the value of the debt would remain constant. Therefore, one can expect that some fraction of investors would respond very strongly to slight variations in programming royalties, especially as such changes would be deemed to be long term in nature and not transient. Generally speaking, these comparable-based techniques are better suited for slower growth firms where the metric in question is not changing rapidly or more mature industries where changes in the metric are better understood.

Current Wall Street Analysts' "Baseline Scenario" and Valuations

41. The satellite radio business model is primarily a subscription content distribution model with limited advertising. The key business drivers and assumptions for a subscription model are subscriber growth, churn rate, average revenue per user (ARPU) which is predominately subscriber revenue with limited advertising revenue, subscriber acquisition costs (SAC), and programming and content expenses. A group of recent reports from the research analysts at major Wall Street Investment Firms covering the Satellite Radio industry was used to develop the Wall Street analysts' "Baseline Scenario" for both Sirius and XM (details of the research reports can be found in the Appendix). Each key business driver and the respective Wall Street analyst assumptions are discussed below:

(a) Subscriber Growth Assumptions

42. Satellite radio subscribers are typically added through the OEM channel or the retail channel. Most analysts are bullish on subscriber additions particularly as the OEM channel continues to ramp up production of vehicles with factory installed satellite radios. This is due to a marked preference on the part of most consumers to not alter the sound equipment in their car following purchase. As I mentioned earlier, recent exclusive content agreements have also contributed to subscriber growth in both the OEM and retail channels.

43. The analysts' reports that I have referenced expect Sirius' subscriber base to grow a compound rate of approximately 28% per year from 6.3 million subscribers in 2006 to 16.9 million subscribers in 2010. Analysts expect XM's subscriber base to grow by a compound rate of approximately 25% per year from 8.2 million subscribers in 2006 to 18.0 million subscribers in 2010.

EOY subscribers ('000,000s)						CAGR
	2006E	2007E	2008E	2009E	2010E	'06-'10
Wall Street Est. (Sirius)	6.30	9.19	11.98	14.53	16.91	28.0%
Wall Street Est. (XM)	8.17	10.67	13.43	15.93	18.01	21.9%
Total	14.47	19.87	25.41	30.46	34.92	24.6%

Source: Wall Street analysts' reports

(b) Churn Rate Assumptions

44. Analysts are assuming average monthly churn rate for both Sirius and XM to increase from 1.8% in 2006 to 2.2% in 2010 (see table below). These analysts predict that churn rate will increase as the percentage of OEM customers increase relative to the overall subscriber base. OEM customers tend to have a higher churn rate because the average new automobile ownership period is approximately four years. This translates into a monthly churn rate of approximately 2.1% if I assume that all OEM customers subscribe to satellite radio after the promotional or prepaid period. But not every OEM subscriber converts to become a satellite radio subscriber after the OEM promotional or prepaid period, and therefore, churn rates for OEM subscribers would have to be higher than 2.1%. In addition, most industry observers expect churn to increase as early adopters of technology products are more enthusiastic and have historically lower churn than later adopters.

Churn Rate (monthly)						CAGR
	2006E	2007E	2008E	2009E	2010E	'06-'10
Wall Street Est. (Sirius)	1.8%	2.0%	2.1%	2.2%	2.2%	6.0%
Wall Street Est. (XM)	1.9%	2.0%	2.0%	2.1%	2.1%	3.2%
Average	1.8%	2.0%	2.1%	2.1%	2.2%	4.6%

Source: Wall Street analysts' reports

(c) Average Revenue per Subscriber (ARPU) Assumptions

45. Wall Street analysts expect ARPU to increase from $10.60 in 2006 to $11.99 in 2010, or basically a $1.40 price increase over the next five years. These rates are not particularly different from current inflation projections as evidenced by interest rates for inflation protected securities. The competitive structure of the satellite radio industry (including its competition

from terrestrial radio and other sources) would lend itself to disciplined pricing strategies between Sirius and XM. Furthermore, the addition of exclusive content may reduce consumers' elasticity of demand, allowing for price increases. However, new technologies such as the iPOD, Internet radio and HD radio may put pressure on the satellite radio industry offsetting the ability to increase prices, and perhaps even pushing prices lower. I will address these issues in later sections of this report.

ARPU (monthly)						CAGR
	2006E	2007E	2008E	2009E	2010E	'06-'10
Wall Street Est. (Sirius)	$ 10.72	$ 11.03	$ 11.56	$ 12.02	$ 12.27	3.4%
Wall Street Est. (XM)	$ 10.49	$ 10.95	$ 11.38	$ 11.54	$ 11.71	2.8%
Average	$ 10.60	$ 10.99	$ 11.47	$ 11.78	$ 11.99	3.1%

Source: Wall Street analysts' reports

(d) Subscriber acquisition costs (SAC) assumptions

46. Analysts expect average SAC to decrease from $90 in 2006 to $57 in 2010, representing a 10% decline in SAC every year as shown below. This is due to the assumption that both companies are moving down the technology cost curve which will lead to cheaper chipsets used in the radio hardware. In addition, the continual increase in gross subscriber additions will create economies of scale for sales and marketing expenses that will improve total Cost per Gross Addition (CPGA) or fully loaded SAC.

SAC (not CPGA)						CAGR
	2006E	2007E	2008E	2009E	2010E	'06-'10
Wall Street Est. (Sirius)	$ 112.17	$ 93.79	$ 78.40	$ 65.40	$ 59.40	-14.7%
Wall Street Est. (XM)	$ 66.35	$ 60.95	$ 57.75	$ 56.75	$ 55.75	-4.3%
Average	$ 89.26	$ 77.37	$ 68.08	$ 61.08	$ 57.58	-10.4%

Source: Wall Street analysts' reports

(e) Programming and Content Cost Assumptions

47. As I discussed earlier, programming and content costs include both semi-fixed costs (*e.g.*, exclusive programming contracts) and variable costs (*e.g.*, royalty payments). I believe that a majority of the total programming & content costs in 2006 are due to expenses of the semi-

fixed variety such as the exclusive programming contracts. However, these semi-fixed multi-year contracts become less significant (as a percentage of revenue) as the subscriber and revenue base increases. Therefore, Wall Street analysts project programming & content costs to decline as a percentage of total revenue from 36% in 2006 to 15% in 2010 for Sirius (see table below) as a result of major content deals remaining fixed.

Prog. & Content (% of Rev)						CAGR
	2006E	2007E	2008E	2009E	2010E	'06-'10
Wall Street Est. (Sirius)	36.2%	24.2%	19.5%	16.5%	14.7%	-20.1%

Source: Wall Street analysts' reports

48. Since XM separates its content and programming costs from royalties and revenue sharing on its financial statements, I will focus on the latter in our analysis. Subsequently, XM's revenue share and royalty costs as a percentage of revenue remain relatively constant as both are variable costs driven by subscriber revenue. Wall Street analysts expect revenue share and royalty payments to approach 20% of revenue in 2010 for XM (see table below). The slight increase is due to the revenue share agreement with General Motors that increases until GM has produced 8 million vehicles with XM factory installed radios.

Revenue Share & Royalties (% of Rev)						CAGR
	2006E	2007E	2008E	2009E	2010E	'06-'10
Wall Street Est. (XM)	17.0%	18.4%	19.5%	20.0%	20.0%	4.2%

Source: Wall Street analysts' reports

49. Sirius' programming & content expenses as a percentage of revenue is lower than XM's revenue share and royalties as a percentage of revenue because Sirius includes revenue share in their sales & marketing expenses. It is important to note that I am not comparing Sirius to XM above as these two line items are fundamentally different.

50. In connection with the music programming, most analysts estimate that the satellite radio companies are paying approximately 6%-8% of revenues to the copyright organizations representing both the musical works and sound recordings. The actual figure is not publicly

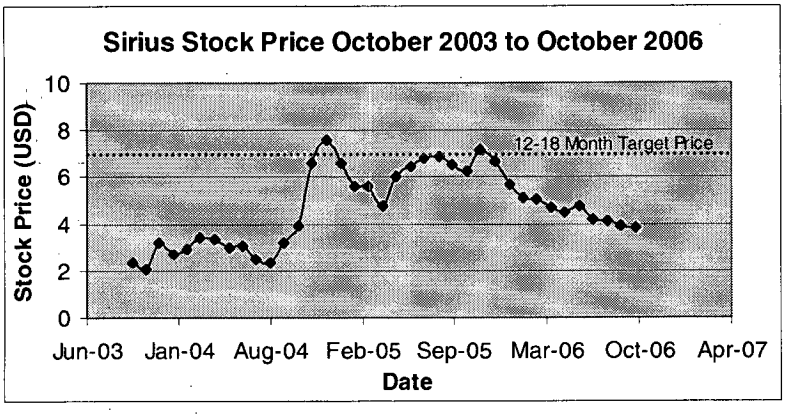
known, and thus, this estimate might not be accurate. Whether it is accurate or not is not important from an investor's perspective as they are only aware of the total content costs disclosed in financial statements and projected by analysts. What is important is the market's expectation about future increases in royalty payments from the current level as such increases would affect the total costs incurred and affect analysts' future cost projections. Due to substantial subscriber growth, the actual dollar amounts of these payments are expected to increase significantly as subscriber revenues increase. Therefore, the programming and content projections as well as the revenue share and royalty payments in the tables above do not make any allowances for an increase in the rate for royalty payments.

51. Non-projected increases in royalty rates thus pose a concern in the mind of investors regarding the value of these satellite radio companies. The concern is that these royalty payments are variable costs, and a percentage increase in royalty payments reduces operating cash flow dollar-for-dollar without adding any new subscribers. This impact would disproportionately affect the programming and content costs in the outer years. For example, a 1% increase in royalty payments would be less disruptive to cash flow in 2006 than in 2010 since revenues are less in 2006 than 2010, but such an increase would delay cash flow breakeven and thus adversely affect the companies' cost of capital as explained below. Furthermore, a company's value is highly sensitive to changes in EBITDA or cash flow in the outer years, depending on the valuation method used. Therefore, a change in the EBITDA and cash flows in the outer years can significantly change the Wall Street analysts' valuations. You will see the potential effect on stock price due to changes in "programming and content" costs in following sections.

(f) Sirius Satellite Radio (SIRI) Valuation Summary

* Different banks are used due to the timing and availability of updated target prices.

52. A recent query of Wall Street analysts' reports produces an average target price of $6.20 per share over the next 12-18 months. The reports used to get the average target price differ because of the timing and availability of the most recent Wall Street analysts' reports within the last two months.



Stock Target Price (12-18 months)

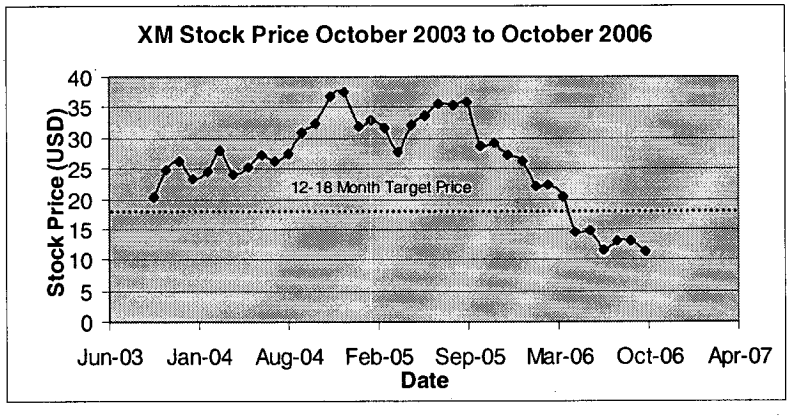
Sirius Satellite Radio

Bear Stearns	$	7.00
CIBC World Markets	$	7.00
Credit Suisse	$	6.00
Deutsche Bank	$	6.00
RBC Capital	$	5.00
Wall Street Est. (Sirius)	$	6.20
Share Price, close (10/17/06)	$	3.83

Source: Stock price from NASDAQ, Target price from Wall Street analysts' reports

(g) XM Satellite Radio (XMSR) Valuation Summary

53. A recent query of Wall Street analysts' reports produces an average target price of $17.80 per share over the next 12-18 months.



Stock Target Price (12-18 months)

XM Satellite Radio

Bear Stearns	$	17.00
Credit Suisse	$	17.00
Deutsche Bank	$	20.00
RBC Capital Markets	$	20.00
Wachovia	$	15.00
Wall Street Est. (XM)	$	17.80
Share Price, close (10/17/06)	$	11.96

Source: Stock price from NASDAQ, Target price from Wall Street analysts' reports

Implications of Changes to "Baseline Scenario"

54. I have conducted a financial analysis for Sirius and XM using the Wall Street baseline assumptions mentioned above. The financial analysis is utilized to predict the theoretical impact on each company's valuation, debt coverage and break even scenarios due to changes in the baseline assumptions.

(a) Theoretical Impact on Stock Price, Debt Covenants and Capital Raising

55. The next section contains several tables which can also be described as a sensitivity analysis. Each table has two variables, one for the rows and one for the columns in which they are gradually increasing or decreasing. The purpose is to show if variable "A" in the top row increases or decreases and variable "B" on the side column increases or decreases what affect will the changes have on the companies' stock price. While the purpose of this testimony is to show the effect changes in royalty rates have, I feel that it is necessary to compare such effects to changes in other major drivers of the companies' stock price as well. This will demonstrate the magnitude that royalty payments carry relative to the other major drivers. In later sections I will analyze the effects changes in royalty rates have on the costs and availability of additional capital.

56. Sensitivity to Target Stock Price. Our sensitivity analysis shows that a change in royalty payments from the actual current level (whatever that level may be) can significantly change Wall Street expectations of each company's stock price. Analysts' estimates of the current royalty levels are immaterial to my analysis since royalty payments are expressed as a percentage of revenue and I can assume that a percentage increase in royalty payments is a one-to-one increase in the expense line item "Programming and Content (as a percentage of revenue)" for Sirius and a one-to-one increase in the expense line item "Revenue Share and

Royalties (as a percentage of Revenue)" for XM. Thus, any analyzed increase in the royalty rate has a direct increase in the projected costs versus the existing analysts' expectations regardless of what the current royalty rate may be.

57. In the sensitivity tables below, the baseline case for Sirius is when there is a 0% increase in the row named "Programming & Content (as a percentage of revenue)", and a 0% change in the column named "Wall Street baseline case" for each of the key assumptions. The baseline case for XM is when there is 0% increase in "Royalties and Revenue Share (as a percentage of revenue)" and 0% change from the "Wall Street baseline case". The stock price in the sensitivity tables below represents Wall Streets' target price in 12-18 months for both companies ($6.20 for Sirius and $17.80 for XM).

58. In all of the sensitivity tables below, the target stock price begins to fall when one increases the royalty rate. The change in stock price due to changes in the royalty rate is at least equal to or exceeds the change in stock price when other key drivers such as subscriber growth, APRU, churn rate and SAC are changed by the same percentage amounts.

59. In tables 1 and 2 below, it is important to note, increases in costs for proprietary content would be expected to increase the number of subscribers as the services offered would become more desirable; whereas an increase solely in royalty payments would have no effect on the number of subscribers. As the tables point out, a 1% increase in royalty rates in the Sirius case represents a decrease in target price from $6.20 to $5.91. To get back to the $6.20 target price, Sirius would have to increase net additions by approximately 4% (without incurring any additional subscriber acquisition costs). As such, an increase of 3% or 5% in royalty rates would represent a decrease in Sirius' target price to $5.34 and $4.78 respectively which would require significant increases in subscribers in excess of 10% to get back to the current price.

Table 1: Royalty Rate vs. Net Subscriber Addition Growth: Sirius Satellite Radio (SIRI)
(Changes in the royalty rate below reflect changes only in the royalty rate and no other expenses)

Sensitivity Analysis on Sirius Stock Price: Royalty Rate vs. Net Addition Growth								
		% increase in Royalty Rate (as a % of total revenue)						
		-5%	-3%	-1%	0%	1%	3%	5%
Sub Growth (% change from Wall Street baseline)	-5%	$7.33	$6.70	$6.09	$5.81	$5.54	$4.98	$4.43
	-3%	$7.52	$6.88	$6.24	$5.97	$5.69	$5.13	$4.57
	-1%	$7.71	$7.06	$6.41	$6.12	$5.84	$5.27	$4.71
	0%	$7.80	$7.15	$6.49	$6.20	$5.91	$5.34	$4.78
	1%	$7.90	$7.24	$6.58	$6.27	$5.99	$5.42	$4.85
	3%	$8.09	$7.42	$6.75	$6.43	$6.14	$5.56	$4.98
	5%	$8.27	$7.60	$6.92	$6.59	$6.29	$5.71	$5.12

Source: Near Earth LLC analysis

Table 2: Royalty Rate vs. Net Subscriber Addition Growth: XM Satellite Radio (XMSR)
(Changes in the royalty rate below reflect changes only in the royalty rate and no other expenses)

Sensitivity Analysis on XM Stock Price: Royalty Rate vs. Net Addition Growth								
		% increase in Royalty Rate (as a % of total revenue)						
		-5%	-3%	-1%	0%	1%	3%	5%
Sub Growth (% change from Wall Street baseline)	-5%	$20.14	$18.34	$16.53	$15.63	$14.73	$12.93	$11.13
	-3%	$21.06	$19.24	$17.41	$16.50	$15.59	$13.76	$11.94
	-1%	$21.98	$20.14	$18.29	$17.36	$16.44	$14.59	$12.74
	0%	$22.44	$20.59	$18.73	$17.80	$16.87	$15.01	$13.15
	1%	$22.90	$21.04	$19.16	$18.23	$17.29	$15.42	$13.55
	3%	$23.82	$21.94	$20.04	$19.09	$18.15	$16.25	$14.35
	5%	$24.74	$22.83	$20.92	$19.96	$19.00	$17.08	$15.16

Source: Near Earth LLC analysis

60. In tables 3 and 4, an increase in royalty rates would not improve ARPU since the subscribers would not be benefiting from additional content. However, more than a 5% increase in ARPU from the baseline case would be needed to offset a 3 % increase in royalty rates to maintain the stock price targets. In this case, an important dynamic occurs between ARPU and royalty payments. By increasing ARPU, the absolute dollars of royalty payments increase automatically since they are a percentage of revenue. Therefore, a greater increase in ARPU is needed to offset the increase in royalty payments.

Table 3: Royalty Rate vs. ARPU: Sirius Satellite Radio (SIRI)
(Changes in the royalty rate below reflect changes only in the royalty rate and no other expenses)

Sensitivity Analysis on Sirius Stock Price: Royalty Rate vs. ARPU								
		% increase in Royalty Rate (as a % of total revenue)						
		-5%	-3%	-1%	0%	1%	3%	5%
ARPU Growth (% change from Wall Street baseline)	-5%	$6.71	$6.15	$5.61	$5.34	$5.07	$4.53	$3.99
	-3%	$7.15	$6.51	$5.96	$5.68	$5.41	$4.85	$4.30
	-1%	$7.59	$6.94	$6.31	$6.03	$5.74	$5.18	$4.62
	0%	$7.80	$7.15	$6.49	$6.20	$5.91	$5.34	$4.78
	1%	$8.02	$7.36	$6.70	$6.37	$6.08	$5.51	$4.93
	3%	$8.46	$7.79	$7.11	$6.77	$6.44	$5.83	$5.25
	5%	$8.90	$8.21	$7.52	$7.18	$6.84	$6.16	$5.57

Source: Near Earth LLC analysis

Table 4: Royalty Rate vs. ARPU: XM Satellite Radio (XMSR)
(Changes in the royalty rate below reflect changes only in the royalty rate and no other expenses)

Sensitivity Analysis on XM Stock Price: Royalty Rate vs. ARPU								
		% increase in Royalty Rate (as a % of total revenue)						
		-5%	-3%	-1%	0%	1%	3%	5%
ARPU Growth (% change from Wall Street baseline)	-5%	$18.64	$16.86	$15.08	$14.20	$13.31	$11.53	$9.75
	-3%	$20.16	$18.35	$16.54	$15.64	$14.73	$12.92	$11.11
	-1%	$21.68	$19.84	$18.00	$17.08	$16.15	$14.31	$12.47
	0%	$22.44	$20.59	$18.73	$17.80	$16.87	$15.01	$13.15
	1%	$23.20	$21.33	$19.45	$18.52	$17.58	$15.70	$13.82
	3%	$24.72	$22.82	$20.91	$19.96	$19.00	$17.09	$15.18
	5%	$26.23	$24.30	$22.36	$21.40	$20.42	$18.48	$16.54

Source: Near Earth LLC analysis

61. Once again in tables 5 and 6, royalty rates have no effect on monthly churn whereas increasing other content costs, such as for proprietary content, could be expected to reduce churn. As the analysis shows, a 3% increase in royalty payments would require more than a 25% decrease in the monthly churn rates' baseline case for Sirius and XM just to maintain the same target prices. For example, Wall Street analysts predict churn to increase from 1.8% to 2.2% from 2006 to 2009. A 25% decrease in churn would bring this total to 1.35% and 1.65% respectively, levels almost impossible to achieve due to the turnover of automotive vehicles.

Table 5: Royalty Rate vs. Monthly Churn: Sirius Satellite Radio (SIRI)
(Changes in the royalty rate below reflect changes only in the royalty rate and no other expenses)

Sensitivity Analysis on Sirius Stock Price: Royalty Rate vs. Churn								
		% increase in Royalty Rate (as a % of total revenue)						
		-5%	-3%	-1%	0%	1%	3%	5%
Monthly Churn (% change from Wall Street baseline)	-25%	$8.59	$7.93	$7.28	$6.95	$6.62	$6.01	$5.44
	-15%	$8.27	$7.62	$6.96	$6.64	$6.31	$5.74	$5.18
	-5%	$7.96	$7.30	$6.65	$6.33	$6.05	$5.48	$4.91
	0%	$7.80	$7.15	$6.49	$6.20	$5.91	$5.34	$4.78
	5%	$7.65	$6.99	$6.35	$6.06	$5.78	$5.21	$4.64
	15%	$7.33	$6.68	$6.08	$5.80	$5.52	$4.95	$4.38
	25%	$7.02	$6.39	$5.82	$5.53	$5.25	$4.68	$4.11

Source: Near Earth LLC analysis

Table 6: Royalty Rate Sharing vs. Monthly Churn: XM Satellite Radio (XMSR)
(Changes in the royalty rate below reflect changes only in the royalty rate and no other expenses)

Sensitivity Analysis on XM Stock Price: Royalty Rate vs. Churn								
		% increase in Royalty Rate (as a % of total revenue)						
		-5%	-3%	-1%	0%	1%	3%	5%
Monthly Churn (% change from Wall Street baseline)	-25%	$23.45	$21.62	$19.78	$18.86	$17.94	$16.10	$14.27
	-15%	$23.04	$21.21	$19.36	$18.44	$17.51	$15.67	$13.82
	-5%	$22.64	$20.79	$18.94	$18.01	$17.08	$15.23	$13.37
	0%	$22.44	$20.59	$18.73	$17.80	$16.87	$15.01	$13.15
	5%	$22.24	$20.38	$18.52	$17.58	$16.65	$14.79	$12.92
	15%	$21.84	$19.97	$18.09	$17.16	$16.22	$14.35	$12.47
	25%	$21.43	$19.55	$17.67	$16.73	$15.79	$13.91	$12.03

Source: Near Earth LLC analysis

62. Finally in tables 7 and 8, a three percent increase in royalty payments would require more than a 5 percent decrease in the subscriber acquisition costs' baseline case for Sirius and XM just to maintain the same target prices.

Table 7: Royalty Rate vs. SAC: Sirius Satellite Radio (SIRI)
(Changes in the royalty rate below reflect changes only in the royalty rate and no other expenses)

Sensitivity Analysis on Sirius Stock Price: Royalty Rate vs. SAC								
		% increase in Royalty Rate (as a % of total revenue)						
		-5%	-3%	-1%	0%	1%	3%	5%
SAC (% change from Wall Street baseline)	-5%	$7.96	$7.30	$6.65	$6.33	$6.05	$5.48	$4.91
	-3%	$7.90	$7.24	$6.59	$6.28	$5.99	$5.42	$4.86
	-1%	$7.84	$7.18	$6.52	$6.22	$5.94	$5.37	$4.80
	0%	$7.80	$7.15	$6.49	$6.20	$5.91	$5.34	$4.78
	1%	$7.77	$7.12	$6.46	$6.17	$5.89	$5.32	$4.75
	3%	$7.71	$7.05	$6.40	$6.12	$5.83	$5.27	$4.70
	5%	$7.65	$6.99	$6.35	$6.06	$5.78	$5.21	$4.64

Source: Near Earth LLC analysis

Table 8: Royalty Rate vs. SAC: XM Satellite Radio (XMSR)
(Changes in the royalty rate below reflect changes only in the royalty rate and no other expenses)

Sensitivity Analysis on XM Stock Price: Royalty Rate vs. SAC								
		% increase in Royalty Rate (as a % of total revenue)						
		-5%	-3%	-1%	0%	1%	3%	5%
SAC (% change from Wall Street baseline)	-5%	$23.06	$21.21	$19.35	$18.42	$17.49	$15.63	$13.77
	-3%	$22.81	$20.96	$19.10	$18.17	$17.24	$15.38	$13.52
	-1%	$22.57	$20.71	$18.85	$17.92	$16.99	$15.13	$13.27
	0%	$22.44	$20.59	$18.73	$17.80	$16.87	$15.01	$13.15
	1%	$22.32	$20.46	$18.60	$17.67	$16.74	$14.88	$13.02
	3%	$22.07	$20.21	$18.35	$17.42	$16.49	$14.63	$12.77
	5%	$21.82	$19.96	$18.10	$17.17	$16.24	$14.38	$12.52

Source: Near Earth LLC analysis

63. Effect on Debt Covenants and Leverage. Debt covenants are specific restrictions that a borrower agrees to abide by during the life of its loan. The restrictions can be as simple as a cash minimum or restricting the amount of additional debt that can be borrowed to a more complex agreement involving maintaining certain debt ratios. Covenants are important for analyzing companies as a covenant can have a substantial effect on a company's ability to execute a business plan if there is risk of breaching one. A breached covenant can at best increase borrowing costs and at worst allow creditors to foreclose. I believe that under the baseline scenario the major financial covenants of both Sirius and XM (shown in table below) will have little effect on executing their business plans as the chances of a breach is minimal.

Major Debt Covenants

Sirius	XM
Can borrow up to $500 million in Sr. Debt and once positive EBITDA is achieved can borrow an additional 6X EBITDA.	Requires a minimum of $75 million in liquidity.
Additional 175% of new equity raised.	Credit revolver rate is based on company performance.

Source: Company reports

64. The following tables show changes to debt coverage ratios for Sirius and XM as these expenses are increased to 5%. Although I do not expect any of these covenants to be triggered, an increase of 5% significantly reduces the companies' coverage ratios, and thus, would affect

the trading levels of outstanding notes and result in increased borrowing costs. Note that the general effect of a 5% increase is to delay by a full year the time at which the companies' leverage approaches suitable levels (i.e. below 7.0x Net debt/EBITDA).

65. **SIRIUS Satellite Radio Debt Ratios.** At 0% increase in "Programming & Content as a % of Sales": (SIRI)

SIRIUS SATELLITE RADIO	2006E	2007E	2008E	2009E	2010E
Debt Ratios					
EBITDA	($510.1)	($256.7)	$43.9	$380.1	$647.9
Interest Expense	$67.0	$68.5	$67.1	$64.4	$55.6
Total Debt	$1,031.7	$1,031.7	$1,031.7	$730.0	$730.0
Net Debt	$565.4	$648.6	$576.8	$103.1	($547.1)
Total Debt/EBITDA	NM	NM	23.5x	1.9x	1.1x
Net Debt/EBITDA	NM	NM	13.1x	0.3x	NM
EBITDA/Interest Expense	NM	NM	0.7x	5.9x	11.7x
Free Cash Flow/Interest Expense	NM	NM	NM	6.8x	11.0x

Source: Near Earth LLC analysis

At 5% increase in "Programming & Content as a % of Sales": (SIRI)

SIRIUS SATELLITE RADIO	2006E	2007E	2008E	2009E	2010E
Debt Ratios					
EBITDA	($527.7)	($307.9)	($30.1)	$283.5	$530.7
Interest Expense	$67.0	$68.5	$67.1	$64.4	$55.6
Total Debt	$1,031.7	$1,031.7	$1,031.7	$730.0	$730.0
Net Debt	$588.5	$734.0	$750.4	$398.6	($104.1)
Total Debt/EBITDA	NM	NM	NM	2.6x	1.4x
Net Debt/EBITDA	NM	NM	NM	1.4x	NM
EBITDA/Interest Expense	NM	NM	NM	4.4x	9.5x
Free Cash Flow/Interest Expense	NM	NM	NM	5.2x	8.7x

Source: Near Earth LLC analysis

66. As you can see above, changing the "Programming & Content as a percentage of Sales" pushes out meaningful debt coverage ratios to 2009 and deteriorates them in 2009 and 2010. These are the general metrics of credit risk that lenders look for. The higher these ratios are, the higher the cost of borrowing and lower availability of funds.

67. **XM Satellite Radio Debt Ratios.** At 0% increase in "Royalty/Revenue Share as a % of Revenue": (XMSR)

XM SATELLITE RADIO	2006E	2007E	2008E	2009E	2010E
Debt Ratios					
EBITDA	($284.1)	($130.4)	$21.1	$218.6	$404.0
Interest Expense	$86.1	$92.0	$100.7	$98.7	$92.7
Total Debt	$1,354.9	$1,346.5	$1,338.0	$929.4	$920.8
Net Debt	$1,121.4	$1,356.9	$1,311.8	$1,118.8	$749.3
Total Debt/EBITDA	NM	NM	63.3x	4.3x	2.3x
Net Debt/EBITDA	NM	NM	62.1x	5.1x	1.9x
EBITDA/Interest Expense	NM	NM	0.2x	2.2x	4.4x
Free Cash Flow/Interest Expense	NM	NM	6.9x	3.0x	5.0x

Source: Near Earth LLC analysis

At 5% increase in "Royalty/Revenue Share as a % of Revenue": (XMSR)

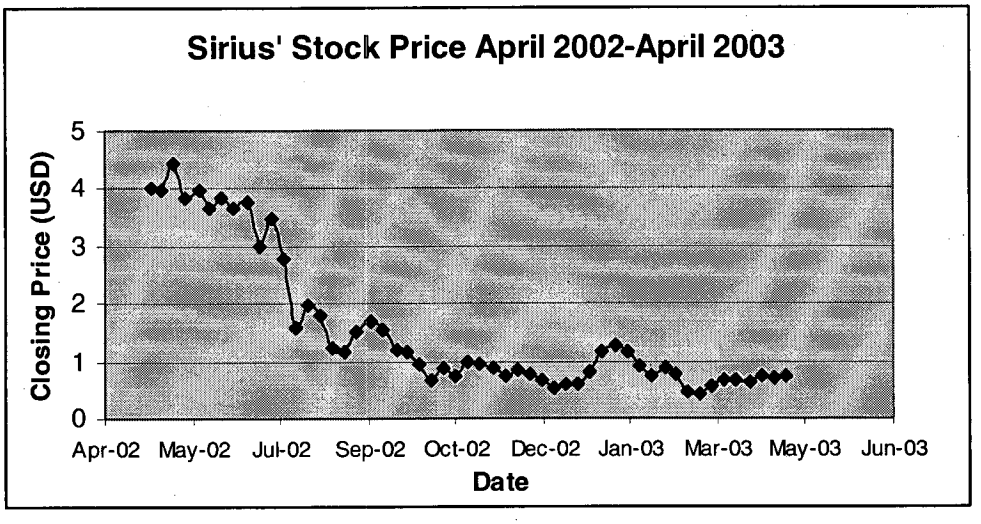
XM SATELLITE RADIO	2006E	2007E	2008E	2009E	2010E
Debt Ratios					
EBITDA	($308.6)	($197.0)	($66.8)	$110.3	$277.5
Interest Expense	$86.1	$94.9	$108.4	$98.7	$92.7
Total Debt	$1,354.9	$1,346.5	$1,338.0	$929.4	$920.8
Net Debt	$1,145.8	$1,450.9	$1,501.3	$1,416.7	$1,173.7
Total Debt/EBITDA	NM	NM	NM	8.4x	3.3x
Net Debt/EBITDA	NM	NM	NM	12.8x	4.2x
EBITDA/Interest Expense	NM	NM	NM	1.1x	3.0x
Free Cash Flow/Interest Expense	NM	NM	NM	1.9x	3.6x

Source: Near Earth LLC analysis

68. Similar to Sirius, increasing the "Royalty/Revenue Share as a percentage of Revenue" pushes XM's meaningful ratios out to 2009 and then reduces the coverage of those ratios, increasing the risk of defaults from a potential creditor's perspective. This generally causes them to increase rates or reduce willingness to lend.

69. Liquidity Crunch and Impact on Capital Raising. A major factor in the perceived internal risk for these companies is their ability to execute their business plans without the need for additional cash investments. Both Sirius and XM have, at earlier points in their histories, encountered market resistance to providing them additional capital in increments that could not completely cover their cash use through cash flow breakeven. During these periods, XM and especially Sirius equity holders were subjected to substantial dilution as additional shares were issued to new investors at relatively low valuations.

70. By mid 2002, Sirius was straddled in debt to the extent that it could not raise additional funds. As you can see below, this had a tremendous effect on the stock price as it went from over $4.00 per share to under $1.00 per share. Finally, in order to just survive, Sirius exchanged 91% of its debt for common stock severely diluting the equity holders percent of ownership. This dilution is the primary cause of the large difference between the return that debt holders and equity holders of Sirius have received to date.

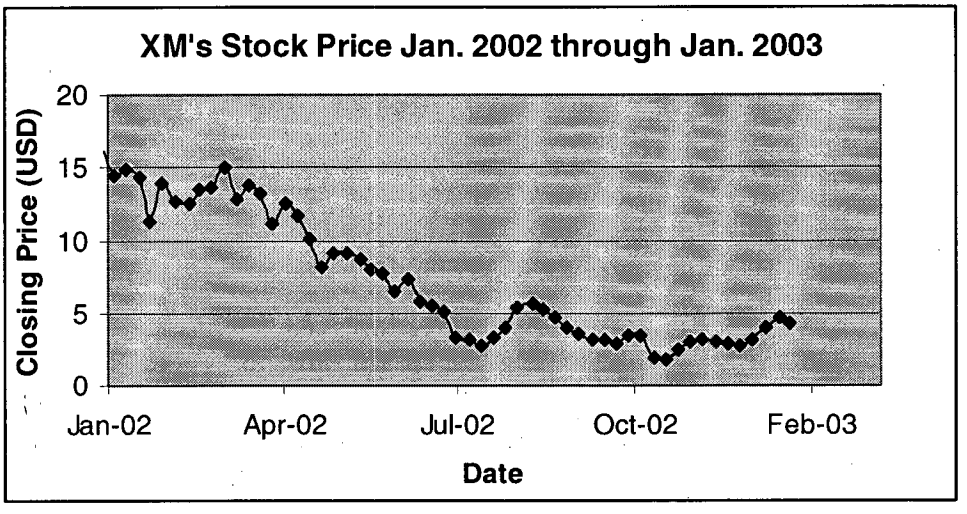


Source: Stock price from NASDAQ

71. In January 2003, XM raised $425 million of equity capital at $3.18 per share versus a stock price as high as $19.20 (intraday high) at the start of 2002. In addition XM was not able to raise this capital as common stock in the public market, but had to issue preferred stock with a dividend and special provisions to private investors.

72. As you can see in the graph below, as XM was struggling to secure financing throughout 2002, the stock price deteriorated to the point that the financing that was secured was only at a fraction of the value of XM the previous year. Consequently, any change in the cost structure for these firms that pushes out the time in which this breakeven milestone is reached could be expected to increase investors' risk perception. This, in turn, would raise the cost of

capital for the firms and could destroy value for current investors, potentially far in excess of the actual dollar amounts that increased costs would extract.



Source: Stock price from NASDAQ

(b) Effect on Investor Psychology

73. Change in EBITDA, FCF Break-Even Timeline. A key investor milestone for Sirius and XM is when they will reach EBITDA and cash flow break-even. In other words, it is the time when either EBITDA or free cash flow is positive. As of today, assuming no increases in royalty rates, Wall Street analysts expect Sirius to reach long-term EBITDA break-even in Q1 2008 and long-term free cash flow break-even in Q2 2008. Analysts expect XM to reach long-term EBITDA break-even in Q1 2008 and long-term free cash flow break-even in Q1 2008 (see table below). The break-even milestones can quickly be pushed back into 2009 if operation costs such as programming and content expenses as a percentage of sales for Sirius or royalty/revenue share expenses as a percentage of sales for XM increases (see table below). I believe that a delay in the break-even milestones would have a significant effect on the psychology of the investors as these types of delays raise doubts on the current management's' credibility and/or ability to project their results. Although delaying these milestones by a quarter might be tolerated by

investors, investors have historically reacted negatively when such delays are several quarters or longer, especially for companies that have never produced positive EBITDA or cash flows.

Sirius				
% Increase in "Prog. and Content as a % of sales"	0%	1%	3%	5%
EBITDA break-even	Q1 2008	Q2 2008	Q3 2008	Q1 2009
Free cash flow break-even	Q2 2008	Q1 2009	Q1 2009	Q1 2009
XM				
% Increase in "Royalty/Revenue Share as a % of sales"	0%	1%	3%	5%
EBITDA break-even	Q1 2008	Q1 2009	Q1 2009	Q1 2009
Free cash flow break-even	Q1 2008	Q1 2008	Q1 2008	Q1 2009

Source: Wall Street analysts' reports and Near Earth LLC analysis

74. Investor Turnover from Growth/Momentum Buyers Could Pressure Stock. Investors look at the predicted timeline of a company's EBITDA and cash flow break-even points as a general measure of the maturity of a company. The closer a firm is to EBITDA and cash flow break-even the more mature it is considered to be and vice versa. Moreover, the more mature a firm is perceived to be, the less risk investors equate with that firm, and thus, lowering the required rate of return. If either Sirius or XM's royalty rates are increased and as a result, their EBITDA and cash flow break-even points are delayed, their perceived growth rates, momentum and progress toward maturity will decrease. Consequently, some current investors would then perceive these firms as lower growth, lower momentum companies with higher risk than when they made their initial investments. Many would then perhaps sell out to move their capital to higher growth, higher momentum companies. This would put short and intermediate term downward pressure on the stock until investors who were seeking a higher risk investment moved into the stock and prices reached a point where investors thought they were getting a reasonable price for the new lower level of growth.

75. Stock Prices Decrease as Margins Decrease. One of the most fundamental ways to evaluate a firm is based on the profit margins (revenue minus cost of goods sold) a company produces. Obviously, the higher the profit margin, the stronger a company is viewed by the

market. In the case of satellite radio, increasing the royalty rate would increase the cost of goods sold and decrease profit margin, thus, having a negative effect of the value of Sirius and XM's stock.

Discussion of Major Risks

76. I used Wall Street analyst estimates to give a proxy as to what the market as a whole is thinking. However, given the recent performance of both Sirius and XM stock relative to the previously mentioned price targets ($2.57 premium for Sirius and $5.84 premium for XM), well above current trading levels, it seems that investors may be more concerned with the risks these companies pose than the Wall Street analysts. Some of these risks include:

(a) Commoditization of Music

77. Originally investors put billions into XM and Sirius in part to provide listeners with a differentiated listening experience combining high quality digital music sound with nationwide service and hundreds of channels. Today, this new service faces intense competition from terrestrial radio, moreover, a listener can get digital quality music through MP3s or iPODs, DBS and cable radio services on their TVs, and using the internet to their PCs. Listeners can download thousands of songs on their MP3's or iPODs, listen to dozens of channels on their DBS or cable service or click on hundreds and hundreds of ad free channels from the internet. In the not too distant future digital music channels will also be available wirelessly and almost nationwide to smart phones and automotive vehicles. In a sense music is becoming commoditized and satellite radio's advantage of ubiquitous digital coverage may erode.

78. Original non-music programming and proprietary premium content will increasingly become even more important as the differentiator between satellite radio and competing technologies. Even today, many of XM's and Sirius' top 20 channels are either proprietary

content, news, talk, sports or comedy. What may continue to draw listeners to XM and Sirius is that the music, though somewhat commoditized, is available everywhere via satellite, is largely ad free and frequently comes with DJs or on-air personalities of national caliber funded by and servicing a national versus local audience. From an investor's point of view, it is their capital that has financed these service attributes. In addition, many artists in less popular genres of music such has jazz and classical have actually benefited immensely from SDARS investors who are not only making their music available nationwide and sound better, but avoiding it being interrupted by 10-20 minutes of ads per hour. The SDARS companies are reaching more people than ever for these "long tail" niche artists because they can aggregate such niche audiences across the entire nation and enjoy the economies of scale of their billion dollar satellite systems. But new technology threatens this advantage and over time may lower the value of providing such niche content offerings if they become more expensive.

(b) Potential for Falling Price for Service

79. Although most Wall Street analysts have subscription prices increasing, I believe there could be sufficient competition from existing and new technologies to put downward pressure on prices for satellite radio service. For example, terrestrial radio operators have begun to offer HD digital radio, Apple's iPOD and competing MP3 devices continue to proliferate, and Internet radio is taking shape and may soon be available for cars and smart phones. Furthermore, 95% of adults still listen to terrestrial radio at least once a week. Consumers now have a tremendous amount of choices for digital quality audio entertainment compared to only a few years ago. Therefore, satellite radio companies not only have to differentiate themselves from each other, but also from both traditional and emergent technologies in order to maintain, much less increase their prices.

(c) Potential for Paying More for Major Exclusive Content

80. The exclusive content agreements with Howard Stern, NASCAR, NFL, Major League Baseball, Oprah, etc. currently serve as a major remaining long-term differentiator between satellite radio and its competitors. Listeners can listen to music through several different media. On the other hand, there is only one place to listen to Howard Stern or Oprah on the radio. This exclusivity helps justifies a subscription based service to a satellite radio subscriber or any other distribution model that could charge a subscription fee in the future. Satellite radio companies depend on these exclusive content deals and with other entrants coming into the audio entertainment market such as iPODs, internet radio, and HD radio, SDARS operators could potentially have to increase not only the number of exclusive contracts they sign but the amount they are willing to pay for each to compete with these new entrants. With only a given number of listeners in the country, this could lead to a price war for top content, which would then reduce the operating performance of these companies below our projections.

Conclusion

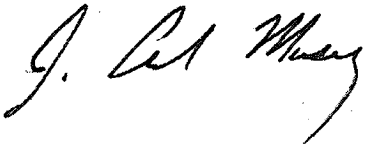
81. From my analysis above, it becomes quite clear that relatively small changes in operating costs can significantly affect the future target price expectations for both Sirius and XM. These future target prices, that is to say, investor returns, are particularly sensitive to changes in royalty costs as these cost increases are not associated with offsetting increases in subscribers or revenues as for instance would be increases in subscriber acquisition cost or costs for proprietary non-music content. A resulting decrease in the target prices for Sirius and XM, as estimated by Wall Street analysts, could make it more difficult for these companies to raise capital in the future and have a disruptive impact on their ability to compete with other audio services, maintain and improve their services and potentially even to survive.

82. My analysis shows that investors for the most part, and certainly on average, have suffered below market rates of returns compared to the risks they have taken. These investors now face additional competitive pressures from new distribution mediums and technologies that could have an adverse impact on their future returns. Yet, having suffered such low returns and facing such uncertainties they now run the additional risk of very disruptive increases in operating costs associated with royalties. Such increases would deny satellite radio investors a fair return on investment.

Certification

83. I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information and belief.

Dated: New York, New York
October 30, 2006



J. Armand Musey
President, Near Earth LLC

Index of Exhibits for J. Armand Musey

Ex. No.	Sponsored By:	Description
SDARS-Musey Ex. 1	J. Armand Musey	J. Armand Musey Curriculum Vitae
SDARS-Musey Ex. 2	J. Armand Musey	Information Considered in Developing this Analysis

Exhibit 1
Curriculum Vitae

J. ARMAND MUSEY, CFA
215 E. 80th Street, Apt 7J
New York, NY 10021
amusey@alumni.uchicago.edu
917-514-2132

CAREER HIGHLIGHTS

Recognized finance and strategy expert on issues related to the satellite communications industry and associated telecommunications sectors:

- Built Near Earth LLC, over a three year period, into a leading boutique investment bank focused on the satellite communications industry.
- Regularly quoted in trade publications as well as national and international publications such as The Wall Street Journal, The New York Times and others.
- Frequent speaker at major satellite industry conferences as an expert in satellite finance and strategy.
- Achieve coveted ranking in the Institutional Investor poll for equity research in the satellite communications industry three continuous years (from 2000 until 2002, the last year it was ranked as a separate category)
  - Achieved first ranking in first full year of coverage as senior analyst.
- Ranked #1 analyst covering satellite communications industry by Greenwich Associates poll in 2000.
- Rated as Top Broadcasting Industry Stock Picker in the Wall Street Journal's "All Star" Analyst Survey of 2000.
- Appeared numerous times on national television as an expert on the satellite communications industry, including Bloomberg, Fox and CNN.
- Winner of Salomon Smith Barney research department's internal "Report of the Month" Award, June 2002 and the "Call of the Month" Award, November 2001.

EXPERIENCE

2003 – Present **NEAR EARTH LLC** New York, NY
President and Partner, November 2003 – Present
• Originate and execute transactions in boutique investment bank focused on the satellite, media and telecom industries. Primary services are merger and acquisition and private equity placement advisory.
• Oversee maintenance of the firm's client base, investor relationships and new business prospecting.

2001 – 2003 **SALOMON SMITH BARNEY (CITIGROUP SECURITIES)** New York, NY
Director and Senior Satellite Communications Research Analyst
Satellite Communications and Towers, March 2001 – February 2003
• Primary coverage responsibility for fifteen companies in the satellite communications and tower industries.

9 – 2001 **BANC OF AMERICA SECURITIES** New York, NY

Managing Director and Senior Satellite Communications Research Analyst
Satellite Communications, April 1999 – March 2001

- Primary coverage responsibility for twelve companies in the satellite communications industry.

1998 – 1999 **C.E. UNTERBERG, TOWBIN** New York, NY

Senior Analyst – Satellite Communications, October 1998 – April 1999

- Primary coverage responsibility for eleven companies in the satellite communications industry.

1997 – 1998 **MERRILL LYNCH & CO.** New York, NY

Industry Analyst – Satellite Communications, September 1997 – October 1998

- Assisted senior analyst in initiating and maintaining coverage for 11 companies in the satellite communications industry.
- Given primary company coverage responsibility after only nine months.

1995 – 1997 **INVESTMENT BANKING** New York, NY

Associate – Investment Banking at PaineWebber (August 1995 – November 1995) and Nesbitt Burns (March 1996 – September 1997)

- Member of corporate finance generalist teams.

EDUCATION

2 – 1995 **J. L. KELLOGG GRADUATE SCHOOL OF MANAGEMENT** Evanston, IL
NORTHWESTERN UNIVERSITY

Master of Management degree (MBA) , June 1995

- Majored in Finance and Marketing; 3.7/4.0 GPA.
- Worked full-time as regional manager for Zacks Investment Research while completing degree.

1985 – 1989 **UNIVERSITY OF CHICAGO** Chicago, IL

Bachelor of Arts Degree in Sociology with Honors, June 1989

- Significant coursework in Economics and Mathematics.

PROFESSIONAL ACTIVITIES

Chartered Financial Analyst (CFA). Holder of Series 7, 63 and 24 licenses. Member of the New York Society of Security Analysts and the CFA Institute. Vice-Chair of New York Society of Security Analysts Corporate Governance Committee.

Publications

While working in a research capacity from 1997 to 2003, I published analysis on the industry virtually every week, usually multiple times a week. Below are some of my major publications. I was the senior analyst and lead author on all of the reports except where noted.

1) IPTV – The Future of Television?, Near Earth LLC, July 2006 (41 pages)
2) Analysis of the Fixed Service Satellite Industry, Near Earth LLC, July 2006 (38 pages)
3) Analysis of the GEO Satellite Manufacturing Industry, Near Earth LLC, July 2006 (27 pages)
4) DBS Industry Update; Revisiting the Hughes EchoStar Merger, Salomon Smith Barney, June 13, 2002. 39 pages.
5) Equity in the Balance, Aligning Balance Sheet Risk with Equity Valuations, Salomon Smith Barney, May 23, 2002. 50 pages.
6) The Guide to Fixed Satellite Service, Salomon Smith Barney, November 2001. 136 pages
7) DARS Duopoly; The Dawn of a New Age in Radio, Banc of America Securities, October 1999. 107 pages.
8) The Big 3; Hughes, Loral and Orbital Sciences - The Role of Diversified Satellite Operators at the Turn of the Millennium, Banc of America Securities, October 1999. 336 pages.
9) The Satellite Book, C.E. Unterberg Towbin, First Quarter 1999. 54 pages.
10) The Satellite Report 1999, C.E. Unterberg Towbin April 1999. 457 pages
11) Pegasus Communications, C.E. Unterberg Towbin, January 19, 1999. 53 pages.
12) The Global Satellite Marketplace, Merrill Lynch, April 1998 246 pages. Thomas W. Watts was the senior analyst on this report.
13) Hughes Electronics; SatCom Blue Chip, Merrill Lynch, March 20, 1998. 83 pages. Thomas W. Watts was the senior analyst on this report.
14) CD Radio, Inc. Merrill Lynch, July 14, 1998. 10 pages. Thomas W. Watts was the senior analyst on this report.

Periodicals

1) "From the Group Up", Near Earth LLC. Monthly Newsletter from November 2005 to Present.
2) "Heard From the Street", Via Satellite Magazine. Monthly column from late 1999 until early 2003.
3) The Satellite Model Book, Salomon Smith Barney, Second Quarter 2001 – Third Quarter 2002.
4) Payload Monthly. Banc of America Securities. October 1999 – February 2001. 50-100 pages.
5) The Bus Tour; A Quantitative Overview of the Satellite Industry, Banc of America Securities, Third Quarter 1999 – First Quarter 2000. 150-200 pages per edition
6) Hotbird Monthly; Monthly Satellite Industry Update, CE Unterberg, Towbin December 1999-Aril 2000. 30-50 pages per edition.

Exhibit 2
Information Considered in Developing this Analysis

Wall Street Analyst Reports

Date	Firm	Research Analyst	Title
Sirius Satellite Radio			
10/4/2006	Deutsche Bank*	James G. Dix, CFA	XMSR misses subs by more than SIRI, but not changing ests
10/3/2006	CIBC World Markets*	Jason Helfstein	Reducing 3Q sub estimate on weaker retail trends; FY unchanged
10/3/2006	RBC Capital Markets*	Ryan Vineyard	Expect 3Q retail headwinds
9/14/2006	Credit Suisse*	Bryan Kraft	Lowering 3Q Net Adds on OEM production cuts
9/11/2006	Bear Stearns*	Robert S. Peck	Stiletto pre-orders halted... still expects summer release
8/1/2006	Credit Suisse	Bryan Kraft	Sirius Reported a strong (but in-line) quarter
8/1/2006	Deutsche Bank	James G. Dix, CFA	2Q beat & higher guidance despite US OEM risk
8/1/2006	Wachovia Securities	Jeff Wlodarczak	SIRI: Results and guidance in line with expectations
5/16/2006	Morgan Stanley	Benjamin Swinburne, CFA	Raising contribution from Ford in 2007; comfortably FCF positive in 2008
XM Satellite Radio			
10/3/2006	Bear Stearns*	Robert S. Peck, CFA	Channel Checks Point to higher Q3 Adds...Part 1
7/27/2006	CIBC World Markets	Jason Helfstein	No Confidence in NPV model, Removing Target and Downgrading to SP-Spec
5/25/2006	Citigroup	Eileen Furukawa	XMSR: XM Cuts Subs to Reset Bar-But, Expect Better News Lies Ahead
10/11/2006	Credit Suisse*	Bryan Kraft	XM Addressing a New Market Segment
7/21/2006	Deutsche Bank	James G Dix, CFA	2Q Preview: lowering XM ests on retail uncertainty
10/04/2006	Deutsche Bank*	James G Dix, CFA	XMSR misses by more then SIRI, but not changing ests
10/4/2006	Lehman Brothers	Vijay Jayant	3Q update
5/16/2006	Morgan Stanley	Benjamin Swinburne, CFA	Long-Term, The Song Remains the Same
10/04/2006	RBC Capital Markets*	David Bank	3Q Net Sub Adds Below Consensus on Rental Car Accounting Change
7/27/2006	Wachovia Securities	Jeff Wlodarczak	XMSR Q2: Below Expectation; Reducing Valuation Range

*Indicates report was only used for Target Prices. These reports are only updates to previous full length reports and thus, can only provide limited information such as the price target.

PUBLIC VERSION

Before the
COPYRIGHT ROYALTY BOARD
LIBRARY OF CONGRESS
Washington, D.C.

In the Matter of	)	
	)	Docket No. 2006-1 CRB DSTRA
Adjustment of Rates and Terms for Preexisting Subscription and Satellite Digital Audio Radio Services	)	

Expert Report of Dr. John R. Woodbury
October 30, 2006

Table of Contents

I Qualifications

My name is John R. Woodbury and I am a vice president at CRA International, an economics and business consulting firm, where I have been employed since 1992. I received my B.A. from the College of the Holy Cross (*summa cum laude*) and my M.A. and Ph.D. in Economics from Washington University (St. Louis). Among other positions, I have served as a Brookings Economics Policy Fellow at the Civil Aeronautics Board, as a Senior Economist on the Network Inquiry Special Staff of the Federal Communications Commission, as Vice President for Research and Policy Analysis at the National Cable Television Association (now the National Cable and Telecommunications Association), and as Associate Director for Special Projects in the Bureau of Economics of the Federal Trade Commission.

I have been involved in numerous matters regarding intellectual property. During my tenure at the National Cable Television Association, I served as staff liaison to the Association's Copyright Committee, charged with overseeing economic initiatives and proceedings before the Copyright Royalty Tribunal. In that capacity, I was responsible for analyzing the empirical basis for the then 3.74% distant signal compulsory license fee and for estimating the appropriate inflation adjustment for distant signal payments made by cable operators and for presenting those findings to various claimant groups. In addition, I was part of a small negotiating team that included the Association's President and the Chairman of its Executive Committee whose purpose was to determine whether an agreement could be reached with the Motion Picture Association of America ("MPAA") on simplifying the copyright royalty payment scheme.

I have testified a number of times before the Copyright Royalty Tribunal and before the Copyright Arbitration Royalty Panel ("CARP") as a rebuttal witness on behalf of MPAA addressing issues dealing with the distribution of distant signal license payments. I provided both direct and rebuttal testimony on behalf of Music Choice (formerly known as DCR) and DMX in the first CARP under the Digital Performance Right in Sound Recordings Act of 1995. I (along with my colleague, Jane Murdoch) also provided written direct and rebuttal testimony on behalf of the Corporation for Public Broadcasting and National Public Radio addressing reasonable license fees for the public

performance of sound recordings by public radio entities on their Internet sites. Most recently, I provided both direct and rebuttal testimony on behalf of Music Choice regarding the appropriate rate to be paid to BMI for performances of musical compositions. My *curriculum vitae* is attached as Exhibit 1 to this report.

II Overview

I have been asked by Sirius and XM to estimate a reasonable rate to be paid for the sound recording performance right ("SRPR") when these services transmit performances of sound recordings to subscribers of satellite radio. I understand that in this regard, Sirius and XM satisfy the definition of pre-existing services in the Digital Performance Right in Sound Recordings Act of 1995 ("Act").[1] From that same Act, I understand that the Copyright Royalty Board ("CRB") must choose a rate that satisfies four statutory objectives ("801(b) objectives"):

> (A) To maximize the availability of creative works to the public;
>
> (B) To afford the copyright owner a fair return for his creative work and the copyright user a fair income under existing economic conditions;
>
> (C) To reflect the relative roles of the copyright owner and the copyright user in the product made available to the public with respect to relative creative contribution, technological contribution, capital investment, cost, risk, and contribution to the opening of new markets for creative expression and media for their communication;
>
> (D) To minimize any disruptive impact on the structure of the industries involved and on generally prevailing industry practices.[2]

As a general matter, there are a number of avenues available to an economist (and the CRB) for identifying an appropriate price for a good or service. In some cases, factors that identify the demand for and the supply of a good or service are readily available and can be used to estimate a market-clearing price, i.e., a price at which the quantity demanded and supplied are equated. Numerous transactions across buyers and

[1] Pub. L. No. 104-39, 109 Stat. 336 (1995).

[2] 17 U.S.C. 801(b)(1).

sellers or across time enable the use of this approach. Another common approach to identifying a price is to search for a comparable product whose price can be used as a benchmark. For example, suppose a policy maker was concerned that a price of a good or service reflected market or monopoly power on the part of the seller. An economist could look to the sale of similar goods or services being sold but under more competitive conditions and compare that price to the price in the market of concern. While these comparisons are not perfect, economists are usually able to account for the relevant differences in the good or service in question to permit an "apples to apples" comparison.

In conducting previous analyses of appropriate royalties, I have sought benchmark rates associated with services that are generally analogous to the services and the rights for which the rate is being determined. In these kinds of rate-setting proceedings, the identification of useful benchmarks provides a sound starting point for determining the appropriate payment between the parties for the sound recording performance right in accordance with section 801(b) of the Act. I, like other economists, would regard rates negotiated at arms-length as a promising start to developing the rate in question. Similarly, a useful start would be rates that have been determined by a third party, such as the CRB and the courts.

The benchmark approach to rate-setting for performance rights is also a familiar one in these kinds of proceedings. For example, the Librarian of Congress, in the 1998 rate setting proceeding concerning the sound recording statutory license for non-exempt digital transmission services, quoted a 1980 proceeding for coin-operated phonorecord players, in which the Tribunal wrote, "While acknowledging that our rate cannot be directly linked to marketplace parallels, we find that they serve as an appropriate benchmark to be weighed together with the entire record and the statutory criteria."[3] However, courts recognize that the benchmark may need to be adjusted based on contrasts between the benchmark and the target settings. In its recent Music Choice—BMI decision, the Second Circuit, quoting an earlier decision, stated, "In choosing a benchmark and determining how it should be adjusted, a rate court must determine 'the

[3] Library of Congress, Copyright Office 37 CFR Part 260, Docket No. 96-5 CARP DSTRA, Determination of Reasonable Rates and Terms for the Digital Performance of Sound Recordings, Federal Register, Volume 63, No 89, May 8, 1998 ("Librarian Decision 1998") at 25404, quoting 1980 Adjustment of the Royalty Rate for Coin-Operated Phonorecord Players, 46 FR 884, 888 (1981).

degree of comparability of the negotiating parties to the parties contending in the rate proceeding, the comparability of the rights in question, and the similarity of the economic circumstances affecting the earlier negotiators and the current litigants.'"[4]

I have concluded that one possible benchmark is the rate paid by the pre-existing subscription services ("PSS")—Music Choice, DMX, and Muzak—for the SRPR after suitable adjustments and after accounting for the 801(b) factors as they apply to XM and Sirius. As discussed below, this rate was originally established in the 1998 proceeding at 6.5% and then renegotiated in 2003 to 7.25%.

Upon consideration of the nature of the service provided by the PSS on one hand, and XM and Sirius on the other, I have identified a number of substantive differences between the services that result in adjustments to the 7.25% rate. One difference stems from the end-to-end functionality of XM and Sirius, another from the mobility of the XM and Sirius services, and still another from the suite of music and non-music channels offered by the services. Music Choice, for example, offers a suite of commercial-free music channels sold to third-party providers, who in turn deliver the service to consumers as part of a bundle of services for in-home listening. By contrast, XM and Sirius provide both music and non-music channels in a complete, end-to-end package for mobile, nationwide listening (including in-vehicle and in-home listening) directly to subscribers. The importance of these kinds of differences in the services was acknowledged in the earlier appellate ruling in the Music Choice—BMI litigation cited above: "If it were demonstrated that retail purchasers were motivated to pay more because of advantages that resulted from a particular mode of delivery, such as better quality, better accessibility or whatever, this might justify a conclusion that retail price of the service purchased by the customer exceeded the fair market value of the music."[5] My analysis incorporates this insight.

A second benchmark is the payments made by XM and Sirius to ASCAP, BMI, and SESAC for the musical works rights that underlie the public performance of a sound

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[4] United States v. Broad. Music, Inc., 04-3444-CV, 2d Cir., Oct. 6, 2005 at p. 8, quoting United States v. ASCAP (Application of Buffalo Broad. Co., Inc.), No. 13-95 (WCC), 1993 U.S. Dist. LEXIS 2566, at *61 (S.D.N.Y. Mar. 1, 1993).

[5] United States v. Broad. Music, Inc., 316 F.3d 189 (2d Cir. 2003) at 196 n.3.

recording, the proceeds of which are distributed to music publishers and composers. The acquisition of both the musical works rights and the SRPR are necessary for a user to provide a public performance of the sound recording.

The analyses of these two benchmarks lead to rate estimates ranging from 0.88% to 2.35% of the gross revenues of XM and Sirius.

I have also evaluated how accounting for the 801(b) factors would affect where in this range the rate should be set. Among other conclusions, it is my opinion that XM and Sirius generally outperform the PSS with respect to enhancing the availability of music, have made more significant creative contributions (e.g., in the creation of enhancements to the music channels as well as original non-music programming), technological contributions (e.g., the development of a mobile, end-to-end satellite system), and investments. They have incurred greater costs and risk than the PSS, and they have done (and will continue to do) more to open new markets in providing their services, relative to the PSS. I make similar observations with respect to XM and Sirius relative to the record labels. As a result, I conclude that a fair rate under the Act is one that would be at the lower end of the range.

In forming my opinions, I have reviewed a variety of materials. In particular, I have reviewed XM's and Sirius' financial statements and the results of market surveys conducted by XM and Sirius, as well as various analyst reports. I have interviewed business people at XM and Sirius to better understand the nature of their business. At XM, these executives include Eric Logan, Executive Vice President of Programming; Mark Vendetti, Senior Vice President of Corporate Finance; John Kramer, Vice President of Corporate Finance; Stephen Cook, Executive Vice President, Automotive (previously Executive Vice President of Sales and Marketing); John Dealy, Senior Advisor to the CEO; and Tony Masiello, Senior Vice President of Operations. At Sirius, these executives include David Frear, Chief Financial Officer; Michelle McKinnon, Director of Investor Relations; and Douglas Kaplan, Senior Vice President, Business Affairs and Development, Entertainment and Sports. I have also reviewed previous decisions relating to the determination of reasonable fees paid by Music Choice to BMI and to the Recording Industry Association of America ("RIAA"), as well as my own expert reports in these matters. In addition, I have reviewed publicly available information on the

promotional value of satellite radio to recording artists and record labels as well as internal information provided by XM and Sirius. I have compiled a list of these materials contained in Exhibit 2.

The analysis that I present in this report has been performed by me or under my direction. As additional evidence becomes available prior to trial, I reserve the right to refine my analysis.

In the next section, I provide a description of the XM and Sirius services. In Section IV, I discuss the benchmark approach and introduce the potential benchmark rates available for my analysis of the SRPR fee to be paid by XM and Sirius. In Section V, I discuss the first potential benchmark, the SRPR rate paid by the PSS, and the adjustments to this benchmark that are required to make the analogy appropriate. In Sections VI to IX, I present the conceptual framework, the implementation of the various adjustments, as well as a summary of the rate estimates based on the PSS rate. In Section X, I discuss the second potential benchmark – the rates paid by XM and Sirius to the Performance Rights Organizations ("PROs"). In Section XI, I address the 801(b) factors as they apply to XM and Sirius. The final section summarizes my conclusions.

III The XM and Sirius Services

Sirius and XM compete with each other, as well as with terrestrial radio and other ways of spending discretionary time, to attract and retain subscribers to their subscription radio services. These services are designed primarily for listening in a car or other vehicles and can also be used for in-home listening. Because they are satellite delivered, each service is available throughout the United States, for a monthly subscription fee that is currently $12.95.[6] Sirius' service consists of nearly 130 digital channels, including 66 commercial-free music channels, 3 comedy channels, 2 kids' channels, and 56 non-music channels.[7] Similarly, XM's service consists of more than 170 digital channels, including

[6] Both companies also offer subscription fee discounts for purchases of additional radios or commitments to annual or other longer-term subscriptions. XM Service & Subscription at http://www.xmradio.com/service_subscription/service_subscription.jsp?refsrc=hp_gs. Sirius Plans, at http://www.sirius.com/servlet/ContentServer?pagename=Sirius/CachedPage&c=Page&cid=1150907696769.

[7] Reported channel counts were compiled by CRA and are based upon a complete listing of Sirius' channels, obtained from the Sirius website as of September 26, 2006.

69 commercial-free music channels, 4 comedy channels, 2 kids' channels, the 5 music channels programmed by Clear Channel, and 93 non-music channels.[8] (See Exhibits 3 and 4, which present the complete list of XM and Sirius channels, respectively.) Channels that use commercially released sound recordings include the commercial-free music, the comedy channels, and the kids channels; and, in the case of XM, they also include the channels programmed by Clear Channel. In the analysis that follows, I refer to "music channels" as all channels that use commercially released music. For Sirius, this represents a total of 71 channels, and for XM, 80 channels.

The services that Sirius and XM provide require a license from the FCC, a process that took 5 years from the start of the FCC license proceeding to the time the licenses were awarded in 1997.[9] Indeed, I understand that Sirius had begun efforts to persuade the FCC to issue a license as early as 1990.

In order to provide an end-to-end mobile service with a national footprint, Sirius and XM each undertook substantial infrastructure investments. For example, I understand that each firm had to develop or assist in the development of a suitable audio compression system to "fit" the channels into a single encrypted signal while maintaining the audio quality of the service. XM and Sirius also had to develop their own uplink systems that transmit the service signal to the satellite and (in this case) authorize the receipt of the signal by a subscriber. These systems were not off-the-shelf systems.

In addition to developing a customized uplink to the satellite, Sirius and XM were each responsible for building, launching, and tracking their own satellites. Each service has developed its own satellite system to provide a service that would permit radios in cars (and other moving vehicles) to receive a satellite signal within a nationwide footprint. My understanding is that a signal by a conventional satellite would be too weak to be received by anything but an earth station of substantial size, likely too large to fit on the roof of a car. The satellites developed by the two services were designed to be

[8] As with Sirius, reported channel counts were compiled by CRA and are based upon a complete listing of XM's channels, obtained from the XM website as of September 26, 2006. The five Clear Channel transmissions include commercials.

[9] See FCC News Report No. IN 97-4, "FCC Announces Plan for Satellite DARS," at http://www.fcc.gov/Bureaus/International/News_Releases/1997/nrin7004.txt.

powerful enough to be received by a small antenna on a moving vehicle anywhere in the country.

Sirius owns and operates three satellites—launched in 2000—in a highly inclined elliptical orbit above North America, meaning that the Sirius satellites rise and set over the United States.[10] Once a satellite moves below the horizon, its transmission cannot be received. Accordingly, two of Sirius' satellites are always above the country, beaming their signal from that orbit. In addition, the Sirius satellites are positioned in such a way that the signal travels to the earth at a steep angle, thus reducing most of the interference from tall buildings, trees, and other obstacles. To handle the remaining reception difficulties, Sirius has constructed a network of 140 terrestrial repeaters that receive the Sirius signal and retransmit the signal to subscribers.[11]

XM owns and operates three satellites, each covering the continental United States from widely separated positions in geostationary orbit over the equator.[12,13] Two satellites were launched in March and May of 2001 (and are currently co-located in one orbital slot due to faster than expected equipment degradation) and the third was launched in February, 2005. One replacement satellite (XM-4) is scheduled to be launched this year, and another new satellite (XM-5) will serve as a ground spare.[14] XM uses an extensive network of approximately 800 terrestrial repeaters located throughout the continental United States.[15]

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[10] Sirius also maintains a fourth satellite on the ground, ready to be launched in the event that one of its three active satellites fails. See 2005 Form 10-K, Sirius Satellite Radio Inc, p. 7.

[11] 2005 Form 10-K, Sirius Satellite Radio Inc, p. 8.

[12] Telesat Canada monitors and controls the satellites for XM. Sea Launch provided launch services. XM Fast Facts, at http://www.xmradio.com/corporate_info/fast_facts.html; 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 28.

[13] Like Sirius, one of XM's satellites broadcasts 4.7 seconds ahead of the other, providing a memory buffer. (I understand that the third XM satellite is a spare in the event that either one of its other two satellites fail.) "About Sirius," at http://www.sirius.com/servlet/ContentServer?pagename=Sirius/Cached Page&c=Page&cid=1018209032792. Heltzel, Paul, "Tuning In to Satellite Radio," January 25, 2002, Technology Review, at http://www.technologyreview.com/read_article.aspx?id=12736&ch=infotech. I understand that a fourth XM satellite will be launched shortly; see 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 12.

[14] See 2003 Form 10-K, XM Satellite Radio Holdings Inc., pp. 12, 14; 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 12; and Satellite Radio Outlook, Kagan Research, LLC, July 2005, p. 21.

[15] 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 13.

My understanding is that the repeaters of both services were again not off-the-shelf, but were designed to provide the subscriber with a seamless listening experience.

Because traditional AM/FM radios cannot receive satellite signals, XM and Sirius had to develop their own radios, with customized chipsets that allow the requisite functionality. I understand that XM's proprietary chipset consists of two custom integrated circuits that process satellite and repeater signals and decode audio and data streams, enabling channel tuning and providing for the display of information. I also understand that Sirius has undertaken similar efforts. These radios receive and decrypt the digital data signal from specially-designed satellite transponders and repeaters. In addition to the encoded sound, these devices can also unscramble additional information transmitted by the services—such as the song title, the artist, and the genre of music and other information—for display on the radio. Finally, I understand that both companies have developed algorithms to minimize signal interruption where the signal may be weak.

XM and Sirius expend substantial resources in attracting and retaining subscribers. Each service has third-party arrangements for the sale of radios. One significant sales channel for both companies is the automotive original equipment manufacturer ("OEM"). XM and Sirius have arrangements with numerous car manufacturers for the installation of XM and Sirius radios in the OEM's vehicles. These OEMs include GM, Toyota, Honda, and Nissan for XM, and they include Ford, Chrysler, BMW, Audi/VW, and KIA for Sirius.[16] Both services subsidize the cost of the radio, the design of the space in the vehicle where the radio is located, its installation in the vehicle, and the training of OEM salespeople with respect to the services. The OEMs also generally receive a share of subscription revenues for all car buyers who activate a regular subscription to the services after the free trial period. This revenue share provides incentives to the OEMs to advertise the subscription radio service and, ultimately, to increase sales of cars with preinstalled receivers.

[16] 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 2; 2005 Form 10-K, Sirius Satellite Radio Inc, pp. 2-3.

In addition, XM and Sirius have third-party deals with a number of retailers, such as Wal-Mart, Best Buy, and Target, for the sale of the radios and the monthly service.[17] The services pay these retailers for shelf space, provide them with sales training, and offer a commission on sales. The radios can also be purchased online directly from XM and Sirius.

Of course, the cost of the radio can represent a significant deterrent to subscription sales. To lower this cost to subscribers, Sirius and XM engage in a variety of subsidies and revenue sharing arrangements. For example, XM subsidizes its radio manufacturers on a per radio basis, in an effort to reduce the wholesale cost borne by retailers and car manufacturers, and ultimately to place downward pressure on equipment prices paid by subscribers. Sirius does the same with its manufacturers.

In addition, Sirius and XM have state-of-the-art broadcast studio facilities located in New York City and Washington D.C., respectively, used for live performances and for the production of original programs. The XM broadcast center covers 150,000 square feet and includes some 80 programming and broadcast studios.[18] XM's state-of-the-art network storage and server infrastructure is capable of broadcasting more than two million recorded tracks. Besides the main studio in Washington, XM has additional broadcast studios in New York City, Chicago, and Nashville.[19]

Similarly, Sirius has state of the art, all digital studio facilities around the country, including New York City, Houston, Memphis, Nashville, and Los Angeles.[20] These studios allow Sirius to record and broadcast live performances as well as to produce original programming for the various channels. It also has a network server infrastructure comparable to that of XM. These are two of the largest broadcasting facilities in the world.

Exhibit 5 presents a simplified illustration of how the XM and Sirius system works. The programming is prepared at services' studio and production facilities and then "uplinked" or transmitted by each service to its satellite system. The signal is then

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[17] 2005 Form 10-K, XM Satellite Radio Holdings Inc., pp. 5, 37; 2005 Form 10-K, Sirius Satellite Radio Inc, p. 5.

[18] "XM Studios," at http://www.xmradio.com/how_it_works/xm_studios.html.

[19] 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 10.

[20] 2005 Form 10-K, Sirius Satellite Radio Inc, p. 8.

beamed back down to earth for reception by a radio or to a repeater which then retransmits the signal to the subscriber's radio.

IV Identifying a Benchmark Rate

The ideal benchmark rate would be a competitively-negotiated, arms-length rate for a right perfectly analogous to the SRPR by a service that is perfectly analogous to XM and Sirius and reflects the application of 801(b) factors. While perfect analogies are not usually available, there nonetheless may be services and rates sufficiently comparable to those being examined that they can provide useful benchmarks. With respect to a generally analogous service, economists look to services that are similar to those whose rates are at issue, making adjustments where appropriate to account for any significant differences. With respect to an analogous rate, economists look to fees paid for rights that are comparable to those at issue, making adjustments where appropriate to account for any significant differences in the rights.

In subsequent sections of this report, I discuss two rates that can be used as starting points to estimate a reasonable rate for XM and Sirius. One benchmark is the current rate paid by the PSS for the SRPR. The advantage of this benchmark is that the services are generally analogous and the rights in question are the same as those in this proceeding, and the rate was recently re-negotiated in the shadow of the 801(b) factors, at least as applicable to the PSS. Another benchmark is the collection of rates paid by XM and Sirius for musical composition performance rights. The advantage of this benchmark is that the services are those in this proceeding (and so perfectly analogous) and the rights are for the use of inputs comparable to the SRPR.

While both benchmarks have their appeal, neither is perfectly analogous in all respects. In the next sections, I describe the relevant differences and suggest modifications to these candidate benchmark rates to account for the differences. I discuss each benchmark in turn.

V Appropriately Adjusted, the SRPR Rate Paid by the PSS is a Useful Benchmark Rate

a. *XM and Sirius offer services generally analogous to those offered by the PSS*

Like XM and Sirius, the PSS provide a subscription music service for use by consumers. They all offer digital quality sound, and most of their music channels are commercial-free. The PSS, XM, and Sirius each offer a large number of musical genres and a large number of music channels within each genre. Exhibit 6 presents the number of music channels provided by each of XM, Sirius, and Music Choice (which I treat as a typical PSS), by genre.[21] XM and Sirius offer more music channels than does Music Choice. XM has a total of 80 music channels, 69 of which are commercial-free.[22] By comparison, Sirius has 71 music channels, 66 of which are commercial-free, and Music Choice has 58 music channels, all of which are commercial-free. I understand, however, that the number of Music Choice channels received by most cable subscribers is much lower than that. For example, I understand that the number of Music Choice channels offered as part of Comcast cable packages ranges from 40 to 47.

The PSS are currently paying a SRPR rate of 7.25%, a rate that I understand was based on an agreement between Music Choice and SoundExchange, the organization representing the holders of the SRPR in this proceeding.[23] In particular, I understand that in 2003, Music Choice agreed to pay SoundExchange 7% of its gross revenues in 2002 and 2003 and 7.25% in 2004 through 2007. I understand that this negotiated rate was the

[21] To create this comparison of channels by genre, I assigned Sirius and XM channel groupings (as presented in Exhibits 3 and 4) to the Music Choice defined genres. In doing so, I relied upon channel descriptions available on the XM and Sirius websites.

[22] Recall that I define "music channels" to include all channels that use commercially released sound recordings.

[23] I understand that a number of record labels have a significant ownership interest in Music Choice. I am assuming for purposes of this discussion that the financial interests of the other non-label owners of Music Choice will ensure that any negotiated rate between Music Choice and SoundExchange is one that is arms-length.

first rate change for a pre-existing service following the proceeding that established the initial rate of 6.5% in 1998.[24]

In addition to being an outcome of an agreement, a key advantage of the PSS 7.25% rate as a benchmark rate is that the Music Choice/SoundExchange negotiations took place in the shadow of a rate-setting proceeding to which either of the parties could have resorted in the event of a negotiation failure. Because any rate setting proceeding would have been based upon the 801(b) statutory factors, the negotiated rate presumably reflects those factors as well.

Still, for at least three reasons, the PSS rate needs to be tailored to the XM and Sirius services before it can be applied to XM and Sirius. First, the PSS offer only music audio services without any embellishment. In contrast, XM and Sirius offer substantial non-music programming to their subscribers, including that on the music channels. As I discuss in greater detail below, the services have made investments in acquiring exclusive talent (such as Howard Stern and Oprah) for non-music channels. And on their music channels, both services have hired programmers with substantial and acknowledged expertise in particular musical genres. In addition, both services employ experienced on-air talent for their music services, including experienced music programmers and well-known artists.

Second, XM and Sirius provide an end-to-end service with a national footprint directly to subscribers and incur all of the costs of providing the end-to-end service. As noted above, these costs included the design, building, and launch of the satellite system capable of providing a mobile service, the design and development of the radios, and all of the marketing associated with attracting and retaining individual subscribers to the service as well as the billing and collections costs, all required for a direct-to-the-consumer business. By contrast, the PSS provide a service that it hands off to a cable operator. The cable operator then incurs the costs of distributing the service to cable subscribers, the costs of billing, and the costs of fee collection.

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[24] See Library of Congress, Copyright Office 37 CFR Part 260, Docket No. 2001-1 CARP DSTRA2, Determination of Reasonable Rates and Terms for the Digital Performance of Sound Recordings by Preexisting Subscription Services, *Federal Register*, Volume 68, No 128, July 3, 2003 at 39840.

Third, the XM and Sirius services are not only end-to-end services, they are end-to-end mobile services with a national footprint—the subscriber can listen to the services in a vehicle, at home, or (depending on the radio) while walking about. The PSS services are available only for in-home listening.

All of the above-referenced differences between XM/Sirius on the one hand and the PSS on the other require adjustments to the 7.25% SRPR fee paid by the PSS before it can be applied to the revenues of XM and Sirius.[25] In addition (but discussed separately below), the application of the statutory factors in the XM and Sirius rate determination may be different from that encompassed in the PSS rate.

b. ***Use of the 7.25% PSS rate***

I understand that the SRPR rate paid by the PSS services will be determined as part of this proceeding and the PSS may be recommending a downward adjustment to that rate. Thus, my use of the 7.25% rate may be misplaced. In particular, the same methodology adopted by the CARP and the Librarian in setting the prior 6.5% rate could today yield a lower rate for the PSS.

The original PSS rate of 6.5% of gross revenues for the use of the SRPR by pre-existing services appears to have been based on the DMX/Music Choice – ASCAP rate that was being adjudicated at the time.[26] Recognizing that this benchmark rate itself was being decided and that the ultimate ASCAP rate paid by DMX/Music Choice would not be as low as the then interim rates, both the Librarian and the CARP based the SRPR rate on "an upper limit on the value of the performance right for the musical compositions."[27] The numerical range used by the CARP has been redacted from the public versions of the Librarian's and CARP's decisions. However, based upon the discussion by the Librarian, it is reasonable to assume (at least in principle) that the upper bound would reflect an offer from ASCAP to the PSS.

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[25] While my discussion focuses on modifying the PSS rate that will be applied to the Sirius and XM revenues, I could have equivalently modified the revenues of XM and Sirius to account for the described differences, and then applied the PSS rate to the adjusted XM and Sirius revenues.

[26] Librarian Decision 1998 at 25404, 25414.

[27] Librarian Decision 1998 at 25403.

In the Music Choice – BMI proceeding, which was taking place contemporaneously, BMI offered Music Choice a rate of 3.75%.[28] To the extent that this offer was similar to the offer made by ASCAP to Music Choice, the rate of 3.75% may reflect the "upper limit" of the Librarian's and the CARP's original range. I understand that ultimately, however, Music Choice and BMI reached agreement on a [[ ]] rate for past payments (and 2.5% for payments going forward). Had the CARP and the Librarian known of the ultimate [[ ]] rate, they would have likely started with a lower rate at the top end of the range and then adjusted that rate downwards upon applying the logic of the 801(b) factors.

To see this, if the upper bound in the original pre-existing PSS proceeding was based on a 3.75% rate and if SESAC payments amounted to [[ ]] the ASCAP and BMI payments, then the sum of PRO rates would be [[ ]] (i.e., 2 x 3.75% x [[ ]]).[29] After accounting for the 801(b) factors, the actual rate was set at 6.5% by the Librarian. This suggests that the 801(b) factors had the effect of setting the SRPR rate [[ ]] below the upper bound. The subsequently negotiated PSS rate of 7.25% then represented an increase of 11.5% over the 6.5% rate.

However, I understand that today the now-finalized BMI rate is not 3.75% but [[ ]]. If the Librarian followed the same logic as in the original PSS proceeding, the upper bound for that rate would have been [[ ]] (i.e. 2 x [[ ]] x [[ ]]). Accounting for the effect of the 801(b) factors would have resulted in a rate of [[ ]] (i.e., [[ ]] times the (100%-[[ ]]). The subsequent rate increase of 11.5% would have resulted in a current PSS rate of [[ ]], not 7.25%.

While my discussion of the PSS benchmark focuses on the 7.25% rate, I note what the implications would be if the [[ ]] rate were used instead. More generally, the methodology described below can be used to derive a rate for the XM and Sirius services even if the CRB were to determine a PSS rate different from the 7.25% rate or the [[ ]] rate. That derivation would be a calculation that simply replaces the [[ ]] rate with the CRB-determined rate, absent any other mitigating factors.

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[28] United States v. Broad. Music, Inc., No. 64 Civ. 3787 (LLS), 2001 U.S. Dist. LEXIS 10368 (S.D.N.Y. July 23, 2001) at pp. 5-6.

[29] I understand that historically, XM and Sirius payments to SESAC for their subscription radio service have equaled about [[ ]] of their combined payments to ASCAP and BMI.

c. ***Some revenues earned by XM and Sirius are attributable to non-music services and need to be accounted for in setting the SRPR rate***

A key difference between XM and Sirius on the one hand and the PSS on the other is in the broader suite of channels offered by XM and Sirius. Music Choice and the other PSS offer no non-music audio services. By contrast, Sirius offers its subscribers 56 non-music channels and XM as many as 93 non-music channels, in addition to their music channel offerings.[30] (See Exhibit 7.) Indeed, non-music programming has become an increasingly central element of the Sirius and XM services. In 2001, the year its service was launched, XM offered non-music programming on 27% of its channels (27 out of 101). By 2005, non-music channels had increased to 46% of channels (61 out of 133), while the number of music channels had actually decreased slightly.[31] For Sirius, the percentage of non-music channels has grown from 39% (39 out of 101) in 2002, the first year of operation, to 44% (59 out of 133) last year.[32] (See Exhibits 8.a and 8.b.)

But simple channel counts understate the significance of non-music programming in the efforts of the two services to attract and retain subscribers. Both services have made substantial investments in original, exclusive and non-exclusive brand-name non-music content. These investments are intended to attract subscribers to Sirius' and XM's subscription radio services and to distinguish the one service from the other and from other competing services like Music Choice and over-the-air radio.[33] Sirius has signed exclusive contracts with individual celebrities, such as Howard Stern, Martha Stewart, Jerry Rice, Barbara Walters, and Deepak Chopra, as well as with the National Football League, the National Basketball Association, the National Collegiate Athletic Association's Mens Division I Basketball Championship, and Wimbledon – where these exclusives are relative to XM.[34]

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[30] A large portion of XM's non-music channels consist of play-by-play sports channels that subscribers receive as part of the Sports Package. For example, there are 15 major league baseball play-by-play channels and 5 NHL hockey channels.

[31] In these counts, multiple play-by-play channels are counted as a single channel.

[32] Information on historical channel lineups from 2001-2005 is taken from XM and Sirius Form 10-Ks.

[33] "Satellite Radio Outlook," *op. cit.*, p. 63.

[34] 2005 Form 10-K, Sirius Satellite Radio Inc., p. 5; "Sirius Reports Strong Second Quarter 2006 Results," August 1, 2006, at http://investor.sirius.com/releaseprint.cfm?releaseid=205864

Similarly, XM has signed exclusive contracts with celebrities such as Oprah, Opie and Anthony, Bob Dylan, Ellen Degeneres, and Bob Edwards, as well as with Major League Baseball and NASCAR.[35] Indeed, MLB is carried on 16 XM channels during the baseball season.[36] In addition, XM and Sirius have non-exclusive content deals that include: ABC News and Talk; BBC World Service News; Bloomberg News; CNBC; CNN; C-Span; E! Entertainment; ESPN; ESPNEWS; Fox News; Radio Disney; and The Weather Channel, among others.[37] All of these services represent well-known consumer brands and represent an investment by the two services in accumulating their own brand equity.

This growth in the role of non-music programming has been accompanied by substantial expenditures on those programs. For example, based on the contractual obligations for non-music programming at XM, it is clear that the increases in programming expenses on the non-music side have been dramatic. In 2004, [[ ]] of XM's total programming costs, were dedicated to non-music programming contractual payments. In 2005, that number had risen to [[ ]] of programming costs.[38] The Sirius story is even more dramatic. In 2004, its non-music expenditures accounted for [[ ]] of programming costs. By 2006, those expenditures had increased to [[ ]] of programming costs. See Exhibit 9.

A number of investments in non-music programming are particularly noteworthy. In October 2004, Sirius signed a five year, $500 million deal to broadcast Howard Stern programming on two dedicated channels.[39] In addition to the Howard Stern deal, Sirius has acquired broadcast rights for other celebrity hosts, such as Martha Stewart.[40] Earlier this year, XM announced a three year, $55 million deal to broadcast the Oprah & Friends

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[35] 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 1-2. NASCAR will move to Sirius starting in 2007. See 2005 Form 10-K, Sirius Satellite Radio Inc., p. 4.

[36] 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 8.

[37] "Satellite Radio Outlook," *op. cit.*, p. 63.

[38] Note that these numbers are a lower bound of the share of programming costs attributed to non-music programming, since some of the non-contractual programming expenditures were for non-music programming as well.

[39] "Satellite Radio Outlook," op. cit., p. 63.

[40] 2005 Form 10-K, Sirius Satellite Radio Inc., p. 3.

channel.[41] In addition, XM has additional deals for rights to other celebrity broadcasts, such as The Opie & Anthony Show.[42]

Similarly, in October 2004, XM agreed to an eleven year, $650 million deal with Major League Baseball.[43] Through this year, NASCAR had been broadcast on XM, costing XM about [[ ]] per year. However, Sirius has acquired the rights to broadcast NASCAR starting in 2007 for about $22 million per year.[44] In addition, XM and Sirius have bid against each other for the rights to broadcast other sports leagues and events as well.[45]

Various industry sources attest to the value of these deals in attracting new subscribers. In describing the Oprah & Friends deal, industry analyst Tom Eagan of Oppenheimer stated that, "On a per-subscriber basis, XM can break even on this deal if they add 145,000 subscribers over the three-year period. That should be very easy for them to do."[46] Regarding the Howard Stern deal, Business Week wrote, "It can't be denied: Howard Stern is earning his keep at Sirius Satellite Radio ("SIRI"). Since the talk-radio star announced he would join Sirius, its subscriber rolls have jumped to more than 4 million, with more than 1 million net additions attributable to Stern, analysts say."[47]

Advertising revenues provide an additional measure of the increasing role of non-music programming. These revenues are driven by non-music channels since the music channels are predominantly commercial-free. The advertising revenues of both Sirius and XM are now beginning to reflect that importance. In 2005, the advertising revenues of XM were $20.1 million while those of Sirius were $6.1 million. In just the first half of 2006, following the launch of the Stern programming, I understand that Sirius' ad

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[41] 2005 Form 10-K, XM Satellite Radio Holdings Inc., p.1.
[42] 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 9.
[43] "Major League Baseball Partners with XM Satellite Radio for 11-Year, $650 Million Broadcast and Marketing Agreement," at http://xmradio.mediaroom.com/index.php?s=press_releases&item=1209.
[44] "NASCAR Selects Sirius as New Home on Satellite Radio," February 22, 2005, http://investor.sirius.com/ReleaseDetail.CFM?ReleaseID=156582.
[45] "Satellite Radio Outlook," op. cit., p. 70.
[46] Quoted at http://www.orbitcast.com/archives/oprah-joins-xm-satellite-radio.html, visited on 8/29/06.
[47] "Stern Is the Draw At Sirius Satellite Radio", *Business Week*, April 10, 2006, p. 104. See also "Is Howard Stern Worth It?", *Business Week*, January 23, 2006, p. 38; "Can Stern Make Satellite Radio Hum?", *CNNMONEY.com,* December 21, 2005.

revenues totaled [[ ]]. By contrast, both services had relatively trivial advertising revenues in the first year of operation.[48]

The platform for advertising growth is comprised in large part of the talent and other non-music programming that has been acquired by the two services. For example, I noted above the expectations regarding the effect of Howard Stern's exclusive relationship with Sirius on increasing Sirius' subscribership. The same is true for the subscriber effect of XM's exclusive relationship with Oprah. These and other programming investments discussed above are expected to generate greater listenership in the future, to these particular services as well as to other ad-supported services.

As a final measure of the significance of non-music programming to satellite radio revenues, survey results suggest that talk and other non-music channels disproportionately drive subscriber decisions. In a 2006 survey, Sirius listeners were asked which channels they had listened to in the past week.[49] For each channel they had listened to, they were then asked whether they would cancel their subscription if that channel were no longer offered.

Using these data, I created a "channel-attachment" index to measure the cancellation responses for music relative to non-music programming. Specifically, for each Sirius channel, I multiplied the fraction of the surveyed Sirius subscribers listening to the channel in the last week by the fraction of those subscribers who indicated that they would cancel their service if the channel were deleted from the Sirius lineup. This calculation produces a weighted cancellation rate, where the weight is the fraction of surveyed subscribers listening to the channel. I then sum these weighted cancellation rates over all channels and calculate the fraction of that sum accounted for by music and non-music channels.

For example, suppose that 20% of Sirius subscribers listened to a particular music channel in the past week and 20% of those indicated that they would cancel the Sirius service if the channel were withdrawn from the Sirius lineup. Further suppose that 40%

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[48] See 2003 and 2005 Form 10-K, XM Satellite Radio Holdings Inc.; 2003 and 2005 Form 10-K, Sirius Satellite Radio Inc. Note that Kagan Research forecasts that Sirius' ad revenues will continue to grow as a fraction of total revenues, reaching 11.5% in 2014 versus 2.5% in 2005 (*Satellite Radio Outlook*, Kagan Research, LLC, July 2005, p. 74.)

[49] *Sirius Satellite Radio Listener Study – Wave 2,* June 2006, pp. 37-61. The number of useable responses was [[ ]].

of Sirius subscribers listened to a particular non-music channel in the previous week and 50% of those indicated that they would cancel the Sirius service if Sirius stopped offering that channel. The weighted cancellation rate for the music service is 0.04 (i.e. 0.2 x 0.2), and the weighted cancellation rate for the non-music service is 0.2 (i.e. 0.5 x 0.4). The sum of the weighted cancellation rates in this example is 0.24, and 83% of these total 0.24 "points" are accounted for by the non-music channel.

Overall, [[ ]] of the channels listened to during the survey period were music channels.[50] However, music channels accounted for only [[ ]] of total weighted cancellation rates. (See Exhibit 10.) Non-music channels accounted for the remainder.[51] This suggests that listenership may overstate the significance of music channels to subscribers. This does not seem particularly surprising, as suggested by the apparently substantial advertising efforts undertaken by the two services to promote (e.g.) Howard Stern and Oprah.

In short, the benchmark PSS SRPR rate must be adjusted to reflect the significance of non-music programming in generating the revenues of XM and Sirius, before it can be applied to the XM and Sirius revenues. Note that this package of non-music programming benefits SRPR holders: it attracts more subscribers than would otherwise be the case and diverts their music listening from over-the-air radio that pays no SRPR fee to XM and Sirius that do pay that fee. Indeed, another survey conducted by Sirius indicates that after subscribing to Sirius, in-vehicle listenership to AM and FM stations dropped from [[ ]] of the time spend in the vehicle to [[ ]]. (See Exhibit 11.)

d. *Some revenues incurred by XM and Sirius are due to enhanced music programming*

The music channels of Music Choice and the other PSS contain jukebox-style music programming. That is, they offer continuous music generated primarily by

[50] This survey only asks about which channels were listened to and not how much time was spent listening to each channel.

[51] If the Howard Stern channels are excluded, [[ ]] of the channels listened to were music channels, but music still accounted for less [[ ]] of the total weighted cancellation rates than would be suggested by the listenership data.

computer-generated playlists. By contrast, XM and Sirius use a variety of talent, including experienced music programmers with genre-specific expertise, to program most of their various music channels in order to make those channels more attractive to subscribers. In particular, I understand that both XM and Sirius have hired program directors that have extensive experience in each genre of focus. For example, XM has hired Robert Aubrey Davis and Martin Goldsmith to oversee the XM classical music offerings. Similarly, Sirius has contracted with classic rocker Little Stevie Van Zandt to program its Underground Garage music channel offering a variety of alternative rock music.

In addition, both services offer individual artists the opportunity to lead specific programs in their lineup. For example, Bob Dylan hosts a weekly XM show where he reminisces and chooses what music to play and what kind of theme to offer listeners. Similarly, Tom Petty is host of a weekly XM show playing classic rock and roll. Eminem created the channel Shade 45 on Sirius, which is dedicated to uncensored hip-hop music, and Shooter Jennings hosts his own show on Sirius' Outlaw Country channel.

Both services also host live performances and other programs to highlight individual performers. Sirius' *The Who* channel plays a full recent concert recording by The Who every night, and every concert on Jimmy Buffett's "Party at the End of the World Tour" will air live on Sirius' *Radio Margaritaville*. On XM, "Then...Again...Live" offers classic rock artists the chance to perform their music again, likely exposing some listeners to performers of whom they might otherwise not have been aware. XM has also broadcast live from various musical events. For example, in 2005, I understand that the service carried more than 55 hours of Live 8 performances held in London, Paris, Rome, Berlin, Philadelphia, and Toronto.

Like non-music programming, enhanced music programming generates subscribership for XM and Sirius over and above that for a plain-vanilla music-only service. Enhanced music programming also provides benefits to SRPR holders to the extent that it results in more listening to music, diverting listeners from terrestrial radio that does not pay a SRPR fee to a service that does.

e. ***XM and Sirius incur higher costs than Music Choice because they provide a mobile service delivered directly to ultimate subscribers***

I understand that services like Music Choice and other PSS use their own facilities and personnel to program and store the music for various music channels. The PSS then "uplink" (or transmit) the music channels to a conventional for-lease satellite. The signal is then "handed off" to a purchasing cable operator who receives the signal via its own earth stations at its head-end. The cable operator pays a fee to the "hand-off" provider for its service that reflects the value of the audio music service to the cable operator's subscribers and then distributes the music service via its cable infrastructure to the homes of its subscribers. The cable operator is also responsible for attracting and retaining the subscriber, billing the subscriber, and collecting the subscriber payments, a portion of which are effectively used to offset the cable operator's payment to the music service provider.[52] Thus, the hand-off provider incurs the costs to the point of hand-off, and the cable operator incurs the remainder of the costs as well as the cost of the hand-off service itself. A simplified version of this kind of two-part distribution system is depicted in Exhibit 12.

Like a hand-off provider, XM and Sirius create a programming package that is uplinked to a satellite system, and as such, incur the same general categories of costs as does a hand-off provider. These costs include the uplink costs as well as the costs of compiling the programming package. For convenience, I refer to these costs as "hand-off provider costs."

But unlike the hand-off provider (or the PSS), the core business of XM and Sirius is to provide an end-to-end, mobile service directly to subscribers. Accordingly, XM and Sirius also incur substantial additional costs, on top of the hand-off provider costs. These costs include the cost of distribution, including the design, building, and launch of a customized satellite system to provide a mobile service as well as the radios that receive and decode the XM and Sirius transmissions; the cost of marketing the services directly to subscribers; the cost of subscriber acquisition and retention; as well as the cost of

[52] Both XM and Sirius (and, at one point, Music Choice) also sell their service to the direct broadcast satellites, DirecTV and Dish. The discussion in the text focusing on the "hand-off" to cable operators is for ease of exposition only. My focus here is on the core business of XM and Sirius—the provision of a direct-to-subscriber mobile audio service.

billing and collection of fees from their subscribers. For convenience, I describe all of these additional costs borne by an end-to-end, mobile service provider as "subscriber distribution and acquisition costs."

In sum, XM and Sirius incur subscriber distribution and acquisition costs not incurred by a hand-off provider to deliver their programming to final subscribers. Those greater costs are driven by both the mobile characteristic of the XM and Sirius service and the accompanying added cost responsibility borne by XM and Sirius for delivering the service directly to consumers (costs that are borne by the cable operator in the case of the PSS).[53] As with the need to adjust the PSS rate to account for the non-music channels provided by XM and Sirius, that rate must be adjusted to reflect these greater costs incurred by XM and Sirius for the mobility characteristic and for the end-to-end cost responsibility before the PSS rate can be applied to the revenues of the two services. If the 7.25% rate were applied to the XM and Sirius revenues without adjustment, the payments to SoundExchange would be excessive—even if the music offerings of XM and Sirius were identical to those of the PSS. The SRPR fee paid by XM and Sirius would be higher only because of the added revenue (reflecting the higher costs) attributable to providing an end-to-end mobile service, not necessarily because of any inherently higher value of the music.[54]

In what follows, I describe the kinds of adjustments that would account for these differences in costs and in the subsequent section, I implement those adjustments.

VI The Conceptual Framework for Accounting for the Functional Differences between XM and Sirius and a Hand-Off Provider

To explain the practical importance of the functional differences between XM and Sirius and a hand-off provider in calculating an appropriate SRPR fee, I provide a simple

[53] To be sure, many XM and Sirius listeners who have portable radios listen to the services at home as well as in a vehicle. But I understand that only a small fraction of listening is solely within the home. For example, a survey conducted by Sirius reports that only [[ ]] of its subscribers listen to the service only in non-vehicle locations. *Sirius Customer Satisfaction Monitor 2Q '06 Results*, August 28, 2006, p. 20. The total number of respondents was [[ ]].

[54] Of course, to the extent that mobility results in more music listening, SRPR holders will directly benefit, even with the adjustments described below.

example. Suppose a hand-off provider offers an audio music-only service like the PSS, hands off its service to a cable operator for in-home listening, and earns $1000 from the cable operator. Suppose as well that that service must pay 7.25% of its revenues for the use of the SRPR, and so pays $72.50 to SoundExchange (i.e., 7.25% of $1000).

Now suppose the cable operator charges its cable subscribers that $1000 plus another $2000 to recoup the costs for final distribution, marketing, billing, and fee collection, for total subscriber payments of $3000. Thus, the total payments made by cable subscribers for the music service recoup not just the costs of the hand-off provider service alone, but also the costs of delivering that music to ultimate subscribers. If instead the hand-off provider paid the cable operator for the use of its infrastructure and performed the billing and fee collection services itself at a cost of $2000, the hand-off provider would charge its subscribers a total of $3000.

Since the ultimate service that subscribers purchase is, by assumption, exactly the same in both cases, the SRPR fee should be the same in both cases, $72.50. If the rate for the SRPR were to be levied on the hand-off provider's total revenues (because the hand-off provider now provides an end-to-end service), the appropriate rate would be 2.42%, which, when applied to revenues of $3000, would also yield $72.50 for the use of the SRPR. In this example, the only, but key, difference between the two scenarios is whether the hand-off provider or the cable operator is responsible for final distribution, marketing, billing, and fee collection, leading to a difference in the revenues against which the rate is assessed.[55]

That key difference provides yet another way of reaching the same result. That is, we could have adjusted the 7.25% rate to account for the relative difference in the cost of providing the hand-off provider service and the end-to-end service. It is that cost difference that drives the revenue difference in the two scenarios. The appropriate rate to

[55] Suppose the hand-off provider had always provided the end-to-end service and the SRPR rate had been levied on the end-to-end revenues of the (now misnamed) hand-off provider to begin with, i.e., the original SRPR rate was 2.42%. If this provider now decided to hand off its service to the cable operator, letting the cable operator incur the final distribution costs, marketing costs, and the costs of billing and collection, the firm's revenues would be $1000. It would not be any more appropriate to apply the 2.42% to the new revenues of $1000 than it would be to apply the 7.25% to the revenues of $3000. The music delivered is exactly the same, so the payment for the SRPR should be the same (i.e., $72.50). Thus the "new" SRPR rate would have to be adjusted upwards from 2.42% to 7.25%.

be levied on the end-to-end version of the service would be 7.25% times ($1000/$3000), or 2.42%.

This example suggests one way of accounting for the fact that XM and Sirius offer subscribers an end-to-end service and not a hand-off provider service: Determine the dollar payment that would be made by XM and Sirius for the SRPR if they offered only a hand-off provider service. In principle, this could be done by applying the 7.25% rate to the revenues earned by XM and Sirius if they provided a hand-off provider service. To then calculate the SRPR rate that would be applied to the end-to-end revenues of XM and Sirius, I would divide the dollar payment made to SoundExchange for the hand-off provider service of XM and Sirius by the end-to-end revenues of XM and Sirius, just as in the example above.

Of course, I do not know directly what the hand-off provider revenues of XM and Sirius would be since they do not offer that more limited service as a core business. However, one way to meter revenues, as suggested above, is through costs. The relative revenues earned by a hand-off provider service hypothetically provided by XM and Sirius and by the end-to-end services actually provided by XM and Sirius would reflect the relative costs of the two types of services. Thus, if I could estimate what a hand-off provider service would cost XM and Sirius and if I knew the costs of the end-to-end service, I could use that information to adjust the 7.25% rate so as to apply the adjusted rate to the end-to-end revenues of XM and Sirius.

Any translation of the 7.25% rate to one that could be levied on the end-to-end revenues of XM and Sirius must also reflect other key differences between the XM and Sirius service and the PSS service above and beyond the end-to-end nature of the XM and Sirius services. XM and Sirius have incurred considerable costs to develop and deploy a mobile service as well as to provide substantial non-music components to the audio package provided. Applying the PSS rate to Sirius and XM revenues when both of these services provide significant attributes unavailable on a PSS would overstate the payment due to SoundExchange. That is, it is not the music that drives the higher per-subscriber revenues earned by XM and Sirius. Rather, it is in large part the mobility characteristic, along with the non-music offerings and the enhancements to the music offerings of XM and Sirius, that drives those revenues. That conclusion is consistent

with the inability of Music Choice, DMX, and Muzak to financially sustain a standalone in-home, music-only premium cable service. Apparently, not enough consumers valued an à la carte audio service consisting of multiple channels of continuous music streams in the home to render an à la carte service profitable. The difference between XM and Sirius on the one hand and the PSS on the other is the mobility of the service (along with the non-music programming, and the music enhancements offered by the satellite radio services).

To develop a way of estimating the costs of a more limited hand-off provider service offered by XM and Sirius, consider the following thought experiment. Suppose it were possible to divide XM and Sirius into two parts. One part would be the functional equivalent of a hand-off provider, compiling the audio programming and uplinking the programming to third parties (which would be the "other" part of XM and Sirius) using conventional satellite technology. The third parties would then be responsible for injecting the service with the mobility characteristic and for the ultimate distribution to the consumer (including advertising, promotion, the sale of radios, customer service, and billing). And the third parties would have the customer relationship. If I knew the costs of the hand-off provider service of XM and Sirius, I could then calculate what fraction of the costs of the end-to-end mobile service actually incurred by XM and Sirius was accounted for by the hand-off provider service of XM and Sirius (including the SRPR payment that would be made by levying the 7.25% rate on the hand-off provider revenues for XM and Sirius). Just as in the example above, that fraction could be used to translate the 7.25% rate into a rate that could be applied directly to the end-to-end revenues of XM and Sirius. This functional adjustment to the 7.25% rate for XM and Sirius would then account for the mobile as well as the end-to-end component of the XM and Sirius service, and would be the equivalent of the PSS rate in terms of the fees that it would generate for SoundExchange (because the lower rate is applied to greater revenues) for a hand-off provider service provided by XM and Sirius. (Of course, I also need to consider programming adjustments to that rate, as discussed later.)

VII Accounting for the Functional Differences between XM and Sirius and a Hand-Off Provider Service

The framework developed in the previous section suggests a mechanism for translating the 7.25% rate into one that can be levied on end-to-end revenues of XM and Sirius. I would expect that the higher revenues earned on the end-to-end mobile service relative to the hypothetical hand-off provider service will reflect the higher costs of the end-to-end mobile service relative to the hand-off provider service. This is a matter of simple economics: Higher costs require that the firm generate higher revenues if it is to remain financially viable.

One translation mechanism is to adjust the PSS rate to account for the relative difference between costs that would be incurred by Sirius and XM if they offered their core business service as only a hand-off provider and their actual end-to-end costs.[56] That translation of the 7.25% rate could then be levied on the end-to-end revenues of XM and Sirius because that rate would then have accounted for the higher costs on the end-to-end mobile service relative to their hand-off provider service. The translation would result in XM and Sirius paying SoundExchange the same dollar amount it would have been paid if XM and Sirius offered only the hand-off provider service in the same functional manner as Music Choice, DMX, or Muzak.

The first step in the translation process is to generate a functional adjustment to the 7.25% PSS rate that will account for the mobility characteristic of the XM and Sirius service as well as for other end-to-end services provided by the two companies. This functional adjustment requires an estimate of which of the end-to-end costs incurred by XM and Sirius would fall into the hand-off provider category. Of course, an important question is what the "hand-off provider" service would be for XM and Sirius. I define the hand-off provider to include the entire audio package (both music and non-music programming) offered by Sirius and XM, because it is that package that would generate the demand for the service by third parties in turn that would reflect ultimate demand for the XM and Sirius services by consumers, not just the music component of the package.[57]

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[56] As noted previously, I account for the non-music programming of XM and Sirius below.

[57] Of course, as I have noted a number of times, I must still account for the differences in the programming offered by XM and Sirius and that of the PSS.

The subscriber distribution and acquisition costs that would be incurred by the third-party distributors (i.e., the "other" part of XM and Sirius) would include the additional end-to-end costs as well as the costs of injecting the XM and Sirius services with the mobility characteristic.

a. ***Cost assignment for XM***

My decomposition of costs between hand-off provider costs and subscriber distribution and acquisition costs begins with an analysis of XM's costs, by line item. Exhibit 13 details a set of cost line items provided by XM, averaged over the fiscal years 2005 and the first two quarters of 2006. Because unanticipated costs can vary from year to year, I use average costs over this period. The Appendix describes the XM line items in Exhibit 13 and the reasons for categorizing them as either hand-off provider costs or subscriber distribution and acquisition costs.

Some cost line items, even at a detailed level, cannot be categorized as a hand-off provider cost or as a subscriber distribution and acquisition cost. In such cases, I allocate that cost line item according to the ratio of hand-off provider costs to end-to-end costs for the other assignable cost line items.[58] Additionally, I exclude certain cost line items which are not relevant to this calculation (for example, XM's share of the earnings or losses of its Canadian affiliate). Exhibit 13 reports each of the "baseline" line items provided to me by XM and how those items were assigned to the hand-off provider or subscriber distribution and acquisition category, as well as indicating which line items were allocated between the two cost categories.

b. ***Cost assignment for Sirius***

I repeat this categorization of baseline cost data as hand-off provider or subscriber distribution and acquisition costs for Sirius in Exhibit 14, with the detailed line items described in the Appendix. Like XM, Sirius provided data for fiscal year 2005 and the

[58] I have allocated some of the cost components that could not be directly assigned to the hand-off provider or to the subscriber distribution and acquisition cost category because it did not seem reasonable to assign all of the, for example, G&A expenditures to either the hand-off provider or to the subscriber distribution and acquisition level. Against that background, allocation of these unassigned costs to the hand-off provider level by the ratio of the assignable hand-off provider costs to the end-to-end costs seemed reasonable.

first half of fiscal year 2006. However, a key cost component for Sirius programming—the Howard Stern deal—is not reflected in the 2005 data. To ensure that going forward the Stern costs were appropriately counted, I assigned the 2006 Stern costs to 2005 as well. As with XM, costs that could not be obviously assigned to the hand-off provider or subscriber distribution and acquisition category were allocated to the hand-off provider category by the ratio of assignable hand-off provider costs to end-to-end costs.

c. ***Imputing the payment for the use of SRPR***

The second step in estimating the cost ratio is to impute what the payments to SoundExchange would be based upon the fraction of total Sirius and XM costs that are accounted for by the hand-off provider costs.[59] Based on the current end-to-end revenues of XM and Sirius, I use the ratio of the hand-off provider costs to end-to-end costs to estimate what the hand-off provider revenues of XM and Sirius would be. This assumes that the relative difference between the revenues of providing the hand-off provider service and the end-to-end service reflects the relative difference in costs between the hand-off provider service and the end-to-end service (both cost components including the SRPR fee itself).[60] I then use the PSS rate of 7.25% to determine what the payments to SoundExchange would be based upon hand-off provider revenues for XM and Sirius, and incorporate those payments as part of both the hand-off provider and end-to-end costs.

The assumption that the hand-off provider revenues relative to the end-to-end revenues directly reflects the hand-off provider costs relative to the end-to-end costs is reasonable. In competitive markets, revenues tend to be driven to costs and the services offered by XM and Sirius (at both the hand-off provider level and the end-to-end level) are competitive, as I discuss in greater detail below. But for my purposes here, revenues

[59] Of course, these estimated payments will be excessive because (e.g.) the calculations do not account for the distinction between music and non-music services, a distinction we address in the next section, or the application of the 801(b) factors.

[60] To be precise, I assumed that $(R_{\text{hand-off provider}}/R_{ee}) = (C_{\text{hand-off provider}}/C_{ee})$ where "ee" refers to the end-to-end service, R refers to revenues, and C refers to costs. In the baseline case being developed here, XM's estimated payments to SoundExchange are equal to the 7.25% PSS rate applied to the ratio of hand-off provider costs to end-to-end costs, multiplied by XM's actual revenue. The estimated payment to SoundExchange is also a component of the hand-off provider and end-to-end costs, which means that the estimated payment to SoundExchange can be determined by rearranging this equation and solving for the payments to SoundExchange.

do not have to be equal to costs or approximately so for my analysis to be valid: All that is necessary is that the revenues at both the hand-off provider and the end-to-end levels be in the same proportion to costs. Below, I address factors that support my conclusion that deviations from equality do not seem to be a significant issue in the sense that such deviations would lead to a systematic underestimate of the applicable SRPR rate.

d. ***Calculating the PSS rate using the functional adjustment***

I now have the data to apply a functional adjustment to the PSS SRPR rate, i.e., an adjustment to account for the fact that, unlike the PSS, XM and Sirius provide a nationwide mobile end-to-end service. To determine the SRPR rate that would be applied to the end-to-end revenues of XM and Sirius to account for this functional difference, I multiplied the 7.25% rate by the ratio of hand-off provider costs to end-to-end costs.[61] Using the baseline data and allocations in Exhibits 13 and 14 for XM and Sirius, respectively, that ratio for XM is about [[ ]] and for Sirius, that ratio is about [[ ]]. That exercise results in a functionally-adjusted rate of [[ ]] for XM and [[ ]] for Sirius, i.e., one that is now consistent with the end-to-end service provided by XM and Sirius. (See Exhibit 15.) Of course, this functionally-adjusted rate cannot be the final rate because it fails to account for the non-music programming components of XM and Sirius, programming which is unavailable on Music Choice, DMX, and Muzak. I make this adjustment in a subsequent section.

e. ***Other considerations***

There are a number of issues that might be raised in using this approach to estimate a functionally-adjusted rate. First, my calculations rely upon a categorization of cost line items maintained by XM and Sirius in the normal course of business, and as such, these cost categories were not created inherently to distinguish between hand-off provider and end-to-end functions. I adopted an approach that is reasonable, which is to

[61] Of course, I could have obtained this same result by dividing the imputed SoundExchange payments by the end-to-end revenues earned by XM and Sirius. However, the discussion in the text retains the fundamental intuition of the approach here—that the PSS rate needs to be adjusted for the fact that XM and Sirius incur end-to-end costs and the PSS services do not.

allocate these costs that I could not assign to the hand-off provider level by the ratio of assignable costs at that level to assignable end-to-end costs.

A second issue is that some of the accounting costs may not accurately reflect economic costs. Most obviously, the interest cost of debt is a component of both the hand-off provider and the end-to-end costs and is included in the analysis, but I have not accounted for the cost of equity. Because the end-to-end costs encompass some of the riskiest components of the XM and Sirius business—such as those arising from the need to design and develop a satellite transmission infrastructure quite different than an off-the-shelf satellite system and associated receivers—the end-to-end costs may be substantially understated. Similarly, I have not accounted for the over $3 billion of losses already incurred by each of XM and Sirius in offering their services, losses that would (if amortized) likely increase the end-to-end costs of XM and Sirius relative to the hand-off provider costs. In short, I have no reason to believe that accounting biases would result in a systematic understatement of the cost ratio, and many of those biases result in an overstatement of the cost ratio, and so result in an excessive rate.[62]

Of course, these functionally-adjusted rates for the SRPR are excessive because (among other things) they fail to account for the extent to which non-music components of the XM and Sirius service generates revenues for the two services. We turn to those additional adjustments now.

VIII Accounting for Revenues Generated by Non-Music Programming on XM and Sirius

In addition to the functional adjustment of the PSS rate, the PSS rate also needs to be adjusted for the fact that unlike the PSS, XM and Sirius both offer non-music channels and music channels to their subscribers. As I have already explained, those services appear to have a significant impact on attracting and retaining subscribers. Accordingly, a

[62] A third possibility is that the relationship of relative revenues and relative costs may not be one-to-one because many of the end-to-end costs are being incurred in anticipation of future subscribers. That is, because those end-to-end costs are intended to support future as well as current subscribers, the ratio of hand-off provider-equivalent costs to end-to-end costs will appear artificially low and as a result, so may the corresponding imputed SoundExchange payments. However, there is no particular reason to believe that the fraction of hand-off provider-level costs that are undertaken in anticipation of future revenues would differ from the analogous end-to-end fraction.

portion of XM and Sirius revenues are generated not by music but by non-music services. Without accounting for the effect of non-music programming on revenues, the application of the adjusted PSS rate to the end-to-end revenues of the two services will result in an overpayment to SoundExchange. In this section, I consider a number of methods to account for the availability and importance of non-music services to XM and Sirius subscribers.

a. ***Programming adjustment using listenership data***

Listenership data collected by both XM and Sirius provide one way to account for the importance of non-music programming to subscribers. XM collects channel-specific listenership through Arbitron, where listening is measured using Arbitron's average-quarter-hour listening.[63] Sirius conducted a survey of its subscribers that asked, among other things, how many hours they spent listening to music and non-music programming in the last week prior to the survey.[64]

A key limitation with the listenership data is that its correlation with the value consumers place on music and non-music is uncertain. There may well be some non-music channels (or music channels) that are highly valued but not listened to for any extended period of time (e.g., the NFL or local weather and traffic channels). Thus, listenership is very likely an imperfect indicator of the value that consumers place on non-music services relative to music services. Nonetheless, a listenership adjustment is an obvious one to consider. The listenership data indicates that [[ ]] of all of XM's listenership is accounted for by music. For Sirius, the corresponding figure is [[ ]]. If the functionally-adjusted rates are modified to account for these listenership patterns, then this programming adjustment results in a corrected rate for XM of [[ ]] and [[ ]] for Sirius.

[63] XM Arbitron Custom Study, Fall 2005. The average quarter hour measure is for Monday to Sunday, 6 AM through midnight.

[64] *Sirius Customer Satisfaction Monitor 2Q '06 Results*, August 28, 2006, p. 22. The survey polled [[ ]] Sirius subscribers, who on average listened to music for [[ ]] of listening to all Sirius channels.

b. ***Programming adjustment using a channel attachment index***

The channel attachment index I discussed previously provides another way to account for the importance of non-music programming to subscribers. Data on those consumers who are prepared to cancel the service if any particular channel is withdrawn provide an indication of the intensity of their demand for a particular channel: Notwithstanding the availability of other channels on the services, these consumers are prepared to forego the entire service if a particular channel is unavailable. These data are similar to survey data often compiled in antitrust matters to identify the products that are close substitutes for the product under antitrust scrutiny. The consumer is asked what product he/she would choose if a preferred product was unavailable. Here, the question is analogously informative: Is the channel in question so important to the subscriber that he/she would choose to cancel the Sirius subscription if this channel were eliminated from Sirius' channel lineup, notwithstanding the array of other channels available on the service. In this way, the Sirius cancellation data provide useful information on the importance to consumers of music versus non-music channels.[65]

As I explained previously, for each Sirius channel, I calculate the fraction of Sirius subscribers responding that they would cancel their Sirius subscription if the channel were dropped. Because listenership varies across channels, I weight these cancellation percentages by the fraction of subscribers who responded that they had listened to the channel in the previous week. Finally, I calculate the sum of these weighted cancellation percentages for music channels, and then take that sum and divide by total of the weighted cancellation percentages across all channels (music and non-music channels). In this way, I create an index of the attachment of subscribers to music channels relative to non-music channels.[66]

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[65] Of course, a consumer who cancels his/her Sirius subscription as a result of withdrawal of a particular channel on Sirius may choose to subscribe to another service (like XM) that does offer a channel comparable to that lost on Sirius. However, there is no reason to conclude that there is a differential availability of attractive music channels on alternative services relative to attractive non-music services. Thus, there is no reason to believe that the differences in cancellation rates more likely reflect the relative availability of alternatives to Sirius for the withdrawn service rather than the relative intensity of demand for those services.

[66] As in the other adjustments for non-music programming, here I treat Sirius' comedy and kids channels as music programming.

Because I only have cancellation data for Sirius, I use the same data for XM as well. However, in the case of XM, I exclude Howard 100 and Howard 101 (channels with high cancellation percentages and high listenership). This assumes that the other music and non-music programming of the two services is roughly comparable in terms of listeners' attachment.

Including the Stern channels produces an index of the importance of music programming of [[ ]], while excluding the Stern channels increases the index to [[ ]]. If the functionally-adjusted rate is modified using these indices (I apply the with-Stern index to Sirius' functionally-adjusted rate and the without-Stern index to XM's functionally adjusted rate), this programming-adjusted rate would be [[ ]] for Sirius and [[ ]] for XM.

c. ***Programming adjustment using program expenditure data***

One natural way of accounting for the significance of music relative to all programming on XM and Sirius is to apply a programming adjustment based on the ratio of music programming expenditures to total programming expenditures, which would reflect the relative importance of music programming and non-music programming for the Sirius and XM services. I understand that the two services have spent a substantial amount of money for non-music programming because they expect that these expenditures will lead directly to increased subscribers and subscription revenue.

For XM, we estimate music programming expenditures as [[ ]] and total programming expenditures as [[ ]] (including the imputed SoundExchange payment), the resulting ratio of music to total programming expenditures being [[ ]].[67] Similarly, for Sirius, we estimate music programming expenditures as [[ ]] and total programming expenditures as [[ ]]. In the case of Sirius, the resulting ratio of music to total programming expenditures is [[ ]]. This programming adjustment leads to a rate of [[ ]] for XM and [[ ]] for Sirius.

[67] Music programming expenditures include the payment for the SRPR, which is determined as the result of this computation. For the sake of simplicity in calculating this adjustment, I use the estimated SRPR payment from the baseline case, which is conservative insofar as it will result in a higher programming-adjusted rate.

The obvious appeal of this approach is that it highlights the important role that non-music programming plays in the packaging of the two services. In particular, this approach can be thought of as identifying the value that consumers place on the programming containing sound recordings of the audio package compiled by XM and Sirius relative to the value they place on the non-music programming.

However, the approach does have limitations. Roughly speaking, the adjustment may not fully "meter" the revenues associated with music programming. Some consumers who subscribe to the services largely because of the non-music programming services will nonetheless listen to some music and that additional listening will not be captured in this adjustment. So this particular programming adjustment may understate the SRPR rate. However, to the extent that some consumers subscribe to the services because of the music, some of those will also listen to the non-music programming, and this adjustment approach would fail to account for the additional revenues associated with resulting from the availability of non-music programming to subscribers.

Nonetheless, because the programming expenditure-based adjustment may understate what a reasonable rate should be, I have not included those rates in my consideration of the reasonable range of rates. However, this rate calculation does underscore the importance of non-music to the services and their view of what programming is necessary to attract additional subscribers. In so doing, it provides me comfort that the lower bound I do include is reasonable.

IX Summary of Rate Estimates Based on the 7.25% PSS Rate

It is my opinion that the PSS 7.25% rate paid by a hand-off provider service offering an audio package like that of XM and Sirius provides a useful benchmark rate to determine royalties payable to SoundExchange. Upon consideration of the differences between XM and Sirius on the one hand and the PSS on the other, I have identified the need for three significant adjustments (two of which are feasible given data limitations). The first is the functionality adjustment, accounting for the end-to-end mobile service provided by XM and Sirius in contrast to the more limited service offered by the PSS.

The second is a programming adjustment accounting for the importance of non-music programming to XM and Sirius.

Exhibit 16 summarizes the complete analysis. As is obvious, the program-adjusted rates for XM and Sirius fall within a narrow range and given the similarity between the estimated rates of the two services, the use of the same rate for both seems reasonable. Thus, based on the PSS rate, a reasonable range for the SRPR rate for XM and Sirius is between 0.88% and 1.04%.

Instead of the 7.25% starting rate, it may be more appropriate to consider a lower starting rate of [[ ]] for a PSS. This lower rate, the derivation of which is explained above, reflects the logic of the original PSS decision but is based on the actual PRO benchmark rate that was used in that proceeding. Applying the adjustments to this lower rate results in a range of rates between [[ ]] and [[ ]] for the two services. (See Exhibit 17.) (Of course, the rates in Exhibits 16 and 17 do not account for the 801(b) factors.)

Finally, the third adjustment stems from the value-added contributions made by XM and Sirius to music programming. To the extent that these enhancements result in a higher subscription price for the XM and Sirius services, then the SRPR holders may be overcompensated because I have not accounted for these enhancements in my analysis. Suppose, for example, that after adding the enhanced music, the number of sound recording performances remained unchanged but the price that consumers were willing to pay for the service increased. Under a per-listener/performance fee, the payments for the use of the SRPR would not change. But because the fee here is based on a percentage of revenue, the payments to the SRPR holders will increase even though the number of sound recording performances has not changed.

X Appropriately Adjusted, the Payments Made by XM and Sirius to the Performance Rights Organizations May Provide a Useful Upper Bound to the SRPR Rate for XM and Sirius

Another useful benchmark for the SRPR royalty rate is the set of royalty payments made to the performance rights organizations: ASCAP, BMI, and SESAC.

These payments are the royalties received by composers and publishers for the use of the musical works public performance rights underlying the sound recording performance.

The appropriate SRPR payment should be no larger than the PRO payment. A buyer of the sound recording performance rights needs both rights in order to render a public performance of the sound recording. Thus, the buyer is in exactly the same position with regard to the two broadcast rights: Both are needed to broadcast sound recordings, and the benefit received by the buyer applies to both rights jointly. In addition, each seller of the sound recording performance right is in the same position as the seller of the musical works performance right for that sound recording. From the seller's perspective, the direct cost of using either right for additional performances of a sound recording is the same (zero).

The characterization that the sellers of the sound recording performance rights and the musical works rights face zero incremental costs seems a good one as an empirical matter. To see this, consider the fact that record companies earned a total of $24.4 billion from worldwide sales of recorded music in 2005.[68] Even supposing that XM and Sirius both paid a PSS rate of 7.25%, (a completely inappropriate rate for the reasons I have already explained), the combined payments by XM and Sirius to SoundExchange would still account for less than 0.24% of recorded music revenues. Accordingly, a reasonable conclusion is that the fees received by SoundExchange for the use of the SRPR from XM and Sirius would not have any detectable effect on the sound-recording production decisions of the labels. Thus, the assumption that the cost of extending the SRPR to XM and Sirius is effectively zero seems appropriate. Hence (based on the direct costs and benefits of the transaction) whatever bargaining process is used to determine one royalty rate would arrive at the same result for the SRPR royalty rate as well. As I will discuss shortly, consideration of indirect promotional benefits suggests that the SRPR royalty would be somewhat less than the musical works performance royalty.

[68] I estimate worldwide record company sales of $24.4 billion by dividing Warner Music Group's $2.924 billion in worldwide recorded music sales by its 12.0% share of retail record sales. See Warner Music Group, 2005 Annual Report, p. 2; International Federation of the Phonographic Industry, as reported in *Market Share Reporter*, 2007, Volume1, "Top Music Firms Worldwide, 2006," p. 446.

I understand that XM has negotiated a final rate with ASCAP of [[ ]] of its adjusted gross revenues for the next five years for the use of the musical works performance right to the music in the ASCAP library. In addition, I understand that payments to SESAC are about [[ ]] of the payments made to ASCAP and BMI.[69] While XM has not yet negotiated a final rate with BMI, my understanding is that ASCAP and BMI typically have the same rates.

As noted, the XM-ASCAP rate applies to adjusted revenues, where these adjustments include certain deductions such as [[ ]] of subscriber acquisition costs. I understand that the XM-ASCAP rate of [[ ]] of adjusted gross revenues accounts for about [[ ]] of gross revenues. Accordingly, the total payment to the PROs made by XM would be [[ ]] of gross revenues (i.e. [[ ]]). I also understand that Sirius has not yet negotiated any final rates with the PROs; for purposes of this discussion, I am assuming that the rates Sirius ultimately pays will be comparable if not identical to those paid by XM.[70]

For a number of reasons, the sum of these PRO rates is likely to be an upper bound on the rate to be levied for the use of the SRPR. First, the PRO rates themselves are negotiated in the shadow of the courts that administer the Department of Justice's consent decrees for BMI and ASCAP. In order to become the sole agents for the musical works performance rights in their respective libraries, ASCAP and BMI each had to agree to terms embodied in the consent decree, which were designed by the Justice Department to constrain the exercise of monopoly or market power by each monopoly rights agent.[71] In the event that the rights user believed the negotiated rates would be too high, it could incur the costs of litigation to ask the courts administering the consent decree to determine a reasonable rate for the use of the musical works in the library of each PRO. However, the incentive to incur litigation costs may be different for a user of rights than

[69] XM's payments to SESAC were [[ ]] of the payments to ASCAP and BMI over 2005 and the first two quarters of 2006. (XM financials.) The corresponding figure for Sirius was [[ ]]. (Sirius financials.)

[70] However, I do understand that Sirius views the rates paid by XM as excessive and so believes that basing an upper bound on the PRO rates of XM is equally excessive.

[71] See, for example, the discussion of the earlier decrees in the Department of Justice press releases describing more recent decree modifications: http://www.usdoj.gov/opa/pr/2000/September/517at.htm and http://www.usdoj.gov/atr/public/press_releases/1994/211869.htm.

for the PRO. For the user, the rates are set for that particular use, while for the PRO the rates can serve as a precedent for other ratemaking negotiations and proceedings involving other uses, i.e., they could serve as benchmarks for rates in those other uses. Because the benefit of a successful litigation is higher for a PRO than for a user, the PRO will be prepared to bargain harder with the user for a higher rate. Thus, the current ASCAP and BMI rates may be well in excess of that which would be forthcoming in a more competitive market.

Second, the payments to the PROs do not reflect consideration of the 801(b) factors and should be considered an upper bound for the SRPR rate to be levied on the revenues of XM and Sirius. While I discuss the 801(b) factors below, some of that discussion is worth foreshadowing here.

When a sound recording is performed on XM and Sirius, it generates a promotional benefit to the SRPR holders in that some listeners who hear the performance (and see the artist name and song title displayed on their receiver) may go out and purchase a copy of that recording via a CD or download. As discussed below, this promotional benefit spans the range of genres played on Sirius and XM, and applies to both new and old recordings. While both the PRO and the SRPR holder benefit from the additional sales of sound recordings, the incremental return on the sale of a sound recording is likely to be greater than that for the holder of the musical works right because the price of the CD itself is designed to recoup all of the costs borne by the producer of the sound recording. Moreover, the increased exposure of artists will likely increase the sales from concert tours, some of which will no doubt be contractually captured by the labels. While we discuss these benefits in detail below, the effort exerted by the labels to obtain airplay from terrestrial radio suggests that the flow of payments in a more competitive market may well be from the SRPR holders to the SRPR users.

A third factor which leads to the conclusion that the use of the PRO rates as a benchmark is an upper bound stems from the fact that the PRO rate is levied on the use of all of the music in the PRO libraries. By contrast, it is my understanding that under the Act, performances of pre-1972 recordings are exempt from the payment of the SRPR. Thus, because the library of sound recordings is smaller than the entire library, if the PRO rate were used as the starting point for setting the SRPR rate, one would have to

reduce that rate to reflect the reduction in the library of relevant recordings. In addition, the services are not required to pay a SRPR fee for live performances and archival performances, while payments to the PROs are required. This would require yet another downward adjustment in the PRO rate before being applied to the revenues of XM and Sirius as a SRPR rate.

An additional factor is the broader scope of the PRO license compared to the SRPR license. The SRPR licensee is subject to the sound recording complement rule that (unless granted an exception by the record companies, which may require additional compensation) limits the number of songs played from a particular album to no more than two in a row, or three in any three hour period. In addition, no more than three songs in a row, or four in any three hour period, can be played from the same artist or boxed set.[72] There is no such limitation on the scope of the PRO license.

Finally, I note that Sirius has not as yet accepted the rate of [[ ]] of adjusted revenues of the XM-ASCAP agreement. To the extent that Sirius and ASCAP agree upon a lower rate, the upper bound of the range estimated here should be adjusted to reflect this change. I understand that Sirius will be testifying regarding its view as to why the ASCAP rate is excessive. I also understand that XM agreed to this rate with ASCAP in light of other consideration.

XI Consideration of the 801(b) Factors Suggests that the SRPR Rate to be Paid by XM and Sirius Should Be Towards the Low End of the Range

As noted at the outset, the rates ultimately established for the SRPR payment by XM and Sirius must reflect the Section 801 (b) factors:

(A) To maximize the availability of creative works to the public;

(B) To afford the copyright owner a fair return for his creative work and the copyright user a fair income under existing economic conditions;

(C) To reflect the relative roles of the copyright owner and the copyright user in the product made available to the public with respect to relative creative contribution, technological contribution, capital investment, cost, risk, and

[72] For the complement rule see http://www.copyright.gov/fedreg/1997/62fr34035.html.

contribution to the opening of new markets for creative expression and media for their communication;

(D) To minimize any disruptive impact on the structure of the industries involved and on generally prevailing industry practices.[73]

Using the rates estimated above, a range of estimates for the reasonable rate of the SRPR can vary from 0.88% (based on the 7.5% PSS rate) to 2.35% (based on the PRO rates). However, the estimates based on payments to the performance rights organizations do not account for the 801(b) factors. As I understand it, those rates are subject to a willing buyer/willing seller standard. The rates based upon the PSS rate do reflect the 801(b) factors, but as they apply to Music Choice and (perhaps) DMX and Muzak, not to XM and Sirius.

What follows is my assessment of the performance of XM and Sirius in fostering objectives A, C, and D relative to the record companies (who I identify for shorthand purposes as the holder of the SRPR) and Music Choice, as a representative PSS. I conclude that based on these factors, the rate for XM and Sirius should be towards the lower end of the range of estimated rates. In satisfying these objectives, such a rate would provide a fair return to the holder of the SRPR because it accounts for these and marketplace factors.

a. ***Evaluating the role of XM and Sirius in promoting the availability of music***

In evaluating the XM and Sirius contribution to the "availability" of music, "availability" can be interpreted in terms of music distribution, i.e., transmitting more music and more types of music to more listeners, or in terms of the supply of music, i.e., the creation of more music.

I understand that in previous decisions, the Librarian has interpreted "availability" to mean only the production of sound recordings.[74] However, an economist would naturally interpret "availability" to encompass both distribution and production. And given the nexus between the two described below, that interpretation is key to

[73] 17 U.S.C. 801(b)(1).

[74] See Librarian Decision 1998 at 25406.

understanding how distribution affects the production of sound recordings. I discuss each of these in turn.

i. Availability interpreted as music distribution

The XM and Sirius services currently encourage the more widespread availability of music in a number of ways. First, the services offer subscribers a substantially wider array—in terms of formats or stations within a format—than do over-the-air radio and Music Choice. Sirius and XM both provide more music channels than are found in even the largest terrestrial radio markets, and those channels cover a more diverse set of genres. While Sirius has 71 music channels and XM has 80, the five largest radio markets, as measured by BIA, have an average of 43 music stations.[75] Of these music stations in the largest terrestrial radio markets, 52% are in the rock or pop genres. In contrast, pop and rock stations at XM and Sirius account for only 39% and 45%, respectively, of the music channels.

The remaining channels span a wider array of formats than are found even in the top five radio markets. For example, the top five radio markets have no stations dedicated to playing kids music and only one station (in San Francisco) using a dance music format. Both Sirius and XM have multiple channels in each of those formats.

Moreover, even within the common genres, there is a greater diversity in the satellite radio offerings. For example, four of the top five terrestrial radio markets have only one station in the jazz and blues genre. The fifth, San Francisco, has two, but both offer a smooth jazz format.[76] In contrast, both Sirius and XM have five channels in the jazz and blues genre, with each channel focused on a different subgenre (classic jazz, modern jazz, blues, etc.). The contrast between the number and range of choices for music available on Sirius and XM and what is available on terrestrial radio in smaller markets would be even more pronounced.

[75] Information on terrestrial radio markets is from the 2006 BIA Investing In Radio Market Report; see Exhibit 18. See Exhibits 3 and 4 for the channel lineups on XM and Sirius.

[76] See 2006 BIA Investing In Radio Market Report, p. 2.

Similarly, both XM and Sirius offer more music channels than Music Choice, indicating that the contribution of XM and Sirius to music distribution is greater than that of Music Choice. (See Exhibit 6.)

Second, the labels do not expend any incremental effort to provide music to XM and Sirius that will enhance the transmission of the music provided by the two services. The labels are not involved in those transmission decisions and so do not enhance the availability of music in terms of its distribution.

ii. Availability interpreted as the supply of new music

I earlier observed that availability can also be interpreted to mean the supply of sound recordings. To be sure, the recording companies, the performers, and composers are directly involved in the production of music, unlike XM/Sirius. But as I noted above, even if XM and Sirius were to pay SRPR fees at the inappropriate and excessive rate of the PSS, those payments would likely have an undetectable effect on increasing the supply of sound recordings.[77] Moreover, the fees paid by XM and Sirius for the SRPR may represent fees that record companies would not otherwise accrue. As shown in Exhibit 11, most of the listening to Sirius is diverted from over-the-air radio which pays performers and the holders of the SRPR nothing for airplay. SoundExchange benefits directly from this conversion of over-the-air listeners to XM and Sirius subscribers because terrestrial radio does not pay a SRPR fee.

In addition, there is normally a tension in simultaneously attempting to increase both the distribution of a product and the supply of a product. A lower price charged by the distributor for the product will the increase number of consumers to whom the product is available, but can reduce the earnings of the product supplier and so reduce the supply of the product.

Here, the tension between these two goals is muted if not completely absent. A lower SRPR fee leading to more widespread distribution of the XM and Sirius services will expose listeners to artists, songs, and genres more or more effectively than would

[77] Indeed, it appears that nearly a third of the revenues collected by SoundExchange are not distributed to the responsible artists, further diminishing any effect of the SRPR fee on encouraging the supply of new musical works. See http://soundexchange.com/news/documents/SoundExchange_PR_6_14_05.pdf .

otherwise be the case. That exposure, in turn, will tend to encourage the sale of music (CDs, downloads) to final consumers, thus benefiting the artists and recording companies and thereby encouraging the production of new sound recordings. While the SRPR payments themselves by XM and Sirius may have no measurable effect on encouraging new sound recordings, that does not mean that the services do not contribute to expanding the supply of sound recordings. The evidence certainly suggests that the recording industry values the promotional impact of XM and Sirius (or services like them) on sales of sound recordings and concert tickets.

Record companies engage in numerous promotional practices to increase airplay for their artists. Some of the practices used to influence terrestrial radio airplay have recently received considerable notoriety in the investigation carried out by the New York State Attorney General. As the AG's office noted in the press release announcing a settlement with Universal Records, "Radio airplay is the single most effective driver of music sales."[78] Among the practices documented in that investigation are payments to radio stations and programmers, sponsorship of events and listener contests, and use of independent promoters, all efforts intended to increase the airplay of the label's sound recordings.[79]

While promotion on terrestrial radio is an important and ongoing component of the marketing strategy of record companies, the effectiveness of that component is limited by the range of programming carried over broadcast radio. A 2001 article from Billboard begins by stating the problem: "While labels have increased the amount of new product coming through the pipeline, radio has tightened its playlists. It's like trying to pour a gallon of water into a pintsized container."[80] The article concludes quoting Fred Mills, a promotion representative from DreamWorks: "'Maybe we will have to find other avenues to expose product, whether it be through more fragmentation of formats, the Internet, satellite radio, or visual mediums.'" Thus this article, written shortly before

[78] http://www.oag.state.ny.us/press/2006/may/may11a_06.html

[79] See "Executive fired amid charges of payoffs", *New York Times,* January 12, 2005; "Sony BMG settles radio payola probe", *Washington Post*, July 26, 2005; "Music labels say it costs too much to get songs on the radio," *The Wall Street Journal,* June 10, 2002, p. B1.

[80] "Radio and labels at odds again," *Billboard*, May 12, 2001, p. 135.

satellite radio service was launched, had already begun envisioning a role for satellite radio in expanding the promotional reach of record labels.

From the inception of service, an element of the strategic plan for satellite radio was to develop promotion opportunities for record companies, taking advantage of the scale economies and national coverage of satellite radio.[81] This has been accomplished by the breadth of musical styles covered among the music channels as well as specific opportunities to feature and promote artists.[82] For example, XM has an Artist Confidential series in which an artist from somewhere across the spectrum of musical genres gives a live performance from XM's performance theater, which is broadcast on the appropriate music channel.[83] Numerous shows anchored by celebrity hosts on both Sirius and XM provide opportunities to expose devotees of particular music formats to new or less well known artists.[84] XM produces a program called "Then...Again...Live" that features classic rock performers giving live renditions of their classic rock and another called "Offstage" in which XM visits a performer at his or her home and broadcasts a show from that home.[85] Sirius also broadcasts a number of live shows, both from its own studios and from remote locations such as those hosting various winter extreme-sports events. These efforts go beyond anything undertaken by the PSS audio services.

Satellite radio has also provided a forum for airplay for veteran artists who, while no longer listed on the top of the charts essential for terrestrial radio playlists, nevertheless are able to reach potential buyers among devoted fans listening to the targeted musical formats on satellite radio.[86] Emails received from subscribers[87] and

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[81] See 2001 Form 10-K, XM Satellite Radio Holdings Inc., p. 4

[82] See "Start Me Up: satcasters go early on new artists," *Billboard*, March 17, 2006, p. 135.

[83] See 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 8; *Satellite Radio Outlook*, Kagan Research, LLC, July 2005, p. 74.

[84] Among the hosts of music shows on Sirius are Eminem, Tony Hawk, and Jimmy Buffett; XM hosts include Snoop Dogg, Bob Dylan, Tom Petty, and Ludacris. See http://www.sirius.com/servlet/ContentServer?pagename=Sirius/Page&c=Page&cid=1065475754125 and http://www.xmradio.com/exclusivemusic/.

[85] See http://www.xmradio.com/exclusivemusic/offstage.jsp

[86] See "Stymied by radio, veteran acts try new outlets," *Billboard*, January 29, 2005, p. 30; "XM credited for band's worldwide exposure," *Richmond Times Dispatch*, August 10, 2006, p. F-11.

artists[88] attest to the value of airplay on satellite radio in increasing CD and download sales.

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[87] For example, "Where can I purchase your music? I was listening to it on XM and fell in love with it! I work at a top 40 station and need a change of music for the drive home---yours was perfect!!!" (3/17/2006, p. 8); "A station like the Loft has been sorely missing for years in Southern California and your station is the reason I became an XM subscriber. Now I have three radios. I have found that since I started listening, I am actually buying more music than before....I listen at home and in the car ... weekdays and weekends ... and I'm a total cheerleader for the format. Thanks for making me enthusiastic about radio again." (9/12/05 p. 3); "If it only had channel 74 that would be enough for me to keep paying my subscription to xm radio. Since I got the new car (and xm radio) I have heard so many new (and old artists). For the first time in a long time I'm buying music and attending live shows. For example, I heard Sonny Landreth's 'Congo Square' for the first time on XM....(not much Louisianna Music here in Boston). I bought the album and as good luck would have it learned he would be performing nearby. My son, an aspiring guitarist (at 16 he has no interest in the blues) went to the show and had a ball." (3/21/06 p. 23). "I'm trying to find a good Download Site that carries the music played on XM-31 since i-tunes and Napster don't carry a lot of the music you play. Can you recommend anywhere on the Web that offers these tunes and others you play for download? Pay, of course ....." (3/20/06, p. 25); "Thank god I opted for XM so I could discover what you are putting together. I am one of the pickiest people when it comes to music. I have not listenned to radio music for about ten years, online or local. I could never find something to hit my exact taste. Not only do you play the indie rock titles that I am addicted to but you also play many up and coming r and b, rap groups. I thought if I had satellite radio, I would not have to buy so many cd's. Now that i have XMU, I have doubled my catalog. Thanks for all of the hard work." (11/26/05, p.27) "Thank you for a great station and some incredible new music. Because of U-POP I have been purchasing the artists I hear you play (some are very hard to find in U.S. even from ITunes). My music collection is now back to the levels when I was in high school 10 years ago." (12/13/04, p. 31) "The fact that I can REAL music that I have not heard before, and see who is actually playing it to buy the album is AWESOME. You guys are great for the record industry." (7/14/03, p. 66); "When I bought my XM, the salesman told me I would no longer need my CD's. With the variety of music, I would listen to the XM radio all the time. My purchases have actually increased because I hear songs I haven't heard in years. I also buy music I would never have heard on commercial radio I LOVE XM!!!!!!" (11/15/02, p. 70); "This is the best service that I have ever bought, and I have never looked back on it. Furthermore, I never bought too many CD's in the past, but now with artists names and titles being shown, I am going out and buying CD's of bands that I have never heard before. Thanks again for the awesome service you provide." (1/21/03, p. 71); "i love this radio station more and more each day. i have bought more cds from hearing them on your station, than i ever have. i would do anything to have my band heard on this station even if it is the only station we are ever heard on again." (2/22/06, p. 100)

[88] [[

Furthermore, there is no evidence to support the proposition that satellite radio listenership displaces any CD or download sales, let alone by a large enough amount to offset the substantial promotional benefits.[89] In addition, the sound recording complement rule described previously further limits the ability of XM and Sirius listening to substitute for purchasing recorded music.

Moreover, accounting for the effect of satellite radio listenership on CD purchase or downloading habits (and associated consequences to SRPR holders) would require systematic review of potential changes in all of the other ways in which subscribers may use their discretionary time (e.g. DVD watching, video game playing, use of iPODs, listening to over-the-air radio, etc.), making the empirical effort difficult at best.

In short, the transmission of music by XM and Sirius is unlikely to reduce, and in fact is likely to enhance, the production of music by the recording artists and the record labels. Application of this factor to XM and Sirius suggests that a reasonable rate would be at the lower end of the range.

b. ***Evaluating the role of XM and Sirius in "creative contribution, technological contribution, capital investment, cost, risk, and contribution to the opening of new markets for creative expression"***

In this section, I review the role of XM and Sirius in advancing the objectives of the 801(b) factor (C), relating to creative contribution, technological contribution, capital

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[89] While not directly relevant, it is instructive to note that there is a growing literature on the effect of music downloading on CD sales and concert revenues. On music downloading, there is no clear consensus on the direction or magnitude of the effect of downloading on CD sales. For example, a 2005 study by Oberholzer and Strumpf finds no statistically significant effect of file-sharing on CD sales. (See Oberholzer and Strumpf, "The Effect of File Sharing on Record Sales: An Empirical Analysis," Working Paper, 2005.) A 2004 study by Blackburn finds that file-sharing has a negative impact on the sales of an average CD, though it has a positive effect for relatively unknown artists and a negative effect for popular artists. (See Blackburn, "On-line Piracy and Recorded Music Sales," Harvard University Dissertation Thesis, 2004.) On concert revenues, Mortimer and Sorenson find that music downloading has eroded CD sales, but that the loss of these revenues is more than offset by increases in the number of live concert performances and the profitability of those performances. (See Mortimer and Sorenson, "Supply Responses to Digital Distribution: Recorded Music and Live Performances, Working Paper, 2005.) If downloading has no clear displacement effect or effect on artists' incomes, then it seems even less likely that listening to satellite radio would lead to displacement.

investment, cost, risk, and contribution to the opening of new markets for creative expression and media for their communication. I discuss each in turn.

i. Creative Contribution

With respect to "creative contribution," it is certainly true that record labels and performers (along with composers and publishers) are directly involved in the music production process. Nonetheless, I am unaware of any evidence that the labels expend any incremental effort to create new music for XM and Sirius. This is not surprising since as previously noted, any fees paid by XM and Sirius for the SRPR would be a very small fraction of their overall revenues.

However, both XM and Sirius have invested in the creation of attractive non-music content, including music-related programs (such as Willie's Place hosted by Willie Nelson) and other programs (including Oprah, Martha Stewart, and MLB). In addition, both services have incurred costs to tailor their experienced music programmers and personalities to various music channels in order to make those channels more attractive to listeners. None of the music channels offered by Music Choice have such enhancements and Music Choice offers only music programming. In this important programming dimension, XM and Sirius clearly deserve more weight than Music Choice as creative contributors.

The non-music focus of XM and Sirius has likely increased the number of subscribers to these services. For example, as noted previously, the skew of XM and Sirius towards non-music programming and the apparently substantial attachment that subscribers have to the non-music program offerings have likely attracted subscribers who may have been "talk-focused" but still listened to some extent to music on terrestrial radio. Some, if not all, of these subscribers will switch their music listening from terrestrial radio to the music services of XM and Sirius and so will contribute to the SRPR payments being made to performers. Moreover, the addition of the non-music services may result in greater promotion of the sale of sound recordings by these new subscribers to the extent that these subscribers either increase their music listening above what it was prior to subscribing to XM or Sirius or because they take advantage of the

other promotional aspects of the XM and Sirius services, namely, song and singer identification.

ii. Technological Contribution

The technological contribution of XM and Sirius to music distribution is substantial and one in which the recording industry played no role. As noted above, both Sirius and XM developed their own satellite systems to provide a mobile service and developed the chipsets required for the satellite radios themselves. With respect to the radios in particular, [[

]] That was an effort undertaken by XM. In addition, the antenna for the vehicle installation needed to be as unobtrusive as possible—a design effort that was also undertaken by XM. I understand that the first XM antennas were quite bulky, but now are about the size of a quarter, which has enhanced the ability of XM to attract OEM partners.

My understanding is that Sirius also faced many of these same technological hurdles in developing its service. Sirius developed a chipset with the assistance of Lucent that was capable of receiving and playing the satellite signals, and built into these chipsets the ability for its radios to choose the strongest signal source (either of two satellites or terrestrial repeaters) and buffer the signal so that, for example, the broadcast is uninterrupted when driving through an underpass. Sirius also incurred the costs associated with developing unobtrusive (so that they can easily be installed on the roof of a vehicle) antennas capable of receiving its programming (in contrast, satellite television services like DirecTV require antennas greater than a foot and a half in diameter). Sirius also works with consumer electronics companies and OEM partners to subsidize the development of new radios and the integration of Sirius radios into new automobiles.

Both XM and Sirius have received patents for a number of their innovations. XM has 42 patents, with 8 more pending, while Sirius has 12 patents and 2 pending. As an example, XM has more than 10 patents related to the design of mobile antennas that can access satellite signals, while Sirius was awarded several patents related to using the

elliptical geosynchronous orbit of its satellites. A complete listing of the patents can be found in Exhibit 19.

Investments in R&D have totaled [[ ]] over the past 3 years for XM. Sirius, which tracks expenditures on engineering, design, and development, has spent [[ ]] in the past 3 years. (See Exhibit 20.) There is no corresponding incremental contribution by the recording companies in expanding and improving upon the innovations in satellite radio.

Similarly, the innovations of XM and Sirius are not matched by those of Music Choice. Music Choice has relied on conventional distribution schemes (transponder leases on conventional satellites and use of the existing cable infrastructure) while XM and Sirius created an entirely new music distribution system. The number of patents received by Music Choice is significantly less than that of XM and is also smaller than that of Sirius. Among the innovative features pioneered by XM and Sirius are the plug-and-play satellite radio concept that allows the same radio to be used in a home docking station or in an automobile; the development of a portable/wearable radio, including the miniaturization of the antenna, that allows subscribers to receive live satellite radio broadcasts; the initial chipset development for satellite radios and the subsequent reduction in size, reduction in power consumption, and improvements in signal reliability; and work with automobile manufacturers to integrate satellite radio antennas into their vehicles. (See Exhibit 19.)

iii. Capital Investment, Cost, and Risk

XM and Sirius have expended considerable funds on both capital investments and R&D investments to deploy a satellite radio service—the design and production of receivers, the acquisition of the land rights and the positioning of repeaters, the satellite design itself, all done well in advance of service launch. These investments have totaled [[ ]] since inception for XM and [[ ]] million for Sirius, or more than [[ ]] dollars combined across the two services. (See Exhibit 21. Exhibit 22 details the services' satellite expenditures.) They also have invested in developing innovative content for both the music and non-music services (which in turn, attracts more listeners to the service). By contrast, the recording companies have not incurred

any incremental investment or any other costs with respect to the development and deployment of satellite radio service or programming on that service.

Similarly, XM and Sirius have likely expended far more in capital investments and other costs than Music Choice. Music Choice relied on standard satellite transmission technology and cable infrastructure for the deployment of its service and provides only all-music channels. XM and Sirius developed a customized satellite radio service for mobility in a nationwide footprint.

The same higher level of expenditures associated with satellite radio service also represents highly risky investments on the part of the two services. They deployed new satellite technology, bought and launched their own satellites, invested in the chipset and other aspects of the satellite radio itself, invested in the development of non-music content for both the music and non-music channels, and invested in the promotion of a new service that still has no guarantee of ultimate success.

The only possible risk that the recording labels incur is that of displacement of CD or download sales, but as discussed above, there is no credible reason to believe that such displacement is either significant or indeed exists at all. In fact, to the extent that XM and Sirius provide another avenue of exposure promoting the artists, CD sales, downloads, and concerts, the overall risk of recording and distributing CDs and downloads to the recording companies and of selling concert tickets may be reduced. Moreover, to the extent that XM and Sirius subscriptions come at the expense of terrestrial radio, the recording artists and labels will earn fees for the SRPR that they would otherwise not receive.

It is also likely that the risk incurred by XM and Sirius is greater than that incurred by Music Choice, both at the outset and today as well. As noted, XM and Sirius developed their own satellite and radio technology while Music Choice relied largely on existing technology. In addition, the size of the financial stake—the magnitude of the investments that are at risk for XM and Sirius—is likely much more substantial for Sirius and XM.

iv. Opening New Markets

As noted previously, the development of satellite radio has provided a mobile service that offers more music and non-music services than is available via traditional radio. XM and Sirius both overcame substantial obstacles in order to obtain licenses from the FCC. In 1990, Sirius first approached the FCC regarding the possibility of allocating satellite spectrum for a satellite-based radio service. The services (or their corporate predecessors) applied to the FCC for licenses in 1992. It wasn't until 1997 that XM and Sirius were awarded the licenses.[90] Chief among the obstacles confronted by XM and Sirius in seeking the licenses was the persistent objections by what I have understood to be one of the most powerful lobbying organizations in the country, the National Association of Broadcasters whose members include commercial over-the-air radio stations. As the above discussion suggests, there has been no effort by the recording companies to assist either the initial acquisition of the licenses or in the development of a mobile satellite radio service.

The key contrast with the contributions of Music Choice and other PSS to opening new markets is the development of the mobile satellite radio service. The PSS introduced cable operators and their subscribers to a new way of receiving in-home music without commercials. XM and Sirius went substantially beyond the efforts of the PSS by providing an end-to-end mobile service. This effort, unlike the efforts of the PSS, required the development of complex technology required to support that service. In addition, XM and Sirius both offer subscribers more channels of music and more music diversity than the PSS, providing an increased opportunity for subscriber exposure to new artists and different music genres. This discussion suggests that the contribution of XM and Sirius to opening new markets is more substantial than that of the PSS, particularly in light of the required new technology development by XM and Sirius. Indeed, while XM and Sirius appear several times in one compilation of a list of important events in radio history, Music Choice does not appear at all.[91]

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[90] See FCC News Report No. IN 97-4, "FCC Announces Plan for Satellite DARS," at http://www.fcc.gov/Bureaus/International/News_Releases/1997/nrin7004.txt.

[91] See http://beradio.com/features/radio_today_radio_history/ .

c. ***Evaluating the potential for a SRPR rate that could prove disruptive to the satellite radio business***

Under Section 801(b), the statute requires that the chosen SRPR rate "minimize any disruptive impact on the structure of the industries involved and on generally prevailing industry practices." XM and Sirius clearly have not turned the corner on the profitability of their service. As shown in Exhibit 23, XM lost $667 million last year, while Sirius lost $863 million. The cumulative losses to date for each company are well over $3 billion. Indeed, analyst reports suggest that it will take several years before XM and Sirius have positive net income. These projections rely on the assumption that both companies will at least double the number of subscribers over that time frame; if these additional subscribers do not materialize, then the companies will not turn a profit.[92] And of course even if things play out according to the projections, total accumulated losses will have risen by another billion dollars or more by the time these companies reach the break even point.[93] This suggests that for some time to come, both XM and Sirius will remain financially fragile. That fragility is underscored by the sea of competition faced by Sirius and XM. Most obviously, every vehicle produced (as far as I know) has as standard equipment an AM-FM radio by which consumers can listen to music and talk "channels." As noted earlier, in the five largest radio markets, free over-the-air radio provides listeners on average with 43 music channels and 74 channels in all. (See Exhibit 18.)

Because terrestrial radio pays no SRPR fee for its over-the-air service, that tilts the competition towards terrestrial radio. When considering adding more music to their services, terrestrial radio, XM and Sirius will consider the costs and benefits of adding that music. But in performing that calculus, over-the-air radio will not account for a SRPR fee that it does not have to pay, and thus has a greater incentive at the margin to play more music.

In the near term, the competition provided by terrestrial radio to XM and Sirius is likely to become more intense as radio goes digital. One website notes that as a result, radio will offer more genres of music, more non-music programming, real-time traffic

[92] See "Satellite Radio Outlook," op. cit., pp. 5-15.
[93] See "Satellite Radio Outlook," op. cit., p 15.

reports and stock prices, and real-time song, singer, and album identification. The site notes that these services will be provided "**free of charge** like radio should be" (emphasis in the original) and with "no subscription costs, no plans, and no monthly bills."[94]

Moreover, competition with over-the-air radio may be becoming more intense in other dimensions as well. I understand that some large group owners of radio stations have begun reducing the number of commercials on air or to make those commercials less intrusive.[95]

In addition, XM and Sirius are not likely to be less financially fragile than Music Choice. Indeed, the financial stake in success or failure is much greater for XM and Sirius than for Music Choice. In 2005, the revenues of Music Choice were only 0.9% of the total operating expenses of XM and 1.0% of the total operating expenses of Sirius.[96]

These circumstances suggest that the established SRPR should be set towards the lower end of the range. In considering where to set that rate, an economist would also consider the asymmetric effect of making a mistake in setting the SRPR rate. If the rate is set too low, the recording companies will not exit the industry nor will there be any measurable effect on the companies' incentives to create new sound recordings. If the rate is mistakenly set too high, XM and Sirius will likely confront a substantial increase in financial risk which in turn will result in a curtailment of their services offered and a reduction in their ongoing investments in innovation.

d. *Providing a fair return to both the copyright owner and copyright user under existing economic conditions*

A rate towards the lower end of the range described above satisfies the statutory requirement that the rate be fair to both the copyright owner and copyright user. First, the Music Choice benchmark used here is a negotiated rate and so must be viewed by both parties as "fair" in light of all of the statutory standards. The rate is "fair" to the copyright owner precisely because it is based on that benchmark and is consistent with

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[94] See http://www.hdradio.com/what_is_hd_digital_radio.php .

[95] See "Fewer commercials on the horizon?" CNNMoney.com, August 15, 2005; "Satellite option forces traditional radio to alter format" *Newsday*, December 11, 2005.

[96] Music Choice earned $10.3 million in fiscal 2005. See Hoover's Company Record – Basic Record, Music Choice, 8.22.06; 2005 Form 10-K, XM Satellite Radio Holdings Inc., p. 35; 2005 Form 10-K, Sirius Satellite Radio Inc., p. F-4.

the music works rates that are market-driven. That rate (or a rate towards the lower end of the range) will also permit satellite radio to remain competitive with the numerous competitive alternatives to satellite radio.

Similarly, the rate "fairly" compensates the copyright holder for the use of the SRPR by XM and Sirius. Indeed, to the extent that satellite radio acquires its subscribers because it attracts them from over-the-air radio, the holders of the SRPR will clearly benefit. Subscribers are being diverted from a medium (over-the-air radio) that has no obligation to compensate performers and SRPR holders to one that does (satellite radio).

XII Conclusion

Based on the foregoing analysis, I conclude that a reasonable range for the SRPR fee to be paid by XM and Sirius should be between 0.88% and 2.35%. This rate range is based on rates paid by analogous services or for analogous rights. Consideration of the 801(b) factors leads me to the conclusion that the rate should be set at the lower end of the range. I understand that XM and Sirius are proposing a rate of 0.88% and such a rate would be consistent with the analysis I have conducted.

Given the data available, there are a number of reasons to regard this estimated range as generally conservative. First, I have not accounted for the value to subscribers of the enhancements that each service creates for its music channels. Thus, some of the payments to SoundExchange will be excessive in that they reflect the subscriber value of the enhancements rather than the value of the underlying music. This means that programming adjustments based on listenership and subscriber cancellation rates may overstate the value of the underlying sound recording performances on the music channels. In particular, the listenership adjustment counts all music listening without counting the effect of the music programming enhancements on music listening. Thus, I may be giving credit to the sound recording performance that in fact is attributable to the programming enhancements. While the attachment index based on cancellation rates may be a better indicator than listenership of the value that consumers place on music and non-music programming, those subscribers who indicate that they are prepared to cancel the Sirius service if a favored music channel is pulled from the Sirius lineup may be doing so at least in part because of the music channel enhancements. This index, then,

may also overstate the significance of the sound recording performance for rate-making purposes.

Second, in tallying the costs of the end-to-end level, I have not accounted for the cost of equity capital acquired by both services. Given the substantial inherent riskiness of the two services, as indicated by their cumulative losses, this is a significant omission and likely results in a substantial overstatement of the hand-off provider costs relative to the end-to-end costs. Nor have I accounted for the cumulative losses that the two services have already incurred.

Third, the PRO rates likely overstate the "true" upper bound of the range of reasonable rates. Those rates may be excessive because of the incentive of the PROs to harden their bargaining stance in light of the possible precedental value of the rates. In addition, I have not accounted for the fact that pre-1972 sound recordings, live performances, and archival performances are not subject to the SRPR while all musical works performances result in payments to the PROs. That failure results in an overstatement of the upper bound. Moreover, the sound recording performance license is more restrictive than the musical works license because of the sound recording performance complement. Thus, other things equal, the PRO right would be more valuable than the sound recording performance right.

Fourth, neither the PRO upper bound rate nor the rates that derive from my use of the PSS rate as a benchmark reflect the 801(b) factors. I have concluded that the application of the factors to XM and Sirius would result in a rate towards the lower bound of the range. But I have not suggested that those factors should be lower than that lower bound even though had I been able quantify those factors, that might well be the case. I have recommended the lower end of the range because as a general matter, XM and Sirius appear to outperform the recording labels and the PSS with respect to these factors. As one obvious example, the importance of airplay could lead competing record labels to pay compensation to the services to encourage sound recording performances, not the reverse.

It is certainly possible that there are reasons why my estimates understate the "true" SRPR rate. For example, it's possible that the amortization schedules for the up-front content payments by XM and Sirius are excessive, but I have no reason to believe

that that would be the case. It's also possible that a refined study would better reveal subscriber valuation of the music and non-music programming, and in particular reveal that I have overstated the importance of non-music programming. But based on my analysis here, I have no reason to believe that such a study would contradict my conclusions and in fact could indicate a greater significance to non-music programming than I have assumed. As a final example, it is possible that I have understated the likelihood that listening to satellite radio displaces CD and download sales, but that too seems unlikely based on my previous discussion.

In short, while there are certainly assumptions embedded within my analysis that could result in an understatement of the rate, I conclude on balance that given the data available, my approach more likely than not overstates that rate.

Appendix

This Appendix describes the particular line items in the data provided to me by XM and by Sirius, and their categorization as hand-off provider costs and subscriber distribution and acquisition costs. Sirius and XM each reviewed the categorization of these various line items.

Assignment of XM Costs[97]

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[97] [[ ]]

[98] [[

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[99] [[

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[100] [[

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[101] [[

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[102] [[ ]]

[103] [[ ]]

[104] [[ ]]

[redacted]

[105] [redacted]

[redacted]

[106] [[

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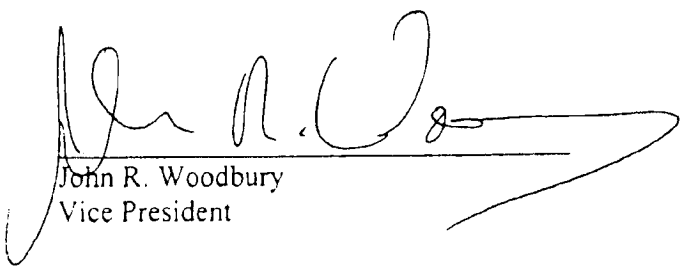
Certification

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information and belief.

Dated: Washington D.C.

October 30, 2006



John R. Woodbury
Vice President

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Exhibit 1

CRA INTERNATIONAL

JOHN R. WOODBURY

Vice President

Ph.D. Economics,
Washington University

M.A. Economics,
Washington University

B.A. Economics,
College of the Holy Cross

Dr. Woodbury's principal fields of expertise are industrial organization, regulation, antitrust, law, and economics. He is an expert in and has published on the economics of antitrust and regulation in broadcasting, cable, telecommunications, and other industries.

PRIOR PROFESSIONAL EXPERIENCE

1989–1992 *Principal*, Microeconomic Consulting and Research Associates, Inc. (formerly Competitive Analysis Group, ICF Consulting Associates)

- Responsible for providing antitrust and regulatory advice to clients.

1989 *Research Associate*, Analysis Group

- Responsible for providing antitrust and regulatory advice to clients.

1985–1989 Federal Trade Commission

Associate Director for Special Projects, Office of the Bureau Director, Bureau of Economics

- Responsible for initiating, conducting, and reviewing economic studies on Commission and other regulatory policies (including telecommunications); drafting speeches for the chairman; and reviewing Bureau participation in Federal Trade Commission cases.

Assistant Director for Rulemaking, Division of Policy and Evaluation, Bureau of Consumer Protection

- Responsible for managing the Commission's rulemaking agenda and drafting recommendations to the Commission from the Bureau director. Rules reviewed include holder-in-due-course, vocational schools, cooling-off, and funeral rules.

Deputy Assistant Director, Regulatory Analysis, Bureau of Economics

- Responsible for conducting or supervising studies or filings before regulatory agencies, including the Federal Communications Commission, the International Trade Commission, and the National Highway Traffic Safety Administration.

1983–1985 *Vice President*, Department of Research and Policy Analysis, National Cable Television Association

- Responsible for conduct or supervision of studies related to cable television, including consumer costs of the franchising process, deregulation of cable prices, effects of copyright fees on consumers, and the extent of competition with cable television.

1982–1983 *Senior Economist*, Regulatory Analysis Division, Bureau of Economics, Federal Trade Commission

- Responsible for broadcasting and telecommunications.

1979–1982 Federal Communications Commission

Chief, Economics Division, Common Carrier Bureau

- Senior economic advisor to Bureau and Commission on common carrier policy. Directed 25 subordinates in policy analysis.

Industry Economist, Network Inquiry Special Staff

- Responsible for the analysis of the program supply industry and the competitive impact of new broadcast technology.

1978–1979 *Assistant Chief, Policy Analysis Division, Brookings Economic Policy Fellow,* assigned to Office of Economic Analysis, Civil Aeronautics Board

- Responsible for the development of merger policy, international aviation policy, and service to small communities.

1977–1978 *Assistant Professor of Economics*, State University of New York at Albany

1975–1977 *Economist*, International Research Department, Federal Reserve Bank of New York

- Responsible for assessing bank-reported capital flows and exchange-rate movements.

1974–1975 *Lecturer*, Southern Illinois University, Carbondale

EXPERT WITNESS ACTIVITIES

Expert witness in a BMI rate setting proceeding on behalf of Music Choice, Second District Court of New York (expert report, supplemental report, direct case report, data affidavit, deposition testimony, and trial testimony), November 2003-April 2004.

Expert witness in a conspiracy/monopolization matter on behalf of IBEW Local No. 3. Expert report and deposition testimony. October–December 2002.

Expert witness before the Copyright Arbitration Royalty Panel, Direct and rebuttal testimony, regarding the determination of reasonable license fees for digital performance right in sound recordings and ephemeral recordings of music performed on public radio websites. Prepared on behalf of National Public Radio/Corporation for Public Broadcasting. April and October 2001.

Expert witness before the Illinois Commerce Commission, regarding the proposed SBC/Ameritech merger. Prepared on behalf of Sprint Communications Company, L.P. July 1999.

Expert witness before the Commonwealth of Virginia State Corporation Commission, regarding the proposed Bell Atlantic/GTE merger. Prepared on behalf of Sprint Communications Company, L.P. March 1999.

Expert witness before the Ohio Public Utilities Commission, regarding the proposed SBC/Ameritech merger. Prepared on behalf of Sprint Communications Company, L.P. December 1998.

Expert witness before the Illinois Commerce Commission, regarding the proposed SBC/Ameritech merger. Prepared on behalf of Sprint Communications Company, L.P. October and December 1998.

Expert witness to Copyright Arbitration Royalty Panel, Direct and Rebuttal Testimony, regarding the determination of reasonable rates for the digital performance of sound recordings. Prepared on behalf of Music Choice and DMX. June and July 1997.

Expert witness to Copyright Arbitration Royalty Panel, Rebuttal Testimony, regarding the shares of royalties due copyright claimants. Prepared on behalf of the Motion Picture Association of America. March 1996.

Expert witness before the Copyright Royalty Tribunal, rebuttal testimony on the value of distant signal sports programming. Prepared on behalf of the Motion Picture Association of America, December 1991.

Expert witness preparation in five antitrust investigations, 1988–1992, on behalf of the FTC.

Expert witness, FTC v. Elders Grain, Preliminary Injunction Proceeding, Sixth District Court. Testimony prepared on behalf of the FTC, June 1988.

Expert witness before the International Trade Commission and Department of Commerce, imports of Japanese semiconductors. Testimony prepared on behalf of the FTC, 1986.

Expert witness, Texas International/National/Pan American Acquisition Case and Continental/ Western acquisition case. Testimony prepared on behalf of the Civil Aeronautics Board, 1978–1979.

Expert witness, iPCS Wireless Inc. v. Sprint Corporation, Circuit Court of Cook County, Illinois, on behalf of Sprint Nextel Corporation, January 2006.

Expert witness, Horizon Personal Communications and Bright Personal Communications v. Sprint Corporation and UbiquiTel Inc. v. Sprint Corporation, Court of Chancery of the State of Delaware In and For New Castle County. Testimony on behalf of Sprint Nextel Corporation, April-May 2006.

OTHER SELECTED CONSULTING ACTIVITIES

Submitted a report, "In the Matter of Implementation of Section 621 (a) of the Cable Communications Policy Act of 1984 as Amended by the Cable Television Consumer Protection and Competition Act of 1992, MB Docket No. 05-311." With Stanley M. Besen. To the Federal Communications Commission on behalf of the National Cable & Telecommunications Association, 2006.

Submitted a report, "Attachment B to, In re Applications of Nextel Communications, Inc., Transferor, and Sprint Corporation, Transferee, for Consent to the Transfer of Control of Entities Holding Commission Licenses and Authorizations Pursuant to Sections 214 and 310 (d) of the Communications Act." With Stanley M. Besen and Steven C. Salop. To the Federal Communications Commission on behalf of Sprint Nextel Corporation, 2005.

Submitted a report, "Economic Analysis of the DOT's NPRM Proposals—Reply Comments." With Professor Steven C. Salop. To the Department of Transportation on behalf of Sabre, Inc., 2003.

Submitted a report, "Economic Analysis of DOT's NPRM Proposals." With Professor Steven C. Salop. To the Department of Transportation on behalf of Sabre, Inc., 2003.

Submitted a report, "Cable Television Subscriber Limits: A Critique." With Carl Shapiro. To the Federal Communications Commission on behalf of National Cable and Telecommunications Association, 2002.

Submitted a report to the Justice Department regarding unilateral effects related to a merger in the personal care industry, 2001.

Submitted a report to the European Commission on the effect of partial ownership interests in the luxury goods industry, 2001.

Submitted a report, "The Incentives of Cable Operators to Carry Multiple ISPs." With Stanley M. Besen and Patrick J. DeGraba. To the Federal Communications Commission on behalf of The National Cable Television Association, 2000.

Submitted a report on a media merger to the European Commission, 2000.

Submitted a report, "The Staff's Flawed Economic Analysis of Harm from Control Over 'Inactive' Programs" With Steven C. Salop. To the Federal Communications Commission on behalf of CBS Corporation and Viacom, Inc., 2000.

Submitted a report, "An Economic Analysis of the Effects of the AT&T-MediaOne Merger on Competition in the Supply and Distribution of Video Program Services: Response to the Critics." With Stanley M. Besen and Serge X. Moresi. To the Federal Communications Commission on behalf of AT&T, 1999.

Submitted a report, "An Economic Analysis of the proposed Bell Atlantic/GTE Merger." With Stanley M. Besen and Padmanabhan Srinagesh. To the Federal Communications Commission on behalf of Sprint Communications Company, L.P., 1998.

Submitted a report, "An Economic Analysis of the proposed SBC/Ameritech Merger." With Stanley M. Besen and Padmanabhan Srinagesh. To the Federal Communications Commission on behalf of Sprint Communications Company, L.P., 1998.

Submitted a report, "An Economic Analysis of the FCC's Cable Ownership Restrictions." With Stanley M. Besen. To the Federal Communications Commission on behalf of Tele-Communications, Inc., 1998.

Submitted a report, "Comments on Dertouzos and Wildman, 'Programming Access and Effective Competition in Cable Television.'" With Stanley M. Besen. To the Federal Communications Commission on behalf of Tele-Communications, Inc., 1998.

Submitted a report, "An Economic Analysis of the Effects of Partial Ownership Interests in Cable Systems." With Stanley M. Besen, Daniel P. O'Brien, and Serge X. Moresi. To the Federal Communications Commission on behalf of Tele-Communications, Inc., 1998.

Submitted a report, "A Response to Ameritech's New Media's 'Allegations of a Price Squeeze' by Vertically Integrated Cable Operators." With Stanley M. Besen. To the Federal Communications Commission on behalf of Tele-Communications, Inc., 1998.

Submitted a report, "A Further Analysis of the Effects of Cable Diversion, Premium Service Buy Rates, and Volume Discounts on Primestar's Competitive Incentives: A Response to Dr. Rosston." With Steven C. Salop, Stanley M. Besen, and E. Jane Murdoch. To the Federal Communications Commission on behalf of PRIMESTAR Partners, L.P., 1998.

Submitted a report, "An Economic Analysis of the Impact of the WorldCom-MCI Merger on the Provision of Internet Backbone Services." With Stanley M. Besen and Padmanabhan Srinagesh. To the Federal Communications Commission and the European Commission on behalf of Sprint Corporation, 1998.

Submitted a report, "A Comparison of Primestar's Costs with Those of a Standalone Entrant." With Steven C. Salop, Stanley M. Besen, and E. Jane Murdoch. To the Federal Communications Commission on behalf of PRIMESTAR Partners, L.P., 1998.

Submitted a report, "An Economic Analysis of Primestar's Competitive Behavior and Incentives: Reply to the Oppositions." With Steven C. Salop, Stanley M. Besen, and E. Jane Murdoch. To the Federal Communications Commission on behalf of PRIMESTAR Partners, L.P., 1998.

Submitted a report, "An Economic Analysis of Primestar's Competitive Behavior and Incentives." With Steven C. Salop, Stanley M. Besen, and E. Jane Murdoch. To the Federal Communications Commission on behalf of PRIMESTAR Partners, L.P., 1998.

Conducted statistical and other analyses of anticompetitive allegations surrounding a major media merger and submitted to the Federal Trade Commission, 1996.

Submitted a report, "Competitive Market Considerations in the Licensing of the 37-40 GHz Band." With Steven R. Brenner. To the Federal Communications Commission on behalf of WinStar Wireless, Inc., 1996.

Conducted statistical and other analyses of anticompetitive allegations surrounding a major media acquisition and submitted to the Justice Department, 1995.

Assisted in the preparation of testimony for the D.C. District Court regarding the competitive effects of the "must-carry" rules imposed on cable systems, 1996.

Submitted a report, "A Competitive Markup Approach to Establishing Rates When Adding Cable Program Services." With Stanley M. Besen. To the Federal Communications Commission on behalf of Tele-Communications, Inc., 1994.

Submitted a report, "Exclusivity and Differential Pricing for Cable Program Services." With Stanley M. Besen and Steven R. Brenner. To the Federal Communications Commission on behalf of Tele-Communications, Inc., 1993.

Submitted a report, "An Analysis of Cable Television Rate Regulation." With Stanley M. Besen and Steven R. Brenner. To the Federal Communications Commission on behalf of Tele-Communications, Inc., 1993.

Evaluated the prospects for Direct Broadcast Satellites on behalf of a potential investor, 1992.

Assisted in the preparation of testimony on the value of distant signal programming to earth station owners on behalf of the Motion Picture Association of America, 1992.

Prepared estimates of the supply elasticity of crude oil production and a paper, with F. Warren-Boulton and K. Baseman, on the alternatives to traditional pipeline regulation for a pipeline client, 1991–1992.

Prepared analyses of liability and damage estimates, with F. Warren-Boulton, on behalf of NEC in a bid-rigging allegation and presented those analyses to Justice Department officials, 1991.

Prepared a report, "Economic Analysis and Policy Implications of the Financial Interest and Syndication Rule." With F. Warren-Boulton. On behalf of the Motion Picture Association of America, 1990.

Submitted a report, "Assessing The Effect of Rate Deregulation on Cable Subscribers." With Sherman and Baseman. To the Federal Communications Commission on behalf of the National Cable Television Association, 1990.

Submitted an affidavit, "Economic Implications of the Pac Tel/Chicago Waiver Request." To the Department of Justice on behalf of the National Cable Television Association, January 1990.

Submitted an analysis of sham litigation allegations to the Justice Department on behalf of a software client, 1989.

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"Analyzing Vertical and Horizontal Cross Ownership in Cable Television: the Time Warner–Turner Merger (1996)," in J.E. Kwoka and L.J. White, *The Antitrust Revolution: Economics, Competition, and Policy,* Scott, Foresman. With S. Besen, E. Murdoch, D. O'Brien, and S. Salop. Third Edition, Oxford University Press, 1999.

"Telecommunications in the U.S.: Evolution to Pluralism." With S. Besen and S. Brenner. In B. Lange (ed.), *ISDN in the USA, Japan, Singapore and Europe*, 1996.

"Market Structure, Program Diversity, and Radio Audience Size." With R. Rogers. *Contemporary Economic Policy* 1996.

"Rate Regulation, Effective Competition, and the Cable Act of 1992." With S. Besen. *Hastings Communications and Entertainment Law Journal,* 1994.

"Assessing Competition and Deregulation in Telecommunications: Some Observations on Methodology." In B. Cole (ed.), *After the Breakup: Assessing the New Post-AT&T Divestiture Era.* New York: Columbia University Press, 1991.

"Deterrence and Justice." With J. Bilmes. *Research in Law and Economics*, 1991.

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"Video Competition and Consumer Welfare." In E. Noam (ed.), *Proceedings of the Arden House Conference on Video Competition.* New York: Columbia University Press, 1986.

Misregulating Television. With S. Besen, R. Metzger, and T. Krattenmaker. Chicago: University of Chicago Press, 1984.

"Regulation, Deregulation, and Antitrust in Telecommunications." With S. Besen. *Antitrust Bulletin,* Spring 1983.

"Determinants of Network Television Program Prices: Implicit Contracts, Regulation, and Bargaining Power." With S. Besen and G. Fournier. *Bell Journal of Economics,* Autumn 1983.

"Advertising, Price Competition, and Market Structure." With A. Arterburn. *Southern Economic Journal,* January 1981.

"Exchange Rate Stability and Monetary Policy." With B. Putnam. Albany Discussion Paper #95 in *Review of Economics and Business Research,* Winter 1980.

"Capital Market Integration Under Fixed and Floating Exchange Rates: An Empirical Analysis." *Journal of Money, Credit, and Banking,* May 1980.

OTHER COMPLETED RESEARCH

"Empirical Evidence on Efficiencies in the Common Ownership of Broadcast Stations." With K. Anderson. Comments on FCC Proceeding, 1991.

"Do Government-Imposed Ownership Restrictions Inhibit Efficiency?" *Working Paper of the Bureau of Economics,* No. 169, 1988.

"Over-the-Air Television and Cable Prices: An Econometric Inquiry." With M. Bykowsky. Served as basis of FCC decision deregulating cable prices, 1985.

"The Effect of Rate Regulation and Franchise Delay on Program Availability." With D. Koran. Comments on FCC Proceeding, 1985.

"Pricing Flexibility and Consumer Welfare: The Deregulation of Basic Cable Rates." NCTA White Paper, 1984.

"Economic Assessment of the Financial Interest and Syndication Rules." With K. Anderson. Comments on FCC Proceeding, 1983.

"Domestic Fixed Satellite Transponders Sales." Comments on FCC Proceeding, 1982.

An Analysis of Television Program Production, Acquisition, and Distribution. With R. Metzger. Network Inquiry Special Staff, Preliminary Report, Federal Communications Commission, June 1990.

"Production Abroad: Theoretical Considerations and Empirical Analysis." Mimeo, 1978.

"Scale Economies in the Airline Industry: A Survey." Mimeo, 1978.

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"Market Structure, Program Diversity, and Radio Audience Size." With R. Rogers. Meetings of the Western Economics Association, July 1993.

"The Effects of Rate Deregulation on Cable Subscribers." With K. Baseman. Policy Approaches to the Deregulation of Network Industries: An American Enterprise Institute Conference, October 1990.

"Economic Analysis and Policy Implications of the Financial Interest and Syndication Rule." Telecommunications Policy Research Conference, Airlie House, October 1990.

"The Design and Evaluation of Competitive Rules Joint Ventures for Mergers and Natural Monopolies." With F. Warren-Boulton. American Economic Association Meetings, December, October 1990.

"Do Media Ownership Restrictions Reduce Economic Efficiency?" Telecommunications Policy Research Conference, Airlie House, November 1989.

"The Conflict Between Spectrum Efficiency and Economic Efficiency." With R. Rogers. Telecommunications Policy Research Conference, Airlie House, November 1989.

"Regulation versus Antitrust." Annenberg Conference: The Divestiture Five Years Later." March 1989.

"Regulating Cable Television." Telecommunications Policy Research Conference, Airlie House, September 1987.

"An Empirical Analysis of Television Program Prices." With S. Besen and G. Fournier. Meetings of the Southern Economic Association, November 1981.

"Flexible Exchange Rates and Market Integration." With B. White. Federal Reserve System Conference on Financial Market Research, June 1979.

"Advertising, Price Competition, Market Structure." With A. Arterburn. Meetings of the Southern Economic Association, November 1978.

"The Effects of Exchange Rate Systems on International Capital Market Integration." With B. White. Federal Reserve System Conference on International Research, November 1977.

OTHER PROFESSIONAL ACTIVITIES

Chair, "Competition between Cable Television and Telephone Companies." Telecommunications Policy Research Conference, September 1991.

Discussant, "Competition and Ownership in the Media." Telecommunications Policy Research Conference, September 1991.

Chair, "Spectrum Management Session." Telecommunications Policy Research Conference, Airlie House, September 1988.

Book Review, *Productivity in the United States* by John Kendrick and Elliot Grossman, *Southern Economic Journal*, April 1981.

Discussant, "Deregulation of Telecommunications." Meetings of the Western Economic Association, July 1981.

Referee, *Southern Economic Journal*, *RAND Journal of Economics*, Harvard University Press.

AWARDS

- Award for Excellence in Economics (FTC), 1988
- Competition Advocacy Award (FTC), 1987
- Brookings Economic Policy Fellow, 1978–1979
- SUNY Faculty Research Grant, 1978
- NSF Traineeship, 1973–1974
- *Finalist*, Woodrow Wilson Fellowship Competition, 1971

Exhibit 2: List of Documents and Materials Reviewed

I. Prior Decisions and Codes of Law

1 17 U.S.C. 801(b)(1)
2 "Digital Performance Right in Sound Recordings Act of 1995," Pub. L. No. 104-39, 109 Stat. 336 (1995)
3 Copyright Office 37 CFR Part 260, Docket No. 96-5 CARP DSTRA, "Determination of Reasonable Rates and Terms for the Digital Perfomance of Sound Recordings," *Federal Register*, Volume 63, No 89, May 8, 1998
4 Copyright Office 37 CFR Part 260, Docket No. 2001-1 CARP DSTRA2, "Determination of Reasonable Rates and Terms for the Digital Perfomance of Sound Recordings by Preexisting Subscription Services," *Federal Register*, Volume 68, No 128, July 3, 2003
5 Copyright Office 37 CFR Chapter II, Docket No. RM 96-3A, "Notice and Recordkeeping for Subscription Digital Transmissions," *Federal Register*, Volume 62, No. 121, June 24, 1997
6 Copyright Office 37 CFR Part 261, Docket No. 2000-9 CARP DTRA 1&2, "Determination of Reasonable rates and Terms for the Digital Performance of Sound Recordings and Ephemeral Recordings," *Federal register*, Vol. 67, No. 130, July 8, 2002
7 United States, Music Choice v. Broadcast Music, Inc., 04-3444-CV (2d Cir., Oct. 6, 2005)
8 United States, Music Choice v. Broadcast Music, Inc., Docket No. 01-6183 (2d Cir. 2003)
9 United States, Music Choice v. Broadcast Music, Inc., No. 64 Civ. 3787 (LLS), 2001 U.S. Dist. LEXIS 10368 (S.D.N.Y. July 23, 2001)

II. Email

1 Promotion Emails from Artists
2 Promotion Emails from Subscribers
3 Promotion Emails from Record Labels

III. Sirius and XM Internal Documents

1 Sirius Financial Data
2 Sirius Satellite Radio Listener Study – Wave 2, June 2006
3 Sirius Satellite Radio Listener, Customer Satisfaction Monitor, 2Q'06 Results, August 28, 2006 - Final
4 Sirius Satellite Radio 2005 Annual Report and Proxy Statement
5 Sirius Subscriber Past Week Listening and Satisfaction, June 2006
6 XM Financial Data
7
8
9
10 XM Annual Shareholders Meeting, May 2006
11
12

IV. Publicly Available Data

1 2006 BIA Investing In Radio Market Report

V. News Articles and Press Releases

1 "FCC Announces Plan for Satellite DARS," *FCC News Report* No. IN 97-4
2 "Stern Is the Draw At Sirius Satellite Radio," *Business Week*, April 10, 2006
3 "Is Howard Stern Worth It?" *Business Week*, January 23, 2006
4 "Can Stern Make Satellite Radio Hum?" *CNNMONEY.com*, December 21, 2005
5 "Justice Department Agrees to Modify Broadcast Music Inc. 1966 Consent Decree," *DOJ Press Release*, June 30, 1994
6 "Justice Department Announces Agreement to Modify ASCAP Consent Decree," *DOJ Press Release*, September 5, 2005
7 "Sound Exchange Board Meets, Extends Deadlines for Artists/Labels to Receive Royalties from First Distribution, Votes on New Board Members and Receives Word on Latest Distribution," *Soundexchange Press Release*, June 4, 2005
8 "Universal Music Settles Payola Probe," *Office of New York State Attorney General Press Release*, May 11, 2006
9 "Executive fired amid charges of payoffs," *New York Times*, January 12, 2005
10 "Sony BMG settles radio payola probe," *Washington Post*, July 26, 2005
11 "Music labels say it costs too much to get songs on the radio," *The Wall Street Journal*, June 10, 2002
12 "Radio and labels at odds again," *Billboard*, May 12, 2001
13 "Start Me Up: satcasters go early on new artists," *Billboard*, March 17, 2006
14 "Stymied by radio, veteran acts try new outlets," *Billboard*, January 29, 2005
15 "XM credited for band's worldwide exposure," *Richmond Times Dispatch*, August 10, 2006
16 "Fewer commercials on the horizon?" *CNNMoney.com*, August 15, 2005
17 "Satellite option forces traditional radio to alter format," *Newsday*, December 11, 2005
18 "Tuning In To Satellite Radio," *Technology Review*, January 25, 2002
19 "Major League Baseball Partners With XM Satellite Radio for 11-Year, $650 Million Broadcast and Marketing Agreement," *XM News Release*, October 20, 2004
20 "NASCAR Selects SIRIUS As New Home on Satellite Radio," *Sirius News Release*, February 22, 2005
21 "Sony BMG Music Settles Spitzer's Payola Probe," *MSNBC.com*, July 27, 2005

VI. Academic Articles

1 Blackburn, D. (2004) "On-line Piracy and Recorded Music Sales," Harvard University Ph.D. Dissertation
2 Mortimer, J.H. and A. Sorenson (2005) "Supply Responses to Digital Distribution: Recorded Music and Live Performances," Working Paper
3 Oberholzer, F. and K. Strumpf (2005) "The Effect of File Sharing on Record Sales: An Empirical Analysis," Working Paper

VII. 10-Ks and other SEC Filings

1 Forms 10-K, XM Satellite Radio Holdings Inc., 1999-2005
2 Form 10-K Amendment, Sirius Satellite Radio Inc., 1996, 1998, 2001
3 Forms 10-K, Sirius Satellite Radio Inc., 1996-2005
4 Form 10-Q, XM Satellite Radio Holdings Inc., June 2006
5 Form 10-Q, Sirius Satellite Radio Inc., June 2006
6 Form 10-K Microsoft Corporation, 2005
7 Form 10-K, Motorola Inc., 2005
8 Form 10-K, Sony Corporation of America, 2005
9 Form 10-K, Warner Music Group Inc, 2005
10 Form 10-K, EMI Music, 2005
11 Form 10-K, Adelphia Cable Communications, 2005
12 Form 10-K, Comcast Cable Communications, 2005
13 Form 10-K, Cox Communications, 2005
14 Form 10-K Time Warner Cable, 2005

VIII. Websites (as viewed on October 29, 2006)

1 http://www.sirius.com
2 http://www.sirius.com/servlet/ContentServer?pagename=Sirius/Page&c=Page&cid=1065475754125
3 http://www.sirius.com/servlet/ContentServer?pagename=Sirius/CachedPage&c=Page&cid=1150907696769
4 http://investor.sirius.com/releaseprint.cfm?releaseid=205864
5 http://www.sirius.com/servlet/ContentServer?pagename=Sirius/CachedPage&c=Page&cid=1018209032792
6 http://www.xmradio.com
7 http://www.xmradio.com/exclusivemusic/
8 http://www.xmradio.com/exclusivemusic/offstage.jsp
9 http://www.xmradio.com/service_subscription/service_subscription.jsp?refsrc=hp_gs
10 http://www.xmradio.com/corporate_info/fast_facts.html
11 http://www.xmradio.com/how_it_works/xm_studios.html
12 http://beradio.com/features/radio_today_radio_history/
13 http://www.musicchoice.com/
14 http://www.orbitcast.com/archives/oprah-joins-xm-satellite-radio.html
15 http://www.hdradio.com/what_is_hd_digital_radio.php
16 http://www.stateofthenewsmedia.org/2005/narrative_radio_contentanalysis.asp?cat=2&media=8
17 http://patft.uspto.gov/netahtml/PTO/search-bool.html
18 http://appft1.uspto.gov/netahtml/PTO/search-bool.html

IX. Testimony

1 Testimony of Adam B. Jaffe, in the matter of Digital Performance Right Sound Recordings and Ephemeral Recordings on behalf of Digital Media Association
2 Direct and Rebuttal Testimony of Erik Brynjolfsson, in the matter of Digital Performance Right Sound Recordings and Ephemeral Recordings, on behalf on SoundExchange
3 Testimony of Michael Pelcovits, in the matter of Digital Performance Right Sound Recordings and Ephemeral Recordings, on behalf of SoundExchange
4 Direct and Rebuttal Testimony of John R. woodbury in re: Determination of Statutory License Terms and Rates for Certain Digital Subscription Transmissions of Sound Recordings on behalf of DCR and DMX
5 Direct and Rebuttal Testimony of John R. Woodbury in BMI rate setting proceeding on behalf of Music Choice
6 Direct and Rebuttal Testimony of E. Jane Murdoch and John R. Woodbury before CARP on reasonable license fees for digital performance right in sound recordings and ephemeral recordings of music performed on public radio websites on behalf on NPR/Corporation for Public Broadcasting

X. Interviews

1 Interviews with Eric Logan, Executive Vice President of Programming, XM
2 Interviews with Mark Vendetti, Senior Vice President of Corporate Finance, XM
3 Interviews with John Kramer, Vice President of Corporate Finance, XM
4 Interviews with Stephen Cook, Executive Vice President, Automotive, XM
5 Interviews with Tony Masiello, Senior President of Operations, XM
6 Interviews with John Dealy, Senior Advisor to the CEO, XM
7 Interviews with David Frear, Chief Financial Officer, Sirius
8 Interviews with Michelle McKinnon, Director of Investore Relations, Sirius
9 Interviews with Douglas Kaplan, Senior Vice President, Business Affairs and Development, Entertainment and Sports, Sirius

XI. Other Materials Reviewed

1 Satellite Radio Outlook, Kagan Research, LLC, July 2005
2 Warner Music Group, 2005 Annual Report
3 Market Share Reporter, 2007, Volume 1, "Top Music Firms Worldwide, 2006
4 Hoovers Company records - Basic records, Music Choice, August 22, 2006
5 Morgan Stanley Analyst Reports
6 Bernstein Analyst Reports
7 Lehman Brother Analyst Reports

Exhibit 3: XM Radio Channels by Format

Non-Music Content	Music Content
Especially for Women (2 channels)	*Christian (3 channels)*
Take Five	The Message
Oprah & Friends	Spirit
	enLighten
News (13 channels)	
ABC News & Talk	*Classical (3 channels)*
BBC World Service	XM Classics
CNN Headline News	Vox
CNN	XM Pops
Quoi de Neuf	
Canada 360	*Comedy (4 channels)*
XM Public Radio	Laugh USA
FOX News	XM Comedy
The Weather Channel	Laugh Attack
C-SPAN Radio	National Lampoon Comedy Radio
CNN en Español	
Bloomberg Radio	*Country (7 channels)*
CNBC	US Country
	Willie's Place
Talk & Entertainment (13 channels)	Bluegrass Junction
E! Entertainment	America
The Power	The Village
FamilyTalk	Highway 16
XM Live	X Country
Open Road	
FOX News Talk	*Dance (5 channels)*
High Voltage	Chrome
Extreme XM	The System
Talk Radio	XM-Chill
Air America Radio	BPM
Radio Classics	The Move
America Right	
Sonic Theater	*Decades (6 channels)*
	The 40s
Regional Talk, News & Music (1 channel)	The 50s
WLW	The 60s
	The 70s
	The 80s
	The 90s
	Jazz & Blues (5 channels)
	Beyond Jazz
	Real Jazz
	Watercolors
	Frank's Place
	Bluesville

(Exhibit 3 Continued)

(Exhibit 3 Continued)

Non-Music Content	Music Content
Traffic & Weather (22 channels)	*Pop & Hits (8 channels)*
Miami/Ft. Lauderdale, FL	Top 20 on 20
Washington, DC	On Broadway
Dallas/Ft. Worth, TX	Cinemagic
Chicago, IL	U Pop
Tampa / St. Petersburg, FL	The Blend
Boston, MA	XM Hitlist
St. Louis, MO	Flight 26
Seattle, WA	The Heart
San Francisco, CA	
Pittsburgh, PA	*Kids (2 channels)*
XM Emergency Alert	Radio Disney
Atlanta, GA	XM Kids
Los Angeles, CA	
Houston, TX	*Latin (4 channels)*
Detroit, MI	Caliente
Phoenix, AZ	Aguila
Philadelphia, PA	Viva
Orlando, FL	Fuego
New York, NY	
Baltimore, MD	*Lifestyle (4 channels)*
San Diego, CA	Audio Visions
Minneapolis/St. Paul, MN	Escape
	Hear Music™
Sports (42 channels)	Fine Tuning
XM Sports Guide	
NASCAR Radio	*Regional News & Talk (5 channels)*
FOX Sports Radio	Nashville (Today's Country)
ESPNEWS	KISS
ESPN Radio	WSIX (Nashville Country)
XM Sports Nation	MIX
XM Deportivo	Sunny
Home Ice	
NHL Hockey Play-by-Play (5 channels)	*Rock (14 channels)*
College Sports - PAC-10 (3 channels)	Bone Yard
MLB Play-by-Play Channels (14 channels)	Deep Tracks
College Sports - Big Ten (3 channels)	Fred
College Sports - ACC (3 channels)	Top Tracks
MLB Play-by-Play en Español	XM Cafe
PGA TOUR Network	XMU
Sport Plus	The Verge
IndyCar Series Racing	XM Liquid Metal
MLB Home Plate™	Big Tracks
Big East Football/Basketball	Lucy
	Fungus
	Squizz
	The Loft
	Ethel

(Exhibit 3 Continued)

(Exhibit 3 Continued)

Non-Music Content	Music Content
	Hip-Hop & Urban (7 channels)
	RAW
	The Heat
	Soul Street
	The City
	The Groove
	The Rhyme
	Suite 62
	World (3 channels)
	Sur La Route
	The Joint
	Air Musique

Note:
Reported channel counts are based upon a complete listing of channels obtained from XM's website as of September 27, 2006. The channel formats in this exhibit reflect the channel classifications used by XM. The channels in the music, commedy, and kids formats are assigned to "music" content because they all use commercially released music.

Source:
XM website.

Exhibit 4: Sirius Radio Channels by Format

Non-Music Content	Music Content
Family & Kids (2 channels) RadioClassics Discovery Radio Channel	*Christian (3 channels)* Revolution Praise Spirit
Financial News (2 channels) CNBC Bloomberg Radio	*Classical (3 channels)* Symphony Hall Classical Voices SIRIUS Pops
International News (6 channels) BBC Mundo CBC Radio One Premiére Plus BBC World Service News Radio Korea World Radio Network	*Comedy (3 channels)* Blue Collar Comedy Raw Dog Laugh Break
Public Radio (3 channels) NPR Talk PRI Public Radio International C-SPAN Radio	*Electronic and Dance (5 channels)* Area 33 Boombox Chill The Beat The Strobe
Religion (2 channels) Christian Talk EWTN Global Catholic Network	*Family & Kids (2 channels)* Radio Disney Kids Stuff
Talk (13 channels) Howard 100 Howard 101 SIRIUS Stars E! Entertainment Radio Maxim Radio Court TV Radio SIRIUS Patriot FOX News Talk SIRIUS Left Road Dog Trucking SIRIUS OutQ Playboy Radio The Roadhouse	*Jazz & Blues (5 channels)* Planet Jazz Jazz Café Pure Jazz Spa 73 SIRIUS Blues
US News (5 channels) FOX News Channel CNN CNN Headline News NPR Now ABC News & Talk	*Latin & International (5 channels)* Universo Latino Rumbón Bande Á Part CBC Radio 3 Iceberg Radio
	Country (5 channels) The Roadhouse Outlaw Country New Country Prime Country Bluegrass

(Exhibit 4 Continued)

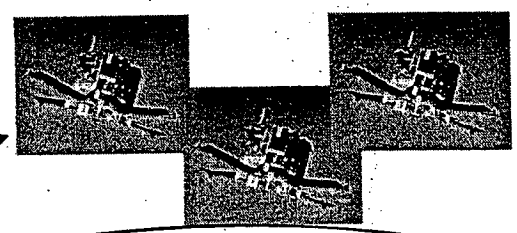
(Exhibit 4 Continued)

Non-Music Content	Music Content
Traffic & Weather (12 channels) New York Boston/Philadelphia Los Angeles Chicago/St. Louis Washington DC/Baltimore Atlanta/Miami Dallas/Houston Detroit/Pittsburgh San Francisco/Seattle Phoenix/San Diego Orlando/Tampa-St. Petersburg SIRIUS Weather & Emergency	*Rock (19 channels)* Classic Rewind The Vault Jam_ON The Spectrum Buzzsaw Octane Alt Nation First Wave Hair Nation SIRIUS Disorder Underground Garage Left Of Center Hard Attack Faction The Coffee House Radio Margaritaville Reggae Rhythms Rolling Stones Radio Classic Vinyl
Lifestyles (3 channels) Martha Stewart Living Radio LIME Cosmo Radio	*Standards (2 channels)* Standard Time Broadway's Best
NBA (1 channel) NBA Radio on SIRIUS	*Hip-Hop/R&B (6 channels)* Backspin Shade 45 Hot Jamz Heart & Soul Soul Town Hip-Hop Nation
NFL (1 channel) SIRIUS NFL Radio	*Pop (13 channels)* SIRIUS Hits 1 Star Lite SIRIUS Love Movin' Easy SIRIUS Gold '60s Vibrations Totally '70s Big '80s The Pulse The Bridge BBC Radio 1 Super Shuffle Elvis Radio
Sports News & Talk (6 channels) Sports Play-by-Play 1 ESPN Radio ESPNEWS Sports Byline USA SIRIUS Sports Action ESPN Deportes	

Note:
Reported channel counts are based upon a complete listing of channels obtained from Sirius' website as of September 27, 2006. The channel formats in this exhibit reflect the channel classifications used by Sirius. The channels in the music, commedy, and kids formats are assigned to "music" content because they all use commercially released music.

Source:
Sirius website.

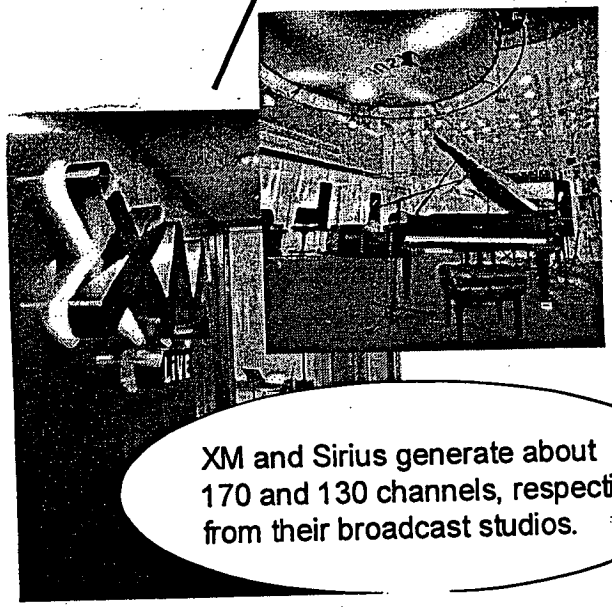
Exhibit 5: How Satellite Radio Works



The XM satellites are in stationary orbit. The Sirius satellites are in an inclined elliptical orbit.

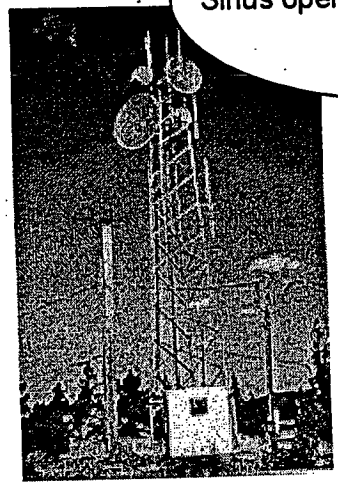
Dishes relay signals to fleets of satellites owned by the satellite radio companies.

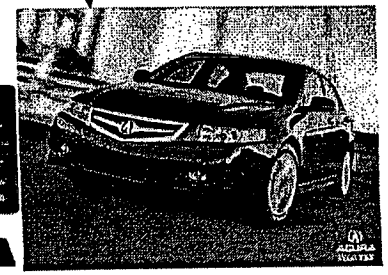
Some consumers receive signals directly, others via a ground repeater.



XM and Sirius generate about 170 and 130 channels, respectively, from their broadcast studios.

XM operates 800 repeaters and Sirius operates 140 repeaters.





Consumers can listen to their satellite radios in the car or at home.

SDARS-Woodbury Ex. 5

Exhibit 6: Music Choice, XM Satellite Radio, and Sirius Satellite Radio Music Channels by Format

Format[1]	Music Choice (Audio Content Only)	XM Radio	Sirius Radio
Urban[2]	7	7	6
Rock	8	14	19
Pop[3]	9	17	13
Dance[4]	3	5	5
Country[5]	4	9	5
Jazz & Blues	3	5	5
Classical	3	3	3
Religious[6]	2	3	3
Kids[7]	1	2	2
Comedy[8]	0	4	3
Standards and Theatrical[9]	3	0	2
Latin and International[10]	10	7	5
Lifestyle[11]	0	4	0
Other Genres[12]	5	0	0
TOTAL[13]	58	80	71

Notes:

1. These formats reflect CRA's categorization of the formats used by Music Choice, XM, and Sirius. Except where otherwise noted, CRA format classifications follow those used by Music Choice, XM, and Sirius.
2. Urban includes Sirius' Hip-Hop and R&B formats, and XM's Hip-Hop & Urban format
3. Pop includes Music Choice's Pop format and Party Favorites channel within its Variety format; XM's Hits, Decades, and parts of its Regional N&T formats.
4. Dance includes Sirius' Electronic and Dance formats.
5. Country includes XM's Country format and the two country channels from the Regional N&T format.
6. Religious includes the Christian format for both XM and Sirius.
7. Kids includes Radio Disney from Music Choice's Variety format; Sirius' channels within the Family and Kids format (depending on whether they were music or talk centered); and Radio Disney on XM and XM Children. These channels are treated as "music" channels because they use commerically released music.
8. The comedy channels are treated as "music" channels because they use commercially released music.
9. Standards and Theatrical includes Music Choice's Vocal/Theatrical format and its Big Band and Swing channel in its Variety format. Also includes Sirius' Standards format.
10. Latin and International includes Music Choice's Latin format and its Reggae channel from its Variety format. Also includes XM's Latin and World formats and Sirius' Latin & International format.
11. Lifestyle format is split depending on whether the channels are music or talk oriented. Music Choice carries no channels in the Lifestyles format. XM's channels in the Lifestyle format are music and Sirius' channels in the Lifestyle format are talk.
12. Other Genres include Music Choice's Instrumentals format and Showcase and Sounds of the Seasons from the Variety format.
13. XM's Regional N&T channels are not commercial free. The number of commercial-free XM music channels is 69.

Sources:

XM website.
Sirius website.
Music Choice website.

Exhibit 7: Music Choice, XM Satellite Radio, and Sirius Satellite Radio Non-Music Channels by Format

Genre[1]	Music Choice (Audio Content Only)	XM Radio	Sirius Radio
Sports[2]	0	42	8
News[3]	0	14	16
Traffic & Weather	0	22	12
Talk[4]	0	14	13
Kids[5]	0	0	2
Religious[6]	0	1	2
Lifestyle	0	0	3
TOTAL	0	93	56

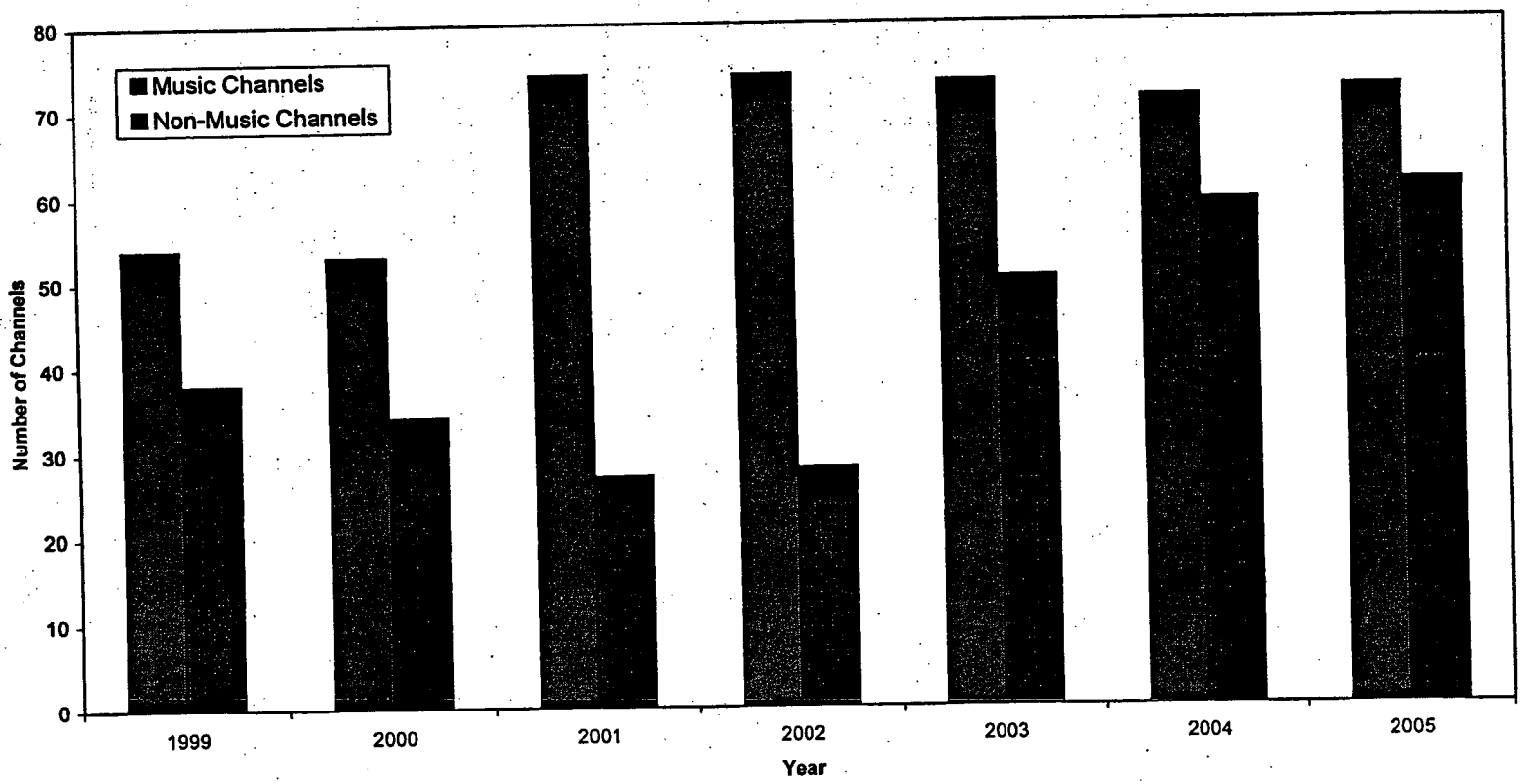
Notes:

1. These formats reflect CRA's categorization of the formats used by XM and Sirius. Except where otherwise noted, CRA format classifications follow those used by XM and Sirius.
2. Sports includes Sirius' NBA, NFL, and Sports News & Talk formats.
3. News includes Sirius' Financial News, International News, Public Radio and US News formats; and XM's News format as well as the WLW channel within the Regional News & Talk format.
4. Talk includes XM's Talk (except for the Christian Talk channel), Entertainment, and Especially for Women formats.
5. Kids includes Sirius' channels within the Family and Kids formats (depending on whether they were music or talk centered).
6. Religious includes Sirius' Religion format and the Christian Talk channel from XM's Talk format.

Sources:

XM website.
Sirius website.
Music Choice website.

Exhibit 8.a: Number of Music and Non-Music Channels on XM, 1999-2005

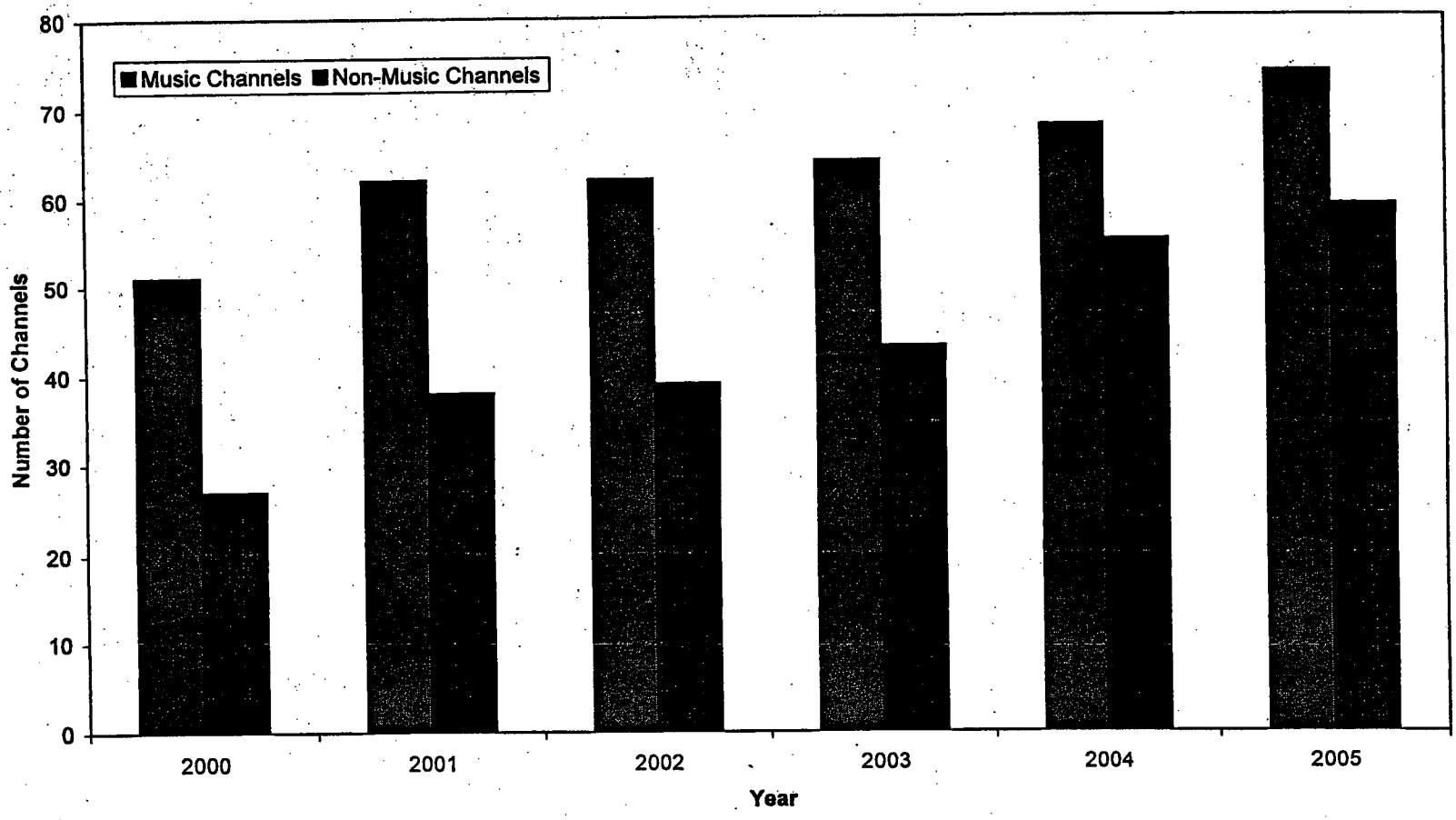


Notes:

1. 1999 and 2000 channel lineups were representative of what XM planned to offer at the time for future programming. These channel lineups included "Reserved Channels" for Special / Events programming.
2. XM channel lineups in 2001 and 2005 include the Preview channel as a non-music channel.
3. Play-by-Play channels are reported as one channel.
4. Kids and Comedy channels are counted as music channels.

Sources: XM Form 10-K's, 1999-2005.

Exhibit 8.b: Number of Music and Non-Music Channels on Sirius, 2000-2005



Note:
Kids and Comedy channels are counted as music channels.
Sources: Sirius Form 10-K's, 1999-2005

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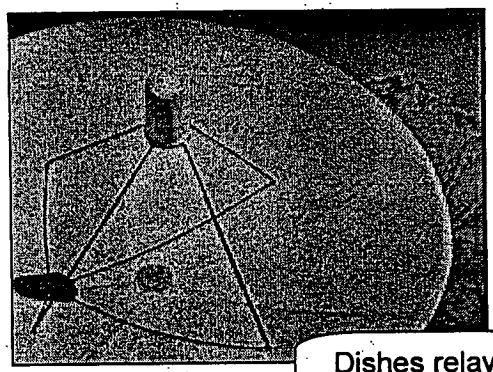
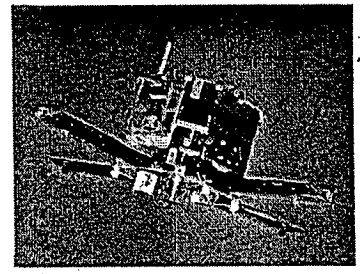
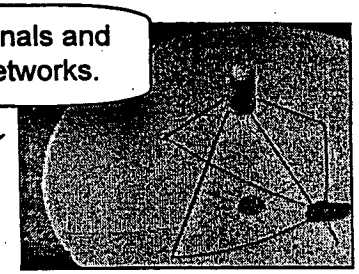
Exhibit 12: How Music Choice Works

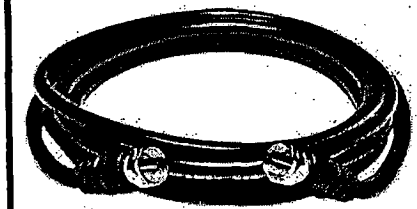


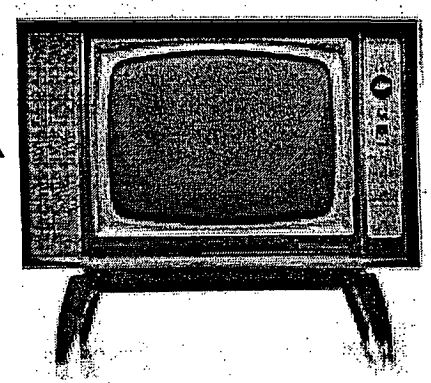
Dishes relay signals to third-party satellites.



Cable providers receive signals and transmit them over their networks.







Music Choice programs approximately 58 music channels.

MUSIC CHOICE®

SDARS-Woodbury Ex. 12

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Exhibit 18: Music Channels by Format for XM, Sirius, and the Five Largest Over-the-Air Radio Markets

			Over-the-Air Radio Markets[15]				
Format[1]	XM	Sirius	New York	Los Angeles	Chicago	San Francisco	Dallas-Ft. Worth
Urban[2]	7	6	5	4	4	3	6
Rock[3]	14	19	10	4	9	11	3
Pop[4]	17	13	16	15	22	13	10
Dance[5]	5	5	0	0	0	1	0
Country[6]	9	5	0	0	3	2	11
Jazz & Blues[7]	5	5	1	1	1	2	1
Classical	3	3	1	1	1	1	1
Religious[8]	3	3	1	1	4	1	5
Kids[9]	2	2	0	0	0	0	0
Comedy[10]	4	3	0	0	0	0	0
Standards and Theatrical[11]	0	2	7	3	5	1	2
Latin and International[12]	7	5	4	3	4	3	5
Lifestyle[13]	4	0	3	0	0	2	0
Total Music Channels[14]	80	71	48	32	53	40	44
Total Channels	173	127	73	75	86	68	67

Notes:
1. These formats reflect CRA's categorization of the formats used by BIA, XM, and Sirius. Except where otherwise noted, CRA format classifications follow those used by BIA, XM, and Sirius.
2. Urban includes Sirius' Hip-Hop and R&B formats; XM's Hip-Hop & Urban format; and BIA's Urban format (excluding Blues).
3. Rock includes BIA's Rock and Album Oriented Rock/Classic Rock formats.
4. Pop includes XM's Hits, Decades and parts of its Regional N&T formats; BIA's Oldies, Adult Contemporary, and Contemporary Hit Radio/Top 40 (excluding Dance) formats.
5. Dance includes Sirius' Electronic and Dance formats; and Dance in BIA's Contemporary Hit Radio/Top 40 format.
6. Country includes XM's Country format and the two country channels from the Regional N&T format.
7. Jazz & Blues includes BIA's Jazz/New Age format and Blues in its Urban format.
8. Religious includes the Christian format for both XM and Sirius and BIA's Religion format.
9. Kids includes Sirius' channels within the Family and Kids format (depending on whether they were music or talk centered); and Radio Disney on XM and XM Children. These channels are treated as "music" channels because they use commerically released music.
10. The comedy channels are treated as "music" channels because they use commercially released music.
11. Standards and Theatrical includes Sirius' Standards format; BIA's Nostalgia/Big Bands and Middle of the Road (excluding full services) formats.
12. Latin and International include: XM's Latin and World formats; Sirius' Latin & International format; and BIA's music stations under the Spanish format.
13. Lifestyle format is split depending on whether the channels are music or talk oriented. XM's channels in the Lifestyle format are music; Sirius' channels in the Lifestyle format are talk. Lifestyle also includes BIA's Easy Listening/Beautiful Music format.
14. Over-the-air radio stations with talk format or mixed format are not included in the count.
15. Largest markets determined by metro area population.

Sources:
Sirius website.
XM website.
2006 BIA Investing In Radio Market Report.

Exhibit 19.a: XM Patents

Patent Number	Filing Date	Patent Title
6,493,546	March 5, 1999	System for providing signals from an auxiliary audio source to a radio receiver using a wireless link
6,272,328	May 12, 1999	System for providing audio signals from an auxiliary audio source to a radio receiver via a DC power line
6,823,169	May 25, 1999	Low cost interoperable satellite digital audio radio service (SDARS) receiver architecture
6,735,416	May 25, 1999	Receiver architecture for SDARS full band signal reception having an analog conversion to baseband stage
6,724,827	May 25, 1999	Low cost interoperable satellite digital audio radio service (SDARS) receiver adapted to receive signals in accordance with advantageous frequency plan
6,295,033	May 25, 1999	Vehicle antenna assembly for receiving satellite broadcast signals
6,154,452	May 26, 1999	Method and apparatus for continuous cross-channel interleaving
6,640,085	September 1, 1999	Electronically steerable antenna array using user-specified location data for maximum signal reception based on elevation angle
6,564,003	November 4, 1999	Method and apparatus for composite data stream storage and playback
6,549,774	November 4, 1999	Digital audio service satellite receiver having switchable operating modes for stationary or mobile use
6,510,317	November 4, 1999	Satellite digital audio radio service tuner architecture for reception of satellite and terrestrial signals
6,442,385	November 4, 1999	Method and apparatus for selectively operating satellites in tundra orbits to reduce receiver buffering requirements for time diversity signals
6,347,216	November 4, 1999	Method and system for providing geographic specific services in a satellite communications network
6,229,824	November 4, 1999	Method and apparatus for concatenated convolutional endcoding and interleaving
7,020,217	November 4, 1999	Satellite digital audio radio receiver with instant replay capability
7,123,875	November 4, 1999	System and method for multipoint distribution of satellite digital audio radio service
6,563,805	November 5, 1999	Digital radio prepaid music recording system
6,397,076	November 5, 1999	Method and apparatus for dispatch communications in a broadcast radio system
6,229,499	November 5, 1999	Folded helix antenna design
6,232,926	November 10, 1999	Dual coupled vehicle glass mount antenna system
7,010,263	December 14, 1999	System and method for distributing music and data
6,614,767	October 17, 2000	Method and apparatus for continuous cross-channel interleaving
6,876,835	October 25, 2000	Method and apparatus for providing on-demand access of stored content at a receiver in a digital broadcast system
6,834,156	October 25, 2000	Method and apparatus for controlling user access and decryption of locally stored content at receivers in a digital broadcast system
6,686,880	October 25, 2000	Method and apparatus for prompting a reverse channel response from receiver in a digital broadcast system
6,970,565	December 22, 2000	Apparatus for and method of securely downloading and installing a program patch in a processing device
6,538,609	April 30, 2001	Glass-mountable antenna system with DC and RF coupling
7,058,086	May 7, 2001	Method and apparatus for concatenated convolutional encoding and interleaving
6,785,656	June 5, 2001	Method and apparatus for digital audio playback using local stored content
6,483,471	June 6, 2001	Combination linearly polarized and quadrifilar antenna
6,470,058	June 11, 2001	System for and method of jointly optimizing the transmit antenna patterns of two geostationary satellites in a satellite broadcasting system
6,553,077	July 31, 2001	Method and apparatus for customized selection of audio channels

Patent Number	Filing Date	Patent Title
7,010,264	August 17, 2001	System and method for detecting the connections of two antennae to a radio receiver
6,421,020	September 17, 2001	Vehicle antenna assembly for receiving satellite broadcast signals
7,075,946	October 2, 2001	Method and apparatus for audio output combining
6,535,179	October 2, 2001	Drooping helix antenna
6,686,882	October 19, 2001	Apparatus and method for transferring DC power and RF energy through a dielectric for antenna reception
7,035,628	December 31, 2001	Method and apparatus for content blocking
6,661,386	March 29, 2002	Through glass RF coupler system
6,621,458	April 2, 2002	Combination linearly polarized and quadrifilar antenna sharing a common ground plane
6,806,838	August 14, 2002	Combination satellite and terrestrial antenna (Patent Jointly Held with Delphi-D Antenna Systems)
6,810,233	November 7, 2002	System for providing signals from an auxiliary audio source to a radio receiver using a wireless link
Pending	April 30, 2001	Glass-mountable antenna system with DC and RF coupling
Pending	May 7, 2001	Method and apparatus for concatenated convolutional encoding and interleaving
Pending	June 14, 2004	Antenna diversity system
Pending	December 15, 2004	Digital remodulation
Pending	January 14, 2005	Automatic on/off switch for vehicle power outlets
Pending	January 14, 2005	Method and system for converting streaming digital data to FM modulated data
Pending	April 22, 2005	Method and system for hierarchical modulation and demodulation for digital radio
Pending	September 22, 2005	Wireless satellite digital audio radio service (SDARS) head unit with portable subscription and cell phone abilities (Joint Filing with Interoperable Technologies and Sirius)

Note:
The Patent and Trademark Office's Patent Application Full-Text and Image Database only includes pending patents filed since 2001.

Sources:
United States Patent and Trademark Office, Patent Full-Text and Image Database, available at <http://patft.uspto.gov/netahtml/PTO/search-bool.html>.
United States Patent and Trademark Office, Patent Application Full-Text and Image Database, available at <http://appft1.uspto.gov/netahtml/PTO/search-bool.html>.

Exhibit 19.b: Sirius Patents

Patent Number	Filing Date	Patent Title
5,278,863	April 10, 1992	Radio frequency broadcasting systems and methods using two low-cost geosynchronous satellites
5,319,673	April 16, 1993	Radio frequency broadcasting systems and methods using two low-cost geosynchronous satellites
5,485,485	April 13, 1994	Radio frequency broadcasting systems and methods using two low-cost geosynchronous satellites and hemispherical coverage antennas
5,592,471	May 4, 1995	Mobile radio receivers using time diversity to avoid service outages in multichannel broadcast transmission systems
5,745,839	September 1, 1995	Satellite multiple access system with distortion cancellation and compression compensation
5,864,579	July 25, 1996	Digital radio satellite and terrestrial ubiquitous broadcasting system using spread spectrum modulation
5,720,039	November 1, 1996	Satellite multiple access system with distortion cancellation and compression compensation
5,794,138	February 26, 1997	Satellite broadcast system receiver
6,023,616	March 10, 1998	Satellite broadcast receiver system
6,223,019	May 20, 1998	Efficient high latitude service area satellite mobile broadcasting systems
6,564,053	October 19, 2000	Efficient high latitude service area satellite mobile broadcasting systems
6,892,987	July 25, 2003	Predicting, bounding and mitigating satellite attitude disturbances arising from infrared earth sensors for satellites in inclined, elliptical orbits
Pending	July 9, 2001	System and method for creating and receiving personalized broadcasts
Pending	September 22, 2005	Wireless satellite digital audio radio service (SDARS) head unit with portable subscription and cell phone abilities (Joint Filing with Interoperable Technologies and XM)

Note:
The Patent and Trademark Office's Patent Application Full-Text and Image Database only includes pending patents filed since 2001.

Sources:
United States Patent and Trademark Office, Patent Full-Text and Image Database, available at <http://patft.uspto.gov/netahtml/PTO/search-bool.html>.
United States Patent and Trademark Office, Patent Application Full-Text and Image Database, available at <http://appft1.uspto.gov/netahtml/PTO/search-bool.html>.

Exhibit 19.c: Music Choice Patents

Patent Number	Filing Date	Patent Title
6,879,963	April 12, 2000	Cross channel delivery system and method
7,028,082	March 8, 2001	Personalized audio system and method
7,076,561	March 18, 2002	Personalized audio system and method
Pending	April 12, 2006	Media content delivery systems and methods

Note:
The Patent and Trademark Office's Patent Application Full-Text and Image Database only includes pending patents filed since 2001.

Sources:
United States Patent and Trademark Office, Patent Full-Text and Image Database, available at <http://patft.uspto.gov/netahtml/PTO/search-bool.html>.
United States Patent and Trademark Office, Patent Application Full-Text and Image Database, available at <http://appft1.uspto.gov/netahtml/PTO/search-bool.html>.

Exhibit 20: Sirius Expenditures on Engineering, Design, and Development and XM Expenditures on Research and Development

Year	Sirius Engineering, Design, and Development[1] ('000s)	XM Research and Development[2] ('000s)
1994 to 1997	$1,390	N/A
1998	$2,150	$7,311
1999	$33,134	$6,510
2000	$70,690	$11,948
2001	$58,453	$13,689
2002	$30,087	$10,843
2003	$24,534	$12,285
2004	$30,520	$23,513
2005	$44,745	$31,218
First and Second Quarters 2006	$35,166	$19,499
Cumulative Expenditures Since 1994[3]	$330,869	$136,816
Cumulative Expenditures Since 2003	$134,965	$86,515

Notes:
1. Expenditures reported for Sirius from 1994 to 1996 are for research and development. Expenditures for 1997 to 2006 are for engineering, design, and development.
2. XM research and development expenditures exclude depreciation and amortization.
3. Research and development expenditures for XM were not available prior to 1998.

Sources:
XM Form 10-Ks, 1999-2005; XM Form 10-Q, June 2006.
Sirius Form 10-Ks, 1996-2005; Sirius Form 10-K Amendment, 1996; Sirius Form 10-Q, June 2006.

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Exhibit 23: Sirius and XM Net Losses Since Inception[1]

Year	Sirius Net Losses ('000s)	XM Net Losses ('000s)
Prior to 1997	-$18,536	N/A
1997[2]	-$4,737	-$1,659
1998	-$48,396	-$16,167
1999	-$62,822	-$36,896
2000	-$134,744	-$51,873
2001[3]	-$235,763	-$284,379
2002[4]	-$422,481	-$495,012
2003	-$226,215	-$584,535
2004	-$712,162	-$642,368
2005	-$862,997	-$666,715
First and Second Quarters 2006	-$696,372	-$378,330
Cumulative Net Losses Since 2003	-$2,497,746	-$2,271,948
Cumulative Net Losses Since Inception	-$3,425,225	-$3,157,934

Notes:

1. Sirius' inception was in May 1990 (as Satellite CD Radio), followed by an initial public offering (as CD Radio) in September 1994. XM's inception was in June 1992 (as American Mobile Radio), followed by an initial public offering was in October 1999.
2. Sirius and XM received licenses from the FCC in October 1997 to construct and operate satellite radio services.
3. XM service became available nationwide in November 2001.
4. Sirius service became available nationwide in July 2002.

Sources:

XM Form 10-Ks, 1999-2005. XM Form 10-Q, June 2006.
Sirius Form 10-Ks, 1996-2005. Sirius Form 10-K Amendment, 1996. Sirius Form 10-Q, June 2006.

CERTIFICATE OF SERVICE

I hereby certify that on January 17, 2007, I caused copies of the Public Version of The Witness Testimony and Exhibits Jointly Submitted by Sirius Satellite Radio Inc. and XM Satellite Radio Inc. in Docket No. 2006-1 CRB DSTRA, without exhibits, previously served in its entirety on October 30, 2006, to be served via overnight courier on the following parties:

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