

---

# Catching the Wave: Should Canada Follow the Global Trend Toward Spectrum Auctions?

---

Martin C. Glass and David M. Rhodes\*

---

This article examines different methods of spectrum allocation to determine which one best accomplishes Canada's spectrum allocation goals. The June 1996 amendments to Canada's *Radiocommunications Act* permit licenses, previously allocated by administrative selection, to be sold by auction to the highest bidder. The experiences of other countries have shown that spectrum auctions only accomplish public policy and efficiency goals when they are carefully designed.

After examining the advantages and disadvantages of different methods of spectrum allocation, the authors conclude that Canada would be best served by a hybrid system which uses a screening process to qualify bidders to enter into an auction for spectrum licenses. The screening stage would determine whether bidders meet certain socially desirable criteria, thus being eligible for bidding credits. The auction stage would involve a simultaneous multiple round auction in which licenses could be purchased either individually or in groups. Licenses acquired pursuant to the auction process would be transferable and divisible. They would have a fixed duration of fifteen years and would be re-auctioned at the end of that period.

A spectrum allocation system designed in this fashion would provide the proper balance between market forces and social policy considerations for the Canadian context.

Cet article examine les différentes méthodes d'attribution de spectre afin de déterminer laquelle méthode permet de mieux accomplir les objectifs du Canada dans ce domaine. En juin 1996, des amendements à la *Loi sur les radiocommunications* canadienne ont permis d'attribuer des licences par vente aux enchères, alors que précédemment elles étaient attribuées par sélection administrative. L'expérience des autres pays a démontré que l'attribution de spectre par vente aux enchères n'accomplit les objectifs d'ordre public et d'efficacité que lorsqu'elle est organisée soigneusement.

Après avoir examiné les avantages et inconvénients des différentes méthodes d'attribution de spectre, les auteurs concluent que le Canada serait mieux servi par un système hybride qui utiliserait une procédure d'évaluation pour qualifier les enchérisseurs à participer aux ventes aux enchères et à obtenir des licences de spectre. L'étape d'évaluation déterminerait si les enchérisseurs rencontrent certains critères considérés désirables dans notre société et s'ils sont par conséquent éligibles pour des crédits d'enchère. Au même temps, l'étape de vente aux enchères impliquerait une vente à multiples tournées par laquelle des licences pourraient être achetées soit individuellement, soit en groupe. Les licences acquises en vertu de la procédure de vente aux enchères serait transférable et divisible. Elles auraient une durée fixe de quinze ans et seraient revendues par vente aux enchères à la fin de cette période.

Un système d'attribution de spectre organisé de cette façon pourrait fournir pour le contexte canadien l'équilibre recherché entre les forces du marché et les considérations de politique sociale.

---

\* Martin C. Glass, B.C.L., LL.B. (McGill, 1998), is an associate at White & Case, New York, and David M. Rhodes, B.C.L., LL.B. (McGill, 1998), is a law clerk to the Honourable Madame Justice Desjardins of the Federal Court of Appeal, Ottawa, and future associate at Sullivan & Cromwell, New York. We are very grateful for the assistance and commentary of many people in the production of this article. We would like to thank Professor David Johnston, C.C. for his guidance and encouragement throughout the writing process; Ian Munro and Michael Connolly—both of Industry Canada—for their insight and commentary; and Assistant Deputy Minister Michael Binder for his support. We would also like to thank Professor Richard Janda, Dr. Sunny Handa, and Dr. Michael & Mrs. Brenda Rhodes for having read previous versions of this article. We take full responsibility, however, for any errors or omissions.

© McGill Law Journal 1999

Revue de droit de McGill 1999

To be cited as: (1999) 44 McGill L.J. 141

Mode de référence : (1999) 44 R.D. McGill 141

---

## Table of Figures

### Summary of Recommendations

#### Introduction

#### I. Nature of the Spectrum

#### II. Spectrum Allocation

A. *History of Spectrum Allocation in Canada*

B. *History of Spectrum Allocation in the United States*

1. Comparative hearings

2. Lotteries

3. Auctions

C. *International Spectrum Allocation Processes*

1. New Zealand

2. Australia

3. Columbia

#### III. Comparative Advantages of Spectrum Allocation Methods

A. *What Goals should Canada Seek to Achieve Through Spectrum Allocation?*

1. Promotion of Canadian culture

2. Diversity of service providers

3. Availability to businesses of all sizes

4. Enhanced competition and customer choice

5. Speed of allocation

6. Rapid network deployment

7. Efficient use of the spectrum

8. Access to services

9. Ensuring sufficient spectrum for essential public services

10. Transparency of the allocation process

11. Revenue for the government

B. *Relative Advantages of Different Methods of Allocation*

1. First come/first served

2. Lotteries

3. Comparative analysis

4. User fees

5. Auctions

C. *Specific Objections to Pure Market Auctions*

D. *Meaning of these Results for Canada*

#### **IV. Tailoring an Auction System for Canada**

##### *A. Introduction*

##### *B. Hybrid Models—Blending Auctions with Other Methods of Spectrum Allocation*

1. Reservation of spectrum for specific purposes
2. Bidding credits
3. Screening auction applicants
4. Imposing conditions on spectrum licenses

##### *C. Selecting an Auction Method*

1. Criteria to be used in comparing different auction methods
2. Oral ascending (English) auction
3. Oral descending (Dutch) auction
4. First-price sealed bid auction
5. Second-price sealed bid auction
6. Sequential English auction with sealed-bid package bidding
7. Simultaneous multiple round auction

##### *D. Conclusion*

#### **V. Proposed Method of Spectrum Allocation in Canada**

##### *A. Stage 1: Expression of Interest*

##### *B. Stage 2: Screening Stage*

##### *C. Stage 3: Auction*

##### *D. Post-Allocation Stage*

##### *E. Transfer and Change in Use of a License*

##### *F. Divisibility of Spectrum Rights*

##### *G. Duration of License and the Possibility of Renewal*

#### **Conclusion**

---

## Table of Figures

Figure 1: The inherent features of different pure methods of allocation. Note that first come/first served, user fees and lotteries are significantly less desirable than auctions or comparative analysis.

Figure 2: The strengths of the simultaneous multiple round auction system as compared to other auction methodologies is clear when the features of all these systems are compared.

Figure 3: Formula for calculating the reimbursement of a bidding discount when a license is divided.

## Summary of Recommendations

Canada should adopt a simultaneous multiple round auction system which is tailored to complement the tendency of pure market auctions to satisfy only our efficiency goals. This would involve a three stage process to allocate commercial spectrum bands.<sup>1</sup> At the first stage, potential participants would express their interest in bidding for a spectrum license. At the second stage, a two-tier screening process would ensue. The first tier would involve an evaluation of the business/service plans of all potential bidders to ensure that they satisfy certain criteria. The second tier would screen for compliance with desirable social criteria which an applicant might choose to fulfill in order to earn bidding credits for the auction stage. The third stage would involve an auction between all applicants who pass the screening stage, with bids starting at a designated reserve price. Bidders would be able to withdraw any bids they wished to change, but would be subject to a penalty equivalent to the difference between the price eventually paid and the amount of the withdrawn bid. Winning bidders would pay 25% of their bids at the conclusion of the auction and would pay the remaining 75% over the first half of the license term.

Violations of the first tier criteria would result in the forfeiture of the license. Licensees which qualified for bidding credits under the second tier criteria would have to maintain their qualifying status or refund the amount of the bidding discount plus interest and a 50% penalty.

Licensees would be able to transfer their licenses or change their use of implementation. Upon the transfer of a license, the transferee would have to convince the Spectrum Management Branch (SMB) that its proposed business/service plan satisfies all criteria of the first tier. If the transferor of the license benefited from bidding credits, the transferor would have to refund the amount of the bidding discount on transfer plus a 50% penalty, unless it demonstrated to the SMB's satisfaction that the transferee fulfilled the criteria upon which the bidding credits were awarded. Where the original licensee desires to change the use of its license, it would have to satisfy the SMB that its new business/service plan would continue to fulfill all first tier criteria, and if it wished to avoid refunding any bidding discounts and penalties, it would also have to show continued compliance with the second tier criteria.

Licensees could divide their spectrum rights either by geography or by frequency. All holders of spectrum rights would have to meet all first tier criteria. Failure to satisfy any applicable second tier criteria would be treated in the same way as a transfer or change in use.

The duration of a license would be fifteen years to allow sufficient time for licensees to recoup their investments. Two years before the end of the term, a license would be re-auctioned. In this re-auction, bidding credits would be awarded to in-

---

<sup>1</sup> Spectrum bands for essential public services would be allocated by other means.

cumbents to alleviate the potential for successful predatory bidding by their competitors. The amount of this bidding credit would depend on the revenues of the licensee.

Our belief is that this system would provide the proper balance between market forces and social policy considerations for Canada at present and in the future.

## Introduction

The radio spectrum is a public resource which is used as a medium of communication by a diverse group of entities ranging from cellular telephone companies and paging services to fire departments and air traffic controllers. Canadians benefit from spectrum-related services every day. In a knowledge-based economy, much of the wealth in society rests in ideas. Dependence on these services will only increase as they become the primary means by which ideas are shared. Therefore, the way in which spectrum use is allocated between service providers has a direct impact on the lives of all Canadians—and the method of allocating this scarce resource deserves careful examination.

Spectrum allocation in Canada is presently at an important crossroad which will determine its evolution for decades to come. Since the inception of radiocommunication in this country, spectrum licenses have been allocated through an administrative process which compared the proposed uses of each applicant according to public interest criteria. The applicant who came closest to meeting those criteria was selected as the winner. Now things are poised to change. In June 1996, the *Radiocommunications Act*,<sup>2</sup> was amended to permit the allocation of spectrum licenses through auctions. This represents an increased faith in market forces as mechanisms to guide the development of the economy and a belief that the existing administrative process would be unable to adapt to the pressures generated by increasing spectrum scarcity. Canada's interest in this method reflects the growing use of spectrum auctions in the international community.

The experiences of other countries have shown that the success or failure of an auction is dependent upon its design. Correct design is important from the outset because the rights being auctioned can last for decades, and if they are allocated badly, the entire Canadian telecommunications industry will suffer the consequences.

In this article, different methods of spectrum allocation are examined with a view to assessing their relative strengths and weaknesses, and determining which method would be most desirable in the Canadian context. First, the nature of the spectrum and how it is used for communications will be examined. Second, the history of spectrum allocation in Canada, the United States and other countries will be reviewed. Third, the discussion will shift to elaborate a series of goals which Canada's allocation method should achieve. Various proposed methods of allocation will be assessed according to their proficiency in satisfying these goals. Fourth, an examination as to how these methods could be tailored to improve their effectiveness will be undertaken. Finally, a method of spectrum allocation will be proposed which is believed to be best suited to meet the spectrum allocation goals of this country.

---

<sup>2</sup> R.S.C. 1985, c. R-2.

## I. Nature of the Spectrum

The electromagnetic spectrum is a continuum which includes all possible forms of radiation arranged according to the wavelength and frequency properties of waves. Wavelength is the distance between any two wave crests, measured in metric units of distance ranging from millimeters to kilometers. Frequency is calculated by measuring the number of wave crests that pass a stationary point in one second. It is represented in cycles per second, or hertz (Hz). Since all electromagnetic waves travel at the speed of light, a wave with a longer wavelength must have a lower frequency.

For purposes of identifying waves which share similar wavelength and frequency characteristics, the electromagnetic spectrum is conceptually grouped into broad sections. The section we are most familiar with is visible light. Other familiar groupings include X-rays, ultraviolet rays and radio waves.

The radio wave spectrum is simply a grouping of waves in the electromagnetic spectrum which range from 3 kHz to 3,000 GHz. With present technology, we are only able to use the portion of the radio spectrum between 3 kHz and 100 GHz. However, as technology advances, it steadily increases the useable portion of the radio spectrum. The portion of the radio spectrum that can be used at any given time to transmit information is known as the "spectrum".

Radio waves can be made to carry information through a process known as "modulation". This is a way of coding the information to be transmitted and causing the radio wave to vibrate according to the coded pattern. The coded radio wave energy is then radiated in all directions by a transmitting antenna. Some of these coded waves can be collected by a receiving antenna and the information is extracted by the process of demodulation, which simply involves separating the coded information from its carrier waves and decoding it. One important prerequisite for successful transmission is the absence of interference from other radio waves. Each transmitter must have the exclusive use of a portion of the radio spectrum between itself and each receiving antenna. If two transmitters try to use the same portion of the spectrum in the same geographic area, interference between the two waves will garble the information which they are carrying and prevent accurate demodulation.

Because of their physical properties and the limitations of current technology to code and decode information accurately, certain frequencies of radio waves are more suited to carrying particular types of information. In practice, there is a balance between the information-carrying capacity of a wave and its distance of travel. All parts of the spectrum can carry the same amount of information, but because of the interference problem, there is less low frequency spectrum available to carry information. Lower frequency radio waves—those between 150 and 1,500 kHz—travel great distances because they are not easily stopped by obstacles. This means that low frequency transmitters must be spaced further apart to avoid interference, and there is less opportunity to reuse the same frequency in different areas of the country. With many people wanting to use a portion of these low frequency waves locally, there is less bandwidth available at lower frequencies. The limited availability of bandwidth restricts the use of low frequency waves to those purposes which do not require large amounts of information to be transmitted. Low frequency waves are suitable for the

long distance transmission of audio information such as voice and music used in commercial radio broadcasts.

Higher frequency waves, those between 30 and 3,000 MHz, travel only short distances because they are easily blocked or absorbed by people, buildings and the terrain itself. Because higher frequency waves have more limited range, transmitters can be placed close together providing greater bandwidth across Canada for transmitting information. The availability of bandwidth makes these waves suitable for transmission of video information, including ordinary television and high definition television (HDTV) signals.

Portions of the spectrum which share similar information-carrying capacity are conceptually grouped into units known as "bands" or "blocks". With the need to use a band having the proper balance between information-carrying capacity and distance of travel, there are a limited number of spectrum bands suitable for any given type of communications service. However, as technology advances, the amount of spectrum suitable for any given service generally increases. Improvements in technology make it possible to compress more information into lower frequency waves and tailor higher frequency transmission systems to carry information across greater distances without absorption. The upper limit of the useable portion of the spectrum, moreover, is constantly being pushed higher by new transmission technologies. Despite these advances, new technologies and the growth of new services tend to increase the demand for spectrum faster than it becomes available.<sup>3</sup> For this reason, the spectrum is considered a scarce resource whose allocation must be managed with care.

## II. Spectrum Allocation

Due to interference, transmission of information via the spectrum requires each radio transmitter to have exclusive use of a spectrum band. This necessitates a method of allocating spectrum bands whenever more than one person wants to use a given band. Indeed, every country has a national agency to allocate the right to use spectrum bands within a given area of the country. In Canada, this function is performed by Industry Canada's SMB. The same role is performed in the United States by the Federal Communications Commission (FCC) and in Australia by the Spectrum Management Agency. Each of these bodies has established elaborate methods of allocating the spectrum among different services and competing service providers. In order to appreciate the controversy surrounding spectrum auctions, it is important to examine the history of spectrum allocation.

---

<sup>3</sup> Examples demonstrating how improvements in technology change the way we use the same spectrum bands for new services include the shift from ordinary radio broadcasting to digital radio, and the shift from analogue cellular telephones to personal communications services (PCS) digital cellular telephones. Innovations in spectrum band use include the broadcast of internet information, satellite telephony and wireless local area networks of personal computers.

### A. History of Spectrum Allocation in Canada

Statutory authority to allocate the spectrum is given to the Federal Minister of Industry by sections 5(1)(a)(i.1) and 5(1)(e) of the *Radiocommunication Act*. These sections empower the Minister to plan the allocation and use of the spectrum by granting licenses to use a specified radio frequency area for a certain purpose within a defined geographic area. The statute does not specify any method of allocation or any clear criteria according to which one is to be selected.<sup>4</sup> It only states that the Minister "may have regard to" the objectives contained in section 7 of the *Telecommunications Act*<sup>5</sup> in exercising his or her powers of allocation.<sup>6</sup> Recent amendments stipulate that the Minister may use competitive bidding to award an applicant with a spectrum license.<sup>7</sup> However, there is no requirement that this process of allocation be used. The choice of allocation method is ultimately left to the Minister and—by derogation—to the SMB. The method which this agency has traditionally used is known as a "comparative selection process".

This comparative process involves three major stages. The first stage is the expression of interest. Here the SMB is involved in determining what type of use is most appropriate for a given spectrum band.<sup>8</sup> For example, the SMB has selected the bands between 1,850 and 1,990 MHz for PCS.<sup>9</sup> Once a service is selected for the designated spectrum bands, the SMB invites anyone who wants to provide the service to make its interest known to the SMB before a specific closing date, at which point the names of all interested parties are published. This usually results in mergers and joint ventures between parties intending to provide similar services, since applicants with more resources are better able to provide the service. After these mergers have occurred, if there is sufficient spectrum available for all parties who express an interest, the spectrum licenses are allocated among them on a first come/first served basis.

---

<sup>4</sup> S. 5(1) indicates that the Minister is to "tak[e] into account all matters which he considers relevant for ensuring the orderly establishment or modification of radio stations and the orderly development and efficient operation of radiocommunication in Canada."

<sup>5</sup> S.C. 1993, c. 38.

<sup>6</sup> *Radiocommunication Act*, s. 5(1.1).

<sup>7</sup> *Ibid.* at ss. 5(1.2)-(1.4).

<sup>8</sup> In making this determination, the SMB will frequently request public submissions as to the best match between services and available spectrum bands. See Notice, C. Gaz. 1994. DGTP-006-94, for an example of a request for public comment on the proper spectrum bands for PCS. In making these decisions, the SMB is influenced by the choices of the FCC since significant differences between Canada and the United States in the designation of spectrum bands for the same services requires modifications of American communications equipment for the Canadian market. This has the effect of delaying the deployment of new technologies and increasing equipment costs. See Industry Canada, "Wireless Personal Communications Services in the 2 GHz Range: Implementing PCS in Canada" (15 June 1995) at 6, s. 5.2, online: Industry Canada <<http://spectrum.ic.gc.ca/pcs/engdoc/policye.html>> (date accessed: 24 January 1999).

<sup>9</sup> PCS telephones are the next generation of mobile communication. They rely on digital as opposed to analogue technology to code information onto radio waves, permitting more callers to use the spectrum at the same time and ensuring the privacy of communications.

If there is insufficient spectrum for all of the interested parties (a situation known as “mutual exclusivity”), then the process of allocation moves to the second stage where the parties submit detailed applications concerning the way in which they intend to provide their communications services. These submissions are used by the SMB to select the applicant, or applicants, best qualified to provide the services in question. The SMB requires a great deal of information to make this decision—consequently, applications are long and detailed. They typically include engineering designs of communications equipment, construction plans for facilities, long term business and marketing plans, proof of sufficient financing to successfully operate the services in question, and proof of Canadian control and/or ownership if the service in question is subject to such restrictions. These applications can easily run up to a thousand pages in length and cost \$100,000 or more to prepare.

These applications are reviewed by two levels of SMB experts, and their recommendations go to the Minister who makes the final decision about which applicants should be granted spectrum licenses. There is no right of appeal or review of the Minister’s allocation decisions. The goal of this selection process is to determine which applicant’s proposed services would produce the greatest public benefit. While no fixed criteria exist to determine what constitutes a benefit to the public, certain factors are commonly examined. These include: (i) the efficiency of proposed use (number of users per portion of spectrum), (ii) the suitability of the proposal to the spectrum band available, (iii) the need for spectrum in order to provide the service as proposed;<sup>10</sup> (iv) the financial capacity of applicants to perform their proposals, (v) the potential for interference between the proposed service and those of other spectrum users, (vi) the resulting increase in competition in the communications sector, (vii) the use of new technologies, (viii) the demonstrated competence of the applicant to run a communications undertaking, (ix) the resulting economic benefits to society, and (x) the extent to which the social objectives of section 7 of the *Telecommunications Act* would be fulfilled. In this context, the relevant social objectives could be summarized as:

- (1) strengthening Canadian culture;
- (2) providing high quality service to remote areas of the country; and
- (3) increasing competitiveness both nationally and internationally.<sup>11</sup>

---

<sup>10</sup> Normally, the issue is whether the same service could be adequately provided over wires.

<sup>11</sup> The full text of *Telecommunications Act*, s. 7 reads as follows:

It is hereby affirmed that telecommunications performs an essential role in the maintenance of Canada’s identity and sovereignty and that the Canadian telecommunications policy has as its objectives

- (a) to facilitate the orderly development throughout Canada of a telecommunications system that serves to safeguard, enrich and strengthen the social and economic fabric of Canada and its regions;

All applications are considered in light of these factors in order to best determine which applicant's proposed use of the available spectrum will generate the greatest public benefit. The successful applicant, or applicants, then proceed to the third stage of Canada's spectrum allocation process which involves equipment certification.

Once the successful applicant is awarded a spectrum license, it can begin constructing its communications facilities, networks and transmitters. Before this equipment can begin to transmit, however, it must be certified by the SMB as meeting the technical standards established for equipment of that type. These standards help ensure that interference is not created by substandard equipment. Certifications are not difficult or costly, and they are mostly a formality if the licensee has used high quality communications equipment.<sup>12</sup> Once the certification process is complete, the licensee can begin to provide communications services. The licensee, however, is not free to do anything it wishes. Each spectrum license comes with several important conditions attached.

The most important condition requires the licensee to provide the services it promised in its application. This includes both the type of service and the geographic area in which those services are provided. There is also a requirement that the licensee pay an annual license fee for its use of the spectrum band. These fees are determined by the SMB according to the anticipated revenues generated by the services provided. As such, they vary widely from service to service. The SMB presently receives over \$150 million each year in license fees, and this amount is expected to increase as more PCS providers begin to provide service. Failure to pay license fees and failure to honour the terms of an application can lead to a license being revoked. Conversely, if an applicant has provided its service as promised and paid its fees on time, it can gen-

- 
- (b) to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada;
  - (c) to enhance the efficiency and competitiveness, at the national and international levels, of Canadian telecommunications;
  - (d) to promote the ownership and control of Canadian carriers by Canadians;
  - (e) to promote the use of Canadian transmission facilities for telecommunications within Canada and between Canada and points outside Canada;
  - (f) to foster increased reliance on market forces for the provision of telecommunications services and to ensure that regulation, where required, is efficient and effective;
  - (g) to stimulate research and development in Canada in the field of telecommunications and to encourage innovation in the provision of telecommunications services;
  - (h) to respond to the economic and social requirements of users of telecommunications services; and
  - (i) to contribute to the protection of the privacy of persons.

<sup>12</sup> If the equipment or network design is found to be insufficient, the SMB will require the licensee to make changes before providing services.

erally expect to have its license renewed by the SMB when the term expires.<sup>13</sup> The final important condition attached to a spectrum license is that it cannot be transferred.

The costs and delays involved in this allocation process are considerable. On average, six to eighteen months elapse between the time the SMB requests expressions of interest and the time the spectrum license is allocated to the successful applicant. The total cost of applying for a license and having equipment certified ranges from \$200,000 to \$700,000.

Despite the cost, delay, complexity and uncertainty of the comparative selection process, it has received very wide support from the Canadian wireless telecommunications industry. In recent public hearings, 95% of industry submissions strongly favoured the comparative selection process over spectrum auctions.<sup>14</sup> Despite the opposition of the industry, the SMB decided to conduct auctions of the spectrum bands designated for local multipoint communications services starting in the fall of 1998.<sup>15</sup> This was decided by the SMB because with the increased demand for the spectrum and the need for government fiscal restraint,<sup>16</sup> the traditional comparative process will become a great deal slower if its use is continued in the future.

### **B. History of Spectrum Allocation in the United States**

In the early days of broadcasting in the United States, chaos and interference reigned because the law was interpreted to give the United States Secretary of Commerce the power to grant spectrum licenses, but not to reject applicants on the grounds that interference would result.<sup>17</sup> The resulting spectrum congestion threatened radio communications and prompted the United States Congress to resolve the problem with the *Radio Act of 1927*<sup>18</sup> and the *Communications Act of 1934*.<sup>19</sup> These stat-

---

<sup>13</sup> The duration of a spectrum license varies considerably depending on the type of service it provides. Generally, licenses last for at least five years and for no more than twenty years. However, since renewal is relatively assured, the only important consequence of the expiration of a license is that renewal can involve an alteration in license fees.

<sup>14</sup> Notice, C. Gaz. 1996. DGRB-001-96: Industry Canada, "Review of the Comparative Selection and Radio Licensing Process—Findings" (20 February 1996) at 1, online: Industry Canada <<http://strategis.ic.gc.ca/cgi-bin/basic/ftsearch>> (date accessed: 24 January 1999) [hereinafter "Comparative Selection Review"].

<sup>15</sup> Notice, C. Gaz. 1997. DGRB-003-97: Industry Canada, "Consultation on Issues Related to Spectrum Auctioning" (1 August 1997) at 1, online: <<http://strategis.ic.gc.ca/SSG/sf01435e.html>> (date accessed: 24 January 1999) [hereinafter "Auction Consultation Review"].

<sup>16</sup> *Ibid.* at 4.

<sup>17</sup> *United States v. Zenith Radio Corporation*, 12 F.2d 614 (N.D.Ill. 1926), online: WL (DCT-OLD); *Hoover v. Intercity Radio Co.*, 286 F. 1003, 52 App. D.C. 339 (D.C.C.A. 1923), leave to appeal to U.S.S.C. refused 266 U.S. 636, 45 S.Ct. 10 (1924). Note also that the Secretary of Commerce did not have the authority to limit the power of transmission used by licensees, their frequency or hours of operation.

<sup>18</sup> 47 U.S.C. § 81ff.

<sup>19</sup> 47 U.S.C. § 151ff.

utes created the FCC—giving it broad authority to allocate spectrum licenses and control the use of the spectrum in accordance with public interest, convenience and necessity criteria.<sup>20</sup>

### 1. Comparative hearings

Until 1981, the FCC used a comparative approach to allocate spectrum licenses, similar to the process adopted by the SMB. The FCC determined the services best suited to each spectrum band and invited interested parties to apply for spectrum licenses to provide these services. Where mutual exclusivity occurred, detailed applications<sup>21</sup> were submitted and a quasi-judicial comparative analysis to select applicants—based on the criteria of public interest, convenience and necessity—ensued.<sup>22</sup> One important difference between the FCC process and the SMB process was that the selection criteria were applied by FCC administrative judges in a quasi-judicial forum in which competing applicants could argue why they should be awarded the license over competitors. Interested third parties were allowed to argue for or against an applicant. The final decision of these FCC judges could be appealed to an internal FCC appeal panel, and ultimately to the Commissioners themselves. In addition, the final allocation decision of the Commissioners could be appealed through the ordinary court system all the way up to the Supreme Court.<sup>23</sup>

Because of intense competition between many qualified parties for very limited amounts of spectrum, the FCC regularly faced great difficulties in deciding which of two equally qualified applicants would better use the spectrum license in the public interest. In such situations, the FCC frequently decided between applicants based on rather tenuous grounds. In one case, an applicant was selected because it pledged to build a twenty-four cell cellular network instead of the twenty-three cell cellular networks promised by its competitors.<sup>24</sup> In another instance, an applicant was selected

---

<sup>20</sup> G.L. Rosston & J.S. Steinberg, "Using Market-Based Spectrum Policy to Promote the Public Interest" (1997) at Part II, online: Federal Communications Commission <[http://www.fcc.gov/Bureaus/Engineering\\_Technology/Informal/spectrum.txt](http://www.fcc.gov/Bureaus/Engineering_Technology/Informal/spectrum.txt)> (last modified: 6 February 1997).

<sup>21</sup> These applications would generally contain the same information as the SMB would require. However, they tended to be longer and even more expensive to produce, with the cost ranging from \$US 150,000 to \$US 400,000 dollars.

<sup>22</sup> It is important to note that the FCC selection criteria lack any reference to cultural or political goals. The only social goal included is universality of service. Another important difference is the somewhat greater emphasis on market forces and free competition that have existed in the FCC criteria from the beginning. Conversely, the references in the Canadian law to reliance on market forces are a relatively recent addition.

<sup>23</sup> The delay caused by these levels of appellate review could protract the granting of a spectrum license by up to eight years.

<sup>24</sup> J. Blake, "FCC Licensing Methods: From Comparative Hearings to Auctions" (1994) 47 Federal Comm. L.J., online: Federal Communications Law Journal <<http://www.law.indiana.edu/fclj/pubs/v47/no2/blake.html>> (last modified: 28 September 1997).

because it promised to provide more washroom facilities at its broadcasting station.<sup>25</sup> These types of decisions had three notable results. First, they led to a great deal of litigation and delay as disappointed applicants sought to overturn the FCC's decisions. Second, they made the comparative selection process appear arbitrary, effectively discrediting it in the eyes of the communications industry and the general public. Third, they undermined the requirement that an applicant's license was conditional upon meeting the terms of its application. The apparent arbitrary nature of the selection process pushed many qualified applicants to make promises they could not keep. When these applicants failed to honour the terms of their inflated applications, the FCC rarely revoked their licenses. Instead, it recognized that all applicants were promising more than they could provide, estimating that the applicant selected was probably as close to fulfilling its promises as any other applicant was likely to be. The effect of this reasoning was to turn the comparative selection process into a breeding ground for laudable—but unfulfilled—promises.

Not only was the process' transparency and effectiveness seriously questioned, it was also derided as expensive and time consuming both for applicants and for the FCC. For example, over two hundred applicants applied for the initial thirty licenses to provide cellular service, and the second and third set of licenses attracted nearly one hundred applications. Each of these rounds took over two years to complete—including litigation time—and strained the FCC's resources to the limit. Factoring in litigation, the delay in receiving a spectrum license could be nearly eight years. The costs involved were equally large, ranging from \$500,000 up to several million.<sup>26</sup> Because of these deficiencies, the FCC's comparative selection process failed to win the support of the American wireless communication industry.<sup>27</sup>

## 2. Lotteries

In 1981, because of the difficulties encountered in the comparative selection process, the FCC was granted the authority to allocate spectrum licenses by lottery. Lotteries were initially proposed as a way to assign a license when two or more equally qualified applicants had been chosen by the comparative selection process. They were seen as a method to avoid the costs and delays of litigation and to remove the apparently unfair elements from the FCC's spectrum allocation process. However, because of the costs and delays of the comparative process, the FCC used lotteries as its general method of deciding between all applicants, not just between those most qualified to provide service.

---

<sup>25</sup> *Ibid.*

<sup>26</sup> See Federal Communications Commission, "In the Matter of Amendment of the Commission's Rules to Allow the Selection from Among Mutually exclusive Cellular Applications using Random Selection or Lotteries Instead of Comparative Hearings" CC Docket No. 83-1096, Report and Order, (1984) 98 F.C.C. (2d) 175, online: WL (FCOM-FCC).

<sup>27</sup> Note that the FCC selection process involves an equipment certification stage similar to the one used by the SMB. This stage applies to all broadcasting equipment regardless of the method used to allocate the spectrum license.

With spectrum licenses now equally available to anyone at little cost,<sup>28</sup> a speculative market in the licenses began to emerge. Licenses were auctioned by the winners of the lotteries to the serious service providers waiting in the wings. In some cases, licenses fetched \$US 30 million or more for the lucky winners. The FCC was soon flooded with applications; for some lotteries, the agency received over 65,000 in a two day period. Since screening would have taken over two years to complete, the high volume of applicants forced the FCC to remove even the minimal screening procedures it had proposed for weeding out applicants clearly unable to provide service. Moreover, lotteries did not avoid the costs and delays of litigation. Schemes to rig the lotteries prompted legal challenges on the grounds that they had been improperly conducted and thus were invalid. In short, FCC spectrum lotteries appeared to have many more flaws than comparative hearings ever did.<sup>29</sup>

With a few modest changes, however, the lottery system might have worked effectively. The first important change would have been to prohibit multiple applications from the same person or group of persons. Charging significant application fees—and then much larger license fees to the eventual winner—would have limited the applicants to only those who were serious service providers. Another step in the same direction would have been to screen applications for proof of technical capacity and financing. Finally, imposing and enforcing transfer restrictions would have prevented the winner of a lottery from transferring its spectrum license either directly or indirectly. With these changes, the lottery process might have been an effective method of allocation rather than a disaster.

### 3. Auctions

In the *Omnibus Budget Reconciliation Act of 1993*,<sup>30</sup> the United States Congress amended the *Communications Act of 1934*<sup>31</sup> requiring the FCC to design and conduct auctions to allocate spectrum licenses. At the outset, auctioning was not enacted for the purpose of raising revenue. Rather, auctioning was conceived as a way to quickly assign licenses to those who would use them, to avoid the problems associated with speculation in the spectrum license market, and to reduce administrative costs. The

---

<sup>28</sup> Lottery applicants only needed to pay the \$US 35 filing fee for each application which had to be submitted along with an engineering plan for the proposed service. Most applicants would file between one and several dozen applications. This rate of filing was facilitated by lottery application mills which provided applicants with everything necessary to apply *en masse*, including numerous pre-designed engineering plans.

<sup>29</sup> One undesirable side-effect of lotteries that was never present with the comparative selection process was the emergence of investment fraud schemes. The highly visible revenues earned by the winners of the FCC's lotteries were used as a lure by con-artists to induce people to invest in a chance to win a spectrum lottery. Generally, these con-artists would overestimate the chance of winning a license and charge their victims application fees much larger than necessary to enter the lottery. These practices were investigated by various United States law enforcement agencies.

<sup>30</sup> Pub. L. No. 103-66, §6002, 107 Stat. 312 at 387-392 [hereinafter *Budget Act*].

<sup>31</sup> 47 U.S.C. § 309(j) was added.

philosophy behind auctions was that the high costs of winning a license would dissuade all but the most serious service providers from applying, and the winners of the auction would be those service providers who valued the spectrum most and would be able to implement services the quickest.<sup>32</sup>

In both the design and the implementation of auctions, the *Budget Act* stipulated that the FCC's primary goal was to protect the public interest. The fee was also to promote certain specific objectives. These objectives included: (i) quick deployment of new technologies and services to the public, including rural areas, (ii) economic development and competition through broad distribution of licenses to a diverse group of license holders, (iii) recovery for the public of some of the value of the spectrum, and (iv) efficient spectrum usage.<sup>33</sup> The FCC was also directed to ensure the participation of small business, rural telephone companies and businesses owned by women and minorities.<sup>34</sup> Raising revenue was a secondary concern, and the FCC was prohibited from making decisions based solely on the amount of revenue that would be generated.<sup>35</sup> There is some evidence, however, that Congress's clarity of purpose wavered once it became obvious that the auctions would raise much more revenue than previously anticipated. This shift occurred after the fourth and fifth auctions (PCS blocks A, B and C) which raised ten times the anticipated revenue. One indicator of this shift in focus is that Congress ordered the FCC to auction the bands designated as "cellular unserved" in time to balance the United States budget despite the FCC's protestations that the market was uncertain about how to use those bands, making it inefficient to auction them at that time. The FCC's concerns appear to have materialized because the cellular unserved auction raised only a tenth of the money that Congress had expected.

As of September 30, 1997, the FCC has conducted fourteen auctions which have allocated over 4,300 licenses and raised over \$US 23 billion. According to the FCC, in cases where demand exceeds supply, auctions are a more efficient way to assign spectrum licenses than any previously employed mechanism. Compared with lotteries and the comparative selection process, auctions rapidly award licenses to productive users,<sup>36</sup> encourage the emergence of innovative firms and technologies, generate market information about the value of a spectrum license, encourage the participation of small businesses, and compensate the public for the use of public resources. They are

---

<sup>32</sup> Federal Communications Commission, "In the Matter of FCC Report to Congress on Spectrum Auctions" WT Docket No. 97-150, [1997] WL 629251 at Part II, online: WL (FCOM-FCC) [hereinafter "FCC Report"].

<sup>33</sup> 47 U.S.C. § 309(j)(3)(A)-(D).

<sup>34</sup> *Ibid.*, § 309(j)(4)(D).

<sup>35</sup> *Ibid.* § 309(j).

<sup>36</sup> Note, however, that spectrum auctions can take a long time when many licenses and bidders are involved. For example, the bidding phase of the United States auctions for blocks A and B of the PCS spectrum lasted three and a quarter months, block C lasted for five and a half months, and blocks D, E and F lasted for four and a half months. This represents only the duration of the bidding phases. See "FCC Report", *supra* note 32.

supposed to do all these things at a lower cost than other methods of allocation.<sup>37</sup> However, it is too soon to reach any definitive conclusions because the long term effects of auctions on the United States wireless communications industry are unknown. Auctions, moreover, may generate some unforeseen countervailing effects which undermine their supposed virtues.

### C. International Spectrum Allocation Processes

The spectacular revenues generated by the FCC's early spectrum auctions and the increasing importance of economic theory have induced many countries to consider auctions as a method of spectrum allocation. Seven years ago, no country had conducted spectrum auctions. Today, over a dozen countries have done so,<sup>38</sup> and many others have announced their intention to conduct auctions in the future or are in the process of making that decision. Auctions have received particular attention as a method of allocating the most valuable private commercial spectrum bands. While the auctions conducted to date have been met with varying degrees of success, most of the difficulties can be traced to poor auction design.<sup>39</sup>

#### 1. New Zealand

New Zealand was the first country to conduct spectrum auctions. Its experience in 1990 was somewhat of a failure. New Zealand used single round, sealed bid auctions which prevented each bidder from knowing how much its rivals had bid, and the winner was only required to pay the amount of the next highest bid.<sup>40</sup> The results were dramatic and some of the licenses were awarded for winning bids as low as \$NZ 1. There was also great deviation in the estimated value of the licenses. In one case, the

---

<sup>37</sup> Auctions can, however, be extremely costly for participants. In preparation for the FCC PCS auctions, Pacific Bell Mobile Service Inc. lobbied the FCC for a year and a half to ensure the auction's rules would not jeopardize its business strategy. It also employed a core team of over a dozen experts to design fail-proof bidding strategies and supported them with many economists and attorneys. To ensure that the electronic bidding process would not be interrupted by power failures, third parties or natural disasters, it built special secure facilities with encrypted communications networks and established duplicate facilities forty miles apart. Pacific Bell Mobile won two PCS licenses for which it paid \$US 696 million. See Nordicity Group Ltd., *The Stakes are High and the Meter is Ticking...* (Report prepared for WIC Ltd.'s submission to Industry Canada Re: Notice C. Gaz. 1996. DGRB-001-96: Industry Canada, "Radio Authorization Fees for Local Multipoint Communication Systems in the 28 GHz Range (LMCS)" (16 May 1996) [hereinafter *Nordicity Report*]).

<sup>38</sup> Countries which have already conducted auctions include New Zealand, Australia, the United Kingdom, Egypt, India, Colombia, Argentina, the United States, and Spain. See *Nordicity Report*, *ibid.*

<sup>39</sup> *Ibid.*

<sup>40</sup> See the discussion of second-price sealed bid auctions in Part IV.C.5, below. The winner only pays the amount of the second highest bid because, *inter alia*, certain auction theorists believe that the highest bid may represent an over-valuation of the license and that the second highest bid is a closer approximation of true value.

highest bid was \$NZ 100,000 and the second highest bid was \$NZ 6. In an even more extreme case, the highest bid was \$NZ 7 million and the next highest bid was \$NZ 5,000.<sup>41</sup> In both of these cases, the highest bidder only had to pay the lower amount. This was politically embarrassing since it failed to raise the anticipated amount of revenue for the government. As a result, New Zealand has radically redesigned its auction methodology.<sup>42</sup>

## 2. Australia

Australia also suffered embarrassing difficulties with its first auctions because of their faulty design. While the Australian auctions for two satellite television service licenses required the winners to pay the amount of their bids, they did not make sure that all bidders had adequate financing or had made advance deposits. The two groups which won the auction used this deficiency to pay much less than their winning bids. They accomplished this by setting up a series of shell corporations which together submitted twenty bids staggered by \$Aus 5 million—ranging from very low to very high amounts (*i.e.*, much more than anyone would bid). After they knew the amount of the highest bid by a third party, they allowed all the corporations to default except the one which had bid just above the third party bid. When a winner defaults, the license passes to the next highest bidder. Thus, the license passed from one defaulting corporation down to the next. Only the corporation which had bid immediately above the highest third party bidder actually paid its bid for the licenses. The difference between the highest bids and the amounts actually paid was large. For one license the highest bid was \$Aus 212 million, but only \$Aus 117 million was actually paid. The other license was won by a high bid of \$Aus 177 million, but the eventual licensee only paid \$Aus 77 million. These embarrassing events caused a one year delay in the introduction of satellite television services in Australia. Furthermore, they almost led to the dismissal of the Minister of Communications.<sup>43</sup> Perhaps this *debacle* could have been avoided if Australian authorities had required up front deposits from all bidders. This would have covered any default penalties that might have been incurred.

## 3. Columbia

The auction system used by Colombia in 1994 to allocate three regional cellular licenses was much more successful. The process involved an auction conducted between those applicants who had passed a technical and financial screening process designed to exclude bidders who were unqualified to provide wireless service.<sup>44</sup> The government raised over \$US 1 billion, and services were quickly deployed to the

---

<sup>41</sup> See *Nordicity Report*, *supra* note 37.

<sup>42</sup> New Zealand now uses a first-price sealed bid method. See the discussion of this method in Part IV.C.4, below.

<sup>43</sup> J. McMillan, "Selling Spectrum Rights" (1994) 8:3 J. Econ. Persp. 145 at 150.

<sup>44</sup> The auction methodology was a simultaneous single round auction. See the discussion of this method in Part IV.C.6, below.

public. The success of this method should be attributed to the use of screening processes.<sup>45</sup>

### III. Comparative Advantages of Spectrum Allocation Methods

#### A. *What Goals should Canada Seek to Achieve Through Spectrum Allocation?*

A successful Canadian spectrum allocation system is one that reflects Canada's spectrum allocation goals and serves the public good. The purpose of this section is to define these goals. It will be seen that some of the criteria are germane to any spectrum allocation system, while others seek to reflect the distinctiveness of Canada itself. The following are the goals which should be promoted by a system of spectrum allocation, and they are the criteria by which the various methods of allocation will be subsequently judged. In establishing our criteria, it should be noted that we are mindful of the letter and spirit of the *Telecommunications Act*.

##### 1. Promotion of Canadian culture

Canadians want to see more of their culture reflected in the mass media. They overwhelmingly support the government's protection of their cultural industries and its attempt to protect these industries in free trade agreements.<sup>46</sup> However, as the final report of the Information Highway Advisory Council (IHAC) states, "[m]arket forces have never provided fully for Canada's unique needs—not because Canadians are uninterested in their own stories, debates and heritage—but simply because there are not enough Canadians to form a viable market, particularly for higher-cost forms of content."<sup>47</sup> Canadian content helps Canadians understand their country and each other. The view is repeated in section 7(1) of the *Telecommunications Act* which states that "telecommunications performs an essential role in the maintenance of Canada's identity and sovereignty," and in section 3(1)(b) of the *Broadcasting Act*<sup>48</sup> which states that "the Canadian broadcasting system ... makes use of radio frequencies that are public property and provides ... a public service essential to the maintenance and enhancement of national identity and cultural sovereignty." The promotion of Canadian culture and content, therefore, is a consideration that must figure prominently in the se-

---

<sup>45</sup> See Part V.B., below.

<sup>46</sup> "[A] December 1996 Angus Reid survey found that 78 percent of Canadians supported government protection of Canada's cultural industries, while 84 percent (93 percent in Quebec) believed the federal government should protect Canada's cultural industries when negotiating trade agreements" (Industry Canada, Final Report of the Information Highway Advisory Council, *Preparing Canada for a Digital World* (9 September 1997) at 60, online: Industry Canada <<http://strategic.ic.gc.ca/SSG/ih01650e.html>> (date accessed: 24 January 1999) [hereinafter *Preparing Canada*]).

<sup>47</sup> *Ibid.* at 57.

<sup>48</sup> R.S.C. 1985, c. B-9.01.

lection of the appropriate spectrum allocation process. As telecommunications and broadcasting converge, this concern will become even more important.<sup>49</sup> To identify what qualifies as “Canadian” content and culture, one must look to the *Broadcasting Act* as well as the content-related recommendations of the IHAC.<sup>50</sup>

## 2. Diversity of service providers

Diversity, tolerance and multiculturalism are hallmarks of Canadian society—so much so that the promotion of multiculturalism has been elevated to a constitutional imperative in this country.<sup>51</sup> In the chapter on access to the information highway, the final report of the IHAC states that Canadians have always worked hard within their society to overcome social factors creating barriers to equality.<sup>52</sup> Canadian spectrum policy should continue to ensure that these barriers are reduced. Hence, any system of spectrum allocation should ensure that aboriginal groups, French language minority groups, students, and other groups that are traditionally under-represented in their spectrum use or consumption, have access to the spectrum. The United Kingdom White Paper on spectrum allocation recommends that a spectrum allocation system should “place due weight on ... social and cultural applications of radio and protect the continuing diversity of radio use within the community.”<sup>53</sup> This means that regulators should ensure: (i) that wireless service providers offer a wide range of services including those catering to special groups, and (ii) that these special groups have sufficient access to spectrum licenses to enable them to provide services.

## 3. Availability to businesses of all sizes

Just as under-represented social groups should have access to the spectrum, small businesses—which are also less represented on the spectrum—should enjoy the benefits of radio communication. Examples of small businesses that use spectrum are taxi co-operatives, messenger services, and bus companies. In its submission to Industry

---

<sup>49</sup> At present, spectrum allocation is primarily relevant for telecommunications services since a separate regulatory regime run by the Canadian Radio-television & Telecommunications Commission (CRTC) applies to the broadcast media. However, we believe that the system outlined in this article could be useful in the broadcast context.

<sup>50</sup> Industry Canada, Final Report of the Information Highway Advisory Council, *Connection, Community, Content: the Challenge of the Information Highway* (1 August 1995) at c. 3, online: Industry Canada <<http://strategis.ic.gc.ca/SSG/ih01070e.html>> (date accessed: 24 January 1999). A more detailed definition of “Canadian culture and content” is beyond the scope of this paper.

<sup>51</sup> *Canadian Charter of Rights and Freedoms*, s. 27, Part I of the *Constitution Act, 1982*, being Schedule B to the *Canada Act 1982* (U.K.), 1982, c. 11 provides that the “Charter shall be interpreted in a manner consistent with the preservation and enhancement of the multicultural heritage of Canadians.”

<sup>52</sup> *Preparing Canada*, *supra* note 46 at 41.

<sup>53</sup> U.K., Department of Trade and Industry, *Spectrum Management: Into the 21st Century* (17 June 1996), online: Radiocommunications Agency <<http://www.open.gov.uk/radiocom/specintr.htm>> (date accessed: 14 February 1999) [hereinafter *UK Report*].

Canada, Quick Messenger Service Ltd. (a courier company in Ottawa) expressed concern about the impact of changes in allocation and licensing procedures on the cost of doing business.<sup>54</sup> In the technology sector, the small businesses of today could very well be the corporate leaders of tomorrow. Their progress should not be stifled by lack of access to the spectrum. Spectrum allocation policy should ensure that frequency continues to be used by businesses of all sizes in order to generate wealth and jobs, and to improve competitiveness.<sup>55</sup>

#### 4. Enhanced competition and customer choice

Since Canada is a diverse nation, the services offered to Canadians should be equally diverse. Customer choice is enhanced when wireless service providers offer a wide range of programming and services. An allocative process should strive to ensure enhanced competition and customer choice. As broadcasting and telecommunications converge, these objectives will become increasingly important.

#### 5. Speed of allocation

In the United Kingdom, an economic impact study calculated that a two year delay in introducing PCS as competition to existing cellular services would have resulted in economic losses of over £2 billion per year by the end of the century, and the loss of over 7,000 jobs.<sup>56</sup> A prominent member of the Progress and Freedom foundation has stated that a three year delay in allocating a license can easily wipe out one-fourth of the present value of the license.<sup>57</sup> Furthermore, spectrum that has not been allocated is spectrum that is not being utilized—thereby depriving customers of services to which they might otherwise have access. The speed in which the computer industry changes is universally acknowledged. If companies such as Apple, Lotus and Intel had required spectrum to get to market, it is arguable that the delays they might have encountered could have resulted in a postponement of the personal computer revolution.<sup>58</sup> Similarly, the increasing convergence of broadcasting and telecommunications could be significantly slowed if unnecessary delays occur in the allocation of

---

<sup>54</sup> Submission of Quick Messenger Service Ltd. to Industry Canada Re: Notice, C. Gaz. 1996. DGRB-002-96; Industry Canada, "Consultation on Radio License Fees—Phase 1" (22 April 1996). Submission of U-need-a-cab limited to Industry Canada Re: Notice, C. Gaz. 1996. DGRB-002-96: *ibid.* (13 May 1996).

<sup>55</sup> *UK Report*, *supra* note 53 at para. 4.5.

<sup>56</sup> *Ibid.* at para. 3.7. Similarly, it has been estimated that the cost of regulatory delay in the introduction of cellular telephone service in the United States is close to \$100 billion with more than \$25 billion lost in a single year (J.H. Hausman, "Valuing the Effect of Regulation on New Services in Telecommunications" (1997) Brookings Papers on Economic Activity, Microeconomics, online: The Brookings Institution <<http://www.brook.edu/pub/journals.htm>> (date accessed: 14 February 1999)).

<sup>57</sup> Testimony of Peter K. Pitsch before the FCC, online: *En Banc* Hearing on Spectrum Allocation <<http://www.pff.org:80/cad/pits0305.html>> (date accessed: 24 January 1999).

<sup>58</sup> *Ibid.*

spectrum licenses. It should also be noted that delays in the introduction of new services can effectively subsidize existing services which would otherwise face increased competition from the new services. The speed of spectrum allocation, therefore, should be a priority in any new regime of license distribution.

#### 6. Rapid network deployment

Quick spectrum allocation is important, but by itself it does not ensure the rapid proliferation of new services. Individuals and corporations with capital, established use plans, and existing infrastructure are more likely to rapidly put spectrum to use. The longer spectrum is not actually being used, the longer consumer choice and the overall economy suffer. Hence, spectrum policy should select the market participants who would most rapidly develop the communications infrastructure. Participants who have paid for their spectrum will have the greatest incentive to deploy their networks quickly in order to recover their investment.

#### 7. Efficient use of the spectrum

Once spectrum has been allocated and is being used, Canadians should maximize their enjoyment of the resource. As such, licensees should maximize the amount of information that they transmit by way of the frequency allocated to them. For example, Canadians would be better served if spectrum services were offered twenty-four hours a day. Similarly, they would be better served if they could receive voice, video and digital information over the spectrum, rather than simply one or two of those forms of information. Increased spectrum efficiency might require that users relinquish unused or under-used spectrum, or that they engage in greater sharing of channels.<sup>59</sup> For example, if the military no longer needed a certain frequency, an ideal spectrum allocation model would provide for the re-allocation of that unused frequency, or provide for shared use with another user until the military again required the band. It is clearly in the interest of all Canadians that the method of spectrum allocation encourage efficient use.

#### 8. Access to services

Spectrum users should be encouraged to provide services to as many people as possible within the area covered by their licenses. Canadian consumers should be able to choose from a wide range of commercial and non-commercial spectrum-based services at a reasonable cost, regardless of location. Access to spectrum-based services is limited for people living in rural and remote areas—particularly the far North—because the low population density makes it inefficient to deploy networks.<sup>60</sup> Spectrum allocation policy should address these concerns.

---

<sup>59</sup> *UK Report*, *supra* note 53 at para. 4.4.

<sup>60</sup> *Preparing Canada*, *supra* note 46 at 45.

### 9. Ensuring sufficient spectrum for essential public services

The armed forces, air traffic control, emergency services, meteorologists and certain charities all require spectrum for their everyday operations. Because of their public service missions, these organizations frequently lack the financial resources to acquire their spectrum on the open market. The major difference between public service providers and commercial users is their inability to charge for services and thereby generate revenue. For example, in Barrie, Ontario, the police service expressed concern that if they had to compete on the same financial terms with private sector companies for their right to use the spectrum, they would be hindered in their ability to provide policing services.<sup>61</sup> Similarly, in Etobicoke, Ontario, the fire department expressed concern that if its access to spectrum was impeded, it would place the public in grave danger.<sup>62</sup> Canadian spectrum policy should therefore ensure that these vital organizations continue to have access to the spectrum.<sup>63</sup>

### 10. Transparency of the allocation process

Ideally, the spectrum allocation process should be as objective as possible so that applicants can see that it is fair and non-discriminatory. It is important that all participants see that spectrum allocation decisions are based solely on the stated criteria.<sup>64</sup> The process, in particular, must ensure that there is no appearance of favoritism toward established spectrum service users over new entrants. The SMB is sensitive to the requirement for procedural fairness in the spectrum allocation process and has strived to instill the comparative process with a greater degree of transparency.<sup>65</sup>

### 11. Revenue for the government

As illustrated in the discussion of the FCC auction process,<sup>66</sup> fiscal austerity has led to a temptation on the part of government to maximize the revenues it obtains from spectrum allocation. This temptation should be resisted. Instead, as one commentator has argued, "spectrum should be released as rapidly and efficiently as possible, even if that reduces the government's auction proceeds, because the goal is to free up spectrum for the benefit of the ... economy."<sup>67</sup> Not requiring spectrum users to pay for their use, however, will encourage inefficient and excessive use of scarce spectrum resources. Hence, the amount of revenue that the government raises should be a crite-

---

<sup>61</sup> Submission of Barrie Police Service to Industry Canada Re: Notice, C. Gaz. 1996. DGRB-002-96: *supra* note 54 (29 March 1996).

<sup>62</sup> Submission of Etobicoke Fire Department to Industry Canada Re: Notice, C. Gaz. 1996 DGRB-002-96: *supra* note 54 (29 March 1996).

<sup>63</sup> This fact is recognized in *UK Report*, *supra* note 53 at paras. 4.11-4.13.

<sup>64</sup> *Ibid.* at c. 4.

<sup>65</sup> "Comparative Selection Review", *supra* note 14 at 13.

<sup>66</sup> See discussion at Part II.B.3, above.

<sup>67</sup> Pitsch, *supra* note 57 at 4-5.

tion in the spectrum allocation process, but only to the extent that charges for use are the best way to ensure efficient spectrum use.

### ***B. Relative Advantages of Different Methods of Allocation***

Having identified the goals and values which a Canadian spectrum allocation scheme should seek to achieve, the capability of various models to achieve these goals will now be assessed. Keep in mind that the following discussion assumes the "pure" form of each model, *i.e.*, a system that is not tailored to circumvent some of the inherent defects in the selection process. A tailored process usually exhibits traits of other allocation methods and is therefore known as a hybrid. Despite the benefits of hybrid processes, an examination of each method of allocation in its pure form better reveals its inherent advantages and disadvantages.

#### **1. First come/first served**

According to this model, the first person to request a license obtains it. Since the first claimant may have no interest in promoting social policy goals, this model does not ensure that content reflecting the distinctiveness and diversity of Canada will find its way onto the airwaves. Similarly, given its random nature, this allocation method does not ensure that spectrum will be available to businesses of all sizes or that consumer choice will be enhanced. While the first come/first served method is certainly a speedy method of allocation, the rapidity of network deployment and efficient use of spectrum will depend entirely upon the intentions, financial resources and technical know-how of the first claimant. Furthermore, there is no guarantee that public service providers will be among the first claimants for a license. Sufficient spectrum is therefore not ensured for essential public services. Additionally, giving away spectrum to the first person who claims it does not generate any revenue for government. Aside from being speedy, the only redeeming feature of this allocation method is its transparency. Giving the right to utilize a frequency to the first person in line certainly entails an objective determination. In sum, the adoption of a first come/first served model amounts to leaving the fulfillment of policy goals to chance. This is clearly not a good way to ensure that Canada's spectrum allocation objectives are met.

#### **2. Lotteries**

In a lottery, applicants participate in a random draw for the available spectrum. Lotteries suffer from the same drawbacks as the first come/first serve model. Spurred by low capital requirements, unqualified, undercapitalized and inexperienced parties are able to obtain spectrum licenses.<sup>68</sup> Since anyone can obtain a license, this assign-

---

<sup>68</sup> W. Kummel, "Spectrum Bids, Bets, and Budgets: Seeking an Optimal Allocation and Assignment Process for Domestic Commercial Electromagnetic Spectrum Product, Services, and Technology" (1996) 48 Federal Comm. L.J. 511 at 526, online: Federal Communications Law Journal <<http://www.law.indiana.edu/fclj/pubs/v48/no3/kummel.html>> (last modified: 28 September 1997).

ment method delays development of spectrum services, limits diversity of service providers and limits universality of customer access to services—and more often than not leads to delays in network deployment and overall inefficient use of spectrum. The lottery process primarily results in private gains without generating direct public revenue. The American experience shows that the lottery process fuels speculation, and in many cases allows license winners to realize windfalls by selling their licenses in secondary market transactions.<sup>69</sup> In a typical case, a little-known group called RACDG Partnership was chosen by lottery in 1989 to operate cellular telephone services in Cape Cod. The partners sold their license to Southwestern Bell for \$41 million.<sup>70</sup> This delayed the assignment of the license to the eventual service provider while allowing lucky private citizens to pocket money that could have gone into government coffers. Lotteries do not quickly and efficiently get spectrum licenses into the hands of those who can actually use them. The need for after-market transactions results in significant losses because—as illustrated—time is of the essence in the spectrum allocation process.<sup>71</sup> Furthermore, the lottery process does not ensure that Canadian culture will be provided via the radio spectrum, or that small businesses and essential public services will have access to spectrum. The only positive feature of this method of allocation is its speed of license allocation and its transparency. Having a machine choose a number is quick and objective. These are the same features that prompt millions of Canadians to play various lotteries each year. While this method is fair and equitable, it does not ensure that Canada's spectrum allocation goals are met.

### 3. Comparative analysis

In a comparative process of allocating spectrum licenses, proposals are judged on their merits with licenses allocated to applicants who best meet certain specified criteria.<sup>72</sup> The criteria can be tailored to meet Canada's spectrum policy goals, and can be made to reflect the desire to protect and foster Canadian culture and a diversity of service providers. Of course, any applicant can promise to satisfy certain social policy goals; it is up to the government to ensure that the licensee actually fulfills them.<sup>73</sup> Making the size of the applicant's business and the nature of the organization relevant criteria can ensure that small businesses and essential public services get their fair share of spectrum. A comparative analysis guarantees that only applicants with a credible business plan, sufficient capital, and the requisite level of expertise are allocated spectrum licenses—leading to a greater probability that the spectrum services

---

<sup>69</sup> M. Spicer, "International Survey of Spectrum Assignment for Cellular and PCS" (1996) at Part III.4, online: FCC Wireless Telecommunications Bureau <<http://www.fcc.gov/wtb/auctions/papers/spicer.html>> (date accessed: 24 January 1999) [hereinafter "International PCS Survey"].

<sup>70</sup> "Selling Spectrum Rights", *supra* note 43 at 146.

<sup>71</sup> See discussion at Part III.A.5, above.

<sup>72</sup> "Comparative Selection Review", *supra* note 14 at 3.

<sup>73</sup> "International PCS Survey", *supra* note 69 at 6.

and networks will be rapidly deployed. The costs of preparing an application in a comparative process are considerably high because of the large amount of detailed information that has to be presented. A comparative process can also help to ensure that service is provided to rural areas, by making the granting of a license covering major urban centers contingent upon servicing outlying areas.

It has been argued, however, that determining efficient use of spectrum is a complex task requiring vast amounts of continually updated information beyond the capacities of the administrators charged with performing the analysis.<sup>74</sup> Furthermore, under the comparative analysis process, licensees who no longer need some or all of the spectrum covered by their licenses have no real incentive to return the unused frequencies for reassignment or to migrate to uncongested frequencies.<sup>75</sup> Since the allocating agency must process information on a wide range of factors, comparative analysis suffers from delays brought about by the need to wade through voluminous submissions and deliberate at length on their contents. The FCC has reported that the average number of days from the filing of an application to the granting of a license is 720.<sup>76</sup> Another major disadvantage of the comparative analysis process is its lack of transparency. The final decision of an allocating agency is discretionary, and this may cause some applicants to feel that they have been treated unfairly. Such suspicions are hard to dispel and often lead to judicial review of the allocation decision where available. Discretionary decision-making by government officials can also invite political interference into the allocation process. In France, the fact that senior politicians became involved in the selection process for a national PCS license just weeks before the license was allocated made it appear that the final decision was influenced by political considerations.<sup>77</sup> In Ireland, although several major international companies applied for spectrum licenses, the government awarded a Global System for Telecommunications (GSM) license to a little-known consortium. The unhappiness of the unsuccessful participants was compounded by the government's refusal to divulge its reasoning in awarding the license in that manner. One disappointed participant appealed the government's decision to the European Commission.<sup>78</sup> While the integrity of the Canadian comparative analysis process has never been questioned, the subjective nature of any such process inevitably leads to a lack of transparency.

#### 4. User fees

Under a user fee system, a license is granted to the first person who is willing to pay a set fee. Policy goals—like the promotion of Canadian content guidelines—are not assured in the user fee model, as the first person willing to pay for the license will

---

<sup>74</sup> Pitsch, *supra* note 57 at 2.

<sup>75</sup> *UK Report*, *supra* note 53 at para. 3.5.

<sup>76</sup> This can be contrasted with the much shorter delay of 233 days for auctions. See "FCC Report", *supra* note 32 at s. 5(a).

<sup>77</sup> "International PCS Survey", *supra* note 69 at 13.

<sup>78</sup> *Ibid.* at 12.

not necessarily be interested in advocating such objectives. Access by small businesses and diversity of service providers is also not assured. In fact, such a system favors better capitalized organizations who are able to devote significant time and financial resources to monitoring the allocation of spectrum licenses in order to claim them as they become available. Enhanced competition and customer choice are not assured by this variation on the first come/first served method. Moreover, this method of allocation fails to ensure that sufficient spectrum is available for essential public services. Public service organizations are not well funded in this era of budget cuts, and they could be hard-pressed to pay the required fees.<sup>79</sup> The absence of administrative analysis, however, makes the user fee system a speedy and transparent method of allocating spectrum licenses. Rapid network deployment would be encouraged. Eager to recoup the money they paid for the spectrum license, licensees would have some incentive to use the spectrum in the most efficient way possible, in order to maximize their return on investment. This method would also raise revenue for the government. However, it would be difficult for the government to set an appropriate price for the use of spectrum because licenses are difficult to price without the possibility of market feedback. The government would be forced to estimate the price that users would be willing to pay if spectrum were available on the free market. The haphazard nature of the pricing mechanism can send the wrong signals to the market about the amount that should be invested to exploit the spectrum. A high price would result in over-investment and a low price would lead to under-investment. These pricing inefficiencies would result in higher costs and risks, forcing spectrum users to seek higher returns on their investments.<sup>80</sup>

Under a user fee system, universality of service—particularly in rural areas with lower density and lower incomes—would improve as licenses in these areas would cost less than those in major metropolitan areas with higher density and lower income, thereby reducing development costs.

## 5. Auctions

Under an auction system, spectrum licenses are allocated to the highest bidder. Auctions would not by themselves ensure the promotion of Canadian culture on the radio spectrum, as the highest bidder may not have any interest in promoting it. Diversity of service providers is impeded because the communities whose interests should ideally be promoted rarely have the financial resources to compete effectively on the open market. Essential public services and small business are among the

---

<sup>79</sup> As such, the Emergency Measures Organization of Nova Scotia feels that these organizations should receive special consideration for radio frequency license purposes. See Submission of Emergency Measures Organization of Nova Scotia to Industry Canada Re: Notice, C. Gaz. 1996. DGRB-002-96: *supra* note 54 (19 May 1996).

<sup>80</sup> The foregoing discussion on setting user fee prices borrows heavily from Kummel, *supra* note 68 at 526; and T.J. Shroepfer, "Fee-based Incentives and Efficient Use of Spectrum" (1992) 44 Federal Comm. L.J. 411 at 419.

groups vulnerable to a market-oriented allocation process.<sup>81</sup> Since large enterprises generally have more capital than small enterprises, small business access to the spectrum is also not assured. For example, if a taxi company or emergency dispatcher had to compete directly with a cellular service provider for the same spectrum band, it is unlikely that the former would ever win. Enhanced competition and consumer choice is also not assured. While specialty channels might generate some interest among consumers, that interest might not be sufficiently widespread to justify a bid that is competitive *vis à vis* more mainstream services. The speed of allocation is much higher under the auction system than under the comparative analysis process, as auctions do not require administrative officials to confront a morass of papers or to deliberate before deciding.<sup>82</sup> Auctions, however, are slower than either the first come/first served or the user fee methods of allocation. Speed of network deployment is increased because the cost of the license induces successful bidders to launch services as soon as possible in order to recoup their initial investment.<sup>83</sup> For the same reason, efficient use of the spectrum is highly likely. Proponents of the auction process also argue that markets can “parallel-process” information gathered by millions of consumers and businesses to continually provide signals as to the relative usefulness and efficiency of a service—thereby rendering markets a more effective method to determine which use is or is not “efficient”.<sup>84</sup> Service to less populated areas would invariably improve. With licenses in remote areas costing comparatively less than those in major urban centers, startup costs would diminish, providing incentive for wireless service providers to expand into outlying markets.<sup>85</sup> The auction process itself is very transparent and objective. Participants know the rules in advance, and it is clear why the bidders finish as they do.<sup>86</sup> Auctions, moreover, also raise significant revenue for the government.

---

<sup>81</sup> To alleviate this problem, the *UK Report* recommended that safeguards be put into place to ensure that essential public services have continued access to spectrum licenses: see *supra* note 53 at para. 4.11.

<sup>82</sup> See *supra* note 76 and accompanying text.

<sup>83</sup> Kummel, *supra* note 68 at 527; and *UK Report*, *supra* note 53 at para. 6.2. Some industry applicants to Industry Canada have suggested that the converse would actually result if auctions were to be used. Opponents worry that auctions would attract speculators whose intentions would be to hoard the spectrum and then resell it at a profit to firms who wish to provide services (see “Comparative Selection Review”, *supra* note 14 at 11). This fear can be effectively addressed through the adoption of “use it or lose it” provisions. Opponents also fear that the large up-front sum that would have to be paid by an auction winner would constitute a barrier to entry and rapid service development. While this is a legitimate concern, it can be alleviated by allowing the winner to pay for the spectrum over the duration of the license (see “Comparative Selection Review” at 10).

<sup>84</sup> “Comparative Selection Review”, *supra* note 14 at 10.

<sup>85</sup> Kummel, *supra* note 68 at 526.

<sup>86</sup> Questions and Answers: Framework for Spectrum Auctions in Canada at question 7, online: Industry Canada <<http://spectrum.ic.gc.ca/auctions/engdoc/q&aian.html>> (date accessed: 24 January 1999).

The chart below gives a general overview of the pros and cons of various methods of spectrum allocation. Comparative analysis and auctions appear to be the best approaches. It is beyond the scope of this article to discuss the current comparative analysis model. Rather, the focus is the advisability of adopting an auction model in Canada. Objections that have been raised to the auction process should be confronted. Only then may one examine the extent to which auctions can be tailored to overcome its inherent problems.

| COMPARATIVE ADVANTAGES OF SPECTRUM ALLOCATION METHODS          |                         |              |                      |              |                      |
|--|-------------------------|--------------|----------------------|--------------|----------------------|
|  | First Come/First Served | Lotteries    | Comparative Analysis | User fees    | Pure Market Auctions |
| (1) Promote Canadian Culture                                   | Low (random)            | Low (random) | Very High            | Low (random) | Low (random)         |
| (2) Diversity of Service Providers                             | Low (random)            | Low (random) | High                 | Low (random) | Very Low             |
| (3) Availability to Businesses of all Sizes                    | Low (random)            | Low (random) | Very High            | Low (random) | Low                  |
| (4) Enhanced Competition and Customer Choice                   | Low (random)            | Low (random) | High                 | Low (random) | Low                  |
| (5) Speed of Allocation  | Very High               | High         | Low                  | High         | High                 |
| (6) Rapid Network Deployment                                   | Low (random)            | Low (random) | High                 | High         | Very High            |
| (7) Efficient and Intensive Spectrum Use                       | Low (random)            | Low (random) | High                 | High         | Very High            |
| (8) Universality of Service (rural and urban)                  | Low (random)            | Low (random) | High                 | High         | High                 |
| (9) Ensuring Sufficient Spectrum for Essential Public Services | Low (random)            | Low (random) | Very High            | Very Low     | Very Low             |
| (10) Transparency of Decision Making Process                   | Very High               | Very High    | Very Low             | Very High    | Very High            |
| (11) Revenue for Government                                    | Very Low                | Very Low     | Very Low             | High         | Very High            |

Figure 1: The inherent features of different pure methods of allocation. Note that first come/first served, user fees and lotteries are significantly less desirable than auctions or comparative analysis.

### C. Specific Objections to Pure Market Auctions

In addition to the defects inherent in the auction process described above, several specific objections have been made against auctions as a method of spectrum allocation. These objections will now be explored along with possible answers to these legitimate concerns.

It has been argued that while auctions may be workable in the United States, they are not suitable for a country like Canada with a smaller population and lower levels of spectrum congestion.<sup>87</sup> By the late 1980s, spectrum scarcity was evident for certain bands in Canada's major urban centers.<sup>88</sup> However, countries such as Panama<sup>89</sup> and Israel—whose populations are much smaller than Canada's—have successfully conducted spectrum auctions.

Opponents argue that the development of spread spectrum technology—which allows devices to scan the spectrum and utilize any frequency that is free at that given moment—will render the current paradigm of exclusive usage of a single frequency obsolete. Hence, allocation methods like auctions that perpetuate the current paradigm retard the development of technology. According to Industry Canada, however, the extent to which new technology may render spectrum scarcity a moot point in the future cannot be known with certainty.<sup>90</sup> In any case, should proponents of spread spectrum technology turn out to be right, it would be much easier for the government to expropriate the licenses in Canada than in the United States, where license holders enjoy a constitutional guarantee to property rights. Alternatively, when the duration of a license ends, the SMB could refuse to renew it and instead designate the associated portion of the spectrum for spread spectrum use. It would therefore appear that adopting an auction method of license allocation would not hamper Canada's ability to adapt to the emergence of spread spectrum technology in the future.

Critics fear that auctions may give rise to cases where one party would out-bid its rivals for spectrum rights simply to prevent competition, thus creating monopolies.<sup>91</sup> The report of the Radiocommunications Agency in the United Kingdom acknowledged this potential problem. It thereby recommended that caps be placed on spectrum holdings to prevent a single bidder from acquiring an undue concentration of licenses so that it could generally affect competition.<sup>92</sup> Another possible countermeasure that could be adopted to solve this problem is the extension of bidding preferences to smaller companies by way of bidding credits.<sup>93</sup> This measure would be desirable in Canada. Competition law would presumably apply to prevent monopoliza-

---

<sup>87</sup> "Comparative Selection Review", *supra* note 14 at 11.

<sup>88</sup> "Auction Consultation Review", *supra* note 15 at 2.

<sup>89</sup> "International PCS Survey", *supra* note 69 at 4.

<sup>90</sup> "Comparative Selection Review", *supra* note 14 at 11.

<sup>91</sup> *Ibid.*

<sup>92</sup> *UK Report*, *supra* note 53 at paras. 6.12-6.13.

<sup>93</sup> See discussion at Part IV.B.2, below.

tion of the spectrum because it represents an essential facility for all competitors in the wireless industry.

Opponents of auctions also argue that any amount paid in an auction for a license would be passed on to consumers in the form of higher prices. However, it is more likely that licensees will charge what the market can bear regardless of whether or not they have to pay to get spectrum. Even if costs are passed onto consumers, it could be argued that it is more Pareto efficient<sup>94</sup> to make consumers who actually use the service pay for the cost of spectrum, rather than to make all members of society pay by foregoing the public revenue that could be raised.

A major objection to spectrum auctions is that they require winning firms to make large payments at the outset, thereby depriving them of the capital required to develop their wireless networks and services. This leads to slower network deployment and a higher risk of firm failure. This objection stems from the United States experience. After the auctions for Block C PCS licenses, many of the winning bidders asked for extensions of their payment deadlines because they had insufficient funds to simultaneously pay their winning bids and construct their PCS networks. This demonstrates that an auction system must be careful to select market participants who have sufficient financing to simultaneously absorb both costs. In many of these situations, the firms defaulted on their payments and forfeited their licenses to the FCC. This required new auctions which delayed the introduction of PCS services in some parts of the United States by six months.

An auction can be structured to accommodate the payment of a winning bid over a given time frame. The financial burdens imposed on winning bidders thus can be spread evenly across the entire term of the license, or deferred until the network is deployed. Significant up front payments, however, offer one critical benefit: they reduce the probability of speculation in spectrum licenses.

Speculation occurs when a firm acquires a spectrum license in the hope that economic and technological changes in the near future will increase its value and allow the speculator to sell the license at a profit. Speculation can prevent the efficient assignment of licenses which might otherwise be acquired by firms intending to use them to provide services immediately. Speculation is especially likely in auctions where winning bidders are allowed to pay the value of their bids over the entire duration of the license. Indeed, the possibility that a license will ultimately be worth less than anticipated is not a large risk because the speculator can always stop paying and permit the license to be reclaimed by the allocating agency. The simplest way to avoid speculation is to require the winning bidder to pay the entire amount of its bid near the beginning of the license term.<sup>95</sup> As previously discussed, however, large up-front

---

<sup>94</sup> Pareto efficiencies arise when market participants maximize the internalization of the benefits and detriments of their conduct. In essence, an allocation is Pareto efficient if there is no other allocation which would make some people better off and no one worse off.

<sup>95</sup> This was done in FCC auctions: see "FCC Report", *supra* note 32.

payments could be burdensome to winning bidders, since they will occur at the time when they are investing heavily in the wireless networks necessary to exploit their spectrum licenses. It is therefore proposed that a middle course be adopted. The allocating agency should require a significant up-front payment (20-35%) and then spread the remaining payments over the first half of the license period. Thus, a winning bidder who bid \$1 million for a ten year license might pay \$250,000 after the auction and then make annual payments of \$150,000 for the next five years. The balance of payments should be adjusted to take into account special factors arising from different types of licenses. This recommendation is a simple, yet effective compromise.

Another effective method of accomplishing the same result is to make it a condition of a spectrum license that the holder provide services within a stipulated period or risk forfeiture. The difficulty with this approach is that service providers may only provide the minimum service necessary to avoid losing their licenses, thus the public will not receive the benefit of efficient spectrum use.

#### ***D. Meaning of these Results for Canada***

Despite the criticisms leveled against the auction process, it remains a viable option. According to Figure 1—outlining the comparative advantages of different spectrum allocation methods—the comparative analysis process is the best way to allocate spectrum licenses. However, as previously mentioned,<sup>96</sup> Figure 1 only takes into account the “pure forms” of the various methods of allocation. As such, it does not consider the fact that auctions can be tailored to the Canadian context. Comparative analysis, as set out here, is already customized for the Canadian context because of the special selection criteria it uses when judging applicants. Therefore, before drawing any conclusions about which system is best for Canada, the extent to which an auction system can be tailored to the Canadian context must be analyzed.

### **IV. Tailoring an Auction System for Canada**

#### ***A. Introduction***

As previously illustrated, the major drawback of the auction method lies in its failure to promote goals unrelated to efficiency. This difficulty would make auctions as a method of spectrum allocation unattractive to many countries were it not possible to develop hybrid auction models to incorporate some of the beneficial elements of other methods of allocation. There are as many hybrid models as there are ways of incorporating non-auction elements into a market-driven method of spectrum allocation. Some of the more popular modifications to the strict auction are the reservation of spectrum for specific purposes, the use of bidding credits, the screening of auction

---

<sup>96</sup> See discussion at Part III.B., above.

applicants and the imposition of license conditions. The following section will consider each of these variations.

### ***B. Hybrid Models—Blending Auctions with Other Methods of Spectrum Allocation***

#### **1. Reservation of spectrum for specific purposes**

Reserving spectrum for particular purposes is not really a hybrid auction process since the allocating agency simply determines that certain spectrum bands will be allocated in some manner other than by auction. Despite this complete exclusion of the market mechanism, every country which has conducted spectrum auctions has refrained from auctioning those portions of the spectrum which are used for public services. This makes sense because most groups providing public services have insufficient revenues to outbid private commercial interests.<sup>97</sup> A wide variety of spectrum users fall into this category: ambulance services, air-traffic controllers, the military and any government body providing essential services. On account of the benefit derived from their providing free television to the public, another group that could be exempted from the auction process are public broadcasters.<sup>98</sup>

The advantages of reserving spectrum are clear. It is an excellent way to ensure sufficient spectrum for essential public services. It is also a good way to promote Canadian culture, diversity of service providers and availability of spectrum to businesses of all sizes. Because of the high degree of administrative control over spectrum reservation, it is very likely that these goals can be met. The disadvantages, however, are equally apparent. Reservation of spectrum can easily lead to inefficient spectrum use by the groups exempted from competition or payment for spectrum licenses. It also encourages these groups to use spectrum technologies where non-spectrum substitutes are available. It may be difficult to determine whether the benefits derived from reserving spectrum licenses for these groups justifies the loss of revenue because without an auction, the value of the reserved spectrum licenses can only be estimated.

It is also possible to combine spectrum reservation with an auction system by reserving certain spectrum bands for auction among designated entities. For example, in the FCC auction process, only small businesses could bid on certain spectrum li-

---

<sup>97</sup> See discussion at Part III.A.11, above.

<sup>98</sup> The spectrum bands assigned to television broadcasters were excluded from the FCC auction process. However, there was some debate about whether this should be the case. In Canada, the SMB has indicated that the spectrum assigned to broadcasters licensed by the CRTC are not subject to auctioning (see "Auction Consultation Review", *supra* note 15 at 8). Canadians would benefit if broadcast spectrum were treated in the same fashion. As the country moves toward convergence in communications technologies, maintaining a distinction between broadcasting and telecommunications spectra is tenuous and unnecessary. One allocation system could adequately serve both fields.

censes. This compromise may represent the best way to reserve spectrum—at least for those groups which face some competition in providing their public services.

## 2. Bidding credits

A system of bidding credits promotes particular groups or goals by allowing certain auction participants to pay only a specified percentage of their actual bids. The FCC relied heavily on this method to promote the participation of small businesses in the auction process. The FCC awarded a 15% bidding credit to those businesses which had gross annual revenues of less than \$3 million, and a bidding credit of 10% to those businesses which had gross annual revenues of less than \$15 million.<sup>99</sup> Accordingly, a business with a 15% bidding credit would only have to pay 85% of its winning bid—enabling it to make higher bids and compete more effectively with better capitalized entities. According to the FCC, this system was a success because a high proportion of licenses were won by small businesses. However, the success of the FCC's use of bidding credits has been called into question.<sup>100</sup> For example, of the 1,020 SMR licenses that were auctioned, 250 were awarded to small businesses.<sup>101</sup> Bidding credits are especially effective where the goal to be promoted is specific and can be associated with one or more auction participants. Thus, they could effectively promote diversity of service providers, availability of spectrum licenses to businesses of all sizes, and availability of spectrum for public services. Conversely, bidding credits are not useful for promoting goals like Canadian culture and content, speed of allocation and efficient spectrum use. The major disadvantage of bidding credits is that they require a price preference to be assigned to each designated entity which promotes the chosen goal without over-compensating that entity. A more mundane problem with bidding credits is the fact that a targeted group's capital—while clearly inferior to that of other auction participants—must still be significant for a price preference to be useful.

Economic studies have shown that a proper bidding credit system does not result in decreased government revenue. A price preference for the targeted firms stimulates the bidding competition, forcing other auction participants to bid higher. If the price preference is set at the correct level, its revenue raising effect from higher bids by non-targeted firms outweighs its revenue lowering effects from chance wins by targeted firms paying lower prices. As a rule of thumb, a 10% preference would result in about 10% more of the licenses being won by targeted firms than would have happened without the preference.<sup>102</sup>

---

<sup>99</sup> "FCC Report", *supra* note 32 at s. 5(e).

<sup>100</sup> See P. Cranton, "The FCC Spectrum Auctions: An Early Assessment" (1997) 6 J. Econ. & Mgt. Strategy 431.

<sup>101</sup> *Ibid.*

<sup>102</sup> "Selling Spectrum Rights", *supra* note 43 at 145.

### 3. Screening auction applicants

When the allocating agency conducts a screening of auction applicants it requires all potential bidders to submit relevant information and show that they meet certain policy driven criteria for admission to the auction process. Any criteria can be chosen, but the process must be carefully designed to ensure it does not unwittingly import the shortcomings of a full blown comparative analysis. The key is to avoid trying to select the best bidders from the pool of applicants. Instead, the goal should be to exclude those potential bidders who are clearly unsuitable. This means that applicants should only be required to meet those criteria which are truly essential. If the screening stage is too demanding, there is a risk that it will prejudice the auction by excluding applicants who might have been able to use the spectrum efficiently. In particular, there is a risk that start-up firms might not be admitted, thus depriving Canadians of the benefits and innovations of competition. Screening criteria, therefore, should not include those elements which are already accounted for in the auction process. These include efficient use of the spectrum, suitability of the applicant's proposed services to one or more spectrum bands, and the relative competitiveness of the applicant.

The more objective the criteria used to screen applicants, the quicker and more transparent the system will be. This does not mean, however, that less objective criteria cannot or should not be used. It simply means that less objective criteria should not be the overriding concern, and when used, it should be as clearly defined as possible. If administered correctly, a screening process can ensure the strengthening of Canadian culture, the expertise and financial capacity of applicants, and the basic feasibility of the services applicants propose to provide.

Eliminating competition among applicants will markedly speed up the screening process since applicants will not feel obliged to submit large amounts of detailed information to offset the risk of being denied spectrum licenses. Most of the delays involved in a comparative analysis stem from the need for applicants to prepare voluminous submissions and the need for spectrum managers to read them. Two other ways to speed up the process are to prohibit the use of hearings and to permit applicants excluded by the allocating agency to submit additional information before the close of the screening phase.

The great benefit of a screening process is that it can take into account non-objective criteria which are not easily factored into a pure auction system. For an auction to function properly, however, the addition of a screening mechanism should remain true to the efficiency advantages of the auction process.

### 4. Imposing conditions on spectrum licenses

The imposition of conditions on spectrum licenses is attractive because it provides a way to ensure that all licensees do things which the allocating agency considers to be in the public interest. However, conditions are only compatible with auctions where they are sufficiently limited and well defined for bidders to accurately estimate the costs associated with compliance. If too many vague conditions are attached to a spectrum license, bidders will be unable to accurately predict its value—and the auc-

tion may not allocate the license to a bidder who is actually able to exploit the spectrum most efficiently. License conditions, therefore, are only suitable for promoting those policy goals which can be clearly articulated in an objective fashion—such as stipulated network construction requirements and price caps on wireless services. Promoting Canadian culture or ensuring sufficient spectrum for essential public services is simply not specific enough to be a good license condition. Attaching major conditions to licenses can also significantly reduce revenues for the government because bidders will likely over-estimate the cost of compliance with these conditions.

### C. *Selecting an Auction Method*

If Industry Canada were to decide that auctions are the mechanism of choice for spectrum allocation in Canada, it would then have to determine the actual design of the auction. The importance of auction design should not be underestimated. In Australia, the failure of the auction design to ensure that bidders actually paid for the spectrum they won almost resulted in the replacement of the Minister of Communications and delayed the introduction of satellite-television services by one year.<sup>103</sup> Any oversight in auction design can have harmful repercussions, as bidders can be counted on to find ways of outsmarting the allocation method.

#### 1. Criteria to be used in comparing different auction methods

Since one of the goals of auctions is to raise money for the government, the level of revenue generated by a particular method of auctioning is a relevant consideration.

Spectrum licenses are interdependent, since firms trying to build a regional or nationwide presence may have to purchase several licenses. In essence, they can be seen as bricks in a larger wall, rather than as separate and discrete bundles of rights. Since licenses can complement each other, the value of an aggregation of licenses may also greatly exceed their independent value. Aggregation is also economically efficient. Firms that have several licenses can spread the fixed costs of developing and acquiring technology as well as building a customer base.<sup>104</sup> Consumers of spectrum services also benefit from aggregation. For example, consumers value the ability to use the same cellular phone anywhere in Canada. This can only be achieved if the cellular phone provider can aggregate enough licenses to cover the whole country.<sup>105</sup> An ideal auction design, therefore, should be flexible enough to allow the bidders to construct their preferred license aggregations.

An ideal auction system would also minimize the so-called “winner’s curse”. This concept characterizes the highest bidder as the one who most over-estimates the value

---

<sup>103</sup> See discussion at Part II.C.2, above. See also “Selling Spectrum Rights”, *ibid.* at 150.

<sup>104</sup> *Ibid.* at 151.

<sup>105</sup> *Ibid.*

of the item for sale, and finds that it has paid more for the item than it is worth.<sup>106</sup> Bidders who experience winner's curse are more likely to have second thoughts about their winning bids and to default on them. Winner's curse has a close causal connection to bidder's default—and the two should therefore be analyzed together.

Auction designers must also ask whether their design minimizes the potential for collusion among the bidders. Collusion occurs when several bidders unite to manipulate the results of the auction. While such collusion is prohibited under Canada's *Competition Act*,<sup>107</sup> this does not mean that it will not occur.

In sum, the level of revenue generated by the auction, the possibility of aggregating auctioned items, the likelihood of winner's curse, the probability of default on winning bids and the likelihood of collusion among the bidders should all be taken into consideration when designing an auction system for Canada. The next section involves an analysis of the extent to which various methods promote these goals.

## 2. Oral ascending (English) auction

In an oral ascending auction, bidding is open and escalates until one party remains. In this manner, individual licenses are sold off one by one in a series of successive auctions. This is called a "sequential auction". Bidders get feedback from their competitors' bids about how their estimates of the license's true value compares with that of their rivals. Participants, therefore, are more comfortable submitting higher bids because their fear of experiencing winner's curse is eased by the continuing interest of other market participants. However, this market feedback can be a false safety blanket, sometimes causing the winner to bid too high in the exhilaration of the moment. When the FCC used this method in the July 1994 IVDS auction, several winners experienced winner's curse and later defaulted on their bids.<sup>108</sup>

High prices and subsequent government revenue are the usual results of such a system. The sequential system impedes aggregation by requiring a bidder to win each license independently. Increased costs and delays can result as participants seek to construct aggregations through secondary market transactions.<sup>109</sup> License aggregation can also be thwarted by predatory bidding. This occurs when auction participants' bids are not meant to reflect the true market value of the spectrum, but rather to hinder the progress of their competitors. A bidder may try to drive the prices up to excessive levels for the early licenses in order to prevent the winners from competing for the later licenses—thereby further decreasing the chances of aggregation.

---

<sup>106</sup> See generally J. McMillan, "Why Auction the Spectrum?" (1995) 19 *Telecomm. Pol'y* 191 at 199. See also "Selling Spectrum Rights", *ibid.* at 153.

<sup>107</sup> R.S.C. 1985 (2nd Supp.), c. 19.

<sup>108</sup> Kummel, *supra* note 68 at 530.

<sup>109</sup> Federal Communications Commission, "In the Matter of Implementation of Section 309(j) of the Communications Act—Competitive Bidding" PP Docket No. 93-253, (1993) 8 F.C.C. Rcd. 7635 at para. 35, online: WL (FCOM-FCC).

The risk of collusion under the oral ascending auction system is high. The identity of each bidder is known to all others, making it easier for participants to communicate with one another and reach collusion agreements. Through their bidding patterns, participants can signal to others what they consider to be "their territory", and what they consider to be "other's territory". In sum, revenue under this model is high and the likelihood of winner's curse is increased. This model, however, does not provide for the efficient aggregation of licenses, and participants find it relatively easy to collude with one another.

### 3. Oral descending (Dutch) auctions

Under the oral descending auction system, the auctioneer—by open outcry—starts the price high and descends until one party bids. The bidder automatically wins the license.<sup>110</sup> Since spectrum licenses are auctioned off sequentially under this model, efficient aggregation is not provided for. The winning bidder does not have the benefit of feedback from the market about the value of the auctioned license. As such, firms tend to bid low in an effort to avoid winner's curse. Revenue for government also tends to be lower under this method than under the oral ascending system. Collusion among the bidders, moreover, is made very difficult since the first price expression by a bidder ultimately ends the auction.

### 4. First-price sealed bid auction

In a sealed bid auction, bidding occurs secretly and escalates through multiple rounds until one party—the highest bidder—remains. Anonymous bids prevent bidders from knowing the amount and origin of the bid. Since participants are ignorant of the bid amounts pledged by their opponents, they tend to bid low to avoid winner's curse. This conforms to the general theory that government can increase its revenue by publicizing any available information that affects the licenses' assessed value.<sup>111</sup> Due to the bidders' fear of winner's curse, bids and revenue tend to be relatively low. The likelihood of winner's curse, however, is also rather low. Aggregation is not provided for because the licenses are auctioned off one by one. Only through good luck can a firm win all the licenses it needs for its business plan; bad luck can either mean that a firm wins more licenses than it needs, or that it wins a collection it cannot use with any plausible business plan.<sup>112</sup> The sealed bid system does, however, reduce the likelihood of collusion between bidders because, given the anonymous nature of the auction, it is very easy for a party to renege on a collusion agreement.

---

<sup>110</sup> This system is habitually used in Canada to auction tobacco.

<sup>111</sup> "Selling Spectrum Rights", *supra* note 43 at 153.

<sup>112</sup> "Auction Consultation Review", *supra* note 15 at 27.

### 5. Second-price sealed bid auction

Under this method, bidding is secret and escalates through multiple rounds until one party is left, but the winning party only pays the price of the second-highest bid. Government revenue clearly decreases under this model. This was dramatically illustrated in New Zealand after they used this method to auction spectrum licenses in 1990. In one case, a firm that had bid \$NZ 100,000 only paid the second highest bid of \$NZ 6.<sup>113</sup> In another auction, the high bid was \$NZ 7 million and the second highest bid \$NZ 5,000. An Otago University student bid \$NZ 1 for a television frequency that serviced a small city. As the only bidder, he got the license for free. Revenues fell far short of expectations—having only received \$NZ 36 million as opposed to the predicted \$NZ 240 million. These developments led to harsh criticism of the government's policy, and New Zealand promptly switched to first-priced sealed bid auctions.

Second-priced sealed bids, however, do alleviate the problem of winner's curse. Since winning bidders only pay the second highest bid, they are less likely to feel that they are paying too much for the frequency. The risk of default is reduced commensurably. Aggregation remains difficult because the frequencies are still being auctioned individually. Due to the anonymous nature of the bidding, the likelihood of collusion between bidders also remains rather low.

### 6. Sequential English auction with sealed-bid package bidding

This model is a variation on the sealed-bid methods. Parties are allowed to submit a sealed bid for any combination of licenses they desire. Oral ascending bids are then taken for the individual licenses one after the other. When the oral bidding is completed, the auctioneer compares the winning oral bids to any package bids and awards the license to a package bid where it proves greater than the sum of the individual oral bids.<sup>114</sup> At the conclusion of the auction, all bids are made public—enhancing the transparency of the process. This model is expressly designed to provide for aggregation. Because an aggregation of licenses across various geographic locations is often worth more than the value of the individual licenses on their own, bidders are willing to pay a premium to obtain the aggregation. Bidders are able to purchase the aggregation they desire rather than having to purchase a block pre-selected by the government. This flexibility leads to increased government revenue. Two factors greatly reduce the likelihood of collusion: (i) the sealed bid nature of the auction, and (ii) the number of bidders involved in the auctioning of multiple licenses probably would be greater. The likelihood of winner's curse and consequent default on the bid is quite low because, lacking full price expression from other parties at the moment the bid is made, firms are likely to bid conservatively to avoid an overbid.

While this system increases government revenue by allowing for aggregation, the premium received could be greater if the package bidders had the benefit of full price

---

<sup>113</sup> "Selling Spectrum Rights", *supra* note 43 at 149.

<sup>114</sup> Kummel, *supra* note 68 at 531.

expression from other market participants, and were thus reassured that they would not fall victim to winner's curse. To allow for this greater premium, the simultaneous multiple round auction was designed.

### 7. Simultaneous multiple round auction

In the simultaneous multiple round auction, multiple licenses are open for bidding at the same time, and bidders have the opportunity to bid on as many licenses as they desire in successive discrete bidding rounds. Bidding remains open as long as there is some bidding on any of the licenses. Bidding occurs over rounds with the results of each round announced to the bidders before the start of the next round. This auction is best run by a computer capable of processing on-line bids.<sup>115</sup> The two hallmarks of this system—the simultaneous bids and the multiple round (ascending) bids—aid efficiency. Multiple round bids allow participants to witness the full price expression of their competitors and adjust their bids accordingly. This information increases the likelihood that licenses will be assigned to bidders that value them most. Since bidders are reassured by the market, their fear of winner's curse diminishes, and they are willing to bid more for the license. Since winner's curse diminishes, so too does the probability that winning bidders default on their bids. As a result, revenue to the government increases.

A simultaneous auction with multiple rounds of bidding gives bidders full flexibility in building license aggregations, as well as the ability to switch to their back-up aggregations should their first choice aggregations prove to be too expensive. Since the auction induces the bidders to express their ideas about desirable license aggregations, the market process determines the outcome. Therefore, the allocating agency need not know how the available licenses complement or substitute for each other.<sup>116</sup> The symmetry of the system prevents the occurrence of certain kinds of predatory bidding. In a sequential system, a bidder may try to drive up prices to excessive levels for the early licenses so that winners will be unable to compete for later licenses. This strategy would fail in a simultaneous system because bidders can vary their bids on any license at any time. Anonymous bidding decreases the likelihood of collusion because any bidder can secretly alter its agreement to collude. The potential for aggregation and the level of revenue for the government increase, while the potential for winner's curse diminishes.

Based on the table below, one can clearly see that simultaneous multiple round auctions are clearly the best way to auction spectrum licenses. They provide for license aggregation, maximize revenue for the government, and greatly decrease the probability of winner's curse and collusion. If Canada decides to adopt the auction

---

<sup>115</sup> For a discussion of this auction method, see generally J. McMillan & P. McAfee, "Analyzing the Airwaves Auction" (1996) 10 J. Econ. Persp. 159. See also "Auction Consultation Review", *supra* note 15 at 26.

<sup>116</sup> McMillan & McAfee, *ibid.* at 173.

method of spectrum allocation, a simultaneous multiple round system is recommended.

#### D. Conclusion

| COMPARATIVE ADVANTAGES OF DIFFERENT TYPES OF AUCTIONS         |                  |                  |             |              |                       |                             |
|---|------------------|------------------|-------------|--------------|-----------------------|-----------------------------|
|   | Oral Ascending   | Oral Descending  | First-price | Second-price | Sequential Sealed-Bid | Simultaneous Multiple Round |
| (1) Revenue   | High             | Medium           | Medium      | Low          | Very High             | Highest                     |
| (2) Aggregation of Auctioned Items                            | Not Provided for | Not Provided for | No          | No           | Yes                   | Yes                         |
| (3) Likelihood of Winner's Curse (and probability of default) | High             | High             | Low         | Low          | Low                   | Low                         |
| (4) Likelihood of Collusion Among Bidders                     | High             | High             | Low         | Low          | Low                   | Low                         |

Figure 2: The strengths of the simultaneous multiple round auction system as compared to other auction methodologies is clear when the features of all these systems are compared.

Auctions can be tailored to meet certain public policy goals not otherwise provided for by a pure auction method. Spectrum can be allocated directly to essential public services, thereby ensuring their continued access to the spectrum. Bidding credits can also be granted to certain groups to help them win spectrum licenses. Furthermore, auction participants can be screened to ensure that they all have *de minimus* technical and financial capability to operate a wireless service. Finally, licenses can be granted on the condition that licensees meet certain conditions. These innovations alleviate the defects inherent in the pure auction system, and should be adopted to compose the appropriate hybrid auction method for allocating spectrum. With the above assertions in mind, our final objective is to propose a comprehensive method of spectrum allocation for Canada.

#### V. Proposed Method of Spectrum Allocation in Canada

As demonstrated, comparative analysis and auctions appear to be the most desirable methods of spectrum allocation. The comparative process allows for the promotion of social goals. However, it is ill-suited in promoting efficiency goals because the allocating agency cannot absorb and process enough information to make licensing decisions accurately. As for the pure auction model, it cannot effectively promote social goals which cannot be expressed in efficiency terms. On the other hand, auctions are ideal for promoting efficiency goals because they can "parallel process" information gathered by millions of consumers and businesses about the relative desirability and efficiency of a spectrum-related service. Because of the different strengths and

weaknesses of these two methods, synergies can be achieved if the two are merged correctly. This section outlines a proposal for a three-stage hybrid auction method of spectrum allocation. In harnessing the advantages of the existing comparative process as well as the benefits of an auction system, Canada's spectrum allocation goals would be achieved.

The first stage of this hybrid process would duplicate the existing expression of interest procedure used by the SMB. At the second stage, all applicants would be screened through an assessment process designed to select only those applicants who meet the criteria which administrators deem to be essential. Those applicants who also satisfy certain secondary criteria would be assigned bidding credits for use in the third stage of the process. The third stage would involve a simultaneous multiple round auction conducted among those applicants who pass the screening stage.

### **A. Stage 1: Expression of Interest**

At the beginning of the process, the SMB must determine what spectrum is available for allocation and divide it into suitable licensing units. A suitable licensing unit is the smallest band of contiguous frequencies that can be put to practical use given the current state of technology (*i.e.*, the smallest band that can be used to transmit intelligible information). To ensure continued spectrum access by public service providers, certain spectrum bands would be reserved for those groups and allocated by non-market methods. For those bands not reserved for public services, the SMB would publish a notice defining the available blocks and invite all parties interested in participating in an auction of these bands to express their interest. After all expressions of interest have been received, the names of these parties would be published—thereby facilitating mergers and joint ventures among the parties. If there was sufficient spectrum available for all parties after these groupings have been formed, then the available spectrum licenses would be allocated among them on a first-come/first-served basis. If there was insufficient spectrum for all interested parties, then the SMB would request that all parties file a business/service plan describing their proposed use of the spectrum.<sup>17</sup> These plans are needed to demonstrate to the SMB that the applicants meet the conditions of the screening stage.

---

<sup>17</sup> Note that in the FCC spectrum auctions, bidders are not free to provide any services they choose with their licenses. Instead, they must provide the service which the FCC has determined to be best suited to the spectrum in question. The authors are of the view that the market should play a greater role in deciding which services are provided over which spectrum bands. Thus, it is proposed that applicants be allowed to choose the services they wish to provide. The SMB's division of available spectrum into licensing units would not determine the services a bidder would have to provide because the units would be small enough that a bidder would never be forced to purchase more than it needed. Further, as explained below, it would be open to a purchaser to acquire licensing units from other owners or to sell any units it did not need.

### **B. Stage 2: Screening Stage**

The purpose of the screening stage is to ensure that all participants who advance to the third stage have *de minimus* ability to: (i) operate a feasible spectrum-based service, and (ii) fulfill the essential public interest goals of Canadian telecommunication policy. This means that the screening process would not be comparative in the sense of seeking to select the best firm, but rather would focus on ensuring that the business/service plan proposed by each applicant would—at a minimum—fulfill these two requirements.

The SMB would use a two-tier screening approach that would distinguish those criteria which are essential in a candidate from those which are merely desirable. At the first tier, each applicant would have to demonstrate, to the satisfaction of the SMB, that it is capable of meeting all of the following criteria:

- (1) Its proposed service will not interfere with existing spectrum services. When two spectrum users try to use portions of the spectrum which are too close to each other, the resulting interference will prevent either one from communicating over their respective frequencies. Interference can also be generated if broadcasting equipment is improperly located or operated.
- (2) It has never violated any SMB auction rules.
- (3) It has the basic technical competence to operate the proposed service.
- (4) Its business/service plan is feasible.
- (5) It has (or will have) sufficient capital to provide the proposed service. This helps prevent speculation in spectrum licenses.

While it is recognized that other goals could have been included as essential requirements for acquiring a spectrum license, those other criteria are best handled through the provision of bidding credits at the auction stage. Too many criteria in the first tier of screening would make the process slower and more discretionary, perpetuating the very weaknesses of the comparative process. Therefore, once the applicant has demonstrated that it meets all of the first tier criteria, it should advance to the auction stage of the allocation process.<sup>118</sup>

An applicant, however, could choose to demonstrate to the SMB that its business/service plan would promote other goals of Canadian telecommunications policy which would entitle it to receive bidding credits. At this second tier of the screening process, the applicant would have to demonstrate any one or more of the following:

---

<sup>118</sup> The SMB would provide written reasons for any refusals. These would enable the unsuccessful applicant to modify its proposed business/service plan and resubmit it before the deadline for admission to the auction stage.

- (1) It is an entity whose participation in the provision of spectrum services ought to be encouraged (it increases diversity of service providers, *i.e.*, native groups, students, francophones, etc.).
- (2) It is a small business (less than the stipulated level of annual gross revenues).
- (3) It would provide universality of service (offering services to a stipulated proportion of the persons within the area covered by its licenses).
- (4) It would provide service to remote areas of the country.
- (5) It will strengthen Canadian content and culture.

Satisfaction of one or more of these criteria would give the applicant the right to exercise a bidding credit in the auction stage of the allocation process. The calculation of bidding credits should be weighted according to the following recommendations:

- (1) If the applicant is an entity whose participation in the provision of spectrum services should, according to the SMB, be encouraged: 20%.
- (2) If the applicant is a small business, based on a sliding scale depending on the firm's revenues: 5% to 15%.
- (3) If the applicant would provide universality of service: 10%. Universality of service is generally a licence condition for broadcasters and local service telephone companies. Universality should not be a condition of a spectrum license because it is not an achievable goal for many spectrum services.
- (4) If the applicant would provide service to remote areas of the country: 10%. This should not be imposed as a license condition because many licenses would cover both remote and non-remote areas of the country. Service providers holding those licenses might find that there is simply no demand for their services in the remote areas covered by the license.
- (5) If the applicant would strengthen Canadian content and culture: 5% to 20%.

The maximum cumulative bidding credit to which any applicant would be entitled should be limited to 50%. This would be the best way to incorporate legitimate social policy concerns into the process of spectrum allocation while maintaining the integrity of the free market auction process. Many of the selection criteria used by the SMB in the existing comparative analysis process do not need to be taken into account at the second stage because an auction is already designed to reflect these goals. These goals include: (i) the speed of network deployment, (ii) efficient use of the spectrum, (iii) suitability of spectrum bands to the proposed services, (iv) revenue for government, (v) enhanced competition and customer choice, and (vi) secondary benefit to the economy.

### C. Stage 3: Auction

The auction methodology proposed here would be a standard simultaneous multiple round auction, similar in principle to the system used by the FCC.<sup>119</sup> This is the best form of auction because it allows for full price expression by all parties, thereby reducing the probability of winner's curse. If bidders' fears of winner's curse are alleviated, higher bids are made, thus leading to greater revenue for the government. The proposed auction provides for license aggregation by allowing bidders to bid on many licenses at the same time. Due to the larger number of participants and licenses being auctioned at the same time, collusion is difficult.<sup>120</sup>

Parties who earn bidding credits would make bids like any other bidder. If they win, the amount of their winning bids would be discounted by the amount of the bidding credits. For example, if a firm has qualified for a 20% bidding credit because it is operated by natives, and has also qualified for a 10% bidding credit because it proposes to provide services to remote areas of the country, then it would only have to pay the SMB 70% of its winning bid. Thus, if it had bid \$100,000, it would defeat a non-qualifying firm which had bid \$90,000, and it only would be required to pay \$70,000 to the SMB.

Bids would start at a minimum amount set by the SMB for each license. This amount would represent a reserve price below which the SMB would not allocate the license. In setting the level of the reserve price, there are two competing influences. High reserve prices would prevent the spectrum from being allocated to a bidder who is willing to provide services, but who places less value on the license than anticipated by the SMB. This is an inefficient outcome because it means that valuable spectrum is not being used. Low reserve prices contribute to long, drawn-out auctions since bidding can start at levels far below the actual value of a license. These delays in allocating a license lead to lost revenue and reduced economic growth. Reserve prices would not be set at very high levels because efficient allocation is more important than government revenue.<sup>121</sup> The current practice is to employ a declining reserve price. This reserve price is initially set at a high level and if there are no bids, the auction authority can reduce it until bids are made. This overcomes the difficulty of establishing a fixed reserve price.

Bidders would be able to withdraw any bids which they later wanted to change. In order to ensure that only serious bids were tendered, a bid withdrawal penalty would be imposed. When registering for the auction, bidders would be required to tender an up-front security deposit. This deposit would be used to pay any withdrawal penalties. This would prevent people from making bids which did not represent their estimated value of the spectrum. It would also prevent a repeat of the events in Australia where

---

<sup>119</sup> See discussions at Parts II.B.3 and IV.C.7, above.

<sup>120</sup> See discussion at Part IV.C.7, above.

<sup>121</sup> "Auction Consultation Review", *supra* note 15 at 29.

bidders made excessively high bids with no intention of ever honoring them.<sup>122</sup> The penalty would correspond to the potential loss in revenue caused by the withdrawal of the bid. If the license for which a bid has been withdrawn ends up selling for more than the withdrawn bid, no penalty would be charged to the bidder. If the license ultimately sells for less than the withdrawn bid, the penalty would be the difference between the withdrawn bid and the eventual final selling price. The withdrawal penalty would be due as a lump sum payment shortly after the close of the auction.<sup>123</sup>

Unlike the FCC auctions, bidders would not be required to pay their winning bids as lump sums at the conclusion of the auction. Instead, they would have to submit an up front payment of approximately 25% of the amount of their bids in order to receive their licenses. If the winning bidder fails to make the up front payment, then the license would go to the next highest bidder. If the winning bidder makes the up front payment, then the remaining 75% of the bid would have to be paid in biannual installments over the first half of the license term. Interest on these payments would be computed at the market rate. This payment scheme represents a compromise between the need to avoid speculation and the desire to avoid draining firms of much needed capital. It also ensures that winning bidders will have enough capital left over after acquiring their licenses to effectively develop their wireless service networks while still requiring a large enough initial investment to deter speculators. To illustrate, a winning bidder who bid \$1 million for a ten year license would pay \$250,000 after the auction, and then make biannual payments of \$75,000 (plus interest) for the next five years. This balance of payments would be modified to account for special factors arising from different types of licenses or different categories of winning bidders.<sup>124</sup>

As illustrated above, the auction process ensures rapid network deployment and efficient use of the spectrum because bidders will be eager to recoup the cost of their bids by quickly maximizing the return on their investment. This means that they will have a strong incentive to provide the services which customers demand the most.

---

<sup>122</sup> See discussion at Part II.C.2, above.

<sup>123</sup> "Auction Consultation Review", *supra* note 15 at 31.

<sup>124</sup> For example, the FCC set up special installment plans for small businesses which varied the duration of payments and the rate of interest according to the annual gross revenues of the business: see "FCC Report", *supra* note 32 at s. 5(e). The proceeds of spectrum auctions could be designated for some special purpose, or they could simply go to the general treasury. The danger of allocating proceeds to some specific task, such as balancing the budget, is that it can induce spectrum managers to design the auction process in order to meet earnings targets rather than to achieve efficient spectrum allocation. However, if the auction process is kept separate from the administration of the resulting proceeds, then it would be possible to use auction proceeds for a specific goal. For the purposes of determining how the spectrum should be allocated, it does not matter which goals the auction proceeds are used to promote. However, it is important that the proceeds are not used to undermine efficient allocation by subsidizing auction participants or spectrum-based services. Either of these things will result in distortions in demand which could undermine the auction process. Those goals should be promoted exclusively through the bidding credit system in the manner described. If greater incentives are desired than the credit amounts proposed here, they should take the form of larger bidding credits.

The result will be greater customer choice. The revenue generated from a given spectrum band will be greatest if it is used for the service which is most suitable for its information-carrying properties. Therefore, the market will select those services most suitable to each spectrum band. Since the auction mechanism ensures rapid network deployment, it will result in more jobs and quicker economic growth—benefiting all Canadians indirectly.

Despite the advantages of the auction process, it is still subject to market failures that may lead to undue concentrations of spectrum licenses in the hands of a few firms. To avoid this problem, it is proposed that caps be instituted on the total amount of spectrum which any person or group of persons can hold. Every country which has experimented with market-based methods of spectrum allocation has instituted such measures. A system of spectrum caps would have to be established before any auctions were conducted. Competition law authorities, however, should be encouraged to provide their views about the implications of this system before it is implemented.

#### ***D. Post-Allocation Stage***

After winning a spectrum license, a bidder would have to pay the 25% up front payment in order to have the license allocated. Failure to pay within the stipulated time—usually thirty days after the auction—would lead to forfeiture and a re-auctioning of the license. Once the winning bidder has actually received its license, it would have to honor the business/service plan submitted to the SMB at the screening stage of the process. This means that it would meet the first tier criteria by providing the promised services pursuant to the conditions stated in its business/service plan. It would also comply with the second tier criteria by continuing to fulfill the social policy goals it had promised to promote. A licensee which qualified for bidding credits would also have to maintain its qualifying status. For example, a licensee which qualified for a 20% bidding credit because it is native-operated must continue to be operated by natives. Small businesses would not be required to maintain their annual gross revenues below the stipulated level, but they could not be acquired by a non-qualifying business.

If a licensee fails to fulfill any first tier criteria, it would forfeit its license to the SMB. If a qualifying applicant fails to fulfill any applicable second tier criteria, the penalty would be less severe. The violator would have to pay the SMB an amount equivalent to the bidding discount to which it would be no longer entitled (plus interest). A violating licensee, moreover, would be subject to a further penalty equal to 50% of this amount. This would dissuade firms from fraudulently claiming to be qualifying entities. If this penalty were not implemented, firms would seek to qualify for bidding credits in order to unfairly defer a portion of the license costs during the capital intensive period when they were constructing their wireless networks.

#### ***E. Transfer and Change in Use of a License***

After having received a license, a licensee might desire to provide services other than those promised in its business/service plan. This might occur because improve-

ments in technology or changes in the demand for wireless services would make other uses more efficient than those the licensee originally wished to provide. It is very important that these changes be allowed in order to permit licensees to respond to market forces and shifts in consumer demand. However, the policy goals set out in the tiers of selection criteria must still be met.

It is proposed that if a licensee wants to make significant modifications to its business/service plan, it should have to submit a new plan to satisfy the SMB that all the first tier criteria would still be met. If the new plan did not fulfill the first tier criteria, the licensee would not be able to make these changes. However, the licensee would always have the option of submitting another business/service plan for evaluation. If the licensee qualified for bidding credits in the auction, then it should satisfy the SMB that the new business/service plan also meets the same criteria as the original one submitted. Should the new plan not meet one or more second tier criteria, the licensee would have the option of withdrawing the new plan or paying an amount equal to the bidding discount (plus interest), as well as a 50% penalty. If a licensee—which did not qualify for one or more bidding credits in the auction—were to submit a new business/service plan which satisfied one or more second tier criteria, it would be entitled to a discount equal to the amount of the associated bidding credit. The same system would apply to the transfer of a license by the winning bidder. In that case, the transferee would have to submit a business/service plan in the same manner as a licensee who wanted to modify its original plan. The transferee would have to meet all of the first tier criteria and would have to satisfy any applicable second tier criteria if it wished to avoid reimbursing the SMB for the bidding discount plus a 50% penalty.

In order to account for future contingencies and avoid imposing undue restrictions on licensees, the 50% penalty should apply to violations of second tier criteria which occur only within the first two-thirds of the license's duration. After that point, a licensee in violation of those criteria would have to reimburse only the bidding discount.

### ***F. Divisibility of Spectrum Rights***

For the same reasons that licensees should be permitted to transfer their licenses or change the services they provide, they also should be able to divide their licenses and transfer portions to others. This means that licenses should be divisible both according to bandwidth and according to area covered. There are several advantages to doing this. First, it would remove the barriers faced by many small businesses in getting access to spectrum licenses, and thereby encourage competition. Second, it would allow winning bidders to keep only those portions of their spectrum licenses which they actually need in order to provide their desired services. This would enhance customer choice by allowing more services to be provided with the same spectrum licenses. The same requirements for SMB screening would also apply to the division and transfer of a fraction of a license as it would to the transfer of an entire license. With respect to the services it proposed, the receiver of a fraction of a license would still have to comply with all first tier criteria. If a fractional transferee did not comply

with the second tier criteria under which the license was granted, then a portion of the bidding discount (and interest) equivalent to the portion of the license used by the transferee would have to be refunded. A 50% penalty would also be assessed on the amount of the refund. The refund should be paid by the winning bidder since it would be in the best position to insist that the fractional transferee either comply with the second tier conditions or pay the cost of not complying. The amount of the refund could be calculated according to the following formula:

|   |   |
|---|---|
| $\frac{A}{B} \times \frac{C}{D} \times E$ | <p>A = Bandwidth of the transferred fraction.</p> <p>B = Bandwidth of the license as a whole.</p> <p>C = Population of the geographic area covered by the transferred fraction.</p> <p>D = Population of the geographic area covered by the license as a whole. With respect to refunds involving provision of service to remote areas, the reference to population in variables C and D would have to be replaced with a reference to the areas actually served.</p> <p>E = Price paid for the whole license at auction.</p> |
|---|---|

Figure 3: Formula for calculating the reimbursement of a bidding discount when a license is divided.

Any instalments of the winning bid due after transferring a fraction of a license would be divided between the original licensee and the fractional transferee in proportion to the respective population/area and bandwidth they have allocated between themselves. The duration of the license would not be affected by the transfer of a fraction to another person. The fractional transferee's portion of the license would have the same duration as that remaining on the original license at the time of division and transfer.<sup>125</sup>

### ***G. Duration of License and the Possibility of Renewal***

Two important considerations must be balanced in determining the appropriate duration of a license. While a longer duration provides the licensee with increased certainty when determining how much to invest in the construction of its wireless network, it makes it more difficult to reallocate spectrum to new uses as wireless technology evolves. A shorter license duration coupled with uncertain renewal discourages the licensee from making large investments which may be needed to exploit the spectrum license. Given the speed of technological change, however, shorter duration does make spectrum reallocation much easier.

Different countries have come to different conclusions about the best balance between these concerns. Australia has proposed an extension to the maximum dura-

---

<sup>125</sup> In the event of a division of a license, the holders of the fractions would have to provide the SMB with detailed information specifying the bandwidth and area held by each party.

tion of a spectrum license from the current ten years to fifteen years. At the end of this period, the license would be re-auctioned.<sup>126</sup> In New Zealand, legislation currently permits license duration of up to twenty years, but the government is considering increasing this to a quasi-perpetual duration.<sup>127</sup> The United Kingdom government has also noted the need for some security of tenure when licenses are auctioned.<sup>128</sup> In the United States, the FCC has auctioned licenses with relatively short ten year terms, but these licenses also feature a "significant expectancy of renewal" which for most purposes amounts to perpetual licenses. Non-renewal is only likely if the licensee breaches fundamental license conditions or deceives the FCC.<sup>129</sup>

Instead of providing shorter terms with a high probability of renewal, licenses should have longer durations—perhaps fifteen years—and be re-auctioned two years prior to expiration. This duration provides the proper balance between the legitimate concerns of incumbent licensees and the need to allow other market participants to gain access to spectrum licenses. Such an approach would also result in greater uncertainty for incumbent licensees than the "significant expectancy of renewal" provided by the FCC. However, advance re-auctioning would provide incumbent licensees with foreknowledge of whether or not they would receive another license term. Due to their established wireless networks and client base, incumbent licensees would also presumably have a significant advantage in the re-auction. Therefore, if they have been using the spectrum in an efficient manner, they should be able to consistently outbid the competition and retain their licenses. Alternatively, if improvements in technology or changes in demand for wireless services render the incumbent's technology obsolete or its services redundant, the market would ensure that the license is transferred to more efficient uses. As a general rule, a license which has been divided into two or more pieces would be re-auctioned as separate pieces. The SMB would have the discretion to recombine the separate pieces of a license at the re-auction stage. This has the benefit of allowing market forces to determine how spectrum rights should be divided.

The downside of this approach is the potential for predatory bidding. This occurs when auction participants' bids are not meant to reflect the true market value of the spectrum, but rather to impede the progress of their competitors.<sup>130</sup> On re-auction, an initial licensee may be targeted by an investor who hopes to win the spectrum license

---

<sup>126</sup> Australian Communications Authority, "Spectrum Licence Allocation: 800 MHz and 1.8 GHz Bands—Applicant Information Package" (6 February 1998) at 19, online: Australian Communications Authority <<http://203.37.2.230/pcs/explan.pdf>> (date accessed: 14 February 1999).

<sup>127</sup> W. Wedderspoon, "Radio Spectrum Management: The New Zealand Approach" (Speech, National Radio Spectrum Policy, Communications Division, New Zealand Ministry of Commerce, October 1995), online: Radio Spectrum Management <<http://www.moc.govt.nz/rsm/speech2.html>> (date accessed: 14 February 1999).

<sup>128</sup> *UK Report*, *supra* note 53 at paras. 8.7-8.9.

<sup>129</sup> "Auction Consultation Review", *supra* note 15 at 17.

<sup>130</sup> See discussion at Part IV.C.2, above.

and then acquire the incumbent licensee's network at a low price.<sup>131</sup> Alternatively, participants may bid solely for the purpose of breaking-up an incumbent's license aggregation.<sup>132</sup> To alleviate the problem of predatory bidding in license re-auctions, it is proposed that incumbent licensees be granted a bidding credit of 5 to 20%, depending on their annual gross revenues. In this manner, a proper balance between the incumbent's need for certainty in renewal and society's need for maximum allocative efficiency would be ensured.

## Conclusion

Canada's movement toward a knowledge-based economy means that a major portion of its future wealth will rest in ideas. Spectrum technologies, in effect, will become the main method by which we exchange our ideas. It follows that the quality of our spectrum-based communications services is important to the evolution of the whole economy. The transition to a knowledge-based economy, moreover, will be impeded if spectrum-based services are implemented inefficiently. Since the development of spectrum services takes many years, ensuring high quality services in the coming decades requires optimum allocation of spectrum licenses today.

Spectrum allocation in Canada is now at an important crossroad. It has been demonstrated that auctions are an attractive course to take, but they must be carefully designed in order to ensure their success. Only when an auction takes into account all of Canada's policy goals will it be a suitable method of allocation for this country. A pure auction system that focuses on efficiency concerns fails to account for policy goals. Canada must therefore look for ways of incorporating these policy goals into its auction system.

A hybrid auction model is proposed which draws upon the experience of other countries. It represents a compromise between the comparative analysis method which Canada now uses and the FCC auction system operational in the United States. It is designed to address the two key considerations for a successful auction system: market efficiency and social policy goals. To ensure efficient allocation of the spectrum resource, the proposed hybrid auction model would employ a simultaneous multiple round bidding system providing for license aggregation, reduction in the probability of winner's curse, maximization of government revenue and limitation of the potential for collusion. To maintain Canada's cultural identity, it is recommended that a screening process be adopted to incorporate essential policy goals. In addition, a system of bidding credits should be implemented reflecting secondary policy goals that, while important, are not considered to be fundamental.

---

<sup>131</sup> "Auction Consultation Review", *supra* note 15 at 18.

<sup>132</sup> For example, an economically efficient assignment of spectrum licenses might involve one licensee acquiring a block of similar frequencies covering Vancouver Island. A competitor may seek to damage this licensee by bidding very highly in a re-auction for just one key license, such as Victoria, and thus significantly disrupt the business of the incumbent licensee: see *ibid.* at 18.

This system is designed to ensure a fair and efficient allocation of spectrum licenses. It balances efficiency concerns and cultural objectives in a way that allows Canada to advance into the knowledge-based economy with confidence.

---