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Spectrum Management

Radio Systems Policy

General Spectrum Policy Principles and Other Information Related to Spectrum Utilization and Radio System Policies

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1. Introduction

The purpose of this document is to incorporate in one paper general principles and other information which are common to this series of documents and form the basis for the specific policies on spectrum utilization, orbit protection and radio systems matters for various bands and for all radio services, broadcasting and non-broadcasting included.

From time to time, through a public consultation process, specific policies have been established relating to the particular use to be made of a given frequency band (spectrum utilization policies) or what generic types and developments of radio equipment (radio systems policies) will be furthered in Canada. While the SP series as a whole will form the permanent record of these specific policies in a convenient fashion, this document contains the general or overall guiding principles which the Department considers form the basis for policy, and where applicable, associated regulatory and operational initiatives. As these policies are updated and new policies created, users are encouraged to ensure they are using the latest version of these documents. The consistent application of these spectrum policy principles in the policy development process may be considered as departmental spectrum-related policy decisions, but also an indication of future thrusts and directions in the spectrum policy field.

These principles may be adopted to meet specific requirements in various locations across Canada and are intended as guidelines for spectrum management practices.

2. Spectrum and Radio Systems Policy - Mandate of the Department

The Department of Communications seeks to fulfill its mandate to foster the orderly development and operation of communications for Canada in the domestic and international spheres, in part through the management of the radio frequency spectrum. Through its Telecommunications Policy Branch, it develops policies for achieving optimum utilization of the radio frequency spectrum and the orbit resource to meet the varying and conflicting needs of users.

These policies are intended to reflect, in part, the following major responsibilities of the Minister of Communications:

- a) To optimize the utilization of the radio frequency spectrum, and the geostationary satellite orbit;
- b) To provide for the planning of the efficient and orderly growth of the Canadian radio telecommunications network as an entire system;
- c) To ensure that the public interest is served through the consideration of all relevant factors in the granting of licences for new radio transmission facilities;
- d) To anticipate, analyze and resolve interference problems in the early stages of system development;

- e) To consider future system expansion plans and provide for these to the extent possible;
and
- f) To ensure that Canadian radiocommunication systems conform to the extent practicable to the International Radio Regulations established by the International Telecommunications Union.

3. General Spectrum Policy Principles

This section describes the following general spectrum policy principles, application of the principles and information on public consultation:

1. Spectrum Conservation

- 1.1 Maximization of Public Good
- 1.2 Spectrum Allocation
- 1.3 Designation of Spectrum by Type of Use
- 1.4 Frequent Priority
- 1.5 Encouragement of Non-Radio Alternatives
- 1.6 Maintenance of a Single National Standard
- 1.7 Encouragement of New Technologies

2. Application of Spectrum Policy Principles

- 2.1 Non-Reservation of Spectrum
- 2.2 Use of Station Parameters which Promote Spectrum Conservation
- 2.3 Non-Standard Systems
- 2.4 Right of Refusal
- 2.5 First Come, First Served Radio Licensing
- 2.6 Radio Station Licences
- 2.7 Interference Protection
- 2.8 Geo-Stationary Orbit Protection
- 2.9 "Last In" Protects Existing Users
- 2.10 Principle of Channel Sharing
- 2.11 Phased Implementation

3. Public Consultation

- 3.1 Use of the Canada Gazette in Public Consultation
- 3.2 Call for Applications and its Selective Use in Radio Licensing and General Spectrum Management Activities
- 3.3 Public Disclosure

It should be noted that their order of appearance does not indicate any relative weighting or priority among them as to their importance. In addition, the Minister may, by virtue of the statutory powers described in the Radiocommunication Act and the Department of Communications Act, which allow broad latitude in decision-making power, prescribe conditions of licence which supersede any of the principles specified. Moreover, the list of

principles described in this document is not exhaustive and refers to matters of a spectrum/orbit-related nature only.

3.1 Spectrum Conservation

The radio frequency spectrum is a natural resource which is not contained by regional or national boundaries and whose exploitation is therefore contingent on an efficient and effective body of policies, rules, procedures and practices designed to accommodate as many users as possible, and to facilitate equitable sharing among the users in an environment from harmful interference. Key elements related to spectrum conservation are:

3.1.1 Maximization of Public Good

Since the radio frequency spectrum in general and each spectrum allocation in particular are limited national resources whose use must be managed in the public interest and for the public good, generally those operations which provide and extend similar services to the greatest number of users or subscribers, or which use greater technical sophistication to increase the efficiency of spectrum use and hence the number of subscribers which can be served, are to be given preference particularly in the areas of moderate or intensive spectrum use.

In rendering a decision, an assessment of the public interest to be met by the application is of great importance, particularly in areas where there is intensive spectrum usage and/or two or more applicants are competing for the same spectrum. For example, radio systems recognized as providing a "safety service" (e.g. police, ambulance, fire) assume primary importance in comparison to other uses of radio in competitive situations.

3.1.2 Spectrum Allocation

Spectrum should be allocated to services whose specific needs are best tailored to the use of that spectrum. Generally, the Canadian Table of Frequency Allocations specifies the full range of specific radio services. While its primary purpose is to accommodate domestic needs, it is consistent, with very few exceptions, to the International Table of the International Telecommunications Union.

Each frequency range possesses propagation and other characteristics peculiar to it which more or less determine its optimal usage. Sub-allocations of spectrum to support a particular service operation are made by factoring into the process such considerations. Thus, when choosing a band allocation in which to authorize a system, the Department gives preference in its licensing process to local mobile radio over fixed point-to-point operations in the VHF and UHF bands, and preference to fixed operations in higher UHF and SHF bands. Similarly operations requiring longer range communications, (i.e., international broadcasting, mobile and fixed services) are satisfied preferentially in the HF bands.

As another example, at higher microwave frequencies, radio path links tend to decrease in distance because of attenuation by rainfall and absorption in the atmosphere. As the lower portions of the SHF microwave frequency range are more

attractive for multi-hop or long-haul systems, application of this principle could also lead to a requirement for each applicant to demonstrate that use of a higher available frequency band is not technically or economically feasible.

3.1.3 Designation of Spectrum by Type of Use

The Department designates spectrum by type of use rather than type of user¹; a principle which has proved to be effective in satisfying the varying public demand for radio services in various areas of Canada. Under this arrangement, spectrum which is not required by one type of user at any location is available for others, who have a use for it. In addition, radio systems designed for a common type of use are more easily co-ordinated with the operation of other similar systems, permitting a greater number to be licensed in a given area. Therefore, the principle of designating spectrum by type of use will be continued, and spectrum will usually not be designated exclusively for any one group of users.

3.1.4 Frequency Priority

The Department recognizes a priority in the use of frequencies for various radio services. Services involving safety of life and property - "safety services", take precedence over others to be established for industrial or business communications purposes - "preferred services". Included in the "preferred service" category are federal and provincial civil defense systems, provincial and municipal hydro electric power, highways and transportation systems, systems essential to the distribution and maintenance of electrical, oil and gas services and so on. Generally, non-shared, exclusive use assignments are made to operations in the "safety service" category. Those applicants, for land mobile service as an example, whose systems are not encompassed by the safety channels are available for assignment in the area involved and that assigned frequencies are time-shared as necessary with other like systems in the same local area.

3.1.5 Encouragement of Non-Radio Alternatives

As a principle, the Department will encourage applicants for radio systems to pursue, to the extent possible, the use of non-radio alternatives where these could be more economical and could realistically be employed from a technological point of view. Consequently, applicants may expect the Department to encourage the use of non-radio alternatives such as fibre optics and cable, especially in areas where spectrum is congested, where system paths are relatively short and where these alternatives can reasonably be employed.

1 Type of use refers to the types of radio systems such as paging use, dispatch mobile use, low capacity analogue radio relay use, etc. User types are exemplified by the common carriers, electric power utilities, railway companies, etc.

3.1.6 Maintenance of a Single National Standard

As a general rule, any application must conform to the most recent issue of departmental standards (for example, Radio Standards Procedures, Standard Radio System Plans, and Broadcast Procedures) including those for the extension or replacement of existing systems. It has been argued, however, that strict adherence to standards for systems operating in remote areas is unnecessary since any additional spectrum required is usually freely available and economic and operating advantages could result for the user. On the question of spectrum availability, it may be noted that while the remote areas of Canada are extensive, installations in those areas are often confined to the few routes accessible by road or water, and these routes tend to have intense frequency usage because of the existence of multiple systems. Even sites serviced by air, principally located in mountainous terrain, are often found on established routes which are subject to intense usage. In this situation it is difficult to predict spectrum availability with confidence, making a blanket exception to national radio system standards in remote areas unwise. The Department remains committed, therefore, to the principle of establishing a single set of national standards for radio systems applicable to all areas of Canada.

3.1.7 Encouragement of New Technologies

With the necessity to achieve more sharing coupled with the demand for access to the same spectrum by an increasing number of users, new and more efficient means will be required to achieve the increased band occupancy. One of the means at the Department's disposal to achieve spectrum efficiency is to encourage the use of newly available technologies which would result in increased traffic-carrying capabilities without requiring increased spectrum.

Consequently, the Department will measure systems proposals in terms of optimum and economically feasible usage of innovative and state-of-the-art practices.

3.2 Application of Spectrum Policy Principles

3.2.1 Non-Reservation of Spectrum

As a matter of principle, the Department does not reserve spectrum for any user(s) since the establishment of such impediments may compromise efficient spectrum management. The only exception of this rule is the reservation of a limited number of specific frequency bands for the exclusive use of the Government of Canada.

However, the Department does encourage spectrum users to discuss their plans for future growth with the Department, where the period between conceptualization and operation of the system may amount to years and the financial consequences of an inability to obtain a radio licence for additional frequencies may be significant.

3.2.2 Use of Station Parameters which Promote Spectrum Conservation

In the licensing process, the Department authorizes radio systems to use technical station parameters which promote spectrum conservation while satisfying the

coverage and reliability requirements of the applicant. As an example, the Department will, as a matter of course to effect good spectrum management, require reductions of the effective radiated power (ERP) to the minimum required to provide the desired coverage at a specified level of reliability. For the same reasons, it may require the use of directive and/or high performance antennas. For fixed systems, protection channel arrangements using frequency diversity may be denied for applications which do not justify their need for reliability, and limits may be placed on the equivalent isotropically radiated power (e.i.r.p.) for each transmitter in order to resolve sharing problems with the fixed satellite service.

3.2.3 Non-Standard Systems

Applications for radio systems which do not conform to the established national standards are dealt with on their own merits on a case-by-case basis. Applicants should note that licensing of such systems will be only on a non-standard basis, and thus such systems will be subject to upgrading, modification or replacement if at some time in the future the non-standard aspects of their operation should block the entry of a new radio system which conforms to the national standard. The licensing of new systems that do not conform to the applicable standards should be regarded as an infrequent occurrence justified by special circumstances.

3.2.4 Right of Refusal

The Minister of Communications may issue licences for such terms and under such conditions as are considered appropriate for ensuring the orderly development and operation of radio communications in Canada. The Minister may set the time within which the licensee shall commence construction and may also set a time within which the licensee must have the station in operation.

The Minister retains the right to not issue radio licences if it is clear that the public interest would not be served in doing so or that impediments would be created to the orderly development of telecommunications in Canada.

3.2.5 First-Come, First-Served Radio Licensing

The processing and assigning of frequencies for radio applications, i.e., applications whose licensing does not pre-empt the licensing of other similar applications in the immediate future and whose processing is accomplished according to existing policy and/or regulatory procedures, standards, and norms, will be on a "first-come, first-served" basis. That is to say that applications for similar types of radio services which provide similar private or public benefits that are received during the average processing period will be dealt with equally. When a number of non-competitive applications are received at separate times within this general period, they will be processed. In areas of spectrum shortages, preference will be given to those providing greater public benefits, spectrum utilization and overall efficiency, irrespective of the receipt dates of the applications. Those received at a later date will be accommodated to the extent possible in the remaining spectrum. It should be noted that in the final analysis the Minister reserves the right to make the

determination and decide whether "first-come, first-served" licensing or other procedures will be used for processing.

3.2.6 Radio Station Licences

A Radio Station Licence is an authorization by the Minister of Communications under the Radiocommunication Act, allowing the licensee to establish a radio station or install, operate or have in his possession a radio apparatus. The General Radio Regulations Part II made pursuant to the Radio Act states that a licence shall not be construed as conferring any right of continued tenure in respect of a frequency. The Department, as part of its authorization process, endeavours to the extent possible to ensure that the operation of any licensed station will neither cause nor receive interference from other licensed stations with the same status, the licensing of a system in itself does not offer any guarantee to this effect. Licences are sometimes issued with a set of associated conditions often relating to the status of that authorization versus others in geographic or frequency proximity to it.

A key element in the management of spectrum is the radio licence which serves a number of basic purposes.

The radio licence is the means of identifying authorized users and facilitating orderly use of the spectrum. Licences, with their associated technical conditions and internationally-agreed system of call signs, enable the identification of those using the spectrum. This is an essential element of the enforcement process by which efficient and equitable sharing of this natural resource is assured. The licensing of new radio users allows smooth integration of these users and services with existing ones. Licence renewals provide an opportunity to re-evaluate the appropriateness of a particular station's continued operations.

It should also be clear what a licence does not do. As noted above, it does not confer in any way ownership of a particular radio frequency nor does it guarantee a continued right to operation. Nevertheless, in the normal course of events, it does engender an expectation that the licensee will be able to continue to operate on the licensed frequency at least until the end of the licence period. However, continued unmodified operation is not guaranteed unconditionally because the use of the spectrum must be tempered by needs of both existing and new users, and licensed users may be asked to re-arrange their installation for the general good.

3.2.7 Interference Protection

In the event that, as a condition of licence, a system is ascribed a lower relative status in terms of interference protection vis-à-vis other licensed operations, as prescribed in the Canadian Table of Frequency Allocations, it is the responsibility of licensees of such systems to ensure that the operation of their particular stations do not constrain the operations of those with higher allocation status. As a condition of licence, these authorizations are made only on a non-interference, no-protection (NIB) or secondary basis. In cases where the International Table of Frequency Allocations allocates a service, but domestic policy considerations preclude its use on a standard basis, other services could be identified to operate as standard systems.

3.2.8 Geo-Stationary Orbit Protection

To ensure geo-stationary orbit protection, when considering applications for line-of site radio-relay systems sharing frequency bands with the fixed satellite service, the Department discourages applicants from planning to overbuild radio-relay stations on "existing" routes and generally refuses to license the establishment of new radio facilities whenever the antennas of such systems point within two degrees of the geo-stationary orbit.

3.2.9 "Last in" Protects Existing Users

In the processing of licence applications on a "first-come, first-served" basis where licences have been issued to different users or even to the same users on an equal protection basis, should interference to an existing system result from the authorization of a new system, the new licensee will normally be held responsible for accommodating the original user - by either reducing power, changing frequency or physically re-locating his equipment, or by ceasing operations.

If it can be shown, however, that existing users can modify their systems with relative ease or with little operational dislocation, they may be asked to modify their systems at the option of the Department. The Department will, furthermore, mediate and liaise between users to ensure that all reasonable measures are employed to permit the accommodation of a new entry. The new licensee is responsible, in most cases for accommodating existing users if the existing radio system meets current technical standards.

As the authorization process involves the investigation and resolution to the extent possible of potential problems of radio system compatibility between a new application and the existing radio and geographic environment, this principle of the "last in" licensee protecting existing users may not be generally apparent to applicants. From time to time, this general principle is set aside in specific regulatory or policy proceedings involving public consultation where, for example, its continued use would thwart the entry of systems with improved technical standards, or the entry of new radio services into certain frequency bands.

3.2.10 Principle of Channel Sharing

Since the radio spectrum is a limited resource (limited by present technology, economics and practicality of implementation) geographic urban areas having large concentrations of population will require the use of techniques to allow for more intensive use of the available spectrum than rural areas. For this reason, the time sharing of radio channels becomes a practical alternative for certain radio systems in providing for the needs of the many users in those areas where demand for radio exceeds the available supply of spectrum.

As a matter of principle, the Department routinely sets channel loading guidelines and assigns radio channels in the land mobile service on a shared basis to non-competing users, primarily in areas where availability of spectrum is short in comparison to the demand, or where a single user's channel utilization is much less

than the capacity that the radio channel can potentially accommodate. For this reason, the Department currently pursues a licensing policy of authorizing channels on a shared basis, where compatible, among non-competitive users before assigning the next available empty channel. This process ensures that radio channels will generally be readily available for future requirements for both dedicated and shared channel proposals and ensures that the authorized channels are utilized to their fullest extent.

Exceptions to this general principle are permitted in some cases where channel sharing would be incompatible with the proposed service to be provided. Generally, safety services (i.e. fire, police, ambulance) involving safety of life and/or property and preferred services are not required to share channels.

3.2.11 Phased Implementation

In the implementation of any new policy/regulatory initiative such as new or revised technical standards, or for the reallocation of spectrum from one service to another, as a principle, the Department generally provides for a transitional or phased implementation. If the operator of a licensed system conforming to the previous norms is required to relinquish a frequency or set of frequencies or otherwise modify his operation, provision is made to ensure that the transmission is accomplished both as expeditiously as possible but also without undue hardship on the parties involved.

In introducing new or revised standards, for example, the Department continues to take every step possible to protect radio systems already licensed. However, particularly in cases where spectrum is at a premium, there are occasions when an existing system at a particular location has to be modified or replaced in favour of new systems which make more efficient use of the spectrum or otherwise are in the public interest. Under the Radiocommunication Act, the Minister of Communications has the power to regulate, control and amend all technical matters relating to the operation of stations including changing the frequency used.

3.3 Public Consultation

3.3.1 Use of the Canada Gazette in Public Consultation

As a general principle, the Department formally consults with the public before undertaking new policy or regulatory initiatives usually through a formal announcement in the Canada Gazette, and at times through publication of an associated paper.

The consultation procedure is carried out in stages. The first stage may begin with the issue of a "background paper" formally announcing the review or initiative, identifying some of the issues or factors to be considered and asking for public comment following which specific proposals will be generated in a subsequent paper. The process ends by announcing the release of a "decision paper" by the Department.

While the Department will consider unsolicited comments at any time, the public is encouraged to input submissions/comments which are requested as part of the initial

stages of public consultation. The outcome of the Department's analysis of such comments usually represents a compromise which has been weighed and balanced against the interests of particular respondents and the overall responsibilities of the Minister.

3.3.2 Call for Applications and its Selective Use in Radio Licensing and General Spectrum Management Activities

As a means of processing radio applications for which there are no policy and/or regulatory guidelines and/or whose licensing on a first-come, first-served basis may pre-empt licensing of other similar services, due to spectrum limitations or other considerations, the use of a call for applications procedure may be employed on a selective basis at the discretion of the Department. A notice in the Canada Gazette may call for applications with a specified cut-off date and outline the terms and conditions for the application process as a whole. This process may give public notice of the Department's consideration of an application, which in effect, precludes the possibility of other applications being considered, and solicits public comment before the licensing decision is taken. The Minister is empowered under the Radiocommunication Act to make regulations prescribing the form and manner in which applications for licences are to be made and this can include the call for applications process. Due to the expenditure of time and manpower resources which implementation of this process requires, it will be used only on a selective basis and only where in the Department's assessment, the public interest would be best served in such an undertaking.²

3.3.3 Public Disclosure

The Department reserves the right to disclosure to, and consult on, any systems proposed for licensing with other parties of interest who may be affected, either technically or economically by the proposals. Precautions will be taken to preserve the confidentiality of any information which the Department receives from an applicant which is noted to be classified on a commercial, or proprietary basis.

The Department also reserves the right to discuss with other users of the radio frequency spectrum, or to release to them on demand and without prejudice, the technical parameters and performance characteristics of existing or proposed systems.

² In more complex situations, the mechanism by which this procedure could be implemented would involve in its initial stages a notice in the Canada Gazette of the general terms and conditions of the application. Where deemed feasible, certain proposals could also be developed by the Department for public comment in order to highlight policy and/or operational/regulatory concerns. Applicants would be required to prepare their applications and would also be free to make comments suggesting revisions or modifications. If revisions to the proposals are accepted then subsequent re-application by the original applicants to the "call" may be required. A revised and final version of the proposals by the applicants would then be made public in the Canada Gazette. The last phase in this process would involve the announcement of an authorization decision.

In a call for applications procedure, the disclosure of non-proprietary aspects of the original application along with a set of preconditions concerning its status with respect to other similar but subsequent applications may be presented to the public.

4. Summary

While these principles provide a general outline for consistent action/reaction to various proposals/situations that may be encountered, further consultations may in some cases be warranted and if so, contact should be made with the Spectrum and Orbit Policy Directorate in Ottawa.

