



ECCC-MSC-MDSD Response to ISED Consultation SMSE-009-21

**Consultation on Updates to the Licensing and Fee
Framework for Earth Stations and Space Stations in Canada**

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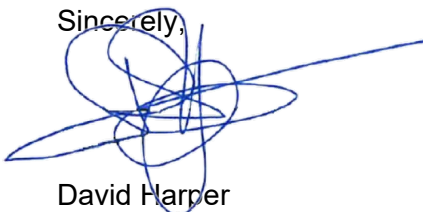
Innovation, Science and Economic Development Canada
Senior Director, Space Services and International
Engineering, Planning and Standards Branch
235 Queen Street (6th Floor, East Tower)
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To Whom It May Concern:

Attached are comments from Environment and Climate Change Canada's (ECCC) Monitoring and Data Services Directorate (MDSD), of the Meteorological Service of Canada Branch (MSC), in response to the *Consultation on Updates to the Licensing and Fee Framework for Earth Stations and Space Stations in Canada* (SMSE-009-21; *Canada Gazette*, Part I, August 2021).

MDSD thanks Innovation, Science and Economic Development Canada for the opportunity to provide comments on this consultation. Should ISED have any questions regarding MDSD's comments, please direct those inquiries to the MSC's Radio Frequency Coordinator, Alec Casey (alec.casey@ec.gc.ca).

Sincerely,

A handwritten signature in blue ink, appearing to read 'David Harper', with a long horizontal stroke extending to the right.

David Harper

Director General
Monitoring and Data Services Directorate
Meteorological Service of Canada
Environment and Climate Change Canada

1. Overview

Environment and Climate Change Canada's (ECCC) Meteorological Service of Canada (MSC) branch has a strong reliance on satellites for providing weather and environmental services to Canadians, including the provision of severe weather warnings to ensure the safety of life and property. Therefore, ECCC has a strong interest in this consultation, particularly with respect to proposals that could affect the licensing and fee framework for space and earth stations operating in the Meteorological-Satellite (MetSat) Service and the Earth Exploration-Satellite Service (EESS).

1.1. ECCC Fixed Earth Stations

The MSC's Monitoring and Data Services Directorate (MDSD) operates hundreds of fixed earth stations. Currently, MDSD operates two types of fixed earth stations:

- Data Collection Platforms (DCPs) – to support the transfer of environmental data from its remote weather, water and climate monitoring stations, and
- Direct Broadcast Ground Stations (DBGSSs) – to receive direct broadcasts of meteorological and environmental data disseminated in near real-time by MetSat and EESS space stations.

Data Collection Platforms

DCPs are small, transmit-only, fixed earth stations operating in the MetSat Service (401-403 MHz frequency band) that uplink environmental data from remote monitoring stations to space stations in either geostationary satellite orbit (GSO) or non-geostationary satellite orbit (NGSO). The satellites act as a 'bent-pipe' and downlink the meteorological and environmental data to centralized earth stations from which the data can be disseminated to operational centres in near-real time via traditional terrestrial internet networks.

MDSD operations are heavily reliant on the National Oceanic and Atmospheric Administration's (NOAA) Geostationary Operational Environmental Satellite (GOES) Data Collection System (DCS), for which there are several hundred uplink (Earth-to-space) channels in the 401.7-402.1 MHz frequency range. MDSD's National Hydrological Service and Atmospheric Monitoring Division currently operate > 1700 DCPs that utilize the GOES DCS. These DCPs are distributed across all Provinces and Territories, and are critical for relaying hydrological data for flood monitoring and forecasting, and surface weather data for severe weather forecasting and climate science. NOAA has indicated that it will continue to operate the GOES DCS on its next-generation GSO MetSats, providing continuity of this service into the early 2040s. MDSD will continue to operate these DCP earth stations for the foreseeable future as there are currently no viable and cost-efficient alternatives for retrieving data from its remote monitoring stations.

ECCC notes that its Provincial and Territorial partners also have a strong reliance on the GOES DCS for retrieving environmental data from their monitoring networks, including hydrological networks, traffic weather networks, and fire weather networks.

Direct Broadcast Ground Stations

DBGSSs are receive-only, fixed earth stations that receive "direct data broadcasts" from MetSat and EESS satellites. DBGSSs utilize parabolic antennas with typical diameters of 1.5 m to 7 m. These earth stations provide near-real time access to satellite data, which is critical for many ECCC operations, particularly the MSC's weather forecasting and numerical weather and environmental prediction (NWEF) services. Near-real time access to MetSat and EESS data are

critical for ensuring the MSC has the capability to provide timely and accurate severe weather warnings to safeguard the life and property of Canadians.

Currently, MDSD operates two DBGS networks, one to receive broadcasts from GSO networks and one to receive broadcasts from NGSO systems. MDSD's GSO DBGS network (a.k.a. "GOES network") receives direct data broadcasts from the NOAA GOES satellites, which operate in the MetSat service (space-to-Earth) allocation in the 1670-1698 MHz frequency band. MDSD's NGSO DBGS network (a.k.a. "POES network") receives direct data broadcasts from a variety of satellites including NOAA's Polar Operational Environmental Satellites (POES), the National Aeronautics and Space Administration's (NASA) Terra and Aqua satellites, and the European Organization for the Exploitation of Meteorological Satellites' (EUMETSAT) Meteorological Operational (Metop) satellites. These NGSO satellites downlink direct data broadcasts in the 1690-1710 MHz (MetSat), 7750-7900 MHz (MetSat), and 8025-8400 MHz (EESS) frequency bands.

MDSD's DBGSs are located across the country, including one NGSO earth stations in the High Arctic (Resolute Bay, NU). For its GSO DBGS network, earth stations are geographically separated to provide redundant reception of data from both the GOES-East and GOES-West satellites. For its NGSO DBGS network, earth stations are distributed across the country to ensure the station's reception masks provide complete coverage of the entire Canadian landmass and territorial waters.

MetSat operators (NOAA, EUMETSAT) have long-term plans to continue the dissemination of satellite data via direct data broadcasts to support the global weather forecasting community. Many new GSO and NGSO satellites are planned to ensure continuous operations through the early 2040s. MDSD therefore intends to continue to operate its DBGS networks for the foreseeable future. MDSD recently renewed its GSO DBGS network and is currently investing in its NGSO DBGS network to enable reception of next-generation NGSO meteorological satellites, whose direct data broadcasts will occupy a much larger bandwidth in the X-band (space-to-Earth) frequency allocation to accommodate the increasing data volumes to be generated by next-generation MetSat systems.

1.2. ECCC's interest in space stations

While ECCC does not currently operate any space stations and does not have existing plans to operate space stations, ECCC is heavily reliant on data provided by space-based Earth observation (SBEO) systems (i.e. MetSat and EESS satellites). While the MSC is critically reliant on direct broadcast data as described above, ECCC as a whole is reliant on many satellites beyond those from which data is received at MDSD operated earth stations. ECCC utilizes data and products generated by MetSat, EESS (active) and EESS (passive) systems. In particular, ECCC (like many Government of Canada departments) has a strong reliance on data from the RADARSAT Constellation Mission (RCM). RCM space stations are operated by the Canadian Space Agency (CSA) and fixed earth stations for the RCM ground segment are operated by Natural Resources Canada's (NRCan) Canadian Centre for Mapping and Earth Observation (CCMEO). ECCC is also strongly reliant on SBEO data from space stations operated by its international partners, particularly NOAA, the National Aeronautics and Space Administration (NASA), the European Space Agency (ESA) and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). While space stations operated by these partners are not licenced in Canada, and are thus outside of the scope of this consultation, these partners increasingly are striving to provide science and environmental data at reduced latencies.

Therefore, these partners have an interest in operating earth stations within Canada (or using commercial earth station services located in Canada) to support the near-real time downlink of science data, particularly for polar-orbiting NGSO satellites. MDSD could benefit greatly from reduced data delivery times from international satellites. Therefore, MDSD has an interest in ensuring the proposed framework would be beneficial to earth stations operated in Canada by its international partners.

1.3. Summary of MDSD's Position on the Consultation

At a high level, MDSD is supportive of the spectrum (consumption-based) licensing and fee framework proposed in the consultation and believes that its implementation to all satellite services can provide benefits to Canadians.

MDSD is particularly supportive of the fact that the proposed framework provides an incentive for the efficient use of radio spectrum, as this finite resource is in high demand and pressure continues to grow on radio spectrum used by scientific services on which MDSD's mission critical operations rely.

MDSD is also supportive of potential changes that could simplify or streamline the application process and management of radio licences for earth and space stations.

Finally, MDSD is supportive of ISED's objective of spurring innovation and growth in Canadian satellite services. MDSD could potentially benefit from enhanced satellite radiocommunication services that provide complete national coverage (including in the Arctic). Such systems could provide MDSD with options for alternative or redundant telemetry systems to retrieve data from its remote weather, water and climate monitoring stations.

2. Responses to questions of relevance to MDSD

Question 1:

1a) MDSD is supportive of ISED's proposal to use spectrum licences to authorize fixed earth stations within Canadian territory, with multiple earth stations authorized under a single licence. This proposed framework would simplify the management of MDSD's fixed earth station licences, particularly its numerous licences for DCP earth stations. The current use of apparatus-based radio licences results in significant fee distortion for MDSD's DCP earth station networks, particularly considering the very small amount of spectrum used by each individual earth station (300 Hz to 1.2 kHz) and that the full range of GOES DCS channels spans only 0.4 MHz. MDSD believes that the licensing of individual DCP earth stations, which are limited to a few commercial off the shelf (COTS) models of similar technical characteristics, is cumbersome and unnecessary. The use of a spectrum licence to authorize many (not necessarily identical) fixed earth stations would be welcomed by MDSD, particularly in the 401-403 MHz MetSat frequency band used for DCS. In general, MDSD would be supportive of spectrum licences for fixed earth stations operating in the MetSat and EESS services.

1b) MDSD is supportive of ISED's proposal for spectrum licences to be issued for a Tier 1 service area and have those licences authorize the radio service and frequency bands. For MDSD's DCPs and DBGSs earth station networks, for which earth stations are deployed nation-wide, licensing at a different Tier would dramatically and unnecessarily inflate licensing costs for MDSD operations, which provide safety of life and property services to Canadians. MDSD specifically supports the application of a Tier 1 service area for licenses issued for the MetSat and EESS

Services, noting that most users of these services operate multiple earth stations with a broad geographical distribution.

1c) MDSD supports the proposal to apply the general conditions of license listed in Annex A of the consultation to earth station spectrum licences.

Question 2:

2a) MDSD assumes that its DCP and DGBS earth stations, which operate in shared frequency bands (401-403 MHz, 1670-1710 MHz, 7750-7900 MHz, and 8025-8400 MHz), are considered earth stations requiring site approval. Under this assumption, MDSD is supportive of the proposal to implement spectrum licenses for earth stations that require site approval. MDSD reiterates that its earth stations contribute critical data to the MSC's weather services including services to support safety of life and property, and therefore the interference-free operation of these earth stations is essential.

2b) MDSD supports the proposal to collect and assess the technical information listed in annex B of the consultation as part of the site approval process, given that this information is required to conduct electromagnetic compatibility analyses and international coordination as outlined by ISED in paragraph 39.

Question 4:

MDSD believes that DCP and DBGS earth stations, operating in the frequency bands listed in our response to Question 2a, could be subject to spectrum licences that require site approvals.

Question 7:

MDSD notes that paragraph 62 indicates that sensor networks and environmental monitoring stations could be considered for generic spectrum licensing for fixed earth stations. If ISED believes this could apply to MDSD's DCP and DBGS earth station networks, MDSD would welcome further discussions with ISED to determine which approach (site-approved earth stations or generic earth stations) is most suitable for the MetSat and EESS allocations in the 401-403 MHz, 1670-1710 MHz, 7750-7900 MHz and 8025-8400 MHz frequency bands. MDSD reiterates that it is supportive of the concept of spectrum licensing over the existing apparatus based licensing framework, especially for the 401-403 MHz frequency band used for DCS operations.

Question 10:

As noted in Section 1.2, ECCC does not operate space stations but it does rely heavily on space stations operated by the Canadian Space Agency (CSA), particularly the RADARSAT Constellation Mission (RCM). ECCC and the CSA are also collaborating on the development of several proposed satellite mission concepts that could lead to the launch of new Canadian EESS and MetSat satellites beyond the RADARSAT program. We therefore encourage ISED to ensure that input is received from the CSA regarding the proposals related to applying spectrum licensing for space stations in non-communication satellite services.

Question 14:

14b) MDSD supports the proposal to allow communication with multiple GSO satellites on a single earth station spectrum licence, particularly in the 401-403 MHz MetSat allocation used for DCS. For MDSD's DCP earth station network, individual earth stations are assigned to transmit to either the GOES-West or GOES-East satellite, and requiring two separate licences (one for each of the GOES satellites) would unnecessarily double the cost of our spectrum licences.

14c) MDSD believes that there are cases in which an earth station spectrum licence should allow for communication with more than one NGSO system, particularly for certain receive-only earth stations. In the case of MDSD's NGSO DBGS network, there are multiple NGSO MetSats with separate ITU filings that operate direct data broadcasts at the same or overlapping frequencies. For example, NOAA's Joint Polar Satellite System (JPSS) missions, including the Suomi-NPP, NOAA-20, and planned JPSS-2/-3/-4 satellites all operate direct data broadcasts with a centre frequency of 7812 MHz (although the bandwidth of the direct data broadcasts varies from satellite to satellite, increasing over time as the instruments on those satellites evolve and generate more data). It would be unnecessary to require and charge for multiple spectrum licences to allow our DBGSs to receive direct data broadcasts from these NGSO satellites as they are already using spectrum efficiently and our receive only operations place no additional constraints on other users whether we receive data from one or all of those NGSO systems.

Questions 15 and 16:

MDSD is supportive of the proposals to utilize a consumption-based fee model for earth station spectrum licences, whether they are for site-approved or generic earth stations, as this provides incentive for the efficient use of spectrum.

MDSD has no objections to the proposed fees outlined in paragraphs 94 (site-approved earth stations) and 96 (generic earth stations). We note that this would result in substantial increases in the licensing costs of our DGBS earth station networks, but we expect that such increases would be offset by a potentially significant reduction in the total cost of licences for our DCP earth stations.

Question 19:

As noted in our response to Question 10, ECCC does not operate space stations but does rely heavily on space stations operated by the Canadian Space Agency (CSA). We therefore encourage ISED to ensure that input is received from the CSA regarding the proposal to assign a consumption-based fee for new spectrum licences for all other satellite services (including MetSat and EESS).

Question 21:

MDSD has no objection to the proposal to introduce a minimum annual spectrum licence fee of \$160 for earth stations and \$300 for space stations. However, MDSD does question how the amount of spectrum used would be calculated in the case of DCP and DBGS earth stations.

In the case of DCPs, MDSD has hundreds of earth stations deployed in the 401-403 MHz band, more specifically within the 401.7-402.1 MHz range used by the GOES DCS. These DCPs are deployed across dozens of DCS channels that do not necessarily occupy a contiguous chunk of spectrum. Under the consumption-based model, if MDSD were to licence the entire 0.4 MHz of spectrum used by the GOES DCS a licence would cost \$800/year. However, if a separate licence was required for each distinct DCS channel (most of which have a bandwidth of 300 Hz), each individual DCS channel licence would be subject to the minimum fee of \$160, and operating across more than 5 DCS channels (as is the case for MDSD which operates DCPs on dozens of DCS channels) would cause unnecessary inflation of the licensing costs. As NOAA assigns which DCS channels MDSD's DCPs are authorized to operate on, MDSD has no control over which channels its DCPs utilize. As a result, we suggest that for frequency bands such as the 401-403 MHz MetSat allocation, where many discrete but narrow spectrum channels are used, the licensee should be charged based on the range of frequencies across which earth stations

operate in that band, rather than charging for many discrete but narrow channels that would each incur the minimum spectrum licence fee. It would also not make sense for the licence to be charged based on the entire width of the MetSat allocation (401-403 MHz = 2 MHz), as the GOES DCS system as a whole uses only 20% of the spectrum in that allocation.

In the case of DBGSs, specifically for NGSO DBGSs, as outlined previously in our response to question 14c, earth station spectrum licences should be charged based on the total amount of spectrum used; there should not be additional charges to utilize a portion of spectrum to communicate with multiple NGSO systems that have identical or overlapping bandwidths for direct data broadcasts received at receive-only earth stations.

Finally, MDSD notes that as an organization with existing earth station radio licences, it would appreciate the opportunity to review and ensure the accuracy of its existing licences in advance of the transition to the spectrum based framework, should the proposed framework be implemented. MDSD's radio licences are currently distributed across a large number of Spectrum Management System accounts, as licences were originally applied for by staff distributed across various regional ECCC offices. This is particularly true for MDSD's DCP licences. MDSD would therefore appreciate the opportunity to work with ISED to centralize its DCP earth licences into a single national account and a single resulting spectrum licence.

Question 24:

At this time, MDSD is not aware of any potential need for developmental licences in the frequency bands in which it operates fixed earth stations. However, we note that it is plausible that developmental licences could be requested in some bands in which MDSD's mission critical services operate, particularly for the co-primary EESS and Space Operations Service allocations in the 401-403 MHz frequency band used for DCS. Should developmental licences be considered in this frequency band (or in the bands used for the direct broadcast of MetSat and EESS data, i.e. 1690-1710 MHz, 7750-7900 MHz, and 8025-8400 MHz), it is imperative that such developmental licences do not impose constraints or cause interference to MDSD's mission critical systems (DCPs and DBGSs) that provide services for the safety of life and property of Canadians. MDSD therefore proposes that if developmental licences are to be considered in the 401-403 MHz, 1690-1710 MHz, 7750-7900 MHz, or 8025-8400 MHz frequency bands that they be issued on a no-interference, no-protection basis.

MDSD also supports ISED's comment in Paragraph 121 that developmental licences would not be appropriate for the authorization of frequencies used for satellite Tracking Telemetry & Command (TT&C).

Question 25:

MDSD supports the proposal to apply a prorated fee for licences issued part-way through a licensing year.

Question 27:

MDSD has no objection to the proposed service standards outlines in paragraphs 129-132. In particular, MDSD supports the shorter (7 week) duration for adding sites under an existing site-approved earth station licence.