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Supplementary Information

Written submission from SRB Technologies (Canada) Inc.

In the Matter of the

SRB Technologies (Canada) Inc.

Application for the renewal of the licence for SRBT Facility

Commission Public Hearing

April 27, 2022

Renseignements supplémentaires

Mémoire de SRB Technologies (Canada) Inc.

À l'égard de

SRB Technologies (Canada) Inc.

Demande de renouvellement de permis pour l'installation de SRBT

Audience publique de la Commission

27 avril 2022

Canada

Table of Contents

1. Introduction

SRBT submitted our original Commission Member Document (CMD) to the Registrar in support of the application for renewal of NSPFOL-13.00/2022 on January 14, 2022. A total of sixteen (16) public submissions have been filed, representing a varied range of positions with respect to the request for renewal of this licence.

In light of the low number of requests for oral presentations, the Commission revised the hearing schedule from two days to one day, and decided to hold the hearing virtually, instead of going in the community.

Our team has worked tirelessly throughout the course of the last several decades, in order to:

- continuously improve all aspects of our operations,
- reduce our impact on the environment,
- increase the amount of information that we share with the public,
- ensure full compliance with regulatory requirements,
- be a positive contributor to our local communities, and
- achieve the highest levels of safety performance by a major nuclear licensee in Canada.

We feel that the low number of requests for oral presentations, and the low number of written submissions with concerns reflect a contrasting position on the renewal, is a direct result of that hard work.

We feel that the results of this work are clearly illustrated in our licence application, in our original CMD, and in CNSC staff's CMD. We also feel that this work will never cease; we will always strive to improve in every area, and ensure the highest level of safety for our workers, our neighbours in our community, and our shared environment.

The purpose of this supplementary CMD is to highlight a selected number of key themes or statements from the various public submissions, and to offer additional information and data where warranted, in order to ensure that the Commission is provided with a complete perspective of issues raised going in to the hearing process.

2. Tritium and Risk

REFERENCES: CMD 22-H8.3 and CMD 22-H8.10

The authors of both CMDs H8.3 and H8.10 have put forth several points that share common themes, including questioning the relative radiological risks to persons posed by tritium, and the impact of the operation of the SRBT facility on our community and our shared environment.

When calculating the effective dose to workers and the public, SRBT incorporates accepted and recommended dosimetric parameters for any given receptor, including dose coefficients and conservative behavioural data for adults, children and infants, as recommended by CSA standard N288.1-14, *Guidelines for derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities.*

These dose coefficients are based on several factors, including the noted relative biological effectiveness (RBE) for tritium, which has been established by expert international organizations as a value of one, as both authors note.

The author of CMD 22-H8.10 cites several studies that suggest that consideration of tripling the RBE for tritium is perhaps warranted. If this change were to be implemented by the international radiation protection community, it is important to note that calculated effective doses to workers and to the people in our community due to SRBT operation would remain extremely low.

Ensuring that the public is kept well-informed of the impact of our operations on the community is an important part of our identity.

Submissions H8.3 and H8.10 both put forth several recommendations that are wide-ranging and varied in nature, most of which are beyond the scope of the process of SRBT licence renewal.

SRBT would like to take this opportunity to directly address one of these recommendations, which we find to be alarmist.

In CMD 22-H8.10, the author notes in paragraph 70, item (viii);

> *"...local women intending to have a family, and families with babies and young children should consider moving elsewhere. It is recognised this recommendation may cause concern but it is better to be aware of the risks to babies and young children than ignorant of them."*

As a proud member of the Pembroke community, we take exception to this unfounded assertion. The risk to any person in our community due to the operation of the SRBT facility is exceedingly low, even when considering all added conservatisms and hypotheticals.

Calculated doses to members of the public are based on the highest real-world measurements of tritium in the local environment during any given year. These measurements are independently verified by a third-party laboratory every year.

Dose calculations incorporate 95th-percentile intake rates of produce, milk, water and air for all characterized persons, including children and infants. True effective doses to any given member of the public are very likely to be much lower than the figure presented every year as part of our compliance reporting, due to these conservatisms.

Independent environmental monitoring performed by CNSC staff has, on multiple occasions, verified and confirmed the exceedingly low impact of our operations on the community. We have also gone to great lengths to expand our understanding of the conditions in the local environment through supplementary studies associated with the Environmental Risk Assessment.

Even if one were to account for and accept the author's position that the relative risks associated with tritium are higher than what is currently acceptable, there is absolutely no credible scientific basis upon which the author of CMD 22-H8.10 should make such a claim.

As part of our Public Information Program, information on the risks associated with operation of our facility is openly shared with the members of our community every year, through our website and various information products, including our safety pamphlet.

This pamphlet includes descriptions of our company, our manufacturing processes, and the line of safety products that we sell internationally. The pamphlet also includes detailed information on tritium, its effects on the environment and the public, and on our groundwater and environmental monitoring program activities.

We provide easy-to-understand data illustrating the relative risks associated with operations for both workers and members of the public. This pamphlet is updated every year, typically around the same time as the release of our Annual Compliance Report. Contact details are provided for any person who would like additional information or a tour of our facility.

This year's edition of our safety pamphlet was delivered door-to-door to nearby residences on April 1st, a date that was advanced in consideration of the upcoming licence renewal hearing, and the intervenor's comment discussed above. SRBT ownership and staff does not want any local women intending on having a family, and families with babies and young children to unduly be worried about living near the facility.

3. Application of Conditional Clearance Levels

REFERENCE: CMD 22-H8.3

Beginning on page 5 of submission CMD 22-H8.3, the author provides extensive comment on several aspects of SRBT's Waste Management Program (WMP), and on the process of providing device end-users with a safe and reliable method of return and disposal of expired safety signs.

One of the key aspects of the program that the author discusses is the application of conditional clearance levels (CCL) to certain defined waste materials, for the purposes of effective, risk-informed waste management.

The concept of a CCL is described in CSA Standard N292.5, *Guideline for the exemption or clearance from regulatory control of materials that contain, or potentially contain, nuclear substances*.

Within this standard, the definition of a CCL is documented as:

> *"…the total activity or activity concentration (activity per unit mass or activity per unit area) of a radioactive nuclear substance in a material below which the material is suitable for release to a specified disposition path (i.e., a defined recipient for disposal, re-use, or recycling of the material). With respect to its application in the NSRDR, "conditional clearance level" means an activity concentration that does not result in an effective dose (a) greater than 1 mSv in a year due to a low probability event referred to in the IAEA RS-G-1.7; or (b) greater than 10 μSv in a year."*

The SRBT CCL (in effect since 2018) is as follows: material that is assessed as exhibiting less than or equal to 0.15 MBq per gram of material may be disposed of through conventional waste pathways, to a limit of 5,000 kg per year, per disposition pathway. The SRBT CCL has been reviewed and accepted by CNSC staff as part of the overall WMP.

Eligible materials for the application of the clearance assessment include a category of waste articles designated as very-low level radioactive waste (VLLW), such as materials that have been physically used in active areas of the facility (i.e. waste paper, recyclable metals, containers, very mildly-contaminated disposable protective clothing).

Expired light sources, crushed glass light source pre-form stubs, and other significantly contaminated items are not eligible to be assessed for clearance, and are automatically routed to a licensed waste management service provider.

The SRBT CCL is based on pathways modelling of exposure scenarios that would lead to the most-exposed persons. The CCL, if applied, must clearly be shown to lead to effective doses that fall below the maximum annual effective dose as described in the standard (10 μSv per year / 1 mSv per year for low probability events).

The pathway modelling scenarios utilized is SRBT's CCL analysis are based upon two specific scenarios described in IAEA Safety Report Series No. SRS-44, *Derivation of Activity Concentration Values for Exclusion, Exemption and Clearance*. SRS-44 is specifically referenced in N292.5 as an acceptable methodology for modelling exposure scenarios in support of CCL development.

The author of CMD 22-H8.3 notes that SRBT's application of CCLs:

> *"…is allowing material contaminated with tritium to be deposited in landfills without protective measures, etc., and thus without proper accounting or protection of the environment"*, and that it *"fails to protect public health and safety"*.

Any material that undergoes the process of clearance at SRBT is fully accounted for, and upon disposal, does not pose a significant health and safety risk to any member of the public in any scenario. The specific activity of any material is conservatively calculated based upon multiple sample data points, and extensive records are retained of clearance test results and disposition paths, along with quality control data.

The processes that govern the application of CCLs are mature, and robustly controlled in order to provide assurance that the associated risk to persons and the environment are acceptable.

If the maximum allowable mass of material was disposed of through a pathway at the maximum allowable specific activity in a year, the resultant realistic and low-probability doses to persons fall well short of the dose thresholds identified in the N292.5 standard. Typically, SRBT disposes far less mass, and at much lower specific activities, than those analyzed as acceptable for the purposes of CCLs.

Another key assertion by the author of this CMD is that:

> *"…the cumulative impacts that this waste will have is not being considered or taken into account. Nor is there any recognition of the half-life of tritium, 12.3 years. So the radioactive waste keeps piling up with time, as relatively little will decay"*.

These statements are not correct. In establishing and justifying the CCLs, SRBT modelled what the cumulative effects on exposed persons could be over long periods of time if the maximum amount of mass and activity was added to a landfill every year.

For a CCL of 0.15 MBq per gram, to a total of 5,000 kg in a year, the maximum activity that could theoretically be introduced to a landfill in any year equates to 750,000 MBq. The CCL analysis shows that under no circumstances would the annual effective dose to any person exceed prescribed limits (1 mSv per year) for low-probability events, nor would it exceed the 10 µSv threshold for realistic scenarios.

Even if one were to neglect all other factors except the natural decay rate of tritium, and if the landfill were to remain open indefinitely and accept the maximum activity under the SRBT CCL every year without fail, the total landfill inventory of tritium would reach equilibrium conditions

(about 13.7 TBq) in approximately 120 years (equilibrium would be when annual waste addition balances the annual decayed activity).

Under these extremely conservative, purely hypothetical conditions, the annual dose to a worker at a landfill in the equilibrium state would be on the order of 0.20 mSv, or around 20% of the 1 mSv limit.

Note that in any given year, the amount of material typically processed as clearance-level waste is far lower than the defined limits. For example, in 2021 a total of 2,850 kg of material was cleared to landfill, with a total activity of 37,050 MBq (less than 5% of the theoretical maximum). The associated risk is therefore far lower than the limiting cases analyzed in support of implementing the CCLs.

The application of the process of conditional clearance is an effective, safe and risk-informed waste management practice.

4. Annual Compliance Reports

REFERENCE: CMD 22-H8.14

In section 2 of CMD 22-H8.14, the author provides several comments on the content and format of SRBT's Annual Compliance Reports (ACR), as well as commentary on the application of the Safety and Control Area (SCA) framework for both reporting and compliance performance evaluation.

The author notes that "***the current ACR content is challenging to review because of unnecessarily excessive content requirements, over 300 pages for an annual summary***".

The breadth and depth of content that is included in our ACR each year is determined by three key factors:

1. The applicable requirements and guidance described in REGDOC-3.1.2, *Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills*,

2. Information that SRBT has evaluated as important for inclusion, based upon recent and historical input from key stakeholders and members of the public.

3. Information that is incorporated into the ACR, based upon feedback and requests received from CNSC staff each year after review and comments are provided on the report submitted for the previous year.

In particular, the trend towards increasing volume of information provided in our ACR over the last two decades has been driven primarily by the feedback, questions and comments received from CNSC staff and the public.

Each year, comments are received that request additional information, data and clarification, in support of review and acceptance of the report. This often requires SRBT to publish an addendum to the ACR, which we submit to CNSC staff, as well as publish alongside the original report on our website.

If the request involved information or data that is generated annually, that information and data will then be incorporated into the ACR going forward every year.

The intervenor states that the SRBT ACR "is challenging to review because of unnecessarily excessive content requirements". Although the typical ACR is a relatively large document, SRBT counters that the open sharing of such a wide variety and depth of operational and safety data is an important part of a successful public outreach program.

The purpose of the ACR, in this case, is two-fold. Primarily, the report is of course aimed at demonstrating compliance with regulatory requirements to the CNSC; however, in addition to this, the document represents an important conduit of information to people in our community, and interested stakeholders.

5. Safety Considerations of Nearby Facilities

REFERENCE: CMD 22-H8.14

In section 3 of CMD 22-H8.14, the author provides several technical comments on the potential impact of an accident scenario at a propane transfer facility near SRBT.

This facility is located approximately 250 metres due east from SRBT. The facility includes one main storage tank (49,000 USWG capacity), as well as a much smaller nurse tank (2,000 USWG) for emptying transit containers, within a secure fenced-in compound. Propane delivery trucks frequent the facility, for distribution to customers in Pembroke and area.

The fenced-in compound is also used to store a small number of older propane tanks (i.e. transient containers) that have been emptied to the nurse tank, and taken out of service for ultimate recycling or disposal. These tanks are stored well away from the main storage and nurse tanks.

During the 2017 revision of the SRBT Safety Analysis Report (SAR), the organization that operates this facility was contacted to inquire about the safety case for this location. The organization provided SRBT with the *Risk Assessment Summary Report* on file for this facility, from which the data on the subject was included in the SRBT SAR.

A Level 2 *Risk and Safety Management Plan* has been implemented and documented by the proprietor, in accordance with the established guidelines of the regulatory body for this type of facility (Technical Standards and Safety Authority (TSSA)).

Within this plan, risk factors are established for different types of loss of containment (LoC) accidents, including vapour cloud explosions (VCE) and boiling liquid evaporation vapor explosions (BLEVE), in consideration of the design, safety features and storage capacity of the facility, and the general characteristics of the impacted area (i.e. population density and commercial / industrial presence).

The overall risk is defined in terms of both the probability of a given accident occurring at the transfer facility, and the probability of a fatality in such an event within a certain radius from the facility, in accordance with criteria defined by the Major Industrial Accidents Council of Canada (MIACC).

The analysis incorporates conservative assumptions, such as the storage tank being filled to maximum capacity at the time of a given accident, and that tank failure occurs when liquid temperature and pressures result in the worst-case consequences.

The risk of a fatality occurring during a given accident scenario is one of the two elements in the determination of risk. These figures are provided in Table 5 from the *Risk Assessment Summary Report,* which is presented here to illustrate the relationship between distance from the transfer facility, and the probability of a fatality in the case of five different types of industrial accidents at the transfer facility.

Table 5: Consequence Results for Risk Analysis

Distance (m)	Probability of Fatality (%)				
	Flash Fire/VCE Medium LoC	Flash Fire/VCE Large Horizontal LoC	Flash Fire/VCE Large Vertical LoC	Flash Fire/VCE Massive LoC	BLEVE Fireball
0 - 100	100	100	100	100	100
120	0	100	100	100	52
140	0	100	100	100	44
160	0	100	100	100	35
180	0	100	100	61	27
200	0	100	100	61	20
220	0	100	100	42	14
240	0	100	60	42	10
260	0	100	60	41	6
280	0	100	60	40	4
300	0	100	60	40	2
320	0	100	60	40	1
340	0	0	60	40	1
360	0	0	60	40	0
380	0	0	40	40	0
400	0	0	0	0	0

The distance of 240 m is highlighted here, as this is taken to be representative of the distance between the transfer facility and SRBT.

Note that for Flash Fire events (first four columns), the distances are directional in nature (i.e. there will be a specific impact on persons at those distances if in the direction that the

fire/explosion occurs) while the BLEVE distances in the final column are radial in nature (the impact is expected at this distance in all directions).

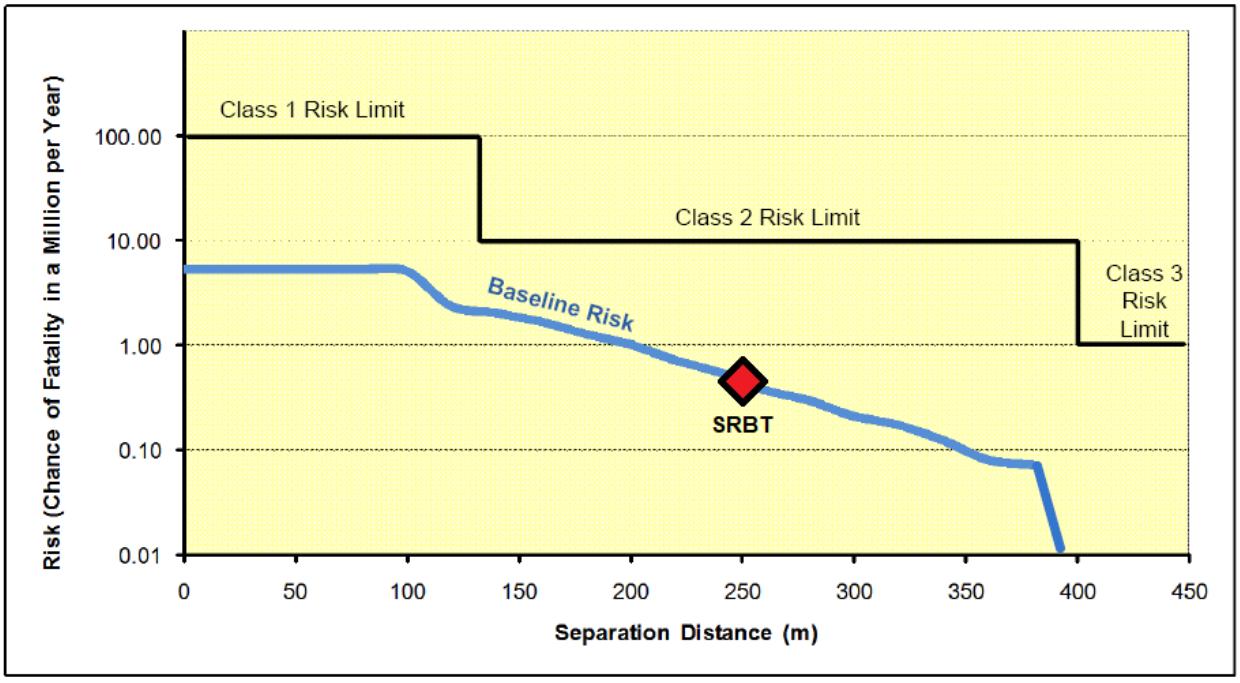
The probability of any of these accidents taking place, considering the safety designs and features of the transfer facility in question, is the second element in the overall risk assessment. The Risk Assessment Summary Report includes these analyzed probabilities in Table 6 of the report.

The data from Table 6 is presented below. We can also express these frequencies as the equivalent number of years that would be expected to pass before we expect one such event to take place, which we have included in the right-hand column.

Hazard	Frequency (Occ./year)	Expected Years per Event
BLEVE/Fireball	4.1×10^{-6}	243,902 years
Medium Flash Fire/VCE	8.8×10^{-7}	1,136,364 years
Large Flash Fire/VCE – Horizonal LoC	4.8×10^{-8}	20,833,333 years
Large Flash Fire/VCE –Vertical LoC	4.8×10^{-8}	20,833,333 years
Massive Flash Fire/VCE	1.3×10^{-7}	7,692,308 years

Combining the hazard frequencies, the probability of fatality, and the distances and characteristics of the land usage surrounding the transfer facility, a risk summary curve is generated that leads to the conclusion that the risk is below the MIACC Risk Assessment Criteria risk limits, and no additional mitigation is required on behalf of the facility operator.

The risk summary curve is presented here, including a highlighted point on the curve showing the distance at which the SRBT facility is located.



The SRBT SAR notes that *"If an emergency situation were to develop at…these facilities, the respective emergency plans…include provisions for SRBT to be notified".*

The emergency plan for the propane transfer facility includes SRBT in a table of emergency phone numbers of neighbours to be contacted if a potential accident scenario were developing. The plan includes both the SRBT landline as well as the cell phone number of the President.

It is fully expected that if a fire situation were to develop at the site necessitating evacuation, the Fire Department or police would implement the evacuation if not already done so by SRBT management or the operator of the transfer station.

The author of CMD 22-H8.14 also suggests that additional deterministic consequence analysis be integrated into the SRBT SAR in order to predict the consequences of a BLEVE on the facility. In the event such a low-probability event were to take place, the SRBT facility could indeed potentially be impacted by blast wave overpressure, thermal radiation from a fireball, and missile impact.

The SRBT SAR states that "*any interaction between the physical effect of the worst-case accident and nuclear substances in the facility is expected to be bounded by the analysed worst-case scenarios for the SRBT facility alone, from the point of view of radiological hazards to workers, the environment and the public*".

The SRBT facility design **does not** incorporate nor require 'active' safety systems in its design (i.e. systems or components that must be continuously functional in order to ensure safety, such as a reactor cooling or shutdown system). For example, even if electrical power was lost for a prolonged period of time, there would be no impact on the radiological safety of the public.

As noted in the SAR, any major damage to facility structures, systems and components would not be expected to result in consequences that – from the point of view of nuclear or radiological safety – would exceed the analyzed scenarios in the current SAR, which includes a tornado destroying the facility, a rogue vehicle striking the facility with maximum consequence, and the accidental release of an entire bulk container of tritium.

As well, the author's discussion on the application of the concept of design basis accident (DBA) in the SRBT safety case is acknowledged. The physical nature of SRBT's facility and operations is such that a ground-level release of the entire inventory of tritium as tritium oxide is virtually impossible.

The conditions that could feasibly lead to an event causing 100% conversion of the facility inventory of molecular tritium gas and stored metallic tritide into the oxide state, with this inventory released at ground level, are certainly beyond the design basis of the facility.

There is no operations-based accident scenario that could reasonably be expected to cause this condition – the complete conflagration and destruction of the facility would need to occur in a very short period of time. It is reasonable to note that any such event that somehow led to 100% conversion of the facility tritium inventory into oxide would undoubtedly result in a release that was very atmospheric in nature.

Nonetheless, the author's points are acknowledged and appreciated, in that the facility safety analysis could be improved to include more detail in these areas. SRBT will certainly take these points into consideration during the next review and revision cycle for the SRBT SAR, scheduled for November 2022.

It is also expected that the CNSC may have published REGDOC-2.4.4, *Safety Analysis for Class IB Nuclear Facilities* by that time. As of the date of submission of this CMD, the Commission is scheduled to consider the latest draft of this REGDOC for publication at a meeting on June 28, 2022.

SRBT participated as an industry reviewer of this REGDOC, and provided feedback and comments on its content. Once published, it is expected that this REGDOC will be incorporated as compliance verification criteria in our Licence Conditions Handbook, and that it will be the standard against which the SRBT SAR will be reviewed and accepted.

The draft REGDOC includes many of the safety analysis concepts that the author of CMD 22-H8.14 discusses; as such, many of his points are expected to be addressed once SRBT integrates that REGDOC into the SAR.

6. Indigenous Engagement

REFERENCES: CMD 22-H8.8 and CMD 22-H8.15

We appreciate the contributions of both the Algonquins of Ontario (AOO) and the Algonquins of Pikwakanagan First Nation (AOPFN) to the discussion on the subject of the renewal of our operating licence.

Over the past few years, SRBT has been working very hard to increase both the quantity and quality of meaningful engagement with interested Indigenous stakeholders. In particular, we have begun to integrate and consult with the AOPFN and their community members, with respect to the scope of our environmental monitoring activities in the area. As noted in CMD 22-H8.8, the SRBT facility is located within the traditional territory of AOPFN.

We are proud of the collaboration that took place during the sampling campaign supporting SRBT's Environmental Risk Assessment in 2020, which was conducted by a team of four persons – two SRBT representatives led by two AOPFN knowledge holders, who welcomed our representatives into the community and openly shared insights on the plant materials sampled, and their importance and use in the AOPFN community.

We also appreciated that the AOPFN shared valuable information on key ecosystem components that were selected and incorporated in the SRBT ERA. In particular, the selection of the Lake Sturgeon (*Anishinàbemowin*), Blanding's turtle (*mikinàk*) and the Butternut Tree (*pagànàkominaganj*) as bounding valuable ecosystem components in the study were the direct result of this sharing of knowledge.

We recognize that an open, strong and mutually-governed relationship with the AOPFN is important. We continue to work towards improving our relationship, to learning about AOPFN cultural and spiritual values, and to ensuring that resources are protected.

Two virtual meetings have recently taken place (February 1 and 23, 2022) between the AOPFN, SRBT, and the Firelight Research Group, where discussions have begun towards establishing a framework towards a long-term relationship agreement (LTRA).

As well, proposals on taking some of the first steps towards an enhanced relationship have been exchanged.

On February 24, SRBT requested that the AOPFN provide a quote for the provision of AOPFN's Cultural Awareness Training for 20 employees, to be performed as soon as possible.

We feel that this training would be a critical first step in building the relationship, and are hopeful to receive details on this offered service in the near future.

We look forward to continuing to learn and understand how our facility and our team can positively and effectively contribute to the development of our relationship with the AOPFN in the coming years.