



Natural Resources
Canada

Ressources naturelles
Canada

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Our file: A-2022-00382 / JOB

August 8, 2023

Susan O'Donnell

Dear Susan O'Donnell:

This is in response to your request made under the *Access to Information Act*, which was received in our Department on December 28, 2022 and reads as follows:

“All communications received by the Minister, Deputy Minister, Associate Minister or Directors in the Department with respect to the "recycling" or "reprocessing" of nuclear fuel waste (irradiated nuclear fuel, spent fuel, CANDU fuel) including as may be undertaken in conjunction with nuclear research or small modular reactors generated between January 1, 2016, and Present December 28, 2022. Include those communications generated within the department and those received from other federal departments, regulatory bodies and contracted entities, including but not limited to Natural Resources Canada, the Canadian Nuclear Safety Commission, Atomic Energy Canada Limited and Canadian Nuclear Laboratories, and any private sector entity or agent including but not limited to the Canadian Nuclear Society, Canadian Nuclear Association, CANDU Owners Group or others.”

Enclosed is the first package of documents that are relevant to your request.

You will notice that certain information has been withheld from disclosure in accordance with the exemptions or exclusions described in sections 15(1) I.A., 19(1), 20(1)(b), 21(1)(a), 21(1)(b), and 69(1)(g) re (a) of the *Act*. We have enclosed the texts of these sections of the *Act* for your information.

The second package of documents will be sent to you once final recommendations regarding their disclosure have been received.

Please be advised that you are entitled to complain to the Information Commissioner concerning the processing of your request within 60 days after the day that you become aware that grounds for a complaint exist. In the event you decide to avail yourself of this right, your notice of complaint should be addressed to:

The Information Commissioner of Canada
30 Victoria Street
Gatineau, Quebec K1A 1H3
Telephone: (613) 995-2410 (National Capital Region)
1-800-267-0441 (Toll-free)

Should you have any questions regarding this request, please do not hesitate to contact Julie O'Bryan at 343-543-5022 or by e-mail at julie.obryan@nrcan-rncan.gc.ca.

Sincerely yours,

Nikolina Vaskovic

for: Ami Najm
Director
Access to Information and Privacy

Enclosures: Pages 1 to 70

Access to Information Act

Exemptions and Exclusions

15(1) I.A. INTERNATIONAL AFFAIRS

The head of a government institution may refuse to disclose any record requested under this Act that contains information the disclosure of which could reasonably be expected to be injurious to the conduct of international affairs.

19(1) PERSONAL INFORMATION

19. (1) Subject to subsection (2), the head of a government institution shall refuse to disclose any record requested under this Act that contains personal information as defined in section 3 of the Privacy Act.

20(1)(b) FINANCIAL, COMMERCIAL, SCIENTIFIC OR TECHNICAL INFORMATION GIVEN IN CONFIDENCE TO THE GOVERNMENT AND TREATED IN A CONSISTENTLY IN A CONFIDENTIAL MANNER BY THE THIRD PARTY

(b) financial, commercial, scientific or technical information that is confidential information supplied to a government institution by a third party and is treated consistently in a confidential manner by the third party;

21(1)(a) ADVICE OR RECOMMENDATIONS

(a) advice or recommendations developed by or for a government institution or a minister of the Crown;

21(1)(b) CONSULTATIONS OR DELIBERATIONS

(b) an account of consultations or deliberations involving officers or employees of a government institution, a minister of the Crown or the staff of a minister of the Crown,

69(1)(g) re (a) ANY RECORDS MAKING A REFERENCE TO (A)

Records that contain information about the contents of any record within a class of records referred to in paragraphs (a).

From: [Brady, Daniel](#)
Sent: March 8, 2022 11:30
To: [Hannah, Justin](#); [Marrison, Curtis](#)
Subject: FW: Notes: Moltex + Reprocessing
Attachments: Brief - Memo to MINO - Reprocessing 22-June-2021.doc;
Brief - Memo to DM - Reprocessing 5 Oct 2021.doc; 193186 -
Attachments 1 to 5 - DM BRIEF REPROCESSING.pdf; 193186 -
Clean November 1 - Memo to DM for Information - Status of
Reprocessing.docx; 191321 - Clean May 5 - Scenario Note
OCNI-Moltex Webinar 2021-05-10.docx; 185040 - MIN
Meeting NB and Moltex.doc; 186824 - MEETING NOTE - DMA
Meeting with Moltex Rory O Sullivan - 2020-05-20.docx

Info on Moltex

From: de la Chevrotière, Antoine <antoine.delachevrotiere@NRCan-RNCan.gc.ca>
Sent: March 8, 2022 10:47
To: Brady, Daniel <daniel.brady@NRCan-RNCan.gc.ca>
Subject: Notes: Moltex + Reprocessing

Hi Dan,

See attached (and below) for the notes we've prepared re: Moltex and reprocessing.

MOLTEx

191321 - Clean May 5 - Scenario Note OCNI-Moltex Webinar 2021-05-10.docx

<https://gcdocs.gc.ca/nrcan-rncan/llisapi.dll/link/60843031>

186824 - MEETING NOTE - DMA Meeting with Moltex Rory O Sullivan - 2020-05-20.docx

<https://gcdocs.gc.ca/nrcan-rncan/llisapi.dll/link/52010642>

185040 - MIN Meeting NB and Moltex - 2020-01-28.doc

<https://gcdocs.gc.ca/nrcan-rncan/llisapi.dll/link/52009833>

REPROCESSING

Brief - Memo to DM - Reprocessing 5 Oct 2021.doc

<https://gcdocs.gc.ca/nrcan-rncan/llisapi.dll/link/64991312>

Brief - Memo to MINO - Reprocessing 22-June-2021.doc

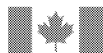
<https://gcdocs.gc.ca/nrcan-rncan/llisapi.dll/link/64937518>

193186 - Clean November 1 - Memo to DM for Information - Status of Reprocessing.docx

<https://gcdocs.gc.ca/nrcan-rncan/lisapi.dll/link/65279201>

193186 - Attachments 1 to 5 - DM BRIEF REPROCESSING.pdf

<https://gcdocs.gc.ca/nrcan-rncan/lisapi.dll/link/65280417>

**SCENARIO NOTE TO THE ASSOCIATE DEPUTY MINISTER****ORGANIZATION OF CANADIAN NUCLEAR INDUSTRIES-MOLTEx WEBINAR**
REMARKS AND EVENT DETAILS**EVENT DETAILS**

- **DATE/TIME:** May 10, 2021, 11:00 a.m.–12:30 p.m. EDT
- **LOCATION:** Virtual
- **PARTICIPANTS:**
 - Rory O'Sullivan, Chief Executive Officer, Moltex Energy
 - Mike Holland, Minister of Natural Resources and Energy Development, New Brunswick
 - Jim Ward, North Shore Mi'kmaq District Council
 - Andy Hayward, Chief Nuclear Engineer and Director of Advanced Reactor Development, New Brunswick Power (NB Power)
 - Andy Ballard, Project Director, Moltex Energy
 - Simon Newton, Corporate Development Director, Moltex Energy
 - Biyash Bhattacharya, Research and Development Manager, Moltex Energy
 - Jose Zuniga, Research and Development Chemist, Moltex Energy
 - Ryan Brown, Mechanical Engineering, Moltex Energy

DESCRIPTION OF EVENT

- This webinar will be held jointly by the Organization of Canadian Nuclear Industries and Moltex, to discuss their project to develop a molten salt small modular reactor (SMR) and spent fuel recycling technology in New Brunswick, the recent announcement of the Government of Canada's \$50.5-million investment in this project, and the company's plans for the future.
- This webinar, titled "Moltex: Progress and Plans", will discuss the benefits that this project will bring to New Brunswick, including supply chain growth and creation of highly skilled jobs.

ASSOCIATE DEPUTY MINISTER'S ROLE

- You will be delivering five-minute remarks on the following topics:
 - The Government of Canada's support for SMRs, and their role in fighting climate change, and helping Canada meet net-zero goals;
 - The Government of Canada's funding for Moltex's technology, a clean energy solution for New Brunswick that recycles nuclear waste; and
 - Social, environmental and economic benefits of new nuclear in New Brunswick.

RUN OF SHOW

- Erin Polka from Moltex will open the session and introduce the ten panellists. Each panellist will be allocated five minutes for their remarks in the following order:
 1. The Honourable Mike Holland (New Brunswick) – Province of New Brunswick's excitement over SMRs, support for Moltex technology, waste recycling, economic benefits.

2. Associate Deputy Minister Tupper (Natural Resources Canada) – Please see remarks below.
3. Jim Ward (North Shore Mi'kmaq District Council) – North Shore Mi'kmaq District Council-Moltex partnership, Indigenous opportunities, importance of early engagement.
4. Andy Hayward (NB Power) – NB Power-Moltex relationship, activities, support for SMR cluster in New Brunswick.
5. Rory O'Sullivan (Moltex) – Words of gratitude to previous speakers, high-level overview of company, technology, opportunities.
6. Andy Ballard (NB Power) – Moltex's Stable Salt Reactor-Wasteburner progress and plans.
7. Simon Newton (Moltex) – Moltex's Waste to Stable Salts progress and plans.
8. Biyash Bhattacharya (Moltex), Jose Zuniga (Moltex), and Ryan Brown (Moltex) – Moltex employee perspectives.

EVENT GOALS/OBJECTIVES

- Participation in this event has two objectives:
 - Emphasize the federal government's \$50.5 million investment into the Moltex project in New Brunswick, as well as supporting investments in New Brunswick, to the stakeholders in attendance, including the New Brunswick government, Indigenous organizations, power utilities, and the nuclear industry.
 - Emphasize the progress that the federal government is making on advancing SMRs in Canada, following the launch of Canada's SMR Action Plan in December 2020.

KEY BACKGROUND

Government of Canada Funding for Moltex

- On March 18, 2021, the Government of Canada announced \$50.5 million in funding toward a \$97.6-million project by Moltex to develop a "Stable Salt Reactor-Wasteburner" SMR technology to potentially produce emissions-free energy through the "Waste to Stable Salts" process that recycles existing nuclear fuel waste to fuel the production of clean energy.
 - Funding will be provided to Moltex through Innovation, Science and Economic Development Canada's Strategic Innovation Fund and the Atlantic Canada Opportunities Agency's Regional Economic Growth through Innovation program.

Additional Support for SMR Development in New Brunswick

- On March 18, 2021, the Atlantic Canada Opportunities Agency announced funding for the following SMR development initiatives in New Brunswick:
 - \$5 million to help NB Power prepare the site at its Point Lepreau location for SMR deployment and demonstration.
 - \$562,000 to help the University of New Brunswick's Centre for Nuclear Energy Research expand its capacity to support SMR technology development in New Brunswick.
- In 2018, Moltex, along with ARC Nuclear, partnered with the province of New Brunswick and NB Power to form a nuclear research cluster. Each vendor is contributing \$5 million, with the province of New Brunswick contributing \$10 million for a total of \$20 million.

Strategic Innovation Fund Net-Zero Accelerator

- In December 2020, the Government of Canada announced the creation of the Net Zero Accelerator, which will provide \$3 billion over five years through the Strategic Innovation Fund to rapidly expedite decarbonization projects with large emitters, scale up clean technology and accelerate Canada's industrial transformation across all sectors.
 - The Government of Canada's 2021 Budget included an additional \$5 billion in funding for the Net Zero Accelerator, for a total program size of \$8 billion over seven years.
 - It is likely, but to be confirmed, that SMR projects will be eligible for funding through the Net Zero Accelerator in the future.

SMR Action Plan

- Canada's SMR Action Plan was launched in December 2020. The Action Plan now has chapters submitted from 114 organizations, with over 500 tracked actions.
- Moltex joined Canada's SMR Action Plan where they made commitments to:
 - Complete the Canadian Nuclear Safety Commission's pre-licensing Vendor Design Review;
 - Engage with the Nuclear Waste Management Organization to contribute to high-level business and technical discussions via the Moltex Advisory Committee;
 - Work closely with relevant stakeholders related to plan siting of its facilities; and
 - Work to identify and demonstrate the link between the development of its reactor technology and the diverse cultural, environmental and economic benefits for Canadians.
- The Organization of Canadian Nuclear Industries joined Canada's SMR Action Plan where they made commitments to:
 - Organize supplier forum webinars with goals of Canadian suppliers partnering with SMR vendors in constructing a fleet of SMRs in Canada and offshore markets, and engage the Canadian supply chain in SMR demonstrations and first-of-a-kind projects;
 - Promote the use of advanced manufacturing methods to reduce SMR costs; and
 - Promote SMR workforce diversity and Indigenous engagement.

POINTS TO REGISTER

Words: 687

Delivery Time: approximately 5.73 minutes (@120 words/minute)

- It is a pleasure to be here to discuss the progress that Moltex is making in developing a small modular reactor technology in New Brunswick, and the impact that this project will have on New Brunswick.
- The priority of the Government of Canada remains supporting people and businesses through the COVID-19 pandemic.
- Il ne fait aucun doute que la pandémie de COVID-19 représente la menace la plus sérieuse à l'heure actuelle. Toutefois, le gouvernement reconnaît que le Canada et le reste du monde ne peuvent se permettre de perdre du terrain face à la menace grandissante que représentent les changements climatiques pour notre planète. [TRANSLATED: And while COVID-19 has been the biggest immediate threat to Canadians, the Government also recognizes that Canada and the rest of the world cannot lose ground on the growing threat that climate change presents to the planet.]
- That is why events like this are important. They bring together stakeholders from government, Indigenous communities and the nuclear industry, to work together to unlock the potential for SMRs to play a vital role in transitioning toward a net-zero future.

Small Modular Reactors

- Nuclear energy is an important part of enabling Canada to reach our climate targets, and plays a vital role in Canada's energy mix, producing 15% of our electricity, and displacing over 50 million tonnes of greenhouse gas emissions every year.
- Comme indiqué dans le plan climatique renforcé, la prochaine génération de technologies nucléaires, qui inclut les petits réacteurs modulaires, sera un outil important afin de respecter les engagements climatiques du Canada et

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atteindre notre cible de carboneutralité en 2050. [TRANSLATED: As was noted in the strengthened climate plan, the next generation of nuclear technologies, including small modular reactors, will be an important tool in meeting Canada's climate commitments and achieving our target of net-zero emissions by 2050.]

Investing in SMRs

- The Government of Canada is committed to investing in nuclear innovation.
- That is why we announced a \$50.5-million investment for Moltex last month, to develop a technology that will produce emissions-free energy through recycling existing spent nuclear fuel.
 - This investment will contribute to the creation of skilled jobs in the province, and the development of technology that generates emissions-free energy through a process that recycles existing nuclear waste.
 - We also announced an investment of \$5 million to NB Power, and more than \$500,000 to the University of New Brunswick in support of SMR development and deployment in the province.

SMRs in New Brunswick

- These investments build on the demonstrated leadership in the province.
 - New Brunswick, Alberta, Saskatchewan, and Ontario have signed a Memorandum of Understanding to advance the development and demonstration of SMRs in Canada.
- New Brunswick, in particular, continues to lead the way on next-generation SMR technologies in Canada, including making investments to form a nuclear research cluster in 2018, and in SMR technologies in 2021.
 - We will continue working closely with provinces and territories to support their priorities in a responsible way.

- For the federal government's part, last December, we launched Canada's SMR Action Plan, along with over 100 partners. The plan outlines over 500 concrete measures being taken across the country to advance the development of SMRs in Canada.
 - We have continued to make progress on the commitments we have made as part of our chapter in Canada's SMR Action Plan, including the investments in technologies highlighted today.
- Last December, the Government also announced the creation of the Net Zero Accelerator, with \$3 billion in funding available for new clean technologies.
 - This was followed up by an additional \$5 billion in funding for the Net Zero Accelerator in the federal budget just a few weeks ago, bringing the total to \$8 billion.

Conclusion

- In closing, the federal government is pleased to support nuclear innovation, such as Moltex's project to develop an SMR in New Brunswick.
- We will continue to work with interested parties to advance this important work, as we committed to in the strengthened climate plan and in the SMR Action Plan.
- Thank you, and I hope that this session is helpful in facilitating productive dialogue about the role that SMRs can play in Canada and New Brunswick.

Attachment: (1)

Attachment 1 – Biographies

ATTACHMENT 1 – BIOGRAPHIES

Rory O’Sullivan

Chief Executive Officer, Moltex Energy Canada



Rory O’Sullivan obtained a First-Class Honours in mechanical and manufacturing engineering from Trinity College Dublin having also studied mechanical design engineering at the National Institute of Applied Sciences of Lyon in France. Before Moltex, he was an award-winning Project Manager at the Bouygues group running over £50-million projects. Mr. O’Sullivan cofounded Energy Process Developments Limited to develop advanced nuclear, where he led a government-funded feasibility study on the development of a prototype molten salt reactor. Mr. O’Sullivan has sat on the MSR advisory committee to the International Atomic Energy Agency and was a Forbes 30 Under 30 standout.

The Honourable Mike Holland, M.L.A.

Minister of Natural Resources and Energy Development, New Brunswick



In his first venture into provincial politics, the Honourable Mike Holland was elected to the Legislative Assembly of New Brunswick in September 2018 for the riding of Albert. On November 9, 2018, he was appointed Minister of Energy and Resource Development. He is co-founder of the Canadian Wild Turkey Federation, a non-profit organization that is quickly becoming the new face of conservation in Canada.

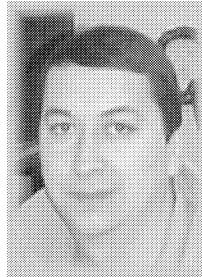
Mr. Holland has been a local entrepreneur who sold outdoor gear that he invented. As the founder of Resourceful Redneck Incorporated, he successfully secured a funding partnership on the CBC TV show Dragon’s Den.

Mr. Holland began gaining political experience in 2010, working as an executive assistant with Cabinet ministers in five different provincial government departments.

In his spare time, Mr. Holland enjoys exploring the outdoors with his three adult children and his partner Alison.

Jim Ward

General Manager, North Shore Mi'kmaq District Council

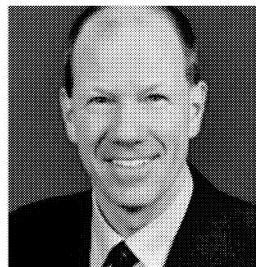


Jim Ward has a substantial background in business operations, business planning, community development and consulting. One of his key responsibilities is to provide leadership as General Manager to the North Shore Mi'kmaq District Council and also the NSMDC-AAROM (Aboriginal Aquatic Resource and Ocean Management).

Mr. Ward is a motivated individual with more than 30 years of experience in project management, business administration, governmental lobbying and has demonstrated an ability to see major activities and associated timeframes to completion on budget and on time.

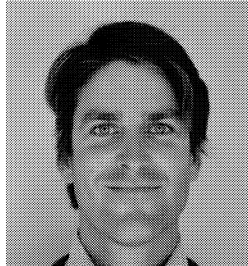
Andy Hayward

Chief Nuclear Engineer and Director of Advanced Reactor Development, NB Power



Andy Hayward became the Chief Nuclear Engineer and Director of Advanced Reactor Development at New Brunswick Power in late 2020. Before assuming this role, he was the Director of Engineering and Chief Nuclear Engineer at Point Lepreau Nuclear Generating Station. Andy also spent two years at the Institute of Nuclear Power Operators and the World Association of Nuclear Operators as a Senior Evaluator. From 2008 to 2016, he worked in various positions at New Brunswick Power, including Director of Maintenance, Work Management and Projects. Mr. Hayward has a Bachelor's degree in chemical engineering from the University of New Brunswick.

Andy Ballard
 Project Director, Moltex Energy



Andy Ballard has worked as Project Director at Moltex Energy since May 2020. Prior to assuming his role at Moltex, Mr. Ballard worked as Project Director at DBD Limited, where he oversaw delivery of systems integration and integrated control systems at the United Kingdom Atomic Energy Authority's Hydrogen-3 Advanced Technology tritium research centre. Mr. Ballard has a Master's of Physics from the University of Manchester, and a Doctorate in nuclear engineering from the University of Tokyo.

Simon Newton
 Corporate Development Director, Moltex Energy



Simon Newton has worked at Moltex's Corporate Development Director since October 2018. He has also worked at Managing Director at Chameleon since April 2005. Mr. Newton has a Bachelor's degree in physics from the University of Bristol.

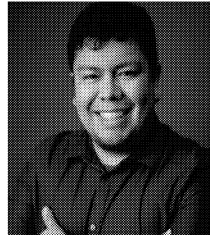
Biyash Bhattacharya
 Research and Development Manager, Moltex Energy



Biyash Bhattacharya has worked as Moltex's Research and Development Manager since March 2021, and previously worked as Technical Manager with Moltex. Prior to that, Ms. Bhattacharya worked at the University of Nottingham, and she holds a Doctorate in molten salt electroreduction from the University of Nottingham.

Jose Zuniga

Research and Development Chemist, Moltex Energy



Jose Zuniga has worked as Research and Development Chemist at Moltex since August 2019. Prior to coming to work for Moltex, Mr. Zuniga worked as a Laboratory Specialist at South Texas College, and as a User Scientist at Oakridge National Laboratory. Mr. Zuniga has a Master's degree in chemistry from the University of Texas Rio Grande Valley.

Ryan Brown

Mechanical Engineering, Moltex Energy



Ryan Brown has worked in mechanical engineering at Moltex since November 2019. Prior to that, he worked as an Undergraduate Student Researcher at University of New Brunswick, and a Quality Control Inspector at Strescon. Mr. Brown has a Bachelor's degree in mechanical engineering from the University of New Brunswick.

s.20(1)(b)

s.21(1)(a)

s.21(1)(b)



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SCENARIO NOTE TO THE DEPUTY MINISTER OR ASSOCIATE DEPUTY MINISTER

MEETING BETWEEN

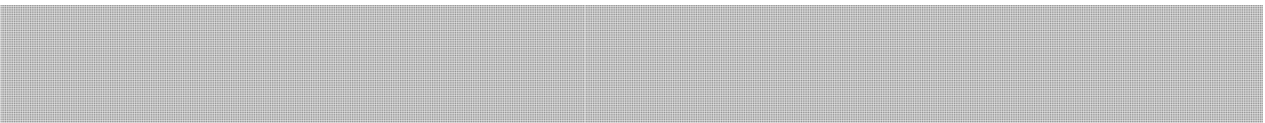
THE DEPUTY MINISTER/ASSOCIATE DEPUTY MINISTER OF NATURAL RESOURCES AND

RORY O'SULLIVAN

MEETING DETAILS

- **DATE/TIME:** May 20, 2020 15:00-15:30
- **LOCATION:** Call
- **PARTICIPANTS:**
 - NRCan:
 - Mollie Johnson, Assistant Deputy Minister, Low Carbon Energy Sector, NRCan
 - Daniel Brady, Deputy Director, Nuclear Energy Division, NRCan
 - Moltex:
 - Rory O'Sullivan, Chief Executive Officer, Moltex Energy Canada

ISSUE

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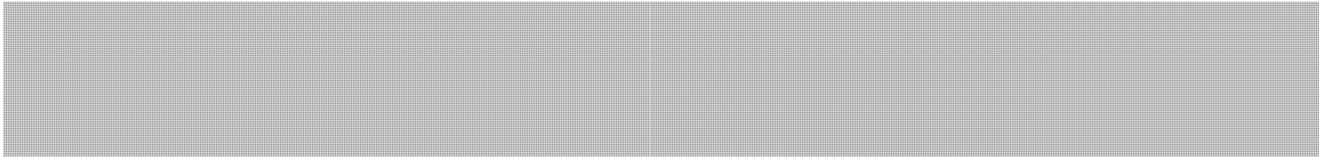
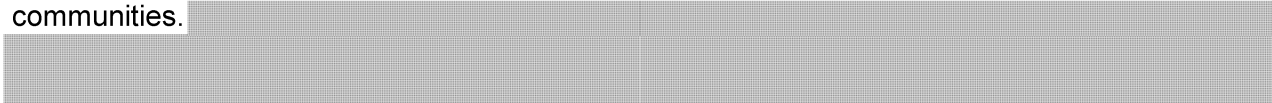
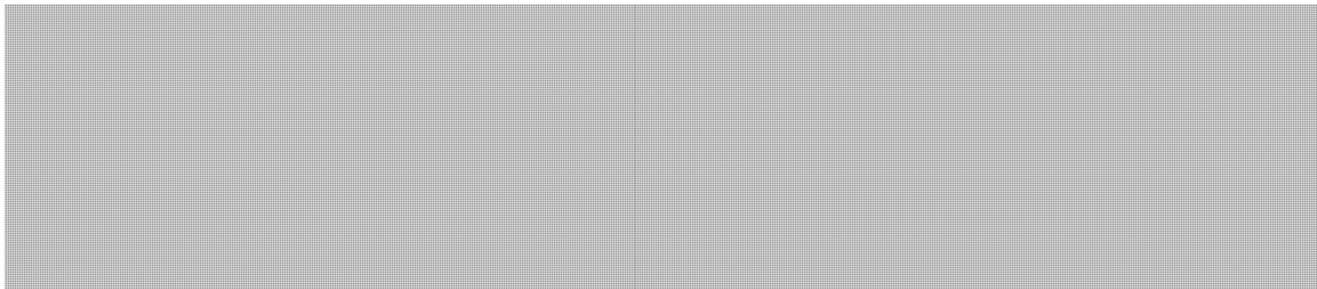
HIGHLIGHTS/KEY CONSIDERATIONS

Recent US DOE Announcements Related to SMRs

- Through the release of the Nuclear Fuel Working Group (NFWG) report and associated announcements, the US has made clear its ambition to restore global nuclear energy leadership and dominance.
- Building on the previous \$770M+ invested in advanced reactors, the US has recently announced several funding opportunities related to advanced reactor technologies, including \$230M for Advanced Reactor Development Program (ARDP).

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Moltex – Financials

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- Moltex is **working to establish a formal Indigenous partnership** with the North Shore MicMac District Council (NSMDC), an organization that services seven New Brunswick First Nation communities. 
- 
- Moltex has received support from **various sources** including the Province of New Brunswick (\$5M). In addition to the province of New Brunswick, other sources of funding include:
 - \$4.1M from a Spanish Engineering, Procurement and Construction (EPC) company to expand the company's operations in Canada.
 - \$3.5M through an innovative crowdfunding round – raising three times more than they had targeted in just four weeks.
 - \$2.1M USD in July 2019 by US Department of Energy to speed commercialization of their waste reprocessing technology.
 - \$300K for preliminary work with the UK, with a view to the export market. They are also in the running for an additional \$10M from the UK Government to support their R&D work in New Brunswick.

KEY BACKGROUND

Moltex – Background

- Moltex is in the process of developing an SMR design known as the Stable Salt Reactor (SSR), a variant on the concept for Molten Salt Reactors. The SSR is designed for on-grid power generation.
- The SSR is unique in its potential to **recycle used CANDU fuel**, limiting the quantities of radioactive waste destined for long-term storage and disposal. Moltex's reactor technology supports New Brunswick's goal to become a global leader in nuclear waste recycling and minimization.
- The company started in the UK but has established an office in New Brunswick because they saw **Canada as the most viable path to market**. Moltex employs ten engineers in New Brunswick, with immediate plans to hire five more. Over 40% of Moltex's needed components can be made in New Brunswick.
- Additional information about Moltex is set out in Annex B.

US DOE Advanced Reactor Development Program (ARDP)

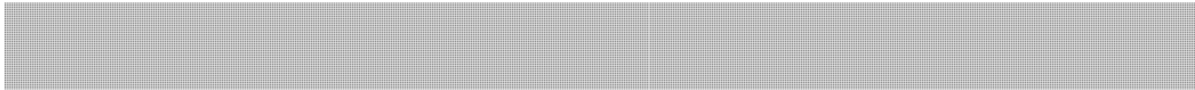
- In December 2019, the US Congress appropriated **\$230M for FY2020** to start a new demonstration programme for advanced reactors: the Advanced Reactor Development Program (ARDP).
- On May 14, 2020, the **US DOE launched of the first phase of the ARDP, providing \$160M in initial funding**, cost-shared with industry, for the construction of two demonstration advanced reactors that can be operational within the next five to seven years.
- ARDP applicants can receive support through three different development and demonstration pathways:
 - **Advanced reactor demonstrations**: are expected to lead to a fully functional advanced nuclear reactor within seven years of the award;
 - **Risk reduction for future demonstrations**: will support up to five additional teams resolving technical, operational and regulatory challenges to prepare for future demonstration opportunities;
 - **Advanced Reactor Concepts 2020**: will support innovative and diverse designs with the potential to be commercial in the mid-2030s.
- Under ARDP, industry will also be able to access and leverage the National Reactor Innovation Center (NRIC) at Idaho National Labs (INL) to efficiently test and demonstrate reactor concepts and assess their performance.
- Separately, DOE recently announced **\$27M in funding for nine projects as part of the Advanced Research Projects Agency-Energy's (ARPA-E) programme**.
 - These projects will work to develop technology to reduce operation and maintenance costs in next generation nuclear plants by exploring opportunities for AI, advanced control systems, predictive maintenance and model-based fault detection.
- Prior to both of these announcements, DOE also announced funding of \$5.4M to two projects through the US Industry Opportunities for Advanced Nuclear Technology Development.

US Nuclear Fuels Working Group Report

- On April 23, 2020, the US Department of Energy (DOE) released the report of the Nuclear Fuel Working Group (NWFG): "Restoring America's Competitive Nuclear Energy Advantage" which seeks to **restore US nuclear energy leadership and re-establish US's competitive nuclear advantages**
 - The Report is **framed in response to evidence that the US has lost its competitive global position as the world leader in nuclear energy** to state-owned enterprises (SEOs), notably Russia and China, who are using nuclear power to advance their foreign influence and economic power, and are aggressively moving to surpass the US.
- The report outlines an ambitious, multifaceted plan to enhance U.S. competitiveness and re-establish US leadership in next-generation nuclear technology vis-a-vis SOEs and other actors, as the US estimates it is missing out on a nuclear reactor market that the U.S. Department of Commerce (DOC) estimates is valued at \$500-740 billion over the next 10 years. Recommended measures include:

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- Continued funding for **high-assay low-enriched uranium (HALEU) projects**, which is a fuel source for many SMR designs
 - Support for the **National Reactor Innovation Center and Versatile Test Reactor**
 - Continued funding of **advanced nuclear reactor R&D** to enable the demonstration in partnership with the private sector.
 - Demonstrating **the use of SMRs and micro-reactors at Department of Defence** military installations and other national security infrastructure sites
- The report also includes several recommendations to enhance U.S. technology competitiveness, the implementation of which are longer-term interagency processes.
 - Some of the proposed changes – designating a new senior nuclear export position, creating a Nuclear Industrial Base advisory committee, and addressing financing policies to allow for investment in nuclear energy projects – have the potential to expand U.S. profile as an international nuclear technology exporter, and Canada needs to monitor these



POINTS TO REGISTER

Government of Canada Support for Nuclear and SMRs

- The Government of Canada recognizes the potential for SMRs and the role of nuclear to contribute to Canada’s net-zero by 2050 commitments.
- Minister O’Regan emphasized this in his speech at the CNA Conference in February 2020, where he also announced Canada’s SMR Action Plan will be launched in Fall 2020.
- The government’s priorities and views on nuclear that he articulated at the CNA still hold and will continue to remain a priority for us post-COVID.

COVID-19

- The regular federal budget cycle was overtaken this year by COVID. As the focus has been on pandemic response, it is not yet known what the timing of federal budget will be.
- As an SME and pre-commercialization innovator, how has the COVID pandemic affected you?
 - Have any of the federal government measures announced been helpful to you?



Attachments: 3

Annex A – Biography

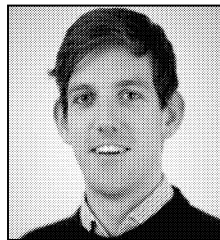
Annex B – Moltex “At a Glance”

Annex C – Summary of Economic Support for Key Nuclear Stakeholder Groups

ANNEX A

Rory O'Sullivan

CEO, Moltex Energy Canada



Rory obtained a 1st class honours in Mechanical and Manufacturing Engineering from Trinity College Dublin having also studied Mechanical Design Engineering at l'INSA de Lyon in France. Before Moltex he was an award winning project manager at the Bouygues group running £50m+ projects. Rory cofounded Energy Process Developments Ltd to develop advanced nuclear, where he led a government funded feasibility study on the development of a prototype Molten Salt Reactor. Rory has sat on the MSR advisory committee to the International Atomic Energy Agency and was a Forbes 30 Under 30 Standout.



At a Glance — Moltex Energy

Size	300 MWe	Markets
Technology		<ul style="list-style-type: none"> On-grid Recycling used nuclear fuel
Molten Salt		
CONDITIONS FOR SUCCESS		
1. Regulatory		2. Site
<ul style="list-style-type: none"> CNSC: VDR Phase I in progress, [REDACTED] 		<ul style="list-style-type: none"> NB Power
3. Financing		4. Operator
		<ul style="list-style-type: none"> NB Power
<ul style="list-style-type: none"> Awarded \$2.1M USD by US DOE, \$300K from UK Recent success in securing private investment (see synopsis below) 		
5. Value Chain		6. Demand
<ul style="list-style-type: none"> Potential for Canadian supply chain Near-term – CNL and University of New Brunswick 		<ul style="list-style-type: none"> NB Power interested for on-grid power generation and spent fuel recycling

SYNOPSIS

- Moltex Energy is a Foreign Direct Investment story:
 - The company started in the UK but moved to New Brunswick because they saw Canada as the most viable path to market; Moltex has received funding from UK and UK governments
 - Moltex employs 10 engineers in New Brunswick, with immediate plans to hire 5 more
 - Over 40% of Moltex's components can be made in New Brunswick.
 - Their reactor technology supports New Brunswick's goal to become a global leader in nuclear waste recycling and waste minimization.
- The Moltex technology is an innovation in waste minimization that seeks to recycle used CANDU fuel.
 - [REDACTED]
- Moltex has had a number of investment successes to date:
 - The Province of New Brunswick has invested \$5M in the company to develop their technology.
 - Earlier this year, Moltex secured \$4.1M from a Spanish Engineering, Procurement and Construction (EPC) company to expand the company's operations in Canada.
 - Moltex secured \$3.5M through an innovative crowdfunding round – raising three times more than they had targeted in just four weeks.
 - Moltex received \$300K for preliminary work with the UK, with a view to the export market. They are also in the running for an additional \$10M from the UK Government to support their R&D work in New Brunswick.
 - Awarded \$2.1M USD in July 2019 by US Department of Energy to speed commercialization of their waste reprocessing technology.

Annex C - Summary of Economic Support for Key Nuclear Stakeholder Groups

Theme	Economic measures	Max Coverage	Utilities	EPC	SMEs	SMR innovators	Research Labs	Uranium Industry	
Operating Costs	Income taxes flexibility (delay) ¹	Payment date for current tax year: Sept 1, 2020	Yes	Yes	Yes	No	Yes	Yes	
	¹ Note: Must have taxable income								
	Wage								
	Work-sharing Program ²	EI benefits for up to 76 weeks; up to \$573/week	case-by-case	Yes	Yes	Yes	case-by-case	Yes	
	² Note: Public sector employers, including government or publicly-owned corporations, such as crown corporations, are not eligible for Work-Sharing. Employees must be eligible for EI.								
Operating Cash Flow	Temporary Wage Subsidy for Employers (10%) ³	\$1,375 per employee to a maximum of \$25,000 total per employer	No	No	case-by-case	Yes	case-by-case	case-by-case	
	³ Note: Canadian-controlled private corporation - CCPC - must be eligible for the Small Business Deduction (Taxable income < \$15 millions)								
	Canada Emergency Wage Subsidy (75%) ⁴	\$847/week up to 12 weeks for \$10,164 per employee; no max per employer	case-by-case	case-by-case	case-by-case	No	Yes	Yes	
	⁴ Note: Available to eligible employers that see a drop of at least 30% of their revenue Y/Y								
Operating Cash Flow	Business Credit Availability Program ⁵								
	Loan Guarantee for SMEs	up to \$6.25 million for SMEs and up to \$80 million for mid-sized companies	No	No	Yes	case-by-case	No	No	
	Co-Lending Program for SMEs	up to \$6.25 million for SMEs and up to \$60 million for mid-sized companies	No	No	Yes	case-by-case	No	No	
	General Envelope	up to \$2 millions	No	No	Yes	case-by-case	No	No	
	⁵ Note: Targets SMEs (< \$50 millions in revenues) and mid-sized companies (< \$300 millions in revenues)								
	Canada Emergency Business Account ⁶	up to \$40,000	No	No	case-by-case	case-by-case	case-by-case	No	
	⁶ Note: Must be an operating company registered in Canada with an annual payroll of between \$50,000 and \$1 million								
	Large Employer Emergency Financing Facility (LEEFF) ⁷	Bridge financing of more than \$60 millions	case-by-case	case-by-case	No	No	No	case-by-case	
⁷ Note: For large companies with \$300 million or more in annual revenue.									
Operating Cash Flow	Regional Relief and Recovery Fund	\$962 million to Regional Development Agencies (RDAs) and the Community Futures Network.	No	No	case-by-case	case-by-case	No	No	
	NRC IRAP Innovation Assistance Program (IAP)	\$847/week up to 12 weeks for \$10,164 per employee	No	No	No	case-by-case	No	No	



Natural Resources
Canada

Ressources naturelles
Canada

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SCENARIO NOTE TO THE MINISTER

MEETING BETWEEN MINISTER OF NATURAL RESOURCES, RORY O'SULLIVAN, CEO, MOLTEX ENERGY CANADA AND NEW BRUNSWICK ENERGY MINISTER MIKE HOLLAND

MEETING DETAILS

- **DATE/TIME:** Tuesday, January 28, 2020, from 5:15 – 5:45 p.m.
- **LOCATION:** West Block, room 215N
- **PARTICIPANTS:**
 - Rory O'Sullivan, Chief Executive Officer, Moltex Energy Canada
 - Mike Holland, Minister of Energy and Resource Development, New Brunswick

ISSUE

- Rory O'Sullivan, CEO, Moltex Energy Canada has requested this meeting to provide an update on their small modular reactor development, and to discuss funding, Canada-UK collaboration, and First Nations initiatives. New Brunswick Energy and Resource Development Minister, Mike Holland, will join on behalf of the Government of New Brunswick in support of Moltex. You will be accompanied by André Bernier, Senior Director, Renewable Energy and Electricity Division, from the Department.

HIGHLIGHTS/KEY CONSIDERATIONS

- New Brunswick has **recently signed a Memorandum of Understanding (MOU)** with Ontario and Saskatchewan, with the aim to **work collaboratively to develop small modular reactors (SMRs) in their respective provinces.**
 - This announcement builds upon the SMR Roadmap in which NRCan played a key convening role.
- Moltex is a **developer and vendor of SMRs.** SMRs are designed to provide electricity for both on- and off-grid applications. The company started in the UK but have established an office in New Brunswick because they saw **Canada as the most viable path to market.**
 - Moltex employs ten engineers in New Brunswick, with immediate plans to hire five more. Over 40% of Moltex's needed **components can be made in New Brunswick.**
 - Moltex is unique in its potential to **recycle used CANDU fuel**, limiting the quantities of radioactive waste destined for long-term storage and disposal. Thus Moltex reactor technology supports New Brunswick's goal to become a global leader in nuclear waste recycling and minimization.

s.20(1)(b)

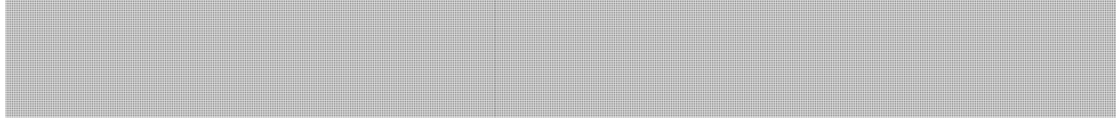
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- Moltex has received support from **various sources** including the Province of New Brunswick (\$5M). It is seeking additional funding from the UK Government to support their research and development work in New Brunswick.

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- Moltex will be participating as a **member of Canada's business delegation in the upcoming Canada-UK Nuclear Energy Dialogue** from March 2nd to March 5th.

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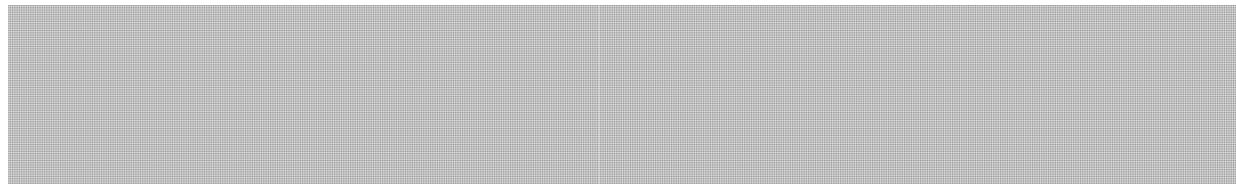
KEY BACKGROUND

The Moltex SMR

- Moltex is in the process of developing an SMR design known as the Stable Salt Reactor (SSR), a variant on the concept for Molten Salt Reactors (MSRs). The SSR is designed for on-grid power generation.
- Notably, the SSR is designed to be a "waste burner", meaning it can be fueled by spent fuel from CANDU nuclear reactors, limiting the quantities of radioactive waste destined for long-term storage and disposal. It is a highly innovative concept, and the design is at a lower level of technology readiness.

Partnerships and Funding

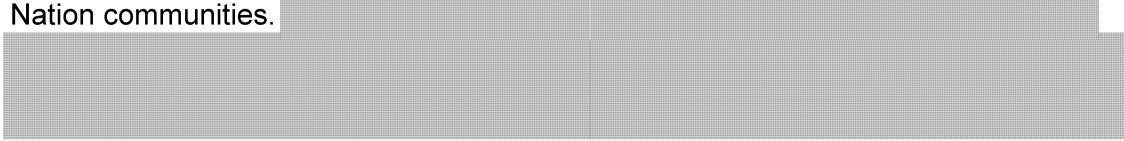
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- In addition to the province of New Brunswick, other sources of funding include:
 - \$4.1M from a Spanish Engineering, Procurement and Construction (EPC) company to expand the company's operations in Canada.
 - \$3.5M through an innovative crowdfunding round – raising three times more than they had targeted in just four weeks.


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- \$300K for preliminary work with the UK, with a view to the export market. They are also in the running for an additional \$10M from the UK Government to support their R&D work in New Brunswick.
- Moltex is **working to establish a formal Indigenous partnership** with the North Shore MicMac District Council (NSMDC), an organization that services seven New Brunswick First Nation communities.



POINTS TO REGISTER

1. Partnerships and Funding:

- We recognize New Brunswick's leadership on the SMR file as a valuable part of Canada's nuclear sector.
- 
- Have you had any further discussions with ISED officials?

2. Memorandum of Understanding

- We welcome the announcement of a New Brunswick-Ontario-Saskatchewan MOU, and see this collaborative effort as an important step in the development in nuclear technology in Canada.
- How are you working with Ontario and Saskatchewan to further SMRs? How do you see NB Power's role?

3. Moltex's SMR plans and progress:

- Health and safety of Canadians is our top priority on nuclear energy. Could you tell me more about how Moltex Energy's technology can address nuclear waste?

RESPONSIVE ONLY:

On nuclear energy being defined as "clean energy":

- *The International Energy Agency and the United Nations have emphasized the important role that nuclear energy has to play in meeting our global Paris agreement targets.*
- *At the May 2019 Clean Energy & Mission Innovation Ministerial in Vancouver, the Government of Canada recognized nuclear energy as a clean, non-emitting source of energy, which displaces over 50 million tonnes of carbon emissions a year across Canada, in addition to being a significant contributor to the economy.*
 - *This government has included nuclear in key initiatives, including Mission Innovation.*

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We continue to work with partners to advance SMR priorities, including for example:

- *Engagement with the mining sector*
- *Continuing discussions with Indigenous and northern communities*
- *Improving our understanding of global markets for SMRs*
- *Deepening international engagement on SMRs with key partners*

Attachments:

Annex A – Biographies

Annex B – Background on Small Modular Reactors

Annex C – Collaboration Memorandum of Understanding on SMR (Ontario, New Brunswick and Saskatchewan)

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ANNEX A

Rory O'Sullivan
CEO, Moltex Energy Canada



Rory obtained a 1st class honours in Mechanical and Manufacturing Engineering from Trinity College Dublin having also studied Mechanical Design Engineering at l'INSA de Lyon in France. Before Moltex he was an award winning project manager at the Bouygues group running £50m+ projects. Rory cofounded Energy Process Developments Ltd to develop advanced nuclear, where he led a government funded feasibility study on the development of a prototype Molten Salt Reactor. Rory has sat on the MSR advisory committee to the International Atomic Energy Agency and was a Forbes 30 Under 30 Standout.

Hon. Mike Holland
Minister of Natural Resources and Energy Development, New Brunswick



In his first venture into provincial politics, the Honourable Mike Holland was elected to the Legislative Assembly of New Brunswick in September 2018 for the riding of Albert. On November 9, 2018, he was appointed Minister of Energy and Resource Development. He is co-founder of the Canadian Wild Turkey Federation, a non-profit organization that is quickly becoming the new face of conservation in Canada.

Mr. Holland has been a local entrepreneur who sold outdoor gear which he invented. As the founder of Resourceful Redneck Inc., he successfully secured a funding partnership on the CBC TV show Dragon's Den.

Mr. Holland began gaining political experience in 2010, working as an executive assistant with cabinet ministers in five different provincial government departments.

In his spare time, Mr. Holland enjoys exploring the outdoors with his three adult children and his partner Alison.

ANNEX B

Small Modular Reactors (SMRs)

Small Modular Reactors (SMRs) are a rapidly emerging area of nuclear energy innovation, in Canada and around the world.

What is an SMR?

- SMRs are small nuclear reactors – both physically and in terms of power output – that could provide electricity for both on- and off-grid applications.
 - In addition to electricity, SMRs could produce heat for buildings, industrial applications, hydrogen production, and desalination.
 - SMRs could also be used in hybrid energy systems to allow for greater load following of variable renewables.
 - SMRs promise to be modular – meaning they are factory constructed, portable and scalable.
- SMR technology is at a pre-commercial stage, but several firms are moving to build demonstration units, with commercial availability expected in the 2020s.

Canada's SMR Roadmap

- To ensure policy-readiness for this rapidly emerging area of technology innovation, NRCan convened a pan-Canadian dialogue on SMRs with provinces, territories, and utilities from Saskatchewan, Ontario, New Brunswick, Northwest Territories, and Nunavut.
- Released in November 2018, Canada's SMR Roadmap identified three potential applications for SMRs in Canada:
 1. On-grid power generation, especially in provinces phasing out coal;
 2. On- and off-grid combined heat and power for heavy industry, including for mine sites and the oil sands; and,
 3. Off-grid power, district heating, and desalination in remote communities.
- The SMR Roadmap found that Canada is well-positioned to capture a share of an emerging global market for SMRs valued at \$150B per year by 2040. The report made 50+ recommendations for action by governments, industry, and other stakeholders to seize Canada's SMR opportunity.

s.20(1)(b)
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Progress since the SMR Roadmap

- The SMR Roadmap was a landmark, cross-sectoral effort encompassing 45,000 person-hours of work. Since its release, even more work has been done to turn the SMR Roadmap into action.
- The Government of Canada has not yet formally responded to the recommendations in the SMR Roadmap; however, NRCan continues to convene informally partners to track progress.
- NRCan is tracking 50+ actions across 45+ FPT partners in a Roadmap Action Report (RoAR) [REDACTED]
- Following the SMR Roadmap, two SMR development tracks are moving quickly in Canada:
 1. On-grid SMRs to replace coal-fired power plants, and
 2. Off-grid SMRs to replace diesel for remote mining applications.
- The Moltex SMR technology is designed for the on-grid market. [REDACTED]
- Moltex is one of two SMR vendors (along with ARC Nuclear) partnering with the Government of New Brunswick, the University of New Brunswick, and NB Power to form a new SMR Research Cluster in the province. Each of the two SMR vendors has contributed \$5M and New Brunswick has contributed \$10M towards the research cluster.

Next Steps

- CEOs from SaskPower, Bruce Power, Ontario Power Generation (OPG), and NB Power have formed an SMR Leadership Forum, with monthly meetings to discuss approaches to SMR development and deployment.

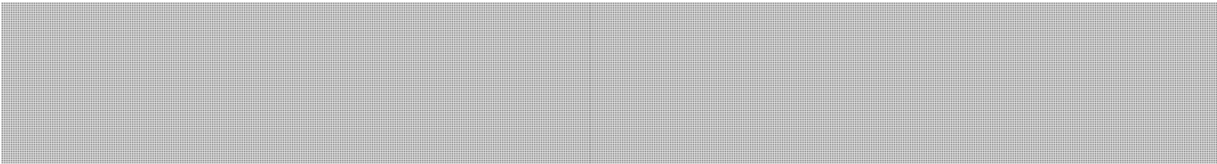
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Six Conditions for Successful SMR Commercialization

- Beyond technical feasibility, there are six conditions for successful SMR commercialization:
 - 1. Regulatory:** Project proponents must obtain approval from the Canadian Nuclear Safety Commission (CNSC), Canada's independent nuclear regulator.
 - 2. Site:** Project proponents must identify a viable site for their project, and obtain concurrence from the owner of the site. The most likely sites for SMR demo projects in Canada are AECL lands and existing nuclear power plants (e.g., Point Lepreau, owned by New Brunswick Power).
 - 3. Financing:** Most project proponents are seeking a combination of private financing and public funding, e.g., through the Government of Canada's Strategic Innovation Fund (SIF).
 - 4. Operator:** Project proponents must negotiate an arrangement with a nuclear operator to operate their SMR demo project. The most likely nuclear operators for SMR demo projects in Canada are: Ontario Power Generation (OPG); Bruce Power; New Brunswick Power; CNL; or Electricité de France (EDF, the largest nuclear operator in the world).
 - 5. Value Chain:** Project proponents must identify and negotiate arrangements with Engineering, Construction and Procurement (EPC) firms (e.g., SNC Lavalin or Hatch) as well as a supply chain for their demo projects.
 - 6. Demand:** SMR demo project proponents that identify potential markets and customers and work to build community support for deployment of their SMRs will have a natural advantage as they seek to secure financing and move projects forward.

ANNEX C
COLLABORATION MEMORANDUM OF UNDERSTANDING

THIS COLLABORATION MEMORANDUM OF UNDERSTANDING ("MOU") is made as of December 1, 2019 (the "**Effective Date**")

BETWEEN:

THE PROVINCE OF NEW BRUNSWICK

- and -

THE PROVINCE OF ONTARIO

- and -

THE PROVINCE OF SASKATCHEWAN

The Provinces of New Brunswick, Ontario and Saskatchewan are hereinafter referred to as the "Parties".

WHEREAS Nuclear is a cost-effective, reliable and non-carbon emitting form of energy;

AND WHEREAS Small Modular Reactor (SMR) technology is the next generation of innovative, versatile and scalable nuclear reactors that promise to further enhance the safety, economic and environmental benefits of nuclear energy;

AND WHEREAS the Parties were instrumental in the development of "*A Call to Action: A Canadian Roadmap for Small Modular Reactors*", referred to as the "Canadian SMR Roadmap" (found at: <http://smrroadmap.ca/>);

AND WHEREAS Canada is a "Tier 1" nuclear nation with a full-spectrum nuclear industry that has a limited window of opportunity to lock in the significant strategic, economic and environmental benefits in this area of high-tech innovation by becoming one of the first-movers on SMR deployment;

AND WHEREAS the Parties are home to most of Canada's world-renowned nuclear industry and are interested in the introduction of SMRs in their respective territories.

NOW THEREFORE, in consideration of the mutual covenants contained herein, the Parties hereby agree as follows:

1.0 Non-Binding MOU.

This MOU is intended to constitute an expression and mutual understanding of the Parties' willingness to work collaboratively in support of the development and deployment of SMRs. None of the Parties intend this MOU will create any legally binding or enforceable rights or obligations, with the exception of **Sections 4.1, 5.1, 5.2, 5.8** (the "**Binding Provisions**"), which are binding and enforceable.

2.0 Commitments.

The Parties commit to the following: (a) To work co-operatively to advance the development and deployment of SMRs to address the needs of New Brunswick, Ontario and Saskatchewan with regards to addressing climate change, regional energy demand, economic development (e.g., supply chain, fuel manufacture, skilled employment and export opportunities) and research and innovation opportunities;

(b) To work co-operatively to address key issues for SMR deployment including technological readiness, regulatory frameworks, economics and financing, nuclear waste management and public and Indigenous engagement;

(c) To work co-operatively to positively influence the federal government to provide a clear unambiguous statement that nuclear energy is a clean technology and is required as part of the climate change solution;

(d) To work co-operatively to positively influence the federal government to provide support for SMRs identified in the Canadian SMR Roadmap and as requested by the Chief Executive Officers (CEOs) of Ontario Power Generation (OPG), Bruce Power, New Brunswick Power Corporation (NB Power) and SaskPower;

(e) To work co-operatively to positively influence the federal government to make changes as necessary to facilitate the introduction of SMRs;

(f) To work co-operatively to inform the public about the economic and environmental benefits of nuclear energy and SMRs; and

(g) To work co-operatively to engage with other interested provinces and territories to explore the potential for SMR deployment in their jurisdictions.

**PURPOSE AND SCOPE OF MOU
COMMITMENTS OF THE PARTIES**

3.0 PROCEDURAL FRAMEWORK

3.1 The Parties direct their respective ministries (“Energy Ministries”) to undertake the following:

(a) The three Energy Ministries will hold a meeting in the January 2020 - March 2020 timeframe (“Winter Meeting”) to discuss strategies that will best advance the development and deployment of SMRs, including engagement with the nuclear regulator, nuclear operators, supply chain companies, academic and research experts, technology vendors and the Federal Government.

(b) By Summer 2020, informed by the Winter Meeting, the three Energy Ministries in cooperation with the respective CEOs of OPG, Bruce Power, NB Power and SaskPower will prepare a feasibility report, including a business case for the development and deployment of SMRs in their jurisdictions.

(c) By Fall 2020, the three Energy Ministries will develop a strategic plan for deployment of SMRs, including market opportunities across Canada and globally, based on the outcomes of the Winter Meeting, and report back to their respective Premiers on next steps.

4.0 TERM AND TERMINATION

4.1 The term of this MOU commences on the Effective Date and will terminate

upon the first to occur of:




(a) termination by mutual written agreement of the Parties;

(b) 18 months after the Effective Date, unless extended by mutual written agreement of the Parties.

MEMORANDUM TO THE DEPUTY MINISTER

(For Information)

SUMMARY

- This memo is to inform you of current research and development in the nuclear industry concerning reprocessing used nuclear fuel and associated public concerns that have recently been expressed in the media.
- Canada does not currently have reprocessing capabilities. Reprocessing spent CANDU fuel would involve mixing fissile elements in the spent fuel with natural uranium. This has the potential to create new fuel to power existing and future nuclear reactors while potentially reducing the volume and activity of waste that would need to be disposed of in a deep geological repository (DGR).
- Some Small Modular Reactors (SMRs) under development in Canada could operate on reprocessed CANDU fuel. One SMR vendor is developing reprocessing technology that would provide the fuel for their reactor concept.
- ISED’s Strategic Innovation Fund has invested in two SMR projects: \$20 million in October 2020 for Terrestrial Energy to help complete pre-licensing of their Integral Molten Salt Reactor (IMSR), and \$50.5 million in March 2021 for Moltex Energy Ltd to develop its Stable Salt Reactor-Wasteburner (SSR-W) and Waste To Stable Salt (WATSS) reprocessing facility in New Brunswick.
- Recently, public both national and international interest has been raised in the media concerning Canada’s support for investigating reprocessing technologies. In particular, concerns centre around the potential waste streams and potential for increased proliferation risks. 

- 
- It is expected that the ISED investment to Moltex Energy Ltd will serve to answer these questions by funding research to provide data to better understand the waste streams and handling processes resulting from reprocessing, as well as risks and any additional safeguards requirements beyond the current protocols for Canada’s existing facilities.

BACKGROUND

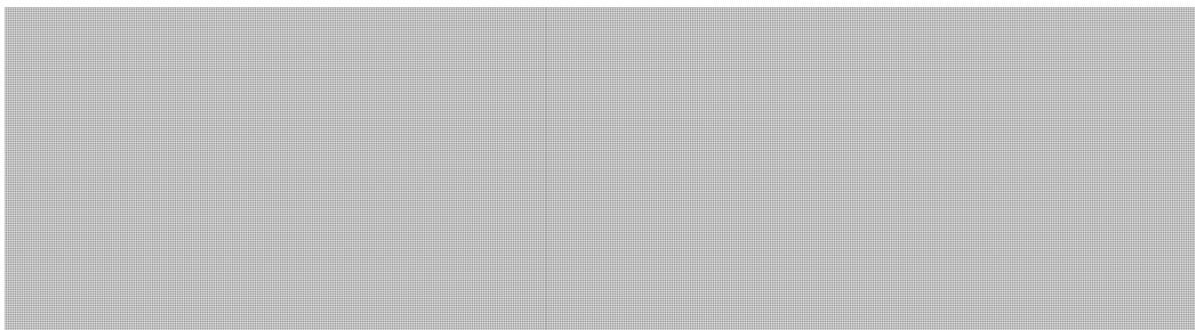
Reprocessing spent CANDU fuel involves chemical separation of materials (Uranium and Plutonium) from the used fuel assemblies into various products and waste streams and then mixing the fissile elements in the spent fuel with fresh natural uranium. This has the potential to create new fuel to power existing and future nuclear reactors while potentially reducing the volume and long-lived radioactivity of waste that would need to be disposed of in a DGR.

Canada does not currently have nuclear fuel reprocessing capabilities. All of Canada's commercial nuclear power reactors are CANDU reactors, which burn natural uranium in a "once through" fuel cycle. Once the fuel leaves the reactor, it is stored in pools of water on site to cool for several years before moving to dry storage for longer-term management. The long-term plan is to dispose of spent CANDU fuel permanently in a Deep Geological Repository (DGR). The Nuclear Waste Management Organization (NWMO) is currently working with self-identified, willing host communities to determine the best location for DGR by 2023.

Until now, the nuclear industry has viewed the reprocessing and recycling of spent fuel as not cost effective or necessary at an industrial scale, given Canada's large high-grade uranium deposits, the low price of uranium, and the high cost of reprocessing and recycling spent fuel.

Some Small Modular Reactors (SMRs) under development in Canada could operate on reprocessed CANDU fuel. One SMR vendor is developing reprocessing technology that would provide the fuel for their reactor concept.

While Global Affairs Canada (GAC) holds the lead on Canada's nuclear non-proliferation and export control policies, NRCan leads on domestic energy policy in Canada.



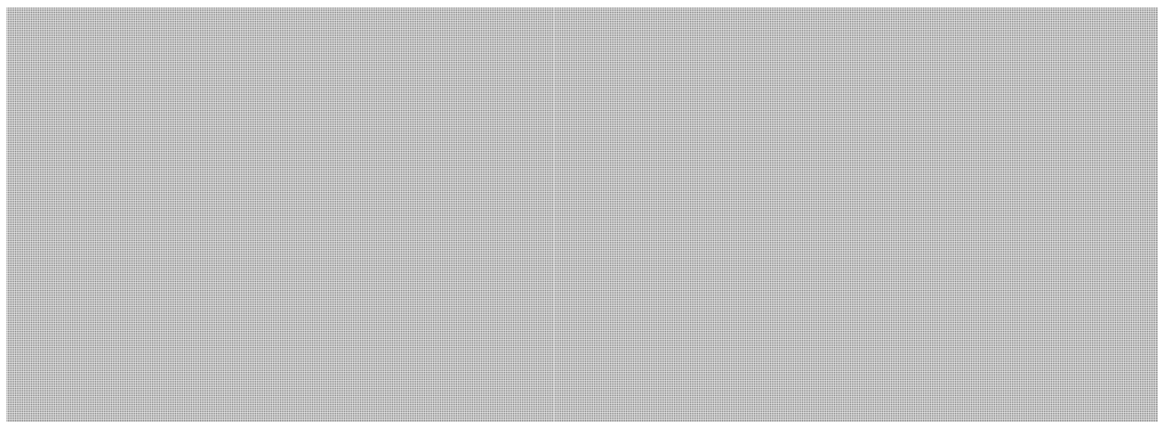
MEDIA INTEREST

In 2021, ISED's Strategic Innovation Fund announced investment in two SMR projects: \$20 million in October 2020 for Terrestrial Energy to help complete pre-licensing of their Integral Molten Salt Reactor (IMSR), and \$50.5 million in March 2021 for Moltex Energy Ltd to develop its Stable Salt Reactor-Wasteburner (SSR-W) and WASTE To Stable Salt (WATSS) reprocessing facility in New Brunswick.

Since the funding announcement, national and international public interest has been raised in the media for Canada's support of reprocessing technologies. On May 25, 2021, an open letter to the Prime Minister was received from Professor Von Hippel and co signatories, who are former scientists of the DOE, expressing concerns over Canada's investment in the R&D of Moltex Ltd reprocessing technology due to the separation of plutonium in the process which could be used in the production of nuclear weapons. The authors suggested Canada should commission high-level reviews of the non-proliferation and environmental implications before providing further support for these efforts.

On July 24, the Minister of Natural Resources replied on behalf of the Prime Minister, assuring that Canada is supporting research into the Moltex Ltd reprocessing concept to answer questions on proliferation and waste concerns specifically, and that Canada remains committed to our treaty obligations concerning non-proliferation.

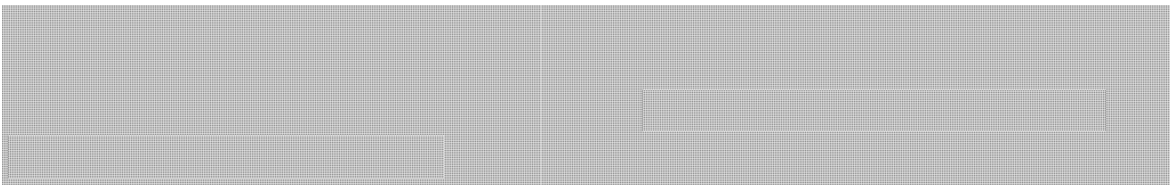
On July 28, 2021, and before receiving this response from the Minister of Natural Resources, Professor Von Hippel and co-signatories issued a second open letter to the Prime Minister, this time countering claims that Moltex Ltd made on their website in response to the first letter of the authors. The Moltex Ltd statement has since been removed from their website. In this second letter, the authors countered some specific claims by Moltex Ltd, particularly related to the way plutonium is separated in the Moltex process and the resulting ease with which plutonium could be made available for nefarious intent.



s.21(1)(a)
s.21(1)(b)
s.69(1)(g) re (a)

It should be noted that reprocessing is currently being carried out internationally by several nations using processes similar to the Moltex WATSS process, but which more completely separate plutonium from the other materials and contaminants in the fuel, and do so successfully while following international safeguards protocols, and under the purview of the IAEA.

Nevertheless, Canada takes its treaty obligations seriously and places nuclear safeguards and safety in highest regard. For this reason, NRCAN has been working closely with NB Power, GAC and CNSC to understand and address these concerns. NRCAN is also carrying out collaborative work with the wider nuclear industry, CNL, CNSC, NGOs and other federal departments under the SMR Fuel Supply Working Group to identify and address gaps to further validate and understand the Moltex process in particular with respect to proliferation, waste, and environmental impacts.



It is expected that the ISED investment to Moltex Energy Ltd will fund research to better understand the waste streams and handling processes resulting from reprocessing, as well as proliferation risks and any additional safeguards requirements beyond the current protocols for Canada's existing facilities so that decisions on reprocessing policy may be made.

Director General, ERB
Marco Presutti

Date

Contacts:

- Daniel Brady, Deputy Director, Nuclear Energy, ERB, LCES 613-240-6357

- I agree
- I disagree
- I wish to discuss

Mollie Johnson, Assistant Deputy Minister
LCES

Date: _____

s.21(1)(a)

s.21(1)(b)

UNCLASSIFIED

MEMORANDUM TO THE MINISTER

(For Information)

SUMMARY

- This memo is to inform you of current research and development in the nuclear industry concerning reprocessing used nuclear fuel and associated public concerns that have recently been expressed in the media.
- Canada does not currently have reprocessing capabilities. Reprocessing spent CANDU fuel would involve mixing fissile elements in the spent fuel with natural uranium. This has the potential to create new fuel to power existing and future nuclear reactors while potentially reducing the volume and activity of waste that would need to be disposed of in a deep geological repository (DGR).
- Some Small Modular Reactors (SMRs) under development in Canada could operate on reprocessed CANDU fuel. One SMR vendor is developing reprocessing technology that would provide the fuel for their reactor concept.
- ISED's Strategic Innovation Fund has invested in two SMR projects: \$20 million in October 2020 for Terrestrial Energy to help complete pre-licensing of their Integral Molten Salt Reactor (IMSR), and \$50.5 million in March 2021 for Moltex Energy Ltd to develop its Stable Salt Reactor-Wasteburner (SSR-W) and WASTE To Stable Salt (WATSS) reprocessing facility in New Brunswick.
- Recently, public interest has been raised in the media concerning Canada's support for investigating reprocessing technologies. In particular, concerns centre around the potential waste streams and potential for increased proliferation risks. [REDACTED]
- [REDACTED]
- It is expected that the ISED investment to Moltex Energy Ltd will serve to answer these questions by funding research to provide data to better understand the waste streams and handling processes resulting from reprocessing, as well as risks and any additional safeguards requirements beyond the current protocols for Canada's existing facilities.

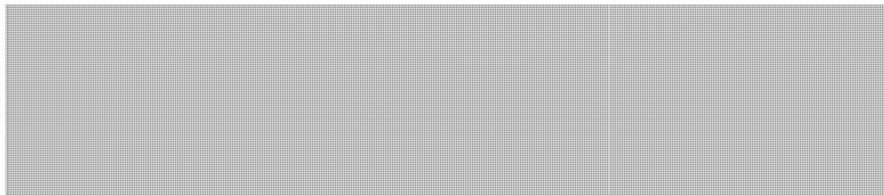
BACKGROUND

All of Canada's current commercial nuclear power reactors are CANDU reactors, which burn natural uranium in a "once through" fuel cycle. Once the fuel leaves the reactor, it is stored in pools of water on site while it cools for several years before moving to dry storage for longer-term management. The long-term plan is to dispose of spent CANDU fuel permanently in DGR. The Nuclear Waste Management Organization (NWMO) is currently working with self-identified, willing host communities to determine the best location for a deep geological repository (DGR) by 2023.

Canada does not currently have nuclear fuel reprocessing capabilities. Reprocessing spent CANDU fuel would involve separation of materials from the used fuel assemblies that is composed of metal and spent fuel into various products and waste streams and then mixing fissile elements in the spent fuel with natural uranium. This has the potential to create new fuel to power existing and future nuclear reactors while potentially reducing the volume and activity of waste that would need to be disposed of in a DGR.

CONSIDERATIONS

Until now, the nuclear industry has viewed the reprocessing and recycling of spent fuel as not cost effective or necessary at an industrial scale, given Canada's large high-grade uranium deposits, the low price of uranium, and the high cost of reprocessing and recycling spent fuel.



In 2015, the NWMO estimated that Canada's existing 100,000 tonnes of spent CANDU fuel could provide Canada with more than 120 years of energy if it were reprocessed and used in reactors capable of burning it.

Canada's nuclear industry has an integral role to play in the nation's clean energy future by replacing carbon emitting energy sources thereby helping to achieve emission reduction targets.

Some Small Modular Reactors (SMRs) under development in Canada could operate on reprocessed CANDU fuel. One SMR vendor is developing reprocessing technology that would provide the fuel for their reactor concept.

Commented [HG1]: Ref

Commented [HG2]: Int'l context of reprocessing

s.21(1)(a)

s.21(1)(b)

In 2021, ISED's Strategic Innovation Fund announced investment in two SMR projects: \$20 million in October 2020 for Terrestrial Energy to help complete pre-licensing of their Integral Molten Salt Reactor (IMSR), and \$50.5 million in March 2021 for Moltex Energy Ltd to develop its Stable Salt Reactor-Wasteburner (SSR-W) and WAsTe To Stable Salt (WATSS) reprocessing facility in New Brunswick.

Recently, public interest has been raised in the media fore concerning Canada's support of reprocessing technologies. In particular, concerns centre around the potential waste streams and potential for increased proliferation risks. NRCan has been working closely with GAC and CNSC to understand and address these concerns.

Work under the SMR Action Plan/SMR Fuel Supply WG on reprocessing to identify and address gaps...

It is expected that the ISED investment to Moltex Energy Ltd will fund research to provide data to better understand the waste streams and handling processes resulting from reprocessing, as well as risks and any additional safeguards requirements beyond the current protocols for Canada's existing facilities so that decisions on reprocessing policy may be made.

RECOMMENDATION

Director General, ERB
Marco Presutti

Date

Contacts:

- Daniel Brady, Deputy Director, Nuclear Energy, ERB, LCES 613-240-6357

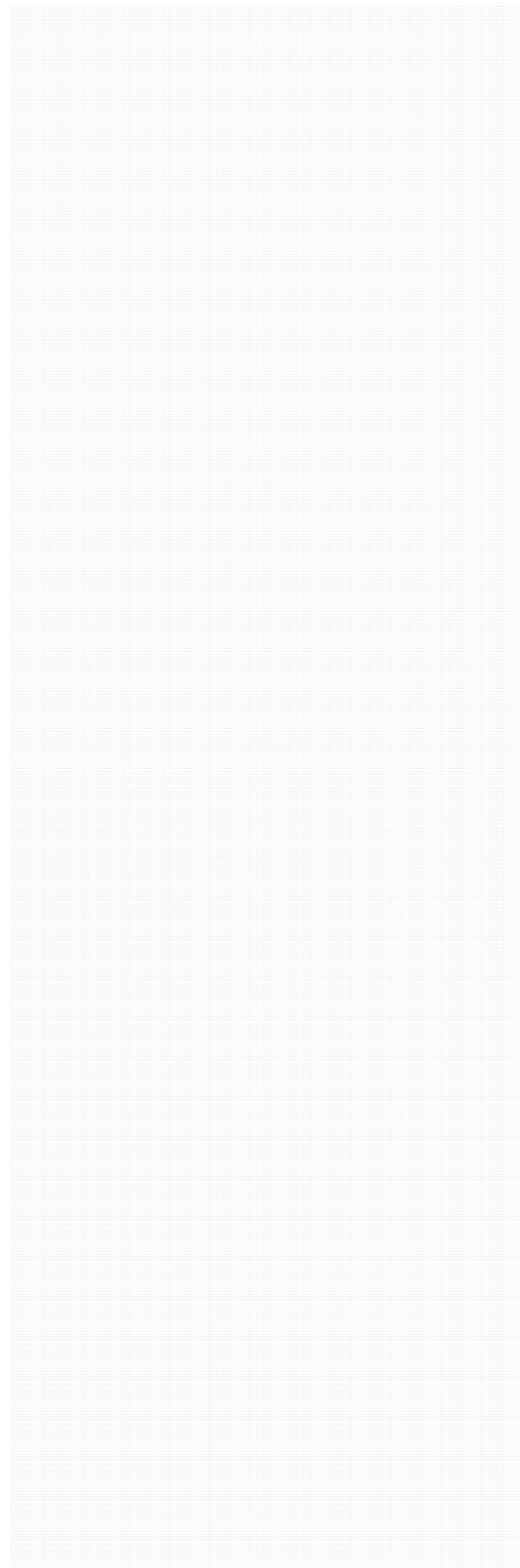
- I agree
- I disagree
- I wish to discuss

- 4 -

UNCLASSIFIED

Mollie Johnson, Assistant Deputy Minister
LCES

Date: _____



From: [Sonia Iqbal](#)
Sent: September 22, 2022 09:23
To: [MANLEY Robin -NEWNUCDEV](#); [REDACTED]
[MCGOEY Eric -NEWNUCDEV](#); [REDACTED]
[Hayward, Andy](#); [Thompson, Paul](#); [Siddiqui, Ali](#);
[\[REDACTED\] Iain Harry](#)
[\[REDACTED\] Brady, Daniel](#); [Brian Fehrenbach](#);
[Steve Coupland](#); [John Gorman](#); [Riley](#)
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[Gary -NUC REFURB](#); [Hannah, Justin](#); [Keith Garel](#); [Jackson,](#)
[Candice](#); [HORROBIN Richard\(R\) - BRUCE POWER](#); [Bill Walker](#);
[Paul McClelland](#); [Jos Diening](#)
Cc: [CHRISTIDIS George -FEDRELATIONS](#)
Subject: COG SMRTF: Fuel Recycling Task Team - Strategy for
Establishing a Policy on Used Nuclear Fuel Reprocessing (FOR
YOUR INFORMATION)
Attachments: Strategy on Reprocessing policyV9.docx

*****Caution** - email originated from outside of NRCAN. **Read the warning below / Attention-** Ce courriel provient de l'extérieur des RNCAN. **Voir la mise en garde ci-dessous*****

Dear SMRTF Participants,

Please find attached for your information a draft document entitled, "Strategy to establish a Policy on Used Nuclear Fuel Reprocessing". This document is being produced through the COG SMR Fuel Recycling Task Team. The document outlines the high-level principles that the industry would follow and the framework that already exists in Canada to ensure that these principles would be adhered to. This could form the basis for a Policy in Canada. It also proposes a focused pathway forward. This document was produced following numerous discussions with senior level representatives in NRCAN, Global Affairs Canada, and the CNSC directorate of Security, Safeguards and import/export Control.

This is to inform you that the draft has now been sent to these federal department and agencies to progress the implementation and discussions are taking place to ensure these departments have a sense of urgency and commitment.

Thanks,

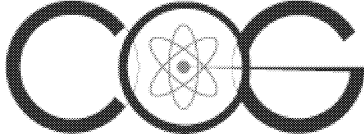
Sonia Iqbal, P.Eng.

Program Manager – SMR Program | Nuclear Safety and Environmental Affairs

CANDU Owners Group Inc.

s.19(1)

655 Bay Street, 17th Floor, Toronto, ON M5G 2K4



"Excellence Through Collaboration"

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September 21, 2022

Strategy to establish a Policy on Used Nuclear Fuel Reprocessing

Introduction and background

The commercial nuclear power industry in Canada currently utilizes a once through fuel cycle strategy of the natural uranium oxide fuel in CANDU reactors. This method is well known, safe, cost effective, and the end-of-life disposal pathway is funded and planned to be through the Nuclear Waste Management Organization's establishment of a Deep Geological Repository. Reprocessing of used nuclear fuel to extract the fission products and reuse the fissile and fissionable transuranic isotopes to produce energy in a commercial power reactor, is not currently done in Canada. although chemical extraction of fuel targets at Canadian National Laboratories (CNL) to extract medical isotopes has been routinely performed. A number of other countries however either have, or continue to, reprocess used fuel. Most, but not all of these countries, happen to be nuclear weapons states.

The reprocessing and recycling of used nuclear fuel has a number of important advantages which can include, depending on the design and fuel conversion ratio of the reactor:

- Improving the efficiency of the fuel cycle by extracting more energy from what would otherwise be treated as waste
- Significantly reducing the amount/volume of long-lived isotopes, thereby improving the public acceptability of nuclear power and the disposal of radioactive waste
- Potentially having a sustainable fuel cycle and significantly extending the availability of uranium supply
- Reducing the demand for fuel enrichment, including that for the production of high assay low enriched uranium.

While reprocessing of used CANDU fuel for re-use in CANDU reactors has not been economically attractive to pursue, the above benefits could potentially be realized in a cost-effective manner for advanced Gen IV fast fission reactors, two of which are specifically being developed currently in New Brunswick Canada.

While review of the various policies, regulations, international agreements, etc. reveal there appears to be no policy inhibitors to prevent the reprocessing of used nuclear fuel for peaceful purposes in Canada, discussion and feedback from critical government departments indicate a clear need to produce a policy before this could take place. The industry understands this need arises because of the perceived significant interest of both the Canadian public and indigenous population, as well as that of our international partners. This view is based on some high-profile opposition of certain groups against reprocessing related to concerns regarding proliferation and waste. Secondly, given the sensitivity in Canada and internationally resulting from the atomic weapons test by India in 1974 using reprocessed used fuel from a research reactor supplied by Canada in

1954, it is felt it is essential for Canada to be open, transparent, and beyond reproach with its plans and guiding policy related to the reprocessing of used nuclear fuel.

The nuclear industry established an SMR recycling/reprocessing task team under the Candu Owners Group. Following numerous discussions with senior representatives in NRCan, Global Affairs Canada, and the CNSC departments of security, safeguards, import and export, high level principles were developed that the task team believes provides guidance on the key areas of interest. These principles could form the basis of a national policy. Furthermore, the task team is of the opinion that Canada already has the necessary legislative and regulatory framework in place that would ensure these principles would be followed thereby ensuring reprocessing would be done safely with regards to impact on workers, the public and environment, and that Canada's international obligations (*to non-proliferation*) would be met.

High level Guiding Principles

- 1. Recycling/reprocessing in Canada would only be done for peaceful uses***
- 2. Adequate provisions must be in place to respect Canada's international obligations related to nuclear non-proliferation of controlled nuclear substances, equipment, and information***
- 3. Adequate provisions need to be in place to limit risks to the health and safety of persons and the environment***
- 4. Waste owners shall arrange for long-term management of radioactive wastes generated by recycling/reprocessing activities***
- 5. Adequate provisions need to be in place to limit risks to the health and safety of persons and the environment related to the secure transportation of reprocessed fuel***
- 6. Import/export of controlled nuclear substances, equipment and information, would be governed through Nuclear Co-operation agreements with supporting Administrative Arrangements***

A discussion of how the existing legislative and regulatory framework that already exists in Canada addresses these principles are provided in Appendix I. In summary however, the key elements of the framework involve:

- Canada being a signatory to the Treaty on Non-Proliferation of Nuclear Weapons (NPT)
- Canada being a signatory to the Additional Protocol to the NPT
- Nuclear Cooperation Agreements with Canada
- Administrative Arrangements with CNSC
- The Canadian Nuclear Regulatory Framework starting with the Nuclear Safety and Control Act, the associated regulations and CNSC regulatory documents

- The Transport of Dangerous Good Regulations
- Impact Assessment Act

Support needed to drive this forward to completion

While the industry has been able to progress discussions and appreciates the support we have received from the various key federal departments/agencies, the industry believes that it will need an increased level of engagement by those organizations to resolve these matters into a policy position at a pace that will support nuclear industry planning needs to support the low-carbon transition. This is especially true in aspects where the federal departments must take the leading role. An integrated workplan with clear names of responsibilities and dates for completion, with oversight of progress is requested.

Various elements as a minimum would include:

- Feedback on the principles and supporting framework
- What form would the policy take?
- How to convert this into a policy
- Communication plan for public (what, who, when etc.)
- Plan for rolling out to key external groups and countries (What, who, when, etc.)
- Strategy to get broader alignment within the broader government departments

The aspirational goal is to have a policy issued by spring 2023

PDT

Details on Framework is provided in Appendix I

Appendix I

Canada's Framework to ensure the Guiding Principles are met

The existing framework already exists in Canada to ensure the guiding principles are met. This is discussed below.

Principles 1,2 and 6.

- *Recycling/reprocessing in Canada would only be done for peaceful uses,*
- *Adequate provisions must be in place to respect Canada's international obligations related to nuclear non-proliferation of controlled nuclear substances, equipment and information,*
- *Import/export of technology, material and equipment would be governed through Nuclear Co-operation agreements with supporting Administrative Arrangements*

Existing framework and discussion:

Canada was the first country with substantial nuclear capability to reject nuclear weapons. Canada continues to be actively involved in the international promotion of the peaceful use of nuclear energy.

The Canadian Nuclear Safety Commission (CNSC) is responsible for implementing Canada's nuclear non-proliferation policy.

In addition, the CNSC participates in several international nuclear organizations in order to strengthen nuclear safety at home and abroad.

- IAEA Emergency Preparedness Review (EPREV) mission to Canada
- IAEA Integrated Regulatory Review Service mission to Canada
- International agreements
- Nuclear non-proliferation
- Nuclear materials verification (safeguards)

The CNSC is responsible for implementing Canada's nuclear non-proliferation policy, which contains two broad, long-standing objectives:

1. to assure Canadians and the international community that Canada's nuclear exports do not contribute to the development of nuclear weapons or other nuclear explosive devices
2. to promote a more effective and comprehensive international nuclear non-proliferation regime

The cornerstone of the international nuclear non-proliferation regime is the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

The NPT establishes commitments to prevent the spread of nuclear weapons, promote cooperation on the peaceful uses of nuclear energy and achieve nuclear disarmament.

Canada is an original signatory to the NPT and has centered on the treaty's provisions.

The CNSC, through the Nuclear Safety and Control Act (NSCA) and corresponding regulations, implements Canada's NPT commitments:

- not to receive, manufacture or acquire nuclear weapons or other nuclear explosive devices
- to accept International Atomic Energy Agency (IAEA) safeguards on all nuclear material in peaceful uses in Canada
- to ensure that Canada's nuclear exports to non-nuclear-weapon states are subject to IAEA safeguards

Under the NSCA and its regulations, Canadian importers and exporters are required to obtain and comply with CNSC licences controlling the international transfer of nuclear and nuclear-related items. Licensees must respect Canada's nuclear non-proliferation commitments.

Through the licensing process, the CNSC takes steps to ensure that nuclear imports and exports are consistent with Canada's nuclear non-proliferation policy.

The policy requires major nuclear exports to be subject to a nuclear cooperation agreement between Canada and the importing country.

These agreements establish reciprocal obligations that are designed to minimize the risk of proliferation associated with the international transfer of major nuclear items.

The CNSC participates with Foreign Affairs, Trade and Development Canada (DFATD) in the negotiation of bilateral nuclear cooperation agreements and implements administrative arrangements with its foreign counterparts to effectively fulfill the terms and conditions of these agreements.

The approaches and measures utilized by the IAEA to verify that nuclear material is not diverted from peaceful uses to nuclear weapons or other nuclear explosive devices in accordance with NPT commitments are commonly referred to as "safeguards".

In 1972, Canada was the first country to bring into force a comprehensive safeguards agreement with the IAEA pursuant to the NPT. The safeguards agreement gives the IAEA the right and obligation to monitor Canada's nuclear-related activities and verify nuclear material inventories and flows in Canada.

In 2000, as part of worldwide efforts to strengthen IAEA safeguards, Canada brought into force the Additional Protocol to its safeguards agreement with the IAEA.

The Additional Protocol gives the IAEA enhanced rights of access to nuclear sites and other locations and provides it with access to information about nuclear-related activities in Canada above and beyond its rights under the original safeguards agreement.

The CNSC is responsible for implementing the Canada/IAEA safeguards agreement and the Additional Protocol. Through the NSCA, regulations and licences, the CNSC implements regulatory controls for the production, use, storage and movement of nuclear material in Canada.

Conditions for the application of IAEA safeguards are contained in nuclear facility operating licences.

Through its regulatory process, the CNSC ensures that all relevant licensees have in place safeguards policies and procedures that include:

- the reporting and monitoring of nuclear material and activities
- the provision of IAEA safeguards inspector access to nuclear facilities

The CNSC performs compliance and auditing activities to ensure licensees' safeguards policies and procedures remain sufficient to meet the safeguards requirements of the agreement and Additional Protocol.

The CNSC maintains a national system that accounts for and controls nuclear materials in Canada, and supplies reports to the IAEA that serve as a basis for IAEA inspection and monitoring activities.

The CNSC also cooperates with the IAEA in developing new safeguards approaches for Canadian facilities and contributes to efforts to strengthen safeguards internationally.

As part of this effort, the CNSC, through its Safeguards Support Program, assists the IAEA in developing advanced safeguards equipment or techniques aimed at strengthening the effectiveness and efficiency of safeguards implementation.

The program also supports domestic needs in resolving specific safeguards issues related to Canadian nuclear facilities and the use of nuclear material.

The CNSC participates in a number of international committees and groups as well as international meetings and research projects committed to ensuring the safe, secure and peaceful use of nuclear materials and technology.

Membership and participation in these international activities ensure that the CNSC's regulatory activities are consistent, as appropriate, with internationally agreed upon best practices and principles.

Membership and participation also ensure that CNSC guidance, policies and technical standards are current. Through the CNSC's participation in various international nuclear fora, Canada's position on nuclear regulatory matters is heard.

In particular, the CNSC participates in various committees and activities of the [IAEA](#) and [Nuclear Energy Agency](#). As part of its work with these organizations, the CNSC represents Canada, or participates in broader Canadian delegations in a wide variety of relevant multilateral discussions, symposia and conferences that address such issues as:

- the physical protection of nuclear materials and facilities
- international transport of nuclear and other radioactive material
- nuclear safety
- radiation protection
- radioactive waste management
- nuclear safeguards

- nuclear regulation

In 2015, the CNSC gained observer status in the Western European Nuclear Regulators Association (WENRA). The CNSC made the request to become an observer, to promote the exchange of experiences with fellow regulators and learn from international best practices. As an observer, the CNSC will have the opportunity to participate in WENRA's working groups on reactor harmonization and on waste and decommissioning.

The CNSC also participates with Global Affairs Canada in two multilateral nuclear export control mechanisms: the Nuclear Suppliers Group and the Zangger Committee. Canada was a founding member of both these bodies.

The CNSC contributes technical and policy expertise in meetings and working groups of these committees to:

- ensure that the guidelines established by these bodies relating to conditions of nuclear supply effectively address proliferation threats
- ensure that the lists of controlled items take into account advances in nuclear and nuclear-related technology

The implementation of the CNSC's statutory responsibilities for the regulation of Canadian nuclear exports is consistent with the guidelines of these bodies.

Security

Nuclear security is a major consideration for all CNSC activities. The CNSC is responsible for enforcing Canada's Nuclear Security Regulations, as enabled by the Nuclear Safety and Control Act. Nuclear security in Canada is aided by federal regulations, which set out detailed security requirements for licensed nuclear facilities. The CNSC's approach follows international physical protection best practices and standards recommended by the International Atomic Energy Agency.

CNSC staff assess if licensees meet the requirements of the Nuclear Security Regulations and the conditions of their licences through ongoing compliance verification activities. The specific areas of security include: facilities and equipment, security practices, response arrangements, and drills and exercises. The CNSC has worked closely with nuclear facility operators, law enforcement and intelligence agencies, international organizations and other governmental departments to ensure that nuclear materials and facilities are adequately protected.

Principle 3

Adequate provisions need to be in place to limit risks to the health and safety of persons and the environment.

The Canadian Nuclear Safety Commission regulates the full life cycle of a facility. The mandate of the CNSC as defined in the Nuclear Safety and Control act is to:

- **(a)** to regulate the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information in order to
 - **(i)** prevent unreasonable risk, to the environment and to the health and safety of persons, associated with that development, production, possession or use,
 - **(ii)** prevent unreasonable risk to national security associated with that development, production, possession or use, and
 - **(iii)** achieve conformity with measures of control and international obligations to which Canada has agreed; and
- **(b)** to disseminate objective scientific, technical and regulatory information to the public concerning the activities of the Commission and the effects, on the environment and on the health and safety of persons, of the development, production, possession and use referred to in paragraph (a).

The CNSC carries out this mandate through a comprehensive framework of regulations supported by regulatory documents, and Licences covering the entire life cycle of a facility. Facility licences are required for; the Licence to prepare site, Licence to construct, Licence to operate, and Licence to decommission. The CNSC conducts the licensing process in an open and transparent manner, holding public hearings that allow for public and indigenous interventions.

The licence application process ensures the following safety and control areas are addressed in a systematic and comprehensive manner.

- management system
- human performance management
- operating performance
- safety analysis
- physical design
- fitness for service
- radiation protection
- conventional health and safety
- environmental protection
- emergency management and fire protection
- waste management
- security
- safeguards and non-proliferation
- packaging and transport

Principle 4

Waste owners shall arrange for long-term management of radioactive wastes generated by recycling/reprocessing activities

The Regulatory framework including any Environmental Assessment or Impact Assessment under the Impact Assessment Act, ensures the full life cycle of a facility, including waste management is considered upfront in the licensing of a facility. Thus, an EA or IA can not be granted, or a licence to prepare a site issued, unless there is a credible pathway for the management and disposal of wastes.

Principle 5

Adequate provisions need to be in place to limit risks to the health and safety of persons and the environment related to the secure transportation of reprocessed fuel

In Canada such shipments fall under Class 7 of Transport Canada's Transportation of Dangerous Goods Regulations. They also fall under CNSC's Nuclear Safety and Control Act and are regulated under the Packaging and Transport of Nuclear Substances Regulations, which in turn is in alignment with IAEA Safety Standards Series No. SSR-6, Regulations for the Safe Transport of Radioactive Material. Transport Canada and the CNSC cooperate in regulating the transport of nuclear substances through a Memorandum of Understanding (MOU)

Packaging and transport of nuclear substances

All nuclear substances are transported in packages that are selected based on the nature, form, and quantity or activity of the substance. There are general design requirements that apply to all package types to ensure that they can be handled safely and easily, secured properly, and are able to withstand routine transport conditions.

The CNSC issues licences and certificates in certain cases for the packaging and transport of nuclear substances as stipulated in the Packaging and Transport of Nuclear Substances Regulations, 2015 (PTNSR 2015). These regulations are based on the International Atomic Energy Agency's (IAEA's) SSR-6, Regulations for the Safe Transport of Radioactive Material, 2018 Edition.

The PTNSR 2015 introduced an ambulatory reference to the IAEA Regulations and no longer explicitly identify and list relevant paragraphs from them. This change ensures that Canadian regulations will continue to align with international regulations if international regulations are modified.

The CNSC published REGDOC-2.14.1, Volume I: Information Incorporated by Reference in Canada's Packaging and Transport of Nuclear Substances Regulations, 2015, to help the regulated community comply with the PTNSR 2015. REGDOC-2.14.1 links provisions in the regulations to relevant content in the IAEA Regulations, the *Nuclear Safety and Control Act*, other CNSC regulations, and other related information.

Certification of transport packages and special form radioactive material

The CNSC regulates all aspects of the packaging and transport of nuclear substances, including the design, production, use, inspection, maintenance and repair of packages. In addition, the PTNSR 2015 require that certain types of package design be certified by the CNSC prior to being used in Canada. They also include provisions for the certification of special form radioactive material, which specify that the sealed source containing the radioactive material must be designed to be strong enough to maintain leak tightness under the conditions of use and wear for which it was designed.

Learn more about the [certification process for transport packages](#).

See the list of [CNSC certified transport packages and special form radioactive material](#).

Transport licences

The transport of nuclear substances is a regulated activity in Canada, with CNSC licensees involved in the majority of shipments. In general, the transport of nuclear substances does not require a CNSC transport-specific licence. The PTNSR 2015 require that specific transport licences be issued only in the following circumstances:

- transport of Category I, II or III nuclear material
- transport of nuclear substances while in transit
- transport of nuclear substances contained in large objects
- transport of nuclear substances when the transport cannot meet all of the regulatory requirements
- transport of nuclear substances that require a multilateral approval of shipments
- transport of nuclear substances that require a special use vessel

The majority of these licences are issued for the transport of in-transit shipments (i.e., nuclear substances transiting Canada while being transported from one country to another) and for the transport of Category I, II and III nuclear material.

Details on the specific information requirements for each type of transport licence application can be found in section 6 and section 7 of the [PTNSR 2015](#).

Category I, II and III nuclear material

A CNSC licence to transport Category I, II or III nuclear material is required to transport material that is defined in section 1 of the *Nuclear Security Regulations*, such as plutonium, various grades of unirradiated uranium-235, and irradiated fuels consisting of depleted or natural uranium, thorium or low-enriched fuel.

[REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material*](#), offers assistance in preparing a written transportation security plan as required under section 5 of the *Nuclear Security Regulations* when applying for these licences.

From: [Canadian Nuclear Association](#)
Sent: March 28, 2022 07:00
To: [Hannah, Justin](#)
Subject: the reactor: nuclear waste, SMR investments, and green bonds

Newsletter of the Canadian Nuclear Association
[View this email in your browser](#)



the reactor

The NSDF needs your support

Nuclear waste and spent fuel, and what to do with it long-term, remains one of the most pressing challenges for the nuclear industry. Concerns around the safety of nuclear waste and spent fuel storage facilities, often based on misinformation and poor science, are consistently raised by anti-nuclear activists in their opposition to further development in the sector. These objections distract government and the public from focusing on the significant environmental benefits of this low-carbon, stable source of power and heat, and delay the action necessary to find long-term, safe, and reliable solutions.

You now have a chance to lend your voice to this vitally important discussion.

At the end of May, the Canadian Nuclear Safety Commission (CNSC) will hold the second part of its public hearing into the application by Canadian Nuclear Laboratories (CNL) to build its Near Surface Disposal Facility (NSDF). The proposed NSDF would be an engineered containment facility with a design that will last 550 years, more than enough time for the low-level radioactive waste contained in the facility to decay to normal levels.

The approval and construction of the NSDF will prove that Canada is still a world-leader in management of nuclear waste and spent fuel. This facility represents not only a solution to temporary storage of low-level radioactive waste, but also a major step forward for the country's long-term plans for nuclear waste management.

To provide a written submission, or even better to sign up to give an oral intervention at the hearing, you can either [visit CNL's website](#), or go [directly to CSNC](#).

SMRs moving from concept to reality

Realizing the vast potential of small modular reactors (SMRs) took yet another step forward a few weeks ago with the [announcement of over \\$27 million in funding](#) by Innovation, Science and Economic Development Canada for the development and deployment of Westinghouse's eVinci micro reactor. This follows last year's announcement by GE Hitachi Nuclear Energy and Ontario Power Generation [that they will work together](#) to deploy a BWRX-300 at the Darlington site by 2028.

In his opening remarks announcing the funding for the eVinci project, François-Philippe Champagne, Canada's Minister of Innovation, Science and Industry, said that the investment *"will play a critical role in fighting climate change, building on Canada's global leadership in SMRs and securing jobs in Ontario's energy sector."*

But these encouraging words only scratch the surface of the potential of SMRs, which will transform not only the way that we generate power for our daily lives, but also produce off-grid power for rural communities, generate hydrogen, produce clean drinking water, power container ships, produce low-carbon, high-temperature heat for heavy industry, among countless other applications.

Unfortunately, the uninformed [criticisms came quickly](#), suggesting that any investment in SMRs is a "distraction" from the investment that's needed in renewables, an ironic argument considering the vast financial government support already provided for other clean energy technologies.

Climate change and energy transition advocates need to stop trying to pick winners. There is no credible pathway to net-zero emissions in Canada that doesn't include nuclear power. If there's anything that's distracting Canada from reaching zero emissions, it's the constant debates about which technology will be the one to lead the fight – because this is a false choice.

There is no single answer to decarbonisation, all zero and low-emitting electricity sources are required to achieve Canada's GHG reduction targets – we're all in this together.

Latest on the Green Bond Framework

Quickly following the announcement of the federal government's Green Bond Framework, thousands of Canadians spoke up to protest the fact that nuclear had been explicitly excluded. This decision, which is not in line with the government's own climate and emissions plans, caught many people by surprise and frustrated an industry that remains unsure of the government's full and long-term commitment to nuclear.

Thanks to the reaction, which was both swift and loud, the government has been forced to answer the public directly as to why it made this decision. During their [press conference](#) detailing the results of the first green bond issuance, Associate Minister of Finance Randy Boissonnault was asked by media why nuclear had been excluded.

Read below for a transcript of his response (or [watch a clip](#) we posted to [@CanadaNuclear](#) last week).

"It's a very good question and let me just begin by saying that this is the first time that Canada was going to go to market with a green bond, and we've seen the success of it, and we wanted to make sure that we harmonized with international best practices. And from what we see in Europe, nuclear is not part of that mix. And so we wanted to make sure that we followed those international best practices on this lead bond issuance.

I can also say this – that our government works very closely with the nuclear sector. And just last week, François-Philippe Champagne, our colleague, Minister of Industry, Science and Economic Development, made an announcement of \$57 million [sic] to Westinghouse Electric, in the riding of Burlington, precisely for a micro reactor.

And so, we see – and Minister Wilkinson has been very clear on this, our government has been clear on this – we see nuclear as part of the pathway to net zero. And should international best practices evolve, we will definitely take a look at that in the future."

Public recognition by the government that nuclear power is central to Canada's net zero ambitions is important, and we welcome this kind of statement. But statements of support in speeches and press conferences are very different than tangible support in the form of policy, programs, and financing mechanisms.

As Ministers Guilbeault and Wilkinson wrote recently when announcing government support for carbon capture and storage, "*When it comes to climate change, there's no magic bullet. So let's use every tool in the toolbox.*"



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s.19(1)

From: [Rory O'Sullivan](#)
Sent: November 14, 2022 13:18
To: [Bernier, Andre](#); [Hannah, Justin](#)
Subject: Recycling/Reprocessing policy

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Hi Andre and Justin,

Just dropping you a note that I heard the recycling/reprocessing policy is still going quite slowly. It appears like it may be in the long grass. I know Paul is getting back to the team with some questions but I would be grateful if you could both keep an eye on this in the coming months to make sure it doesn't get forgotten.

As staff have changed over the last year or two we have had to go backwards several times, going over the same material again. Without a change I could see this going on for another two years.

Thanks and regards,

Rory O'Sullivan
Chief Executive Officer
+1 437 778 4232



Moltex Energy

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From: [Rory O'Sullivan](#)
Sent: March 29, 2022 11:21
To: [Delaney, Jim](#); [Thompson, Paul](#); [Ian Scott](#); [Hayward, Andy](#);
[Bernier, Andre](#); [Hannah, Justin](#); [Yuen, Pui Wai](#)
Subject: Re: Draft Radioactive Waste Policy
Attachments: Moltex comments on draft waste policy - 24 March 2022.pdf

Hi all,
In case you have not received it formally, here is our response to the consultation which we can discuss on the call.
Rory

From: Delaney, Jim
Sent: 24 March 2022 13:03
To: Delaney, Jim <jim.delaney@NRCan-RNCan.gc.ca>; Thompson, Paul
<[REDACTED]> Rory O'Sullivan <[REDACTED]> Ian Scott
<[REDACTED]> Hayward, Andy <[REDACTED]> Bernier, Andre
<andre.bernier@NRCan-RNCan.gc.ca>; Hannah, Justin <Justin.Hannah@nrca-rnca.gc.ca>; Yuen, Pui Wai <puiwai.yuen@NRCan-RNCan.gc.ca>
Subject: Draft Radioactive Waste Policy
When: 29 March 2022 12:30-13:00.
Where: Microsoft Teams Meeting

Microsoft Teams meeting

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March 24, 2022

RE: Natural Resources Canada's Draft Policy on Radioactive Waste Management and Decommissioning

Moltex appreciates that Natural Resources Canada's draft policy incorporates many of the recommendations the company made during the initial call for input on waste minimization, waste storage facilities, decommissioning and waste disposal. The company also agrees with the Government of Canada's vision for radioactive waste management and the three policy principles intended to guide government commitments.

However, Moltex proposes that the final policy exclude draft commitment 1.5:

The federal government: ensures that the deployment of reprocessing technology in Canada, which allows for the extraction of fissile material from used nuclear fuel, is subject to policy approval by the Government of Canada to ensure that due consideration is given to all relevant factors, including ensuring the health, safety and security of people in Canada, as well as compliance with international safeguards and non-proliferation treaties, and respect for environmental considerations.

When Moltex assessed which country would be most suitable for developing its technology, Canada was a top choice, because it did not have any policies opposing reprocessing.

Draft commitment 1.5 requires a reprocessing policy; this would make it very difficult to attract investment until the reprocessing policy is finalized, which could take years. Moltex would likely not have come to Canada if a reprocessing policy had been mandated at the time.

Moltex believes that, before mandating a reprocessing policy, it would be beneficial to hear stakeholder views. Industry-government discussions on this topic are underway. Moltex is ready to support these discussions, and understands that they may eventually lead to a reprocessing policy. But mandating a reprocessing policy before discussions are complete is a barrier to funding – and consequently to advancing technologies that could lead to low-carbon power generation and a reduction in radioactive waste.

Uncertainty about the need for a reprocessing policy could also affect other companies pursuing innovation in minimizing nuclear waste, and may lead them to consider deployment of their technologies in other countries. For example, it could restrict companies that are evaluating ways of converting waste streams into more stable forms prior to storage and disposal.

Moltex values the opportunity to provide input on this matter, and looks forward to a final policy on radioactive waste management and decommissioning that considers the unique needs of companies pursuing waste reprocessing and minimization in Canada.

Sincerely,

Rory O'Sullivan
CEO, North America
Moltex Energy

s.19(1)
 s.21(1)(a)
 s.21(1)(b)

From: [Yuen, Pui Wai](#)
Sent: November 1, 2022 21:43
To: [Hannah, Justin](#)
Subject: FW: EXT - RE: Discussion topics related to recycling/reprocessing paper
Attachments: DECK - Fuel WG Meeting - Reprocessing Final 2021-12-06.pptx

Hi Justin,

Here's what we had shared with the COG task group in terms of Qs on waste when we kick-started the reprocessing 'policy' topical sessions back in December 2021. I'll re-iterate tomorrow that as a first step to help us pull together a briefing package on reprocessing, for industry to provide us answers to the questions.

Jamie mentioned that you will lead if that's correct? And, we'll support you along the way.

PW

From: Yuen, Pui Wai
Sent: 31 octobre 2022 10:50
To: Prosser, Kathleen <Kathleen.Prosser@NRCan-RNCan.gc.ca>
Cc: Calvert, Tom <tom.calvert@NRCan-RNCan.gc.ca>; Fairchild, Jamie <jamie.fairchild@NRCan-RNCan.gc.ca>
Subject: FW: EXT - RE: Discussion topics related to recycling/reprocessing paper

From: Brady, Daniel <daniel.brady@NRCan-RNCan.gc.ca>
Sent: 8 décembre 2021 12:59
To: Thompson, Paul [REDACTED] Delaney, Jim (NRCAN/RNCAN) <jim.delaney@canada.ca>; Hannah, Justin <Justin.Hannah@nrca-nrcan.gc.ca>; Tanya.Hinton@international.gc.ca; kathleen.heppell-masys@cnscccsn.gc.ca
Cc: Sonia Iqbal [REDACTED] Chris Deir [REDACTED] [REDACTED] SPENCE Cameron -NEWNUCDEV [REDACTED] KLEB Heather(HR) - BRUCE POWER [REDACTED] Siddiqui, Ali [REDACTED] Riley Found [REDACTED] Steve Bushby [REDACTED] Bourassa, Pascale <Pascale.Bourassa@cnscccsn.gc.ca>; Reinholz, David <David.Reinholz@cnscccsn.gc.ca>; Tortorelli, Joseph <joseph.tortorelli@NRCan-RNCan.gc.ca>; Fairchild, Jamie <jamie.fairchild@NRCan-RNCan.gc.ca>; Yuen, Pui Wai <puiwai.yuen@NRCan-RNCan.gc.ca>; Nardia [Ontario] Ali - EC | EC (Nardia.Ali@ec.gc.ca)

s.19(1)

<Nardia.Ali@ec.gc.ca>; Calvert, Tom <tom.calvert@NRCan-RNCan.gc.ca>

Subject: RE: EXT - RE: Discussion topics related to recycling/reprocessing paper

Dear all,

Thank you for participating in today's Teams meeting.

Please find enclosed the slides that were used during the meeting. Please review and I look forward to comments, questions, and thoughts on a path forward.

Regards

Daniel

From: Thompson, Paul [REDACTED]
Sent: November 26, 2021 06:33
To: Brady, Daniel <daniel.brady@NRCan-RNCan.gc.ca>; Delaney, Jim (NRCan/RNCan) <jim.delaney@canada.ca>; Hannah, Justin <Justin.Hannah@nrca-rnca.gc.ca>; Tanya.Hinton@international.gc.ca; kathleen.heppell-masys@cnsccsn.gc.ca
Cc: Sonia Iqbal [REDACTED] Chris Deir [REDACTED]
[REDACTED] SPENCE Cameron -NEWNUCDEV
KLEB Heather(HR) - BRUCE POWER [REDACTED] Siddiqui, Ali
[REDACTED] Riley Found [REDACTED] Steve Bushby
[REDACTED] grace.harrison@canada.ca
Subject: RE: EXT - RE: Discussion topics related to recycling/reprocessing paper

Sounds good thanks Dan

From: Brady, Daniel <daniel.brady@NRCan-RNCan.gc.ca>
Sent: November 25, 2021 11:38 PM
To: Thompson, Paul [REDACTED] Delaney, Jim (NRCan/RNCan) <jim.delaney@canada.ca>; Hannah, Justin <Justin.Hannah@nrca-rnca.gc.ca>; Tanya.Hinton@international.gc.ca; kathleen.heppell-masys@cnsccsn.gc.ca
Cc: Sonia Iqbal [REDACTED] Chris Deir [REDACTED]
[REDACTED] SPENCE Cameron -NEWNUCDEV
KLEB Heather(HR) - BRUCE POWER [REDACTED] Siddiqui, Ali
[REDACTED] Riley Found [REDACTED] Steve Bushby
[REDACTED] grace.harrison@canada.ca
Subject: EXT - RE: Discussion topics related to recycling/reprocessing paper

*** Attention: External Message / Message externe ***

Hi Paul,

Thank you for reaching out. I would tend to agree that scheduling regular meetings on specific topics is an appropriate approach to move things forward.

I would like to recommend that the first meeting be on December 8th.

If in agreement, I will send out a meeting invite.

Regards

Daniel

From: Thompson, Paul [REDACTED]
Sent: November 23, 2021 10:18
To: Delaney, Jim (NRCAN/RNCAN) <jim.delaney@canada.ca>; Hannah, Justin <Justin.Hannah@nrcan-rncan.gc.ca>; Tanya.Hinton@international.gc.ca; kathleen.heppell-masys@cnscccsn.gc.ca
Cc: Sonia Iqbal [REDACTED]; Chris Deir [REDACTED]; [REDACTED] SPENCE Cameron -NEWNUCDEV [REDACTED]; KLEB Heather(HR) - BRUCE POWER [REDACTED]; Siddiqui, Ali [REDACTED]; [REDACTED] Riley Found [REDACTED]; Brady, Daniel <daniel.brady@NRCan-RNCan.gc.ca>; Steve Bushby [REDACTED]; grace.harrison@canada.ca
Subject: Discussion topics related to recycling/reprocessing paper

Hi Jim/Justin, at our last meeting you suggested that as path forward we set up a series of meeting to discuss specific topics associated with the paper.

I believe the key areas would be;

1. Needs and benefits
2. Proliferation and security
3. Waste
4. Export
5. Treaty and Policy considerations

Can you and team look to see if these are the topic areas of interest, and what order you would suggest we tackle these.

I would suggest we use the Wednesday 10 to 11 Eastern timeslot starting December 1st.

Thanks
Paul

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Policy Development on Reprocessing

Daniel Brady, Deputy Director, Nuclear Energy Division, Natural Resources Canada

2020-06-18
18/06/2020

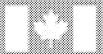
Canada

Current View on Reprocessing Policy

Canada does not have an explicit policy that provides for the reprocessing of spent fuel and it is likely that such a policy decision/statement would be required before implementing reprocessing within Canada.

Such a policy decision/statement **needs to be informed** on variety factors (next slide).

MOLTEX –WATTS is at an early stage, undertaking exploratory R&D on the proposed process.



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**is withheld pursuant to sections
est retenue en vertu des articles**

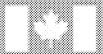
21(1)(a), 21(1)(b)

**of the Access to Information Act
de la Loi sur l'accès à l'information**

Example of Information of Interest

Comparison between existing CANDU once through cycle VS WATTS VS PUREX when it comes to:

- Environmental impacts
- Non-proliferation
- Health
- Safety & Security



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s.21(1)(a)

s.21(1)(b)

Waste Questions for Consideration

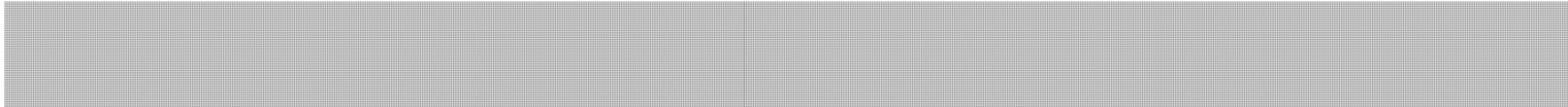
5

- How are the waste streams going to be:
 - handled
 - stored for the short-term
 - long-term disposal
 - if any, identify additional safeguards consideration for the new waste streams that are different than CANDU waste streams
 - types of enabling facilities (for e.g. shielded facilities, and/or treatment, conditioning, processing, packaging facilities) required for the waste handling/storage/long-term disposal
- Decommissioning of reprocessing facilities – identify international experience and challenges if any. How will decommissioning of reprocessing facilities differ from conventional CANDU facilities? For e.g., is it more complex, higher hazards, etc.? Any lessons learned from decommissioning of reprocessing facilities that can be taken into account in the SMR design to facilitate decommissioning.

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Next Steps

- 
- Defined questions from departments?
- Regular meetings on specific topics



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s.15(1) I.A.
s.21(1)(a)
s.21(1)(b)

From: Brady, Daniel
Sent: March 29, 2022 10:36
To: Hannah, Justin
Subject: RE: RW Policy Reprocessing

Hi Justin

A couple of points to note:

1. Canada did research in reprocessing in the past (1960-1970's). Here I am speaking of actual reprocessing small volumes and had an R&D program. Canada has never done commercial reprocessing. [REDACTED]

2. What has changed from the 60s is the world became more focus on non-proliferation given certain historical and current events. Given reprocessing is linked weapons, this is the challenge even though what is being sought is a technology that would not produce weapons grade material. Countries continue to examine the value of reprocessing.

3. [REDACTED]

4. The world has changed a lot in the last 6 months, and there is a potential for nuclear to become a lot more wide spread around the world. In addition, if one is serious about decarbonisation, then nuclear and using the energy in spent fuel will become more discussed, considered and pursued. [REDACTED]

5. [REDACTED]
Hence, NRCan needs to work with industry, lab and other sources to develop the knowledge to develop a policy. [REDACTED]

Would you like me on the call? If so, please forward. Paul has kept me in the loop and I was copied on the emails.

s.21(1)(a)
s.21(1)(b)
s.69(1)(g) re (a)

Dan


From: Hannah, Justin <Justin.Hannah@nr-can.gc.ca>
Sent: March 29, 2022 09:26
To: Brady, Daniel <daniel.brady@NRCan-RNCan.gc.ca>
Subject: FW: RW Policy Reprocessing

FYI, Thoughts?

From: Delaney, Jim <jim.delaney@NRCan-RNCan.gc.ca>
Sent: March 29, 2022 9:05 AM
To: Bernier, Andre <andre.bernier@NRCan-RNCan.gc.ca>; Hannah, Justin <Justin.Hannah@nr-can.gc.ca>
Cc: Yuen, Pui Wai <puiwai.yuen@NRCan-RNCan.gc.ca>
Subject: RW Policy Reprocessing

Hi Andre and Justin,

In advance of our call at 11:30, just a quick note to let you know that we received Moltex's submission on the draft RW Policy (attached).



Here is a [link to the policy](#) for reference. For reference, they are also looking to speak about Green Bonds.

Jim