LEGISLATIVE RETURN

SUBMITTED BY: Hon. Mr. Streicker, Minister of Energy, Mines and Resources

1. On May 1, 2024, Scott Kent, Member for Copperbelt South

   ☒ asked the following question during the Oral Question Period at page(s) 5437 of *Hansard*

   ☐ submitted the following written question – WQ No. #

   ☐ gave notice of the following motion for the production of papers – MPP No. #

   RE: Our Clean Future implementation

OR

2. This legislative return relates to a matter outstanding from discussion with [MLA] on [date] related to:

   Bill No. 211 ☐ Second Reading ☐ Third Reading

   ☐ Committee of the Whole: [Vote]

   Motion No. # RE: [subject]

   at page(s) [page numbers] of *Hansard*.

The response is as follows:

In Our Clean Future the Yukon strategy for climate change, energy and a green economy, on page 48 there is reference to nuclear energy stating "We will also stay up-to-date on new and emerging energy technologies that may be able to meet Yukon's needs in the future, such as nuclear energy, and increase our knowledge of renewable and low-carbon energy sources that may be available in Yukon." In 2023 we commissioned a study on small modular reactors and their feasibility for the Yukon. Appended to this legislative return is the summary of that report.

That full report can be found on the Yukon.ca website here:
https://yukon.ca/sites/yukon.ca/files/emr/emr-feasibility-study-small-modular-reactors-yukon.pdf

May 2, 2024
Date

Signature

Feasibility Study of Small Modular Reactors in the Yukon

Calian Nuclear Report YG-0010-02
Version 3.0
7 August 2023

Presented to:

Government of Yukon
Energy, Mines and Resources – Energy Branch

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5. KEY FINDINGS FOR SMR VIABILITY IN THE YUKON

This section provides a summary of the key requirements that are needed for the successful deployment of SMRs in the Yukon. Recommendations are made as to the actions that the Yukon should consider to facilitate the development and uptake of SMRs.

The availability of the technology is an important factor considered for the feasibility of SMR deployment in the Yukon. There are currently 12 SMR designs undergoing the VDR process in Canada with the CNSC. There are also multiple projects underway in Canada to have SMRs deployed in New Brunswick, Saskatchewan, and Ontario, with expected operation start dates as early as 2027. These projects will help to demonstrate the technical and economic feasibility of the technology. The Yukon does not want to be the first adopter of a new technology but would support following quickly after other projects have been demonstrated. Therefore, this report recommends that Canadian SMR projects proceed further, with the Yukon preparing to be a "fast follower" once technological readiness is proven.

The completion of these projects will also facilitate further development of the domestic supply chain in Canada and improve understanding of the necessary equipment that can be produced locally. Since timelines are still currently theoretical, these projects will also build confidence in the length of the licensing and construction process for an SMR project. The availability of technology does not pose a barrier for SMR deployment in the Yukon, but it is recommended to allow current Canadian projects to progress in order to provide experience to inform future potential SMR deployment in the Yukon.

Logistical considerations, specifically staffing requirements, transportation, and refueling cycle, were additional factors considered for SMR feasibility in the Yukon. SMR projects are designed to require fewer workers throughout their entire lifecycle as opposed to traditional nuclear plants. However, it is still expected that some specialized staff will need to be trained or relocated, but this is not expected to be a barrier to SMR deployment. It is expected that any potential SMR deployment site will need to be accessible by road. The long refueling cycle for SMRs and limited need for transportation of fuel can be seen as a logistical advantage, specifically for remote communities. These transportation considerations are noted but are not expected to represent a barrier to SMR deployment in the Yukon.

The availability of fuel is another important consideration for SMR feasibility in the Yukon. Waste disposal and mining/fuel concerns were identified in Section 4.7 as a concern from engagement respondents. As discussed, many SMRs require enriched fuel like HALEU, and there are short term concerns for the supply of this fuel. Given ongoing efforts to improve the domestic fuel supply chain, availability of fuel is not expected to be a barrier based on the timelines expected for the Yukon. It is expected that long term waste from SMRs will be managed by the NWMO in a deep geological repository in Ontario. There would be no nuclear waste stored long term in the Yukon.

Numerous benefits from an SMR deployment in the Yukon were highlighted. SMRs are carbon free and can help to reduce GHG emissions. Currently, these benefits would be more notable for remote communities and off grid mine sites due to the currently foreseen capacity needs and 10-year renewable electricity plan in place for the main grid. From 2030 and onward, these benefits will become more notable for the on-grid scenario as energy requirements will continue to increase and electrification of different industries will occur. The minimal amount of land use and disruption required for SMRs are additional benefits. Limited interest in new hydroelectric power due to the disruption of river ecosystems was a noted outcome of public outreach activities as documented in Section 4.7. SMRs address this concern due to the minimal amount of land required and lack of disruption of water bodies when compared to other renewable options. SMRs can also induce economic and industrial development due to job creation, local development of equipment, and their additional uses, such as district and industrial heating. Another major benefit of SMRs is consistent and reliable energy production. External conditions such as extreme weather would not influence energy production, and the long refueling cycle would alleviate concerns with the transportation of fuel during extreme weather events.

SMRs were found to be economically competitive with other energy options. In terms of LCOE, SMRs were found to be the cheapest option over time when compared to the other generation technologies in Section 4.5.1. The capital costs for SMRs are higher initially, with lower fuel costs over time. The cost analysis assumed a capacity factor of 80% and a lower capacity factor could change the results of this analysis. It is important to allow for a high capacity factor when an SMR is deployed. This can be done by ensuring the electrical capacity of the SMR is similar to the energy required for the deployment.

In terms of regulatory readiness, there are no major impediments to the licensing of SMRs for deployment in the Yukon. It is noted in the SMR Roadmap that satisfying impact assessment requirements can be a risk to the cost and schedule of SMR projects [16]. YESAB has never undertaken a nuclear assessment process. YESAB and other agencies may require additional support and personnel in order to undertake the assessment of a nuclear project.

Preliminary outreach studies conducted in 2022 found that 22 of 23 correspondents were characterized as favourable of nuclear power. However, the public perception of nuclear energy in the Yukon presents some challenges, but it would not be an insurmountable barrier for SMR deployment in the Yukon. Many concerns repeated by respondents to the outreach study in the Yukon were addressed in this feasibility study and would not have any impact on their feasibility. Concerns related to bias against nuclear energy and the Yukoner “identity” being incongruent with nuclear power need to be addressed through further education and outreach activities. Information sessions with nuclear experts, surveys, increasing discussions on nuclear energy in curriculum, accessible information on nuclear facilities, focus groups, and presentations open to the public are examples of activities that are recommended to help improve public perceptions of nuclear power and general education on SMRs. The Yukon being a “fast follower” for SMR deployment would help to address these concerns through referencing proven operation of SMR technologies in Canada.

Overall, it is concluded that there are no major barriers preventing SMR deployment in the Yukon. It is recommended to allow further advancement of current SMR projects in Canada over the next several years prior to considering deployment of SMRs in the Yukon. This will allow an improved understanding of infrastructure and logistical feasibility considerations, allow improved development of the domestic SMR supply chain (including fuel), and aligns with the results of public outreach indicating a desire to be "fast followers" rather than first adopters. Additionally, while SMRs are shown to be economically competitive with other sources, deployment situations allowing high capacity factor and a need for higher up-front investment are noted as feasibility requirements. Based on currently anticipated capacity needs and planned projects, remote communities, and off-grid mine sites appear to be the most optimal use cases for realizing the benefits of SMRs in terms of GHG reductions, although this may change in the future as electrification of the transportation sector progresses. Additional engagement to determine public perception towards SMRs across a broader population is recommended, given that the individuals included in outreach to date were knowledgeable on energy systems and may not be representative of the general population. It is recommended to consult with YESAB well in advance of any potential SMR development, given the lack of regulatory experience with SMR projects.