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To: Peter Hoang, Responsible Health Physicist, OPG

**Subject: Summary of Planned Updates to the Target Delivery System ALARA Assessment to Account for Target Delivery System Installation in Additional Units**

Dear Peter,

The content of this memo is intended to provide high-level information regarding the future revision of the Target Delivery System ALARA Assessment BWXT-ALP-30550-REP-0007 / NK38-REP-30550-00012.

BWXT NEC had previously designed and installed the Target Delivery System (TDS) at Darlington Nuclear Generating Station (DNGS) Unit 2 for the purpose of producing medical isotopes and will now be replicating the TDS for installation at Unit 3 managed through the Ontario Power Generation (OPG) Engineering Change Control (ECC) process under MEC 166617. As part of the ECC process for this modification, it has been identified that the TDS ALARA Assessment will require revision to account for design changes to the Target Elevator (TEL) upper guide tubes.

The expected changes to the ALARA Assessment outlined in this memo are based on the preliminary design of the TDS for Unit 3 and would be applicable to any TDS installed in additional Units at the DNGS.

The radiological hazard profile associated with the TDS design changes will be quantified and assessed against the existing TDS ALARA Assessment and the design criteria stated within the ALARA Design Guide BWXT-ALP-30550-REP-0005 / NK38-GUID-30550-00001.

### *Impact on the ALARA Assessment*

While the TDS will largely be replicated from the U2 design, there is one planned TEL design change to replace the upper guide tube from a fully tungsten part to a tungsten part with stainless steel internal parts. The reduction in TEL shielding is justified as reasonable since the increase in radiological hazard is expected to be low and replacement of the upper guide tube internals with

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stainless steel provides additional protection of tungsten surfaces and reduces expected inspection and maintenance efforts. The ALARA Assessment will be updated to reflect both design configurations for U2 and U3 and highlight any results that may be applicable to a single TDS installed at any Unit within the DNGS.

There are no expected changes to existing ALARA design controls, the TDS exclusions zones, or TDS Operations.

The following sections provide a summary of the expected impacts on the ALARA Assessment based on the preliminary TDS design for Unit 3 TELs. This memo is not intended to provide an exhaustive list of changes, but to act as a guideline for review, and the work will be done as part of the change control process for the ALARA Assessment.

*3.0 Scope*

Update to note that the ALARA assessment and results are applicable to a single TDS installed at any Unit within the DNGS except as noted with Unit specific considerations.

*5.0 Emissions and Controls*

*5.1.2 Reactivity Mechanism Deck Work Area*

Update the dose rates on the Reactivity Mechanism Deck (RMD) as applicable due to the change of the upper guide tube from a fully tungsten part to a tungsten part with stainless steel internal parts in the TELs.

*5.2.3 Changing Gamma Dose Rates*

Update the fields at the exclusion zone as applicable due to the change of the upper guide tube from a fully tungsten part to a tungsten part with stainless steel internal parts in the TELs.

*6.0 Shielding and Source Term Analysis Overview*

*6.2 Shielding Analysis*

*6.2.4 Target Elevator*

Determine new dose rates due to the change of the upper guide tube from a fully tungsten part to a tungsten part with stainless steel internal parts and reflect both dose rates for the original U2 design and the subsequent design for U3 and other Units. Update the dose rates at the RMD FAAGM and the 124.1 walkway above the RMD as applicable.

*6.3 Dose Maps*

*6.3.6 Upset and Contingency Conditions*

*6.3.6.1 Individual Dose to NEW*

Update Figures 10 through 15 dose maps as applicable due to the change of the upper guide tube from a fully tungsten part to a tungsten part with stainless steel internal parts in the TELs.

*7.0 ALARA Design Controls*

There are no expected changes to existing ALARA design controls, the TDS exclusions zones, or TDS Operations.

*8.0 Collective Dose*

Dose estimates during normal and maintenance TDS operations are expected to remain unchanged.

All existing radiation protection (RP) programs for the TDS managed by OPG RP will remain as they have been proven to be sufficient and preliminary analysis has shown that normal operation of the TDS is bounded by analysis. Further, existing dosimetry, rubber areas, and all radiation monitoring equipment (tritium, gamma) are still applicable.

*9.0 TDS Design ALARA Assessment Summary*

*9.1 Comparison to ALARA Design Guide*

Update design values in Table 11 as applicable due to the change of the upper guide tube from a fully tungsten part to a tungsten part with stainless steel internal parts in the TELs.

*9.3 Recommendations*

The following recommendations are currently made:

- Revise the existing TDS ALARA Assessment as part of MEC 166617.
- Continue following the OPG ECC process through commissioning and available for service (AFS) activities to validate the ALARA design criteria.
- Continue to manage radiation protection and monitoring related to TDS Operations as part of the OPG Radiation Protection Program N-PROG-RA-0013 R012.

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| 2024-10-28 | 29OCT2024 |
| Date | Date |
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| 2024-10-29 |
| Date |
| Reviewed by<br>Darryl McClure<br>Design Engineer, BWXT NEC |

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| 2024-10-29 |
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| Approved by<br>Mike Reed<br>TDS Manager, BWXT NEC |

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