Responses from Deze Energy Corporation to Indian and Northern Affairs Canada's preliminary Hydrology/Flow Model questions in advance of formal Information Requests

**Answers were provided by Deze Energy Corporation on June 8, 2009 (with follow-up answers provided June 18)

INAC Questions	Deze Responses
Q. 1 – In paragraph 4 of page 1 in Appendix 2 - Rating Equations, found in Appendix 9.3A in the DAR, Rescan claims that more flow measurements are required because of uncertainty in the rating equations. When will these measurements be taken? When will the Flow Model be updated to address the current uncertainty? Currently, Model output is provided but the complete field data by which that output was generated has not been provided. Complete information for all parameters, for all rated flows, used in the Taltson River Flow Model from Nonacho Lake to Great Slave Lake should be provided, including any estimates of their uncertainty once the Flow Model is updated with the above information.	More observed data would be required to reduce uncertainty in the rating curves used in the Flow Model. As the Expansion Project moves forward additional data will be added to the model to improve accuracy and reduce uncertainty. At this time, we are confident that, although there is some uncertainty in the rating curves, this does not substantially impact the applicability of the model for use in the DAR. This is supported by the good agreement of modeled to observed flows at the outlet of Tsu Lake from the calibration runs of the model. A summary table can be provided to present all relevant field data and equations representing each rating curve used in the model. Deze hopes to provide this in the near future.

Q. 2 – Could you explain why the tabulated model output (monthly and daily) sometimes depicts Tronka Chua Lake at elevations which are higher than those of Nonacho Lake? Is this due to errors in data, forecasts or the uncertainty of the rating curves? It would seem the DAR does not completely state the implications/uncertainty in the current modeling of hydro power generation and the modeling of flows and water levels in Trudel Creek. To address this, an update should be provided to the DAR once the new measurements and Flow Model revisions are complete.	After review of the model report and data, it has been determined that this is due to an improper datum used to reference modeled water levels in Tronka Chua Lake to mean sea level. For most of the lake outlets, the true elevation of the outlets are unknown and can not be determined due to safety concerns. Rating curves for most of the lake outlets were developed within HEC-RAS using outlet geometry data from the earlier Froelich model. This geometry data was in an arbitrary elevation datum with 0 m at the invert of each outlet. The HEC-RAS rating curves were then compared to observed flow and stage data referenced to mean sea level to determine the outlet elevation (point of zero flow) for the lakes. Essentially the HEC-RAS rating curves were shifted until they fit between observed data points. This exercise did not alter the shape of the rating curves only their elevation datum. For Tronka Chua Lake, observed levels upstream of Tronka Chua Gap were mistakenly used to set the datum for the outlet of Tronka Chua Lake rather than observed levels downstream of Tronka Chua Gap. At this time, there is not enough observed data available for Tronka Chua Lake to accurately correct this issue. However, there is no question that the elevation datum for Tronka Chua Lake should be lower to at least avoid confusion.

	Although this does create confusion when viewing the absolute water levels in Tronka Chua Lake, it has no impact on upstream or downstream modeled levels or modeled flows. Nor does this impact the relative difference in model levels in Tronka Chua Lake between scenarios to the next (i.e. baseline vs. expansion). The above explanation will be submitted to the MVEIRB for clarification. Subsequent revisions of the Flow Model report will highlight this issue. However, only an arbitrary elevation will be used until a more accurate field measurement can be collected. Again, this doesn't change the predicted relative changes presented in the DAR for the two expansion scenarios.
Q. 3 – Can Deze Energy and its consultants provide elevations for the two small saddles north of the SVS through which water can periodically spill into Trudel Creek headwaters from the Twin Gorges Forebay, any estimated flow through those saddles, and estimated probabilities and magnitudes of flow through those saddles under various scenarios (Pine Point Era, Current Era [Baseline], 36 MW Expansion, and 56 MW Expansion)?	Deze would like more time to respond to this question following discussions with our engineer. <u>The following answer was provided June 18, 2009:</u> The two small saddles were surveyed by Deze. These saddles are at the same elevation as the main spillway. Individual rating curves for these individual saddles is not available. Deze uses one rating curve for the summation of flow through the saddles and the main spillway.

Q.4 - It is recommended that a table summarizing salient project parameters be added such that the reader does not need to look for these throughout the report. The following parameters could be included: a. Key elevations (spillway, dam crests..) b. Key structural dimension (lengths, heights...) c. Key water levels (MFL, FSL, TWL...) d. Number of units and capacities e. Transmission line lengths and voltage f. Features of project temporary and permanent infrastructure g. Reservoir volumes h. Reservoir surface areas i. Area of flood shoreline j. Length of submerged shoreline k. Approach and tailrace canal design velocities.	The project has many parameters which Deze feels are best presented in context. Most infrastructure components are presented in table format in clearly titled sections of Chapter 6 (development Description).
Q. 5 – Could you point us to the section in the DAR that explains the rational for raising the Nonacho Spillway crest by 0.5m and its effect on the reservoir full supply level? Also, what is the nominal crest elevation of the existing Nanacho spillway?	The current spillway for the Nonacho Dam has an uneven, irregular bedrock crest. For the expansion project it was desired to construct a concrete spillway over the current spillway to allow for a more reliable rating relationship. The concrete spillway would add approximately 0.5 m elevation to the invert of the current irregular crest. As noted in the DAR the invert of the spillway is irregular and thus some sections will need to be filled in by as much as 0.5 m to produce a set invert elevation across the entire spillway. The current elevation of the crest is assumed to be 322.45 masl. The rise would maximize the storage volume, providing greater control by approximately

	40Mm3 or 2%. Thus, Deze is not changing the invert of the spillway for the purpose of increased storage specifically. The main goal is to have a consistent invert and thus a robust rating curve.
Q. 6 – Basin hydrology is discussed in several sections of the report (6.2, 9.3.1 and 13.1). It would be useful for sections to be cross-referenced somehow.	Section 6.1 is referenced from 9.3 on page 9.3.4. Hydrology discussed in sections 6, 9 and 13 is contained in Appendix 9.3A.
Q. 7 – It was noted that no flood hydrology is provided. Where did the inflow design flood information come from? e.g. latest dam safety assessment? or NTPC Dillon Engineering flood hydrology ca. 1996?	Deze will consult their engineering/design team in regard to this question. <u>The following answer was provided June 18, 2009:</u> Yes flood hydrology is provided in a separate report that was commissioned by the Northwest Territories Power Corp. and completed by Dillon Consulting Ltd. in 1998. I've attached a PDF of the report. This report will be provided to the MVEIRB as well.
Q. 8 – Could you explain what is meant by the statement on in section 13.3.56 "It must be noted that this model (Taltson Basin River Model) was not developed to assess whether there is sufficient water for power production. This is addressed by the Generation Model described in the Development Description (Chapter 6)". Does the mode of	Yes, the Flow Model and Generation Model rely on the same inflow hydrographs and operations of the dam are similar for both models. However, the Generation Model had more specific and accurate representations for actual generation at Twin Gorges. This statement was meant to encourage readers to refer to the Generation Model results if

operation reflect the operating strategy used in the Generation Model? The pattern flow and water variations must reflect the most likely mode of plant operation.	interested in the predicted power generation rather than changes to the hydrologic regime from Nonacho Lake to Great Slave Lake.
Q. 9 – The descriptions of both models (13.1-13.3) do not explain rule curves, firm flow, specific target releases, etc. An understanding of these terms and their application in the related model would help the reader understand the process.	For the Flow Model, operations of Nonacho Lake and Twin Gorges are described in detail in Section 13.3.3 with additional descriptions in Appendix 9.3A.
Q. 10 – It would be useful if the lag time between annual peak flows for base case and other scenarios be measured and reported (ch. 13). It would also be helpful if the existing and future spillway crest elevations were shown in Figure 13.3.3., and if Figure 13.1.2 could be provided at a larger scale to show changes in shoreline location due to construction of Nonacho Dam.	Deze requires some clarification from the Party to better address the first part of your question. However, Deze offers this preliminary reply: Shifts in seasonal timing of high and low flow periods are discussed qualitatively throughout the study area. The shift in timing of annual daily peak flow could be provided but would require time to calculate for all locations. Prior to conducting such an exercise, further understanding of the rationale behind this request would assist in determining if this is the best tool to assist the Party with their effects assessment review. The scale of the Figure 13.1.2 is too small to visually note the shoreline flooding; however, either a very large plot or series of standard sized maps

	would have to be created to rectify this. The actual amount of shoreline flooded is provided in the text immediately preceding the figure. *<u>Note from INAC</u>: After reviewing Appendix 9.3a more carefully we no longer require further information on the first part of this question.*
Q. 11 – Are details provided in the DAR on ramping e.g. how many units would be involved? Over what time period and by what increments will flows by adjusted? A graphic representation similar to those for other sections of the river system would be useful to illustrate this. Also it is not clear from Table 14.3.13 whether the plan bypass gate has been operated to mitigate - please clarify.	Details on ramping are provided in Sections 6.6, 13.3.4, 14.3.3, 17.4 and 17.5. The South Gorge (Bypass) Spillway would be operated, if required, to mitigate ramping during an annual scheduled outage. This is noted in the text of 14.3.3, which is unfortunately separated from Table 14.3.13 by a number of pages of figures, which does make it difficult to reference the table back to the text.
Q. 12 – It would be useful if the timing (and lag from base case) of maximum flows/levels with and without ramping associated with proposed April/may maintenance shut downs were reported. Figures 14.3.5 and 14.3.6 show flow and water level changes at location TRUDEL 1, without defining the location of this station. A reference to Figure 14.3.8 would help clarify this point.	Deze requires some clarification from the Party to better address the first part of your question. We agree that a reference to Figure 14.3.8 would be useful in the same text that reference 14.3.5 and 14.3.6 as the comment notes. *<u>Note from INAC</u>: After reviewing Appendix 9.3a more carefully we no longer require further*

	information on the first part of this question.
Q. 13 – Would it be possible to add flow profiles and velocity profiles along Trudel Creek in the presentation of results?	I assume that this request is to plot the change in average cross sectional velocity with stream flow for each cross section along Trudel Creek. This could be done but would add a lot of figures. This data is summarized in Tables 14.3.6 to 14.3.9 and presented in full in Appendix 14.3B