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May 17, 2011
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Karen McGhee
Swift River Energy Limited
c/o 1959 Creston Place
Burlington, ON L7P 2Y5

Dear Ms. McGhee:

Subject: North Bala Hydro: Proposed Cycling of the Plant

This letter has been prepared in response to DFO's email of March 31, 2011 to Swift River Energy Limited (SREL). DFO's e-mail was earlier prompted by a letter from members of the public which requested clarification whether there would be any impacts from cycling at the proposed North Bala hydro plant and, if so, how these impacts will be addressed. The issues raised in the email are itemised and addressed below.

With regard to the cycling, the agreement between SREL and Ontario Power Generation ("OPG") states:

"... 1. The Proposed Undertaking shall be operated only as a run-of-river facility, incorporating a flow plan developed weekly in consultation with the Ministry of Natural Resources ("MNR") and OPG, based on the conditions forecast for each week. The facility would initially be run flat under normal flow conditions (i.e., no load cycling of the unit throughout the day)...

2. Lake Muskoka would not be used as storage with respect to the operating regime of the Proposed Undertaking.

3. When Inflow at the Proposed Undertaking is less than 26 cms (the minimum operating capability of Ragged Rapids GS), the Proposed Undertaking shall be cycled such that its operating discharge is 26 cms or more. Compliance with the WMP and public safety will continue to be ensured. During summer months, this discharge is to be timed in order to provide adequate navigable water conditions for Go Home Lake on Friday and Sunday evenings. This requirement would be included in the weekly flow plan. ..."

To provide the required operating discharge of 26 m^3/s (26 cms), continuous minimum flows of 1 m^3/s through each of the North and South Bala dams will be maintained and the proposed North Bala facility will be operated at 20 m^3/s (the minimum operating capability of the proposed facility), leaving a flow of 4 m^3/s for Burgess GS. The proposed North Bala facility will be operated at a flow rate of 20 m^3/s for up to 24 hours, which could draw down the level of Lake Muskoka by up to 2 cm.

Once the planned daily release from Lake Muskoka (according to the weekly plan) is reached, operation of North Bala facility would temporarily cease; the minimum flow at each dam and the flow through Burgess GS would continue to provide discharges at Bala Falls. This would allow the water level of Lake Muskoka to rise back up to the original level. The cycling process would then be repeated the next day.

Based on an analysis of the flow regime expected under the MRWMP, the Inflow at the Proposed Undertaking will fall below 26 m^3/s from mid-July to mid-August in most years, thus requiring cycling during

this time period. Furthermore, it is expected that in 50% of the years on average, the Inflow at the Proposed Undertaking will fall below 26 m^3/s for a longer duration, potentially between mid-June to mid-September and cycling would occur throughout this period, except when inflows increase in response to precipitation events. If there is a dry fall period, the inflow can fall below 26 m^3/s from mid-September to late November, but this only occurs in 10 to 20% of the years. In the spring, the Inflow at the Proposed Undertaking can fall below 26 m^3/s from late April to mid-May but the North Bala facility would not be cycled in this period due to the MOE restrictions for spring spawning.

Cycling would therefore not be occurring "every few hours" as suggested by the public. Furthermore, this condition is clearly outlined to only be applicable during low flow conditions when daily average flows are less than 26 m^3/s. The plant will be operated without cycling the rest of the time.

It should be noted that the cycling will occur so as to pass 20 m^3/s, the minimum flow allowable without damaging the North Bala hydro-turbine, and not the maximum capacity of 96 m^3/s. Thus, minimizing the variation in discharge and minimizing the duration of the cycling to the most possible extent, while providing beneficial clean renewable power to the province of Ontario from the OPG and SREL facilities. If cycling was not initiated, this valuable water resource would be lost during low flow periods.

The condition of the MOE decision with respect to cycling (included in the OPG agreement) will have no effect on spring spawning fish species, for which critical habitat exists downstream from the North and South Bala dams and the proposed facility. Cycling shall not occur during the walleye spawning period, which typically occurs at some point between April 15 and June 1, although the actual date of the restrictions on cycling will be determined based on the timing of the spawn each year, which is dependant on a number of variables including water temperature, flow and photoperiod. This condition of the MOE decision will be adhered to.

1. **Tailrace habitat:** The tailrace shoal habitat proposed in the screening report will be designed to be wetted at all times, based on the known water level regime of the Bala Reach, with only the velocity over the shoals varying due to changes in flow through the facility. This constant wetting will not change with cycling. The cycling would lead to a variation in flows and velocities over the shoals during the time when cycling is occurring. Cycling will typically be limited to the summer season when flows and velocities in the area in the Bala Reach are typically at their lowest, with the majority of the reach relatively slow moving with little noticeable flow velocity.

   It is not anticipated that cycling of flows on a daily basis during the time periods noted above will have any significant adverse effects on benthic productivity within the shoal area. A variety of benthos species will colonize the area, each with different tolerances to flow velocity. During periods of cycling, some highly localized drift of less-tolerant benthos may occur from the shoal area in response to changes in velocity. However, given the generally high abundance of benthos on the surface and within the interstitial spaces of shoal rocks (e.g., typically in the range of 1000's per m^2), drift loss is only anticipated to occur in a relatively small proportion of the population within the localized shoal area. Further, drift loss will likely only occur along the inside face of the tailrace shoal structures (the area subject to velocity changes), limiting loss to a smaller proportion of the shoal area. The drifting invertebrates will become part of the forage base for the local fish community, so the area may develop into an important foraging location during periods of cycling. It is anticipated that benthos will recolonize areas that have been vacated by other drifting organisms. Therefore some drift may occur during periods of cycling, but it is not anticipated that this drift will have any significant effect on overall production on the shoal area. During the other time periods of the year when cycling does not occur, the facility will be operated continuously, resulting the relatively constant hydraulic conditions discussed in the Environmental Screening/Review Report, resulting in conditions that will facilitate abundant benthic production.

   The shoal structures will be designed to be stable at the velocities that will occur at the maximum plant outflow rate, so movement/erosion of the substrate will not occur. Cycling flows as well as full flows

during the spring period will continue to cleanse the shoals to keep them free of fine sediments. Therefore, cycling will have no adverse effects on the physical integrity of the shoal structure and its suitability as benthic habitat.

Minimum flows of 1 m^3/s over the North and South Bala dams will occur at all times, such that during periods of cycling, some flow passage will continue into the Bala reach to prevent stagnation of flows, which may have some mitigating effects on benthos on the shoal areas.

Therefore, the cycling operation may result in some change in benthic utilization during the periods when cycling operations are in effect, but it is not anticipated to have any significant adverse effects on overall benthic invertebrate production on the proposed tailrace habitat shoals. These shoals will continue to produce benthos that will be a component of the local forage base for the fish community, as per the original intended function of these shoals.

Fish entrainment and impingement: When the facility is temporarily shut down during cycling operations, there will be no flow going through the intake facility, creating a low velocity zone within the intake channel. Fish may then move into this intake zone to forage or find refuge. Upon facility start-up, commencement of flow through the turbine will induce a flow velocity within the intake channel. The predicted flow velocity that would occur at the intake at a flow of 14 m^3/s is 0.22 m/s, which is generally below the swimming capability of most fish species. However, depending on the rate of increase in velocity (i.e., the "ramping rate"), some fish, particular small fish with weaker swimming capability and those in very close proximity to the intake, could potentially be entrained through the facility and subject to the turbine mortality estimated in Table 6.6 of the ESR. Cycling operations will be resulting in restarting the turbine once per day during periods when cycling is in effect, which, due to the factors noted previously, could potentially result in more fish mortality than originally predicted in the ESR.

Several options exist to mitigate this potential mortality, as described briefly in the following sections. The preferred option will be selected during the detailed design process in consultation with DFO and MNR, and commitments made will be incorporated into the DFO Authorization for the Project.

The first option would be to implement a ramping rate restriction during the turbine start-up process, such that velocity changes at the intake occur over an extended period, to allow fish time to notice the change in velocity (i.e., from around 0 to 0.22 m^3/s) and leave the intake area, as opposed to very rapid increases in velocity, which could entrain fish before they have a chance to react. The normal start-up time in the absence of ramping rate restrictions would be on the order of 5 to 7 seconds. The ramping rates that are feasible will depend on the final design of the turbine and its associated controls, but it should be possible to slowly increase from the no-flow condition to the minimum turbine flow over a duration of 1 minute or more without damaging the turbine, which will result in a slower velocity increase. The adherence to those ramping rates will be part of the operational approval conditions. All operations, including the cycling will be covered by the operational plan. Given that facility start-up is only anticipated to occur once over a 24-hr period when cycling operations are in effect, the minor increase in flow velocity during turbine start-up is not anticipated to have any significant effect on fish entrainment at the intake.

A second option would be to use an underwater infrasound generator to emit a sound that would scare fish away from the intake immediately prior to turbine start-up, such that fish are not caught within the intake flow velocity. This technology has been used at other water intake locations to minimize fish entrainment. This option would primarily be implemented if slowly ramping up turbine flow is not possible due to the design characteristics of the turbine selected during detailed design.

Given the uncertainty associated with the potential for fish congregation at the intake area during cycling operations, the third option would be to implement an adaptive management program to assess effects and implement mitigation (such as the sound generator) if necessary to mitigate impacts. This would involve monitoring actual fish use of the intake area and the entrainment that occurs during cycling

operations once the facility is commissioned. Monitoring could be undertaken by underwater camera, sonar or some other technology. Results would be discussed with the agencies and mitigation would be implemented if required.

Given implementation of one of these options, as determined through further agency consultation, it is not anticipated that cycling operations will have any significant adverse effects on fish due to entrainment.

2. **Upstream water levels:** Based on our calculations, the upstream water levels in Lake Muskoka would be fluctuating a maximum of 2 cm/d under low flow conditions when cycling is occurring. Also, and as stated above, cycling will only occur once per day at a maximum. This variation is equivalent to what could be seen due to wind or wave movement on such a large body of water and therefore the impact of this on shoreline habitats would be undetectable/negligible.

3. **Safety concerns upstream**: Based on in situ velocity measurements taken upstream of the proposed safety boom, the velocity of the water at the boom would be in the order of 0.5 to 0.6 m/s at a plant flow of 80 m^3/s. This cycling condition is applicable only for plant flows in the range of 20 m^3/s (1/4 of this value). Therefore, it follows that velocities at the boom would be in the order of 0.2 m/s. As discussed above, since it will only be necessary to do this cycling once per day, the timing could be done to minimize the likelihood of public being present. It is expected that an upstream camera will be installed to view the area upstream and downstream of the plant prior to starting the project, to ensure no one is in the restricted zone. Whether the plant is on or off, the restricted zone would be in effect. Whatever means were intended to be employed as warning for the previously proposed "start-up" following low flow shutdown hours will be applied during cycling start-ups.

Yours faithfully,

Trion Clarke, PhD.
Senior Environmental Scientist

TC:srg