

Monitoring Plan for Operating Turbines at McNary Dam Outside of the 1% Limit in 2004

1. Background

Turbine operating flexibility during the fish passage season at lower Columbia and Snake River dams is limited to within 1% of best efficiency. This restricted operation results in turbine discharge ranges from approximately 7,800 cfs to 12,400 cfs, depending on total project head at McNary Dam. The origin of this operating restriction is based on the hypothesis that fish survival and turbine efficiency are directly related. The 1% operating limit is called for in the NMFS 2000 BiOp and is implemented through the Corps of Engineers' Annual Fish Passage Plan (FPP).

Further analysis of past information and recent biological study results for McNary Dam have led to questions about fish survival through turbines at that project. Bonneville Power Administration (BPA) has suggested that fish survival at higher discharge rates (above the 1% limitation) may not differ from the existing conditions and they have proposed consideration of operating turbine units at McNary outside of the 1% range.

A study for the McNary Modernization Program to test new vertical barrier screens (VBS) and screen guidance efficiency at different turbine discharges was planned and coordinated through the Regional Forum. This study requires operation of 5 units at McNary alternating between the 1% limit and the maximum turbine discharge in 2-day blocks during the 2004 juvenile fish passage season. The BPA proposal is to change operation of the remaining McNary turbines to allow for higher discharge (up to 16,400 cfs) during the spring 2004 fish passage season as well.

In order to assure that no adverse effects to anadromous fish would occur as a result of operating outside of the 1% range, this monitoring plan has been developed. This plan will provide a real-time evaluation and operational decision criteria to minimize impacts to migrating juvenile salmon.

2. Biological Monitoring

According to physical (hydraulic) model study results, increased turbine discharge causes increased gateway turbulence. Turbulence may cause physical injury and affect the physiological condition of juvenile fish. Debris accumulations in the gatewells may increase the risk to fish either by direct injury or as a result of debris accumulations on the VBSs that cause high-velocity areas that may lead to fish impingement. Biological monitoring criteria are proposed to enable real-time detection of adverse effects on fish resulting from the changed turbine operations. Specifically, fish from the gatewells will be monitored for changes in descaling, physiological condition, and mortality.

Gateway Descaling:

- Descaling rates will be determined for fish from the existing orifice trap in unit 6 every other day. This unit will be operated within 1% limits during the spring fish passage season (April 10 – about June 30). This information will be compared to the descaling rates for fish collected at the juvenile fish facility. These fish will have passed from units operated above the 1% limit. Washington Department of Fish and Wildlife (WDFW) smolt monitoring crew will perform all descaling assessments at the orifice trap and juvenile fish facility. Early in the monitoring, fish condition in the orifice trap will be compared to fish condition at the fish facility to determine any “correction factor” required to account for differences in fish passage experiences of sampled fish. A differential of 2% (after correction factor is applied) between descaling levels at the orifice trap and sampling facility during the fish passage season will be used as a “trigger” for immediate action. If this occurs, the following actions will be taken:

- request that units be returned to within the 1% limit

- inspect facilities to confirm no apparent mechanical problems exist
- review descaling data from the unit 6 orifice trap and juvenile fish facility
- check upstream fish condition from other projects on the Snake and Columbia River to compare with similar stocks fish arriving at McNary.

If nothing is found that would indicate that higher turbine loading is the cause of higher descaling, units will be returned to the higher load operation. If differentials continue with the next sampling, actions described above will be repeated and the 1% limit will continue until further coordination occurs and the TMT agrees to recommend continuing to operate the turbines above the 1% limit.

In addition, juvenile fish for the VBS evaluation will be dipnetted from the gatewells, sorted, PIT tagged, and released back into A-slot gatewells of units 2, 3, 4, 5, and 9. Approximately 9,300 each of yearling Chinook and sockeye will be released into the bottom of the gatewells (canister releases) during the spring season. These fish will be recovered in the juvenile fish facility sampling system (PITtag sort by-code) and be evaluated for descaling. Descaling will also be compared to levels in the fish facility since test fish will have a known gatewell condition.

If descaling levels at the fish facility increases by 6% (WDFW, personal comm.) over the previous day, the following actions will be taken by Project personnel:

- request that the units be returned to within the 1% limit
- inspect the facilities to confirm no apparent mechanical problems exist
- review the descaling data from the unit 6 orifice trap
- check upstream fish condition from other projects on the Snake and Columbia River to compare with similar stocks fish arriving at McNary

If it is determined that the increased descaling may be the result of the higher turbine loading operation, then the 1% limit will continue until further coordination occurs as described above.

In addition to the two methods described above for monitoring descaling, 9000 Chinook fry will be obtained to further monitor descaling. A portion of the fry (>55mm) will be PIT tagged and released into units 5 and 9 (under varied turbine loading). Fish will be recovered at the juvenile fish facility where fish will be examined. Precision on this test will allow detection of approximately 5% difference in descaling between treatments. This is based on an assumed 60% detection of PIT tagged fish, and using a 1-tailed test. This will allow for an estimation of descaling estimates over a larger range of gatewell conditions. This portion of the monitoring plan will occur April – May.

A portion of the fry will be too small to PIT tag (with existing methodologies) and therefore will be released into the B-slot of unit 6 and recovered using the orifice trap. Fish will be released at both high and low load, for 4 days (2 at high, 2 at low loading). Fish will be released into the gatewell similar to the VBS study described above. These fish will be collected in the orifice trap and evaluated for fish condition. Evaluation will include recapture of fish and “dipping” fish into a dye to assist in visualizing injuries. Fish will then be examined under a binocular microscope to quantify injury and descaling. Descaling standards developed for the Smolt Monitoring Program will be used. This portion of the monitoring will occur at the beginning of or just prior to full powerhouse operation above the 1% limit.

Monitoring of juvenile lamprey will also occur in the spring. Lamprey will be collected from the fish facility at John Day Dam. Fish will be transported to, and released in gatewells at McNary Dam (units 5 and 9). Releases will be made similar to the above described methods for salmonids. There will be 5 releases of about 150 fish per release. Fish will be recovered in the juvenile fish facility and examined for injury, including lacerations, bruising, and scrapes. Fish will be dipped in “dye” to assist in making

injuries more visible prior to examination.

Mortality:

Mortality rates in the fish sampling sites will be monitored. If increased mortality is observed among sampling sites that may be attributable to the turbine operation, then units will be returned to operating within the 1% limit. The turbines will then continue to operate within the 1% limit until further coordination occurs and the TMT agrees to recommend resuming operating the turbines above the 1% limit.

Forebay Delay:

Any unexpected impacts that would contribute to juvenile fish delay in the forebay cannot be evaluated in season without a specific two-treatment test. Such a test is not planned, however, forebay residence time will be monitored during the project survival study (to be conducted with radio telemetry). The results from this study will be reviewed to determine any apparent consequences of the turbine operations.

Project Survival:

Project survival, including by routes of passage, will be evaluated at McNary Dam using radio tag technology during 2004. Although this evaluation is not designed specifically to determine survival differences for fish passing through turbines operated either within or outside the 1% limit, it is possible that the data analysis will reveal useful information. This information, however, will be available after the fish passage season rather than real time.

Adult Fallback:

Reduction in involuntary spill levels may result in an increased number of adult fallbacks passing through the Powerhouse (either through turbines or juvenile fish facility). For several years, data has been reported on total number of adults falling back through the juvenile facility. Under the proposed operation we will continue to monitor numbers of fallbacks in-season and, if unexpectedly high levels of fallback are observed, the information will be immediately provided to the TMT for discussion and recommendations on how to proceed with the turbine operations.

3. Physical Monitoring

Physical monitoring will include debris loads, water temperature and total dissolved gas (TDG).

Gatewell Debris: Debris loads in the gatewell and on the VBSs will likely increase with increased gatewell flow occurring as a result of turbine operation above the 1% limit. Higher debris loads are expected to increase potential for fish injury and risk of damage to the vertical barrier screens. Debris accumulation on VBSs causes increased hydraulic loads that can be monitored by changes in the head differential across the VBSs.

Project personnel will monitor the head differential across the VBSs according to the debris management plan in the FPP. When the head differential approaches or exceeds 1.5 ft, turbine unit operation will be reduced to 40 MW until the VBSs can be pulled up to the forebay deck, cleaned and replaced. To accommodate the potential for increased debris accumulations, the head differential monitoring will be expanded to include using radar transducers in the A-slots of each unit and B-slots of units 2 and 4. The new electronic monitoring system will provide continuous early warning coverage of potential critical debris accumulations on the VBSs throughout the fish passage season. Data from these sensors will be sent directly to the NWW District and Project (biologist and project operations).

To accommodate the expected increased debris load, VBS cleaning and maintenance crews will be expanded and additional manpower will be hired.

Water Temperature:

Although warm water temperatures can be a concern at McNary, this doesn't normally occur until later in the summer season, after the turbine operation above 1% would be over (Proposed operation is for Spring only). According to the Water Management Plan (October 2003), the spring season will be over (likewise the turbine operation above the 1% limit) when ambient water temperatures are above 62°F (17°C). This will be well before any temperature-related concerns would occur. Never the less, water temperature monitoring will occur under the McNary Forebay Temperature Study beginning in May and their information will be available on a real time basis for consideration by project personnel monitoring the turbine operations.

Total Dissolved Gas:

If the turbines are operated above the current 1% limit, more flow will pass through the powerhouse and this will reduce the amount of involuntary spill that occurs at McNary Dam. While the effect on total dissolved gas (TDG) production is uncertain at this time, less involuntary spill will result in less time when TDG levels might exceed water quality limits. The TDG monitoring data will be analyzed at the end of the season to assess how much of a potential TDG change occurred.

Adults Fallback

Adult fallback through the facility will be monitored and reported as part of the post season reporting. It is possible that due to operations of the turbines above 1%, adult salmonids fallback (and kelt passage) may increase through the facility.

4. Reporting

During the spring season, periodic progress reports will be made to the TMT regarding the status of the operations, particularly if there are any issues that arise. If the monitoring program results in the turbine operation being shut down because of criteria not being met, this will be immediately reported to TMT for discussion and resolution.

A written report will be prepared at the end of the season to summarize the real time monitoring program results, including information from other ongoing activities at the project that were considered during the operation. This report will be available by November 2004.