# Fish Passage Plan (FPP) Change Form

**Change Form # & Title**: 21MCN006 – Unit 5 Locked Blades

**Date Submitted**: 23-September-2021

**Project**: McNary Dam

**Requester Name, Agency**: Chris Peery, Corps, and Lisa Wright, Corps

**Final Action:**

**FPP Section**: MCN Section 4.3. “Turbine Operating Range”

**Justification for Change**:

Unit 5 runner blades were hydraulically locked at 22.5⁰ (same as Unit 6) due to leaking blade seals and the unit was returned to service August 18, 2021. The operating range is expected to be the same or similar to Unit 6 in FPP Table MCN-6-A. When Unit 5 index test results are finalized, the FPP will be updated if necessary.

**Proposed Change**: See following pages for edits to existing FPP in “track changes”.

**Comments**:

**Record of Final Action**:

4. TURBINE UNIT OPERATIONS & MAINTENANCE

4.3. Turbine Unit Operating Range

**4.3.1.** Turbine unit flow and power output at the lower and upper limits of the ±1% peak efficiency range, and at the operating limit, are defined in **Table MCN-6**, except Units 5 and 6 with locked blades are in **Table MCN-6-A**. Turbine units will be operated within these ranges according to *BPA’s Load Shaping Guidelines* (**Appendix C**), as summarized below.

Table MCN-6-A. Temporary Operating Range Values for McNary Dam Turbine Units 5 and 6 with Locked Runner Blades (Non-Adjustable). a

|  |  |  |
| --- | --- | --- |
| **Project**  | **MCN Units 5, 6 (Blades Locked at 22.5°) –** **With ESBS** | **MCN Units 5, 6 (Blades Locked at 22.5°) –** **No ESBS** |
| **Head** | **Lower Limit** | **Peak Efficiency**  | **Upper Limit** | **Lower Limit** | **Peak Efficiency**  | **Upper Limit** |
| **(feet)** | **MW** | **cfs** | **MW** | **cfs** | **MW** | **cfs** | **MW** | **cfs** | **MW** | **cfs** | **MW** | **cfs** |
| **62** | 46.8 | 10,665 | 49.1 | 11,130 | 49.8 | 11,345 | 47.6 | 10,648 | 49.9 | 11,078 | 50.5 | 11,289 |
| **63** | 47.5 | 10,659 | 50.1 | 11,175 | 50.9 | 11,405 | 48.4 | 10,641 | 50.9 | 11,122 | 51.6 | 11,348 |
| **64** | 48.3 | 10,652 | 51.2 | 11,218 | 52.0 | 11,462 | 49.2 | 10,635 | 52.0 | 11,165 | 52.8 | 11,405 |
| **65** | 49.1 | 10,645 | 52.2 | 11,259 | 53.1 | 11,517 | 50.0 | 10,628 | 53.0 | 11,205 | 53.9 | 11,460 |
| **66** | 49.9 | 10,647 | 53.1 | 11,255 | 54.0 | 11,511 | 50.9 | 10,631 | 53.9 | 11,202 | 54.8 | 11,455 |
| **67** | 50.8 | 10,649 | 54.0 | 11,251 | 54.9 | 11,505 | 51.7 | 10,633 | 54.8 | 11,198 | 55.7 | 11,449 |
| **68** | 51.7 | 10,650 | 54.9 | 11,246 | 55.8 | 11,498 | 52.6 | 10,634 | 55.7 | 11,194 | 56.6 | 11,443 |
| **69** | 52.5 | 10,650 | 55.8 | 11,241 | 56.7 | 11,491 | 53.5 | 10,635 | 56.6 | 11,189 | 57.5 | 11,436 |
| **70** | 53.4 | 10,650 | 56.6 | 11,235 | 57.6 | 11,484 | 54.4 | 10,635 | 57.5 | 11,184 | 58.4 | 11,429 |
| **71** | 54.5 | 10,697 | 57.6 | 11,256 | 58.5 | 11,497 | 55.5 | 10,682 | 58.5 | 11,205 | 59.4 | 11,443 |
| **72** | 55.6 | 10,742 | 58.7 | 11,275 | 59.5 | 11,509 | 56.6 | 10,728 | 59.6 | 11,225 | 60.4 | 11,455 |
| **73** | 56.6 | 10,785 | 59.7 | 11,294 | 60.5 | 11,521 | 57.7 | 10,771 | 60.6 | 11,244 | 61.4 | 11,467 |
| **74** | 57.7 | 10,827 | 60.7 | 11,311 | 61.5 | 11,531 | 58.8 | 10,813 | 61.6 | 11,262 | 62.4 | 11,478 |
| **75** | 58.8 | 10,866 | 61.7 | 11,328 | 62.5 | 11,541 | 59.9 | 10,853 | 62.6 | 11,279 | 63.4 | 11,488 |
| **76** | 59.8 | 10,888 | 62.8 | 11,368 | 63.6 | 11,587 | 60.9 | 10,875 | 63.7 | 11,319 | 64.6 | 11,534 |
| **77** | 60.7 | 10,909 | 63.8 | 11,407 | 64.7 | 11,631 | 61.8 | 10,896 | 64.8 | 11,357 | 65.7 | 11,578 |
| **78** | 61.6 | 10,929 | 64.9 | 11,444 | 65.8 | 11,674 | 62.8 | 10,916 | 65.9 | 11,395 | 66.8 | 11,620 |
| **79** | 62.6 | 10,949 | 66.0 | 11,481 | 66.9 | 11,715 | 63.7 | 10,936 | 67.0 | 11,431 | 67.9 | 11,662 |
| **80** | 63.5 | 10,968 | 67.0 | 11,516 | 68.0 | 11,755 | 64.7 | 10,955 | 68.1 | 11,466 | 69.1 | 11,702 |
| **81** | 64.4 | 10,991 | 68.0 | 11,529 | 69.0 | 11,765 | 65.6 | 10,978 | 69.0 | 11,479 | 70.0 | 11,712 |
| **82** | 65.4 | 11,013 | 68.9 | 11,541 | 69.9 | 11,775 | 66.6 | 11,000 | 70.0 | 11,492 | 71.0 | 11,721 |
| **83** | 66.3 | 11,035 | 69.8 | 11,553 | 70.8 | 11,784 | 67.5 | 11,022 | 70.9 | 11,504 | 71.9 | 11,731 |
| **84** | 67.3 | 11,056 | 70.8 | 11,565 | 71.7 | 11,793 | 68.5 | 11,043 | 71.8 | 11,515 | 72.8 | 11,740 |
| **85** | 68.2 | 11,076 | 71.7 | 11,576 | 72.7 | 11,802 | 69.5 | 11,063 | 72.8 | 11,527 | 73.8 | 11,749 |
| **86** | 69.2 | 11,117 | 72.6 | 11,590 | 73.5 | 11,808 | 70.5 | 11,104 | 73.7 | 11,541 | 74.7 | 11,755 |
| **87** | 70.3 | 11,158 | 73.5 | 11,604 | 74.4 | 11,815 | 71.6 | 11,145 | 74.7 | 11,555 | 75.6 | 11,761 |

1. Units 5 and 6 have hydraulically locked (non-adjustable) runner blades to prevent oil leaks and are restricted to a smaller operating range until the units are repaired. Values provided by HDC based on the Unit 6 abbreviated index test in January 2019.