Fish Passage Plan (FPP) Change Request Form

Change Form # & Title:	15BON006 – PH2 Mid-Range Operation Dates
Date Submitted:	18-Dec-2014; Revised 4-Feb-2015
Project:	BON
Requester Name, Agency:	Scott Bettin, BPA
Final Action:	

FPP Section: BON 5.2.1 - Turbine Unit Operating Range.

Justification for Change: During low flows when total project discharge drops below approximately 170 kcfs, the PH2 1% mid-range of 13-15 kcfs is too narrow of an operating range that is difficult to manage and hard on equipment when the project has to flip units on and off in order to adjust more than 2 kcfs. To allow for a smoother operation, the operating range of PH2 units will be from the 1% lower limit up to the mid-point (approx 11-15 kcfs) April 1 through July 31, and within the full 1% range (approx 11-18 kcfs) August 1 through October 31.

The biological justification for this change is that smolts that pass BON during summer and fall tend to be larger in size than earlier migrants and therefore less susceptible to descaling or mortality as a result of gatewell turbulence. Testing by Gilbreath et al. has shown that operating in the lower half of the 1% range is preferred during passage of smaller fish until the PH2 gatewell issue can be corrected. Analyses of performance testing data (Weiland, PNNL) did not detect survival differences across the 1% range.

At this time, the plan is to install flow control plates in Unit 15. If proven successful, unit 15 will not be restricted by this change form.

- ERDC model observations (2010): general trend was incrementally improving hydraulic conditions in the turbine draft tube as flow increased from lower 1% to upper 1%. NOAA's recommendation (*ERDC Trip Report memo, January 20, 2011*): "Assuming the trend we observed …is correct, we believe it would be prudent to consider minimizing the time these units operate at the low end of the 1% operating range."
- Batelle sensor fish evaluation (Carlson et al. 2008): low pressure points (nadirs) were higher/better for fish at the lower 1%, but hydraulic passage conditions (turbulence) worsened as flows decreased from the upper to lower 1%.
- Gilbreath et al. (2008, 2009, 2014): bypassed subyearling Chinook mortality was lowest at the lower 1% range. As unit flow increased, fish condition deteriorated.
- Weiland 2014: no difference in survival of turbine-passed juveniles (CH1, STH, CH0) across the 1% operating range.
- FPC Technical Memorandum 153-12, December 17, 2012: sample mortality of bypassed subyearling Chinook decreased with increasing Julian Day, which correlated with increasing fish length.

Proposed Change: *See edits in track changes on next page.*

5.2. Turbine Unit Operating Range.

5.2.1. From April 1 through October 31, turbine units are operated within ±1% of peak turbine efficiency (1% range), as specified in the *BPA Load Shaping Guidelines* (**Appendix C**). Turbine unit operating range limits are defined in **Table BON-15** (PH1) and **Table BON-16** (PH2).

Through regional coordination with FPOM and TMT, the 1% range guidelines during this period have been modified as defined below in **5.2.1.1**–**5.2.1.2** to minimize PH2 gatewell turbulence for bypassed juvenile salmonids until structural and/or other solutions are implemented.

5.2.1.1. April 1–~~October~~ July 31: turbine units will operate in the following order of operating ranges to pass increasing flow:

5.2.1.1.a. PH2 units ~~within~~ up to the 1% mid-point (15 kcfs)~~range~~;

Comment [LSW1]:
12-Feb-2015 FPOM: DENIED this change.

5.2.1.1.b. Then, PH1 units up to the 1% upper limit;

5.2.1.1.c. Then, PH1 units up to the Best Operating Point (BOP);

5.2.1.1.d. Then, additional flow in excess of what can be passed in steps above will be passed in one of the three following ways, or as otherwise determined by Project Fisheries based on observed conditions:

d.1. April 1–April 9 / June 16–~~October~~ July 31: PH2 units up to the 1% upper limit.

d.2. April 10–June 15 (Spring Spill) w/ Adult Trigger[1]: When adult spring Chinook total passage counts (excluding jacks) are greater than juvenile spring Chinook collection counts at BON JMF for two consecutive days, Project Fisheries will notify the control room to increase PH2 up to the 1% upper limit in priority order from north to south: 18, 17, 16, 15, 14, 13, 12, 11.

d.3. April 10–June 15 (Spring Spill) w/ Juvenile Trigger[1]: When juvenile spring Chinook collection counts at BON JMF are greater than adult spring Chinook total passage counts (excluding jacks) for three consecutive days, Project Fisheries will notify the control room to maintain PH2 units within the 1% mid-range as a hard constraint and pass additional flow as spill.

5.2.1.2. August 1–October 31: PH2 units may be operated within the full 1% range and PH1 units may be operated up to BOP.

Comments from others:

16-Jan-2015 NOAA memo. "This is not an unreasonable change request; however it still needs a little more work before we can agree with it. When suggesting a change to fish protective operations, there should be some biological rationale in the justification for change section of the form. The record should establish why the requester believes that the benefits of this change (three additional months of above mid-range (PH2) and BOP (PH1) operation within the juvenile fish passage season) would justify the potential biological impact."

22-Jan-2015 FPOM. Fredricks said it appears the data seem to support both operations. Wright and Bettin explained that the lower 1% range might actually be better for bypassed fish. Bettin explained the preference is to operate more units at a lower range than a few units at a higher range. Lorz said if BPA is willing to go low to mid, then he can support the change form. Bettin said the whole range is preferred to allow for maximum flexibility. Fredricks said he would like to see JMF data comparing descaling rates from years when there were no operation restrictions to last year with restrictions. Wright cautioned that the restrictions were implemented in 2012–2013 in-season via teletypes prior to the FPP change in 2014. Bettin said hourly data is fine since changes are requested hourly and not usually in 15 minute increments. **ACTION**: Lorz will ask FPC (Chockley) to take a look at available data and see how often units ran in the upper 1% in August and if there is a difference in descaling.

3-Feb-2015 Bettin via email. Expanded the April 1-July 31 operating range to include the lower 1% range up to the mid-point (11-15 kcfs). Also, added reference to Unit 15 in the Justification section as a reminder that this unit may become exempt from these operating range restrictions if the flow control plates are proven successful.

12-Feb-15 FPOM: Bettin would like to have the whole 1% range available starting August 1 and emphasized that it would not be used very often but is needed for flexibility as well as reserves. FPOM is still awaiting FPC's analysis of data from August operations in previous years to see if there are sufficient data in the upper 1% to compare to smolt condition data. Lorz indicated the analysis should be ready by March FPOM. Fredricks has concerns about hydraulic conditions in the turbine draft tube at the lower 1% and is awaiting the final PNNL (Weiland) report. Fredricks said the ERDC report should be available this summer. Bettin suggested the summer is a bit late. Fredricks and Lorz expressed a desire to wait until the reports and data analysis are available to inform the decision. Fredricks and Lorz are ok with the lower 1% after August 1 but do not want to see any changes April 1-July 31. **DENIED change to April 1-July 31 (section 5.2.1.1.a). PENDING further FPOM review of change to August 1-October 31.**

Record of Final Action: