# Comments on the Labadie Energy Center §316(a) Draft Demonstration (8/8/2019)

Meeting with Ameren: 11/25/2019

Comments are from the Missouri Department of Natural Resources Water Protection Program Industrial Unit of the Operating Permits Section, the Engineering Section, and Environmental Services Program Aquatic Bioassessment Unit of the Water Quality Monitoring Section; and the Missouri Department of Conservation, Policy Coordination.

Summary

The primary concern is the chosen Representative Important Species (RIS). The Asian Carp species should be removed from the RIS assessment, and the statistical analysis re-run. Significant changes will need to occur throughout the 316(a) document but this revision is essential for the final submittal. Rationale for this decision is provided below.

Also, the commenting entities are concerned with the statistical analysis, choice of data exclusions, and sampling methods, including but not limited to not following the sampling plan and requested revisions to the sampling plan. The commenting entities have reason to believe all of these questions can be cogently answered by Ameren prior to (or with) the submission of the 316(a) report.

The commenting entities have several specific comments listed below.

Group 1 Comments (Operating Permits)

1. Page VII, zone of passage. The Department is asking Ameren to better evaluate the zone of passage. Provide data or references showing the zone of passage area is actually used by fish avoiding the thermally affected zone.

2. Section 1.2. The request is explained as requesting a 6% time of deviation from the Thermal Discharge Parameter (TDP) of 0.95 under the following circumstances: river flow is less than 40,000 cfs or ambient river is greater than 87°F. If either of these conditions occur, then the facility may be permitted to exceed the 0.95 TDP 6% of the time.
   a. How does the facility suggest these conditions be monitored; will data be obtained on an hourly or by minute basis?
   b. How will the facility determine the discharge is less than 40% of the river volume? And at what frequency? How will the area of zone of passage be calculated; how does the percentage of river used for mixing compare numerically to the zone of passage?

3. Section 2-1 page 2-2, 4th full paragraph; the text references "MDNR 2015" however this reference is not found in Section 8. Please provide the corrected reference either to the text or added to the reference section.

4. Section 3.3.3 last paragraph; the author indicated the remaining life of the plant was a consideration when assessing thermal discharge consequences.
   What is the remaining useful life of the plant? Is the plant expected to be retired sooner for any reason?

5. Section 5.4.1.1. The conclusion was made that winter abundance in the thermally effected zone indicated this zone attracted certain aquatic species and this conclusion also indicated there was no adverse effect. This statement may need additional citations or data showing how attracting species is not an adverse effect.

6. Section 5.4.1.3 "Diversity". The first paragraph explains the metrics used to elucidate species indices from the raw data obtained in the LEC studies. A sufficient explanation was provided for Hill numbers and the Shannon index, but was not numerically explained for the Simpson concentration. Please explain how each of the indices were used in the following tables (pages 5-18 to 5-23) and how the tables are representative of the study. Additionally, please provide the equations showing the relationship between the $H_0$ (number of species per Hill number); $H_1$ (exponent of Shannon index); and $H_2$ (inverse of Simpson index) used for this study.

7. Figure 5-14. Please provide the units for fish length.

8. Section 5.4.1.3 "Presence of all Trophic Levels". It would be helpful to provide a table (such as was provided in 5-5) of the species and which categories they occur (herbivore, omnivore, planktivore, etc).

9. Section 5.4.1.3 "Lack of Domination by Heat Tolerant Species".
   a. Please provide the rationale for accepting biomass data preferentially to numeric quantities of heat tolerant species. In preferring biomass, the study may be preferring a small subset of large individuals which generally have greater tolerance to changes in heat and may mask the differences in feeding behavior within the different sections in the river.
   b. According to the text, there were no heat intolerant species counted in the discharge and thermally exposed areas, but Figure 5-19 appears to show the opposite.
   c. In addition to this, please graph these by season as Section 6.3.3 indicates certain intolerant species will be completely absent if the river exceeds certain temperatures. Seasonal density graphs were completed for the macroinvertebrate community in Figure 5-24.
   d. Please provide the raw data of the heat intolerant and tolerant species for this section so further statistical analysis can be completed.
   e. Similarly, to assure population skewedness is not a factor, removing all data associated with Asian carp will better show how non-invasive species are distributed in the LEC's region of the LMOR. This is true for all data and graphs; however, as Section 6.2 suggests, Asian carp is an Representative Important Species (RIS), but in fact, an RIS should not be based simply upon abundance or universal presence. The EPA's 1977 316(a) Technical Guidance does not appear to address invasive species, or ecosystems dominated by a class of invasive species (such as the two identified species of carp). Please provide another reference or rationale showing an invasive species could be classified as one of importance.

10. Section 5.4.1.4 provides a plethora of data manipulations and graphs showing a standardized difference between the upstream reference section and the thermally exposed and downstream areas. This data should be presented with the removal of invasive carp species. Just as it is important to use sufficiently sensitive analytical methods to detect specific pollutants, species known to be affected by thermal pollution should be used to show if thermal pollution is a factor at this facility. Invasive carp are not effective detectors of thermal pollution, and given they are an invasive species, these data should be removed from all datasets as they appear to be positively skewing the standardized differences. Several assumptions are required when standardized difference is used to show population dynamics. These assumptions must be met for these statistics to be used. Please provide the assumptions met or not met when using the standardized difference test.

11. Section 5.5.2.2 narratively explains the community characteristics for diversity and dominance. However, the sections do not effectively compare the interrelationships between the upstream and thermally exposed zone, only the differences between the three different sampling events. Using an analysis of covariance, such as ANCOVA or another similar statistical method, should occur to compare the difference between and within the two groups. Page 5-62 describes the differences found in the upstream reference and the thermally exposed zones for heat tolerant species, again, it appears invasive species are dominating the data therefore small changes in resident non-invasive species cannot be shown graphically.

12. Section 5.5.2.3 weighs the evidence of the data. Again, invasive carp are not an effectual tool to measure differences in the heat tolerant vs. intolerant species as they appear ubiquitously at the site. Temporal changes are not necessarily a good measure of differences in community although it is important to show if temporal variability is occurring over discrete periods of time, a comparison should occur between the two groups, upstream and the thermally exposed zone within each study. Again, an ANCOVA could be an appropriate measure of these differences.

13. Section 6 provides the overall assessment of the study. Due to the factors above, these summarized facts may no longer be relevant after the data has been revised and recalculated to show adjusted population indices. The study plan indicated Ameren would consult with the Department over which species should be chosen for RIS. Did this occur? We were in receipt of Addendum 2 dated May 2017 with section 3.2 highlighted as "RIS Evaluation". This appears to not be a final selection but instead was prefaced as "The final selection of RIS for the predictive biothermal assessment will be made in consultation with the MDNR." A response was not provided by the Department to Ameren for the specified document as a request was not made at the time. The DNR and MDC would have not selected Asian carp as a RIS.

14. Page 6-12 provides the primary purpose of the predictive assessment as being able to predict the effect on a biotic community from additional heat sources. In the table for representative important species for the predictive assessment, Asian carp was chosen. The rationale provided was simply that is it a nuisance species. The author seems to be comparing their importance based on entrainment sampling at the LEC, however, again, abundance does not necessarily correlate to importance. It appears a more appropriate representative species should be based on the actual importance to Missourians who use the river for sport fishing or food sources; or as a prey base. Additionally, to provide comment as to whether this study provides for a balanced community, food chain species should also be considered; and lastly, appropriate inclusion of endangered species and species known to be temperature sensitive. Channel catfish, emerald shiner, gizzard shad, pallid sturgeon, walleye, sauger, and white crappie are all appropriate RIS. 40 CFR 125.72(b) indicates the facility should choose species used to develop water quality standards; Asian carp are not a species which has associated in-stream numeric standard protections in Missouri.

15. Section 6.3.2. Please provide references for assessments made and assumptions provided in this section for each species. How does the author conclude larger individuals are better for the balanced community when exposed to thermal pollution?

16. Section 6.3.3. Sampling did not occur in the zone of passage. Does the author have any comment regarding the lack of sampling in this area? Can any data obtained in the study show the zone of passage is being utilized effectively by heat intolerant species and they are realistically avoiding the thermally exposed zone?

17. Section 7, Rationales 9 and 10 have not been substantiated appropriately. Sampling in the zone of passage did not occur to assure these heat intolerant species can use these areas outside of the thermally exposed area as an avoidance area. The assumption needs to be quantified appropriately.

18. Section 7, Rationale 18. In the nutrients, bacterial contaminants, and dissolved oxygen concentrations, a statement was provided saying "there is little likelihood the relatively small increase in temperature will demonstrably increase the rate of" those enumerated contaminants. Can the author provide a calculation of the assessment to show numerically these are relatively small increases?

19. Section 8. Please provide the following references digitally:
    a. Bevelheimer, 2008
    b. Bevelheimer and Coutant, 2004
    c. Bulleit, 2004

d. Coutant, 1972
e. DeLonay et al, 2012
f. EPRI 2013
g. Galat et al, 2005a
h. Galat et al, 2005b
i. McElroy et al, 2012
j. Mestil, 1999
k. Neill and Magnuson, 1974
l. Schramm, 2004 in Welcomme 2004
m. Stanovick, 1999
n. Tripp et al, 2019
o. Union Electric Company, 1976 and 1977
p. Wismer and Christie, 1987
q. Yoder and Emery, 2004

Group 2 Comments (Engineering)

20. Table 5-9 is electrofishing sampling from 1980-1985, 1997-2002, and in 2017-2018. Please address why the electrofishing results from Tables 24 & 28 from Volume 2, Attachment K from 1976 Labadie Thermal Discharge Effects on Biological Populations of the Missouri River were not included.

21. Section 2, it may be beneficial to include more description on the changes in the Missouri River over time and how the river is being used. See Volume 6 Attachment O and Volume 8 Attachments Q & R from 1976 Labadie Thermal Discharge Effects on Biological Populations of the Missouri River.

22. Section 5.4, while the pallid sturgeon are specifically referenced as the only federally listed endangered species, Ameren should provide a discussion on any possible presence of state listed threatened or endangered species. The 2019 list from MDC is available at [ HYPERLINK "https://nature.mdc.mo.gov/sites/default/files/downloads/2019_SOCC.pdf" ].

23. Provide justification on why the sampling plan was not followed.

Group 3 Comments (Bioassessment)

24. The study plans the Bioassessment Unit has all have language along the lines that final selection of representative important species (RIS) will be made in consultation with DNR. However, this unit hasn't heard anything regarding the Labadie project since our joint meeting with Ameren and Amec Foster Wheeler (AFW) in November 2016. The other two DNR people in that meeting were Jake Faulkner and Sam McCord; I do not know whether they were consulted on the RIS topic after the November 2016 meeting, but the Bioassessment Unit has not been involved since then.

25. Section 8. Please provide determination of relevance for the following references:
    a. Holland et al, 1971; how do blue crabs relate to species found in Missouri?
    b. Meldrim et al, 1974; how do the noted estuarine species compare to freshwater riverine species found in Missouri?

26. On page 5-41 Section 5.4.2.3 "Community Characteristics: Diversity," it states, "Due to the differences in taxonomic level (class, order, family, etc.) of identification of the benthic macroinvertebrates, diversity was calculated at the family level because most organisms could be identified to this level." This section goes on to describe differences in macroinvertebrate diversity among sampling zones, ultimately determining in the last sentence of the paragraph, "This analysis demonstrates that the LEC thermal discharge has not

adversely affected the benthic macroinvertebrate diversity in the Thermally Exposed and Downstream zones."

a. Basing diversity on family level identification can mask differences among stations, and this measure, as presented, lacks the precision to say definitively whether or not the macroinvertebrate community is affected by thermal discharge. It has been our experience that genera within a given family respond differently to pollutants. For example, some genera of mayflies are highly sensitive to heavy metals, whereas others are less so. In that scenario, the family is still represented, but there is no measure of the overall community being altered. Their study plan (Appendix A, page 11) and SOP (separate document) both state that identifications will be taken to the lowest practicable taxonomic level. If this level of effort was spent, why not base diversity measures on that? DNR protocols also require lowest practicable taxonomic level, but our biological metrics and criteria thresholds are not limited to the family level.
b. Please provide the rationale for only identifying to the Family level.

27. The study plan (Appendix A) says on page 11 that samples will be subsampled to 200 specimens. The Bioassessment unit could not tell whether they subsampled Hester-Dendy and ponar samples to 200 specimens, but Table 5-6 shows a total of 71,594 individuals identified from Hester-Dendy samplers and 23,115 from ponar samples in 2017-2018. This table also has macroinvertebrate taxa presented both at the family and species level, which suggests that they may have identified specimens to the lowest practicable level, but did not present the data. The heading of "species" in Table 5-6 should be reconsidered, given that relatively few macroinvertebrates can be taken to the species level, especially as larvae. Please supply a response.

28. DNR suggested Hester-Dendy (H-D) samplers be deployed on the bottom of the river as well as suspended in the water column (AFW initially proposed to deploy H-D arrays only at mid-column). Our thought was that this dual deployment would determine whether suspended H-D arrays only sample the drift, rather than the community that actually lives in the benthos at each station. Bill Elzinga (AFW) agreed to this dual deployment, and it was written into the Study Plan. Pages 10-11 of the study plan (Appendix A: Labadie Energy Center § 316(a) Study Plan and Addenda in the August 8, 2019, Final Demonstration) state that one H-D array would be deployed for benthic sample collection, and one array would be set for mid-water column sample collection. At the end of one year, the two sets would be evaluated to determine whether to continue with the dual deployment.
The Bioassessment Unit did not see in any of the reports that this was carried out, nor did we read anywhere in Addendum 3: Summary of Revisions to the Initial Study Plan an explanation for why it was not. Please address the topic and provide an explanation for why this revision was made.

29. Also on page 11 of the study plan it says, "Benthic macroinvertebrate habitat and community analysis will include, but may not be limited to the following metrics: density (#/$m^2$), taxa richness, dominant taxa, EPT index, Biotic index, Shannon diversity index, qualitative sediment characterization (percent abundance of particle types, Wentworth scale). The study plan goes on to say on page 12 that detailed information regarding sample processing and analysis can be found in the SOP and QAPP documents that accompanied the study plan.
a. Density, "EPT Species," and "EPT Intolerant" are presented in Appendix B, Tables B-46 through B-49. The remaining biological metrics (taxa richness, dominant taxa, biotic index, and Shannon diversity index) are not presented in the report. Based on the study plan, I would have expected to see more biological metrics provided and discussed. Tables B-37 through B-49 present a great deal of information, but biological metric trends among stations is notably lacking. Please provide the trend analysis.
b. The SOP concurs with the study plan in that specimens will be identified to the lowest practicable taxon. The QAPP has a section that discusses fish identification, but there is no such discussion for macroinvertebrate identification. Please supply a discussion for the macroinvertebrate discussion.

30. This is a minor point, but in Appendix B, the List of Tables needs to be corrected. For example, the List of Tables shows macroinvertebrate data beginning with Table B-31 (Abundance statistics for benthic macroinvertebrate community sampling for 2017-2018 LEC study by zone, and season). However, macroinvertebrate data are presented in Tables B-37 through B-49. There may be other errors, but I did not check the rest of the tables against the List of Tables.

Group 4 Comments (MDC)

31. The Demonstration is intended to determine whether the alternative effluent limits for temperature will assure the protection and propagation of the balanced indigenous community (page I). According to page V of the report, USEPA's indicators of Appreciable Harm include "no increase in nuisance species." Indigenous species are described on page 3-3, and seem to include those endemic to a waterbody, but also those specifically managed (such as intentional stocking of sport fish). Please provide a summary of the temporal aquatic community and how the populations have changed over time.

32. The Demonstration evaluated data collected on two dates (June 22, 2006 and July 21, 2006) over a 17-year period of record. The rationale described for these dates was they occurred during the most extreme conditions during the "most biologically active period" (page 6-2). June and July are the most biologically active periods but spawning can occur earlier. Please comment as to why spawning months were not included.

33. The report notes the "avoidance temperatures" of pallid sturgeon are "not known" (page V). Please establish if the avoidance temperatures of pallid sturgeon can be determined, either through literature search or other assessment.

34. The Missouri Department of Conservation (Department) is the agency responsible for fish, forest and wildlife resources in Missouri. The Department actively participates in reviews when projects might affect those resources and appreciates the opportunity to provide comments on this project. The following comments and suggestions are offered to avoid, minimize, and where necessary mitigate impacts to fish, forest, and wildlife resources:

35. As acknowledged in Table 2-11, the previous thermal exceedances occur in July, August, and November.

36. The documented previous thermal exceedance months (July, August, November) are not aligned with the selected "most biologically active period" demonstration dates (in June and July, referenced Page 6-2). By selecting demonstration dates in June and July, potentially important data would be excluded (August, November). Excluding these data might result in inaccurate conclusions.

37. A thermal variance for six percent of the year represents 22 days. If these days were consecutive, it could have a cumulative negative effect for fishery resources. Please provide the rationale for allowing 22 consecutive days of exceeding normal river thermal limits.

38. Information about the thermal limits of other sturgeon species included Age-0/1 lake and shortnose sturgeon that showed limits of 31-35 degrees C (87.8 – 95 degrees F). At the low end of the temperature ranges feeding behavior is impacted negatively and at the upper end can be lethal depending on previous acclimation temperatures and duration. In the fish hatchery setting, it has been reported that developmental issues among immature sturgeon may occur over 26 degrees C. Please provide an assessment of this consideration.

39. An added challenge for fishery resources is the higher the water temperature, the lower the natural concentration of dissolved oxygen gas in the water at standard pressure. For example, at 35 degrees C, the 100% saturation point is around 7 mg/L; it is below 6 mg/L at 45 degrees C. Dissolved oxygen is needed for fish respiration. Also, as temperatures increase, fish respiration increases and consumes more dissolved oxygen. Please provide assurances the LEC discharge is not reducing the DO of the stream to levels which would injure fish.

40. Hydrographs for both the Hermann Gage and the Labadie Gage show that water temps usually peaked in July-August around 30-32 degrees C. Ambient water temperatures naturally reach the feeding impact temperatures. Please comment how this will impact this study overall.

41. The Demonstration describes that pallid sturgeon would avoid the thermal discharge zone at Labadie, and would not use shoreline habitat most affected by thermal events. It should be noted that Labadie Plant is located on the outside bend of the Missouri River, where the thalweg occurs. As noted in page 6-39, the species is known to use deeper channel areas (a.k.a. the thalweg). Drifting larval pallid sturgeon would not have adequate motility to avoid thermal mixing zones, and this life stage of the pallid sturgeon is known to be carried in the thalweg.

42. The Demonstration describes not increasing the prevalence of additional invasive species (p. 6-7) as evidence that the demonstration period with thermal variances successfully operates without detriment to the fishery. We consider Asian carp an invasive species and do not stock them as a sport fish. They could be considered a nuisance species.
    a. Can Ameren elucidate the history of the prevalence of Asian Carp?
    b. How would the analysis describe the prevalence of invasive/nuisance species if the Asian carp were included in the sport-fish group?

43. If MDC had been consulted about this study, MDC would have recommended including commercial fish (big mouth buffalo, etc) since other groups were included (invasive, game fish, prey fish, endangered, etc).

44. Regrettably, the MDC did not have time to discuss with our biometricians whether there were potentially other ways to utilize or interpret the original study data.