Comments from a Permitting Perspective on the *Labadie Energy Center §316(a) Demonstration* (8/8/2019)

1. 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?
2. 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.
3. 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?
4. 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.
5. 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.
6. Figure 5-14. Please provide the units for fish length.
7. 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).
8. 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.
    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. It may be important to 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 may 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 showing an invasive species could be classified as one of importance.
9. 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

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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 when using the standardized difference test.

10. 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.
11. 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 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.
12. 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?
13. 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 fort 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. 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 protections in Missouri.
14. 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?
15. 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?
16. 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.
17. 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?
18. 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

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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

19. 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?

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