

May 31, 2011

Mr. John Clements  
U.S. Nuclear Regulatory Commission  
FSME/DWMEP  
Mailstop T-8F5  
11545 Rockville Pike  
Rockville, MD 20852

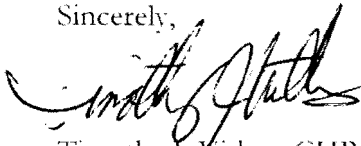
**DOE CONTRACT NO. DE-AC05-06OR23100**  
**SUBJECT: COMMENTS ON THE WESTINGHOUSE ELECTRIC COMPANY, LLC**  
**EFFLUENT AND ENVIRONMENTAL MONITORING PLAN,**  
**HEMATITE DECOMMISSIONING PROJECT,**  
**FESTUS, MISSOURI (RFTA 10-003; DOCKET NO. 070-036)**  
**DCN: 1768-DR-04-0**

Dear Mr. Clements:

The Oak Ridge Institute for Science and Education (ORISE) has reviewed specific sections of the *Effluent and Environmental Monitoring Plan* for the Hematite Decommissioning Project (HDP) in Festus, Missouri. Observations and comments are enclosed for your consideration.

Please contact me at 865.576.5073 or Erika Bailey at 865.576.6659 should you have any questions or require additional information.

Sincerely,



Timothy J. Vitkus, CHP  
Assoc. Director/Survey Operations Director  
Independent Environmental  
Assessment and Verification

TJV:fr

Enclosure

c: J. Hayes, NRC/FSME/DWMEP T-8F5  
D. Schmidt, FSME/DWMEP/DURLD TWFN 8F5  
T. Carter, NRC/FSME/DWMEP/DD/SP T-8F5  
S. Nesmith, NRC/FSME/DWMEP/DD/SP T-8A23  
File/1768  
electronic: E. Bailey, ORISE  
S. Roberts, ORISE

Distribution approval and concurrence:	Initials
Technical Review	DAK

Telephone: 865.576.5073

Fax: 865.241.3497

E-mail: [Tim.Vitkus@orau.org](mailto:Tim.Vitkus@orau.org)

---

---

**COMMENTS ON THE WESTINGHOUSE ELECTRIC COMPANY, LLC  
EFFLUENT AND ENVIRONMENTAL MONITORING PLAN,  
HEMATITE DECOMMISSIONING PROJECT,  
FESTUS, MISSOURI**

**GENERAL DISCUSSION**

At the request of the U.S. Nuclear Regulatory Commission (NRC), the Oak Ridge Institute for Science and Education (ORISE) reviewed the relevant sections of the Westinghouse Electric Company, LLC (WEC) Hematite Decommissioning Project's *Effluent and Environmental Monitoring Plan* (WEC 2011). ORISE was specifically requested via e-mail correspondence to review and evaluate Section 9 of the plan and the proposed use of the Mann-Kendall test for the detection of trends in the environmental monitoring data (NRC 2011). In addition to the review of the plan, the proposed statistical approach was compared with recommendations provided in Gilbert's authoritative text *Statistical Methods for Environmental Pollution Monitoring* (Gilbert 1987).

ORISE offers the following observations for your consideration.

**OBSERVATIONS AND COMMENTS**

**OBSERVATION 1:**

The application of the Mann-Kendall test as provided in Section 9.5 and Appendix D Data Quality Objectives (DQOs) is an appropriate statistical method to evaluate either a stable, upward, or downward trend of groundwater contaminant concentrations. However, it is ORISE's opinion that the monitoring plan lacks much of the specific information relevant to how the test will be applied and other considerations. Information that has not been provided includes:

1. Per Section 9.5 and Table 2, WEC will use the Mann-Kendall test to analyze trends in soil, surface water, groundwater, and vegetation samples. Are all of these media subject to exhibiting contamination level trending and if not, is this an appropriate method for evaluating data from these sample media?
2. How will the null hypothesis ( $H_0$ ) be stated? As with any hypothesis test, overwhelming evidence is required to reject the assumed base condition ( $H_0$ ) and accept the alternative hypothesis ( $H_A$ ). That is, will  $H_0$  be stated in such a way that there is no trend, a one-tailed upward trend, a one-tailed downward trend, or a



two-tailed upward/downward trend? Most example applications state  $H_0$ , with the base condition being no trend, then the  $H_a$  is stated where it accounts for either a one- or two-tailed test. The reviewer anticipates that WEC would be concerned with a one-tailed upward trend.

3. There are two specific methods for applying the test, dependent upon whether  $n$  is  $<$  or  $>$  40. The plan does not discuss this. When  $n > 40$ , a normal approximation test is used.
4. The DQOs provided in Appendix D provide no specific information on the control of the  $\alpha$  and  $\beta$  errors.
5. The document should provide for additional data evaluation methods. For instance, the reviewer assumes that the Mann-Kendall will be applied for each monitoring well. The document does not discuss whether the data from multiple monitoring stations will be evaluated to draw conclusions for the site as a whole. Section 16.4.4 "Homogeneity of Stations" in Gilbert 1987 provides additional information on this assessment. Again, ORISE would like to emphasize that the outlier discussions/evaluations in the plan lack clarity.

#### **CONCLUSION 1:**

The plan provides limited information for prospective review and independent evaluation of the selected statistical test, controls on errors, application of the test, anomalous result evaluation, etc.

#### **PATH FORWARD 1:**

The reviewer recommends WEC revise the plan to include more specific information that clearly defines test parameters, inputs, and data quality assessment methods. A detailed discussion of assumptions and uncertainties need to be presented, along with an explanation of why the Mann-Kendall test is appropriate for all sample media.

#### **OBSERVATION 2:**

The limitations of the test and how the site will account for these limitations are not discussed. These limitations are:

1. The Mann-Kendall test does not consider the magnitude of the data; rather scores are given either a +1 or -1 dependent upon the prior result for a given monitoring point. Therefore, dependent upon  $n$ , the test could conclude there is no trend when there are indeed individual results the site should evaluate. An example would be results of 10 pCi/l; 9,000 pCi/l; 8,500 pCi/l; 9,500 pCi/l; and 8,900 pCi/l. In this example, the result of the statistical test would be to fail to reject  $H_0$ , and conclude there is no trend, when obviously there is a significant and abrupt increase in concentration. Another example for the test concluding there is a decreasing trend are the results: 0.23; 5; 43; 921; 1,340; 103; 1.62; 0.23; 0.23; and 0.23. However, such a result is more indicative of a contaminant slug moving past the well. Would WEC identify similar scenarios as an adverse condition? (Also see Observation No. 3.)
2. The test will not account for seasonality, nor for varying sampling or analytical methods. The underlying assumptions are that these conditions are known/controlled and that any trending is the result of natural attenuation.
3. Because of how the  $H_0$  is generally stated, a “no trend” result for this test is not conclusive. It simply means there is insufficient evidence to reject the  $H_0$ . The examples provided above in Observation 2.1 illustrate this point.

**CONCLUSION 2:**

The plan as currently written does not discuss how the limitations of selected statistical tests will be controlled.

**PATH FORWARD 2:**

ORISE recommends WEC revise the plan to include more specific information regarding the test’s limitations, anomaly detection, decision processes, and potential conclusion errors.

**OBSERVATION 3:**

Section 9.5, page 15 of 28 states that the Environmental Health and Safety (EH&S) Manager and Radiation Safety Officer (RSO) will be notified if an adverse trend is identified. How is an adverse trend defined? Would this be defined as one quarterly monitoring round where the conclusion is there is an upward trend? What about individual anomalous results (refer also to Observation 2.1)?



The discussion provided in Section 8.2 states: "...an investigation level for individual air and liquid effluent samples has been established at 50 percent of the applicable values in 10 CFR 20, Appendix B." Is this intended to define what is meant by an "adverse trend?"

**CONCLUSION 3:**

The plan is unclear in the discussion of anomalous results.

**PATH FORWARD 3:**

The reviewer recommends WEC revise the plan to include more specific information that clearly discusses anomaly detection and evaluations for individual data points for all matrices.

**REFERENCES**

Gilbert, Richard O. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold; New York, New York. Copyright 1987.

U.S. Nuclear Regulatory Commission (NRC). E-mail correspondence from J. Clements to T. Vitkus. Subject: "Request to Review a Portion of the WEC Environmental Monitoring Plan." May 6, 2011.

Westinghouse Electric Company LLC (WEC). Attachment 4 to HDP-PO-EM-001, *Effluent and Environmental Monitoring Plan. Hematite Decommissioning Project*. January 28, 2011.