

October 24, 2014

**UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION  
ATOMIC SAFETY AND LICENSING BOARD**

**Before Administrative Judges:**

**William J. Froehlich, Chairman  
Dr. Richard F. Cole, Special Assistant  
Dr. Mark O. Barnett, Special Assistant**

In the Matter of:	)	
POWERTECH USA, Inc.	)	
(Dewey-Burdock Project	)	Docket No. 40-9075-MLA
In Situ Uranium Recovery Facility)	)	ASLBP No. 10-898-02-MLA-BD01
	)	
_____	)	

**ANSWERING TESTIMONY REGARDING NRC STAFF'S ANALYSIS OF  
TVA WELL LOG DATA**

Q.1. Please state your name, position, employer and prior experience.

A.1.a. My name is Frank Lichnovsky. I have been employed by Powertech (USA) Inc. since June 2006 as the Chief Geologist. My work experience is summarized in Exhibit APP-073. I have extensive, direct experience in exploration, construction, and operation of ISR facilities. I also provided expert testimony in the Hydro Resources, Inc. proceedings (Docket No. 40-8968-ML) while employed by Hydro Resources, Inc. during 1999-2000 and while employed by Uranium Resources, Inc. during 2004-2006.

A.1.b. My name is Errol Lawrence. I am a senior hydrologist employed by Petrotek Engineering Corporation. My curriculum vitae is provided as Ex. APP-038. My relevant experience is discussed in my initial written testimony, Ex. APP-037 at A.1-A.4.

Q.2. Have you previously testified in this hearing?

A.2.a. (Lichnovsky) Yes. I provided oral testimony during the evidentiary hearing on August 20, 2014.

A.2.b. (Lawrence) Yes. I provided written initial and rebuttal testimony. Refer to Ex. APP-037 (pre-filed initial testimony) and APP-066 (pre-filed rebuttal testimony). I also provided oral testimony during the evidentiary hearing, specifically on Contentions 2, 3 and 4 on August 20, 2014.

Q.3. Have you read NRC Staff's supplemental testimony regarding their analysis of TVA well log data in Ex. NRC-158?

A.3. (Lichnovsky and Lawrence) Yes.

Q.4. Were you present during the NRC Staff's visit to Powertech's Edgemont office on September 23, 2014?

A.4. (Lichnovsky) I was present during the office visit. My affidavit submitted on October 14, 2014, with Powertech's Response to the Consolidated Intervenors' and Oglala Sioux Tribe's Motion for Extension of Time, summarizes my observations of the visit by NRC technical consultants.

Q.5. In A7 of NRC Staff's supplemental testimony, they describe how they conducted a spot check analysis of randomly selected digital and paper drill hole logs to evaluate the elevation and thickness of the Fuson Shale. They summarize the results of this spot check analysis in Ex. NRC-173, which lists 34 boreholes along with NRC Staff's independent verification of the thickness and top and bottom elevations of the Fuson Shale. Would you please compare the results of this spot check analysis with Powertech's analysis of the Fuson Shale thickness in its license application and the NRC Staff's analysis in the FSEIS?

A.5. (Lichnovsky) The range of the Fuson Shale thickness in Ex. NRC-173 is 22 to 72 feet. This agrees very well with the license application, which states that the Fuson Shale ranges in thickness from 20 to 80 feet across the entire license area. For example, Powertech's revised Technical Report (TR) states the following (Ex. APP-015-B at 189):

“The Fuson Shale is a low-permeability shale unit within the Fuson Member that ranges in thickness from 20 to 80 feet across the entire project area and crops out east of the project boundary.”

Additionally, the TR RAI responses describe Powertech's evaluation of the Fuson Shale thickness based on thousands of logs in our possession at that time (Ex. APP-016-B at 50):

“Based on Powertech's borehole and geophysical logs for more than 3,000 exploratory holes, the Fuson Shale is continuous and no less than 20 feet thick throughout the entire project area.”

This is also consistent with information on the range of the Fuson Shale thickness presented in the FSEIS (Ex. NRC-008-A-1 at 190):

“The Fuson Shale, which is the shale-siltstone portion of the Fuson Member, ranges in thickness from 6 to 24 m [20 to 80 ft] within the proposed project area (Powertech, 2011).”

Q.6. Also in A7 of their supplemental testimony, NRC Staff describe how they prepared two transects across the area identified by Dr. Moran as a potential fault zone using closely-spaced, digitized drill hole logs. Do you agree with NRC Staff's conclusion that, “The results of our analysis of closely spaced drill hole logs did not reveal significant displacement or thickness variations that would confirm the presence of faulting or fracturing of the Fuson Shale” (Ex. NRC-158 at 11, 2<sup>nd</sup> ¶)?

A.6.a. (Lichnovsky) Yes. I have reviewed the fence diagrams for Transects 1 and 2 presented in Ex. NRC-168 and NRC-169, respectively. I agree that these transects do not show the presence of faulting in the Fuson Shale.

Transect 1 overlaps a portion of Powertech's Cross Section F-F' (see Ex. APP-015-E at 13). Powertech's cross section index map (Ex. APP-015-E at 7) shows the borehole logs used to construct Cross Section F-F'. This map shows that one of the borehole logs used by NRC Staff in Transect 1 (DRJ105) was also used by Powertech in Cross Section F-F'. Neither Cross Section F-F' nor the fence diagram for NRC Staff's Transect 1, which was constructed using borehole logs on a much closer spacing, show the presence of faulting.

Transect 2 overlaps a portion of Powertech's Cross Section G-G' (Ex. APP-015-E at 14) and uses one of the same boreholes used in Cross Section G-G' (KLA10). Based on my experience working in the uranium ISR industry for more than 40 years, neither Cross Section G-G' nor the fence diagram prepared by NRC Staff for Transect 2 show the presence of faulting.

A.6.b (Lawrence) Yes. The fence diagrams presented in Ex. NRC-168 and NRC-169 show that the Fuson Shale elevation and thickness are relatively consistent across each of these transects. These do not support the theory that there is a fault zone in this area that would substantially impact groundwater flow.

Q.7. How does the thickness of the Fuson Shale mapped by NRC Staff in their fence diagrams constructed for Transect 1 (Ex. NRC-168) and Transect 2 (Ex. NRC-169) compare with that determined by Powertech in its license application?

A.7. (Lichnovsky) The thickness of the Fuson Shale shown in the fence diagram prepared by NRC Staff for Transect 1 (Ex. NRC-168) appears to range from approximately 42 to 59 feet. This agrees very well with the portion of Powertech's Cross Section F-F' in this vicinity. For example, Powertech estimated that the thickness of the Fuson Shale is 52 feet at the borehole common to both Cross Section F-F' and Transect 1 (DRJ105).

For Transect 2 (Ex. NRC-169), the thickness of the Fuson Shale in the fence diagram prepared by NRC Staff appears to range from approximately 41 to 54 feet. Again, this agrees well with the portion of Powertech's Cross Section G-G' in this vicinity. Powertech estimated that the thickness of the Fuson Shale at KLA10, which was used both in Cross Section G-G' and Transect 2, is 43 feet.

Q.8. In A10 of the NRC Staff's supplemental testimony, they state that they "found no documented evidence that any historic TVA borehole (boreholes drilled within or in the vicinity of the Dewey-Burdock site during exploration activities in the 1970s and 1980s) encountered subsurface voids or disturbed geologic strata that would be associated with breccia pipes or collapse structures" (Ex. NRC-158 at 16, 2<sup>nd</sup> ¶). In your 8 years' of experience as the chief geologist for Powertech, have you seen any evidence of breccia pipes in Powertech's borehole logs, including those previously in Powertech's possession and those recently acquired from Energy Fuels?

A.8. (Lichnovsky) No. I have seen no evidence of breccia pipes in my evaluation of thousands of geophysical logs throughout the license area. This is documented in Powertech's license application (Ex. APP-016-B at 72, bullet #1), which notes the following:

"Exploration Drilling - The large number of exploration drill holes (more than 4,000) completed within the project area without any indication of solution collapses bolsters the hypothesis that no breccia pipes have penetrated the Inyan Kara Group (Figure TR RAI P&R-12a-3). If such an event had occurred, evidence of solution collapses would be observed in the correlation of the electric logs or from the structure maps developed on top of the Morrison Formation, Chilson Member, Fuson Shale or Fall River Formation. Any subsidence, collapse features or down-dropped sediments would have been evident while preparing cross sections or structure contour maps."

The same RAI response describes Powertech's evaluation of a geophysical log from a much deeper, abandoned oil & gas test well within the license boundary that penetrated the Minnelusa Formation (see Ex. APP-016-B at 71-72). Powertech's evaluation of this geophysical log shows that there is no evidence of dissolution within the upper Minnelusa under the project area. This is not surprising given the abundance of evidence presented in Ex. APP-016-B at 69-84 that supports the conclusion that breccia pipes do not exist within the project area.

Q.9. Also in A10 of its supplemental testimony, NRC Staff describe a fence diagram, presented as Ex. NRC-172, constructed across the location of the alleged sinkhole. They note that, "The land surface profile and stratigraphic profiles illustrated in Exhibit NRC-172 show no evidence of a sinkhole-like structure or any discontinuity that might result from brecciation" (Ex. NRC-158 at 16-17. Do you agree with this conclusion?

A.9. (Lichnovsky) Yes. I have reviewed Ex. NRC-172 and agree that it shows no evidence of discontinuity in the Fuson Shale or other geologic units that would indicate a breccia pipe.

Q.10. Based on your review of the three fence diagrams presented by NRC Staff in Ex. NRC-168, NRC-169 and NRC-172, has your expert opinion changed regarding the lack of faults and breccia pipes within the license area?

A.10. (Lawrence) No. As I stated in my pre-filed initial testimony (Ex. APP-037) at A.47-A.55 and in my pre-filed rebuttal testimony (Ex. APP-066) at A.3-A.5, there is extensive evidence against the presence of faults, fractures or breccia pipes in the license area that would substantially impact groundwater flow. The fence diagrams provide further evidence of geologic confinement, by showing the continuity of the Fuson Shale in these areas. There is an abundance of additional evidence in the record of this proceeding that demonstrates that there is adequate hydrologic isolation of the ore-bearing aquifers to safely conduct uranium ISR operations. This includes potentiometric surface differences between the Fall River and Chilson (see Ex. APP-013 at A.32; see also Transcript at 1063). It also includes water quality differences between the various aquifers at the site (see Ex. APP-013 at A.33). It also includes evaluation of the confining properties of the Fuson Shale with respect to historical and recent aquifer pump test results (see Ex. APP-037 at A.80-A.84). It is also important to reiterate that Powertech will need to present detailed geologic maps and pump testing results demonstrating adequate confinement to safely conduct ISR in the well field packages required for each well field.

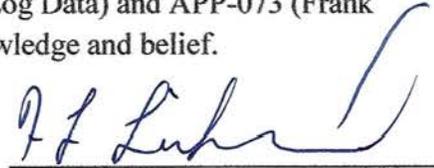
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AFFIDAVIT OF FRANK LICHNOVSKY

I declare under penalty of perjury that my statements in Exhibits APP-072 (Answering Testimony regarding NRC Staff's Analysis of TVA Well Log Data) and APP-073 (Frank Lichnovsky CV) are true and correct to the best of my knowledge and belief.

  
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Frank Lichnovsky

Executed in Edgemont, SD  
this 24 day of October, 2014

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**AFFIDAVIT OF ERROL LAWRENCE**

I declare under penalty of perjury that my statements in Exhibit APP-072 (Answering Testimony regarding NRC Staff's Analysis of TVA Well Log Data) are true and correct to the best of my knowledge and belief.

**/Executed in Accord with 10 CFR 2.304(d)/**  
Errol Lawrence

Executed in Barcelona, Spain  
this 23<sup>rd</sup> day of October, 2014