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January 17, 2012

Bureau of Land Management  
Attn, Rough Draw, WYW-168317  
1425 Fort Street  
Buffalo, WY 82834

**Re: Rough Draw Project Scoping Comments from the Wyoming Mining Association**

To Whom It May Concern,

The Wyoming Mining Association (WMA) appreciates the opportunity to review the application for the Rough Draw Project and provide the comments below as part of the scoping process for the proposed project.

WMA represents bentonite, coal, trona and uranium producers in Wyoming. Wyoming leads the nation in the production of all four of those minerals. Wyoming coal provides almost 40% of the nation's coal and generates over \$1.8 billion per year in the form of taxes, royalties, and fees for use by state, local and federal governments. In addition Wyoming mines employ over 6,800 employees with an annual salary exceeding \$700 million. Continued coal production for Wyoming is critical to the employees, the many service companies and their employees and to state, local and federal agencies.

**Overarching concerns**

The WMA has several concerns with the quality and availability of the information supporting this application and the estimated impacts on coal from the proposed process. There is no information provided on potential impacts to peripheral resources. Details on these and other issues are provided in comments below, principally focused on the Plan of Development and Exhibits 4, 6 and 7. These represent strong concerns with this application and proposed methodology and it is specifically requested that BLM address these and provide additional avenues for public review and comment prior to any approval for the proposed actions. Additionally, this application highlights the lack of available information in the public realm regarding the potential impacts of induced methanogenesis upon host coal and adjacent coal resources. If the proposed actions of this application are approved it is requested that BLM utilize data generated from the project to fill that information void prior to considering any other methanogenesis applications anywhere else within the Coal Development Potential area defined by the Buffalo and Casper Resource Management Plans.

The application does not quantify impacts to potential mineable resources in the vicinity of the project area. Additionally there are numerous documents that are referenced in the application as substantiating claims of minimal or no impacts from the proposed project, yet those documents are classified as confidential or personal communications, rendering them unavailable for public review. In combination these factors result in an application that is insufficient to allow the public to evaluate the environmental and socioeconomic impacts and consequences of the proposed action. Specific examples from the Plan of Development, Exhibit 4 and Exhibit 6 are provided below, with insufficiency statements provided with each so they may be excerpted as stand-alone points.

### **Application categorization**

As proposed, this 283 well project covering more than 17,800 acres is a full-scale gas production operation using federal coal as a host substrate. **Therefore the proposed actions should be permitted as either a gas production operation or a coal operation, with appropriate mineral leasing requirements, rather than under the auspices of a Form 2920-1 Land Use Permit.**

### **Technical, procedural and adequacy concerns with Plan of Development and associated exhibits**

#### **Information inadequacy**

There is an inadequacy of substantiating information, particularly related to potential coal impacts. The discussions in Exhibit 4 are critical to determining project impacts upon the host coal, such as Btu values and other coal quality parameters. Yet more than 50% of the referenced documents in this exhibit are either Email communications to or from Luca, personal communications, or labeled confidential information. None of those materials are provided with this exhibit or with the permit document assemblage. **As such, this application does not provide sufficient information to allow the public to evaluate the environmental and socioeconomic impacts and consequences of the proposed actions.** The unavailable documents are:

- DeBruyn, Roland, 2010, Vice President Luca Technologies, conference call January 15, 2010.
- Hageman, Steve, 2010, BLM mineral appraiser, Wyoming State Office, production royalty for coal gasification, email dated January 15, 2010 and telefax dated February 10, 2010.
- Harris, Steve and Gary Stricker, 2010, US Geological Survey, personal communication, conference call, February 2, 2010.
- Luca Technologies, 2009, Projection of Luca's Potential Impact on the Quality of PRB Coals, CONFIDENTIAL Power Point presentation and conference call, October 20, 2009, 19 pp.
- Sorenson, Randy, 2010, BLM realty specialist, verbal and written communication.

- Stricker, Gary, 2009, Research Geologist U.S. Geological Survey, Denver, Colorado, written report on review of documents and data from Luca Technologies, 3 pp., received via email on December 3, 2009.
- Ulrich, Glen and Roland DeBruyn, 2009, Assessment of Trace Metal Solubility and Mobility in Powder River Basin Coals [sic] Seams Upon Enhancing Methanogenesis, Prepared for BLM Branch of Solid Minerals, Wyoming State Office, unpublished CONFIDENTIAL report by Luca Technologies, 22 pp., dated December 21, 2009.

## **Concerns and issues with potential impacts to coal quality**

### *Btu value impacts*

The Plan of Development (Page 11) makes the observation that the coal seams that have produced the most coalbed methane are the coal seams with the highest Btu value, implying that methanogenesis increases coal Btu values. Similarly, Metric #2 of Exhibit 6 outlines “It can be seen that the calorific values of CBM-productive coals are, in fact, higher than those of stratigraphically-proximate coals not productive of methane. Two scenarios come to mind: either microbes don’t want to live in lower-quality coals, or else the biogenic process consumes lower-quality parts of the coals, and actually serves to high-grade the coals in-situ.”

**None of these observations or claims are substantiated in the application with any analyses or scientific study. Actually, variations in Btu values in the Powder River Basin are instead principally dependent on moisture and ash content. In regard to the application observations, a converse observation would be that higher Btu coals are more conducive to methanogenesis. Factual and repeatable analyses need to be provided in the application to substantiate the observations in the Plan of Development and Exhibit 6 or all such claims should be removed entirely from the application as unsupported speculation.**

The Plan of Development (Page 12) states that measurement of calorific value per pound of coal is repeatable only to 50 to 100 Btu/lb accuracy which is greater than the pro forma degradation predicted by Luca’s material balance calculations.

**In actuality, this is only the case for parallel analyses of splits of the same sample. That margin is routinely reduced with multiple analyses of multiple splits of samples. Additionally, there are several issues with Luca’s material balance calculations (comments below). Any permitted project should be stipulated to include a proper testing program and appropriate statistical analyses that will provide a much smaller repeatability range.**

The Plan of Development (Page 12) assumes that coal quality issues will arise if coal Btu levels have been degraded to a 7,500 Btu/lb threshold or below. Further, the text indicates that: "... average coal degradation of 9.3% must occur before the resource quality is threatened by deployment of the Luca process. By similar analysis, for average coal quality to reach a 7,500 Btu/lb floor, average coal degradation for the 'Middle Mining Area' and 'South Mining Area' would be 11.8% and 15.5%, respectively, since these areas host higher-Btu coals." Using these statements, the application outlines that "For this study, a conservative 'degradation exceedence standard' is set at 4% loss of original calorific value.

**There is no information in the application to support 7,500 Btu/lb as an economic threshold for Powder River Basin (PRB) coal. In actuality, coals with much higher Btu values are often not competitive from the PRB. Additionally, the impacts of a 4% 'degradation exceedence standard' would be highly problematic anywhere within the PRB. This extent of degradation would reduce 8800 Btu/lb standard coal to the lower standard of 8400 Btu/lb with significantly lower pricing structures. Similarly, a 4% impact on 8400 Btu/lb coal would reduce the calorific value below competitive market thresholds for PRB coal. Compounding this is the situation that estimates of the impact of microbial biodegradation on coal heating value is subject to numerous variables, such as whether microbes will selectively attack coal with higher hydrogen contents; these are effects that could have significant impacts on coal quality of host coal and adjacent coal, yet no information is provided in the application. As there is no information provided on lateral extent or controls of the proposed process it is very likely to have effects at the periphery of the project area, at a minimum. The proposed 'degradation exceedence standard' is unacceptable for impacts that could negatively affect future coal leasing considerations for any areas subject to this process and this standard. Reviewing recent (2008-2011) BLM coal lease sales in the PRB, approximately 950 million tons were listed with average Btu levels near the 8400 Btu/lb market category and those sales provided over \$830 million of revenue just in bonus bids alone. Applying a 4% degradation exceedence standard to those coals could render them uneconomic in current markets. The proposed 'degradation exceedence standard' is unacceptable anywhere in the Coal Development Potential area of the PRB as delineated in the BLM Buffalo Resource Management Plan and the BLM Casper Resource Management Plan.**

The text of Exhibit 7 outlines the Core Collection and Analysis Project to support the proposed project.

**There are several issues with the information in this exhibit. The monitoring program proposes to use only two holes to define baseline for a project area covering more than 17,800 acres, and the locations are sited 50 to 930 feet distant from the nearest injection well. None of the proposed baseline or monitoring data collection accounts for preferential local flow in the coal, a point significantly exacerbated by the inadequate baseline and monitoring program proposed. This is wholly insufficient for a project of this scope and with the numerous unanswered questions about impacts to the quality of host coal and coal in the vicinity of the project area. The proposed monitoring program needs to be designed by a third-party coal chemistry expert to determine minimum needs to isolate and identify project impacts to coal quality. At a minimum, the program needs to be significantly expanded to include: Many more monitoring holes, full proximate, ultimate and trace element analyses on all cores, Btu impact analyses based on a Moisture-Ash-Free (MAF) basis to account for any moisture and ash variations. Additionally, there is need for bench-scale tests on several core samples from the specific project area, to determine anticipated ranges of Btu degradation; the bench-scale information could then be used as a direct database to project impacts for the larger project area.**

The application package contains a broad spectrum of projected impacts to host coal Btu values. The Summary and Conclusion section of Exhibit 4 states that: "Methane farming reduces the quality (BTU value) of the coal by consuming coal to generate methane. The available data suggests coal BTU values may be reduced by as much as one percent." Exhibit 4 describes the basis for BTU value impact assessment: "The decrease in coal value caused by loss of BTU content (BTUs per pound of coal) was calculated using Luca's (October 2009) estimated impacts." – the referenced document is listed as "Luca Technologies, 2009, Projection of Luca's Potential Impact on the Quality of PRB Coals, CONFIDENTIAL Power Point presentation and conference call, October 20, 2009, 19 pp."

**Since this key document is confidential and not publicly available this application does not provide sufficient information to allow the public to evaluate the environmental and socioeconomic impacts and consequences of the proposed actions.**

Page 5 of Exhibit 4 indicates that the data summary table (Table 1) was based on a single cored well approximately 20 miles away from the actual project area. The discussions in

Metric #3 of Exhibit 6 outlines that the average carbon weight loss for a coal seam over an 80-acre area is projected and extrapolated through comparison of the coal data from that distant well with methane production 20 miles distant. From all of this, the text of Exhibit 4 outlines that Table 1 indicates a decrease of 0.05 percent to 0.5 percent in coal quality for coals between 100 feet and 30 feet thick. The text of this Exhibit then extrapolates the data from the 30-foot to 100-foot interval at this single core well location to 15-foot intervals that may occur in other wells. As all of the information used is from a single well location this represents a simple case study and only indicates impact ranges for that coal at that location.

**This use of unverified extrapolation, projection and estimation to arrive at a conclusion of insignificant impacts to Btu value is unacceptable. This approach lacks any scientific method of establishing baseline and direct comparisons of effect of treatment. It is not conceivable that coal degradation occurs uniformly over the entire 80-acre parcel monitored by a single well; coal degradation likely occurs in concentrated areas of the coal, such as zones near the well or in certain horizons or fracture zones of the coal. There is no estimate of the extent of local degradation to host coal which is likely significantly higher than an average figure extrapolated over an 80-acre area. This is highly problematic; if the process creates zones of high impacts to coal quality, resulting in very poor quality coal, this could impact the mineability and value of the host coal for future coal leasing. The information in the application is wholly insufficient to provide any indication of actual impacts for a 283 well field or adjacent coal resources. This approach does not provide sufficient information to allow the public to evaluate the environmental and socioeconomic impacts and consequences of the proposed actions.**

The text on Pages 5 and 6 of Exhibit 4 outline that “Luca’s Power Point slides and calculations were reviewed by Dr. Gary Stricker in consultation with Dr. Steve Harris” and states that Dr. Stricker’s written summary in 2009 indicates that “Stricker generally concurs with Luca’s estimates shown in Table 1.”

**That 2009 written summary is listed in the Exhibit 4 References list as: “Stricker, Gary, 2009, Research Geologist U.S. Geological Survey, Denver, Colorado, written report on review of documents and data from Luca Technologies, 3 pp., received via email on December 3, 2009” and is not publicly available. The text does not provide any further details on what the general concurrence entailed. Neither Dr. Stricker’s written summary nor the Email are provided in the application for public review precluding any**

**confirmation of the assessment or determination of what “generally concurs” might mean. This is insufficient information to allow the public to evaluate the environmental and socioeconomic impacts and consequences of the proposed actions.**

The text on Page 6 of Exhibit 4 outlines that: “The coals listed in Table 2 indicate that Luca’s estimates of coal degradation provided on October 20, 2009 should be, for the most part, valid for coals completed in the Patriot Energy wells.”

**The text provides several qualifiers related to the validity of Luca’s estimates, and the referenced document containing the estimates is listed as confidential. As such, this qualified assessment and the base information cannot be publicly reviewed, representing insufficient information to allow the public to evaluate the environmental and socioeconomic impacts and consequences of the proposed actions.**

#### *Impacts to ash content of coal*

Table 3-1 of the Plan of Development document lists several inorganic components. It is likely that these will either be incorporated into microbial biomass, precipitated out of solution and become part of the coal matrix or remain dissolved for some time in the aqueous phase associated with the coal. Most of the inorganics will quite likely become incorporated into the coal matrix by the time that the multiple iterations of the project are completed and/or the coal is mined. This incorporation would increase the ash content of the coal when it is burned. The nutrient contents listed in Table 3-1 are very similar to a nutrient medium used in recent methanogenesis laboratory studies (Papendick et al, 2011; Green et al, 2008). While concentrations cannot be compared since those are not provided in the application, it is presumed that the project concentrations will be similar to those used in the laboratory studies. Review of the calcium, magnesium, potassium, phosphorous and trace metal components of the laboratory medium would project that the metals content of a coal treated with such nutrients could increase by 0.5% by weight. These points strongly suggest that host coal, and adjacent coal subject to nutrient infusions from preferential travel in major cleat structures that extend beyond the project boundaries, could be negatively impacted relative to metals and ash content.

**None of these concerns or impacts are addressed in the application under review. This lack of information and assurances is a potential concern for future coal acquisition and mining by WMA members, as they should be for the lessor and lessee of any federal coal to be leased in the future that is located at or near the sites of this process with untested impacts. The lack of verifiable information and data on potential impacts to coal quality and ash**

**content does not allow the public to evaluate the environmental and socioeconomic impacts and consequences of the proposed actions. Actual, publicly verifiable testing and analyses need to be conducted prior to initiating this process to ensure that adjacent resources are not damaged by it.**

*Trace metals mobilization and concentration*

The Summary and Conclusion section of Exhibit 4 states that “Existing data suggest methane farming activities probably will not significantly concentrate or mobilize trace or major elements within the coal, but should be monitored.” The existing data discussed in the main text of the exhibit is listed as Drever and others (1977) and a written report by Ulrich and DeBruyn (2009); the latter is listed in the Exhibit 4 References section as unpublished and confidential. As the text of Exhibit 4 notes, Drever, et al (1977) found that trace elements have apparently been mobilized and deposited near the coal seam margins in the PRB. However Exhibit 4 does not outline that Drever, et al, concluded that this enriched zone is almost certainly a result of groundwater transport. The water and nutrient process for the proposed action would accelerate current groundwater transport, very likely increasing mobilization and deposition of trace elements at the coal seam margins. The Exhibit 4 text quotes from the confidential Ulrich and DeBruyn report that “it is unlikely that trace metals will be released from the coals or become more concentrated in coals as a result of Luca enhancing methanogenesis” but provides no substantiating data or information. The text also summarizes the confidential report as:

- Indicating that solubility of some metals can be affected by microbial activity.
- Containing laboratory data that indicates that “there does not seem to be significantly higher concentrations of trace metals after methanogenesis. Luca suggests analysis of post treatment water samples to confirm no increase in dissolved metals. Luca’s report is somewhat inconclusive. Continued monitoring of post treatment water samples is justified.”

**No clarifying or confirming data is provided in Exhibit 4 or the remainder of the application to allow public review or confirmation of those statements. This is inadequate to ensure that the adjacent coal resources under lease by other parties, that are not part of this proposed federal action project, are protected from quality degradation. The approach suggested by the discussions in Exhibit 4, to allow the project process to proceed while monitoring for impacts represents an unacceptable risk for these resources. The proposal contains no data or confirmed information to assure owners or lessees of adjacent coal that those resources will not be damaged or reduced in value by metals deposition from this project. Monitoring once the process has already been implemented risks irreversible damage to the quality of the adjacent coal; there is no discussion in the application of any mitigation methods that would reverse deposition of metals in adjacent coal . This is a**

**strong concern, particularly for the implied duration of this project; Exhibit 4 indicates that this process may continue for 50 years and possibly longer. During that time the impacts from the proposed process may create impacts for extensive distances, affecting coal currently owned/leased by other parties, or coal to be leased that has been degraded but is described by quality data that preceded the impacts from the project. The qualified assessments in the application do not provide sufficient information to allow the public to evaluate these and other environmental and socioeconomic impacts and consequences of the proposed actions. Actual, publicly verifiable testing and analyses must be conducted prior to initiating this process to ensure that adjacent resources are not damaged by it.**

*Impacts to coal competence and structure*

**The application fails to address any potential for the host coal or adjacent coal to be negatively impacted by the proposed process relative to coal competence and/or structure. Some coal drilling projects in the vicinity of abandoned coalbed methane wells in the PRB has encountered degraded coal structure such as unusual fracturing and friability. If those same coal characteristics result from the proposed process that could significantly impact the ability to establish safe and effective highwalls when mining this coal. That could have a significant impact on coal owners, lessees and operators that are not part of this project. There is no information in the application to address these concerns. Similarly, this lack of information and assurances should be a potential concern for the lessor and lessee of any federal coal to be leased in the future that is located at or near the sites of this process with untested impacts. In Exhibit 6 the applicant outlines that the process will not involve fracturing of the host coal. Any final permit for this process should include that as a stipulation. The lack of verifiable information and data on potential impacts to coal competence and structure does not allow the public to evaluate the environmental and socioeconomic impacts and consequences of the proposed actions. Actual, publicly verifiable testing and analyses need to be conducted prior to initiating this process to ensure that adjacent resources are not damaged by it. In exhibit 6 it is stated that there will be no additional fracturing of the coal. This should be a condition of the permit.**

**Coal valuation considerations**

The Summary and Conclusions section of Exhibit 4 states that “Lost Federal coal royalty due to coal degradation is estimated to be \$643 to \$756 per well (80 acres) per year. Royalty on methane produced by farming would be approximately three times as much as the lost coal royalty due to coal degradation.” Additionally, the Procedure section of

Exhibit 4 outlines that IM WY 85-14 was used to calculate royalty and that text contains Footnote 1 that states that “A Federal coal lease requires a \$100 per acre minimum bid and three dollars per acre annual rental” but fails to mention any considerations of the sizable bonus bids involved in the BLM coal leasing process (the most recent bonus bid was over \$300 Million on a 1,977 acre tract, corresponding to over \$150,000 per acre) nor the 12.5% coal royalty rate. **From the statements made in Exhibit 4 it appears that neither bonus bid revenue nor coal production royalty was taken into account in estimating lost value to the coal, nor in the comparison of relative values of the coal and the coalbed methane to be produced. IM WY 85-14 could not be located in the public domain, therefore the potential for this oversight could not be reviewed.**

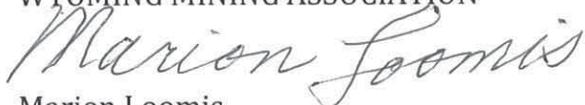
#### References (copies of each attached)

- Papendick SL, Downs KR, Vo KD, Hamilton SK, Dawson GKW, Golding SD, Gilcrease PC. 2011. Biogenic methane potential for Surat Basin, Queensland coal seams. *International Journal of Coal Geology* 88: 123-134.
- Green MS, Flanagan KC, Gilcrease PC. 2008. Characterization of a methanogenic consortium enriched from a coalbed methane well in the Powder River basin, U.S.A. *International Journal of Coal Geology* 76(1-2):34-45.

#### Summary

As detailed in the comments above, there are several outstanding concerns about the technical adequacy of the application, unavailable information and the lack of considerations for some aspects of potential impacts to coal quality and stability in the project area and periphery. Some of those concerns relate to future coal leasing considerations. Collectively, these concerns demonstrate that the application and the scoping process do not provide sufficient information to allow the public to evaluate environmental and socioeconomic impacts and consequences of the proposed actions. WMA requests that BLM address each of these concerns and provide additional avenues for public review and comment prior to any approval for the proposed actions.

Sincerely,  
WYOMING MINING ASSOCIATION



Marion Loomis  
Executive Director