Committee on Resources,

Subcommittee on Energy & Mineral Resources

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Witness Statement

Issues Surrounding Development of Coal Bed Methane in the Powder River Basin of Wyoming and Montana.

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Pennaco Energy, Inc (wholly owned by Marathon Oil Company)

Executive Summary

Pennaco Energy is a wholly owned subsidiary of Marathon Oil Company, and is one of the three most active drillers in the Powder River Basin Coal Bed Methane Project. Over the last three years, Pennaco has drilled over 1400 coal bed methane wells in the project area, with over one thousand wells on production at this time. Pennaco's sole focus has been the development of coal bed methane in the Powder River Basin. I have worked in the Oil and Gas Industry for over twenty five years as an engineer, most of that time spent in the Rocky Mountain region. I have been closely involved with Pennaco in that development from the drilling of the first well and I am quite familiar with virtually all aspects of the technical, environmental, regulatory and political aspects of the activity throughout the Powder River Basin. Pennaco has been a leader in developing and using environmentally responsible methods of dealing with the impacts of coal bed methane development in the Basin. Therefore, I feel qualified to address these issues before this subcommittee.

The Coal Bed Methane resource development currently underway in the Powder River Basin of Wyoming is one of the most important sources of natural gas available to the United States today. The estimated 25 TCF of gas reserves in the basin make it comparable to the remaining natural gas reserves in the Texas offshore Gulf of Mexico. Although current gas production from the Powder River Basin is a healthy 220 BCF per year, the potential exists for the production to increase to 1 TCF per year. This production increase would accelerate the recovery of the reserves to about 30 or 40 years, recognizing that rates tend to decline over time. This resource is located in the center of the country and the gas is connected to pipelines capable of transporting it to both east and west coasts. The gas is poised to not only be a reliable and secure resource, but will also play a key role in the clean energy needs for the U.S. over the next 30 years.

Development of coal bed methane in the Powder River Basin has accelerated over the last three years due to a combination of factors, including enhanced technologies, new gas pipelines and favorable natural gas prices. As a part of this development, producing companies have spent millions of dollars on environmental studies and surface improvements. All of this work was done to monitor the impacts, using that information to minimize the damage and to maximize the benefits. We are using the information gained during the drilling and production of the first 10,000 wells in the basin to improve operations in the remaining development over the next 30 years. This development is being done in a responsible and environmentally sensitive manner.

The rules and regulations needed to protect the environment and to provide for orderly development of this vast natural resource are already in place and being implemented. The next step is to give the state and federal regulatory agencies the funding and directives to set forth and enforce reasonable policies to comply with existing rules and regulations. Support for states' departments of environmental quality and the federal BLM offices must be increased to handle the tremendous technical and personnel demands being placed on them. We must not stifle billions of dollars of development by inadequately funding the regulatory agencies responsible for controlling this critical natural resource. Specific examples include: 1) the current EIS documents being prepared in both Wyoming and Montana must be both timely and usable; 2) the BLM staffs must be increased in the Powder River Basin field offices to handle the huge demands being placed on them; and 3) procedures for processing permits to drill must be streamlined and made more efficient to reduce duplication of efforts for both the BLM and the operators.

Especially at a time when the President is developing a national energy strategy, it is critical that the industry and its governing agencies work together to ensure that this important natural resource be developed to help meet the needs of the Nation, while at the same time addressing the concerns of the local landowners.

Over the last three years, considerable attention has been given to issues surrounding the development of reserves in the Powder River Basin. Some of the criticism that has been voiced has been justified, while a great deal of it has no basis of truth. However, for those who are not intimately involved in the process, it is difficult to discern the difference. Thus, a continuing educational effort has been underway for the last two years to allow interested parties to make decisions based on sound and factual information. This document is an attempt to summarize the issues and comment on how those issues are being addressed. It is important to understand that this development, like any other, is a learning process. As better ways of doing things are identified, those improvements are incorporated into everyday practice.

Primary Issues

There are three primary issues surrounding coal bed methane development in the Powder River Basin. These issues are:

1. Impact on the Ground Water Resources
2. Impact on the Surface Resources, including water, soil, vegetation and animals
3. Surface Owner Rights and Compensation

Impact on the Ground Water Resources

Three studies on the impact of coal bed methane development on ground water resources are either complete or underway. The most recently published study is the "Water Resources Technical Report" for the Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans, prepared for the BLM, Miles City Field Office. The report was prepared by ALL Consulting (Tulsa, OK) and CH2M HILL (Boise, Idaho). The report states on pages 40 and 41 and exhibit 27 and 28, that "**these figures add up to an estimated 249.73 billion cu. ft. of ground water for the projected CBM area of the PRB. This total does not include the volume of all the coal seams in the PRB, instead only those coals in the CBM potential development area. This total does**

not include waters held in non-coal aquifers. The total water production for all CBM wells in all the watersheds is 4.4 billion cu. ft. per year or approximately 1.75% of the water in the coal seams of the Montana PRB Watersheds."

The calculations of water volumes in those studies indicate that, even though this is an arid climate, there are vast amounts of water in the subsurface. The numbers that have been reported show the production of water from coal seams for methane production will impact a very small percentage of the water in the aquifer. Even though the volumes of water withdrawn in coal bed methane development are significant, the huge amount of water left after the methane has been extracted appears to be very adequate for all current and foreseeable future uses of the ground water. Additionally, the water extracted with methane production and subsequently discharged will gradually be replaced over time by infiltration of the discharged water; rain and snow melt back into the subsurface. This will provide continuing water resources for future generations. The water discharged to the surface is **not** wasted.

A very thorough study, to be completed as part of the Wyoming Powder River Basin Environmental Impact Statement, should be ready for review by Spring 2002. The study will provide the operators an opportunity to review the important conclusions of the scientists involved. In the meantime, industry and governmental agencies will continue to monitor and document development impacts on the aquifers.

Another important issue related to ground water is the impact of coal bed methane development on water wells used by residents of Wyoming. Many of the water wells in the basin, both stock water and domestic water, are completed in the same coal zones being developed for methane production. It has been common for many years for people to report that they could light their household water. This was long before anyone knew what coal bed methane was and was certainly long before any development of that methane had begun. Now that the methane is being produced from coal zones, the impact on water wells completed in that same zone can be substantial. As a part of doing business, every coal bed methane producer in the basin has agreed to voluntarily negotiate a contract with the surface owner on the mineral lease that will define the terms of replacing any impacted water wells. The replacement of water supplies, either through a new well or other mutually acceptable means, has become common practice. To date, the State Engineer's office in Wyoming continues to state that no cases exist in its office of a legitimate complaint that a producer has not remedied an impacted water supply. This issue is important to all parties involved and has been handled by cooperative efforts between landowners and producers.

Surface Impacts on Water, Soil, Vegetation and Animals

There are two components to be discussed when it comes to surface waters. One is water quality and the other is water quantity. Both need to be discussed.

The quality of water produced from coals varies dramatically across the Powder River Basin; however, in almost all cases it can be considered fresh water that meets federal drinking water standards. The issue is not whether the water is suitable for drinking. The issue is whether it can be used for the irrigation of pastureland and crops.

The key issue of water quality has now been reduced primarily to the quantity of various salts in the water. All of the surface water, including coal bed water, contains some amount of salts. The most critical salts for irrigation decisions are sodium, magnesium and calcium. In this case, it is not the quantity of salt so much as it is the relative combination of the salts to each other. This leads to a discussion of a term now common

to the Powder River Basin known as SAR, or sodium adsorption ratio.

The SAR is important because is it is an indicator of whether the water will be compatible with certain soils and plants. Technically, the SAR is the ratio of the sodium ion concentration to the square root of the sum of the magnesium and calcium ions. In simple terms, if the sodium ions concentration is much higher than the magnesium and calcium ion concentrations, the SAR is high. If all the ions are present in similar amounts, the SAR is low. If the SAR of the water and the soil is low, say 10 or below, there should be no problems in most types of soils. As the SAR get higher, more care must be taken to match soils, water, plants and irrigation methods. The SAR and water quality vary considerably from one part of the basin to another. The attached map, Exhibit 1, shows the Powder River Basin with its various river drainages and the variations in SAR values from one end to the other. The operators and landowners must understand this variation and apply the knowledge to the specific sites being developed.

Operators have done many soil studies for landowners in an effort to match water and soils for irrigation. In general, irrigation is not effective on soils high in clay. The best soils are loamy and sandy loam. This type of soil tends to be away from the creek bottoms and into the hilly terrain. Soils in Wyoming and Montana tend to be high in natural salts also and this must be taken into account. The higher the salt content of the soil and the water, the more difficult it is to irrigate. In those cases, special methods must be used. Operators are keenly aware of these issues and work cooperatively with the landowners to find the best use for the water in the given terrain and soil type. It is important to remember that many ranchers in Wyoming are not used to having much water and have never irrigated and do not intend to start now. We often hear that "my father and my grandfather never irrigated and I am not about to start now. I am a rancher, not a farmer". Thus, we must fit the solutions to the desires of the landowner in addition to what works for the water, soil, terrain and vegetation.

A second issue is the quantity of the water produced from coal bed development. The water quality and quantity must be considered together in any decisions made regarding how to handle water on the surface. Industry has spent well over a million dollars studying the impacts of coal bed produced water on streams and rivers. The primary purpose has been to assure that water discharges do not negatively impact agriculture downstream. We have addressed all aspects of water quality, including constituents such as iron, manganese, barium, arsenic and salts. A large part of these studies deal with quantity of water in addition to quality. As a result, we believe we have a good understanding of the water and its impact on the surface. We have used this information, as well as knowledge gained from landowners and hydrologists, to customize the methods of handling water to fit the specific situations.

Experience in the basin has shown very clearly that the quantities of water produced vary considerably from area to area and from one coal zone to another. The quantities of water also change dramatically over time. For instance, an average coal bed methane well will produce 12 gallons of water per minute over the first year. The second year the volume will drop in half and then drop to half again in the third year. We are seeing a number of cases in which the water flow drops to near zero, yet the well still produces gas. These water volumes are often lower than what was anticipated prior to drilling, so impacts caused from discharges turn out to be less than expected. This is both good and bad. The change from normal has been less than expected, but the landowners who wanted to water livestock and irrigate have not been able to do as much as they had hoped.

Nearly all of the operators have gone to great lengths to work with the landowners to use the water on the surface for agricultural purposes. Operators have cooperated with landowners to build stock tanks, reservoirs, water distribution lines, power lines and roads to help in the management of their livestock.

Those ranchers who have used the water on the surface have increased crop yields, stock carrying capacity and livestock production as a result of the additional water. Those wells and facilities can be used by the ranchers long after the methane production has ceased. Discharge points for the water are designed to prevent erosion and deposition of any residue on the stream banks. Examples are shown in the photos in Exhibit 2. Often, enough reservoirs are built to keep all produced water on the lease where the water is produced. Stock tanks and water lines have been installed to carry water up to the highland areas away from the stream bottoms. This allows cattle to move up into better grass and lets the stream banks re-vegetate with grass and brush. This in turn increases the habitat for wildlife. Ranchers have been able to increase their income by selling additional permits for hunting on their property. When the landowner desires, the reservoirs have been built to allow for the stocking of trout. The operators have cooperated with the landowner to establish the food chain and then stock the trout.

There are several examples of creative ways that have been used to put the water to use. As one example, Pennaco worked closely with the City of Gillette to develop pipelines and pumping stations so the coal bed methane produced water could be chlorinated and then injected into the partially depleted aquifer used by the city for its domestic water supply. Although this is not a method that can be used in other areas, it was a very effective way to put the water to good use and has been operational for one and a half years. A second case is a cooperative effort between the Wyoming Highway Department, Natural Resource Conservation Service, Pennaco and the landowner. The parties worked together to plant hundreds of trees along Highway 59, south of Gillette, to form a natural show fence. Pennaco piped coal bed methane water to the site for a constant water supply. Exhibit 3 is a photo of that project. Other projects have included sprinkling, center pivot irrigation and several other methods of applying coal bed methane water onto the grasslands and cultivated crops to increase the agricultural yield for the ranchers. All this is done with soil testing and monitoring to assure long term benefits.

The other side of the coin is when a landowner does not want any change at all in his surface. Even though that is certainly his right, it makes a difficult situation for the operators. Coal bed methane cannot be developed without some change in the surface. Therefore, if a landowner is unwilling to help in the planning, the operator must make those decisions alone. This is the least desirable situation for an operator. We go to great lengths to avoid an antagonistic relationship with our landowner and constantly seek ways to cooperate.

Surface Owner Relationships

It is very important for operators to have good relationships with surface owners, whether the owner has mineral rights or not. A commonly heard statement is that the surface owner is completely “out of luck” if he does not have the mineral rights, leaving him susceptible to being run over by the operator. This is far from the truth.

The mineral estate has precedence to the surface estate, but this does not mean the surface owner is without rights. Operators realize that we can either get along with the surface owner and get things done the easy way, or we can fight constantly and spend more time and money than it would have taken to cooperate in the first place. Subsequently, the operators go to great lengths to get surface owner agreements in place before any activity takes place on the surface. This agreement defines in detail what the responsibilities of the operator are and what the expectations of the landowner are. The agreement also defines what fees will be paid to the landowner in return for the use of the surface. These agreements are very common and are the rule, not the exception. For instance, Pennaco has operations with over two hundred landowners. At this

time, there is only one landowner that we have been unable to reach agreement with. As a result, we have held up drilling and production for over a year in an attempt to reach an agreement. In this particular case, the owner does not need money and wants nothing to do with us. So, he continually requests fees several times greater than those that his neighbors have received. Additionally, he asked for conditions that, if implemented, would make drilling and production uneconomic. We are still working with the courts to secure the ability to move forward with development. Fortunately, the vast majority of landowners and operators are able to reach agreement and go forward in a cooperative manner. This is good for both parties.

A number of landowners have asked for overriding royalties in the production rather than accept annual fees for access to their land. The general concept that if the landowner gets a share of the profits, he will be more cooperative, seems logical on the surface. However, this concept continues to be disputed by the producers. The reasons for not giving royalties in lieu of surface damage fees vary from operator to operator; but a few reasons are common. First, coal bed methane is inherently a risky business and may or may not be an economic venture. As the industry moves into deeper and more remote areas, it may take two or more years of pumping water from wells to get the first gas sales from a project area. Even though landowners may believe they will be much better off with a royalty, the reality could be quite the opposite. The activity on the surface could go on for some time with no revenue generated from gas production and sales. This leaves the operator in an awkward position of having a landowner receiving little or no compensation for the disturbance on his land. Additionally, coal bed methane tends to be produced in largest amounts in the second year after gas sales begin, and then the rates drop dramatically. Again the landowner is left in later years with little or no compensation. Finally, a royalty is a mineral assignment and can be separated from the title of the land. If the surface owner sells the royalty or the surface separately, the operator is again in a situation in which the surface owner gets no compensation for the disturbance. This is not perceived as a good way to do business in the long run with surface owners.

Another issue is whether surface owners who do not have mineral rights are being adequately compensated for the presence of methane operators. Operators believe that surface owners are being compensated at a higher level than in any other oil and gas basin in the country. The agreements over the last three or four years allow for an initial payment and an annual payment that is quite substantial in relation to the value of the land. In addition, operators have been paying for new roads, power lines, water wells, stock tanks, reservoirs, trees, fish, soil testing and water well monitoring. These are expenses the operator bears that the surface owner could not afford nor justify in this arid land. Additionally, the operators agree to reclaim any of the surface and facilities after production is uneconomic. Consequently, the owner has the choice of taking over the improvements or having the land reclaimed to its original condition. This includes the wells themselves, so the owner can assume ownership and responsibility for any of the wells he wants as water wells, all with power supplied. Once the gas operation is finished, the landowner can also use the gathering pipelines for water storage and distribution on his ranch. For additional insight, read the attached news article from the August 23, 2001, Miles City Star, Exhibit 4.

As an example of the magnitude of fees paid to surface owners, I will give details of a specific case that is representative of Pennaco's payments in general. I am not revealing the name of the ranch or individual owners, but the numbers are those actually paid or are estimated to be paid. On this ranch in the Powder River Basin, Pennaco is actively drilling a total of 70 wells with one well per 80 acres. On average, each well site will disturb 4.0 acres initially and 1.9 acres in the long term. This includes the well site, access roads and pipelines. If power lines are not installed in the same trench as the pipeline, additional payments and disturbances should be considered. We have paid out approximately $70,000 of well damage payments to date and expect to pay out a total of $110,000 this year in initial damage payments. This amounts to an

average of $390 paid per acre of actual surface disturbed. On an annual basis, Pennaco expects to pay approximately $80,000 per year for an estimated $615 per acre actually disturbed. The annual payments per acre are higher than the initial payments because the acreage disturbed drops as pipelines and well sites are reclaimed, but fees are still paid. As a reference point, the average value of the land, if valued as an entire ranch, should be in the $200 to $400 per acre range. The value of the land varies somewhat, depending on the proximity to Gillette or other population centers. However, the bottom line is that landowners are generally receiving more per acre disturbed every year than the appraised per acre value of their land.

Again, there is another side of the story. The people of the West tend to be very independent and private. Some of them have lived out in the country away from people due to the solitude and wide open spaces. Coal bed methane development is definitely an infringement on that privacy. It is difficult for an operator to put a price tag on that loss of privacy, so it can create a tough situation for both parties. There are also issues of erosion control, dust, low water crossings for cattle, ice in winter, fences left open and similar ranch operational problems to be addressed. This is a situation in which it is best for the two sides to spend time together to understand each other's position and try to find common ground. This can be time consuming and frustrating, but can usually be resolved.

Overall, the industry is working in good faith with landowners to cooperatively develop water and coal bed resources while compensating them for the inconvenience and loss of agricultural and hunting income. If the landowner desires to use the water, due to increases in crop yield and livestock carrying capacity, there should be an increase in income for the rancher rather than a loss. The bottom line is that there is not a single way of dealing with water that fits all situations. In every project, the operator must design the water handling plan to fit the water quality, water quantity, soils, terrain, vegetation and wishes of the landowner. The first choice is to use the water on the surface to benefit the landowner for his agricultural and domestic uses. If and when there is a case in which it is not appropriate to discharge the water on the surface, other solutions are explored, such as shallow injection. The industry and landowners must be able to use the full range of tools available to reach the best solutions.

Secondary Issues

There are a number of smaller issues that arise from time to time that are being dealt with continually. I will touch each of those briefly.

(1) "Bad Operators". In every industry there are operators or companies that cut costs or take short cuts. The coal bed methane industry is no different. Occasionally, there are one or two operators that cause problems for the rest of us. To minimize that, the operators formed a trade organization called the "Methane Operator's Group" or MOG. The purpose of the MOG is to educate and communicate with all the operators in the basin to improve methods and procedures. Subcommittees are operating at this time to address safety, environmental, community relations and best practices issues. As new issues arise, new subcommittees will be assigned to address them.

(2) Safety. Safety has become a concern in the Gillette area due to the number of accidents that have occurred over the last three years. On a per man hour basis, the safety record is average compared to other industries and areas. However, one injury is too much. As a result, a safety committee was formed through MOG that is establishing standards for operators and contractors. Educational programs are underway in cooperation with the local fire department.

(3) Potential Hazards. Some individuals and groups have expressed concern over the potential for three types of coal bed methane hazards: 1) gas migration to the surface, 2) subsidence and 3) underground fires.

The issue of gas migration was addressed by two studies done near the town of Gillette. The first study was funded by Pennaco, the second by the City of Gillette. The conclusions were similar: 1) gas migration through faults or old wells could occur, 2) monitoring should be done and 3) the solution is to produce the coal bed methane gas from under the city to prevent any future migration problems.

The issue of subsidence was addressed in a report done by the Wyoming State Geological Survey as published in December, 2000. The conclusion was that "minor aquifer compression up to ½ inch may occur in the coal beds being developed in the Gillette area. That entire compression, however, may not be transmitted to the surface. To date, no surface subsidence has been associated with other equally significant water withdrawals in the Gillette area." This one half inch potential subsidence is much less than the actual shift in surface soils documented in the Gillette area due to rain and snow fall.

The issue of underground coal fires was addressed in report prepared by the Wyoming State Geological Survey, published in April 2001. The report stated "during the production and post-production phases of a coal bed methane well, conditions necessary to foster spontaneous combustion of coal are not present…The likelihood of completely dewatering a coal bed and exposing large areas of fine coal particles to oxygen seems extremely remote". These two WGS reports are included as Exhibit 5.

Summary

It is our belief that the appropriate rules and regulations are in place to control and monitor the activity of the Powder River Basin Coal Bed Methane Development. The operators and pipeline companies are working responsibly with the regulatory agencies and the landowners to develop the assets in an environmentally sound manner. The stories and reports of "environmental sacrifices" are exaggerated or often simply untrue.

The obstacles left to work through are related to establishing practical policies to enforce the rules and then adequately staff and fund the State and Federal agencies to implement them. Especially at a time when the President is developing a national energy strategy, it is critical that the industry and its governing agencies work together to ensure that this critical natural resource be developed to help meet the energy needs of the United States, while at the same time, addressing the concerns and needs of local landowners. Only by working together can we reach the full potential coalbed methane development has for the State of Wyoming, its citizens and for the people of this nation.

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