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# ENERGY SUPPLY AND CONSTRAINTS IN WESTERN NORTH DAKOTA

## HEARING

BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

**SPECIAL HEARING**

SEPTEMBER 3, 2008—BISMARCK, ND

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# ENERGY SUPPLY AND CONSTRAINTS IN WESTERN NORTH DAKOTA

**WEDNESDAY, SEPTEMBER 3, 2008**

U.S. SENATE,
SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT,
COMMITTEE ON APPROPRIATIONS,
*Bismarck, ND.*

The subcommittee met at 10:08 a.m., in the Auditorium, National Energy Center of Excellence, Bismarck State College, Hon. Byron L. Dorgan (chairman) presiding.

Present: Senator Dorgan.

Also present: Representative Pomeroy.

OPENING STATEMENT OF SENATOR BYRON L. DORGAN

Senator DORGAN. I am going to call the hearing to order. My name is Byron Dorgan. I am a Senator from North Dakota. My colleague is joining me. This is Congressman Earl Pomeroy.

This is a hearing of the Senate Appropriations Subcommittee on Energy and Water. And I appreciate my colleague joining me from the House side.

We are here today to talk about particularly oil and gas development in North Dakota. And I appreciate all of you attending the hearing. I especially appreciate the witnesses who have joined us.

I understand Mr. Hamm is attempting to catch a flight at noon today out of Bismarck, and we hope that we can accommodate your schedule. I appreciate very much your coming here from Oklahoma. We have five or six daily flights to and from Oklahoma, I am sure.

So my guess is we will be able to accommodate that, Mr. Hamm. I appreciate your traveling here today for that purpose.

We are here to talk about the nearly unbelievable amount of energy development that is occurring in North Dakota, particularly in the oil and gas area. As you know, the Bakken Shale development is providing substantial new drilling rigs here in North Dakota. I had asked the U.S. Geological Survey to do their assessment that Dr. Price had done some years before and died before it was peer reviewed or released.

USGS rated the assessment. They assessed that under today's technology, there were 3.6 to 4.3 billion barrels of recoverable oil in the Bakken Shale. It was the largest accumulation of oil—recoverable oil ever assessed in the lower 48 U.S. States, which is an interesting piece of information. It suggests that this industry will be a robust part of our economic future for a long, long time here in North Dakota.

This news of 3.6 to 4.3 billion barrels is good news because we are in an energy crisis of sorts in this country. We use a quarter of the world's oil but produce only 3 percent of it in all of North America. We import well over 60 percent of oil from other nations, some of which are unfriendly and some of which are unstable. And it means we export our wealth to them and have an economy that is unbelievably dependent on their stability and their willingness to sell us their oil.

Five nations in the Middle East control two-thirds of the oil reserves on this Earth. Ninety percent of the world's oil is, in fact, controlled by nationally known or largely nationally owned oil companies. That is, oil companies that have a substantial portion of their ownership by foreign countries.

As you know, the price of oil doubled from May 2007 to May 2008. There are a lot of reasons for that and a lot of conjecture about why. I have my own views about it. I think the oil futures market, while it is now adjusting back downward; I think it was a substantial amount of speculation by noncommercial interests in the market. And that may well be self-correcting, I don't know. But I won't go into that in great depth today, but we need to attack the problem of this energy crisis on all fronts.

We need more domestic production. That means more drilling. We need to wrap up our investment in renewable energy sources. We need to take substantial steps in conservation. We need to address the issue of excess speculation in the futures markets.

But when it comes to the issue of domestic production, the Bakken region is an outstanding resource, both for our State and our Nation. The goal of the hearing today is to talk about how we can maximize the production from the Bakken to contribute to our Nation's energy supply.

My own view has been, for some while, that the largest reservoirs of recoverable oil are in the Gulf of Mexico. I was one of four Senators—two Republicans, two Democrats—that offered the legislation that is now law that opened up 8.3 million acres called Lease 181 in the Gulf of Mexico.

Much greater opportunity exists in the gulf. Just for your information, if you evaluate potential oil resources, the Gulf of Mexico is number one, the west coast of the United States number two, and Alaska is number three in terms of recoverable oil and opportunities for oil and gas that is recoverable under today's conditions.

But we ought to do a lot of things and do them well. The question today is how can we maximize the opportunities from the Bakken Formation? And there are a couple of issues with respect to that. With all wonderful news come challenges and interesting needs for us to address those challenges.

I have heard from a fair number of oil producers in the Bakken region that struggle to move their crude from their wells to the refineries or that they pay substantial prices to get space on a pipeline or a railcar to move their product. And it appears to me that we may well face a bottleneck of sorts if we don't think through this, and I am trying to understand, with this hearing, what may happen in the future with respect to the movement of the oil, the considerable amount of oil that is going to come from the Bakken.

I have a chart that I want to show you. We are going to get to a point in just a few months. You see here that the ramp-up production in June 2008, 166,000 barrels per day is record production. We are told the North Dakota capacity limit for movement is 189,000 barrels. So it is pretty clear that as you ramp up production—I think we have 81 drilling rigs in the State. Someone might correct me on that. But somewhere, 80, 81 drilling rigs at the moment drilling a hole every 30 or 40 days.

As you ramp up production, at some point you reach capacity on transportation. The question is what is going to happen in the future with respect to pipeline capacity? What will happen with respect to rail capacity so that we can move this product out and so that the producers in this region aren't paying a penalty on that product in order to get that movement?

So I have called this hearing today to discuss that. I also think in the context of that, I asked one representative of the group that has been formed in North Dakota to talk about an interest of additional refining capacity in our State because I believe that we should find a way to achieve additional refining capacity, either through incentivizing some company, perhaps Tesoro or someone else, to expand or some company to come in and build a new refinery.

I think it would make a lot of sense for North Dakota to have additional refining capacity. We produce much, much more than we use. And just last week, I had a report that we were going to be short somewhere. Well, we shouldn't be short anywhere. We are not at the end of the pipeline. We are at the start of the pipeline. There is no reason for a State that is at the start of the pipeline to be short of energy that we need in this State.

So we are going to discuss all of that this morning, and I am especially interested in focusing on this question of the good news from this chart about production and where that meets limits on capacity to move it and then what might or might not happen to address those limits. I don't approach this as in any way being pessimistic. I am very optimistic about the future.

This State is going to play a prominent and significant role in our country's energy future. We are going to be a very big contributor. That is very good news for the country, and it is great news for North Dakota. But it will present challenges, one of which is the infrastructure in our State.

Yesterday, I was up in the Northwest region. I can't tell you how many big, old trucks I followed down the road, but there were a lot of them with a lot of weight. And so, you have got all these different challenges and interests. We are going to focus on a portion of them this morning, not all of them.

But I have a group of witnesses. I appreciate very much their willingness to be here today. I will introduce them in just a moment. Let me call on my colleague Congressman Pomeroy.

STATEMENT OF REPRESENTATIVE EARL POMEROY

Mr. POMEROY. In Congress 101, we learn that House guys better keep it short when appearing at a Senate hearing. So I will be very short.

This is an extremely important time for North Dakota as we completely transition to a different place in terms of the energy role we will play relative to meeting our Nation's energy needs. And this is true relative to many sources of energy.

So it is extraordinarily important for us that one of our Senators, Byron Dorgan, is chairman of the Energy and Water Appropriations Subcommittee, the funding committee driving much of congressional research, planning, and program of relative meeting our Nation's energy needs.

A couple days ago, driving around Bismarck, I saw a pickup with a bumper sticker that said, "It ain't over until the last barrel sings." Well, I suppose that was kind of a refrain on the "drill, drill, drill" chorus we have been hearing throughout the summer.

If it was only as simple as that, I guess "infrastructure, infrastructure, infrastructure" doesn't have quite the same resonance. But if we are going to make the most of our domestic energy sources, we better get serious about the infrastructure for getting energy sources from where they are to where they are needed.

Now, North Dakota has seen this in so many places, wind, for example, and the electric transmission issues that represent a choke point in terms of our ultimate potential. We see the same chorus with moving the tremendous opportunity the Bakken play represents. We are going to quickly reach the point, as this chart so painfully demonstrates, where our production outstrips our ability to ship and refine the product.

We know what happens. Our producers pay a very serious price penalty when they butt up against overall transmission and pipeline maximums. And so, dramatic improvements and expansions to our Nation's electricity grid, biofuel pipelines, oil, and natural gas pipelines must all be made as we make steps to bring greater energy independence to our country.

We are proud of North Dakota's role here and are very, very focused on this infrastructure application. I believe that there is going to be a tax component of this. With the House Ways and Means seat, I intend to make certain that we are very carefully attentive to looking at using the tax code in ways that might help build out infrastructure.

So I am looking forward to the panel's testimony, and I think that you have done a terrific job, Mr. Chairman, in terms of pulling together a variety of perspectives to weigh in on this important issue.

Thank you for allowing me to attend.

Senator DORGAN. Congressman Pomeroy, thank you very much.

I want to introduce Franz Wuerfmannsdobler, who works on the Appropriations Committee in the Senate with me, particularly on energy issues, and Jonna Hamilton, who also works on energy issues with us. They are here to my left, your right.

We are going to begin today by hearing from Mr. Joe Kelliher, who is the Chairman of the Federal Energy Regulatory Commission. He has been Chairman of FERC since 2005. He has come to North Dakota previously when we did an energy expo and was a presenter here, and I have always appreciated his work.

Then I am going to turn to Mr. Lynn Helms, who has served as the director of North Dakota's Industrial Commission, Oil and Gas

Division, since July 1998, and director of the department of mineral resources since July 2005.

And then I will turn to Shirley Meyer, a member of the North Dakota House of Representatives, where she serves on the Energy Transmission and Judicial Process Committees and is co-chair of the North Dakota Oil Refinery Committee.

Then we will hear from Mr. Kevin Hatfield, general manager for the gathering systems for Enbridge Pipelines North Dakota. And I will speak more about your background, Mr. Hatfield, in a moment.

And finally, Mr. Harold Hamm is the chief executive officer and chairman of the board of Continental Resources, and we appreciate very much your traveling here.

So we will begin with Mr. Joe Kelliher, who is the Chairman of Federal Energy Regulatory Board.

**STATEMENT OF HON. JOSEPH T. KELLIHER, CHAIRMAN, FEDERAL ENERGY REGULATORY COMMISSION**

Mr. KELLIHER. Thank you, sir.

Mr. Chairman, Congressman Pomeroy, I want to thank you for the opportunity to appear here before the subcommittee. And I want to particularly commend Chairman Dorgan for his interest in this subject, which is actually longstanding. It goes back a number of years.

I am going to summarize my testimony and concentrate on FERC's legal authority with respect to oil pipeline regulation and also discuss the nature of the problem at hand today.

But first of all, it is important to recognize the Nation's oil pipeline network consists of about 200,000 miles of pipelines performing a variety of roles. Crude oil pipelines transport crude oil and synthetic oil from production areas and marine terminals to refineries. Refineries produce a variety of petroleum products, and a separate system of pipelines moves those petroleum products to distribution points. Overall, this is a very robust network, and it operates very well, and it has for some time.

Commission regulation of this network is under the Interstate Commerce Act, which gives the commission authority to regulate the transportation rates and practices of oil pipelines. The Hepburn Act of 1906 began the regulation of interstate oil pipelines, making pipelines common carriers subject to regulation. The act was an amendment to the existing Interstate Commerce Act, which was initially enacted in 1887, which had previously focused primarily on regulating railroads and telegraph companies.

Responsibility for regulating oil pipelines was initially vested in the Interstate Commerce Commission, but was transferred to the Federal Power Commission, FERC's predecessor agency, in 1977.

Now, under the Interstate Commerce Act—the Interstate Commerce Act applies to the transportation of oil and petroleum products from one State to any other State, from any place in the United States to a foreign country, and from a foreign country to any place in the United States, but only insofar as such transportation takes place within the United States.

Because oil pipelines are common carriers, the Interstate Commerce Act requires that they provide transportation upon reasonable request. And that means, for example, that an oil pipeline op-

erating at full capacity must prorate that capacity among current shippers to make capacity available to a new shipper requesting transportation service from the pipeline.

And significantly, the commission has no authority to grant preferential treatment among domestic oil producers in prorationing or to somehow favor domestic oil producers over foreign sources.

The Interstate Commerce Act requires that all charges for oil pipeline transportation must be just and reasonable, and it does authorize the commission to investigate the lawfulness of oil pipeline rates and practices and to prescribe changes upon complaint or upon its own motion.

But there are limits on commission authority under the Interstate Commerce Act. The Interstate Commerce Act does not confer jurisdiction to FERC over the siting and construction of oil pipelines. That is a matter reserved for the States.

The Interstate Commerce Act also does not give FERC authority over oil pipeline mergers and acquisitions, over abandonment of service, or over oil pipeline safety. Safety is entrusted to the Department of Transportation, the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration.

Now let us take a look at the problem we are dealing with today, that we are addressing today. If you look at the nature of the problem, I think it is fair to put it that the simple problem is that current North Dakota oil production and Canadian imports exceed the current transportation capacity of pipelines in the region. And the question is what do we do about that?

I think the problem results in part from the very dramatic growth in crude oil production in the Williston Basin area of North Dakota, and that has increased North Dakota oil producers' need for available oil pipeline capacity to move their crude oil to market. Existing pipelines serving the area are operating at full capacity, requiring that they prorate their capacity among shippers. Actually, prorationing has been the order of the day in North Dakota since 2005. So prorationing is actually not a new circumstance.

Now at the same time as North Dakota oil production is increasing, crude oil imports from Canada are rising. Canadian imports currently comprise about 20 percent of U.S. supply, and Canadian imports are a reliable source of oil for the United States and I think do improve this country's energy security, a point that the chairman made in his opening remarks.

But Canadian imports do require space in the pipeline, and they create bottlenecks in pipeline capacity that limit the amount of crude oil that can be moved out of the North Dakota production region. Pipelines serving North Dakota are increasing their capacity, which should help to alleviate capacity shortages. Nevertheless, it is likely that with additional growth in North Dakota crude oil production and Canadian imports, the pipelines' proposed capacity increases still will not be adequate to transport North Dakota production without capacity prorationing among shippers seeking that capacity.

Now FERC recognizes the need for investment in energy infrastructure to meet the Nation's growing demand for energy and encourages capacity expansion. The commission, in fact, has approved several proposals to expand the Enbridge pipeline's North Dakota

mainline to provide additional takeaway capacity for the North Dakota production area and other Enbridge Energy Company proposals to expand major pipelines importing Canadian crude oil to help relieve pipeline capacity bottlenecks.

But the commission's regulatory authority begins at the border and extends only to transportation that takes place within the United States, regardless of the source of the oil being transported. The commission, thus, does not have a role in regulating foreign sources of crude oil entering the United States, but only its movement once it crosses the border. And the commission does not regulate how much crude oil is coming into the United States from Canada.

Now, as I indicated, the nature of the problem that we are discussing is that current North Dakota oil production, combined with Canadian oil imports, exceed the existing takeaway capacity for pipelines in the region, and that both North Dakota production and Canadian imports are expected to rise, and that even the announced additions in takeaway capacity would probably not suffice to meet those growing needs.

Domestic and Canadian crude oil production, if you look at then the nature of the problem, then what is the nature of the solution? I think the solution is obvious, and I think the correct solution is to increase the pipeline capacity available to both sources; both North Dakota oil production as well as Canadian imports. And the commission certainly favors infrastructure development, and that was recognized in the recent report by the Interstate Oil and Gas Compact Commission.

And I just want to say that to solve the problem—I just want to end with an injunction that to solve the problem, I think it is up to the parties themselves to resolve who will commit to support the development of new pipeline infrastructure and who is willing to pay for that infrastructure? And I think the commission, for its part, will continue to work with all parties to achieve that end.

PREPARED STATEMENT

The Commission has been an infrastructure agency since 1920. So we do like to see infrastructure expanded. We have taken creative approaches to approve surcharges for oil pipeline expansion proposals. So we are willing to take a creative approach, but I think there is a need for both shippers and pipelines to make commitments to support expansion projects.

With that, Mr. Chairman, Congressman, I want to thank you for the invitation to participate in the hearing.

[The statement follows:]

PREPARED STATEMENT OF HON. JOSEPH T. KELLIHER

Mr. Chairman and members of the subcommittee, thank you for this opportunity to appear before your subcommittee to discuss Energy Supply and Constraints in Western North Dakota. My testimony today will include a description of the Nation's oil pipeline network, a brief history of oil pipeline regulation, a description of the Federal Energy Regulatory Commission's (FERC) authority under the Interstate Commerce Act to regulate the transportation of oil and oil products by pipelines and the jurisdictional limitations of the act on that authority, a description of current oil pipeline rate regulation, and comments on North Dakota crude oil transportation.

## OIL PIPELINES IN THE UNITED STATES

The Nation's oil pipeline network consists of approximately 200,000 miles of pipelines performing a variety of roles. Crude petroleum systems transport crude oil and synthetic oil from production areas and marine terminals to refineries. The refiners produce a variety of petroleum products, principally gasoline, heating oil, and jet fuel, but also liquefied petroleum gases (e.g., butane and propane), kerosene, heavier distillates, naphthas, and asphalt. A system of pipelines separate from crude oil lines transport refined petroleum products from refineries or import terminals to distribution points. Both crude oil and petroleum product transportation is measured in barrels (bbls.). A barrel equals 42 U.S. gallons.

## A BRIEF HISTORY OF OIL PIPELINE REGULATION

The Interstate Commerce Act (ICA) gives the Commission the authority to regulate the transportation rates and practices of oil pipelines. The Hepburn Act of 1906 began the regulation of interstate oil pipelines, making pipelines common carriers subject to regulation. The act was an amendment to the existing Interstate Commerce Act that from its enactment in 1887 had focused primarily on railroad and telegraph company regulation. The responsibility for regulating oil pipeline rates was vested in the Interstate Commerce Commission (ICC) and remained with the ICC until 1977, when the Department of Energy Organization Act was enacted. That act transferred jurisdiction over oil pipeline regulation from the ICC to the new Department of Energy and the Federal Power Commission, predecessor to FERC.

Regulation of oil pipelines is governed by the version of the ICA as it stood on October 1, 1977, the day of enactment of the Department of Energy Organization Act. That version can be found only as an appendix to the 1988 edition of title 49 of the United States Code (cited as 49 App. U.S.C. § 1, et seq. (1988)). The 1977 version of the ICA also has been reproduced and made available on the FERC Web site.

## REQUIREMENTS, AND LIMITATIONS, OF THE ICA

The ICA applies to the transportation of oil and oil products, i.e., crude oil and petroleum products, from one State to any other State, from any place in the United States to a foreign country, and from a foreign country to any place in the United States (but only insofar as such transportation takes place within the United States). Because oil pipelines are common carriers, the ICA requires that they provide transportation upon reasonable request. This means, for example, that an oil pipeline operating at full capacity must prorate that capacity among current shippers to make capacity available for a new shipper requesting transportation service from the pipeline. In prorationing, the Commission cannot legally give preferential treatment to domestic oil producers over foreign sources.

The ICA requires that all charges for oil pipeline transportation must be just and reasonable. Oil pipelines must file tariffs showing all their rates and charges and can make changes to those rates and charges only after 30 days' notice to the Commission and the public. On its own motion or in response to a protest, the Commission can suspend tariff filings for up to 7 months and institute investigations into their lawfulness; at the end of the suspension period, the proposed tariffs can go into effect subject to refund. The Commission can also investigate the lawfulness of oil pipeline rates and practices and prescribe changes upon complaint or its own initiative.

Some matters the ICA does not confer jurisdiction over are the siting and construction of oil pipelines (authority rests with States and local jurisdictions), mergers and acquisitions, abandonment of service, and safety (authority rests with the Department of Transportation's Pipeline and Hazardous Materials Safety Administration).

## RATEMAKING UNDER THE ICA

The Commission until 1992 historically used two ratemaking methodologies for the adjudication of oil pipeline rates—cost-based and market-based. The Commission's cost-based ratemaking methodology for oil pipelines employs a "trended original cost" rate base and was instituted in Opinion No. 154–B, Williams Pipe Line Co., 31 FERC (61,377 (1985). In brief, a pipeline's annual revenue requirement is calculated using a rate base that is trended to account for inflation.

As an alternative to the cost-based ratemaking approach, the Commission adopted a market-based approach for Buckeye Pipe Line Company in Opinion No. 360, Buckeye Pipe Line Company, L.P., 53 FERC (61,473 (1990). Buckeye implemented a

lighter-handed regulatory approach that permitted rates charged by the pipeline in competitive markets to be determined by market forces.

In title XVIII of the Energy Policy Act of 1992 (EPAct 1992), Congress directed the Commission to establish a "simplified and generally applicable ratemaking methodology for oil pipelines." Congress in EPAct 1992 also protected oil pipelines' existing rates by deeming them "to be just and reasonable" as of the date of enactment.

There was no legislative history to discern how Congress intended the Commission to simplify its ratemaking methods, and the text of EPAct 1992 itself provided little guidance. In response, the Commission instituted rulemakings that culminated in Order No. 561, which adopted rate methodologies for oil pipeline rate changes, Order No. 571, which established filing requirements for cost information that pipelines must include with cost-of-service rate filings, and Order No. 572, which established filing requirements for pipelines proposing to charge market-based rates. These ratemaking methodologies became effective on January 1, 1995, and were affirmed by the U.S. Court of Appeals for the D.C. Circuit in 1996, *Association of Oil Pipe Lines* v. *FERC,* 83 F.3d 1424 (D.C. Cir 1996).

The regulations adopted in response to EPAct 1992 provide an indexing, or a price cap, methodology as the simplified and generally applicable ratemaking methodology for oil pipelines. The existing rates deemed to be just and reasonable by Congress in EPAct 1992 form a baseline for future oil pipeline rate changes within an indexed ceiling. The index used under the Commission's regulations is the annual change in the Producer Price Index for Finished Goods (PPI–FG), including an annual adjustment factor, currently plus 1.3 percent. Under indexing, oil pipeline rates may be adjusted up to the ceiling level established by the index. Rates changed under the index methodology may not exceed the ceiling level. If the ceiling level goes down, pipelines must lower existing rates that exceed the new ceiling level. The regulations also provide for challenges to individual rates on the basis that they are substantially in excess of the pipeline's costs, even though the rate may be at or below the ceiling level.

A pipeline can seek to charge rates above its index ceiling level by showing that its cost of service substantially exceeds the revenue resulting from application of the index, or by negotiating an agreement with all its current shippers to charge higher rates. A pipeline that desires to charge market-based rates may do so after it has asked for and received from the Commission a finding that it lacks significant market power in the markets it serves.

Other provisions of the Commission's regulations also provide procedures to resolve contentious issues short of full-blown litigation. All protested tariff filings are referred to a settlement judge, and disputed rates are set for hearing only after settlement proves infeasible.

NORTH DAKOTA CRUDE OIL TRANSPORTATION

There has been dramatic growth in crude oil production in the Williston Basin area of North Dakota that has increased the North Dakota oil producers' need for available oil pipeline capacity to move their crude oil to market. In 2007, North Dakota crude oil production was approximately 125,000 barrels per day. In March 2008, daily production levels had risen by 22,000 barrels to approximately 147,000 bpd, or an increase of approximately 17.5 percent on an annual basis. Existing pipelines serving the area are operating at full capacity, requiring that they apportion their capacity among shippers.

At the same time, crude oil imports from Canada are rising. Annual crude oil production levels for 2007 published by the Alberta Resources Conservation Board reveal the Alberta Basin yielded about 482,000,000 barrels that year or 1,860,000 bpd, a 3 percent increase from 2006. Significantly, Canadian imports are projected to reach 3,400,000 bpd by 2017. Canadian oil imports currently comprise 20 percent of U.S. crude oil supply and represent our largest source of oil imports. We expect this trend to continue. These imports are reliable supplies from a secure country and improve our energy security.

However, Canadian imports require space in the pipeline and can create bottlenecks in pipeline capacity that limit the amount of crude oil that can be moved out of the North Dakota production region. Pipelines serving North Dakota are increasing their capacity, which should help to alleviate capacity shortages; nevertheless, it is likely that with additional growth in North Dakota crude oil production and Canadian imports the pipelines' proposed capacity increases still will not be adequate to transport North Dakota production without capacity prorationing among shippers seeking that capacity.

While the Natural Gas Act authorizes the Commission to issue certificates of public convenience and necessity to natural gas companies to construct and operate pipelines for the transportation of natural gas in interstate commerce, there is no similar authority with regard to oil pipelines. For natural gas pipelines, the Commission serves as the lead agency in charge of processing applications to construct interstate natural gas pipeline facilities, conduct the necessary environmental review pursuant to the National Environmental Policy Act, and coordinate the timing of other necessary Federal permits. The Natural Gas Act allows the Commission to attach reasonable conditions to its decisions or "certificates." Further, Commission authorizations convey the right of eminent domain to the recipients of the certificate which may be exercised in the U.S. District Court for the district where the facility will be located or in State courts. In the instances where there is an application for a new pipeline or where a new service on an existing system is being proposed (most likely due to facility additions), the Commission has the authority to approve initial rates for the new service. It should also be noted that interstate natural gas pipelines are contract carriers, i.e., their services are provided on a contractual basis. Thus, if a pipeline is already fully used, a new shipper is not entitled to a prorationed share of the capacity.

The siting of oil pipelines by contrast is handled primarily by State agencies. The Interstate Commerce Act, thus, does not authorize the Commission to regulate the siting or construction of oil pipelines.

The Commission recognizes the need for investment in energy transportation infrastructure to meet the Nation's growing demand for energy and encourages new and expansion crude oil pipeline projects. The Commission, in fact, has approved several settlement proposals involving rates for expansion of Enbridge Pipeline's North Dakota mainline to provide additional crude oil takeaway capacity for the North Dakota production area, and rates for other Enbridge Energy Company proposals to expand the major pipelines importing Canadian crude oil to help relieve pipeline capacity bottlenecks. However, there is no ICA or other statutory provision that allows the Commission to regulate how much foreign oil can displace domestic oil in oil pipelines, since oil pipelines under the ICA are common carriers that must provide nondiscriminatory service to all who request it.

The Commission's regulatory authority also begins only at the border and extends only to transportation that takes place within the United States, regardless of the source of the oil being transported. The Commission thus does not have a role in regulating foreign sources of crude oil entering the United States, but only its movement once it crosses the border. The Commission also does not regulate how much crude oil is coming into the United States from Canada.

CONCLUSION

The nature of the problem is that North Dakota oil production and Canadian crude oil imports exceed current pipeline takeaway capacity in the region. Both domestic and Canadian crude oil production are increasing, exacerbating the competition for limited pipeline capacity. There have been additions to pipeline takeaway capacity in the region, but not enough to eliminate constraints or accommodate future increases in North Dakota production or Canadian imports.

The best solution is to increase the pipeline capacity available to both sources of crude oil. FERC supports energy infrastructure development and the Commission has participated as a member of the Interstate Oil and Gas Compact Commission Crude Oil Market Infrastructure Task Force that was first convened in 2006 to investigate the crude oil market dynamics in the Rocky Mountain region. However, the parties themselves must resolve who will commit to support the development of new infrastructure and who is willing to pay for it. FERC for its part will continue to work with all parties to achieve these ends.

Senator DORGAN. Mr. Chairman, thank you for being here. As I indicated, it is at least your second trip to North Dakota, perhaps more. But we appreciate your willingness to come and testify. You do not have siting authority, but you do have tariff authority. Is that correct?

Mr. KELLIHER. We can set rates for oil pipelines. We don't site oil pipelines. In contrast to natural gas pipelines, where we both site natural gas pipelines, we can authorize eminent domain, and we do as well set rates for gas pipelines.

Senator DORGAN. All right. Next we will hear from Mr. Lynn Helms. He served as the director of the North Dakota Industrial Commission Oil and Gas Division since July 1998 and director of the department of mineral resources since July 2005.

Mr. Helms, thank you. And with you today is Mr. Justin Kringstad, the director of the North Dakota Pipeline Authority, and fairly new on the job, I believe. Mr. Kringstad, there you are. Mr. Kringstad is new on the job. Is that correct?

Mr. HELMS. Yes, sir. He has been with us about 1 month.

Senator DORGAN. All right. Mr. Helms, you may proceed.

**STATEMENT OF LYNN D. HELMS, DIRECTOR, NORTH DAKOTA INDUSTRIAL COMMISSION, DEPARTMENT OF MINERAL RESOURCES**

**ACCOMPANIED BY JUSTIN KRINGSTAD, DIRECTOR, NORTH DAKOTA PIPELINE AUTHORITY**

Mr. HELMS. Well, Senator, thank you very much for the invitation to speak at this hearing, and thank you for your interest in these very valuable resources that the State of North Dakota participates in.

I don't really have to tell you about the size of North Dakota's Bakken resource. I do thank you for your efforts with the U.S. Geological Survey to get them on the ball and evaluating that. And you know, as you stated, that they have identified this as the largest continuous oil accumulation they have ever assessed.

When we did our assessment, we initially came out with a mean value of about 150 billion barrels in place. Now seeing that the Three Forks, which is an underlying formation, is involved as well, that could be as much as 280 billion barrels from which we are only going to recover 2 to 4 billion barrels, and I say that with a smile on my face. "Only" means a 1.5 to 3 percent recovery factor. So, as technology improves, we are certainly going to be in the business of producing Bakken oil for a long time.

Development of this resource to achieve these production levels to move North Dakota to number five in daily production, the State has been working with private investors to increase pipeline capacity, natural gas processing, electric generation, transmission, and refining. We also need to train and to put to work another 12,000 new workers in our energy sector. And that is wonderful to be in this building where exactly that thing is happening, training new workers for North Dakota's energy sector.

If you look at the response of the State of North Dakota, we have leased 106,000 acres in the last year through the State land department. Our current rig count is at 86 rigs. We are producing in excess of 165,000 barrels a day. We did form the Pipeline Authority a little over a year ago, and you have introduced Justin Kringstad. Thank you for that.

The Pipeline Authority and Department of Mineral Resources maintain Web sites where we provide data to the public on a daily basis. Those are updated every day. We also publish quarterly and semi-annual newsletters to try to keep the public informed about what is happening.

With regards to pipeline capacity, you are going to hear from Enbridge. They have expanded, done one expansion on their North

Dakota pipeline system. They are in the process of implementing Phase VI, which will double their pipeline system.

We have worked with the other pipeline company, the Belle Fourche Pipeline Company, who have expanded and redirected some of their oil to provide another market outlet for our Bowman County crude, which was suffering the highest differential. They are also introducing drag reducing agent between here and Guernsey, Wyoming. We hope to achieve about a 10,000 barrel a day increase to the south, which will improve that capacity limit to some extent.

Non-pipeline, we currently have three rail shipping stations, shipping close to 17,000 barrels a day. We are planning some additional shipping stations in Stanley and Minot, and we are working with the tribe on the possibility of one in New Town, trying to work through the Bank of North Dakota and department of mineral resources.

As far as gas gathering, we have built four new gas plants and expanded three systems. We are also going to expand this year four gas plants at Robinson Lake, Stanley, Tioga, and Trotters.

In the refining area, we have helped fund a study by Northwest Refining for a Williston area refinery. We have tried to assist the Three Affiliated Tribes in permitting their refinery, and we have been working with Triad, who is their contractor there. Worked with American Lignite on exploring coal to liquids and also have implemented a sales tax incentive to help our Mandan refinery upgrade and maintain its capacity.

As a result, we have seen record low levels in terms of crude oil price differentials over the last year. As your chart shows, though, we are heading into a time period where those low levels are going to go away, and we are going to see a return of price differentials.

One of the difficulties, I read a——

Senator DORGAN. Can I just—on that point, price differentials means discounting the price to the producer, right?

Mr. HELMS. Yes. That is a very good question, Senator. That is exactly right. The discount ends up going back to the producer, the royalty owners, and the State of North Dakota because we all get our share at the wellhead, where that oil is first sold, that first transaction. And so, that impacts all three parties.

One of the challenges is that under the current scenarios with expanding refinery capacity on the gulf coast and also small expansions in demand, around the year 2020, if our biofuels production does what we would like to have it do, we are actually going to have a small surplus in refining capacity in this country. Not in this region, but in this country. And so, the private investors are struggling to make sense of all that and decide where they should invest.

There is a role for the Federal Government. We would love to see the Federal Government provide tax-exempt status for our Pipeline Authority and Transmission Authority bonds. We really think that we could provide some good financing for our small, independent producers and co-ops to build oil pipelines, gas pipelines, maybe even diesel topping units if we had tax-exempt status for that bonding authority.

Chairman Kelliher talked about permitting. It would be great if we could streamline and expedite some of the permitting and tariff processes for interstate pipelines. The gas pipeline system seems to be working pretty well, and maybe we could take some lessons from that and apply them to the oil pipeline system.

PREPARED STATEMENT

And then, finally, the refining permitting process is just too long and too difficult. And we need to ensure that adequate resources are provided for those permitting authorities. We need to shorten those review timeframes and empower the Department of Energy to be a facilitator, to step in in the middle of these things and facilitate as the FERC does with pipelines.

That is the end of my prepared testimony. Thank you again for inviting me, and I will be available for questions.

[The statement follows:]

PREPARED STATEMENT OF LYNN D. HELMS

NORTH DAKOTA'S BAKKEN RESOURCE

The Bakken Formation is an unconventional oil and gas resource that underlies most of the western portion of the State of North Dakota (> 8.4 million acres).

The original oil in place in the Bakken Formation within the thermally mature portion of the State of North Dakota is estimated to be 149 to 280 billion barrels; however, using current drilling and completion practices, only 2.1 to 4.3 billion barrels are recoverable.

It is apparent that technology and the price of oil will dictate what is potentially recoverable from this formation.

NORTH DAKOTA'S BAKKEN OPPORTUNITY

Full resource development could move North Dakota from number 8 to number 5 among States in daily production. To achieve those production levels, the State is working to increase pipeline capacity, natural gas processing, electric generation, transmission, and refining capacity. The State is also working to recruit and train the roughly 12,000 new workers that will be required for the energy sector.

NORTH DAKOTA'S RESPONSE

Current leasing (106,000 acres), drilling (86 rigs), and production (>165,000 barrels per day).

Formed the Pipeline Authority in 2007.

Signed historic tax and regulatory agreements with Three Affiliated Tribes.

Department of Mineral Resources and Pipeline Authority update their Web sites daily and publish semi-annual and quarterly newsletters.

Efforts supported by the State to increase pipeline export capacity include:

—In 2006, Enbridge implemented their Phase V expansion to increase their crude oil capacity from 80,000 to current 110,000 bpd.

—Enbridge is now implementing Phase VI, a $130 million expansion that will increase capacity by an additional 50,000 bpd for a total of 160,000 bpd. After completion of Phase VI Enbridge will have doubled their pre-Phase V crude carrying capacity of about 80,000 bpd.

—Belle Fourche Pipeline reconfigured their pipeline system serving western North Dakota to reverse traditional north to south flow on one of its pipelines and construct a 35-mile loop into the Alexander area. This created additional outlets for southwestern North Dakota-produced crude oil to go east or west to markets.

—Butte pipeline (current 92,000 bpd) is implementing a drag reducing agent project on their pipeline to Guernsey, WY that is expected to increase throughput as much as 10 percent, roughly 10,000 bpd.

Current efforts supported by the State to increase non-pipeline export capacity:

—Rail cars are now shipping 11,000 to 17,000 bpd from Dore, Stampede, and Ryder.

—Additional rail shipping stations are planned for Stanley and Minot.

—A rail shipping station is being evaluated for New Town.

Gas gathering and processing expansion efforts supported by the State include:

—Four new gas plants (Ray, Nesson, Robinson Lake, and Stanley).

—Expansion of three gathering systems to collect previously flared gas.

—Proposed expansion of plants and gathering systems at Robinson Lake, Stanley, Tioga, and Trotters.

Current efforts supported by the State already underway to increase refinery capacity and fuel production include:

—Oil and Gas Research Council funding for feasibility study of a private refinery in the Williston area due out in September.

—Assisting Three Affiliated Tribes in working on permitting a refinery within the Reservation.

—American Lignite Energy is exploring a coal-to-liquids plant that would produce over 1.38 million gallons of liquid fuel per day. The ALE project is enrolled in Lignite Vision 21 program.

—State sales tax incentives to help Tesoro improve reliability and increase low sulfur diesel fuel production (current input capacity 58,000 bpd). Tesoro is investing $125 million in upgrades to their refinery including expansion of low sulfur diesel production.

FEDERAL ROLE

Provide Federal tax exempt status for Pipeline Authority and Transmission Authority bonds.

Streamline and expedite the permitting and tariff process for interstate pipelines.

The refinery permitting process of 4 to 6 years and is too long and difficult. We need to ensure adequate resources at permitting authorities to shorten review timeframes, and empower the U.S. Department of Energy to serve as a facilitator for timely permit reviews.

Senator DORGAN. Mr. Helms, thank you very much for your testimony.

Next we will hear from Ms. Shirley Meyer, who is a State legislator and is co-chair of the North Dakota Oil Refinery Task Force. Ms. Meyer, why don't you proceed?

**STATEMENT OF HON. SHIRLEY MEYER, NORTH DAKOTA STATE REPRESENTATIVE AND CO-CHAIR, NORTH DAKOTA OIL REFINERY TASK FORCE**

Ms. MEYER. Thank you, Senator Dorgan. I would like to thank you personally for allowing me to testify here today.

As you stated, I am currently the co-chairman, along with Representative Kenton Onstad from Parshall, of the North Dakota Oil Refinery Task Force. The main purpose of this task force was to add economic value to North Dakota crude oil by refining it in North Dakota.

As you have probably noticed in the news, all of the new millionaires, they have become my new constituents. I represent Dunn County. And with that, I am approached on a daily basis by these new millionaires and also oil companies that indicate to me why are we receiving discounts for our oil?

And as you are aware, the price of North Dakota crude is based usually 10 percent less than the NYMEX price of West Texas Intermediate. But in addition to that 10 percent discount, which is basically for transportation, we have had additional months of discounts as high as $11.43 a barrel, and that equates to a tax revenue loss to the State of North Dakota of over $3 million just for that month. The estimated impact on State revenues of a $1 increase or decrease in the price of a barrel of oil is approximately $8.75 million per biennium.

Our production rate is continuing to grow. As was indicated previously, we are over 166,000 barrels per day. That is June, we are all waiting for July records, and I am assuming it is going to be quite a little higher than that yet.

But at this rate of production, any discounts whatsoever amounts to huge losses of revenue to the producers, the royalty owners, and the State. The State of North Dakota is a huge royalty owner. As legislators, we are approached daily with the problems associated with the bottleneck and subsequent discounts of our crude oil.

The producers out there are very concerned when the Bakken crude is discounted because of the high quality premium crude that that is, and it should be bringing a bonus to our citizens instead of being discounted. We are told the pipelines are full. The trucks are full. The trains are full. And we are going to have to shut down production of our wells.

Building a refinery seemed like the obvious solution, and we have had significant community support that continues to grow. North Dakota, because of our sparse population and large agrarian population, burns tremendous amounts of fuel. According to the 2004 statistics at the U.S. Energy Information Administration, North Dakota was the fourth-highest energy-consuming State on a per capita basis.

In late 2007, there were significant price hikes and shortages due to multiple regional refineries being down at the same time. This created huge problems for our fall harvest in North Dakota, and this happened again in December with the shortage of number one diesel with the first cold snap. Our truckers up from Texas learned in a big hurry what it meant to have number two diesel in your trucks when you were coming up to North Dakota. They were sitting on the highway wishing they had learned this lesson a little quicker.

With every hiccup in our current energy supply—whether it is a hurricane, pipeline explosion, refinery shutdown—our prices take huge spikes. North Dakota is last on the refined pipeline. So, subsequently, we will be the first State to suffer from price hikes and short supplies of fuel.

With our vast supplies of oil and gas reserves and increasing population, this is not an acceptable situation for our citizens. The question posed to us most often is, why are we paying the highest gas and diesel prices in the Nation when we are producing record amounts of crude right here in western North Dakota?

The two new refineries that are being proposed in the United States, Arizona and South Dakota, will process Mexican and Canadian crude. This will not ease the demand for refining capacity for our domestic production. There are currently 149 refineries in the United States. Four are inactive at this time for repairs or maintenance.

Since most refineries are operating at about 90 percent capacity, any disruption at a refinery causes a spike in prices. When we have most of the refineries in the Nation operating at or near capacity with these new fields coming on—such as the Sanish, as Mr. Helms mentioned, the Three Forks—as they are developed, we will find that our pipeline and refining capacity is stretched even farther.

Our task force over the course of the year has developed four objectives. Our first objective was to educate policymakers for the implementation of legislative policies that will advance the construction of a state-of-the-art refinery in North Dakota. As policymakers, we need to develop and expedite permit and siting rules for development and decide if the new refinery should have public ownership, private ownership, or a combination of both.

Our second objective is to articulate to the citizens of North Dakota the need to further develop our infrastructure to strengthen our energy security, making us less dependent on foreign sources of oil. A refinery and adequate pipeline capacity will ensure more equitable pricing of North Dakota crude oil. In addition, we need to reassure citizens that they are receiving full benefits from our oil reserves.

Our third objective was to ensure any future developments and decisions for increasing refining capacity was economically sound, environmentally friendly, and provide plans for a North Dakota Strategic Oil Reserve. In order to guarantee our agriculture producers have a continuous supply of diesel fuel, especially during spring planting and fall harvesting, our task force has determined we need to utilize the storage facilities on virtually every farm and ranch.

Our fourth objective is to create an energy center to develop technical and educational support for the oil, gas, and refining industries. Because no new refineries have been built in the United States for over 30 years, refinery expertise and knowledge of this industry is negligible.

To reach these objectives, we have discussed several options, including a State ownership of a refinery, a State/private partnership, or State participation in the permitting and siting processes. Even as we have discussed these issues, the amount of crude being processed in North Dakota continues to grow, far beyond what anyone envisioned a year ago.

PREPARED STATEMENT

We must have the foresight to be proactive on energy. We cannot look at where we are sitting now. The great hockey player Wayne Gretzky, when asked what made him such a great hockey player, he replied, "I don't skate to where the puck is. I skate to where the puck is going to be." And we believe that that is what North Dakota and the Nation must do when we are considering our oil industry.

Thank you for allowing me to testify.

[The statement follows:]

PREPARED STATEMENT OF HON. SHIRLEY MEYER

I would like to thank Senator Byron Dorgan for giving me the opportunity to testify before the Subcommittee on Energy and Water Development on energy supply and constraints in Western North Dakota.

Currently, Representative Kenton Onstad and I serve as co-chairman of the North Dakota Oil Refinery Task Force. After trying unsuccessfully to pass a study resolution in the 2007 session to look at the feasibility of building a North Dakota oil refinery, we decided that the idea had enough merit to form a task force.

The main purpose of this task force was to add economic value to North Dakota crude oil by refining it in North Dakota. Oil producers and royalty owners had approached us concerned with the discounts they had been receiving and continue to

receive. Because of transportation cost, generally, the price of North Dakota crude oil averages approximately 90 percent of the NYMEX price of West Texas Intermediate (WTI) crude oil. In addition to that 10 percent discount we had months with additional discounts as high as $11.43 per barrel which equates to a loss of tax revenue to the State of $3,030,336.94 for just that 1 month.

Our production rate continues to set new records and increased in June to over 166,000 barrels per day. At this rate of production any discounts whatsoever amounts to huge losses of revenue to the producers, the royalty owners, and the State. As legislators we are approached on a weekly basis and asked to come up with answers on dealing with the problems associated with the bottleneck and subsequent discounts of our crude oil; especially the Bakken crude that is a premium crude and should be bringing a bonus instead of being discounted. We are told, "The pipelines are full, the trucks are full, the trains are full, and we are going to have to shut down production of our wells."

Building a refinery seemed like the obvious solution and we have significant community support that continues to grow. North Dakota, because of our sparse population and large agrarian population, burn tremendous amounts of fuel. According to 2004 statistics at the U.S. Energy Information Administration, North Dakota was the fourth highest energy consuming State on a per capita basis. In late 2007, there were significant price hikes and shortages due to multiple regional refineries being down at the same time creating problems for our fall harvest, and again in December with a shortage of number one diesel with the first cold snap.

With every hiccup in our current energy supply, albeit it hurricane, pipeline explosion, refinery shut down, saber rattling, or actual war, our prices take huge spikes. North Dakota is last on the pipeline so subsequently we will be the first State to suffer from price hikes and short supplies of fuel. With our vast supplies of oil and gas reserves and increasing production this is not an acceptable situation for our citizens. The question posed to us most often is "Why are we paying the highest gas and diesel prices in the Nation when we are producing record amounts of crude right here in western North Dakota?"

North Dakota has seen a steady increase in production from 30 million barrels in 2003, to 45 million barrels in 2007. Current production growth will put us well over 50 million barrels in 2008.

The two new refineries being proposed in the United States (Arizona and South Dakota) will process Mexican and Canadian Crude. This will not ease the demand for refining capacity for our domestic production. There are currently 149 refineries in the United States. Four are inactive at this time for repairs or maintenance. Since most refineries are operating at about 90 percent capacity, any disruption at a refinery causes a spike in prices. With most refineries in the Nation operating at, or near capacity, as the Bakken, Sanish, and Three Forks fields are developed; we will find our pipeline and refining capacity stretched even farther.

Because of our limited refining capacity in the United States, besides importing crude oil, we import 66,000,000 gallons of gasoline per day to meet our daily needs above our refining capacity (2004 figures).

Our task force over the course of the year has developed four objectives. Our first objective was to educate policy makers for the implementation of State Legislative Policies that will advance the construction of a state-of-the-art refinery in North Dakota.

As policy makers we need to develop and expedite permit and siting rules for development and decide if a new refinery should have private ownership, public ownership, or a combination of both.

Our second objective is to articulate to the citizens of North Dakota the need to further develop our infrastructure to strengthen our energy security making us less dependent on foreign sources of oil. A refinery and adequate pipeline capacity will ensure more equitable pricing of North Dakota crude oil. In addition, we need to reassure citizens they are receiving full benefits from our oil reserves.

Our third objective was to ensure any future developments and decisions for increasing refining capacity was economically sound, environmentally friendly, and provide plans for a North Dakota Strategic Oil Reserve. In order to guarantee our agriculture producers have a continuous supply of diesel fuel especially during spring planting and fall harvesting, our task force has determined we need to utilize the storage facilities on virtually every farm and ranch.

Our forth objective is to create an energy center to develop technical and educational support for the oil, gas, and refining industries. Because no new refineries have been built in the United States for over 30 years, refinery expertise and knowledge of this industry is negligible.

To reach these objectives, we have discussed several options, including State ownership of a refinery, a State/private partnership, or State participation in the permitting and siting process.

Even as we have discussed these issues, the amount of crude being produced in North Dakota continues to grow, far beyond what we envisioned a year ago. We must have the foresight to be proactive on energy. We cannot look at where we are now.

The great hockey player, Wayne Gretzky, when asked "what made him such a great hockey player", replied, "I don't skate to where the puck is, I skate to where the puck is going to be!"

That is what North Dakota, and the Nation, must do.

Senator DORGAN. Ms. Meyer, thank you very much for your testimony.

Next we will hear from Mr. Kevin Hatfield, the general manager for the gathering systems for both Enbridge Pipeline North Dakota and Enbridge Pipelines Saskatchewan. Enbridge is the operator of the major pipeline that brings North Dakota oil to Midwest refineries and to markets. They have been upgrading their capacity, and I look forward to hearing about their current projects and discussing future options.

Mr. Hatfield recently relocated his office to Minot, North Dakota, to directly oversee the Enbridge pipeline expansion efforts in North Dakota. These expansions, we are told, based on the record Bakken production and forecast, will result in increased pipeline capacity demanded by shippers.

Mr. Hatfield, thank you for being with us.

**STATEMENT OF KEVIN HATFIELD, GENERAL MANAGER, GATHERING SYSTEMS, ENBRIDGE ENERGY COMPANY, INC.**

Mr. HATFIELD. Thank you. Good morning, Mr. Chairman and Congressman Pomeroy, and thanks for the opportunity to share Enbridge's view on pipeline capacity issues in North Dakota, which, along with the Midwest pipeline infrastructure in general, are important components of the North American energy security picture.

Enbridge is a transporter of energy and has an interest in some 50,000 miles of gathering, transmission, and distribution pipelines. Enbridge does not produce or refine crude oil.

My comments will focus on the crude oil pipeline systems. We do have some maps that have been handed out and are on the back for reference, but I will focus on our crude oil pipeline systems, and primarily on the Enbridge North Dakota system, which I am responsible for.

By way of some background, the Enbridge system delivers approximately 1.9 million barrels per day of crude oil to the Midwest. Enbridge is in the process of undertaking a phased-in expansion approach in which it is adding 450,000 barrels per day, expandable to 1.2 million barrels per day capacity to our mainline system, including expansions from Alberta, Canada, to the hubs in Chicago and Cushing and on to the gulf coast of the United States.

On a more local front, the Enbridge North Dakota system delivers crude oil produced in eastern Montana and North Dakota to Clearbrook, Minnesota, and the Tesoro refinery in Mandan. The system has historically had an 80,000 barrel per day maximum capacity but, up until a few years ago, had been largely underutilized due to declining production in the area.

At the end of 2007, we completed the Phase V expansion, which increased our capacity to 110,000 barrels per day. Phase VI is underway and, when completed in 2010, will increase the capacity to 161,000 barrels per day or just over double what we were a few years ago.

The development of the Bakken—and this is no surprise. The development of the Bakken and the Williston Basin has given rise to a dramatic increase in our production levels for the area, and Enbridge has attempted to proactively step up to meet this increased transport capacity requirement. Our expansions have been driven by long-term trends in supply and demand patterns. Crude production from traditional U.S. States is forecast to continue to decline.

On the other hand, the demand forecast, which I am sure the chairman and Congressman are more than well aware of, in the United States shows a continued increase over the long term, even when consideration is given for conservation and additional fuel sources coming out of the market in the future.

Back to the production side, the Alberta oil sands are forecast to increase from 1 million barrels per day today to over 3 million barrels per day in the future. On the North Dakota front, once again, I don't have to reiterate what Mr. Helms and others have talked about, but we could reach as high as 3.65 of the technically producible volumes that are in the reserves at this point with regard to the Bakken. North Dakota has already seen its oil double from approximately 2003 to 160,000 barrels, and the reason we are here today is because we anticipate more to follow.

So there are definitely some bright spots on the horizon. The United States has access to energy supplies in our own backyard, but we need significant enhancement to pipeline infrastructure to connect regions of growing supply to key refinery markets that meet the public's demands for petroleum.

As I have just stated, there is a forecasted increase in supply from the Northern Rockies in Alberta, and Enbridge is a key player in connecting these sources with refineries. Enbridge overall has $12 billion in projects underway, with at least an equivalent amount of projects under review.

Enbridge North Dakota is spending over $220 million that is committed at this point in expansions up to and including Phase VI, with potential for more expansions in the future to meet the demand, including additional potential for utilizing railcars that access off the system near Minot, potential utilization for future spare capacity on what we call a "portal link," which is an interconnection that we could potentially reverse to the north to connect to the Enbridge Saskatchewan system to access pipeline space through the Enbridge mainline at Cromer, Manitoba. And ultimately, we are also reviewing the long-term support for the potential additional pipeline from Minot to Clearbrook, Minnesota.

Enbridge is committed to working with customers to deliver capacity that is right-sized, right-priced, and at the right time. It is not good enough for us to just ensure that the Enbridge North Dakota production has adequate capacity to reach the markets. Additionally, we must ensure that the Enbridge mainline facilities at Clearbrook, Minnesota, have takeaway capacity, such as through

our Alberta Clipper expansion currently pending Federal regulatory approvals.

That brings me to some of our challenges. In addition to the ever-increasing challenges posed by special interest groups and public opposition, as well as challenges faced by increasing costs and something that Mr. Helms referred to with regard to our workforce strategies and shortfalls, there are commercial challenges.

Our customers have varying business models and compete with each other on a day-to-day basis. This causes differing viewpoints with regard to the comment I made about right size, right price, and right time. Projects rarely move forward without critical mass being reached with regard to customer support.

Enbridge North Dakota is attempting to address this challenge through a new forecasting tool which has just been developed, which will enhance our predictive ability to expand the local infrastructure to meet the growing capacity demands produced by Bakken production as it comes onstream.

And finally, the regulatory challenges. I would start by saying that our North Dakota expansions have received permission to proceed from the North Dakota Public Service Commission and anticipated approval from the Minnesota Public Utilities Commission and go on to further state that Enbridge very much appreciates the transparent, streamlined regulatory proceedings of North Dakota that provided the timely approval for our project and, further, would urge other States to follow similar regulatory models.

However, Enbridge's Alberta Clipper expansion project, which is a 990-mile, 36-inch pipeline from Alberta to Wisconsin, with initial capacity of 450,000 barrels per day, is still undergoing a protracted State and Federal regulatory approvals process.

Just to take a brief look at that process, as an example, on the Alberta Clipper, the North Dakota Public Service Commission approval was received in approximately 6 months. The Minnesota Public Utilities Commission and, similarly, the Canadian National Energy Board approvals were in approximately 16 months. And currently, it is anticipated that the U.S. environmental impact statement and subsequent Federal permits will take approximately 24 months.

I would like just to take a second to thank Congressman Pomeroy for your assistance with regard to trying to assist Enbridge in speeding those permits along. So, thank you.

I will restate what I have said earlier. Enbridge's downstream expansions, like Alberta Clipper and others like it are required to ensure North Dakota production has takeaway capacity downstream of Clearbrook to reach the markets.

I have gone into more detail in written testimony, where I have highlighted other challenges. However, in light of keeping my verbal comments brief, I would just like to suggest that the public and the private sector need to work together to streamline the sometimes very lengthy and duplicative State and Federal review of major projects. If we want energy security, we need to ensure these projects are given approval and then delivered when required.

In closing, Enbridge and others are investing billions of dollars in North American energy infrastructure, helping the Nation to be

less dependent on crude oil from unstable or hostile nations. We will continue to work with our customers and stakeholders to address the challenges involved with ensuring the right project is built at the right time. We will continue to work with the industry and Government on a host of energy supply solutions and to hopefully streamline regulatory processes.

PREPARED STATEMENT

This is a complicated issue that we are facing. We believe we can see a path forward to a better energy secure future, and Enbridge would like to continue to help North America get to that point.

That concludes my testimony. I will be available for questions at the end. Thank you.

[The statement follows:]

PREPARED STATEMENT OF KEVIN HATFIELD

Mr. Chairman and members of the subcommittee, thank you for the opportunity to offer Enbridge's views on issues related to pipeline capacity in North Dakota and the Midwest and how such capacity is an important component to North American energy security.

Enbridge is a transporter of energy, and does not produce or refine crude oil. We also have a significant presence in natural gas processing, distribution, and transportation; provide petroleum liquids rail and trucking transport; and through our wind and fuel cell businesses are positioned to contribute to North America's alternative energy sector. However my comments today will focus on our crude oil, common carrier, interstate FERC-regulated pipelines with which I am most familiar. Since 1950, Enbridge has operated what is now the world's longest liquid petroleum pipeline, expanding to now comprise nearly 9,000 miles of pipe spanning over 3,000 miles from the Northwest Territories, through North Dakota, serving Great Lakes refinery markets and beyond. Enbridge acquired the Portal Pipeline system over a decade ago, which we now call the Enbridge North Dakota System. In 2007, Enbridge transported over 1.9 million barrels per day (bpd) of crude oil and natural gas liquids in the Upper Midwest. Our mainline system—the cross-border system connecting western Canada to the Midwest—transports over 10 percent of U.S. imported supply from Canada, America's largest and most secure trading partner.

In the last 2 years, we have phased-in a number of crude oil pipeline expansions, to ultimately add 1.2 million bpd of capacity to our mainline system; extended our reach from Alberta to the Cushing hub; announced plans to extend to gulf coast markets; and expanded our North Dakota system from 80,000 bpd capacity to current levels of 110,000. With the completion of Phase VI in 2010, we expect our North Dakota system to reach 161,000 bpd of capacity. The Enbridge system provides access for North Dakota producers to the majority of refineries in PADD II and as far as the gulf coast, home to over 40 percent of America's refinery capacity.

This subcommittee receives regular updates from the Energy Information Administration and is already well-aware of forecasts that show several key trends. First, the production in the Midcontinent areas of Kansas, Oklahoma and surrounding States continues to decline. Second, we are all too familiar with the disruptions in supply from unstable nations or disruptions caused by storms in the gulf coast. Conversely, production from Alberta's oil sands will increase from the current level of 1 million bpd on the market to grow to over 3 million bpd. Following Senator Dorgan's request, the USGS now estimates the reserves in the Bakken shale to exceed 4 billion barrels. So while Midcontinent production is falling, America can tap supplies in our own back yard to reduce our reliance on imports from overseas. Further, despite increased use of alternative fuels and improved conservation, petroleum demand continues to grow over the long term. Combined, these factors drive the need for major enhancements in our transportation infrastructure to connect regions of growing supply to refinery markets.

Together, this has prompted a number of projects to expand and extend the pipeline infrastructure. Enbridge alone has over $12 billion in approved projects, many of which are already under construction. And we have another wave of investment right behind this that proposes another $12 billion or more in investments. Enbridge recognizes the importance to producers of extending our gathering lines and expanding the capacity of our North Dakota transmission pipeline. Last year,

we added 30,000 bpd of capacity to our North Dakota System and are now investing another $150 million to phase in another 51,000 bpd of capacity by 2010. But it is not enough to just expand our North Dakota System which ends at Clearbrook, Minnesota—a hub that has no refineries. Through interconnections to other pipelines, North Dakota volumes can move to Minneapolis or through the Enbridge mainline system to Wisconsin, Chicago, and Cushing. We have announced projects to extend service to the east coast and, with a joint venture with BP, a network of existing and new lines to reach the gulf coast by 2012. Thus, the expansion of Enbridge's mainline system east of Clearbrook is imperative so Canadian production has transport options around the State and North Dakota producers have unconstrained access and flexibility to not only reach refineries along the Rockies, but serve most markets east of the Mississippi.

Turning attention back to North Dakota, Enbridge has received regulatory approvals for Phase V and is expecting FERC review of our Phase VI tariff rate filing. We received approval from the North Dakota Public Service Commission for Phase VI expansion. Indeed, Enbridge has appreciated the efficient regulatory process in North Dakota and the support we have received in undertaking pipeline expansions in the State.

Further expansion and debottlenecking of our North Dakota system is now under consideration should Bakken production continue to outpace capacity. We are considering all options, including rail links and up to the most expensive, longer term, solution of adding a second transmission line parallel to our existing line to northern Minnesota. Our discussions with shippers are aimed at developing the right-sized, right-priced, and right-timed expansion for take-away capacity into the future. We must keep in mind that as a common carrier, we are obliged to provide service to all without discrimination and must balance the transport needs with the long term support needed to recoup millions in investment.

However even with expansion of the North Dakota system, to get beyond northern Minnesota to tap refinery markets throughout the Midcontinent, Enbridge needs to complete expansions on our mainline system, specifically the Alberta Clipper project that will add initially 450,000 bpd of capacity over and above what can now move east of Clearbrook. This capacity is vital for North Dakota production to access refinery markets throughout the Midwest and beyond. Subject to the U.S. Federal regulatory approval of the Alberta Clipper project, that new 36-inch pipeline can also be easily expanded in the future to reach 800,000 bpd with added horsepower, so we are in good shape to step up to meet anticipated capacity needs in the short-to-medium term on our mainline system.

Opportunities are all too often coupled with challenges. So, while this is an unprecedented era of pipeline expansion opportunities, Enbridge also needs to call attention to some of the hurdles faced when trying to match the needs of the market in a very challenging regulatory regime and when we are so often faced with public skepticism of energy projects.

*Commercial Challenges.*—While it may seem that meeting our customer's needs should come easily, our customers—producers, marketers and refiners—sometimes compete, so designing a system expansion that can be agreed to by all interests can be challenging. That is why Enbridge has attempted to be proactive to plan solutions for tomorrow's needs. We are completing an enhanced forecasting model for the entire Williston Basin which, when complete, will further enhance our ability to predict pipeline capacity demand and gain consensus from all stakeholders to meet the region's energy transportation requirements. Enbridge is up to this challenge.

*Regulatory Challenges.*—While FERC has risen to the challenge of adapting policies to recognize the need for pipelines to recover the costs of investments, FERC's role does not extend (as it does for natural gas pipelines) to the siting, certification or lead Federal agency for environmental assessments for new interstate liquid pipelines. Rather, there is a plethora of Federal and State permitting requirements for liquid pipelines. The best way to illustrate this regime is to summarize the process for the two major projects that most affect North Dakota take-away capacity.

As a transmission system, our expansions in North Dakota have been subject to approvals by the Public Service Commission. Enbridge appreciates the transparent, streamlined regulatory proceedings of North Dakota and Minnesota. Actually we'd like to urge other States, such as Illinois, to follow a similar regulatory model. As I said before, the capacity of pipelines in distant States affect North Dakota producers who need to reach diverse refinery markets. Thus, Enbridge and others have worked, for instance, with the Interstate Oil and Gas Compact Commission (IOGCC) leadership to develop recommendations for effective, publicly transparent, and streamlined State regulatory regimes for approving pipeline routes, capacity, public need and State environmental assessments.

However, the Alberta Clipper expansion project on Enbridge's mainline, which is important to North Dakota producers' ultimate market access, is still undergoing more protracted State and Federal regulatory approvals. The project is a new 990 mile, 36-inch pipeline along our existing route from Alberta to Wisconsin, with its 450,000 bpd of capacity easily expandable to 800,000 bpd. The North Dakota PSC approved our application for the pipeline that crosses the Northeast corner of the State in a record 6 months and the Minnesota Public Utilities Commission is expected to approve a Certificate of Need, a Routing Certificate and complete the State's environmental assessment by October, about a 16 month process. The Canadian portion of the project, spanning three provinces, was approved by the National Energy Board in 16 months and construction began last week on the Canadian portion. The Federal approvals in the United States are still pending the completion of an Environmental Impact Statement led by the U.S. Department of State, who stepped up their role as lead agency following the Executive Order 13337 in 2004. While the initial goal was to have approvals to allow winter 2008/2009 construction in some wetlands, Enbridge is hopeful that the current target of March 2009 approvals of the final EIS is met. Thus the U.S. Federal approvals for the project will take just under 2 years, if the current schedule holds. It is vital that capacity east of Clearbrook, Minnesota be added through the completion of the Alberta Clipper project so North Dakota volumes landing at Clearbrook have unconstrained outlets to refinery markets throughout the Midwest.

*Public Scrutiny.*—Enbridge has built over a thousand miles of new pipeline in the last decade so we appreciate the value of getting public input early and often during a project to help identify and resolve many issues of concern. The public is often frustrated, however, by a confusing array of public meetings, formal regulatory intervention processes and means to offer their written comments. And sometimes the need to connect supply sources with refineries requires a route that a vocal minority of the affected public opposes. This is especially true when environmental interest groups organize or negotiations for the pipeline right-of-way result in an impasse and the pipeline company seeks to use the State's power of eminent domain. Of course, when crossing sovereign tribal lands, there is no process for resolving an impasse in securing the right-of-way. While the private sector is stepping up to the investments needed in energy infrastructure, it is wise to appreciate the challenge presented by trying to satisfy both energy market needs and the public affected by the project. Even a well-planned project with proactive, responsive public consultation can be stopped in its tracks by intense opposition.

*Project Costs and Financing.*—When planning and securing support for a major expansion, shippers need to know what transportation rates they are committing to fund the expansion. Staying true to project capital estimates is expected and is managed by experienced companies. However, as a multitude of projects in North American compete for materials and labor, we've seen costs rise significantly. For instance, in 2008 the price of pipe increased approximately 40 percent and the cost of other steel products, such as valves and pumps increased an average of 50 percent over the last 2 years. Labor costs and availability of experienced welders and construction workers is tight and Enbridge has seen increases in mainline contracting and labor go up by some 5–10 percent each year over last decade. In addition to competition for construction labor, many in the industry are facing the challenge of retaining our own energy-experienced technical and business professionals. We appreciate the continued attention to many of these issues by the Senate Energy Committee over the last year.

In conclusion, Enbridge has devoted significant efforts to try to match pipeline expansions to the needs of the market. We remain committed to working with shippers on future expansions as the promise of production from the Bakken formation is realized. Enbridge also has over $12 billion in projects underway, with double that on the drawing board, to expand our North American pipeline network so that growing volumes produced in both North Dakota and western Canada can reach a variety of refinery markets. The net effect of this infrastructure investment is less dependence on crude oil from unstable nations outside North America.

But these opportunities come with challenges. Pipelines need shippers to align on the right project at the right time. Regulatory processes that require parallel and sometimes multi-year efforts at the State and Federal level should be streamlined. Enbridge, and others in the private sector, need to rise to the challenge of increasing costs, public scrutiny, financing and the frequent intervention by environmental interest groups. It is Enbridge's view, however, that the public and private sector must work together to better streamline regulatory processes.

Energy security requires a host of solutions including alternatives and conservation. While we are still dependant on fossil fuels, U.S. energy security is enhanced with access to growing supplies from Bakken as well as from western Canadian Pro-

duction. Enbridge, and others in the pipeline sector, need to continue to work collaboratively with customers, regulators and elected officials to ensure projects can be completed with the right balance of input from the affected public and the need for swift approvals to meet the needs for secure supplies of energy.

Senator DORGAN. Mr. Hatfield, thank you very much. We appreciate your being here.

And finally, Mr. Harold Hamm is the chief executive officer and chairman of the board of Continental Resources. He also serves as chairman of the board of directors of Hiland Partners, a publicly traded gas gathering and processing company with operations in a number of States, including our State.

He also serves as director of Complete Production Services, a publicly traded oil and gas service company operating in States including North Dakota, served as chairman of the Oklahoma Independent Petroleum Association, president of the National Stripper Well Association, founder and chairman of Save Domestic Oil, and served on the board of Oklahoma Energy Explorers.

You are a busy man, Mr. Hamm. Thank you for being with us. You may proceed.

Mr. HAMM. I just try to stay hooked up.

Senator DORGAN. It sounds like you are pretty well hooked up to me.

**STATEMENT OF HAROLD G. HAMM, CHIEF EXECUTIVE OFFICER AND CHAIRMAN OF THE BOARD, CONTINENTAL RESOURCES, INC.**

Mr. HAMM. Thanks, Senator Dorgan and Congressman Pomeroy. I appreciate the invite and the opportunity to testify here today.

I also thank you for being involved in the request to the USGS. I think that did a whole lot to authenticate the Bakken as a major producing area and gave the pipelines and a lot of the other people, rig people that we need so desperately in the field the confidence to bring equipment into the area and start building the infrastructure out. So appreciate that very much.

Continental has been working up here in North Dakota a long time, and we have a long history. We started drilling the Red River units down there, one of the first fields drilled strictly with horizontal drilling. Currently, we drilled about 600 horizontal wells to date. So we have been doing this a long time.

We are the second-largest producer in the Rocky Mountain region, and as you can imagine, our problems with moving oil, we have been dealing with this a long time. We started over in Elm Coulee in the Bakken. And so, we have been dealing with this pipeline situation for several years now. So it hasn't just started.

I won't say much about the opportunity. We had a big belief in how big this was a long time before the USGS came out with it. Today, we own over 500,000 acres up here in the North Dakota Bakken, so we are the largest leaseholder up here. So it did authenticate what we were doing and a lot of other people.

I will just try to summarize briefly my comments and then talk a little bit about the pipeline challenges and other challenges that exist out there today. I think our industry growth is challenged because, first of all, the market is flooded somewhat by overhanging oil dumped into the Guernsey, Wyoming market by Express Pipeline that came down. Basically, that happened 2004, 2005.

And we all remember, particularly as producers, that differential that we talked about earlier, that came up as high as $34 a barrel, shut in a lot of North Dakota production, very harmful. We shut in our Red River units for over a month at that time so we could access pipelines out of the area.

So an effort to alleviate the situation by bringing more pipelines to the area recently has been delayed somewhat by SemGroup's bankruptcy. You know, they bring a pipeline to Platteville, which we expected to be hooked up to Plains pipeline in Cheyenne, which would alleviate some of the oil coming into that Guernsey market. We still expect that to happen, but it has been slowed down just a little bit. That would give us about 65,000 barrels of additional capacity out in front of the Guernsey market.

As Enbridge said, they have added a lot of capacity, and Continental stepped up to support that capacity every time they have asked by signing on the dotted line, committing barrels. And we will be there for the next expansion.

They have lagged the industry needs, and I don't think anybody could foretell exactly how big this thing was going to be in the beginning. And so, it is natural that that was lagged somewhat. But I think now, without a doubt, the biggest constraint on growth up here is pipelines. We have to get it to market. And so, we have to step up to do that.

So I appreciate Mr. Pomeroy's comments earlier. It is going to mean a whole lot to the State of North Dakota. We just did a rough, back of the napkin, if you will, as to what it might cost North Dakota if the differentials went to $25 or something. And we are hearing it out in the field right now from producers that they are saying that we need to shut it under and take about a $25 differential hickey right now.

So that could mean as much as—that back of the napkin figure was about $168 million a year. So perhaps some help with pipeline construction in like tax-free bonds or whatever it would take to step up big time and increase this capacity out of here I think is duly warranted.

You know, it is kind of ironic that this happens right now. We talk about the development of the North Dakota Bakken. This came about as basically from a geologist's perspective, and that is what I talk from. We were all taught that you look for conventional reservoirs and the ones with permeability, porosity, and everything which you could produce easily.

But the Bakken Shale is anything but that, and all the other shales that have been found across the United States today, we have basically had a virtual revolution that about 15 companies across the country—and I characterize those that are companies that embrace the horizontal technology, the high-pressure fracs, 9,000 to 12,000 pounds, multiple-stage fracs, the use of ceramic proppants—all of these are those companies, the technology that they have employed to bring about this revolution that has occurred, about 15 independents have been involved in this all across the United States.

Now think that this was too small for the majors to begin with. It just didn't look like it was going to work very well. But now we see the majors up here, particularly in North Dakota, getting in-

volved in it, and then that is good. They are picking it up. But this is just at a time that this evolution, as you will, had been brought about for America's needs.

You know, we talked about even the surface perhaps of natural gas. I don't think we will see that with oil because most of these plays are gas. But wouldn't it be something to see gas liquids coming on that would provide a lot of our transportation needs, and I believe that will happen. So it is something that this has occurred. It is rather ironic.

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And yes, we see these infrastructure problems. This is not the only play that has got it. We see those in Marcellus and other places that we are involved in. But you have to step up and figure out ways to deal with it, and a lot of times it takes involvement from a lot of different interagencies to get that job done.

So, anyway, that sums up my testimony, and I thank you very much for being here.

[The statement follows:]

PREPARED STATEMENT OF HAROLD G. HAMM

Senator Dorgan and Members of the Energy and Water Development Appropriations Subcommittee, thank you for the opportunity to speak to you today on this most important subject facing our State and Nation, Energy Supply and Constraints in Western North Dakota.

My name is Harold Hamm. I am founder and serve as CEO and chairman of the Board of Continental Resources, Inc., an $8 billion market cap company, publicly traded under the symbol CLR on the New York Stock Exchange. Currently CLR is the second largest producer of crude oil in the Rocky Mountain Region only behind Conoco Phillips. CLR's capital expenditure budget in 2008 is $883 million, of which over $400 million is being spent on leases and drilling in North Dakota. Continental celebrated its 40th year in business in 2007. I am a founder and current member of the Northern Alliance of Independent Producers, representing producers in North Dakota, South Dakota, and Montana. I am past chairman of the Oklahoma Independent Petroleum Association and past president of the National Stripper Well Association.

Continental has played a pioneering role in horizontal well drilling with over 600 horizontal wells drilled to date and as an unconventional shale resource developer that is active in over 10 resource plays across the Nation. Our Company is currently the largest leasehold owner in the Bakken Shale play with over 500,000 leased acres in North Dakota and Montana. Approximately 80 percent of our production is crude oil, as is the case for the State of North Dakota.

North Dakota has a tremendous opportunity to exploit the Williston/Bakken Shale resource, and independent exploration and production companies are already leading the charge, with new technology, horizontal drilling, etc. However, if the industry isn't encouraged to develop sufficient takeaway infrastructure, with State support, the pace of energy development will continue to be restricted.

THE OPPORTUNITY FOR NORTH DAKOTA

Recently, the United States Geological Survey identified approximately 4 billion barrels of recoverable oil in the Bakken Formation of the Williston Basin with the current level of technology. Approximately 75 percent of the existing assessment is in North Dakota. In short, the opportunity for the State of North Dakota and our Nation is huge considering the $120 pricing environment we are experiencing for crude oil.

And corresponding to this opportunity we have seen a considerable ramp up of drilling activity over the past 18 months to about 84 working rigs now. This is about twice the level in 2007.

THE CHALLENGES TO CONTINUED GROWTH

Recently the price of oil has been trading in a range of $110–$120 a barrel, versus approximately $7.50 per mcf for natural gas. This 15 times oil-to-gas ratio reflects the premium value of oil as an input in the manufacturing of liquid transportation fuels, yet 80 percent of the Nation's drilling rigs today are employed drilling for gas. Why is that we ask?

I would like to suggest a few of the challenges exploration and production companies face in answer to that proffered question for your consideration.

First, we producers clearly remember the historic manipulation of crude oil prices by foreign multi-national oil companies and countries such as Venezuela. When Venezuela decided to dump oil into this country below their cost of production in 1998 and 1999 to drown America's higher cost stripper well operators, they drove the price of oil to $8.00 per barrel. Please note that this occurred less than 10 years ago today. And then there was OPEC always willing to open their spigots whenever America's producers began to get a little traction in reserve replacements. And we must not forget the nationalization of our interests abroad, all without any support from international courts.

Second, let's consider the ever-looming threat of punitive legislation from Congress in the form of windfall profits taxes, rollback of geological and geophysical expensing, and etc. These threats send the wrong message to domestic exploration and production companies. The Federal Government should be encouraging the development of our crude oil resources so that we are less dependent on foreign supplies. However, if instead the Government enacts policies that penalize oil production, then we will expend our resources drilling for natural gas, which is more abundant anyway, and easier to find.

To keep drilling focused on oil, as we did at Continental, we had to be pretty persistent or plain hard headed. Sometimes, it was necessary to ignore the disincentives to oil exploration and production.

In addition to those challenges, there are the physical obstacles of limited infrastructure. In some parts of North Dakota, these include a lack of natural gas gathering transportation lines to market, gas plants, crude oil lines (I'll cover this in more detail later), drilling rigs, frac fleets, service companies, labor to operate equipment, housing for personnel, (many are living in camps in temporary housing) and more deficiencies.

The point is, the process of exploring for and producing oil and natural gas is expensive, high-risk, and complex. The process goes far beyond simply identifying a prospective site and drilling a well.

We need Congress and the American public to know and understand the difference between the producers of crude oil and natural gas and the refiners/marketers of crude oil and its products in America. They are different. We, independent producers, are price takers, so increasing supply is the key to moderating end prices to the consumer. Independents drill 85 percent of America's wells. Consequently, we deserve a supportive attitude—not one of condemnation and punishment. I've been in this business 41 years. I've witnessed the demise of most of my peers in the late 1980s and in 1998 and 1999. It became difficult to keep our eyes on the big picture at times as America's energy dependence deepened and a crisis in energy supply loomed.

However, I continue to be completely dismayed at how little our Congress, even today, understands about our most important industry and the challenges of finding, drilling, and transporting oil and gas to markets. Congress gets caught up in the public's concern over the increased cost of gasoline, but instead of reacting constructively to encourage more supply, they blame the Nation's producers. We aren't price makers. We are price takers who re-invest over 100 percent of our cash flow in exploration and development year after year.

We deserve acclamation for our actions over the past decade and supportive measures such as permanent relief from net income limitations on marginal wells, expansion of the current 1,000 bbl limitation of the depletion allowance for marginal wells (I refer to Senate bill S. 3395, introduced by Senator Inhofe), and alternative minimum tax relief, and immediate expensing of geological and geophysical costs in the year incurred. And the largest one of all, regulatory relief on Federal lands and access to them. It should not take a year to obtain a permit to drill on Federal lands.

UNCONVENTIONAL SHALE EXPLORATIONISTS BREAK RESERVOIR PARADIGM

Over the past decade a small group (about 15), all made up of independent producers have truly brought about an exploration technological evolution which has turned the industry literally upon its head. We have developed the technology to find and extract oil and natural gas from unconventional shale rocks themselves

through unconventional means such as long lateral horizontal well bores, high pressure fracture treatments of up to 9,000–12,000 pounds per square inch, high grade proppants, such as ceramics, and the ability to fracture-stimulate wells in multiple stages along a horizontal well bore.

As a geologist trained to find only conventional reservoirs with high porosity and permeability, I can tell you this transformation is completely phenomenal.

These advances in technology have changed the entire world of exploration in a very short time and made it possible to harvest huge amounts of reserves heretofore believed unrecoverable. Most of these reserves are natural gas. The Williston Basin's Bakken shale formation is an exception, since it is an oil resource play. It is a very good example of trapped reserves becoming accessible through these recent technologic advances.

These pioneering resource players embrace these new technologies and take huge land positions in those shale plays in multiple producing basins. They haven't sought or received much acclaim nor have they been given credit for these advances to release America's energy resources for the consuming public both today and for the next 100 years. Do they deserve to be punished for their years of fortitude and persistence to make these stable domestic resources available to the American consuming public? I don't think so.

PIPELINE ISSUES AND CHALLENGES

To quickly summarize this scenario, North Dakota producers remain flooded by an overhang of oil dumped into the Guernsey, Wyoming market area by Express Pipeline in 2005, which overran all of the existing pipeline take-away capacity and drove differentials through the roof to levels reaching $34 per barrel and shut-in quite a bit of the State's production.

Efforts to alleviate this situation have recently been slowed by SemGroup's bankruptcy, owner of the White Cliff's Pipeline being built to Platteville, Colorado. This segment was expected to connect to Plains Pipeline in Cheyenne, which links to Guernsey and could move 65,000 barrels of oil per day from the area.

Enbridge, a Canadian company, continues to lag the demand for service and remains prorated. Our own company has 16,000 barrels of oil per day to move from the Bakken and was allocated less than half this amount of space on Enbridge.

Keystone Pipeline thwarts the needs of North Dakota producers by design, jogging east of North Dakota's producing region to access right-of-way across the State hauling none of North Dakota produced oil, while gaining access to its markets at Cushing, Oklahoma and refineries in the Midwest.

Keystone XL, another proposed line from Edmonton, Alberta, advertises precisely to its customers in Canada their barrels will not be diminished in any manner on its path directly to refinery markets in Houston.

Yet, the northern States continue to grant right-of-way access unfairly to its northern neighbor at the expense of its own indigenous crude and in the face of fair treatment by FERC. Are we the only guys who must play by the rules?

I urge the use of tax-free bonds to build an adequate pipeline system to move North Dakota's oil to market now.

We also need more support for the development of energy infrastructure, not more market transparency. Once again this year, we are being forced to rail-out oil from this region due to pipeline constraint and lack of infrastructure, with the only alternatives being very negative: shut-in production or differentials of $25 per barrel, or more, which could cost the State of North Dakota up to $168 million per year at current rates of oil production and prices. For this reason, a tax-free bond issue should be considered by the State to meet this need at once.

The State of North Dakota has the authority in this matter to take action. The North Dakota Industrial Commission identified the Williston Basin crude oil transportation bottleneck on July 7, 2006, yet there is no viable plan of action on the table today.

IN SUMMARY

The Nation's independent producers have risen to the occasion and challenge of providing fuel for our country in spite of great obstacles. Encouraging the production of crude oil and natural gas in the United States has huge, beneficial impacts on local and State economies in this country, particularly where these resource plays are located. We can increase supply in an environmentally responsible way, taking advantage of advanced technologies that also benefit exploitation of the resources themselves.

The growth of the global economy, especially in China, India, Brazil and other dynamic societies, will continue to put pressure on energy supplies—demand is not

likely to abate long-term. The U.S. economy will continue to grow, accompanied by increased energy needs. The question is the control of energy resources and whom we will pay for crude oil and natural gas, as we transition to more diversified energy resources. Will we choose to be increasingly self-reliant, to the benefit of local and State economies in the United States, or will we continue to transfer the wealth overseas to satisfy our energy needs?

North Dakota has an unprecedented opportunity today to capitalize on its vast crude oil reserves as the Nation transforms its transportation fuel system to alternative sources such as CNG, ethanol, and natural gas to liquids, which produce light diesel and gasoline. North Dakota is very dependent on its natural resources and has one last shot at getting it right.

This transformation period is expected to occur over the next several years. The leadership and citizens of this great State must not sit idly by and see their resources diminished once again by the challenges of pipeline take away capacity, punitive legislation, and manipulation or lack of infrastructure needs. I urge them to accept a new vision of prosperity and growth for the benefit of N. Dakota, its citizens and all Americans.

Senator DORGAN. Mr. Hamm, thank you very much.

That is all very interesting testimony about a wonderful subject of bountiful production here in North Dakota that will benefit our economy, but also challenges to make certain that that production reaches market without substantial price discounts.

I have a lot of questions. So let me begin with you, Mr. Hamm. With the U.S. Geological Survey study, we had some in the industry here who said, "Well, so what? We knew there was oil there. What value is there in having USGS look at it?" You obviously disagree with that. You think it was valuable?

Mr. HAMM. Oh, I think it was very valuable. Like I say, I think it authenticated the play for a lot of different people. They could start seeing that within the assessment units that, sure enough, that was possible. Along the Nesson incline, that assessment unit, and the one to the east where the Parshall area is, those—obviously, people start adding up the barrels pretty quick. So it was a really good thing.

Senator DORGAN. You were one of the only producers willing to testify at an open hearing. We asked a lot of producers. It is not that we asked for a lot of dates before we got to you, but we did ask a number of producers about their willingness to testify publicly about what they had described to us privately as a potential problem, a looming problem. And a number of them were saying I don't think we can say that publicly because of other concerns.

Mr. HAMM. Well, they have concerns. We are a public company also. We are about an $8 billion market cap company. Actually, my travels today, I am going to New York, and we will put on a presentation tomorrow at Lehman conference up there.

But we have been very open with our situation here in North Dakota and our problems. They know that we are railing oil. Rail is our last choice, last choice of producers. But this is the kind of expensive process, but we have been doing it 3 years and got it down to where we can get it done. But you know it is expensive, and we would much rather have it on pipeline and an environment like that instead of on rail.

Senator DORGAN. Let me ask Mr. Helms. Mr. Hatfield has described Phase VI, which is underway and will be completed in 2010. If you see this line of production, it appears to me that we keep having the experience we have been having. And you see

where these drilling rigs are moving every 30 or 40 days, drilling a new hole and producing new energy.

Are you concerned, are we going to come to a point where we hit an even greater capacity limit than we now have, which is going to impose steeper discounts in 2009 or probably part of 2010?

Mr. HELMS. Senator, that is a very good question, and I think the short answer would be yes.

We are approaching a time period in 2009 where we are going to be very constrained. And just the fact of moving crude oil by rail is going to cost significantly more than moving it by pipeline, a factor of about 10. So, therefore, that results in less value at the wellhead to the producers and the royalty owners and the State.

Part of the situation with Phase VI is delay in equipment. We had hoped that Phase VI would come in in 2009, but as you know, copper, steel, everything is at a premium. And so, it is not going to happen until first quarter of 2010. So we are going to see price differentials in 2009. That is anticipated.

We have been participating fully with Enbridge in constructing their model for future projections, not wanting to have this happen again. And so, we are excited to see that Enbridge is really working the problem and recognizes that Phase VI is only going to provide maybe a few months' to a year's relief and Phase VII needs to be coming right behind that.

Senator DORGAN. But let me ask, is there a Phase VII? My understanding is that Phase VI gets you to kind of where you can be with respect to your current infrastructure. Would you have to, beyond Phase VI, lay new pipe? And if that is the question, what sort of timeline do we talk about with respect to additional capacity for laying pipe?

Mr. HATFIELD. Well, like I mentioned in my verbal testimony, beyond the current Phase VI, we have a couple of options. They are not the overall grand slam option that potentially takes another doubling of North Dakota production and allows it to move to market.

It does potentially take a 20,000 to 50,000 barrel shortfall, and potentially—and I am trying to couch that a bit because some of the projects that I had mentioned in my verbal testimony rely on another system having extra capacity, which, as you mentioned, I have just moved from Estevan and the Saskatchewan system down to North Dakota. I am fully aware of their restrictions up there as well.

Past Phase VI, we need a major undertaking of new pipeline for major volumes again.

Senator DORGAN. But there you are talking long lead times, aren't you?

Mr. HATFIELD. We are talking years out in front, yes.

Senator DORGAN. And in the meantime, we may well be talking about substantial price discounts. I will come back to that in a moment.

But Mr. Kelliher, Mr. Chairman, you have, I assume, some sense of what is happening in Canada with respect to planning and building pipeline capacity, and perhaps Mr. Hatfield and Mr. Hamm have the same notion. I think they have a different system up there. Some observe that and say, well, that seems to work a

lot better, more streamlined, and less cumbersome. What's your assessment of that?

Mr. KELLIHER. I think the U.S. process works reasonably well for oil pipeline expansions. It is different from the gas model in the United States, and it is different still from the way we go with electric transmission.

But in part, it is hard to say definitively because there haven't been very many oil pipeline expansions in the United States in recent years, unlike gas. But as Mr. Hatfield pointed out, the State of North Dakota approved the new line in about 6 or 7 months. So some States act very quickly in approving State siting of the new oil pipelines. In other States, it takes longer.

Senator DORGAN. Mr. Hamm, will the lack of transport cause a company like yours to not expand production as you otherwise might?

Mr. HAMM. If somebody was drilling by lease held, lease term and things like that, but you can usually get those extended or buy a new lease term. But absolutely, we could see this drop precipitously if we can't move from well to market.

A lot of small companies don't have the ability to set up the railing operation, for instance. So they are probably going to be shut out. And that is what they have told me that we are just limited. We either take a big hickey on price or we are shut in.

And so, yes, it could very well——

Senator DORGAN. Is that hickey or hiccup? Is that apparently a term of art of the industry?

Mr. HAMM. We call it hickey, but hiccup, yes. It could very well limit them.

Senator DORGAN. So what we see in front of us is an unbelievable amount of new productive capability here in North Dakota. But it won't happen just because it is there. It will happen because you can pull it up and move it.

We are pretty prodigious users of energy here in North Dakota. But most of what we are going to be producing additionally is going to be moved elsewhere.

Mr. HAMM. Absolutely. Most oil will be moved, going to markets at Cushing or Houston, so most of it will move out of the State.

Senator DORGAN. What is the difference of cost of transporting by pipeline versus rail?

Mr. HAMM. Well, you are looking at $10, $11 or more.

Senator DORGAN. A barrel?

Mr. HAMM. Yes, a barrel by rail, and $2 to $3 by pipeline.

Senator DORGAN. Two to $3?

Mr. HAMM. So it is four times more expensive probably, three or four.

Senator DORGAN. Mr. Hamm, another question. In my subcommittee, we have—in this subcommittee, we have funded the research component, and that research component is oil and gas research, particularly with respect to unconventional and ultra-deep resources. I mean, we have funded that nationally at the Federal level, $75 million a year.

Some have said there is no reason to fund any research any place for the industry. The industry is making a lot of money. Others have said—in fact, the President has said that.

Others have said that that funding of ultra-deep and unconventional kinds of research is what has allowed independents who have led the way in being able to go down and do horizontal drilling and fracture, and it is what has really precipitated the ability to get this oil and gas. It is not from the majors that precipitated this. It is from the independents, and it is from the use of Federal research that has been going on and which puts us in the position of around the world having the best capability of that ultra-deep, whether it is offshore outer continental shelf or here onshore.

Tell me the value of this Federal research. Is it something that has contributed to the 15 independents that you say have led the way here or not?

Mr. HAMM. It has been my experience that every play, including this one, had a learning curve that you had to go around. And it was quite steep. In fact, North Dakota gave some incentive for about a year to help get around the curve on the Bakken, and it has helped.

You know, the wells—our wells drilled a year ago were about 335,000 barrels EUR, and now they are about 455,000. And so, it has helped tremendously in doing better jobs of completing them and better frac rates, proppants, multi-stage fracs all the way around the long well bore. We are seeing as many as 14 and perhaps maybe as many as 20 frac stages along a 10,000-foot well bore eventually.

So this research is very important in every play, and every resource play is very important. And a lot of independents will use, take full benefit of that.

Senator DORGAN. Just a couple more questions and then I will call on Congressman Pomeroy.

Shirley Meyer, you are looking at all that is happening in this State with respect to potential refinery expansion. Can you tell me what you know about what is happening up in the Williston area with that group?

Ms. MEYER. Well, they are very much on track. They have their feasibility study. I was thinking it was going to be released September 1. And it looks very promising. I would agree with all the gentlemen on the panel. We definitely need pipeline capacity, but what we are looking at and what also the Williston group is looking at, is we want to start shipping refined product.

Everyone here is talking about increasing pipeline capacity for crude, to ship our crude out. We want to add value to our crude and refine it here in North Dakota. True, we need pipeline capacity, but we need pipeline capacity to ship our refined product.

And Williston is on course there. I think it is going to be surprising to some people how economically feasible their study has been. Their business plan looks very promising, and they will be releasing that study very shortly, I believe this month.

Senator DORGAN. Are they talking about 100,000 barrels?

Ms. MEYER. A hundred thousand barrels a day is what their——

Senator DORGAN. What is the estimated cost of a project of that type?

Ms. MEYER. We have been—our task force has been told that it was $2.1 billion.

Senator DORGAN. Mr. Helms, the Keystone pipeline is planning to build a pipeline that at one point was to go through western North Dakota and now apparently is just going to touch a tiny corner of our State. What kind of work exists or who is doing what to talk to the folks that build a pipeline of that type to see are there ways to put North Dakota on that pipeline?

Mr. HELMS. Well, Senator, that is a very good question, and that is the very reason that we created a Pipeline Authority in the State is that it is very difficult for producers and shippers to kind of bypass all of that and talk to a company like TransCanada about getting their production on a pipeline like that.

Those pipelines are what they call bullet pipelines. They are designed to take Canadian crude oil directly from the oil sands in Alberta to major refining centers well south of here. The gulf coast really is their goal.

There is a plus in that in that will take away some of the flooding of our refined market by the Canadian crude oil. It will move it outside of the area of refineries that we like to access with our refineries.

But it is very difficult to access those kinds of pipelines with North Dakota crude oil. It takes massive investments in facilities to do so. We did some cost estimation on what it would take to get North Dakota crude oil into the pipeline in the eastern part of the State, and it was going to be a $300 million investment to build a pipe and facility to batch our crude oil into that pipeline. They are really designed to move Canadian crude past us to the south.

However, that is—one of the purposes of the Pipeline Authority is to talk with those people and continue to try to create possibilities for on ramps for North Dakota crude on those pipes. I just don't see a lot of promise in that. Really, the promise of them is relief of the Rocky Mountain crude oil complex from the influx of Canadian oil.

Senator DORGAN. What is, finally, the best case for mid 2009 to late 2009 here in North Dakota, where our production continues to increase? We all expect that to be the case. One only needs to drive around the western part of North Dakota to understand the aggressive activity in production.

What is the best case for, let us say, late 2009 with respect to additional capacity for conveyance, price discounts? What is the best case we can expect?

Mr. HELMS. Well, that is a very difficult question to answer, and we haven't estimated what price discounts might be in late 2009. What we do hope is—or our best-case scenario would be that we add 10,000 barrels a day of takeaway capacity through the Butte pipeline to the south, and we add another 20,000 barrels a day of takeaway capacity with rail stations in Minot and in New Town. So that is a total of 30,000 barrels a day.

We will be very close to overrunning those capacity increases by the time Enbridge Phase VI can kick in. And so, I am almost certain that we are going to see price differentials mid to late 2009. I don't think they are going to approach the catastrophe that we had in early 2006. But they are going to be significant, and they will probably be on the order of what we saw around early 2007.

Senator DORGAN. Which is how much?

Mr. HELMS. We saw price differentials at that time running $4 to $5 a barrel in excess of the normal transportation charges that we would see. So that is a best guess is $4 to $5 a barrel.

Senator DORGAN. Mr. Hatfield, what is your assessment of that?

Mr. HATFIELD. I would very much agree with Mr. Helms, although he is the expert and much closer to it on a daily basis—and my crystal ball happens to be in the shop this week. I believe the fact that—I mean, he is pretty well right on.

One of the things that I would point out is I am not absolutely sure if we are taking into account our current plans on top of the rail facilities at New Town and Minot that Enbridge is also looking at, if that is what Mr. Helms was looking at. That could be a potential.

Now that starts to potentially restrain the rail capacity. I don't have those answers. I think that is—there is a potential for the market to tighten up in that timeframe. I also agree that I don't believe it is going to be anything like the situation that we had a number of months back.

Senator DORGAN. Mr. Hamm, your assessment?

Mr. HAMM. I think with the current rate, this many rigs, you are going to eat up 30,000 barrels a day awfully quick. We have seen it is almost straight up here in 2008, so that is on the chart. My assessment is it is going to get severe pretty quick.

Senator DORGAN. In what timeframe?

Mr. HAMM. In the 2009 timeframe.

Senator DORGAN. Will it restrain production then, do you think?

Mr. HAMM. I think so. I think we can all agree on that.

Senator DORGAN. Well, maybe just an observation. With every opportunity comes challenge. And we would prefer to be sitting here with these problems accompanied by the prospect of increased production than to have no prospect of increased production and certainly no problems. But all of us have to search for ways to begin to address this because I think these are longer-term issues.

So let me ask Congressman Pomeroy to inquire.

Mr. POMEROY. Thank you, Senator Dorgan.

Mr. Hamm, I am very pleased you could be on the panel. You are a well-known figure in North Dakota petroleum that it is an honor to meet you.

Mr. HAMM. Thank you.

Mr. POMEROY. Your name came up in a visit I had recently with T. Boone Pickens. He had one of his town meetings addressing his plan in Fargo. We were talking about you, and I understand he is a geologist?

Mr. HAMM. He is.

Mr. POMEROY. You are a geologist. Guess I am going to have my son go into geology. I commend you for how well you are doing. Your success has been to the benefit of all of us. You have really developed and tapped a tremendous capacity.

Last week, I was talking with Governor Schweitzer of Montana. He is convinced that the horizontal drilling taking place in North Dakota's wells is going down and pulling out this big old pool under Montana. So I am pleased your testimony straightened that one out.

On a serious note, let me just ask you, when we talk about a refinery, would building refining capacity in North Dakota help on this problem of crude oil pipeline capacity?

Mr. HAMM. Well, you know, I am not an expert in that. I did work for Champlin Petroleum, which had refineries, when I first got started.

But generally, refineries are needed for whatever their market is of refined products. Now refined products generally are harder to ship than crude oil is. You need several lines, if you will, pipelines to ship all those refined products or transportation for them, at least—water, rail, whatever—to get that to market.

Where, with crude oil, it is generally one pipe that will send it on down to the markets and where it can be refined and used within a Midwest area or wherever the compilation centers are.

Mr. POMEROY. But what about refining for our needs up in the northern plains? At least you take that off of the pipeline going south and then getting it back up again?

Mr. HAMM. That is true. We have seen the comments on diesel. We have seen shortages up here on diesel. But that is a backhaul for some of these movements of crude for rail is backhaul being diesel. So that will probably take up some of that need.

Mr. POMEROY. Chairman Kelliher, is there a national plan relative to enhancing, especially in light of the tremendous debate taking place now on how we quickly accelerate independent energy capacity? In all the attention on drilling, is there a corollary discussion in terms of increasing a national perspective to somehow fast-track infrastructure development?

Mr. KELLIHER. I think that is part of FERC's mission in these scenarios where we have infrastructure responsibility. We don't regulate oil refineries, so we don't have any activity in that area. But with oil pipelines, we have a rate-making jurisdiction. We have taken some creative approaches to use our rate-making authority to make expansions possible.

We have approved surcharges on a number of crude oil as well as petroleum product pipelines. And that has had the effect of promoting expansions. And last year was a record year for the natural gas pipeline network. We approved 2,700 miles of new natural gas pipelines, and that was a record year, at least going back 15 years or more.

And transmission, electric transmission is a little bit different story. That is under State jurisdiction. We have some very limited new Federal authority that I actually am not very optimistic is going to work very well. So I think siting the grid, the Congress, I think, does need to look at changing the law and adopting the natural gas pipeline model for transmission siting.

Otherwise, I don't think——

Mr. POMEROY. Is that a pretty good parallel, do you think? We can use the natural gas pipeline type approach with electrical transmission?

Mr. KELLIHER. I think so, for the same reasons. It used to be that gas pipelines were sited by States. But it didn't work. That was the way the Federal law was written in 1938. By 1947, Congress concluded that that was an unworkable approach because the network

is interstate, and many States were blocking pipelines for various reasons. They weren't considering the interstate benefits.

Mr. POMEROY. Yes.

Mr. KELLIHER. But I do think the State siting of oil pipelines, I think, works. It is because I think we should be—we shouldn't approach preemption lightly, Federal preemption lightly. And I think in the case of gas pipelines, I think Congress in 1947 did the right thing because there was very compelling evidence that State siting of gas pipelines wasn't working.

So we have gone for exclusive Federal siting, and I don't think States feel aggrieved by the way the Federal process works for gas pipelines generally. We don't have a lot of disputes with States on gas pipeline siting. It works very well. I think we have reached the same point on the power grid.

But oil pipeline siting, partly because there haven't been a lot of pipelines proposed, there is not proof. There is not proof that State siting doesn't work, and there are examples like in North Dakota and South Dakota, where the State acted in a number of months to approve the Enbridge project.

So there is evidence that State siting can work in some cases. It is——

Mr. POMEROY. My expectation would be there that if we can tap into—get it out and tap into another network, maybe you are right. But if a new network to major market is required all the way, I don't see anything about oil pipelines that would be easier than the other pipeline issues or, for that matter, electrical transmission line issues that have proven so problematic State by State.

You know, you have heard Representative Meyer cite the flat-out loss to the State treasury that we are going to have when activity stagnates or maybe is even pulled back because we can't get the product out. So North Dakota has a very clear interest here. Is there activity a State can do to expand its oil pipeline capacity?

Mr. KELLIHER. To me, I can't see what a State can do to expand oil pipeline capacity other than to generally be supportive and act efficiently on projects that expand the pipeline capacity.

Mr. POMEROY. You know, I think that kind of makes my point about more of a national approach perhaps necessary. I mean, we can build all kinds of things out to the borders. But if that is the extent of where we can reach, it gets pretty tough.

Now, Mr. Helms, you have spent a lot of time thinking about this one. What do you think?

Mr. HELMS. Congressman, thank you for the question, and I think it is an appropriate question. I realize that oil pipelines have been working but, as the chairman indicated, largely because there haven't been a lot of proposals for major interstate pipelines. Some movement, I believe, toward the model that is used in natural gas would be appropriate.

I participated, when I worked in the oil industry, in a project to put gas on a major new natural gas pipeline that was being built through North Dakota. And the aspect of firm transportation provided the risk mitigation that that company needed in order to make that kind of investment.

So some application, and I know FERC has been moving in that direction, to provide more and more firm transportation so that

pipeline companies and those who build this infrastructure can see their way clear to a return on their investment as opposed to the old complete common carrier market, where it was all just tariffs and historical production and that sort of thing.

Mr. POMEROY. You mention a rifle pipeline, which I think is an interesting concept. Who could stop a rifle pipeline in exchange for a pipeline that would have more gathering capacity for U.S. supply as well? What authority?

Mr. HELMS. Well, Congressman, it is my understanding that the local utility commissions or public service commissions in each State have authority over those pipeline processes. And so, what you will see with those pipelines is they are frequently routed through parts of the country where States are efficient and fast at approving those kinds of things.

I think that is why you saw Express where you saw it and you see Keystone XL going down through the Rocky Mountain States because we are very infrastructure friendly.

Mr. POMEROY. Why would North Dakota approve a pipeline that really precludes gathering any of our product at a time when we can't get our product out?

Mr. HELMS. That is an excellent question, and I touched on that a little bit in my discussion maybe in answer to a previous question or my testimony, and that is to try to move the huge volumes of Canadian crude that are coming in the next decade.

To move those far south of here, outside of our refining infrastructure so that we maintain our Minnesota, Wisconsin, Oklahoma, Rocky Mountain refinery infrastructure for our crude oil and move that oil well south of here to refineries on the gulf coast, which are better suited to handle it.

Mr. POMEROY. We have to allow—by our law, we have to allow Canadian product into our pipeline, and we do. But the reciprocity of that seems to be kind of tipped on its head if they basically design the location of their pipeline so it misses our product. Yes, we, by law, can get access to it, but we really can't because they put it in the wrong part of the State.

Mr. HELMS. And that is exactly accurate. They did hold an open season on those pipelines. But as I stated, the cost and the process of accessing that pipeline along the way, these bullet pipelines, is tremendous, hundreds of millions of dollars.

Senator DORGAN. I don't understand that. Congressman Pomeroy just put his finger on something important. We want the Canadian crude. It is not as if we don't want it. We want it, and we need it, right? The proximity of that crude is something we want. So we want to be hospitable to anybody that wants to transport it into this country.

And yet the issue of why we can't connect at some connection point to put domestically produced crude on, I don't understand, and if you would tell us a bit more? Because we hear that it costs a king's ransom to find a way to tie into that. That baffles me. Why does it cost a king's ransom to tie into a pipeline at some point to allow some domestic production to be loaded on?

Mr. HELMS. That is a very good question, and the reason is that you have to create a batch of North Dakota sweet crude in this giant bullet pipeline. If you want to maintain premium price for

your crude, then you need to deliver it to a refinery that really wants it, and you have to input it as a large batch of crude oil. You can't just mix it in with the heavy Canadian sour. Otherwise, you get the same price heavy Canadian sour fetches.

So in order to batch into a pipeline, say, such as Keystone to the east, you have to be able to deliver 100,000 barrels over an 8-hour period. So you have to store up 100,000 barrels and put it into their pipeline over about an 8-hour period, and then they will take that to Oklahoma and drop it off for you.

But that is the only way you get premium price for that crude is keeping it in a neat batch and bringing it to a refinery that wants that neat batch. You don't want it to mix with the heavy Canadian sour.

Mr. POMEROY. So is it the types of oil rather than the location of the Keystone pipeline in the northeastern part of the State that is the problem?

Mr. HELMS. It is predominantly that. Yes.

Mr. POMEROY. Is that your agreement, Mr. Hamm?

Mr. HAMM. I would like to comment on that, if you don't mind?

Actually, what has happened is the North Dakota system of Enbridge has been loaded up on other Canadian oil. You know, this is very high-grade oil that is produced out of Bakken. So a lot of people have chosen to blend a lot of low-gravity oil on our system, and we are estimating 12,000, 15,000 barrels.

Because once the Bakken started flowing into it out of Elm Coulee, suddenly we saw the volume blown up because that was a very high-gravity oil that they could blend oil in from Canada. And so, that is what happened. It blew those volumes up at about 40,000 barrels—as Kevin said, it was underutilized—to suddenly over 80,000 barrels and we hadn't produced that much out of Elm Coulee.

So we knew what was happening, and so that occurred. So they have used ours. But we can't use theirs. They basically, by design, sidestepped all of the production in North Dakota. And so, we can't use it. They could have very well come through and that was a straight line of their system that they, by design, sidestepped it.

We are caught in the middle right here, North Dakota is. And we don't have to let them come across. The border State could have stopped them, and we definitely could have said you can't cut across us to carry your oil. But all they want to do is move across us to get to our markets, basically, and that is Cushing and Houston.

So they could very well have carried our oil for us. We don't have that much compared to what they are moving. That is a minute amount compared to it. So it is a failed system that we have working here.

Mr. POMEROY. And that is done? It is too late——

Mr. HAMM. I don't know if it is done yet. I am glad to see North Dakota stepping in the right direction, having somebody on staff here with authority in the pipeline area. But something needs to be done about it. It is criminal.

Mr. HATFIELD. If I could step in just for a second? I just wanted to clarify for the record that I believe Mr. Hamm made a transition from talking at the beginning with the statement on the Enbridge

system we saw the numbers potentially jump with regard to Canadian crude oil and the North Dakota system and then transition into a discussion with regard to the TransCanada Keystone pipeline coming on. That wasn't stated.

I didn't necessarily want to be implicated in that. I don't disagree with the statement, but I don't want to be implicated.

Mr. POMEROY. Well, we are carrying Canada oil on the Enbridge, but we are not getting North Dakota oil on Keystone.

Mr. HATFIELD. Well, just to clarify, and Mr. Hamm put forth a number of in the teens or 12,000 to—I forget the exact number. We don't necessarily know exactly what the number is coming into our system. It is a potential for that crude to come down. We don't see it as being a major driver in the shortage that we have right now. It is a potential driver in the shortage that we have right now.

Mr. POMEROY. The bigger issue is the lost opportunity on Keystone, not the capacity we forego on Enbridge.

Mr. HATFIELD. Well, and that is—the lost opportunity on Keystone is something to discuss with TransCanada. We are interested in coming forward with the forecast that to make sure that we are going to try and have the proper amount of capacity on the Enbridge system, regardless of what Keystone and TransCanada does.

Senator DORGAN. Thank you, Earl.

Let me—on this 166,000 barrel per day production, June 2008, Lynn, where are we now? That is June 2008. It is now September 2008.

Mr. HELMS. Well, Senator, the July numbers are just now coming in at the office, and so I don't have exact numbers. But there is every reason to believe that the trend continues and that we have added in the neighborhood of 5,000 barrels a day every month since then.

So we are very likely, just right at the bottom of your dotted line there, in the neighborhood of 181,000 to 185,000 barrels a day as we move into September and will certainly be there in October.

Senator DORGAN. And if we are probably right now—although we don't have the documentation, if we are up at 180,000 barrels per day that is the highest production in our State's history. That 189,000 barrel per day North Dakota capacity limit, that number comes from your office?

Mr. HELMS. Yes, Senator. That number comes from our office with regards—now that does not include the rail shipping stations that we are expecting to add toward the end of this year. But, yes, that is a number that we provided through the Pipeline Authority with regards to what we have with our Mandan refinery, the Enbridge pipeline, and then what we can get on the Butte pipeline to go south into Guernsey.

Mr. HATFIELD. If I could, Senator, just——

Senator DORGAN. Yes.

Mr. HATFIELD [continuing]. Backing up 1 second. Just to add one comment to the conversation about the amount of Canadian oil that is potentially coming across the border. I would just like to point out, coming from the Saskatchewan system, I know this issue is going both ways.

Now putting your finger on exactly how much net is ending up on one side of the border or the other, from my standpoint, is something that, one, I haven't looked at and, two, I think would almost be impossible from my vantage point to see. But trucking and movement of oil across the Canadian border is going both ways from North Dakota to Saskatchewan and from Saskatchewan to North Dakota.

Senator DORGAN. Right. But the discussion on the panel here describes a number of interesting challenges. Number one, I think we would like to refine more in North Dakota so that to the extent that we are shipping out, we are shipping out a refined product because that provides value to us in North Dakota.

It is also the case that we have seen shortages in North Dakota, acute shortages. And having additional refining capacity in the State would help address that issue because we are a very substantial user of energy.

At the same time that we would like additional refining capacity, much of what we are going to produce has to go elsewhere. And so, the question is what the conveyance to get it there is, and what I am trying to understand is where might there be a restriction or constriction of our ability to continue to produce?

I think all of us would probably prefer in North Dakota, going forward, that we have the capability of producing unimpeded with any other issues, and just produce as much as we can produce. We can address the infrastructure issues of roads and so on as this production occurs, and not be constrained by pipeline or rail capacity. That would be our preference.

It appears to me nearly certain, just because of the timeframe it takes to address these issues, it appears that by the end of this year—perhaps October, November of this year—or certainly in 2009, we are going to have some substantial discounts on North Dakota crude prices because that is the only way it will be able to find conveyance. Is that correct?

And let me try to understand something else because I don't understand this as well as I should. There is a pipeline owner, Enbridge in this case—I want to come back to Keystone in a moment. But there is another intermediate economic activity, isn't there, of people who are gathering contracts and getting space on your pipeline? And they are the intermediaries between the producer and the pipeline. And they are actually out there buying and selling space. Is that correct? Can you help me out on that?

Mr. HATFIELD. Well, with regard to our customer is the shipper on our pipeline. Shippers can be producers. They are not always producers. Shippers can be marketers.

And you are right. Yes, the shipper is—in some cases can be an intermediary to the producer and the pipeline.

Mr. HAMM. Could I speak to that?

Senator DORGAN. Yes. Mr. Hamm?

Mr. HAMM. You have touched on an area that is really a huge concern to us as producers. Right now, due to confidentiality, we don't know who all those shippers are. They keep that secret. But we do know for a fact that a lot of them are marketers, and they usurp that capacity and their nominations, and we call them air barrels for obvious reasons.

Senator DORGAN. Air barrels?

Mr. HAMM. Air barrels. For instance, on his system of 160,000 barrels, they may nominate half a million barrels. So, obviously, it can't fit that much. Nobody can. But they blow all those up, and so they are able to get additional capacity. And producers are somewhat shut out by the process itself.

And so, it is supposed to be based on historical, and I know that they go by that. But a lot of it is totally distorted by these air barrels and the secrecy of who these shippers are month to month. And so, it is really a problem.

Senator DORGAN. It is likely that today on the oil futures market 20 to 25 times more oil will be bought and sold than actually exists today or at least produced today. So is that the same as the air barrel with respect to this intermediate function with respect to the pipelines?

Mr. HAMM. As far as oil delivery, that is correct. There is not that much oil out there. As you can tell, Lynn can tell you exactly how much oil is available for shipment. So there is maybe two, three times as much nominated.

Senator DORGAN. Let me go back to Keystone, if I might, just a minute. You used the word; you said this is "criminal." That is an expression of angst?

Mr. HAMM. It was an expression of angst. I am sorry about that. It really is very disturbing. We give them right-of-way to come across our State, but basically, they don't ship a barrel out of the State. Our pipelines are open to them, but on the flip side, we can't ship a barrel across it.

Number one, by design, they jog across and miss all the producing area, by design. They could have come straight. I don't think it would have been any more expensive to come straight across than it would to go around the oil-producing area in North Dakota or Montana.

Senator DORGAN. So we have a Pipeline Authority in North Dakota that is, Mr. Helms, not completed? Does North Dakota have any leverage at the moment with respect to Keystone? And if so, what leverage might that be?

Mr. HELMS. Well, Senator, at this point, the Keystone pipeline has been permitted across the State of North Dakota. So the big leverage that we had is no longer in place, which was the Public Service Commission. However, there are sales tax and property tax issues leverage that the State can utilize in order to try to get companies like TransCanada to play ball with our producers and our shippers.

And so, as Keystone XL goes through down in Bowman County, we may see our way clear, through the Pipeline Authority, to take a bit stronger approach with these companies. Primarily, the Pipeline Authority is designed around networking these things and trying to get producers and shippers and pipeline companies like TransCanada connected, to sit down at a table and create a win-win situation.

Because of antitrust laws and that sort of thing, we have to be very careful about bringing a group of producers or a group of shippers together in a meeting to discuss oil prices and that sort of thing. And that is a big purpose for the Pipeline Authority is to be

able to do that and not encounter problems with those sorts of antitrust situations that could develop.

Senator DORGAN. But you have explained twice this morning that, in any event, it is very expensive to try to put North Dakota crude on a pipeline of that sort. I assume, even if the expense is not impossible and then the question is how expensive is it relative to the cost that we will exhibit here of deep discounts if we don't have the capacity? So I am just trying to think forward here a bit of it appears to me that if the State siting authority has already permitted the siting, most of the leverage is gone.

But moving that pipeline through the middle of our State, closer to where our productive capability is, the argument that you raised, Mr. Helms, of it being very expensive to put North Dakota crude on it, I assume the reason they moved it was because if they put it in the middle, it is sufficiently economically viable that they would have tremendous pressure to put North Dakota crude on it. Would that not be the case?

Mr. HELMS. There may be something to that. I never heard that, Senator.

The stated reason that they built Keystone where they built it was so they could maximize the use of an idle pipeline that they had in Canada. They wanted to use as much of that existing pipe as possible and minimize the construction of new pipe. And clearly, there was about an $800 million savings to the company by doing that, by utilizing that old TransCanada pipeline.

You know, by comparison, we had looked at the cost of a facility to ship North Dakota crude on Keystone pipeline, around $300 million. That is a very significant investment. Enbridge Phase VI is about $130 million to $140 million. So it is double that.

On the other hand, compared to the cost of a new Greenfield refinery, it is a tenth of that amount. So, all of these things come to play. And we certainly want to encourage private investment in any and all of those kinds of projects, and that is really what the Pipeline Authority and the State is about.

If we can get a Greenfield refinery built with private capital, we would love to have it. If we can get a facility to ship on Keystone built with private capital, we would love to have it. And we would even like to be able to enter in with a tax-exempt bond status to assist one of those projects to mitigate risk.

Mr. POMEROY. Mr. Helms, it is my view that I think—in college, I used to hitchhike. If you got on the road a long, long time, you didn't care what vehicle stopped. You just climbed onboard anything.

And we are not in an environment where North Dakota just wants to be a facilitator for anyone who wants to cross our State. We believe in interconnectedness relative to energy infrastructure development. So we are in there as a cooperative partner. That is fine.

But we have got crude we have got to get out of here or we are going to take a substantial discount on price, and it is going to even impede production that is undertaken. So I think that anyone that wants to cross a little corner of our State better be willing to talk about how we are going to get some of our product on their pipeline.

And if we don't have that as a driving view of the Pipeline Authority, I think we are missing some of the need we have as a State, don't you think?

Mr. HELMS. Well, I agree 100 percent. We need to be in there at the very beginning, pushing these companies to provide access and take North Dakota crude oil on their pipeline. And to the extent that we can maintain their open seasons and get shippers of North Dakota crude to bid on that pipeline capacity, we should be doing everything we can to make sure that we are on those pipes.

Mr. HATFIELD. Could I make a comment?

Mr. HAMM. I have one question. This XL pipeline, has it been permitted already?

Mr. HELMS. No, it has not.

Mr. HAMM. So you have got some authority with that?

Mr. HELMS. We have a lot of leverage over that one because it has not been permitted yet.

Mr. HAMM. It crosses several major pipelines that oil can come out of our Bakken area. Butte, for instance, the proposed line goes right across it right now. And as I understand it, the batch process—I don't want to operate crude oil lines. The Batch process has been around forever.

Mr. HATFIELD. If I could make just a couple of comments with regard to this? I am not going to speak on behalf of TransCanada or the Keystone pipeline at all. I am speaking with regard to the Enbridge view on permitting, and we have had some discussion and comments with regard to how permitting goes forward and how it might improve.

I think either you understand the point of trying to help companies ensure that they are going to pick up the North Dakota crude oil if crossing your State. I believe it is a very dangerous precedent to set at the outset.

One of the things, and just to step back a little bit, with regard to the permitting process, and I would agree with Mr. Helms in that some movement towards a grander oversight by a Federal agency is appropriate. I think we have to be careful to not kind of trip up the—well, in this case, the oil pipelines with regard to the fact that in many cases, we compete with companies that aren't regulated on a Federal basis.

On a gathering system, for example, what I run is competing directly with companies that aren't regulated by Federal agencies. If we are regulated by Federal agencies, many times we lose those competitions if we run directly into competition face-to-face with, say, another producer or somebody else. So I would agree, but we have to be careful that oversight by a FERC-type agency has to be measured.

I would also agree with Chairman Kelliher that, to some extent, some of the States—as I mentioned with North Dakota and the PSC, some of the States are doing a very good job of turning some permits around. Some aren't. That is kind of the fact that we are running up against now.

In order to help that, if we could get across and get assistance from the Federal level with regard to—I mentioned an environmental impact statement that we had in front of the Department of State right now. The major problem that we see with that is that

over the years, the ownership of the environmental impact statement, the agency that was in charge and had the mandate for that has changed a number of times. That has caused inefficiencies in how that permit gets approved.

If we could have a consistent approach with an agency that has the ability to staff that, staff up for that environmental impact statement, that would be much appreciated.

I think the idea—and I will just try and shut my mouth here real quick. The idea of individual States essentially drawing a fence at their border to—and I understand all the best intentions—but if we are an interstate pipeline, trying to put a pipeline in, you can imagine the difficulties we are going to have going from State to State to State to State, who may all want their own piece of the pie.

On the other hand, Enbridge is going to try and come up with a forecast specifically for North Dakota to help fix the problem.

Senator DORGAN. Mr. Hatfield, you represent the pipeline interest very well. We appreciate you being here. That is why we asked you to be on the panel.

And I want to make a closing comment and thank my colleague Congressman Pomeroy for joining us today. There is an issue of stranded energy in this country. We have stranded energy potential with respect to wind energy because we don't have the kind of transmission capability to move everything that we could produce to where it is needed.

It appears to me we are going to have some stranded energy with respect to oil production, especially here, because we don't have the pipeline system to move it to where we want to move it. And at a time when you have an energy crisis and the issue is produce, produce, produce, the last thing you want to do is have stranded energy out there that you have the capability to produce, but not to move it where it is needed.

You know, when Dwight Eisenhower created the interstate highway system, the Congress and the President built an interstate highway system to connect all parts of this country. I have often made the case that someone might have taken a look at that—maybe in today's political climate with all of the individual groups out there, someone would have taken a look at Sentinel Butte to Beach and said, "Do you have any idea what it costs to build four lanes from Sentinel Butte to Beach, North Dakota, and how few people live there?"

Well, so there is Government waste, right? But it was an interstate system. Some make the case, and I think accurately so, on transmission of electric energy. We need to create an interstate system to be able to produce where we can produce and convey where it is needed.

Regarding a pipeline system, I am not making a case here for dramatic new regulation, but I am saying that the current system is whatever happens, happens, and that is fine. Maybe that is not fine. I mean, maybe there needs to be some more direction about what is necessary for our country to have the best use of all of its resources available to where it is needed from where it is produced.

At this point, there is no such plan. It is whatever happens out there to create the incentive for the investment to make that particular availability a reality.

Well, this has been a very interesting hearing for me, and I think there is urgency here about this issue. We are on the front steps of a lot of good news here in North Dakota with energy production. But one of the challenges that accompanies and attends this good news is we are a State without sufficient capability to move that energy where it is needed.

In the case of oil, we need more pipeline capacity. And it appears to me that we are going to have a kind of a bathtub effect here of being able to move product as is produced to where it is needed. And I think the State and the Pipeline Authority at the State, Earl is on the Ways and Means Committee working, I think there is a lot to be said here about tax-exempt bonding and various incentives.

I want in our committee, both in our Appropriations Committee that I chair and also on the Energy Committee of which I am the senior member, to sink our teeth into this, on an urgent basis, and try to find ways to unlock this issue. We need to unlock the opportunity to move our product from where it is produced to where it is needed.

So this is really an interesting hearing. I appreciate it. Chairman Kelliher, as I indicated, you have been to North Dakota previously. I personally think you have done a really terrific job at FERC——

Mr. KELLIHER. Thank you.

Senator DORGAN [continuing]. And I appreciate your being here. I should say that you have done a terrific job at a time when previously FERC didn't do such a good job.

So I won't go back to the west coast energy issue, but you have come in and done a very strong job in setting things right, I appreciate your work.

And the State legislators, who are working on this, Ms. Meyer, thank you very much on that. That is a very important issue, the refining capacity.

And Mr. Helms, you are in the middle of all of it, and this Pipeline Authority, I think all of us are hoping that gets up and operating very quickly.

ADDITIONAL SUBMITTED STATEMENT

The following statement was submitted by the Bakken Formation Resource Study Project for inclusion in the record.

[The statement follows:]

STATE OF NORTH DAKOTA BAKKEN FORMATION RESOURCE STUDY PROJECT—APRIL 2008

(By M. Bohrer, S. Fried, L. Helms, B. Hicks, B. Juenker, D. McCusker, F. Anderson, J. LeFever, E. Murphy, S. Nordeng)

This paper presents the results and methodology of a project by the North Dakota Department of Mineral Resources (DMR) Oil and Gas Division (OGD) and Geological Survey (NDGS) to estimate the original oil in place (OOIP) and recoverable reserves in the Bakken Formation within the State of North Dakota.

The original oil in place in the Bakken Formation within the thermally mature portion of the State of North Dakota is estimated to be 149.2 billion barrels. The estimates are presented by county and separated into the total Bakken Formation,

upper Bakken shale member, middle Bakken member, and lower Bakken shale member to make them more useful for resource evaluation and planning (Tables 1–4) and (Figures 3–6).

OOIP is defined as the total hydrocarbon content of an oil reservoir and refers to the oil in place before the commencement of production. OOIP is measured in stock tank barrels, meaning the volume of oil is corrected for shrinkage that occurs when the oil is brought to the surface to be sold at standard pressure and temperature. OOIP must not be confused with oil reserves which are the technically and/or economically recoverable portion of the oil volume in the reservoir and is referred to in this publication as estimated ultimate recovery (EUR).

The estimates of Bakken Formation OOIP and EUR provided in this publication are valuable for economic forecasting and infrastructure planning. These estimates also highlight the enormous potential for increasing recovery through continued development and deployment of new technology.

Previous publications on the Bakken Formation from Dow (1974) to Flannery and Kraus (2006) focused on the potential of the formation as a source rock. These investigators made estimates of the volume of oil that the Bakken Formation has generated ranging from 10 to 500 billion barrels. This paper differs from those publications in that it uses a wealth of public geology and engineering data generated since 2004 to estimate OOIP in the Bakken Formation. This estimate validates the highest oil generation estimates of Price (unpublished) and Flannery and Kraus (2006).

The Bakken Formation EUR using current drilling and completion practices within the thermally mature portion of the State of North Dakota has also been estimated. The estimated ultimate recovery is approximately 1.4 percent of original oil in place, which is equal to 2.1 billion barrels. The estimated recovery factors are also presented by county to show the high degree of variability in the geology and productivity of the Bakken Formation (Table 1). Note the recovery factors range from a low of 0.7 percent in Divide County to a high of 3.7 percent in Billings County.

The process of estimating Bakken Formation OOIP began with the compiling of a database containing all rock property, oil property, EUR, well cost, and well performance data presented to the Industrial Commission as expert testimony from June 2004 through December 2007. This database contains the geological and engineering data from 496 cases representing over 2,100 square miles of the Bakken resource broadly distributed across the State and is included as an Excel™ spreadsheet on the CD version of this publication. The data was sorted by county and evaluated using standard statistical methods to eliminate outliers and to determine mean, minimum, and maximum values. Well performance and economic data was also included and can be analyzed to evaluate the effectiveness of variations in well spacing and well bore geometry.

The rock properties in the case exhibit database yield statistically representative porosity and oil saturation values for the middle Bakken member for each county within the thermally mature region of the Bakken in western North Dakota. Additional data was required to evaluate the upper and lower Bakken shale members. A total of 601 core derived porosity analyses from the Bakken Formation are included in OGD well files (data is included as an Excel™ spreadsheet on the CD). The average effective porosity from the entire Bakken Formation was found to be approximately 5.5 percent. The upper Bakken shale member and lower Bakken shale member were found to contain an average effective porosity of 7 percent based on 60 analyses from seven wells in the upper Bakken shale member and 104 analyses from 13 wells in the lower Bakken shale member. Plug analyses of the middle member obtained from 437 samples from 16 wells yielded an average effective porosity of 5.4 percent. A water saturation of 30 percent was selected for the mean value because it represents irreducible saturation and reflects the typically water free production from the Bakken shales. Minimum and maximum values of 20 percent and 40 percent were selected as representative of the same range above and below the mean as the middle Bakken member water saturation data.

The rock volume in each county was determined by using Petra™ software to planimeter isopach maps developed by Lefever (2008) as NDGS publication GI–59. Only the rock volume within the thermally mature region as determined through Time Temperature Index (TTI) mapping by Nordeng (2008) as NDGS publication GI–61, was included in this analysis (Figure 1). The TTI mapping was confirmed by comparison with a recent update of the work of Schmoker and Hester (1989). In this study it was proposed that the eastward limits where the upper and lower members of the Bakken Formation in North Dakota are thermally mature can be determined from resistivity measurements. Neset (2007) evaluated resistivity measurements of wells drilled after 1989 using resistivity logs obtained from the OGD Web site to evaluate and confirm or modify the thermal maturity boundaries of the

Bakken Formation. Logs with a geometric average deep resistivity reading of 35 ohm-m or greater were classified as thermally mature and those with a reading less than 35 ohm-m were classified as thermally immature. Neset's results confirm Schmoker and Hester's previous maturity boundary and extended it to the south and west (figure 2).

We estimate that additional resources of 10.5–17.6 billion barrels OOIP have migrated from thermally mature areas into areas of the Bakken Formation that are not thermally mature. This is evidenced by significant production from the upper Three Forks Formation in the Sinclair Field located in southwestern Manitoba more than 70 miles from the leading edge of oil generation in the Bakken Formation. Possible migration pathways include major lineament trends such as the Brockton-Froid or through Bakken Formation "thicks" associated with sub-basins in southern Renville and central Bottineau Counties. OOIP was calculated for the area that is not thermally mature using rock volume, average porosity, and tight sand irreducible oil saturation estimates for the Bakken Formation middle member only. This resource volume is estimated separately because it represents an unconventional tight formation oil play that requires oil migration together with structural or stratigraphic trapping mechanisms. The uncertainty of encountering accumulations of this resource is much greater than for the unconventional resource play within the thermally mature Bakken Formation region. There is currently no data from which to estimate EUR for this migrated resource.

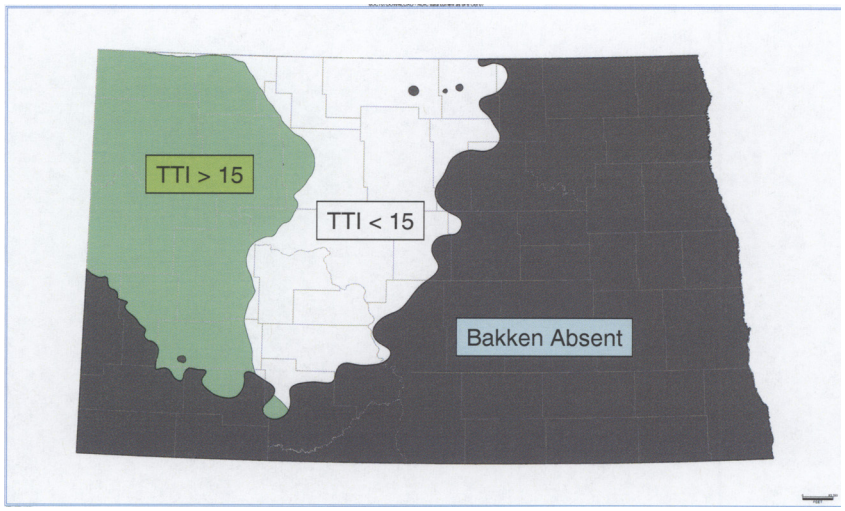



FIGURE 1.—*Thermally Mature Area (green area TTI > 15) of the Bakken Formation, Nordeng(2008) used a TTI of 15 as the limit for the onset of oil generation. TTI < 15 indicates the area of potential migrated oil potential in North Dakota.*

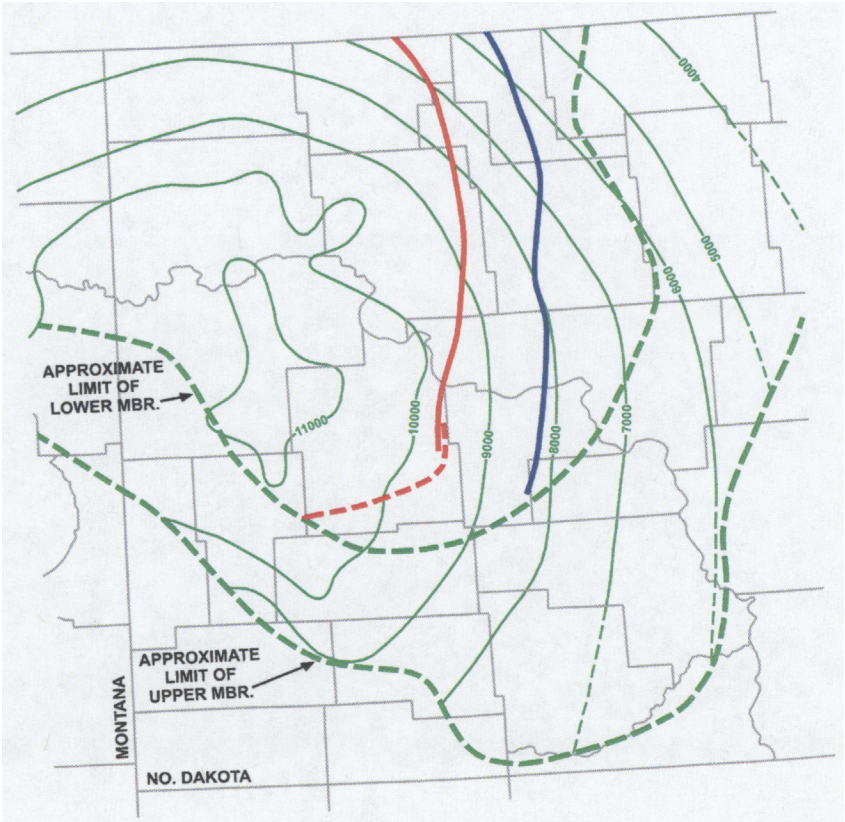



FIGURE 2.—*Green contours are Bakken structure on top of the upper shale member. The red line indicates the eastward limit where the lower shale resistivity exceeds 35 ohm-m and the blue line indicates the upper shale thermal maturity boundary. The red dashed line is the extension from data collected in the Neset study (modified from Neset, 2007).*

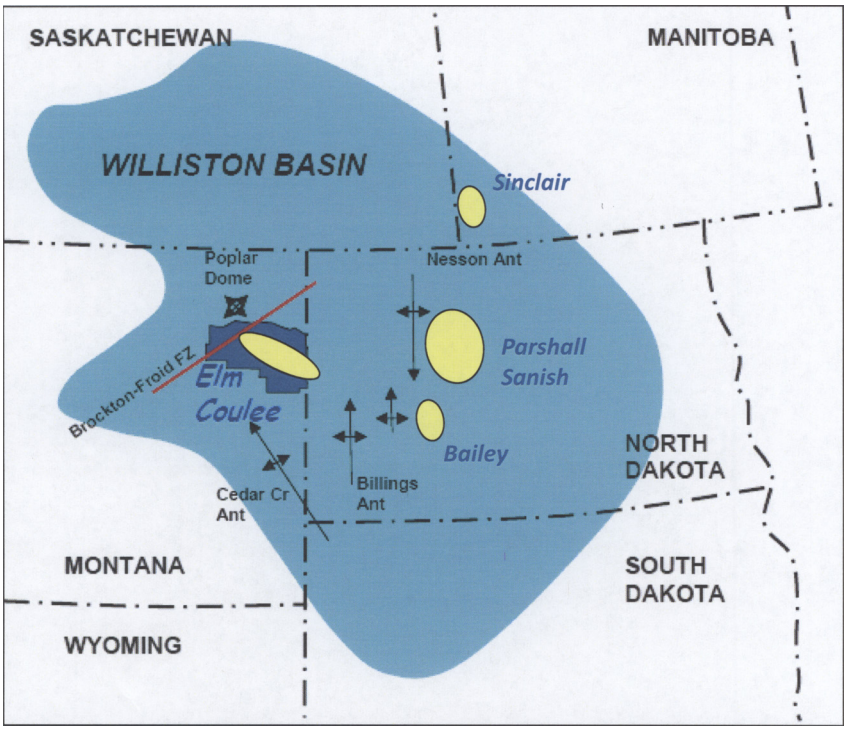



FIGURE 3.—*Williston Basin with major structural features and modern Bakken/Three Forks production areas.*

TABLE 1.—BAKKEN FORMATION OIL IN PLACE AND RECOVERABLE RESERVES (BARRELS)—JUNE 18, 2008

| County | OOIP per County | OOIP per 640 | EUR per County | EUR per 640 | Rec Factor |
|---|---|---|---|---|---|
| | Mean Values | | | | |
| McKenzie | 32,438,937,580 | 11,698,740 | 382,654,320 | 138,000 | 1.18 |
| Mountrail | 27,242,795,837 | 14,043,773 | 424,826,873 | 219,000 | 1.56 |
| Williams | 26,263,485,095 | 12,235,090 | 474,392,108 | 221,000 | 1.81 |
| Dunn | 18,059,716,691 | 9,392,995 | 294,169,921 | 153,000 | 1.63 |
| Divide | 16,836,857,774 | 13,380,393 | 123,315,660 | 98,000 | 0.73 |
| Burke | 14,891,719,317 | 16,715,777 | 187,975,278 | 211,000 | 1.26 |
| Ward | 4,540,670,907 | 7,903,591 | ..... | ..... | ..... |
| McLean | 3,253,719,118 | 10,742,320 | ..... | ..... | ..... |
| Billings | 3,141,271,156 | 4,636,325 | 115,858,434 | 171,000 | 3.69 |
| Stark | 2,349,351,546 | 2,856,068 | 86,371,150 | 105,000 | 3.68 |
| Golden Valley | 66,147,411 | 1,209,544 | ..... | ..... | ..... |
| Grant | 62,508,094 | 509,248 | ..... | ..... | ..... |
| Slope | 10,586,089 | 238,919 | ..... | ..... | ..... |
| Total | 149,157,766,614 | ..... | 2,089,563,745 | ..... | ..... |
| | Minimum Values | | | | |
| Mountrail | 14,054,974,161 | 7,245,397 | 100,872,134 | 52,000 | 0.72 |
| McKenzie | 12,768,723,210 | 4,583,246 | 78,006,785 | 28,000 | 0.61 |
| Williams | 12,218,256,790 | 5,691,989 | 422,874,413 | 197,000 | 3.46 |
| Burke | 10,985,956,451 | 12,331,605 | 50,780,051 | 57,000 | 0.46 |
| Divide | 8,202,264,716 | 6,518,660 | 18,874,119 | 15,000 | 0.23 |
| Dunn | 7,486,735,279 | 3,890,845 | 38,483,854 | 20,000 | 0.51 |
| Ward | 2,261,265,978 | 3,936,009 | ..... | ..... | ..... |
| McLean | 1,277,048,035 | 4,216,239 | ..... | ..... | ..... |
| Billings | 1,242,100,878 | 1,836,073 | 10,147,480 | 15,000 | 0.82 |
| Stark | 1,046,331,232 | 1,349,654 | 62,020,731 | 80,000 | 5.93 |
| Golden Valley | 24,538,677 | 484,981 | ..... | ..... | ..... |
| Grant | 23,265,040 | 189,538 | ..... | ..... | ..... |
| Slope | 3,922,551 | 88,529 | ..... | ..... | ..... |
| Total | 71,595,382,997 | ..... | 782,059,568 | ..... | ..... |

| | Maximum Values | | | | |
|---|---|---|---|---|---|
| McKenzie | 61,092,805,333 | 22,094,637 | 904,171,770 | 327,000 | 1.48 |
| Williams | 52,407,038,986 | 24,414,309 | 804,963,984 | 375,000 | 1.54 |
| Mountrail | 48,066,522,137 | 24,778,490 | 739,082,368 | 381,000 | 1.54 |
| Dunn | 38,148,811,183 | 19,834,738 | 569,306,630 | 296,000 | 1.49 |
| Divide | 33,046,783,554 | 26,262,104 | 241,602,214 | 192,000 | 0.73 |
| Burke | 22,189,139,910 | 24,907,044 | 199,556,693 | 224,000 | 0.90 |
| Ward | 7,454,033,280 | 12,974,653 | ..... | ..... | ..... |
| McLean | 6,871,671,997 | 22,687,176 | ..... | ..... | ..... |
| Billings | 5,796,035,234 | 8,564,872 | 206,400,129 | 305,000 | 3.56 |
| Stark | 4,479,035,609 | 5,317,672 | 108,655,741 | 129,000 | 2.43 |
| Golden Valley | 130,056,732 | 2,239,223 | ..... | ..... | ..... |
| Grant | 126,677,986 | 1,032,035 | ..... | ..... | ..... |
| Slope | 21,249,293 | 479,578 | ..... | ..... | ..... |
| Total | 279,829,861,234 | ..... | 3,773,739,530 | ..... | ..... |

Figure 4 - Thermally Mature Bakken Formation - Total

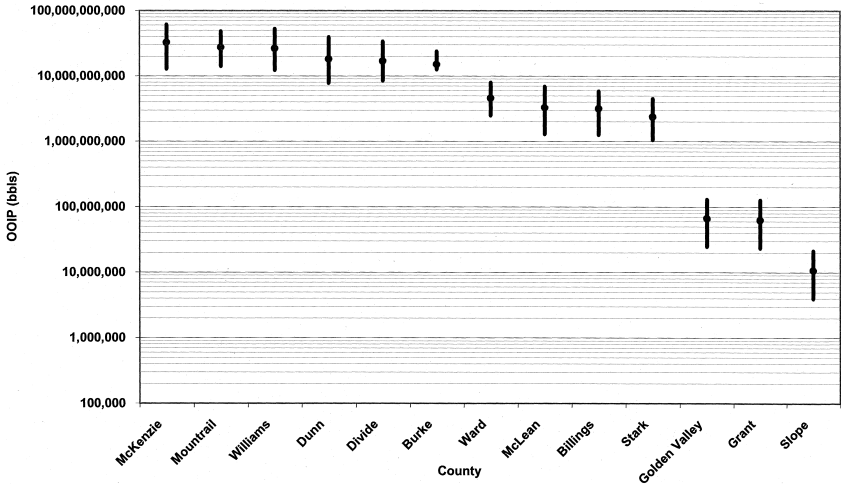


TABLE 2.—UPPER BAKKEN SHALE MEMBER RESOURCE AREA, VOLUME, AND OIL IN PLACE (BARRELS)—JUNE 18, 2008

| County | acres | acre-ft | porosity | Sw | Bo | OOIP per County | OOIP per 640 |
|---|---|---|---|---|---|---|---|
| | Mean Values | | | | | | |
| McKenzie | 1,826,692 | 26,799,229 | 7.06 | 30 | 1.400 | 7,339,167,061 | 2,571,351 |
| Williams | 1,373,805 | 22,163,100 | 7.06 | 30 | 1.500 | 5,664,893,694 | 2,639,044 |
| Dunn | 1,233,355 | 18,315,725 | 7.06 | 30 | 1.400 | 5,015,896,693 | 2,602,798 |
| Mountrail | 1,241,503 | 20,850,610 | 7.06 | 30 | 1.600 | 4,996,332,036 | 2,575,630 |
| Burke | 570,162 | 7,377,558 | 7.06 | 30 | 1.200 | 2,357,132,090 | 2,645,853 |
| Divide | 806,065 | 9,061,937 | 7.06 | 30 | 1.500 | 2,316,233,185 | 1,839,044 |
| Stark | 738,655 | 6,023,577 | 7.06 | 30 | 1.500 | 1,539,627,844 | 1,333,995 |
| Billings | 492,496 | 4,156,380 | 7.06 | 30 | 1.300 | 1,225,813,668 | 1,592,949 |
| Ward | 367,685 | 4,331,664 | 7.06 | 30 | 1.600 | 1,037,975,913 | 1,806,723 |
| McLean | 193,848 | 3,325,726 | 7.06 | 30 | 1.400 | 910,774,749 | 3,006,969 |
| Grant | 78,557 | 244,554 | 7.06 | 30 | 1.500 | 62,508,094 | 509,248 |
| Golden Valley | 63,599 | 191,189 | 7.06 | 30 | 1.350 | 54,297,863 | 546,403 |
| Slope | 28,357 | 38,655 | 7.06 | 30 | 1.400 | 10,586,089 | 238,919 |
| Total | ..... | ..... | ..... | ..... | ..... | 32,531,238,982 | ..... |
| | Minimum Values | | | | | | |
| McKenzie | 1,826,692 | 26,799,229 | 3.27 | 40 | 1.600 | 2,549,476,943 | 893,235 |
| Williams | 1,373,805 | 22,163,100 | 3.27 | 40 | 1.640 | 2,057,005,427 | 958,275 |
| Mountrail | 1,241,503 | 20,850,610 | 3.27 | 40 | 1.640 | 1,935,190,345 | 997,599 |
| Dunn | 1,233,355 | 18,315,725 | 3.27 | 40 | 1.600 | 1,742,420,204 | 904,159 |
| Burke | 570,162 | 7,377,558 | 3.27 | 40 | 1.250 | 898,362,087 | 1,008,401 |
| Divide | 806,065 | 9,061,937 | 3.27 | 40 | 1.660 | 830,924,783 | 659,738 |
| Stark | 738,655 | 6,023,577 | 3.27 | 40 | 1.600 | 573,037,832 | 496,503 |
| Billings | 492,496 | 4,156,380 | 3.27 | 40 | 1.400 | 451,893,441 | 587,237 |
| Ward | 367,685 | 4,331,664 | 3.27 | 40 | 1.640 | 402,031,120 | 699,784 |
| McLean | 193,848 | 3,325,726 | 3.27 | 40 | 1.600 | 316,384,571 | 1,044,560 |
| Grant | 78,557 | 244,554 | 3.27 | 40 | 1.600 | 23,265,040 | 189,538 |
| Golden Valley | 63,599 | 191,189 | 3.27 | 40 | 1.500 | 19,400,884 | 195,232 |
| Slope | 28,357 | 38,655 | 3.27 | 40 | 1.500 | 3,922,551 | 88,529 |
| Total | ..... | ..... | ..... | ..... | ..... | 11,803,315,229 | ..... |

TABLE 2.—UPPER BAKKEN SHALE MEMBER RESOURCE AREA, VOLUME, AND OIL IN PLACE (BARRELS)—JUNE 18, 2008—Continued

| County | acres | acre-ft | porosity | Sw | Bo | OOIP per County | OOIP per 640 |
|---|---|---|---|---|---|---|---|
| | Maximum Values | | | | | | |
| McKenzie | 1,826,692 | 26,799,229 | 10.85 | 20 | 1.200 | 15,038,708,708 | 5,268,963 |
| Williams | 1,373,805 | 22,163,100 | 10.85 | 20 | 1.200 | 12,437,089,556 | 5,793,934 |
| Dunn | 1,233,355 | 18,315,725 | 10.85 | 20 | 1.200 | 10,278,088,597 | 5,333,401 |
| Mountrail | 1,241,503 | 20,850,610 | 10.85 | 20 | 1.410 | 9,957,931,770 | 5,133,355 |
| Divide | 806,065 | 9,061,937 | 10.85 | 20 | 1.200 | 5,085,214,500 | 4,037,561 |
| Burke | 570,162 | 7,377,558 | 10.85 | 20 | 1.200 | 4,140,005,371 | 4,647,106 |
| Stark | 738,655 | 6,023,577 | 10.85 | 20 | 1.300 | 3,120,187,177 | 2,703,456 |
| Billings | 492,496 | 4,156,380 | 10.85 | 20 | 1.150 | 2,433,811,594 | 3,162,746 |
| Ward | 367,685 | 4,331,664 | 10.85 | 20 | 1.410 | 2,068,736,273 | 3,600,887 |
| McLean | 193,848 | 3,325,726 | 10.85 | 20 | 1.200 | 1,866,271,205 | 6,161,590 |
| Grant | 78,557 | 244,554 | 10.85 | 20 | 1.300 | 126,677,986 | 1,032,035 |
| Golden Valley | 63,599 | 191,189 | 10.85 | 20 | 1.175 | 109,571,000 | 1,102,619 |
| Slope | 28,357 | 38,655 | 10.85 | 20 | 1.225 | 21,249,293 | 479,578 |
| Total | ..... | ..... | ..... | ..... | ..... | 66,683,543,030 | ..... |

Figure 5 - Thermally Mature Bakken Formation - upper shale member

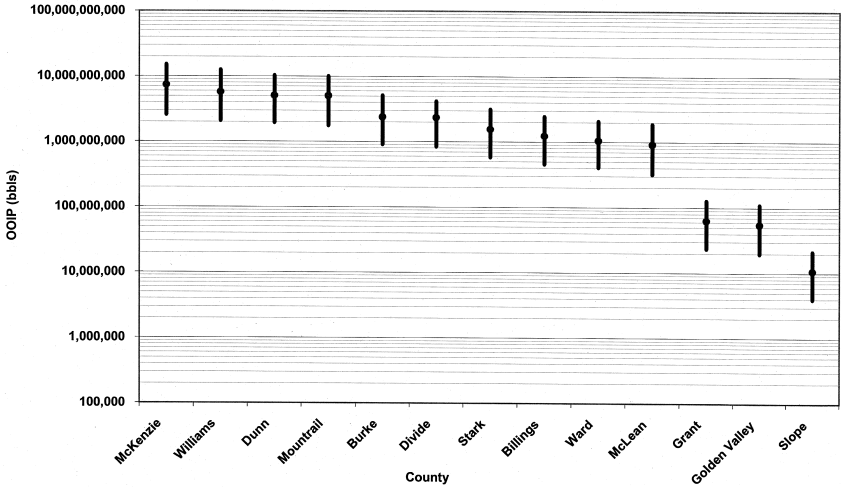


TABLE 3.—MIDDLE BAKKEN MEMBER RESOURCE AREA, VOLUME, AND OIL IN PLACE (BARRELS)—JUNE 18, 2008

| County | acres | acre-ft | porosity | Sw | Bo | OOIP per County | OOIP per 640 |
|---|---|---|---|---|---|---|---|
| | Middle Bakken OOIP Mean Values | | | | | | |
| McKenzie | 1,818,731 | 58,794,758 | 6.70 | 30 | 1.400 | 15,389,491,328 | 5,415,465 |
| Williams | 1,373,805 | 62,906,006 | 5.80 | 29 | 1.500 | 13,435,647,982 | 6,259,122 |
| Mountrail | 1,241,503 | 52,667,884 | 6.20 | 24 | 1.600 | 12,033,194,776 | 6,203,161 |
| Divide | 805,209 | 48,861,367 | 5.50 | 32 | 1.500 | 9,465,290,116 | 7,523,245 |
| Burke | 570,162 | 29,551,776 | 6.00 | 25 | 1.200 | 8,597,350,325 | 9,650,423 |
| Dunn | 1,233,355 | 37,991,535 | 4.90 | 28 | 1.400 | 7,386,142,503 | 3,832,742 |
| Ward | 367,685 | 8,846,722 | 6.20 | 24 | 1.600 | 2,021,237,904 | 3,518,211 |
| Billings | 421,876 | 5,206,097 | 7.00 | 27 | 1.300 | 1,583,245,050 | 2,401,835 |
| McLean | 193,848 | 5,047,835 | 4.90 | 28 | 1.400 | 981,377,177 | 3,240,067 |
| Stark | 377,719 | 2,886,374 | 7.00 | 38 | 1.500 | 653,114,200 | 1,106,626 |
| Golden Valley | 11,042 | 37,000 | 6.85 | 29 | 1.350 | 10,413,908 | 603,581 |
| Grant | ..... | ..... | 7.00 | 38 | 1.500 | ..... | ..... |
| Slope | ..... | ..... | 7.00 | 33 | 1.400 | ..... | ..... |
| Total | ..... | ..... | ..... | ..... | ..... | 71,556,505,269 | ..... |
| | Middle Bakken OOIP Minimum Values | | | | | | |
| Mountrail | 1,241,503 | 52,667,884 | 5.00 | 30 | 1.640 | 8,720,067,439 | 4,495,231 |
| Burke | 570,162 | 29,551,776 | 6.00 | 25 | 1.250 | 8,253,456,312 | 9,264,406 |
| Williams | 1,373,805 | 62,906,006 | 4.00 | 36 | 1.640 | 7,617,948,034 | 3,548,892 |
| McKenzie | 1,818,731 | 58,794,758 | 5.00 | 50 | 1.600 | 7,127,027,052 | 2,507,956 |
| Divide | 805,209 | 48,861,367 | 5.00 | 50 | 1.660 | 5,708,832,597 | 4,537,521 |
| Dunn | 1,233,355 | 37,991,535 | 4.00 | 43 | 1.600 | 4,200,021,176 | 2,179,432 |
| Ward | 367,685 | 8,846,722 | 5.00 | 30 | 1.640 | 1,464,725,799 | 2,549,534 |
| Billings | 421,876 | 5,206,097 | 4.00 | 42 | 1.400 | 669,301,843 | 1,015,353 |
| McLean | 193,848 | 5,047,835 | 4.00 | 43 | 1.600 | 558,045,681 | 1,842,416 |
| Stark | 377,719 | 2,886,374 | 6.00 | 50 | 1.600 | 419,859,129 | 711,402 |
| Golden Valley | 11,042 | 37,000 | 4.50 | 46 | 1.500 | 4,650,139 | 269,518 |
| Grant | ..... | ..... | 6.00 | 50 | 1.600 | ..... | ..... |
| Slope | ..... | ..... | 5.00 | 46 | 1.500 | ..... | ..... |
| Total | ..... | ..... | ..... | ..... | ..... | 36,023,867,762 | ..... |

| | Middle Bakken OOIP Maximum Values | | | | | | |
|---|---|---|---|---|---|---|---|
| McKenzie | 1,818,731 | 58,794,758 | 9.00 | 25 | 1.200 | 25,657,297,387 | 9,028,640 |
| Williams | 1,373,805 | 62,906,006 | 7.00 | 20 | 1.200 | 22,774,490,477 | 10,609,709 |
| Mountrail | 1,241,503 | 52,667,884 | 8.00 | 20 | 1.410 | 18,546,267,039 | 9,560,677 |
| Dunn | 1,233,355 | 37,991,535 | 9.00 | 20 | 1.200 | 17,684,299,689 | 9,176,557 |
| Divide | 805,209 | 48,861,367 | 7.00 | 25 | 1.200 | 16,584,158,693 | 13,181,497 |
| Burke | 570,162 | 29,551,776 | 6.00 | 25 | 1.200 | 8,597,350,325 | 9,650,423 |
| Ward | 367,685 | 8,846,722 | 8.00 | 20 | 1.410 | 3,115,250,656 | 5,422,473 |
| Billings | 421,876 | 5,206,097 | 10.00 | 25 | 1.150 | 2,634,058,978 | 3,995,954 |
| McLean | 193,848 | 5,047,835 | 9.00 | 20 | 1.200 | 2,349,666,026 | 7,757,542 |
| Stark | 377,719 | 2,886,374 | 8.00 | 25 | 1.300 | 1,033,499,393 | 1,751,144 |
| Golden Valley | 11,042 | 37,000 | 9.50 | 25 | 1.175 | 17,405,957 | 1,008,834 |
| Grant | ..... | ..... | 8.00 | 25 | 1.300 | ..... | ..... |
| Slope | ..... | ..... | 9.00 | 25 | 1.225 | ..... | ..... |
| Total | ..... | ..... | ..... | ..... | ..... | 118,993,744,621 | ..... |

Figure 6 - Thermally Mature Bakken Formation - middle member

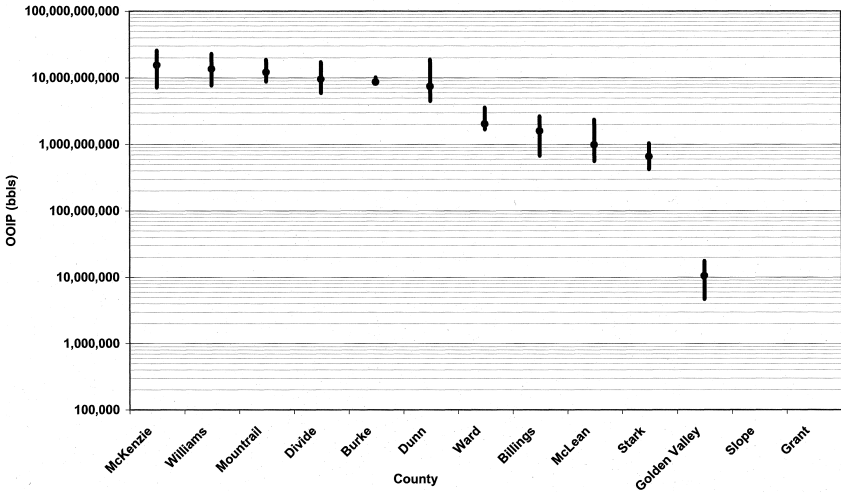


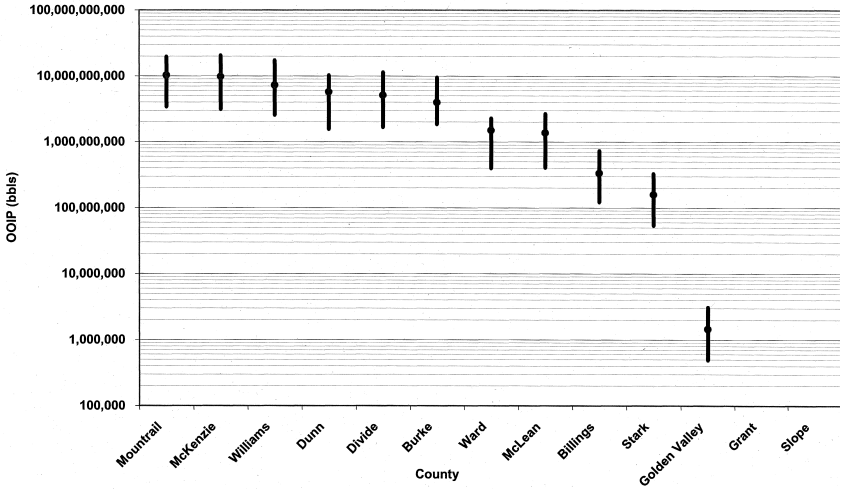
TABLE 4.—LOWER BAKKEN SHALE MEMBER RESOURCE AREA, VOLUME, AND OIL IN PLACE (BARRELS)—JUNE 18, 2008

| County | acres | acre-ft | porosity | Sw | Bo | OOIP per County | OOIP per 640 |
|---|---|---|---|---|---|---|---|
| | Lower Bakken OOIP Mean Values | | | | | | |
| Mountrail | 1,241,503 | 41,303,562 | 6.83 | 30 | 1.500 | 10,213,269,025 | 5,264,982 |
| McKenzie | 1,674,220 | 36,651,456 | 6.83 | 30 | 1.400 | 9,710,279,191 | 3,711,924 |
| Williams | 1,373,805 | 30,898,898 | 6.83 | 30 | 1.600 | 7,162,943,418 | 3,336,924 |
| Dunn | 1,224,334 | 18,304,207 | 6.83 | 30 | 1.200 | 5,657,677,494 | 2,957,455 |
| Divide | 805,209 | 20,444,318 | 6.83 | 30 | 1.500 | 5,055,334,474 | 4,018,104 |
| Burke | 570,162 | 16,984,118 | 6.83 | 30 | 1.600 | 3,937,236,901 | 4,419,501 |
| Ward | 367,685 | 4,792,938 | 6.83 | 30 | 1.200 | 1,481,457,090 | 2,578,656 |
| McLean | 193,848 | 4,772,148 | 6.83 | 30 | 1.300 | 1,361,567,191 | 4,495,284 |
| Billings | 331,414 | 1,253,936 | 6.83 | 30 | 1.400 | 332,212,438 | 641,542 |
| Stark | 241,258 | 633,346 | 6.83 | 30 | 1.500 | 156,609,501 | 415,447 |
| Golden Valley | 15,427 | 5,419 | 6.83 | 30 | 1.400 | 1,435,639 | 59,560 |
| Grant | ..... | ..... | 6.83 | 30 | 1.500 | ..... | ..... |
| Slope | ..... | ..... | 6.83 | 30 | 1.450 | ..... | ..... |
| Total | ..... | ..... | ..... | ..... | ..... | 45,070,022,363 | ..... |
| | Lower Bakken OOIP Minimum Values | | | | | | |
| Mountrail | 1,241,503 | 41,303,562 | 2.90 | 40 | 1.640 | 3,399,716,377 | 1,752,568 |
| McKenzie | 1,674,220 | 36,651,456 | 2.90 | 40 | 1.600 | 3,092,219,215 | 1,182,055 |
| Williams | 1,373,805 | 30,898,898 | 2.90 | 40 | 1.640 | 2,543,303,329 | 1,184,822 |
| Burke | 570,162 | 16,984,118 | 2.90 | 40 | 1.250 | 1,834,138,052 | 2,058,798 |
| Divide | 805,209 | 20,444,318 | 2.90 | 40 | 1.660 | 1,662,507,337 | 1,321,402 |
| Dunn | 1,224,334 | 18,304,207 | 2.90 | 40 | 1.600 | 1,544,293,899 | 807,253 |
| McLean | 193,848 | 4,772,148 | 2.90 | 40 | 1.600 | 402,617,782 | 1,329,263 |
| Ward | 367,685 | 4,792,938 | 2.90 | 40 | 1.640 | 394,509,058 | 686,691 |
| Billings | 331,414 | 1,253,936 | 2.90 | 40 | 1.400 | 120,905,594 | 233,483 |
| Stark | 241,258 | 633,346 | 2.90 | 40 | 1.600 | 53,434,271 | 141,748 |
| Golden Valley | 15,427 | 5,419 | 2.90 | 40 | 1.500 | 487,655 | 20,231 |
| Grant | ..... | ..... | 2.90 | 40 | 1.600 | ..... | ..... |
| Slope | ..... | ..... | 2.90 | 40 | 1.500 | ..... | ..... |

TABLE 4.—LOWER BAKKEN SHALE MEMBER RESOURCE AREA, VOLUME, AND OIL IN PLACE (BARRELS)—JUNE 18, 2008—Continued

| County | acres | acre-ft | porosity | Sw | Bo | OOIP per County | OOIP per 640 |
|---|---|---|---|---|---|---|---|
| Total | ..... | ..... | ..... | ..... | ..... | 15,048,132,568 | ..... |
| | Lower Bakken OOIP Maximum Values | | | | | | |
| McKenzie | 1,674,220 | 36,651,456 | 10.76 | 20 | 1.200 | 20,396,799,238 | 7,797,034 |
| Mountrail | 1,241,503 | 41,303,562 | 10.76 | 20 | 1.410 | 19,562,323,329 | 10,084,458 |
| Williams | 1,373,805 | 30,898,898 | 10.76 | 20 | 1.200 | 17,195,458,953 | 8,010,665 |
| Divide | 805,209 | 20,444,318 | 10.76 | 20 | 1.200 | 11,377,410,361 | 9,043,046 |
| Dunn | 1,224,334 | 18,304,207 | 10.76 | 20 | 1.200 | 10,186,422,897 | 5,324,780 |
| Burke | 570,162 | 16,984,118 | 10.76 | 20 | 1.200 | 9,451,784,214 | 10,609,515 |
| McLean | 193,848 | 4,772,148 | 10.76 | 20 | 1.200 | 2,655,734,766 | 8,768,044 |
| Ward | 367,685 | 4,792,938 | 10.76 | 20 | 1.410 | 2,270,046,350 | 3,951,292 |
| Billings | 331,414 | 1,253,936 | 10.76 | 20 | 1.150 | 728,164,662 | 1,406,173 |
| Stark | 241,258 | 633,346 | 10.76 | 20 | 1.300 | 325,349,039 | 863,072 |
| Golden Valley | 15,427 | 5,419 | 10.76 | 20 | 1.175 | 3,079,774 | 127,769 |
| Grant | ..... | ..... | 10.76 | 20 | 1.300 | ..... | ..... |
| Slope | ..... | ..... | 10.76 | 20 | 1.225 | ..... | ..... |
| Total | ..... | ..... | ..... | ..... | ..... | 94,152,573,583 | ..... |

Figure 7 - Thermally Mature Bakken Formation - lower shale member




BAKKEN FORMATION RESERVES ESTIMATES—APRIL 7, 2008

| County | Max | Min | Mean |
|---|---|---|---|
| Bakken Recoverable Reserves | | | |
| McKenzie | 61,092,805,333 | 12,768,723,210 | 32,438,937,580 |
| Mountrail | 48,071,238,924 | 14,057,191,895 | 27,242,795,837 |
| Williams | 52,407,038,986 | 12,218,256,790 | 26,263,485,095 |
| Dunn | 39,194,906,967 | 7,735,183,028 | 18,059,716,691 |
| Divide | 33,541,035,300 | 8,372,403,011 | 16,836,857,774 |
| Burke | 23,700,992,275 | 12,437,334,722 | 14,891,719,317 |
| Ward | 7,892,628,307 | 2,467,484,199 | 4,540,670,907 |
| McLean | 6,871,671,997 | 1,277,048,035 | 3,253,719,118 |
| Billings | 5,796,035,234 | 1,242,100,878 | 3,141,271,156 |
| Stark | 4,479,035,609 | 1,046,331,232 | 2,349,351,546 |
| Golden Valley | 130,056,732 | 24,538,677 | 66,147,411 |
| Grant | 126,677,986 | 23,265,040 | 62,508,094 |
| Slope | 21,249,293 | 3,922,551 | 10,586,089 |
| Upper Bakken Reserves | | | |
| McKenzie | 15,038,708,708 | 2,549,476,943 | 7,339,167,061 |
| Williams | 12,437,089,556 | 2,057,005,427 | 5,664,893,694 |
| Dunn | 10,278,088,597 | 1,935,190,345 | 5,015,896,693 |
| Mountrail | 9,957,931,770 | 1,742,420,204 | 4,996,332,036 |
| Burke | 5,085,214,500 | 898,362,087 | 2,357,132,090 |
| Divide | 4,140,005,371 | 830,924,783 | 2,316,233,185 |
| Stark | 3,120,187,177 | 573,037,832 | 1,539,627,844 |
| Billings | 2,433,811,594 | 451,893,441 | 1,225,813,668 |
| Ward | 2,068,736,273 | 402,031,120 | 1,037,975,913 |
| McLean | 1,866,271,205 | 316,384,571 | 910,774,749 |
| Grant | 126,677,986 | 23,265,040 | 62,508,094 |
| Golden Valley | 109,571,000 | 19,400,884 | 54,297,863 |
| Slope | 21,249,293 | 3,922,551 | 10,586,089 |
| Middle Bakken Reserves | | | |
| McKenzie | 25,657,297,387 | 7,127,027,052 | 15,389,491,328 |
| Williams | 22,774,490,477 | 7,617,948,034 | 13,435,647,982 |
| Mountrail | 18,550,983,825 | 8,722,285,173 | 12,033,194,776 |
| Divide | 17,078,410,439 | 5,878,970,891 | 9,465,290,116 |
| Burke | 10,109,202,690 | 9,704,834,583 | 8,597,350,325 |
| Dunn | 18,730,395,473 | 4,448,468,925 | 7,386,142,503 |
| Ward | 3,553,845,683 | 1,670,944,021 | 2,021,237,904 |

BAKKEN FORMATION RESERVES ESTIMATES—APRIL 7, 2008—Continued

| County | Max | Min | Mean |
|---|---|---|---|
| Billings | 2,634,058,978 | 669,301,843 | 1,583,245,050 |
| McLean | 2,349,666,026 | 558,045,681 | 981,377,177 |
| Stark | 1,033,499,393 | 419,859,129 | 653,114,200 |
| Golden Valley | 17,405,957 | 4,650,139 | 10,413,908 |
| Slope | | | |
| Grant | | | |
| Lower Bakken Reserves | | | |
| Mountrail | 19,562,323,329 | 3,399,716,377 | 10,213,269,025 |
| McKenzie | 20,396,799,238 | 3,092,219,215 | 9,710,279,191 |
| Williams | 17,195,458,953 | 2,543,303,329 | 7,162,943,418 |
| Dunn | 10,186,422,897 | 1,544,293,899 | 5,657,677,494 |
| Divide | 11,377,410,361 | 1,662,507,337 | 5,055,334,474 |
| Burke | 9,451,784,214 | 1,834,138,052 | 3,937,236,901 |
| Ward | 2,270,046,350 | 394,509,058 | 1,481,457,090 |
| McLean | 2,655,734,766 | 402,617,782 | 1,361,567,191 |
| Billings | 728,164,662 | 120,905,594 | 332,212,438 |
| Stark | 325,349,039 | 53,434,271 | 156,609,501 |
| Golden Valley | 3,079,774 | 487,655 | 1,435,639 |
| Grant | | | |
| Slope | | | |

CONCLUSION OF HEARING

Senator DORGAN. Mr. Hatfield, Mr. Hamm, thank you for being here on behalf of producers and also conveyors.

This hearing is recessed.

[Whereupon, at 11:57 a.m., Wednesday, September 3, the hearing was concluded, and the subcommittee was recessed, to reconvene subject to the call of the Chair.]

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