From The State Geologist

"Gazing into a Crystal Ball - A Brief Look at our Future Energy Resources"

by John Bluemle

In my last "From the State Geologist" column, written last spring, I commented on the likelihood of an imminent, severe, and long-term shortage of hydrocarbon-fuels. That is, I "predicted" that prices for oil and gas will rise – big time – once worldwide production reaches its peak and finally begins its inevitable decline – when demand for oil outstrips the capacity to produce it (this is often referred to as "The Big Rollover"). Although experts disagree exactly when that will happen, it ought to be sometime during the coming decade. For this column, I will borrow somewhat from the work of a friend, Dr. Walter Youngquist, who has lectured and written extensively on the topic; from an article by Mr. Matthew Simmons, President of Simmons & Co., International (a talk Mr. Simmons gave in Oklahoma City on October 2, 2000); and from a USGS report by L. B. Magoon. I've also borrowed some ideas from Lee Gerhard, former state geologist of both North Dakota and Kansas. (Please note, however, that none of these people is responsible for the opinions I'll write here!)

North Dakota has an important role to play in solving or at least leading the way to showing how our energy problems might be solved. I'll get around to discussing that shortly.

It is now obvious to me, and it ought to be obvious to a lot of people, that the problem is really much more serious than I suggested last spring. The problem is that we aren't simply losing our capacity to produce oil. The energy crisis we face involves petroleum, natural gas, and electricity. These are our three main sources of energy, and they are, almost simultaneously, converging into a "crisis" of supply. An excellent analogy is the story of "*The Perfect Storm,*" a book I read a few months ago. In his book, a true story, Sebastian Junger describes a 100-year, monster storm that materializes out of nowhere through the freak convergence of three weather systems. Our impending energy crisis results from an analogous situation. All three of our main energy sources – oil, gas, and electricity – are experiencing demands that are now colliding with each other and the results are going to be catastrophic.

Certainly, North America and the world have not "run out" of oil and natural gas and that won't really happen. Rather, we are going to face shortages of oil, which is currently the most convenient form of energy, the one that propels our planes, trains, and automobiles. Up until now, it has been a buyer's market; after "The Big Rollover," it will be a seller's market. I'll recount some simple facts and figures: world oil consumption is currently 27.8 billion barrels per year and increasing at the rate of 1.1% per year. The U.S. consumes just over 7 billion of these barrels each year. That is, 300 million U.S. consumers out of six billion world consumers (that's 5% of the total) use 26% of the world's oil. We import about 58% of the oil we use. In the past five years, we consumed 27 billion barrels of oil a year (worldwide), but we discover less than 7 billion barrels a year. That is, we replaced one barrel for every five we used.

Here in North Dakota, we have approximately 300 million barrels in proven reserves – oil in the ground that we know about and that we will be able to produce. We have another 800 million barrels of oil yet to be discovered. To put that in perspective, since 1951 when oil was discovered in North Dakota, we have produced about 1.2 billion barrels of oil, about the same amount that we project remains to be discovered and produced. We have about 300 billion cubic feet of proven gas reserves in North Dakota, and another trillion cubic feet of undiscovered gas. All of these figures, for both oil and gas, are large numbers, and they will have a considerable impact on the economy of North Dakota. However, they aren't enough, alone, to make a large difference nationally. Furthermore, lots of potential kilowatts of electricity remain to be generated. What we are lacking is any real way to increase the *ultimat*e supply of each of these energy sources. Let me briefly discuss each of our three main sources of energy.

Oil

I went into some detail about the impending shortage of crude oil in my June article in this newsletter so I'll not say much here about that. Only a few meaningful new oil-supply projects are underway in any of the 40 key countries that keep world oil supplies intact. Don't look for a lot of growth in worldwide oil supply from new projects now underway; there aren't enough of these for this to happen through at least 2005. Major unanswered supply questions include: How much capacity is left behind OPEC's wellhead valves, waiting to be opened to increase the supply? How

much oil and gas remain to be discovered in the countries that make up the former Soviet Union, oil and gas that could ultimately be added to the world supply? How much oil does Iraq have in the ground, just waiting to turn on the tap? There are other imponderables too, but all of them, taken in total, aren't going to change the overall situation much.

Until all the taps are finally on, I don't think anyone will be able to answer all of the questions about how much energy is easily available. Guesses range from as high as an additional three million barrels a day in Saudi Arabia alone, to as little as 500,000 barrels grand total. Any estimate I would make would simply be a guess and, in any event, any excess production capacity would last for only a short time before decline continued. There can't be any doubt or argument that we are on the verge of running out of "cheap" oil (not out of oil, but out of "cheap" oil – and at $30/barrel, it's still "cheap").

Natural Gas

North America has no excess gas-production capacity. Rather, extremely aggressive decline rates exist in almost every producing basin, making it increasingly difficult to even keep current production flat. The American Gas Association (AGA) estimates current (September, 2000) inventories at 2.1 trillion cubic feet (tcf), down 15% from a year ago. In recent weeks, in preparation for the coming winter, gas storage tanks have recently been getting weekly "injections" of 42 billion to 52 billion cubic feet (bcf). At that rate, stocks may rise no higher than 2.7 tcf before winter, less than the 3 tcf normally in storage to get through even a mild winter. More Canadian gas should arrive before frigid weather, since Canada's new Alliance pipeline is slated to start delivering in November. Longer term, the U.S. can't count on further increases from Canada because the Canadians have been struggling with tight supplies too.

To escape rising oil prices, many businesses and homes have switched to natural gas. That swell in demand has pulled down gas storage levels sharply, cutting inventories to a four-year low. Even if we have a reprieve and this winter is unusually mild, natural gas availability will likely get still worse next year (the weather today – election day, November 7 – as I write this, doesn't give me confidence that a mild winter is likely!). The Energy Information Administration estimates natural gas demand is growing at a rate of 4.3% this year, while production is increasing by 1%. So gas prices, which have doubled this year, will likely keep on climbing. If the coming winter is especially cold, there could be problems.

Electricity

The electricity industry has also run out of almost all existing excess generating capacity, whether this capacity is from coal-fired plants, nuclear plants, or hydro-electric plants. The electric-power industry has responded to this shortage with orders for a massive number of natural gas-fired plants. These orders have already been placed and a large number of turbines are already under contract. But these new electrical generating plants will require an unbelievable amount of new natural gas. The immediate incremental supply is simply not there.

Further, in the United States today, the realistic possibilities of building a large dam or drilling for oil and gas in any environmentally sensitive area are close to zero. People are making – have made – aesthetic choices about scenic and recreational vistas and access to energy and mineral resources. Sometimes it's wildlife in Alaska or pristine values in the North Dakota badlands, but the choices are being driven by a relatively affluent and influential, and very politically active constituency.

As I pointed out, we may well be short of the natural gas needed to heat our homes this winter. In part at least, this situation is exacerbated by restrictions on access to federal lands in the western U.S. and offshore. Quite obviously, we will be paying more to heat our homes this winter – the average heating bill may be $200 - $300 higher than last winter's. The choice has been made to restrict access to the lands that contain the resources, but have we insured that the working poor will not be harmed by decreased energy availability and increased cost for that energy to heat their homes? Have we insured from harm those who gain no advantage from untrammeled scenic vistas and the recreational opportunities of backpacking and mountain biking? I admit, I am probably one of the "elite" who benefits more than most from the new environmental awareness and pristine wilderness. But is it fair to others less privileged than I, people who don't have the opportunity to enjoy our scenic wilderness areas, but still would like to keep warm in winter? Or might the energy reserves now off limits in wilderness areas be thought as of a long-term conservation measure? Some day, when we need these resources more than today, they will be there waiting for future generations to extract, perhaps using far more efficient extraction and utilization methods than exist today. There are many considerations.

For all practical purposes though, we are now out of any meaningful energy cushions, not just in the U.S., but virtually throughout the world. I realize there are other important sources of energy out there: such resources as Wyoming's Green River oil shales (several trillion barrels of oil equivalent), the Athabasca tar sands, and, of course, North Dakota's vast lignite resource (measured in billions of tons of recoverable resource – we've barely "scratched the surface" of that, up to now). Other, currently less conventional, sources of energy include wind, solar, geothermal, and others. All of these hold promise.

Some of the energy resources I've mentioned (oil shale, tar sands), while extensive, are going to be expensive

to produce, but it will happen given the right price. Others, (wind, solar, geothermal) have practical limitations, although, taken in total, they have the potential to help solve much of our problem.

I was in Iceland this past summer. That country is planning a massive switch to hydrogen as a fuel. They hope to change over to a "hydrogen economy" over the next 30 years. To do that – to manufacture the hydrogen – they will need to consume huge amounts of geothermal and hydroelectric energy, both of which Iceland has in abundance. It will be an interesting experiment to watch. We might be able to do something similar in North Dakota, using our own renewable energy source – wind energy – to make hydrogen.

North Dakota's lignite offers one of the most promising solutions to the problem, at least in this region. Here is a bright, home-grown spot in the electricity-generating area. Plans are well underway for construction of a new lignite-fired, electric generating plant in western North Dakota. Dubbed the Lignite Vision 21 Project, this is an example of the kind of thing that needs to be done. A new generating plant will combine the latest environmental and generation technologies to provide cleaner, more affordable electricity. Successful completion of this new, environmentally-friendly, state-of-the-art plant will show the value of North Dakota's huge lignite resource and provide the region with the electrical energy we need to keep warm during our cold winters.