America's Perfect Energy Storm

*By Douglas B. Reynolds**

The U.S. Congress, as of this writing, is debating another energy bill and may even have passed it as of this publication; unfortunately probably without ANWR, but fortunately probably with tax credits for an Alaskan natural gas pipeline. I believe these tax credits are in North America's best interest. In my new book, *Alaskan and North Slope Natural Gas* (2003), I explain my reasoning.

In the early 1960's, M. King Hubbert (1962) asserted based on current oil discovery trends that the U.S. Lower 48 oil production would peak in 1969. It actually peaked in 1970. Critics of Hubbert said three things. First they said that U.S. production would continue to increase due to technology. Second they said that oil alternatives such as oil shale would be on hand to substitute for oil. Finally they said that the Middle East and Soviet oil reserves were so vast that there would never be a problem with having enough oil for the U.S. to import. All three reasons proved untrue. Oil production declined, oil alternatives never became feasible, and OPEC used its market power to reduce Middle Eastern oil output. Plus the Soviet Union had its own oil crisis, (see Reynolds (2002a) *Scarcity and Growth Considering Oil and Energy*), a crisis that the U.S. itself is about to experience.

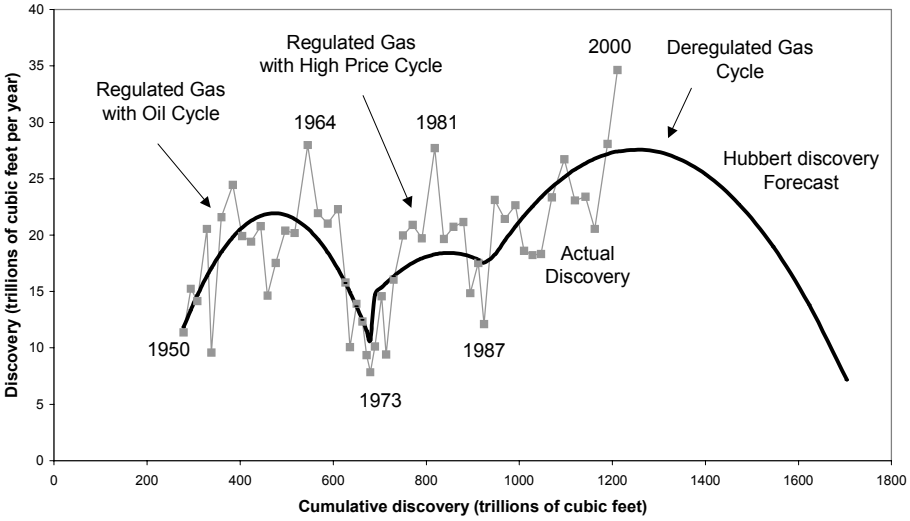
What no one predicted would happen and what actually did happen was that the world would go through two major recessions, with stagflation, trying to reduce the demand for oil and substitute into other already available energies such as coal, natural gas and nuclear power. The only real change was lifestyles. There were no new U.S. energy supplies, except those from Alaska, no radically new technologies, and no infinitely available crude oil from other regions.

Now North America has the same kind of problem as it had with oil but this time with natural gas. U.S. and Canadian natural gas supplies in the currently accessible areas in North America are about to hit the Hubbert peak. And when that happens a new round of radical market changes will hit North America with a possible sever recession and stagflation and with difficult substitutions into existing but less useful technologies. How can we be certain? We simply follow the road that Hubbert laid out.

First how did Hubbert come to his conclusions over oil? He looked at available data on proven oil reserve changes over the years. Hubbert, unlike Cleveland and Kaufman (1997), did not reinterpret oil data or analyze how the data came about. He simply used the data as is. He defined net increases in proven reserves plus production as discoveries and statistically quantified the chronological pattern. Reynolds (2002b) did the same only with a cumulative production pattern. One other idea that Hubbert suggested was that there could be multiple cycles.

If we do what Hubbert did for oil, only do it for natural gas, it is clear the same type of Hubbert pattern is emerging. First take the natural gas discovery data as it is, and second look for a pattern. I did this and it is clear that a pattern of three distinct Hubbert cycles has emerged. Figure 1 shows just such a multiple Hubbert curve for natural gas for the U.S. lower 48 states and southern Canada using a cumulative discovery relationship. Note though that cumulative discovery, a quantity, is statistically independent of discoveries, a rate, and is, therefore, not an I(2) variable, i.e., not a twice integrated non-stationary series. In other words, the current instantaneous velocity of my car (the rate of miles per hour) does not affect the mile marker I am at (the quantity of miles), although the mile marker I am at can affect my velocity, if I am at a rough stretch of road.

Figure 1
U.S. Lower 48 and Southern Canadian Natural Gas Discovery and Forecast Discovery as a Function of Cumulative Discovery



Using econometric techniques, it is possible to see that there are three cycles that exist. These are: the early oil cycle where gas was discovered associated with oil and where the gas market was regulated, the second cycle where high natural gas prices, above a critical level, created a push for new discoveries within a regulated market, and finally a third cycle where deregulation of the gas industry helped discover new reserves. The final cycle started after 1985 when gas deregulation was getting started.

Many believe that future high gas prices will create a vast new Hubbert cycle within the current accessible gas regions as prices begin to go above a new critical level. However, early indications are not promising since high prices and higher rates of exploration are giving disappointing gas discovery results. Also high oil prices never did create a significant increase in Lower 48 oil production above Hubbert's original oil curve. It shows an extremely inelastic supply. See Reynolds (2002b).

This leads to one conclusion. The U.S. is headed for a sever natural gas shortage based on the Hubbert curve pattern

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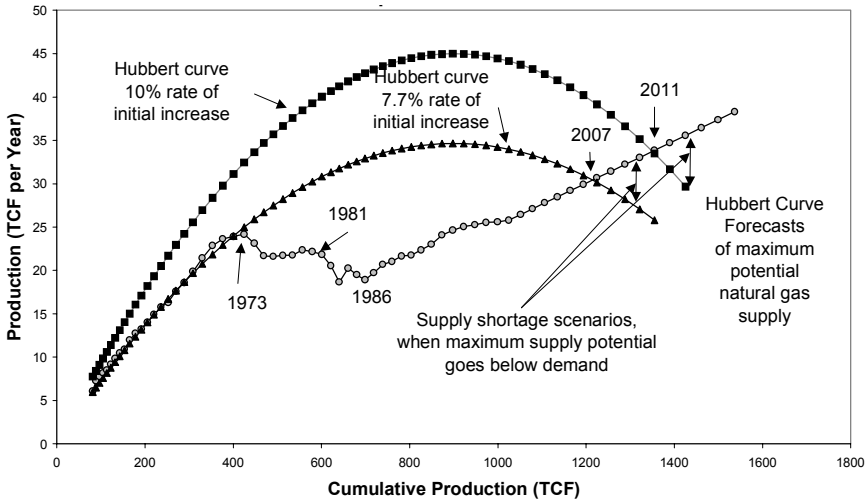
Figure 2
U.S. Lower 48 and Southern Canadian Natural Gas Production and Forecast Maximum Production as a Function of Cumulative Production



for natural gas discoveries. By using the natural gas discovery pattern, we can forecast ultimately recoverable reserves at around 1800 TCF and use that reserve base to forecast actual supplies. Figure 2 shows the gas supply forecast based on discoveries. The results show an imminent production decline. Without significant new supplies from outside the current region, this shortage will hit the U.S. swiftly.

Interestingly enough I have also heard that deep water gas exploration in the Gulf of Mexico may be disappointing owing to a peculiar problem of water seepage into the anticlines. In addition, the U.S. move to deregulate gas has in the short run increased supplies, but has also created greater volatility of prices. Volatility means risk, and risk reduces incentives for new infrastructure investment. So a gas shortage is a real problem. Deregulation of a capital intensive oligopolistic industry with immovable assets works well when the industry is expanding, but not when it is contracting.

On the other hand, other energy shortfalls will soon emerge. Oil too may be in short supply world wide owing to greater OPEC market power and OPEC's desire to preserve a precious resource for future generations. And there is a continuing lack of coal and nuclear power expansion due to environmental concerns. As oil, gas and conventional energy become in short supply either due to depletion or environmental concerns, the U.S. will move into a perfect energy storm. Gas and oil prices will shock upward. Alternative conventional energy supplies will not have expanded. Then the economy will move downward. Europe though should have less of a storm owing to its greater gas potential, but even there, gas supply problems could become a reality. See Banks (2003).

One solution is to get Alaskan and northern Canadian gas online as fast as possible. Congress can push this by giving tax incentives to an Alaskan gas pipeline. We already know we need the gas badly, now we need it quickly too. Unfortunately such a large project as a gas pipeline is very risky for companies which is why it behooves the entire U.S. to give incentives. The U.S. is at risk of a gas price shock. Therefore, the U.S. should help to reduce that risk by giving incentives.

But we are hearing a lot of opposition to giving tax incentives for a gas line because it is assumed that there will be plenty of gas or other alternatives and because of free market ideals. In fact, just like oil in the 1960's we are now paralleling what the arguments were with gas.

For oil in the 1960's, the argument was that technology would create plenty of new oil. But that didn't happen. Hubbert's forecast was right on the money. U.S. oil production declined even with higher prices and new technology. Now we hear that new technology will find plenty of new natural gas reserves. But what happened with oil is likely to happen with natural gas and the Hubbert curve will push supplies down.

In the 1960's, we heard that new alternative energy resources would come on line such as oil shale that would easily substitute for oil. But oil shale never panned out. Oil shale never became feasible even with government incentives. Now we hear that coal bed methane is going to save us, but so far large-scale production has been kept relative low and reserve production ratios for coal bed methane are often magnitudes higher than for conventional gas. Thus the claims of large methane reserves need to be modified by the reality of actual production output potentials.

In the 1960's we heard of vast oil reserves in the Middle East that could be available for U.S. consumption at pennies per barrel. But America failed to take account of OPEC's market power to increase prices and their desire to conserve a precious resource for future generations. So oil imports became more expensive than expected. Now there is talk of vast sources of LNG but the LNG exporters can collude and certainly will if they are at all interested in maximizing their revenue and preserving their valuable gas resources for future generations.

Today we hear that keeping free market competition without incentives is important to keep a level playing field for free trade. But within North America, energy prices are already high and will remain so, therefore, incentives will not affect other energy projects. Outside of North America there is not free trade and property rights of energy resources, and so this justifies tax incentives within North America.

Another problem with LNG and also with oil that is not widely understood is the risk averse nature of countries that control their own energy supplies. See Reynolds (2002a). Countries that control their oil and gas production through a single political entity or a host oil company are risk averse to exploration and development and, therefore, cannot expand production quickly or even expand it at all. Their hands are tied politically. They are so afraid to make a mistake that they generally move very slowly to expand their output. This means LNG will not be available nearly as quickly as we would like to think it will be. This is also a cause behind a new round of oil price shocks that could hit the world at any moment.

In order to try to increase gas supply sources and assure

(continued on page 29)