DEPLETION & U.S. ENERGY POLICY

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I am honored to participate in this unique program and I commend the Swedish government, Uppsala University and the program sponsors for taking the issue of oil depletion and energy reliability seriously. I also applaud Professor Aleklett and Dr. Colin Campbell for assembling some of the world's experts to address this topic.

Before discussing how the role of oil and natural gas depletion has already impacted U.S. energy policy, I thought it might be useful to share with you how I first became interested in the topic of depletion and how my learning evolved over the course of the past 15 years.

I am not an oil and gas person. I am an investment banker who accidentally ended up spending the past 30-years engaged in energy-related investment banking. When I was growing up, I assumed that I would one day assume my father's role and run Zion's Bank in Salt Lake City, Utah, which is now the largest independent commercial bank west of the Mississippi River. Even after I graduated from Harvard Business School, I still considered energy simply as something you put into a gasoline tank.

About 33 years ago, purely by accident, I began my investment-banking career in the energy industry. This happened because I met one of the true visionaries of offshore

oil, Lad Handelman, at a merger and acquisition seminar in Palm Springs, California. In March 1969, Laddie would become the modern-day equivalent of the Wright Brothers to offshore oil. I was remarkably lucky!

In May 1974, in the aftermath of the 1973 Arab Embargo, I moved from Boston to Houston to found Simmons & Company, an investment bank that would end up specializing exclusively in the energy field. For the next 20 years, our firm's exclusive focus was on the oil service and petroleum equipment industry. While the group sounded inconsequential to most energy experts, it included the myriad of companies involved in providing the services and producing the equipment to find oil and gas, install the complex hardware to extract it from the ground and convert it into usable energy.

About eight years ago, our firm began shifting our investment banking focus towards the entire energy field. Today, the firm's 130 employees are the most specialized energy investment-banking group in the world.

My energy knowledge comes despite ever taking a single course on petroleum geology or petroleum engineering. I am also not a mathematician or an energy economist. But, I do love numbers and numerical analysis. (In fact, I almost decided to stay on the faculty at Harvard Business School and become a teacher.) This love of genuine analysis and a growing passion for how important and little understood energy is, even in Houston, Texas, the energy capital of the U.S., has led me on a life-long learning

experience about all aspects of energy Where it comes from, how we convert inert energy into useable energy, why it is used, what drives each form of energy demand and a heavy emphasis on the physical mechanics involved in extracting oil and gas from the ground.

For years, my energy analysis was aimed at merely understanding how the economics of the oil service industry worked and how this operating arm of the oil and gas business is influenced by the broader issues impacting oil and gas. I relied heavily on the conventional wisdom of a relatively small group of energy experts to form my general sense of the macro-energy picture. (I later began to understand that most widely-published energy experts have some knowledge about oil, but know very little about its hydrocarbon twin, natural gas, and even less about electricity, which makes up the other 40% of the total energy picture.)

In 1989, I attended an important energy roundtable that focused on the next 10 years for U.S. oil and gas. The program's moderator outlined a compilation of statistics from various world-class energy forecasters for the future of oil and gas. The statistics indicated the U.S. rig count would stay at 900 to 1,000 rigs at work. But, the forecasts also assumed that U.S. oil production would slowly rise from about 8.2 million barrels per day to over 10 million by the year 2000.

This was one of the first times I paid close attention to long-term oil supply numbers. I was stunned at what they implied. Being a rig expert, I was aware that the U.S. rig

count had fallen on hard times. While having 900 to 1,000 rigs at work was beginning to seem normal, if you took the average rig count from 1946 through 1986, it averaged 2,000 rigs at work.

If the experts were right, and oil production could climb back to the peak levels seen when over 4,000 rigs were “turning to the right”, then this might prove that we really never needed so many wells drilled in the first place.

I subsequently launched into a detailed analysis of the relationship between rigs at work and reserves added per rig in the U.S. To do this correctly, you must add oil and gas together. It is also necessary to exclude the enormous impact the discovery of Alaskan oil had on the U.S. When these adjustments were made, it turned out that there was a very close correlation between rigs at work and reserves added.

This led me to question why people were so certain production would rise. The more people I asked, the fewer sound answers I received. Not a single soul produced a sensible, detailed answer other than, “it must be right because a lot of smart people have compiled these numbers.”

I soon began speaking out on the serious issues this poor analysis raised and the genuine risk that U.S. oil production would soon fall from its 8 plus million barrels per day base, unless a new drilling boom began. Since 80% of the rigs at the time were drilling for oil, I never focussed on natural gas.

A few years later, in 1995, I was preparing a talk on the importance of the North Sea and its future outlook. To complete this analysis, I pulled together the excellent field-by-field production data in both the U.K. and Norwegian sectors of the North Sea. After I got these field-by-field numbers laid out, I was stunned at how far the daily production of giant fields like Brent and Forties had fallen. I was also very surprised to see how long it had been since any really large fields (in terms of daily production) were last discovered.

The conclusion I derived from this analysis was that the North Sea would soon reach its peak. But this was in stark contrast to the conventional wisdom at the time. Most published North Sea production forecasts simply took all the new fields projected to come on-stream and added these volumes to a flat production base. I began to finally grasp that all these supply experts were forgetting about depletion! The base rarely stays flat unless it is a giant oilfield, still being "choked back" to preserve reservoir pressure.

My next big educational "breakthrough" on the power of depletion occurred at the end of 1996 when the IEA issued a major publication entitled "Global Oil Offshore Oil Prospects through 2000". I spent my entire Christmas holidays in Maine carefully studying the extensive and detailed offshore analysis contained in this volume. David Knapp, then editor of the IEA's important Oil Monthly Report, had single-handedly authored this book. He did a masterful job of assembling data on the 147 largest

offshore oilfields in the world. The book contained production statistics for a large number of these fields from 1990 through 1995. For the first time, I saw what the real decline rates were for not only in the North Sea fields, but for offshore fields around almost all parts of the world, which accounted for over 60% of the world's new oil supplies added over the past 40 years. I can honestly say that I was a pronounced critic of David Knapp for several years, but he laboriously produced one of the benchmark supply studies of the past three decades, even though its major conclusions were wrong. Today, David Knapp and I have become quite good friends.

While this IEA publication predicted that offshore oil would grow by 6.5 million barrels per day between 1995 and 2000 (an event that never occurred) it carefully laid out the assumptions for this forecast in remarkable detail. It was the first time I began to realize that a wide group of supposed energy experts were assuming the new generation of oil service technology had facilitated enormously our ability to add supplies and also "reversed the age old decline curve."

Since our firm's investment banking client base created most of this oilfield technology, I knew this was not true. All this technology did was create the ability to drain fields faster and create far higher decline rates once new fields peaked. By carefully digesting the IEA's offshore supply book, I once again received more accidental exposure to the issue of production declines in many large fields, and how increasingly difficult it was becoming to add enough new fields to merely keep daily production flat.

About a year later, I finally read Colin Campbell's excellent book on the pending end of cheap oil. His discussion of blowout depletion and what the industry does to stem this phenomenon taught me even more about this important and largely ignored topic.

Soon, I began using a series of hand-drawn slides about depletion, its growing fury, how little the world knows about actual decline rates in specific fields, how hard it is to track historical decline rates, let alone project future rates. I also began constantly reminding supply forecasters that it was becoming impossible to do any serious supply forecast unless you had a clear sense of how fast the existing base in each forecasted area was declining.

The more I began speaking on this issue, I found, to my great surprise, how little even key industry players knew about the whole depletion topic. I spoke to groups like the worldwide board of the Society of Petroleum Engineers, the world's largest professional energy association, to numerous energy workshops ranging from the U.S. Department of Energy (DOE), to forums of the American Petroleum Institute (API) and the International Energy Agency (IEA.) Time after time, I found myself explaining the basics of depletion to people who should have been instructing me about this topic

One of the slides I have used over 100 times illustrates the projected growth in oil demand and the added amount of oil that needs to be on-stream by 2010 to meet a decline rate in the existing base. The first few times I used this graph, I plugged in an annual decline rate of 3%, which I simply concocted for lack of any real knowledge of

the blended global rate. I now use 10%, but I suspect this will be too low. Last fall, for the first time in its history, the International Energy Agency published a similar table illustrating their projected demand growth for 75 to 96 million barrels a day between 1999 and 2010 and then noted that a total of 60 million barrels of new discoveries would be needed by 2010 if the dotted line of depletion was merely 5% per year.

Every time I have raised this subject, not a soul has been able to produce evidence that the depletion issue is not real, nor have I had anyone at anytime layout a credible way that the world could actually add so much added supply within such a short period of time.

One of the things that most troubles me about all this is that I should not have been one of the few people around the globe raising such a crucial issue for the long-term health of the U.S. economy, let alone the rest of the world.

I have also watched, with amazement, the constant whining and complaining of too many world-class energy experts who loudly dispute the excellent work being done by people like Colin Campbell and Jean Laherrere, without a scrap of factual data to support their opposing views. It would be wonderful if some of these wildly optimistic energy economists' views were right. Sadly, there is no factual data to support their "sense" that the world will be awash in cheap oil and gas forever.

I have studied the depletion issue intensely for too long now to have any remaining doubts as to the severity of the issue. But I am still amazed at the limited knowledge that exists, even in the U.S. or within our major oil and gas company's senior management about this topic and its dire consequences.

The U.S. is the one country in the world that should fully understand the topic of oil depletion. After all, we have already experienced the full brunt of what happens when an oil basin begins an irreversible decline. The U.S. also has by far the most accurate and best energy statistics than any country in the world. Moreover, a very large part of our daily oil and gas supply is produced by publicly held companies who are required by law to report on a quarterly basis the amount of oil and gas they produce. Yet there is still only a limited understanding at the highest levels of both public policy energy planners and the CEO's of our major energy companies about the severity of this depletion issue problem.

While reports that the world was going to run out of oil have been circulated throughout the industry even since Col. Drake first discovered oil, the first time a serious energy scientist produced a major report with detailed numbers and dates predicting the peaking of an important oil province occurred in 1956 when M. King Hubbert published his highly controversial report predicting that the U.S. would peak as the world's largest oil producer in the early 1970's. Ken Deffeyes, Professor Emeritus at Princeton, who worked with Dr. Hubbert at Shell Oil Company's research company in the 1950s, recently published an excellent book on Hubbert's Peak detailing this remarkable work.

By 1970, this Hubbert Peak theory had been so severely criticized and widely discredited that only a handful of passionate fans of Dr. Hubbert even remembered his prediction. I have personally studied the best energy literature available from 1969 through 1973 and there is no mention anywhere that anyone understood that U.S. oil production was finally peaking in 1970, exactly as King Hubbert predicted in 1956.

The U.S. peaked at a daily production of about 9.6 million barrels per day. A decade later, this base had fallen to 6.9 million barrels per day, despite a drilling boom that produced 4 times more oil wells each year.

When Canada's oil production is added to and viewed as a North American picture, one can see that Canada also reached peak production in 1973. Today, Western Canada's oil output is only half of what it was when it peaked.

Today, the U.S. base has dropped to about 3.4 million barrels per day, down from 1970's record 9.6 barrels per day production. This excludes Alaskan and deepwater oil, as neither had anything to do with the U.S. lower 48 and Gulf of Mexico shelf. This is the reason the U.S. currently imports almost 60% of the daily petroleum we use. Depletion was real and our production did peak. This was not some fuzzy concept by a Cassandra. It was a serious study. Yet, almost everyone failed to take notice until it was too late to do any alternative energy planning.

The U.S. experience is also a classic example of what depletion is all about. We have not run out of oil. The U.S. is still the third largest oil producer in the world. We still drill more oil wells each year than any other country in the world. But, our core production has fallen by almost 65% over the course of a mere 30 years.

How does this relate to current U.S. energy policy? And, what should the U.S. energy policy be to properly address this important energy issue?

Just a year ago last week, the Bush Administration unveiled a comprehensive energy policy to address the energy crisis that was descending on our U.S. economy like an insidious virus. The policy was highly controversial and widely misunderstood. Too often, the Bush Energy Plan was described by its critics as being a "one pony show" which endorsed drilling in the Alaskan Wildlife Reserve and doled out goodies for President Bush's oil buddies and not much else. This charge is preposterous and untrue.

In fact, the Bush Energy Plan was the most comprehensive outline for how America must address its future energy needs than ever tabled by any U.S. administration. The plan devoted almost as many pages to the need to increase alternative energy sources like wind and fuel cells as it did for the need to protect the supply of oil and gas. It called for a giant amount of new power plants to be built so the American economy can continue to grow, and also start replacing the antiquated and extremely inefficient, highly polluting power plants that still anchor America's economy. The plan called for

America to begin addressing the need for a return to more nuclear energy and clean coal. What underpinned this startling call to return to what so many people think is ugly, dirty and dangerous energy was not a "payback" to the coal and nuclear energy business, but rather a sad and genuine recognition that America had "bet the ranch" on an abundant and ever-growing supply of natural gas to fuel the incremental electricity needs of the world's largest economy. This bet would have worked and been great for our economy and the environment had depletion for natural gas not been so real.

So, the Bush Administration's U.S. Energy Plan actually addressed the issue of depletion for the first time in U.S. history by turning away from the heavy dependence that our country created during the 1990s on natural gas.

Why was their concern for natural gas so high? It stemmed from the simple fact that President Bush and Vice President Cheney were both staggered to watch a drilling boom for natural gas occur as gas prices spiraled from $3 to over $10 per mcf and to then see that this unprecedented drilling boom merely kept the daily supply of natural gas flat. Despite the fact that gas well completions grew from 10,000 wells completed in 1999 to over 22,000 wells completed in 2001, daily supply did not grow. It stayed as flat as it had been for the previous seven years.

There is still widespread skepticism about the Bush Energy Plan. Too many critics think the plan was solely about supply, when America has no reason to be concerned about supply, and too little about energy conservation and alternate forms of energy.

The supply concerns embedded in the Bush Energy Plan are not only real, they are probably also understated since so much has happened over the course of a single year that now raises supply concerns, particularly for natural gas, to a much higher plane. And, despite many plans to accelerate the adoption of better energy-efficiency and R&D funds to push forward hydrogen, wind and other new forms of energy, none of these new energy sources can grow fast enough to be a real alternative to oil OR natural gas even by 2020.

Issues which rarely get discussed today are America's energy needs, let alone the world's energy needs and how much energy is consumed today, let alone in the future, and the amount of energy it takes to merely convert non-conventional energy into useable modern energy.

On Monday, May 20th, the Wall Street Journal published an editorial entitled "More Corn Pone." It dealt with ethanol, a popular "alternative and renewable energy" source to allow Americans to drive cars. The editorial pointed out that it takes 70% more energy to create the corn to produce ethanol than the gasoline equivalent that ethanol creates as a "renewable substitute for oil!"

Earlier I remarked on the serious issues facing natural gas. Let me end my remarks by sharing my serious concerns on the supply of U.S. natural gas. A few minutes ago I mentioned our gas-related drilling boom. It was real and it also came to an end last

August when gas prices collapsed. By the bottom of its collapse, gas drilling had fallen by 45%. Most gas analysts and many industry executives think that gas supplies will fall by 2% to 4% this year, even though gas drilling fell by 45%. They are making the classic mistake of, once again, misunderstanding depletion, which caused the supply flatness in the first place, despite a drilling boom.

Our firm has just completed an incredibly intensive supply analysis on 53 counties in the state of Texas. These 53 counties represent 66% of Texas' gas supply. Texas represents 31% of total U.S. daily gas supply. Based on this study, I fear that U.S. natural gas supplies could fall as much as 10% in as little as six months from now. The drop could be close to double this amount by the time it bottoms.

If this happens, it will jolt the U.S. economy far worse than the 1973 Oil Embargo. And unfortunately, there is no quick fix to this supply crisis. America's electricity grid is highly dependent on an abundant supply of natural gas that must grow by 35% over the next 8 years.

If gas supplies drop by even 5%, there is a good chance that the industry will not be able to get supplies back to the flat levels we enjoyed for the past 8 years.

I fear that 5 to 10 years from now, historians might look back and discover that natural gas in 2002 finally experienced the same fate as U.S. oil did 32 years earlier. If King

Hubbert was still alive, he might well be publishing a new study showing that his Hubbert Peak was now occurring in North American natural gas.

How this shapes America's future and the unforeseen consequences of natural gas supply collapsing will be a watershed event in U.S. history. If the U.S. cannot grow its electricity demand through a lack of ample natural gas, it is hard to see how our economy can grow. If the U.S. economy is curtailed because of a scarcity of energy growth, this puts some severe pressure on many other economies of the world too.

The key energy issue for the U.S. and for the world is depletion. The decline curve of existing oil and gas supply is creating a vicious treadmill that needs an increasing number of wells to be drilled, not to grow supplies but to simply keep the base flat. There is a vast gulf about this whole depletion issue. But, some progress is finally being made on connecting the dots.

I again commend all the sponsors of this program for implementing a serious discussion about this serious issue. We are late in the game but it is better to start late than not at all.

Professor Deffeyes, who wrote *Hubbert's Peak: The Impending World Oil Shortage*, and I are now collaborating on an updated report as a follow-up to the white paper I wrote last fall entitled The World's Giant Oilfields. This summer, the IFP, the Center for Strategic International Studies (CSIS) and our firm will begin an 18-month intensive

analysis on the Middle East's giant oilfields. Collectively, we will attempt to determine which fields have peaked and the costs to cope with finding the new generation of smaller fields to begin replacing the cheap oil which has fed the world with abundant energy for so long now.

Small steps are being made. Will it be too little too late? Only time will tell.