



Cascade Investment Commentary

This edition of Commentary marks our fifth anniversary as an Independent Investment Counsel. We have delivered 1st Quartile performance to our clients over this period and we hope to continue to do so. This edition is longer than normal and in places more technical. Energy is the major theme in your portfolio and this explains why.

Ross Perot in a now famous campaign speech talked about “a giant sucking sound”. He got it half right: it turned out not to be jobs moving to Mexico, but China importing vast quantities of the world’s natural resources. The price of natural resources was the main story of the 1st quarter of 2004. We believe that it will be **the** very big story for some time to come.

In January, the California pension fund (Calpers) led a revolt to oust Sir Phillip Watts, the Chairman of Shell Oil for his honesty in restating lower some of Shell’s **Proved Undeveloped Reserves**. This is an under-reported story, and for clients of Cascade, a very important one. As Cascade’s long term performance has been substantially enhanced by investments in energy, we thought this Commentary was a good time for an in-depth review of our views and opinions.

Oil is created when organic matter (leaves, plankton, fish, etc.) falls into an oxygen depleted pool of water, is subsequently covered with sediment, and later compressed by the weight of increasing layers of sediment. As the organic matter is compressed at a depth of 7,500 to 15,000 feet it becomes oil. Below 15,000 feet the heat of the earth boils it into natural gas. What seals the oil or gas deposit subsequent to formation is critical.

If salt or gypsum from evaporating seas later provides an impervious cap or seal on the oil pool, it will lie peacefully in wait for discovery and exploitation. If nothing covers it, the lighter molecules will bubble up and evaporate.

There are two schools of thought regarding the total supply of oil and gas: the Naturalist School and the Economic School. The Economic School of thought (referred to by many geologists as “flat-earth economists”) insist that there is almost an infinite amount of oil to be recovered if one spends enough money to find it. This attitude is articulated by Professor M.A. Adelman of the MIT School of Economics:

“Minerals are inexhaustible and will never be depleted. A stream of investment creates additions to proved reserves from a very large in-ground inventory. The reserves are constantly being renewed as they are extracted.....How much was in the ground at the start and how much will be left at the end are unknowable and irrelevant”.

The Naturalists ask the following questions: how much was found, and when was it found? We confess to a naturalist leaning (being value investors), and we go further to ask:

- How much has been produced to date (**Cumulative Production**);
- How much remains to be produced from known fields (**Reserves**);
- How much will be produced from new fields (**Yet-to-Find**);

The sum of these three results in a total endowment (**Ultimate Recovery**).

While the oil industry has a wealth of statistics and information much of it is imprecise. The consequence of acting on faulty or poor data can be very expensive. With political as well as financial stakes so high one could hardly blame the principal players for purposeful obfuscation. No less than our U.S. Geological Service has produced “junk science” that states that we should find 25 billion barrels (25 Gb) of new oil each year forever, despite recent evidence of only 10Gb being found and falling. The last major oil find was in Brazil in 1985, even will all major companies looking.

This concern is not new, but we believe it will shortly become popular conversation as gas and oil prices rise to shocking new levels.

We would like to introduce two phrases not yet used much in the popular press, but soon destined to get there: Hubbert's Peak and Peak Oil. Marion King Hubbert (1903-1989) was an American geophysicist who worked for the Shell research lab in Houston, and later with the U.S. Geological Survey. He famously stated the obvious "oil has to be found before it can be produced", and wrote that over the long term production must follow discovery. In 1956 he drew a bell shaped curve predicting that the total supply of U.S. oil was 200 billion barrels and that peak production would be achieved in the early 1970's. By the same method he estimated total world reserves to be 1.8 trillion barrels with a peak production year of 2001.

Various studies have moved the number to as much as 2.1 trillion with a peak between 2005 and 2010, but the past 10 years of production lie almost exactly on Hubbert's original curve. In 1956 he was, of course laughed at. The laughing stopped when in retrospect it became clear that U.S. production in fact peaked in 1971. Exxon has admitted that world discovery of new oil peaked in 1964. "Hubbert's Peak" has become a noun and is applied to every oil producing country *and* to the world at large.

World	Estimated Hydrocarbon Production				Gb	Peak Date
	Annual Rate -Regular					
Mb/day	2005	2010	2020	2050	Total	
US	3.6	2.6	1.4	0.2	195	1971
Europe	5	3.6	1.8	0.3	75	2000
Russia	9.1	10	5.5	0.9	210	1987
ME Gulf	19	19	16	9	650	2012
Other	27	24	18	8	670	2005
Total World	63	58	43	19	1800	2005
	Annual Rate- Other					
Heavy Oil	2.6	3	4	6	300	~
Deepwater	5.6	8	4	0	60	2009
Polar	0.9	1	2	0	60	2030
Gas Liquids	8.2	9	11	6	400	2027
All	80.3	81	64	32	2700	2012

The above chart represents a model for total world oil recovery. Note that despite 50 years of technological advancement, surveying the planet with seismology and satellites, Hubbert's 1956 estimate of 1800 billion barrels of oil as the total endowment of regular or conventional oil (cheap to produce) has not been successfully challenged. "Other" refers to tar sands and very expensive to recover oil.

Conventional Oil			
Billion Barrels (Gb)	World	Persian Gulf	Russia
Produced-to-date	875	225 (26%)	120 (14%)
Reserves	900	500 (53%)	70 (8%)
Yet-to-find	150	40 (29%)	15 (10%)

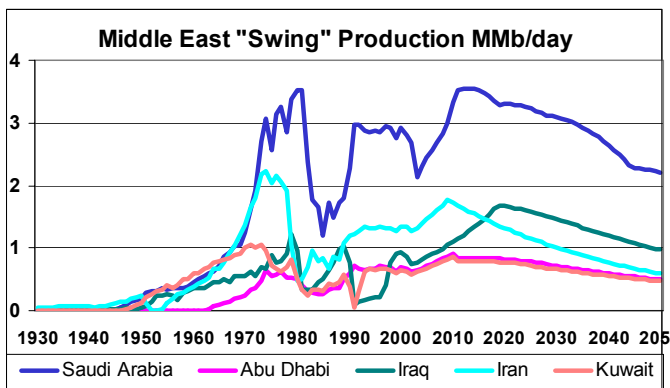
Colin J. Campbell has recently summarized the easy and cheap (conventional) oil situation above. This is an optimistic scenario in which he assumes 1900 billion barrels of oil, all recoverable at some price. The model asks us to believe official statistics from OPEC and Russia; countries not well known for truthfulness. To us the revisions are spurious and all of the Middle East data are suspect.

OPEC Stated Reserves Gb								
	Abu Dhabi		Iran	Iraq	Kuwait	Neutral Zone	Saudi Arabia	Venezuela
1980	28.0	1.4	58.0	31.0	65.4	6.1	163.4	17.9
1981	29.0	1.4	57.5	30.0	65.9	6.0	165.0	18.0
1982	30.6	1.3	57.0	<u>29.7</u>	64.5	5.9	164.6	20.3
1983	30.5	1.4	55.3	41.0	64.2	5.7	162.4	21.5
1984	30.4	1.4	51.0	43.0	<u>63.9</u>	5.6	166.0	24.9
1985	30.5	1.4	48.5	44.5	90.0	5.4	169.0	25.9
1986	30.0	1.4	47.9	44.1	89.8	5.4	168.8	25.6
1987	<u>31.0</u>	1.4	48.8	47.1	91.9	5.3	166.6	25.0
1988	92.2	4.0	92.9	100.0	91.9	5.2	167.0	56.3
1989	92.2	4.0	92.9	100.0	91.9	5.2	<u>170.0</u>	58.1
1990	92.2	4.0	92.9	100.0	91.9	5.0	257.5	59.1
1991	92.2	4.0	92.9	100.0	94.5	5.0	257.5	59.1
1992	92.2	4.0	92.9	100.0	94.0	5.0	257.9	62.7
1993	92.2	4.0	92.9	100.0	94.0	5.0	258.7	63.3
1994	92.2	4.3	89.3	100.0	94.0	5.0	258.7	64.5
1995	92.2	4.3	88.2	<u>100.0</u>	94.0	5.0	258.7	64.9
1996	92.2	4.0	93.0	<u>112.0</u>	94.0	5.0	259.0	64.9
1997	92.2	4.0	93.0	112.5	94.0	5.0	259.0	71.7
1998	92.2	4.0	89.7	112.5	94.0	5.0	259.0	72.6
1999	92.2	4.0	89.7	112.5	94.0	5.0	261.0	72.6
2000	92.2	4.0	89.7	112.5	94.0	5.0	259.2	76.9
2001	92.2	4.0	89.7	112.5	94.0	5.0	259.3	77.7
2002	92.2	4.0	89.7	112.5	94.0	5.0	259.3	77.8

We have underlined major changes in reported reserves, none of which have been supported by reported discovery of new oil, and have underlined the dates of change. It is probable that the numbers were too low before these countries expropriated the fields from private companies, but we guess these numbers are a result of OPEC Quota considerations. Some have argued that these reports are the total discovered amounts (also known as **Original Reserves**) and not the **Remaining Reserves**.

Since the late 1980's approximately 140 Gb have been produced by OPEC. This is about a 34% decline from their Total Discovered. As these companies are state owned, oil field maintenance and discovery funds come from their nation's general operating budgets. The Saudis, Iranians and Iraqis are large net debtors, and there is ample evidence of deferred maintenance in their oil fields.

Cascade suspects that the recent OPEC move to lower its output by 1 million barrels a day is really an admission that they are currently pumping at full capacity, and to increase production levels from here would require capital investments they are not prepared to make for social and political reasons. The consequence of this is very important: it foretells the end of the Middle East as the "Swing Producer" to stabilize prices.



In the graphic above we chart the future contribution of several OPEC Countries in the ASPO Oil Depletion Model. Abu Dhabi, Iran and Kuwait are all in terminal decline before 2010, the big factor is a "ramp up" of Saudi production starting in 2003. That increase in production is totally suspect to us. In February, Matt Simmons, the Houston Investment Banker confronted Saudi Aramco about the accuracy of their reported reserves. The Saudis responded by claiming they could sustain production of 10-15 Mb/d until 2054. This seems to simply take the remaining (overstated) reserves and divide by 50, ignoring natural depletion.

The biggest oil field in the world is the Ghawar field in Saudi Arabia. It was discovered before WWII but not developed until 1948. It was managed by Chevron until nationalized in 1975. At that time Chevron claimed it held 60 Gb, of which 12.5 had been produced, leaving 48 Gb. Private firms have traditionally underreported reserves by about 30% in large fields because it is very expensive to get the last drop of oil out. **Proved Reserves** is an economic term denoting profitable production. Suppose this is so in Saudi Arabia. When Chevron left there were really 80Gb left in the field. We know that at the end of 2003 57Gb had been produced, leaving only 27 Gb.

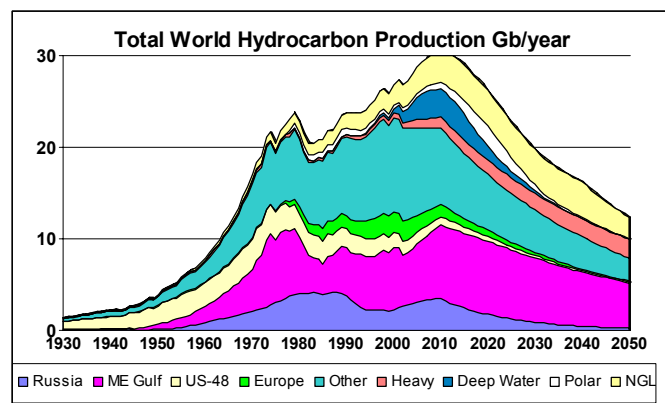
Reports say the field is now producing only 2.5 Gb/year, and is down slightly in recent years. Aramco has reported that it is using multiple branched horizontal wells in Ghawar to hold production as high as possible at the expense of accelerating depletion. One analyst considers the field 70% depleted, and with the method of current extraction (massive water injection below a floating tar barrier) it is likely that the field will die suddenly when the water level reaches the oil lifters.

There are only 15 producing fields in Saudi Arabia, and the 50 or so discoveries of the past 30 years have not had drilling appraisal. The potential in these discoveries have no proof, so if they are what the Saudi's claim, why are they going to such lengths to maintain production from their aging wells? The BP Statistical Review attributes reserves of 674 Gb to the big five Middle East producers. For us to say that it is more like 350 Gb is radical, but that is where the evidence leads.

This brings us to the concept of "Peak Oil". The western and now developing world has organized itself around hydrocarbons: oil as a transportation fuel, gas as a heating fuel, and coal the primary source of electricity. Many decision makers assume indefinite supplies of each, and there will always be a friendly "swing producer" that will supplement the acknowledged decline in known fields as new ones are added for a period of 10-15 years.

Worlds Largest Oilfields			
Country	Field Name	Date of Discovery	2000 Daily Production
Saudi Arabia	Ghawar	1948	4,500
Mexico	Cantarell	1976	1,211
Kuwait	Burgan	1938	1,200
China	Daquig	1959	1,108
Iraq	Kirkuk	1927	900
Iraq	Rumalia North	1958	700
Saudi Arabia	Abqaiq	1940	600
Saudi Arabia	Shayba	1975	600
U.S.A.	Prudhoe Bay	1968	550
China	Shengli	1962	547
Brazil	Marlim	1985	530
Iraq	Rumalia South	1953	500
Saudi Arabia	Safaniyah	1951	500
Saudi Arabia	Zuluf	1965	500
Abu Dhabi	Bu Hasa	1962	450
Abu Dhabi	Zakum - Lower	1963	400
Abu Dhabi	Zakum - Upper	1963	400
Saudi Arabia	Berri	1964	400
Russia	Samotlor	1961	320
Norway	Ekofisk	1971	310

That peaking period will allow the world to switch to electric cars, coal fired and nuclear electric plants, etc. That theory sounds great but what is missing from the Cascade data base is the still unasked question of what is the annual demand for oil and gas on the known reserves, and who exactly is going to be so cooperative during the period of "Peak Oil"?



The graphic above represents the ASPO forecast of hydrocarbon production under a base case scenario of flat average demand for conventional oil. We envision recurring price shocks and consequential recessions until 2010, when the Middle East swing producers are no longer able to offset the decline elsewhere.

Cascade believes that we are just about at the point where world oil demand is aligned with current production 79 Mb/d, or 29 Gb/y. We are probably at a point where the demand for transportation fuels will show some very inelastic qualities. This means that gasoline and diesel prices will show extreme volatility when consumers demand more than is physically available. Such a situation will precede the observance of the "Peak Oil" point, and will be met with howls from the public for governments everywhere to "do something".

While the exact timing of "Peak Oil" is based upon static analysis or flat rates of consumption, no one is consulting the Indians and the Chinese. Going back to the "giant sucking sound", there is no indication that domestic demand in China or India will slow down or even decelerate in the coming years as their middle classes swell. China has 120 automobile manufacturers eager to sell cars to expectant buyers. Further, while population demographics in Russia and Western Europe are in sharp decline, there is a Malthusian explosion on their borders in the North African Moslem countries, the Caucasus and Turkey. How will they react to the news that their perceived inheritance is gone?

According to the 2003 BP (British Petroleum) Statistical Review by 2020 there will be some countries which in 2004 were net exporters, but due to depletion will face major imports even if their current consumption of oil is flat. To name a few:

- China: imports rise to 70%
- United Kingdom: now exporting 50%, imports 60%
- Indonesia: now exports 20%, imports 45%
- Egypt: now exports 50%, imports 50%
- Malaysia: now exports 45% imports 45%

Eric Hoffer said that revolutions are born of rising expectations, not falling. If so, China with its standard of living rising on imported energy may become a very unstable country.

Could Col. Kadafi's new concern for a non-nuclear world be linked to the fact that Algeria's oil peak occurred in 1978, production has declined to 120 Mb/y and has no investment money to get the last oil out of the ground?

The world had its first modern energy crisis starting around 1550 and lasting until about 1700. As history predicts, one of the first responses was political. The crisis was the deforestation of England to heat homes, build ships, forge iron and to generally build an industrial society. The price of firewood in England rose 800% in the years between 1500 and 1650 against a general price rise of 300%. The fear that the Royal Navy would not have enough timber to build and maintain ships caused Queen Elizabeth to prohibit cutting in Crown forests except by special permit. Only the dire gloom of England falling into a dark pit economically and militarily caused them to start to burn coal.

America's first oil crisis (we had plenty of wood) started about the time of our industrial revolution: it was whale oil. Indians hunted for stranded whales for their food and oil before European settlers. The new Americans hunted them also, and the first sperm whale was killed in 1712 by accident, and the superior value of the oil was immediately apparent. In 1731 the price of sperm oil was 7 pounds sterling per ton, and by 1768 the price had risen to 17 pounds/ton. At the start of the Revolution it had reached 40 pounds/ton and all during this time there generally stable prices. The embargos of the British Navy of the American whaling fleet during the wars between the Revolution and the War of 1812 distort historical data, so we will skip to the end.

	Sperm Oil Production (barrels)	Whale Oil Production (Barrels)	Number of Whaling Vessels
1854	?	208,229	543
1856	80,941	197,890	635
1861	68,932	133,717	514
1866	36,663	74,302	263
1876	39,811	33,100	169

The price of sperm oil rose from \$.76/barrel in 1846 to \$1.20 in 1850, and by 1856 to \$1.62 for an increase of 80% in ten years (of price stability). By 1876 the whale population had been decimated, the price had risen another 143%.

American industrialism would have collapsed except that in 1853 George H. Bissell started selling petroleum for \$1.50 per barrel from seepage in on his Pennsylvania property, and in 1859 hired Edwin L. Drake to drill a water type well for his Seneca Oil Company, in Titusville Pennsylvania. We know what followed.

It is probably a safe bet that in a John F. Kerry presidency a policy of price control and government intervention will be attempted (as in the Roosevelt and Carter Administrations), and in a George Bush administration market forces will probably shock consumers into conservation. But this time it looks really different to us, and the only long term solution is innovation.

Schopenhauer said "Truth passes through three stages: first it is ridiculed; second it is opposed; and third it is accepted as self-evident." The issue of oil depletion is about to reach the final stage. Hubbert's Peak is either here now, or will be here very soon.

Mankind has been fighting over finite resources since Cain was a farmer and Abel was a shepherd. To not realize that there is an economic war brewing for them now, particularly in hydrocarbons, is to ignore history, physics, demographics and above all, reality. There is great pain for investors who ignore reality, and Cascade has always been a pain adverse firm.

The world has 2000 years of recorded problem solving whereby man has overcome what appeared, at the time to be impending economic doom. The thoughtful steward of public policy as well as the thoughtful investor should now be planning for the end of the hydrocarbon age. We foresee great profits in your portfolio by thoughtful preparation.

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