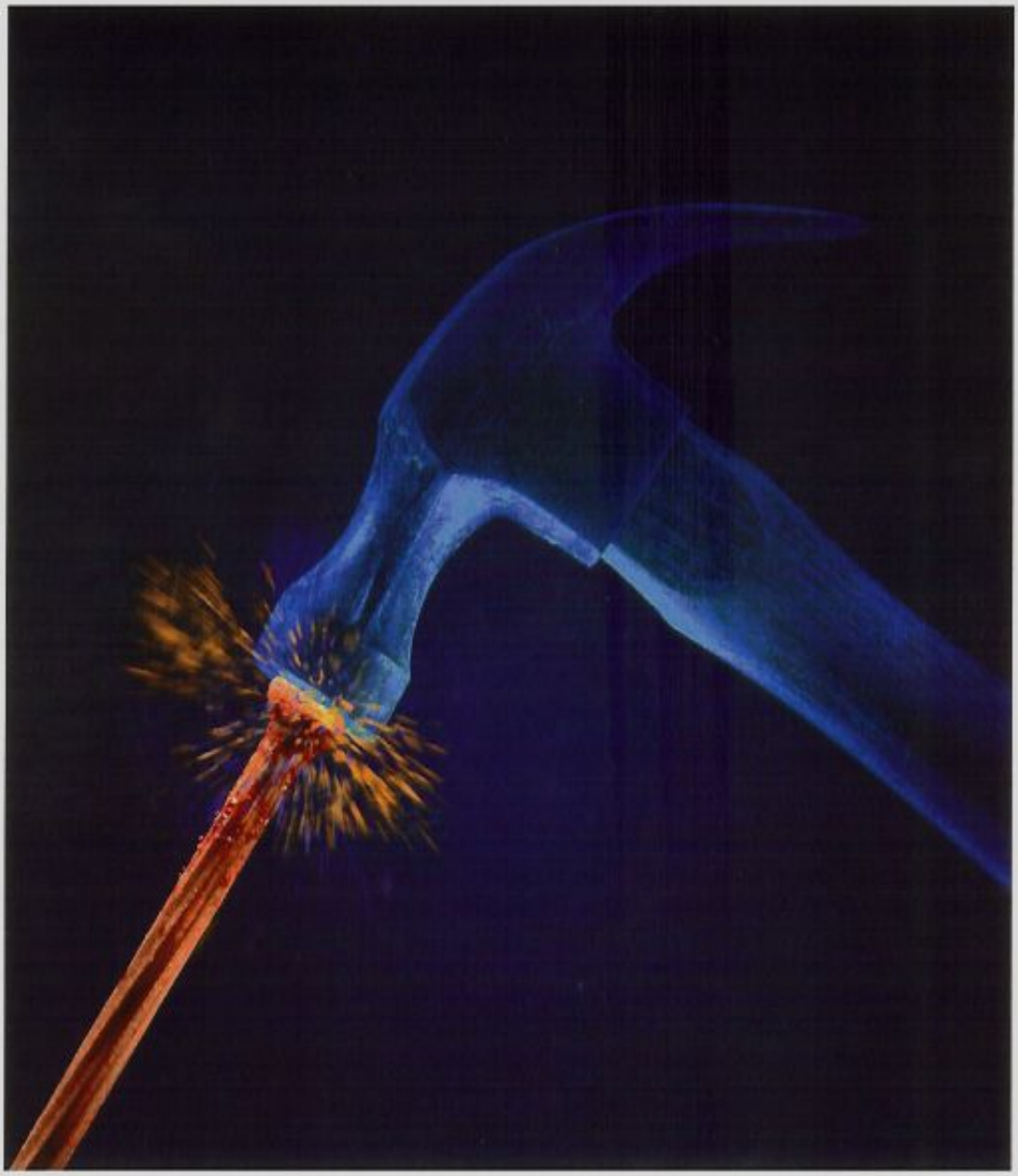

Another Nail in the Coffin of the Case Against Peak Oil

By

Matthew R. Simmons

Another Nail in the Coffin of the Case Against Peak Oil

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November 16, 2007

As oil prices rise, the debate about "Peak Oil" rages on. Optimists, who are still probably the majority of "oil pundits", argue "No.....at least not for decades." They base this belief on various widely-held convictions including the magnitude of the world's energy resource endowment, the ability of technology to recover greater amounts of oil once left behind, the lag time between high oil prices and ramped up drilling they stimulate, the remarkable amount of unconventional oil now commercial through high prices and unspecified "technology advancements."

These cheerful optimists also dismiss the fact that current oil prices having anything to do with tightening market fundamentals. Instead, they argue that today's crude prices are merely a by-product of a weak dollar, hedge fund speculation, geopolitical fears, downstream bottlenecks, the Iraq war, Nigerian political unrest and OPEC's thirst for high prices which keeps massive spare capacity shut-in.

This optimism is welcome news to those who fret that high oil prices will kill the economy, bring on a new oil boom which will quickly be followed by another savage bust, and to oil consumers who would far rather spend their discretionary funds on bottled water, a movie, sporting event or anything rather than paying a "ridiculous price" for motor gasoline and diesel. This latter sense of consumer

outrage is further fueled by an anger that this new "petro-wealth" is directly benefiting undeserving oil moguls in parts of the world we do not like.

While the views of the petro-optimists are well-documented, they are poorly supported from an analytical viewpoint – and exceedingly misguided.

By contrast, a litany of "best-in-class" facts are now starting to emerge which argue that not only is Peak Oil a real risk, but that the world might have already passed peak crude output in the spring of 2005.

As I have expressed over the past decade, the world's data on oil production, oil demand and oil inventories is exceedingly imprecise despite years of effort by groups like the International Energy Agency (IEA) and the U.S. Department of Energy's (DOE-EIA) to improve data quality. Notwithstanding the significant limitations of reported energy data, meaningful trends can be gleaned when digging deep into the raw numbers.

The best of the world's "raw numbers" on global crude oil production still comes from the U.S. DOE/EIA. Eighteen months ago, I began looking closely at the EIA's global crude oil and condensate production report summarized in the EIA's Monthly Energy Report (Table 11.1b) as it showed a peak in crude oil production in 2005. For almost a year, minor adjustments to the 2005 data were made. Over time, however, the facts point to the glaring and inconvenient reality that the May

2005 crude production represented an all-time high, even though it barely exceeded 74 million barrels a day – 74,298,000/day according to the EIA. April, May and December 2005 were the first three months in the 150-year history of oil when the world ever produced this much oil. In July 2006, global crude once more inched above the 74 million barrel a day high-water mark. No other monthly report before or since shows oil produced at or above the 74 million barrel per day mark.

As months passed, the EIA revisions ended through 2006 data. As we near the end of 2007, May 2005 is still the magical "moment in time" when global crude oil peaked at 74.3 million barrels a day. Some miracle series of new oil fields could suddenly be found and quickly brought on to production, but the more time that passes, the less likely this is.

In the meantime, world petroleum demand continues to grow and is projected to near or even top 88 million barrels per day over the next several months. In order to fill the gap between declining crude supply and growing total petroleum use, a number of non-sustainable oil sources are being tapped. Topping the list are natural gas liquids coming primarily from maturing oil fields. As reservoir pressures decline, these giant fields create gas caps. This wet gas needs to be processed but ends up as one of the highest value added fossil fuels.

No one, however, has ever suggested the world could suddenly satisfy its insatiable petroleum demand through a steady growth in natural gas liquids.

Hydrocarbon Processing Gains, the remarkable alchemy of inputting a barrel of crude into a refinery and getting more than a barrel of finished oil at the exiting end of the refinery gate is a secondary source of how we fill the crude to total petroleum gap. However, this is finite because as refineries age and few new ones get built, this source could start to shrink. Bio-fuels, synthetic oil, alcohol, et al, represent the final sliver in meeting the "gap" between petroleum use and crude oil produced. Slivers are hard to grow, however, in a world expecting to use one or two million additional barrels of oil a day than the preceding year.

Once these stop-gaps for filling the need for more petroleum are fully utilized, liquidating our vast pool of oil "stocks" or oil inventory is the only way demand growth can continue. The world's petroleum stocks are immense as they need to provide for all of the oil flow between wellheads to a relatively small number of refineries around the world and then onto the vast wholesale and retail network of outlets that supply the final petroleum consumer with ready-to-use supply.

Since liquidation of oil stocks looms as a key new supply of petroleum, a brief primer about oil stocks might be useful.

Petroleum stocks are a mystery to most oil industry observers. The EIA's Weekly Petroleum Stock Report now mesmerizes oil traders as if they were getting a glimpse into tomorrow's racing form. But few oil experts have ever spent sufficient

time grasping the complexities, the inherent inaccuracies and the useable limits embedded in the weekly reported "petroleum stock data."

The EIA system of measuring oil stocks was hurriedly invented as an aftermath of the 1973 Oil Shock. In haste, the decision was made to sample a group of "primary" holders of crude oil, gasoline, distillate, jet fuel, etc. "Primary" was deemed to be any owner of a "vat of petroleum" greater than 50,000 barrels. Everything else was deemed "secondary" stocks (i.e., inventories at the wholesaler level) or "tertiary stocks" (i.e., the ultimate consumer). The theory behind the design of this data collection system was that primary inventories were "measurable", while attempting to sample secondary, let alone tertiary stocks was essentially impossible. Thus, a decision was made to collect a sample of primary stocks and assume it represented a solid proxy for secondary and tertiary inventories, as well.

In order for the EIA to publish inventory stock reports, it asks a voluntary group of industry participants to report their weekly "primary" stocks. In theory, individuals around the country report, with seemingly remarkable precision, their measurement of "primary" oil stocks every Friday at 7:00 AM. This data is then summarized and electronically sent to the EIA over the ensuing couple of days. By the following Wednesday morning, the EIA's sample is grossed up to represent not just the remainder of non-sampled primary stocks but the entire domestic supply of oil stocks. The Wednesday EIA stock data, as imprecise as it might be, remains

the world's only real-time report of "what is left to use" of the world's most important natural resource, even though it is limited solely to the USA.

There has never been a government audit to see how many stock data reporters actually take a physical measurement. There is no penalty (or reward) for efficiently completing what one could argue is the world's most important glimpse into our country's fuel supply.

Most oil observers who glance through this detailed weekly U.S. oil inventory report then make the flawed assumption that it is a good proxy for global stocks, too. In fact, the quality of weekly oil stock data outside the USA is spotty and exceedingly erratic. Japan and Germany apparently have very high quality data collecting systems, but neither country has ever claimed to be better than the world's "gold standard" – the EIA, and no other country in the world issues "high quality" weekly reports. There is no reliable stock data for any country outside the IEA member countries other than Singapore. Thus the stock accounting system is "hazy" at best.

What is most misleading about these weekly inventory reports is that there is no way to distinguish between the supply required to keep our immense oil system flowing and the remaining cushion of useable oil. When the EIA reports that our system has 310 million barrels of crude stocks, this includes every barrel of oil that has entered the USA by tanker. It also includes all the oil that leaves the North

Slope of Alaska to slowly travel south to the West Coast refineries. All the crude in all our pipelines and the tank farms storing each segregated crude grade are part of this massive crude stock.

Finished product inventories are even more illusive. The USA now has about 170,000 individual gas stations spread throughout its 50 states. Each station has underground tank capacity of 2.0 to 3.0 days gasoline demand. The entire amount of semi-finished gasoline at our refineries and their blender components and all the pipelines, tanker trucks, rail cars and wholesale inventories are included in what are reported as "gasoline stocks." (In actuality, all that gets reported are "primary" stocks contained in excess of 50,000 barrels, in similar fashion to the reported crude stocks.)

One of the world's greatest oil mysteries is when oil stocks get close to "minimum operating levels." This is when no more cushion remains and is equivalent to the human body's 8 pints of blood.

As the world's crude supply slowly shrinks and "stock liquidation" becomes our biggest source of added supply, defining "min-op levels" is as critical as a motor car driver being able to see when his car's fuel gauge compresses into red alert and shows "empty". What the witless driver never knows (and I have been there too many times) is, "Do I have 3 miles before I run out or 25 miles?"

Sadly, the United States of America, the world's most advanced economy, has no fuel gauge of any sort to indicate when our useable spare supply of crude oil and finished products is nearing empty. And the stock data of the USA is the best published oil data of any country.

None of this would be alarming if Peak Oil was decades away. But, this is a fool's dream. The EIA data on global crude oil production is not perfect but it is far better than many of our largest public companies' audited reports.

Twenty-seven months after the EIA reported the record crude output of 74.3 million barrels per day in May 2005, the same report presently shows the world crude output at 72.5 million barrels a day. This number will likely be revised, but the fact that the gap between the all-time record (coincidentally set the month *Twilight in the Desert* was published) is now closing in on a shortfall of 2 million barrels a day, should be extremely alarming to anyone wanting to avoid a debilitating oil shock.

When one then digs into the underlying country-by-country crude oil production reports, the raw numbers tell an even more disturbing story. In the 27 months from May 2005 through August 2007, a handful of countries displayed commendable oil production growth. Angola led the list, followed by Azerbaijan and Russia. Collectively, they added 1.5 million barrels a day more oil, or approximately the equivalent to China and India's growth in energy use.

Leading the list of country production declines is the Kingdom of Saudi Arabia. According to their public remarks, this is simply "shut-in supply." But, there is not a scrap of evidence that this explanation has merit. In our view, this is simply a rather transparent rationalization for their inability to grow production.

The rest of the leading decliners are transportation oil producers who have clearly passed Peak Oil. Norway, the USA, Mexico and the UK have seen their collective production fall by almost 2.4 million barrels a day in just 27 months. Moreover, there is almost no possibility that any fall in production from these key oil producers is temporary. The USA had a brief respite from its relentless drop in oil output as it fell from being the world's largest oil producer once it peaked in December 1970 when North Slope oil came on-stream, and once again when deepwater Gulf of Mexico oil exploration began. Sadly, both frontiers are now mature and in decline. Prudhoe Bay peaked in 1989 at 1.5 million barrels per day and now struggles to stay above 300,000 barrels per day.

Ram-Powell was one of the most significant deepwater oil fields to come on-stream at the end of 1999 when the era of deepwater oil was still new. However, like many other Gulf of Mexico deepwater fields, Ram-Powell never reached its targeted maximum output and quickly peaked at lower levels. In mid-2007, Ram-Powell's production had declined to a mere 12,000 barrels per day. This production profile is typical of most Gulf of Mexico deepwater fields. Similar production profiles will also likely apply to the West African deepwater fields.

The North Sea is a classic Peak Oil case study. Upon analyzing field-by-field production data in 1995, it was glaringly apparent that North Sea peak output was fast approaching. The collective wisdom of most North Sea operators in the mid-1990s, however, was that a peak in North Sea output might happen in early 2000, but that an undulating plateau would keep production at about 7 million barrels a day for a decade.

The North Sea, unfortunately, for a world with a growing thirst for oil, peaked in 1999, and this peak was entirely predictable if anyone studied the field-by-field production numbers. In the 27 months since global crude oil production apparently peaked, the North Sea alone declined by 1.23 million barrels a day. This is not an aberration but a trend that will continue until North Sea oil output bottoms out at between 500,000 and 750,000 barrels a day. Then, thanks to enhanced oil recovery techniques and modern oil field technology, its tail end life might extend for several decades – hardly an example of the decades of undulating production plateau that some predicted.

Of all the major oil producers now in apparent irreversible decline, the most alarming new entry is Mexico, whose oil output has fallen by 598,000 barrels a day since May 2005.

Mexico's oil miracle was essentially encompassed in its great Cantarell field, which continues to be the world's second largest producing giant oil field, accounting for 60% of Mexico's oil output for the past three decades.

What led to PEMEX's discovery of Cantarell was a flurry of complaints by angry Mexican fishermen in the Bay of Campeche who grumbled about an "invisible oil well" that was ruining all their fishing nets by tarring them up. One of these angry fishermen was Pedro Cantarell and PEMEX, frustrated by his constant complaints, humored him by riding out in his boat to look at his nets. What PEMEX discovered, to their amazement, was one of the world's greatest accumulations of crude oil concentrated in a crater less than 20 miles wide. The fouled fishing nets were caused by oil seeps escaping from what turned out to be a giant oil field. The producing formation had a permeability of greater magnitude than any oil field, with the exception of Saudi Arabia's North Ghawar's marvelous "Super K Zones". Drilling quickly commenced and, by 1977, forty producing oil wells in the Cantarell complex collectively produced one million barrels of oil a day for two decades. This miracle oil not only enabled Mexico to become a relatively modern economy, but also the most important neighboring crude supplier to an ever oil-hungry USA.

After 20 years, Cantarell's production began to wane as reservoir pressures fell. In haste, PEMEX drilled 400 additional wells, while simultaneously installing the world's largest nitrogen injection system – a controversial tertiary enhancement recovery technique. Once completed, it worked amazingly well. This new system

was the equivalent of taking a mostly depleted tube of toothpaste, poking 100 holes into the tube and then smacking it with a hammer.

Cantarell's output quickly returned to its one million barrel a day peak and then set one record after another until it finally peaked at 2.2 million barrels a day.

The world now has a front-row seat for the stark realization of Peak Oil, due to the transparency of USA's oil output, the individual field-by-field production of the North Sea fields and PEMEX's highly commendable data transparency.

Why the world is now so complacent and simply trusts too many other key oil producers, including all the OPEC member countries and permits all of our publicly-held oil companies to hide their key field production data makes as much sense as if we decided to abolish the global air-traffic control system and let pilots rely on hand signals.

It would be a wondrous blessing if the world's oil optimists turned out to be right. It would also be a blessing if everyone panicked about Peak Oil and created a Plan B, only to find out we had 10 to 20 more years before this plan to save the globe had to be put into action.

What makes no sense is to ignore the growing amount of hard data that increasingly affirms that crude oil has peaked.

In this context, it is important for people of realize that oil prices are not high. In real economic terms, oil prices have been far too low for far too long -- $100 a barrel oil is the equivalent of only 15 cents a cup. Other than municipal water, nothing of any genuine value in the world is sold as cheaply as refineries purchase crude oil.

One hundred dollar oil will not kill any significant economy. As energy prices rise, which they will, if the phenomenal well-head revenues generated are reinvested into rebuilding a very rusty global energy infrastructure, they will create the world's largest construction project and create a global shortage of blue-collar jobs and a boom for engineers and many sectors of the manufacturing industry.

The Middle East oil-producing countries also need to understand that as their oil peaks, they have an opportunity to fundamentally transform their societies by finally creating sustained economies not entirely dependent on oil and gas. If their exploding wealth is rapidly and responsibly reinvested, they can create a sustainable middle-class community for the nearly half-billion people residing in the region, as well as create prosperity throughout the OECD as Middle East consumer goods are purchased with petro-dollars. Through prosperity in the Middle East will also emerge a final miracle: sustainable peace in this volatile part of the world. Prosperity finally brought peace to Ireland. It can happen in the Middle East, too.

In the meantime, the world is desperately in need of a sustainable series of new energy sources and urgent adoption of conservation measures to wean "us" all from a chronic addiction not just to oil, but all three forms of fossil fuels.

Peak Oil is probably now past-tense. We have no Plan B. Natural gas and possibly peak use of quality coal and uranium might be lurking in Peak Oil's shadow.

The world sleep-walked for three decades while believing all natural resources would last as long as any of us were around. The important Limits to Growth book published by the Club of Rome in 1972 was both misunderstood and ultimately ridiculed.

As our global appetite for energy grew, the era of high quality hydrocarbon energy entered its twilight era. The nub of the world's most singular problem is to insure we can sustain the 21st century without experiencing social chaos and ultimately a widespread geopolitical conflict or war. This, in essence, is embodied in the strange debate about what is known as Peak Oil.

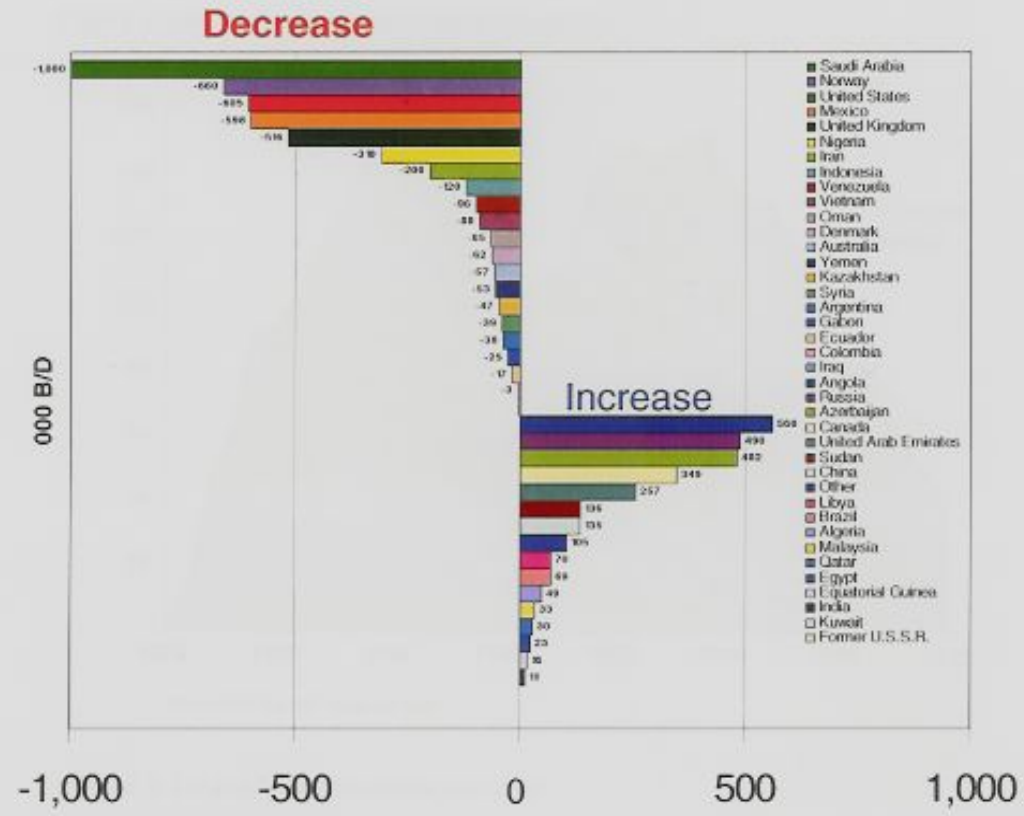
Table 1 details the gainers and losers in the EIA tables illustrating when crude oil production peaked in May 2005.

Appendix A shows the graphics used by the German Energy Watch Group who recently reported that global oil peaked in 2002 and will now begin a rapid decline.

Appendix B displays the powerful graphics presented by Dr. Sadad Al-Husseini at the recent (2007) Oil and Money Conference in London, where he presented his most optimistic case for why global oil might have a decade-long plateau before it begins to decline. (In my opinion, Dr. Sadad Al-Husseini is the best informed scientist on Middle East oil.)

They say that a picture is worth a thousand words. All these exhibits are pictures created by careful digging through best-in-class oil data, albeit fuzzy. Although the final picture is not savory, it is nonetheless extremely important.

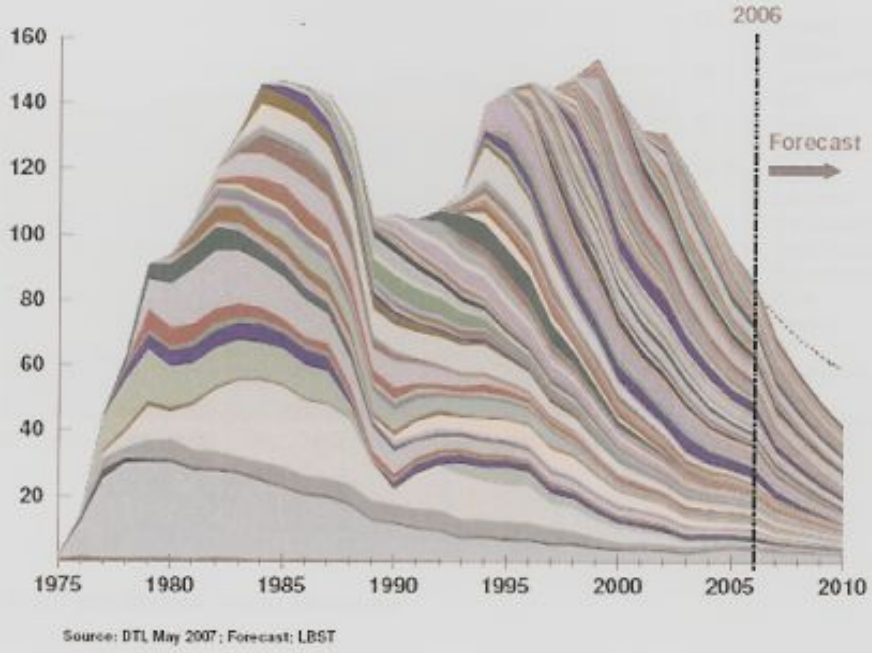
Table 1



Source: EIA –International Petroleum Monthly

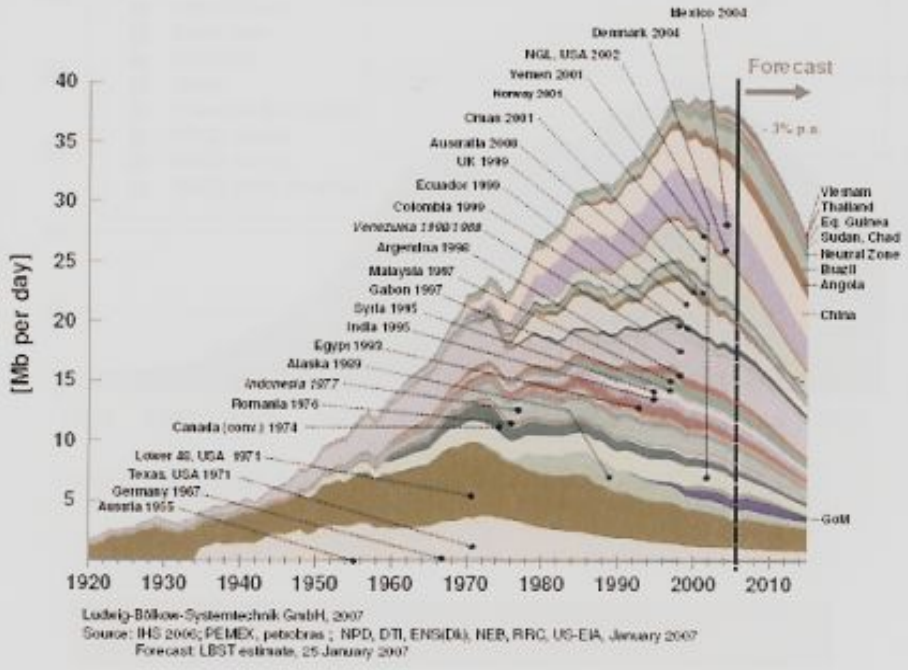
Appendix A

Figure 4: Oil production in the United Kingdom



Source: DTI, May 2007; Forecast: LBST

Figure 5: Oil producing countries past peak



Source: Energy Watch Group: "Crude Oil the Supply Outlook"

Appendix A

Figure 6: Oil production of the oil majors from 1997 to 2007

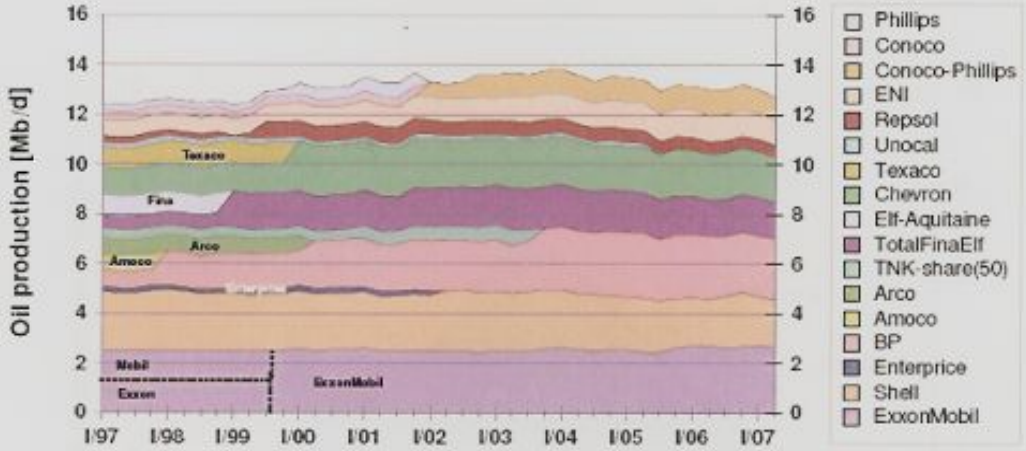
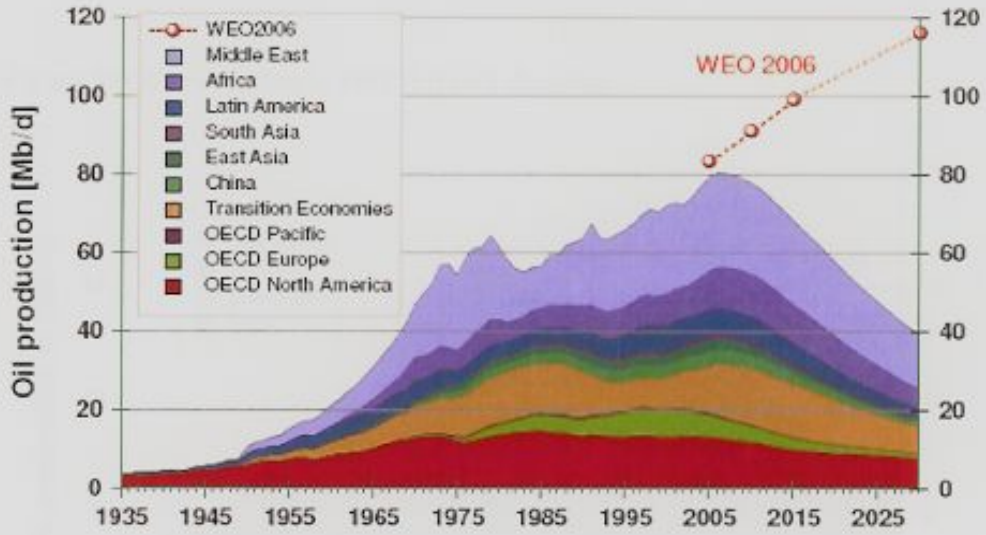


Figure 7: Oil production world summary



Source: Energy Watch Group: "Crude Oil the Supply Outlook"

Appendix A

Figure 8: Oil production in OECD Europe

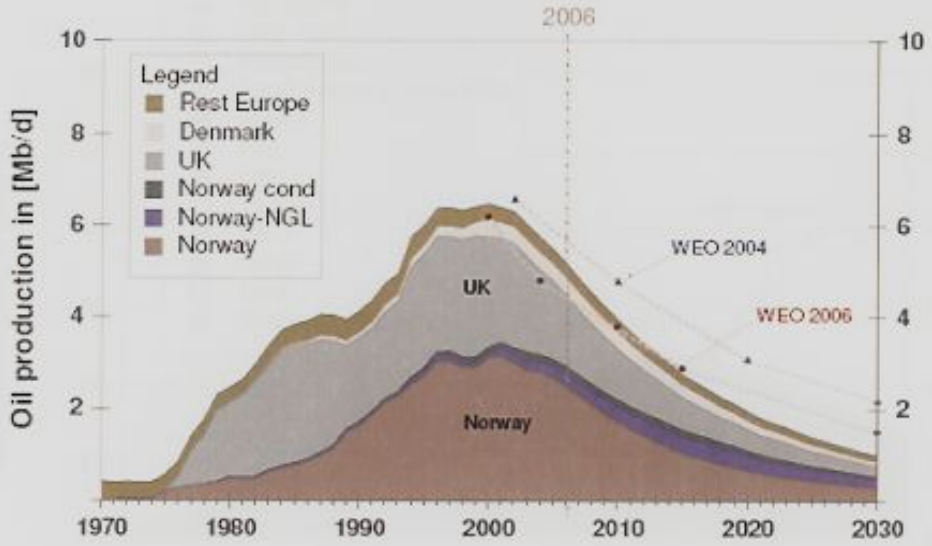
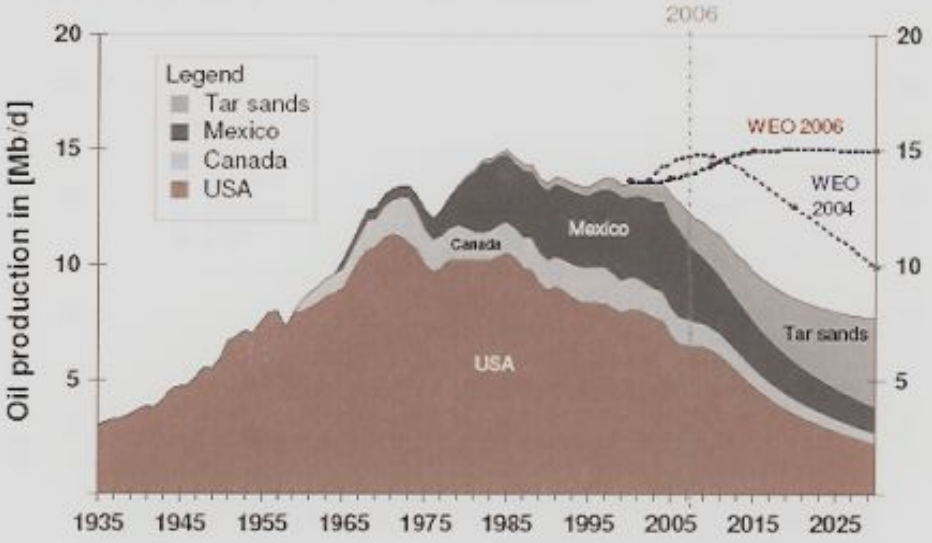


Figure 9: Oil production in OECD North America



Source: Energy Watch Group: "Crude Oil the Supply Outlook"

Appendix A

Figure 10: Oil production in the Middle East

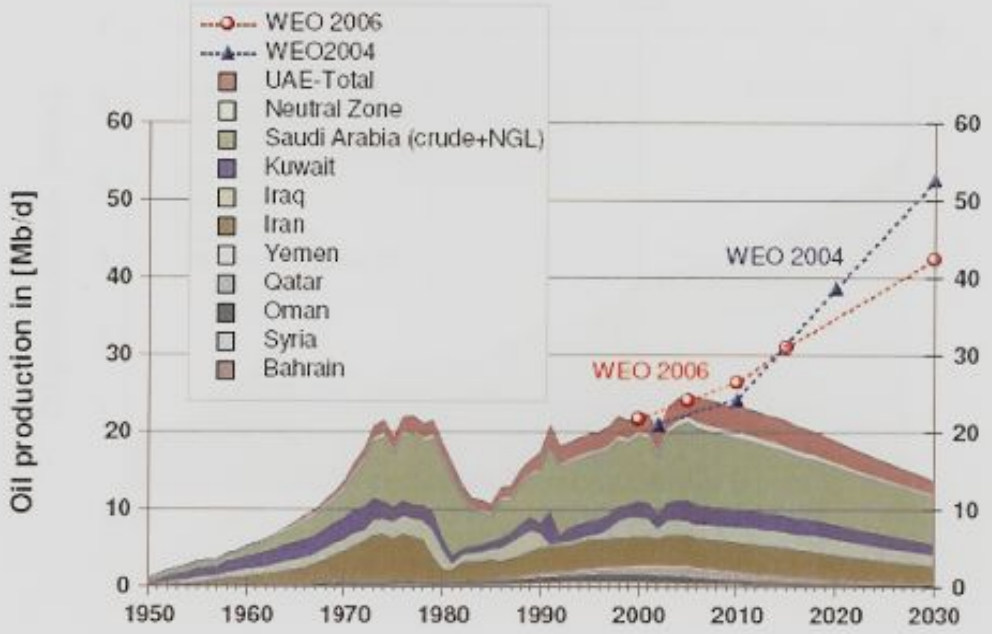
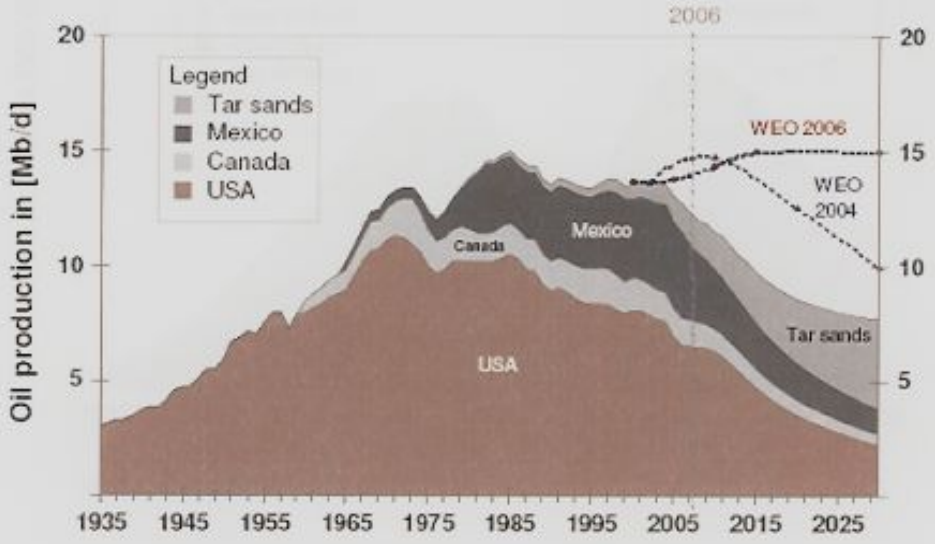


Figure 28: Oil production in OECD North America



Source: Energy Watch Group: "Crude Oil the Supply Outlook"

Appendix A

Figure 31: Oil production in Canada

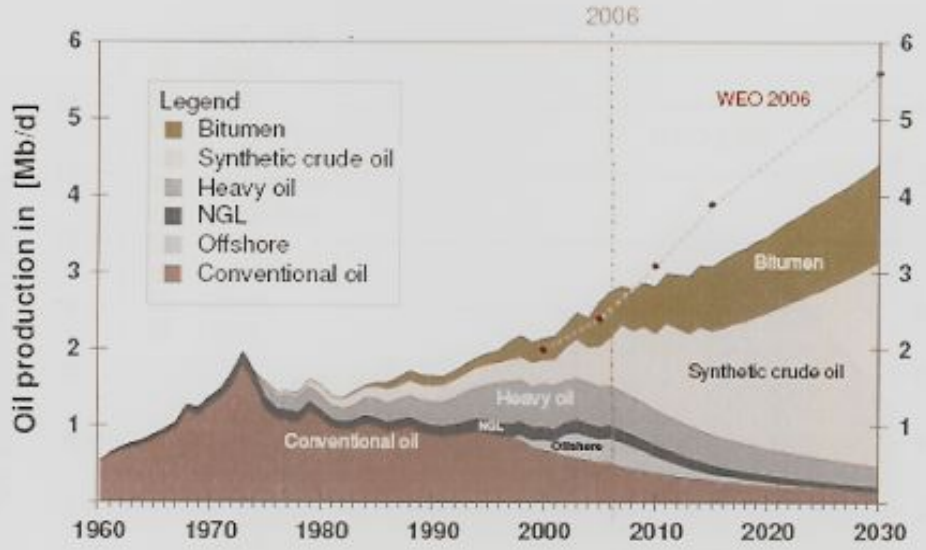
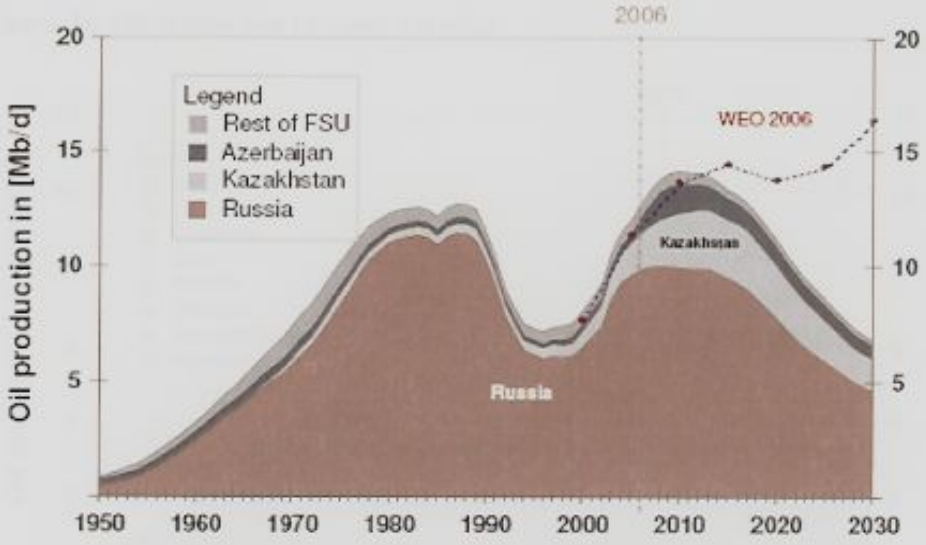


Figure 32: Oil production in Transition Economies



Source: Energy Watch Group: "Crude Oil the Supply Outlook"

Appendix A

Figure 33: Oil production in Africa

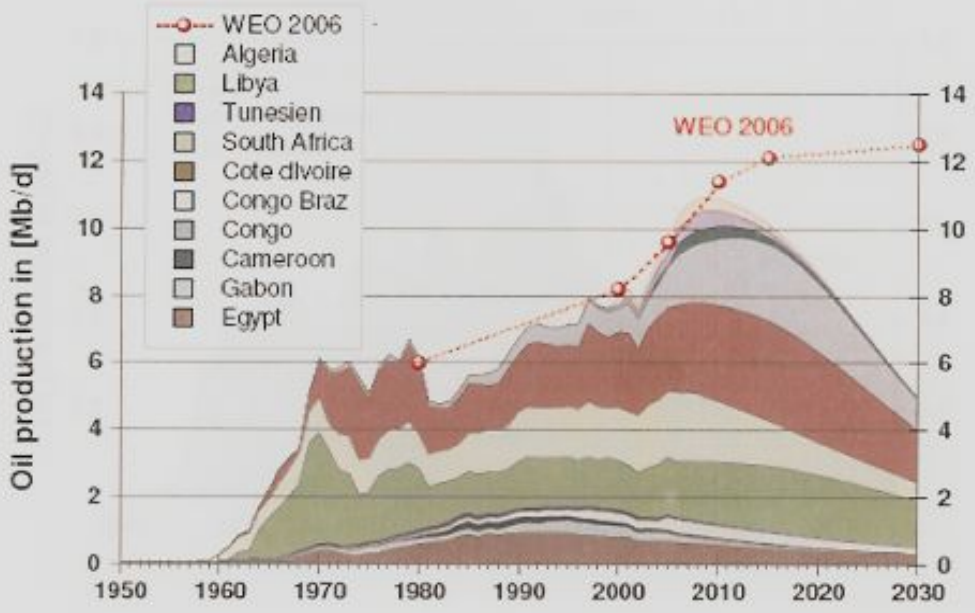
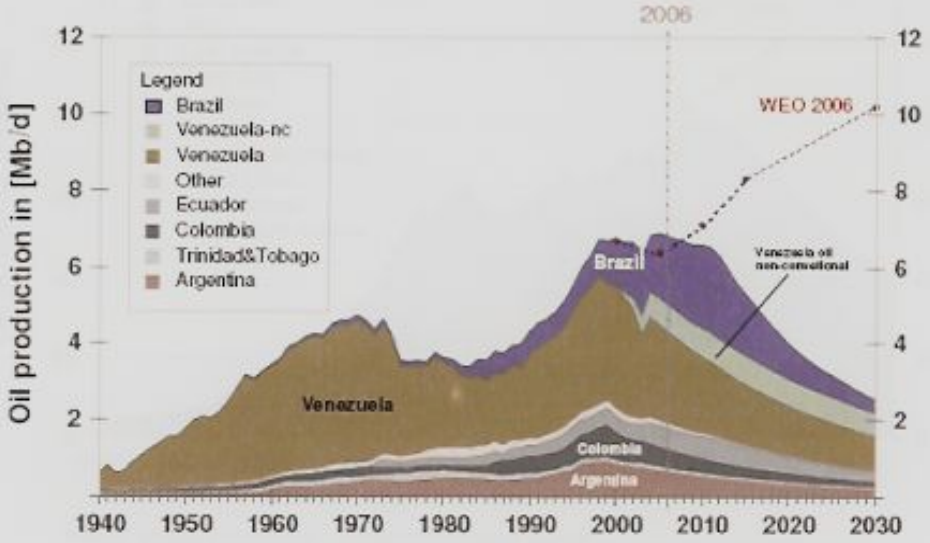


Figure 34: Oil production in Latin America



Source: Energy Watch Group: "Crude Oil the Supply Outlook"

Appendix A

Figure 39: Oil production in OECD Pacific

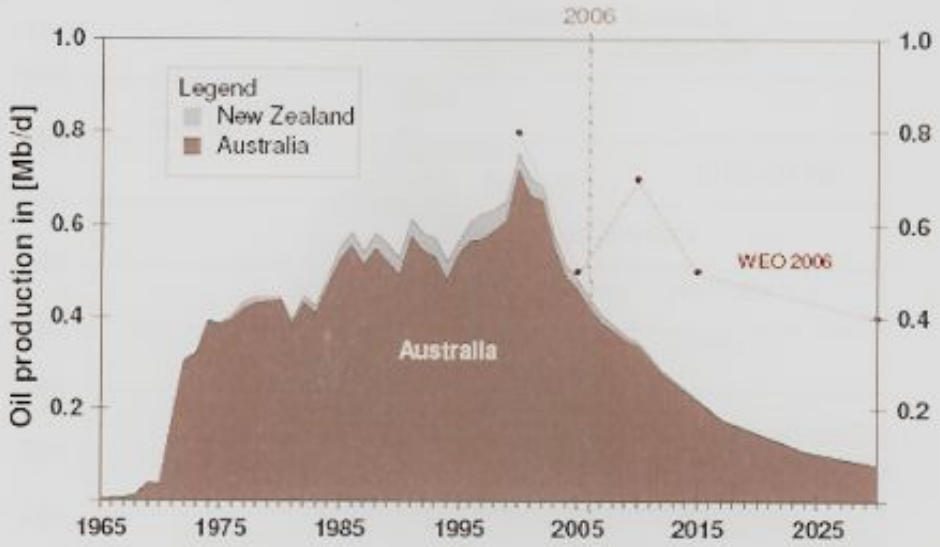
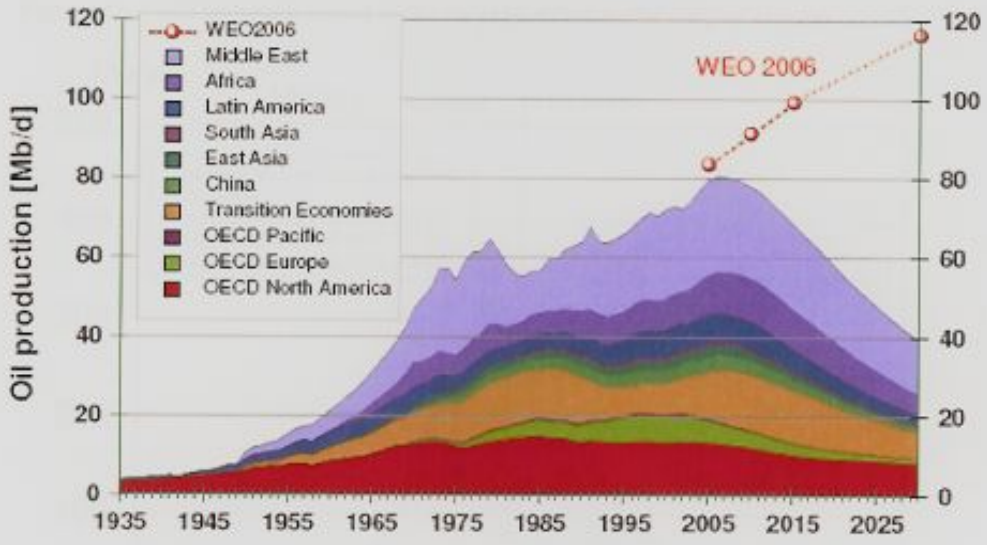


Figure 40: Oil production world summary



Source: Energy Watch Group: "Crude Oil the Supply Outlook"

Appendix A

Figure 42: Field by field analysis of the oil production in Alaska

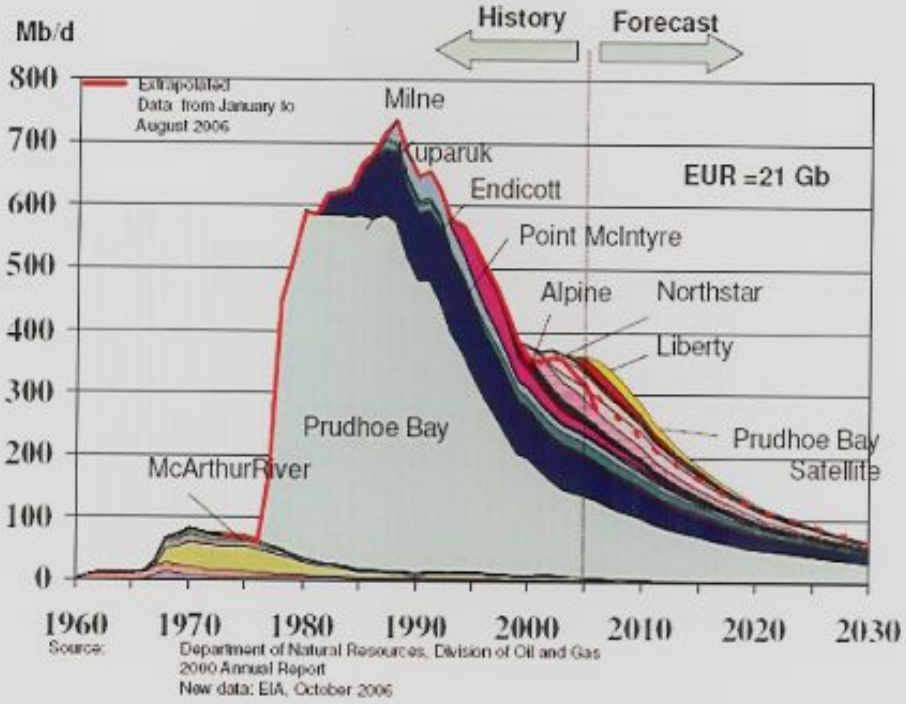
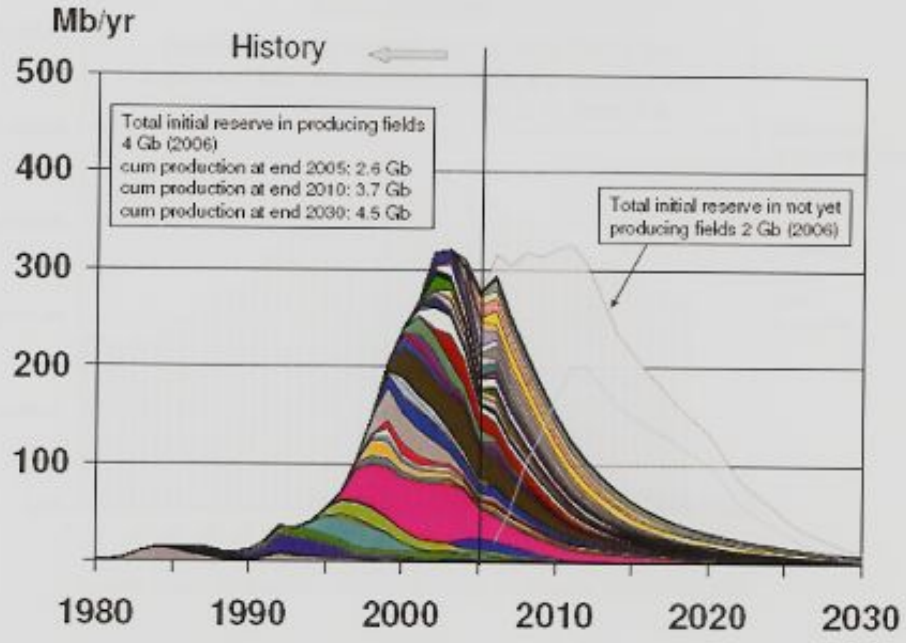


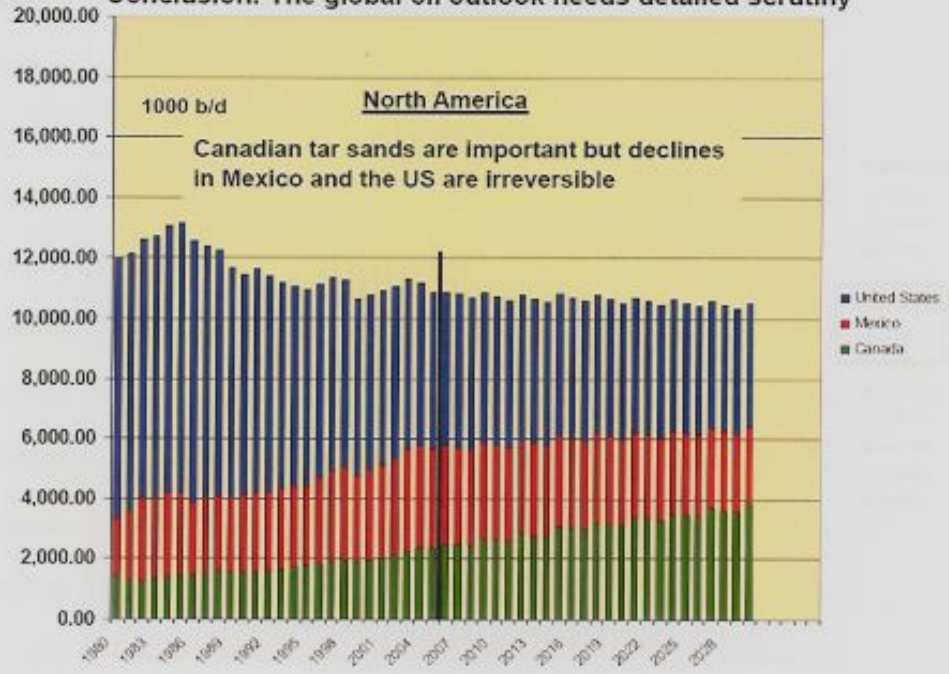
Figure 43: Field by field analysis of the oil production in the Gulf of Mexico

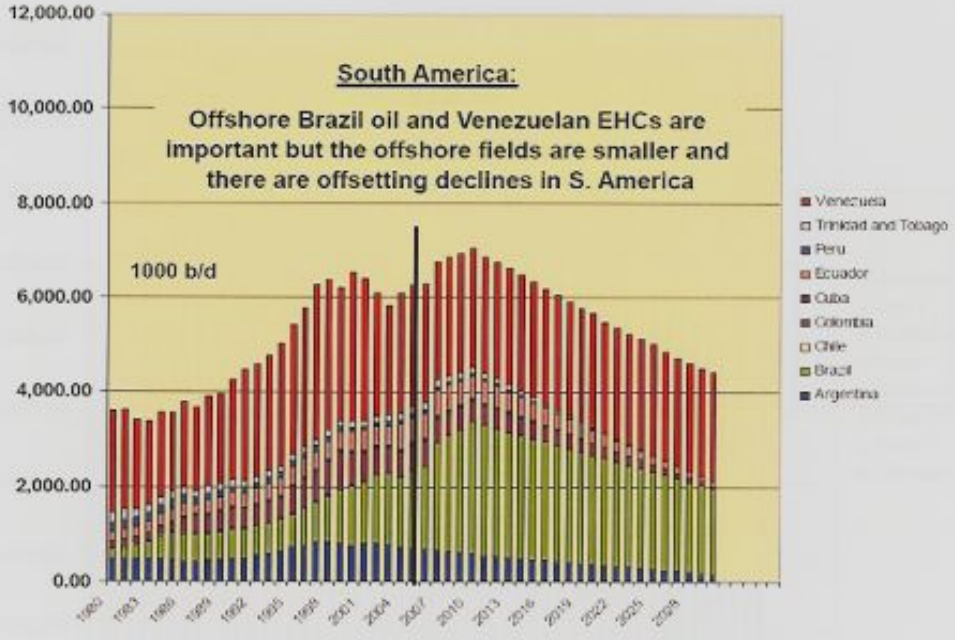


Source: History: MMS 2005, Forecast LBST 2005
Source: Energy Watch Group: "Crude Oil the Supply Outlook"

Appendix B

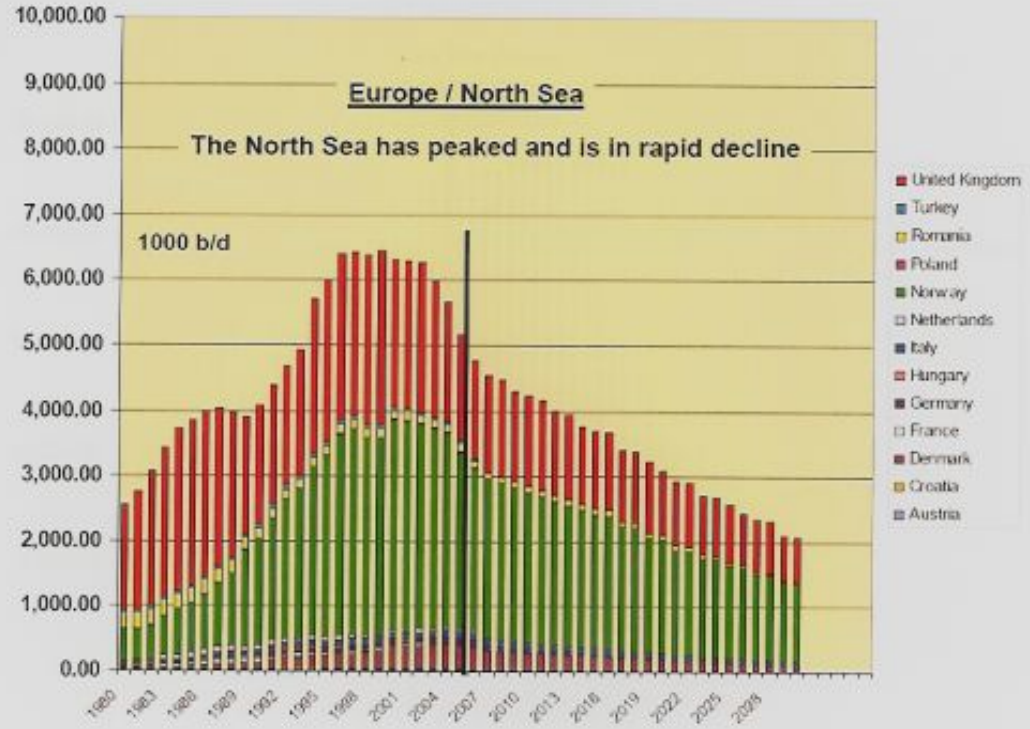
Conclusion: The global oil outlook needs detailed scrutiny

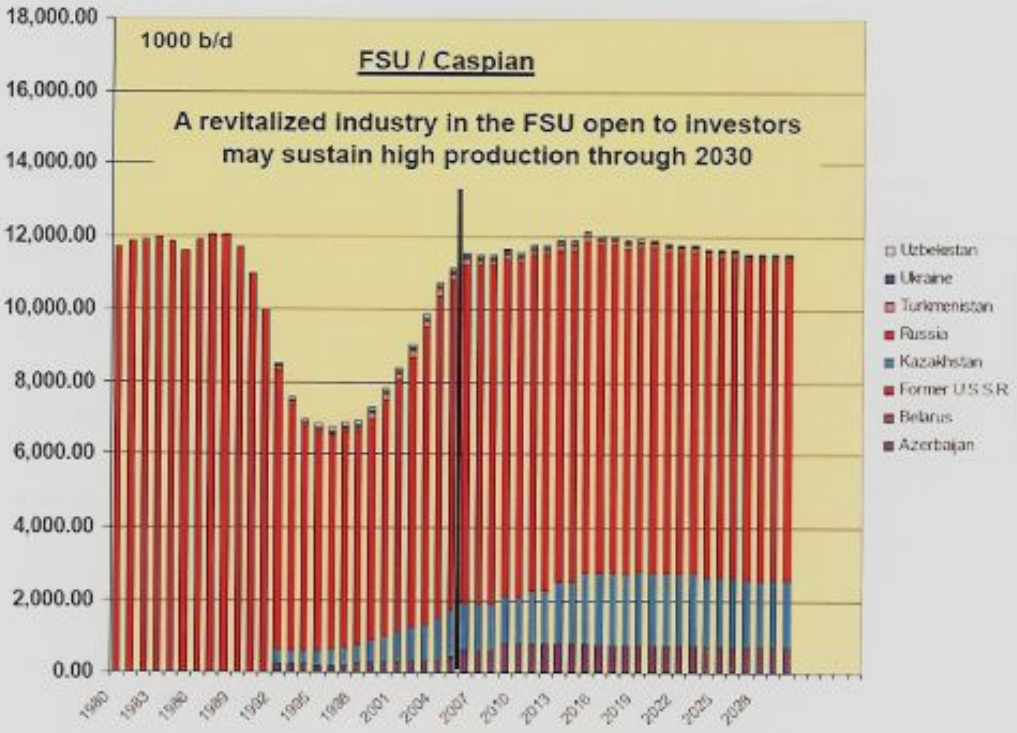




Source: Sadad Al-Husseini – 2007 Oil & Money Conference, October 31, 2007

Appendix B





Source: Sadad Al-Husseini – 2007 Oil & Money Conference, October 31, 2007

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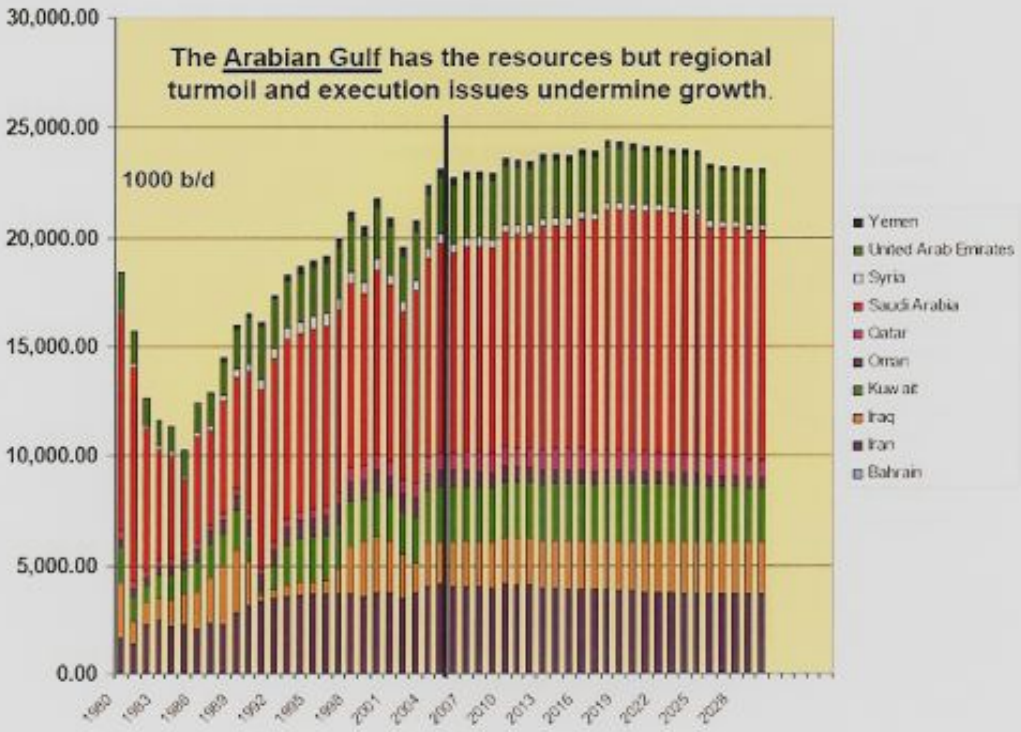
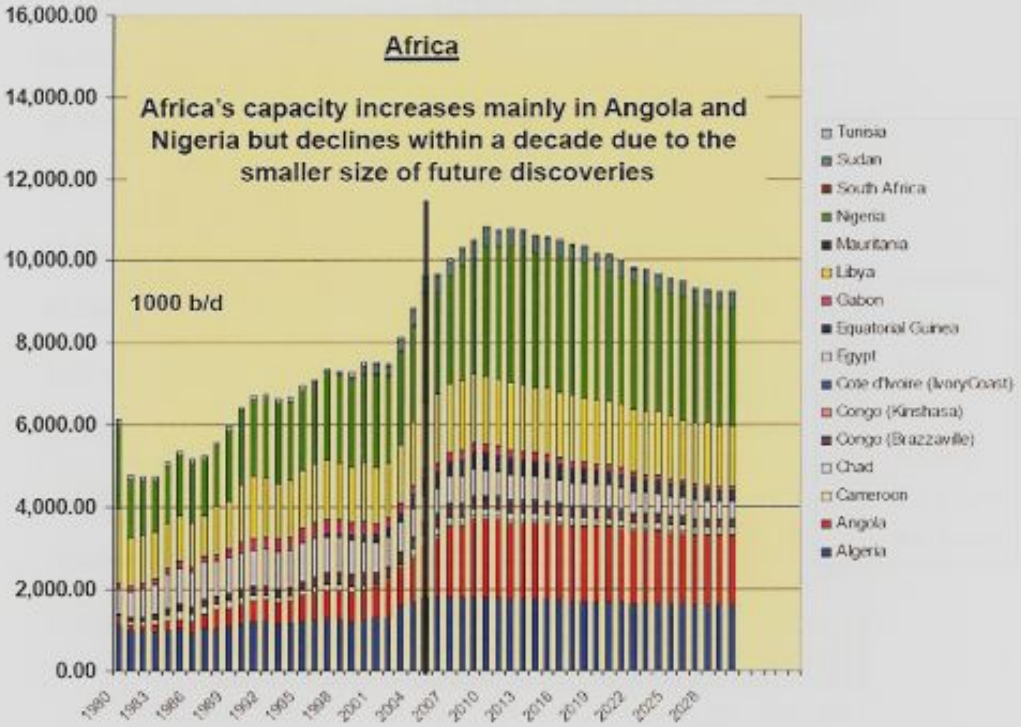
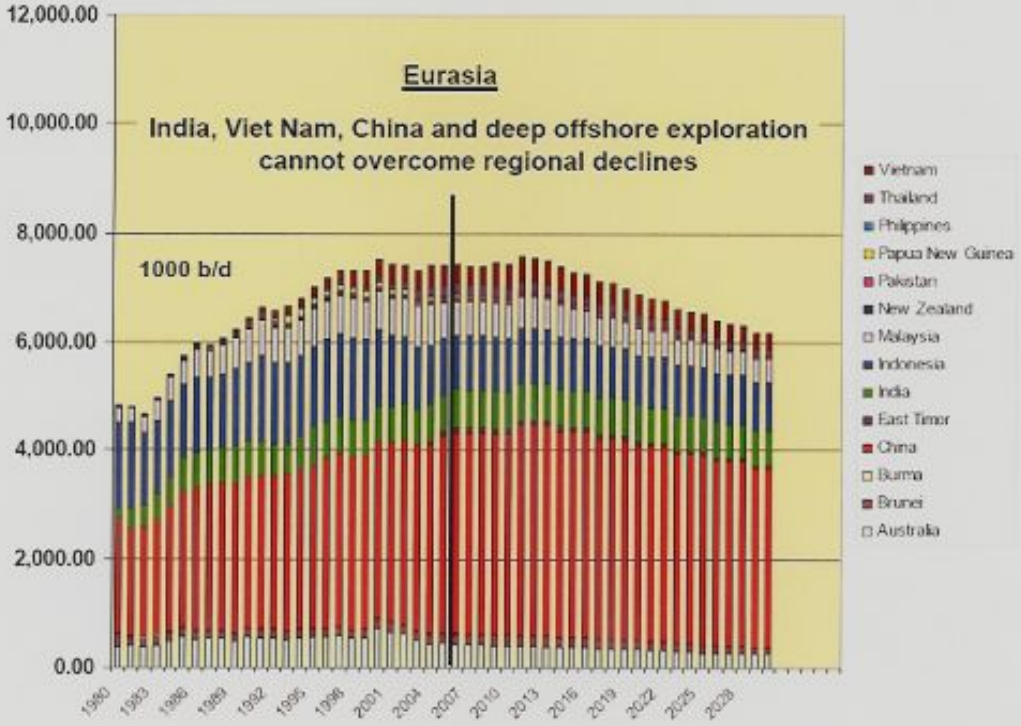


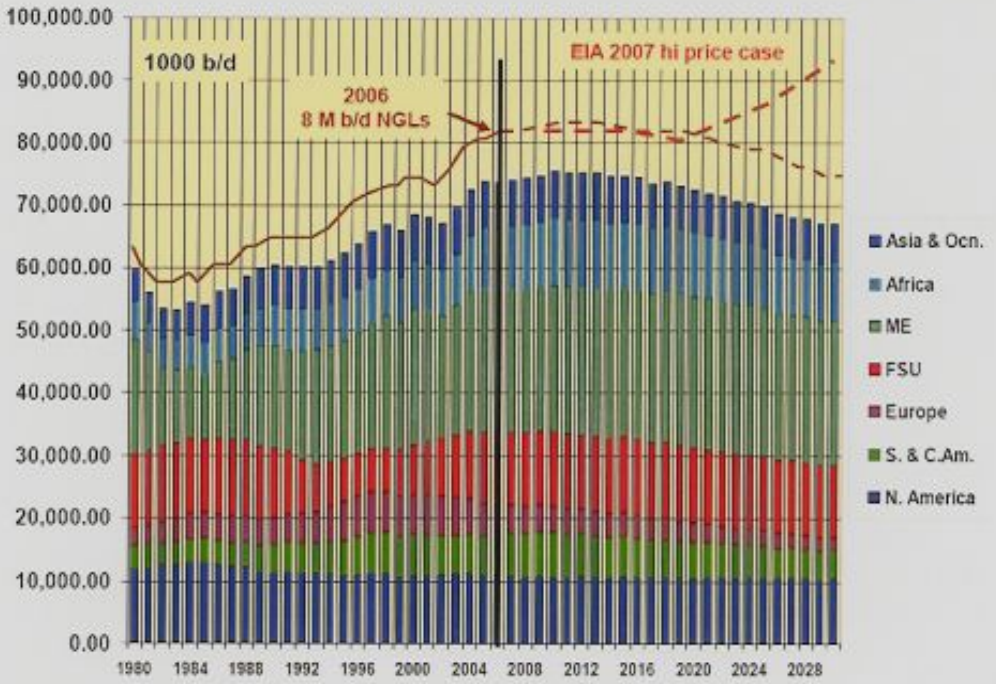


Source: Sadad Al-Husseini – 2007 Oil & Money Conference, October 31, 2007

Appendix B



Capacity outlook: a 10 year production plateau . . .



Source: Sadad Al-Husseini – 2007 Oil & Money Conference, October 31, 2007