THE ASSOCIATION FOR THE STUDY OF PEAK OIL
&
THE OIL DEPLETION ANALYSIS CENTRE
ASPO-ODAC

NEWSLETTER No 14 – FEBRUARY 2002

To ASPO Members in

Austria
Denmark
Germany
Ireland
Norway
Portugal
Sweden
United Kingdom

To ODAC Trustees and Advisors

ASPO is a network of European institutions and universities with an interest in determining the date and impact of the peak and decline of world oil production, due to resource constraints.
ODAC is a charitable organisation in London that is dedicated to researching the subject and raising awareness of the serious consequences.

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ASPO Workshop in Uppsala, May 22-25th

Professor Aleklett reports that he has successfully secured enough sponsorship to be able to confirm that the Workshop will take place. A good programme of speakers is being arranged with growing interest by both the media and the Swedish government itself.
Details can be seen on the home page : www.isv.uu.se/iwood2002

The ASPO members will have a chance to meet, with time being set aside on the last day for them to formally discuss how they would like the association to progress.

ASPO Presentation and Database

A Power-Point presentation on oil depletion, together with an update of the database and depletion model, has been distributed to members. Once any necessarily corrections and revisions have been adopted, this could become a useful statement of the ASPO position.
The 64 producing countries have been divided into groups as follows. It is proposed that each member should take on responsibility for analysing its group of countries. In particular, it is proposed the Foreign Service departments of member countries be contacted and asked to secure the relevant information. Co-operative oil companies may also be approached to furnish details. The basic required information is simple and often in the public domain in the countries concerned. It comprises:

1. Listing of oil and gas fields (larger than say 50 Mb) with a) discovery date, b) annual past production of oil, gas and condensate, and c) reserves - by field.
2. Number of wildcats (exploration wells) drilled each year since the start of oil exploration

It should not be too difficult for commercial attaches in the countries concerned to secure this information. The idea is that we emerge from the exercise with a definitive database and model that will stand on its own, transferring the onus of those who wish to dispute it to supply information in support of their arguments. The world data sheets from the 2001 Update are appended, and existing spreadsheets for individual countries are available on request.

Arsenal	BGR	Clausthal	Cork	Evora	LBS
Saudi Arabia	Russia	US-48	Iraq	Iran	Venezuela
Libya	Kazakhstan	Norway	UK	Indonesia	Algeria
Qatar	India	Australia	Argentina	Colombia	Malaysia
Turkmenistan	Dubai	Brunei	Trinidad	Gabon	Ukraine
Congo	Germany	Tunisia	Italy	Bahrain	Thailand
Croatia	France	Austria	Papua	Hungary	Albania

NPD	Reading	Rogaland	Denmark*	Uppsala
Kuwait	Abu Dhabi	Mexico	China	Nigeria
Canada	Azerbaijan	Neut. Zone	Oman	Egypt
Angola	Romania	Ecuador	Brasil	Syria
Peru	Yemen	Vietnam	Uzbekistan	Denmark
Sudan	Cameroon	Netherlands	Bolivia	Turkey
Sharjah	Pakistan	Chile		

(*in formation)

The Coming Decline of Oil by Gerald Leach

Mr Leach, a senior research fellow at the Stockholm Environment Institute, has published an important article in Tiempo (Issue 42 of December 2001) in which he succinctly explains the peak and decline of oil, drawing on the data provided by the oilcrisis.com website. It opens with:

> *"Amongst the billions of words brought forth by the climate debate over the past years, remarkably few have touched on an issue that ticks behind it like an unexploded time bomb. This is the probability that world oil production will reach a peak sometime during this decade and then start to fall, never to rise again".*

It goes on to explain the colossal impacts of such a discontinuity in economic, political and environmental terms. Readers of this newsletter will find that many of the words, thoughts and expressions have an extraordinarily familiar ring to them

Shell Results

The London Times of February 8th commented on the financial results of the Shell group of companies, which recorded a 71% fall in fourth quarter profits and a 74% fall in *Reserve Replacement* during 2001. The analysts were concerned that Shell was not spending enough on exploration, fearing that output could not be maintained.

When companies report *Reserve Replacement*, which impresses the analysts, they naturally refer to *Proved Reserves*, which represent what the wells in the current phase of development are estimated to eventually deliver, which does not necessarily reflect what the field as a whole is expected to provide. *Reserve Replacement* therefore has comprised both what has been found in new discoveries during the financial year and what is taken from the inventory of under-reported past discovery. It looks as if Shell has depleted its inventory from the past, and now has to rely on new discovery alone. This makes sense because its old fields are now so old that the reported *Proved Reserves* probably do reflect the total as there is no scope left for further development, and the new fields are too small and short-lived to support more than a single initial development. The Company probably is spending as much as it can on the viable exploration opportunities available to it, but sees no reason to drill dry holes to please flat-earth analysts, who are oblivious of the natural resource constraints and fail to grasp that the company is running out of opportunities.

Instead of inventing scenarios of abundance and enduring plenty, the corporate image-makers may soon find it expedient to explain their actions in terms of the truth. The analysts too may come to understand the position, as seemingly Goldman Sachs already did in their famous statement of 1999, which is worth repeating in this context

> "The rig count over the last 12 years has reached bottom. This is not because of low oil price. The oil companies are not going to keep rigs employed to drill dry holes. **They know it but are unable and unwilling to admit it**. The great merger mania is nothing more than a scaling down of a dying industry in recognition of the fact that 90% of global conventional oil has already been found."
>
> Goldman Sachs, August 1999

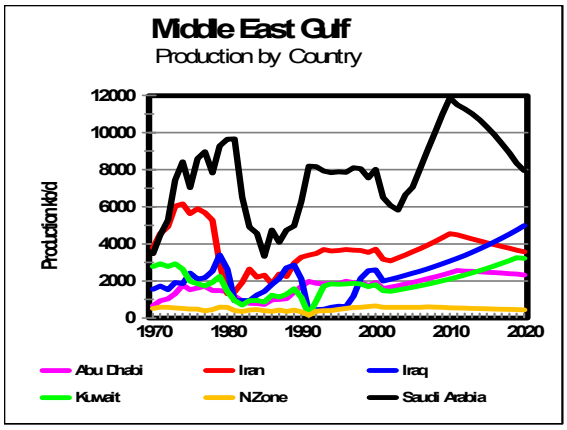
Bloomberg's

This New York financial institution, with wide TV coverage, has been in contact seeking information on the subject of oil depletion, being particularly puzzled by the contrasts between the bland industry comments and the facts of depletion, as depicted herein. No doubt they will eventually deliver a so-called "balanced" view but at least the fact that they are beginning to question the position is a step in the right direction.

BBC

The BBC returned to Ballydehob with a film crew to secure footage for a new series on energy that they are producing for the Open University, based in part on the ASPO Presentation, which was furnished to them.

Call on Middle East Oil



Under the 2001 Update scenario of flat global demand and weak prices, Middle East Gulf share drops slightly for a year or two, before rising to a maximum of 24 Mb/d by 2010, when it supplies 40% of the world's oil. The model assumes that each country (except Iraq) produces its current share of the demand on the region, until it reaches its midpoint, with the balance being provided by Saudi Arabia. It is also assumed that no country can achieve an annual increase in excess of 5%. It is thought that Iraq will gradually increase its production. It is uncertain that the heavy demands of the model on Saudi Arabia to increase from 2005 onwards can in fact be met. Kuwait may also be pressed although its northern fields may contribute enough. Looking at the figures, trends and relationships, especially the low depletion rates, gives the impression that the estimated reserves may still be too high.

This model is naturally tempered by uncertainty about what Russia can and will export, which needs further study. Higher Russian exports would depress the call on the Middle East.

Report by LBST on European Union Green Paper

Dr Zittel and his colleagues at LB Systemtechnik of Munchen has issued an excellent report, commenting on the EU Green Paper "Towards and EU Strategy on the Security of Energy Supply". It divides the world into three groups: countries close to peak; countries after peak, which are set to continue to decline; and countries not yet at peak, analysing the contributions that each can make. It supports the argument with some telling graphs of individual field profiles for Norway and the United Kingdom, also addressing the US situation. In fact, it seems to suggest that the EU's quest for security of energy supply is something of a vain hope, at least in terms of fossil fuels.

Update of Production Forecast for all Hydrocarbons

Part 8 of the ASPO Presentation contained an old forecast of all hydrocarbon production, which needs to be updated (see plot in Letter to IEA below). The addition of the deepwater and the growing gas liquids gives an overall peak around 2010 and ameliorates the subsequent decline such that the production of all liquid will not fall much below present levels until around 2020-2030. Whether it proves economic to bring in so much gas liquid is another issue. Gas is modeled with plateau production at 170 Tcf/a from 2015 to 2040 followed by a 5% annual decline, to reflect at least the general style of gas depletion of a long plateau and a steep terminal decline. Evidently, virtually all hydrocarbons will have been consumed by the end of the Century.

Mbendi Website

A statement of the current state of oil depletion, and the factors affecting it, has been published on a prominent African website : www.mbendi.co.za/indy/oilg/p0070 .

The IEA fails again

A copy of the IEA's 2001 Insights of the World Energy Outlook has been received. The abject failure of this organisation to grasp the nature of its responsibilities is almost beyond belief. It is content to issue bland economic platitudes lacking substance, speaking not of depletion but of the need to cement better relations with suppliers under – wait for it – a more transparent market. It has evidently been willing to accept the flawed findings of the USGS

without critical analysis. It even persists in referring to Reserve to Production Ratio quoted in years, as if it were remotely plausible for production to be held constant for a given number of years and then stop overnight.

It even unwisely solicited comments, attracting the following response:

16 February 2002

Dear Mr Birol

I have now finally had sight of The World Energy Outlook Highlights 2001.

I see from the introduction that comments are welcomed and to be addressed to yourself, so I am tempted to offer some, having studied .the issue of oil depletion for many years.

I have read earlier the Treaty that established the IEA, which I thought was an excellent statement about what the objectives of the organisation should be, but I am left uncertain as to what they turn out to be in practice. It seems to me that there are two main interpretations:

a) it does indeed desire to deliver an objective well studied and sound review of the world's future energy situation; or

b) it is effectively a lobby for its member governments, trying to do whatever is perceived to be best for their interests in political terms.

If it had the first objective, yet has failed to meet it, we may ask why? I think that the answer may well be because it has faced the eternal conflict between science and religion, which in to-day's world translates into a conflict between natural science and classical economics. In earlier years, Darwin's scientific conclusions about evolution by natural selection were rejected as blasphemy by the Establishment. It seems to me that classical economics was developed as a sort of pseudo-science at the end of the Industrial Revolution when Man was perceived to be master of his Environment. The rise in population and the depletion of resources has radically changed that relationship, but to ask a classical economist to accept resource constraints is tantamount to asking him to commit suicide. He cannot do it because it would undermine the very foundations of his subject.

His absolute rejection of resource constraints is summed up by the immortal words of M.A.Adelman, given when the IEA exposed itself to his advice

" 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 unknown and irrelevant"

I note incidentally that his acolyte, Mr Lynch, remains an advisor to the IEA, which perhaps explains much. There is absolutely no point in debate with these people, as they have their own convictions, which rise above any observation measurable in Nature.

It may be that the IEA, with the best will in the world in discharging its responsibilities, finds itself infiltrated by such elements, who will naturally deliver the dictates of their calling. There are indeed many claims in the pages of the Outlook for more market forces, transparency and technology: words, which are the hallmarks of the flat-earth fraternity.

Others, who come from a natural science background, have been trained to observe Nature and understand the physical laws that govern it, recognizing that they are immutable. So when they look at the issue of future energy supply from fossil fuels, they ask two simple questions:

How much was found? and

When was it found?

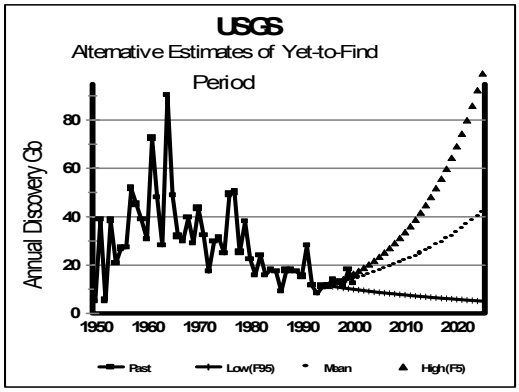
From that starting point, they hope to extrapolate discovery to determine what is left to find in the future. They further accept that oil has to be found before is can be produced, meaning that the production trend has, in some manner, to reflect an earlier discovery trend. They know that an oilfield contains what it contains, having been charged in the geological past, and realize that technological advances serve mainly to hasten the extraction process, having a negligible impact on the reserves themselves.

Those with access to the industry database would have little difficulty in making some relatively simple models of depletion, recognizing that production starts and ends at zero, reaching a peak in between, in the same way as a glass of beer starts full and ends empty. The ease and simplicity of finding valid answers prompts the question of why the IEA declines to make such studies, preferring instead to rely on a range of "business as usual" scenarios which effectively ignore the resource base. Its self-denial of the essential information does, it must be said, suggest that at heart is does not really want to know the answer, perhaps recognizing with a finely tuned political instinct that such would be an unpalatable revelation to its member governments, with many far-reaching not very welcome implications.

At the same time, we do find throughout the text various references to reserves and resources, so although the subject is sensitive, it evidently cannot be buried altogether. Then came the intervention of the eminently reputable United States Geological Survey with a new report, claiming near limitless resources,

which spared the IEA from having to address this delicate matter, being now able to blindly refer to the USGS without critical analysis of how valid its findings might be.

Had even the most cursory attention been given to this issue, some serious questions about the USGS methodology might have been asked. In brief, it made an assessment of the subjective probability of new discovery in each of the world's basins. For example, in the unknown, untested, frozen basin of East Greenland, it concluded that there was a 95% probability of finding more than zero, namely at least one barrel, and a 5% probability of finding more than 112 billion barrels. A Mean value of 47 billion was computed from this range. Since the numbers were quoted to three decimal places, the reader could be forgiven for assuming them to be accurate. But a moment's reflection would question the very concept of a *subjective* 5% probability. In plain language, it was a guess that could as well be half or double, yet it entered the calculations distorting the Mean value. Common sense would cast doubt on the prospect of this unknown, difficult place delivering as much as 70% of the North Sea.



The plot shows the implications of these absurd findings on discovery. (Note that since the USGS did not forecast production itself, the trends have been constructed to deliver the indicated amounts. Note too how the high case implies finding at least as much again after 2025, which is most implausible). It is more than evident that only the low (F95) case bears any reasonable relationship with the past actual trend, which, it is stressed, resulted from the diligent efforts of the industry in a worldwide quest for the biggest and best prospects, having the benefit of all the much vaunted advances of technology and geological knowledge. It follows that if more could have been found, it would have been found, especially recognizing that the industry operates under extraordinarily favourable economic terms whereby the cost of exploration is offset against high marginal tax rates. It effectively spends 10c dollars on exploration.

Not content with this bizarre finding about the Undiscovered, the USGS went on to add Reserve Growth. In the text, it made clear that it identified three options a) to ignore it; b) to cover certain countries where it had some knowledge or c) to apply the experience of the old onshore USA on which it did have data. In the end, it opted for the latter course of action, explaining that it did so simply to raise awareness of the issue and prompt further investigation.

This Reserve Growth element represents a monumental failure to understand the nature of reserve reporting. Stated simply in plain language, *Proved Reserves*, as reported for financial purposes, refer to what the wells of the current stage of development of a field are expected to deliver: in other words, they are *Proved So Far,* saying little about the size of the field as a whole. In the case of the large old fields, initially reported *Proved Reserves* understated the ultimate field size by as much as one-third, as is amply documented by mature North Sea fields or Prudhoe Bay in Alaska. However, in the case of the more recent finds, which are too small to have more than one development phase, initially reported *Proved Reserves* may indeed represent what the field can deliver, as Norwegian experience makes plain. The USGS made the double mistake of assuming that the experience of the old onshore fields of the United States was even remotely representative of the offshore or international arena, which it palpably is not, and secondly of applying the growth factor of the past to the more recent smaller fields.

Exxon made an apposite comment about the USGS report when it said in true Texan style "You get what you pay for - and that came free".

But it does not absolve the IEA from responsibility for accepting this flawed advice, which poses again the question of what the IEA's objectives truly are.

There is another utterly flawed concept that appears in the Outlook, namely Reserve to Production Ratio, quoted in years. A moment's reflection reveals how absurd it is to contemplate production being held constant for a given number of years and then stopping overnight, when production in all oilfields is observed to decline during the latter part of their lives. Yet it gives a comforting impression that the resource will last far into the future - we may ask again for whose benefit is the comfort being delivered ?

Since you kindly include reference to my own assessment for end 2000, I thought I would conclude by sending you a recently completed update for 2001 in the hope that it might be useful in your subsequent work, and do something to counter the flat-earth pressures.

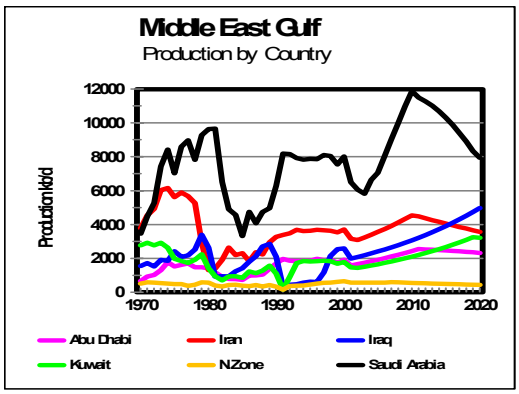
Like the IEA, I have to work without the benefit of the industry database, which would give relatively accurate information on past discovery, with reserve revisions being properly backdated to the discovery of the fields containing them, but I do have various sources of information, which I hope allow me to avoid making the worst mistakes.

The first issue concerns what to measure, which immediately runs into the tiresome question of the definition of Conventional Oil. I use the term in a restrictive sense. But it is nothing more than semantics, as it would be equally satisfactory to adopt the IEA definition and simply sub-divide its Conventional Oil into

the component parts, distinguishing deepwater and polar oil because of their significantly different geology, operating conditions and the state of knowledge regarding them.

Gas liquids pose a particular problem. In the past, I have defined Conventional Oil to exclude gas liquids, which I perceived to be related to gas, not oil, depletion, but I have come to think that this was a mistake. Recognizing that an oilfield contains hydrocarbons in both liquid and gaseous phases, in proportions that may change over time, I now conclude that it is more practical to treat Condensate from the gas-caps of oilfields with Conventional Oil, but to distinguish NGL from gas fields. This change in definition partly explains why my estimated Ultimate has increased from 1850 Gb in the last assessment.

I have also adopted a new Base Case Scenario of world demand. I conclude that there was very little available spare capacity in late 2000, which was forcing up the price of oil. I myself had expected prices to rise higher, but the economy reacted more quickly than expected as it moved into recession, reducing the demand for oil, and the pressure of prices, which have remained weak. If even moderately high oil prices were sufficient to cause recession, it follows that in the event that the economy were to try to recover in the future, oil demand would rise in parallel until it again hit the falling ceiling of capacity, when prices would soar, re-imposing recession. Accordingly, the new Base Case Scenario assumes flat average demand, giving a plateau of production until the five Swing countries of the Middle East are no longer able to offset the decline of the rest of the world. This threshold is expected to be reached in 2010, when the five Middle East countries would have to produce 24 Mb/d, or 40% of world demand. This plateau is followed by the onset of terminal decline at the then depletion rate.



Although described as a plateau, it is likely to be anything but flat, with recurring price surges and recessions, being a time also of increasing international tensions, due to recession, growing conflicts for access to critical oil supplies, and the further deterioration of the indigenous energy supply situation in the United States and Europe. The calls made on individual Middle East countries is shown in the figure. They are considerable, even with flat world demand, especially if their reserves are still exaggerated as I suspect.

In the event that demand should be higher than anticipated, then peak would clearly come sooner and would be followed by a steeper decline.

I have also endeavoured to model the depletion of the other categories of oil and gas, although it is much more difficult to be confident of the results.

Heavy Oil.

Oils heavier than 17.5^{o} API are treated together, with production being controlled by extraction rate rather than the resource base. The assessment shows production rising gradually to 4.5 Mb/d by 2020, which is more optimistic than the IEA's earlier estimate of a ceiling of 2.4 Mb/d by 2010.

Deepwater Oil

Deepwater oil is defined as that lying in more than 500 m of water. The domain is characterized by special geological conditions. Prolific oil generation occurred in certain divergent plate-tectonic settings having early rifts in which source rocks were deposited and preserved. They are probably confined to the Gulf of Mexico and margins of the South Atlantic. Reservoirs are provided by turbidites, which carried sediment far from land, but to be effective they in turn depend on being cleaned up by the winnowing action of long-shore currents as well as being ponded behind relief on the sea-floor. The combination of the required factors evidently occurs only rarely. Elsewhere, deltas may locally extend into deep water, but are likely to be gas prone because they have to rely on the source-rocks within the delta itself.

It is evident that deepwater operations test technology and management to the limit, which means in turn that only the larger prospects or clusters of prospect are likely to be viable. A further constraint is the availability of floating production equipment. It is concluded that deepwater production, from an endowment of about 60 Gb, might rise, with heroic effort, to a peak of about 8 Mb/d by 2010. Experience to-date suggests that this is optimistic, especially if weak prices over the next few years curtail activity.

Polar Oil

Antarctica seems to be poorly prospective and is in any case closed to exploration by agreement. The Arctic regions are more promising with some huge sedimentary basins. However, evidence to-date suggests that, with the exception of Alaska, these areas are mainly gas-prone due to large vertical movements of the crust in response to fluctuating ice-caps in the geological past, which had the effect of depressing the source-rocks into the gas window. Alaska itself appears to be a concentrated geological habitat with much of its oil in one major accumulation at Prudhoe Bay. It follows that no particularly significant finds are likely to result from the opening of various areas currently closed for environmental reasons.

Gas

The higher molecular mobility of gas means that it depletes very differently from oil. It was more widely generated in Nature than was oil, but it needed a better seal to hold in the reservoir, much having been lost

over geological time. Production is generally capped to provide a long plateau with most fluctuation being seasonal. The capped production provides in-built spare capacity, which is progressively drawn down under market pressures that normally reduce prices. The end of the plateau comes abruptly when this in-built spare capacity has been exhausted, and it comes without market signals. It appears that the United States is now at the end of its plateau, such that new gas wells have to be produced at maximum rate, being depleted in a matter of months. It is now draining Canada as fast as it can.

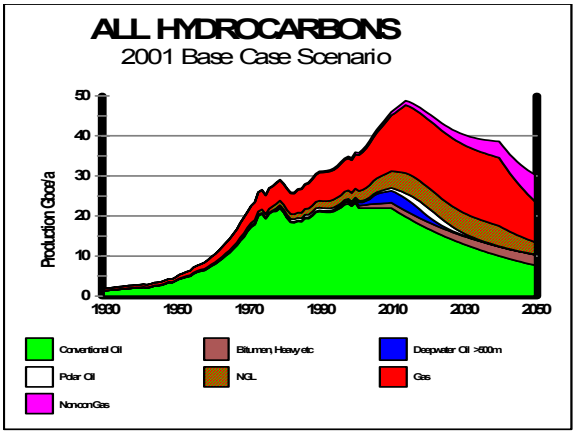
It is very difficult to know how to model gas supply since so much depends on market forces and the construction of new pipelines etc. Based on the consensus endowment of 10000 Tcf, production is here expected to rise to a long plateau from 2015 before eventually declining. The depletion profile with its abrupt end carries grave risks to supply unless properly evaluated.

NGL

The gas production in turn generates substantial NGL production with extraction likely to increase. The US DoE provides useful information to determine and project the extraction rate. Gas liquids form an important additional supply around peak,

Non-Conventional Gases

Some provision is made for non-conventional gases, of which the two most important sources are Arctic gas, much from Siberia, and coalbed methane from the world's coal basins. Gas hydrates, which have attracted a great deal of misplaced research, are dismissed as a realistic source of new energy. The deposits mainly occur as disseminated granules and laminae, meaning that the methane cannot migrate to accumulate in commercial quantities. Some of the reported thicker deposits appear to be nothing more than seepages of conventional gas on the seabed.



The results of the evaluation are shown in the figure. The peak of "narrow" Conventional comes in 2010, with the peak of all hydrocarbons around 2015. Although conventional oil supply is modelled to be flat under the Base Case scenario, the addition of deepwater oil and NGL means that total liquid production need not fall below present levels for some twenty years. This perhaps confirms the IEA view that supply will not be resource constrained for twenty years. However it shows that the previous IEA 2000 forecast of 115 Mb/d by 2020 is absolutely unattainable.

I attach three tables which sum the individual country assessments, and I attach a CD giving the full assessment. (I use Quattro Pro as more friendly than the dreadful Excel, but no doubt you will be able to read it). Please note that what I am sending is not a polished final version but simply an informal working model, which needs much more work.

Most of the computations are self evident, but I should explain that the procedure for assessing reserves. The starting point are *Proved Reserves* as reported by the Oil & Gas Journal. They are then adjusted to remove any identified Non-Conventional and the total production of any period over which the reports were implausibly unchanged (as many as 64 countries failed to update their estimates in 2001). The adjusted value is then multiplied by a factor to deliver a "best estimate" of what the fields are expected to deliver over their full lives ("Proved & Probable" in industry terms). It assumes the application of all appropriate technology, but does not foresee the arrival of any new miracle technology.

The listings of annual discovery, giant field discovery and wildcat drilling are inconsistent and unreliable, but are included to give a certain indication. Future wildcat drilling is forecasted to give an indication of the reasonableness of the Yet-to-Find estimate, but is no more than a very generalized assessment.

The mechanics of the model derive the Yet-to-Find by subtracting the Discovered from a rounded Ultimate. Summing the individual countries gave a World Ultimate of 1908 Gb, but to avoid giving the impression of unjustifiable accuracy this was rounded up to 1950 Gb by a "balancing item" of 42 Gb of "Unforeseen" Reserves and Yet-to-Find.

It goes without saying that all the estimates are WRONG, given the grossly unreliable data in the public domain. The question is By How Much? Despite the uncertainties, I am fairly confident that the results would be found to come close to those provided by a full evaluation of the best available information from industry sources, supported by the full range of proper statistical techniques, including creaming curves, field-size distributions, individual field decline analysis, Hubbert curve modeling and discovery/production trend correlation. All of these robust techniques could be applied without any particular difficulty given access to the appropriate data and the manpower to do the work.

As you probably know, the European Union and several of the member governments are at last waking up to the fact that they have been grossly misinformed and misled about the future supply of oil, in part by the oil companies with their own legitimate and understandable vested interests. The governments can now

plainly see that North Sea production is at peak and set to fall to about one-half in ten years, as confirmed by the Norwegian authorities and the fact the UK production is already in steep decline. Since discovery peaked in 1974 this need not have come as a surprise. The advanced technology of offshore operations managed to accelerate depletion such that it took only 27 years to move from peak discovery to the corresponding peak of production, compared with 40 years in the old days of the onshore United States. Peak world discovery was in 1964, meaning that world peak production is also inevitably approaching fast.

I have been trying to raise awareness of these issues for some years without a great deal of success, but I can now report substantial progress with the establishment of the Oil Depletion Analysis Centre in London and a growing network of important government institutions and universities, so far representing Norway, Sweden, Denmark, Germany, Austria, Portugal, Ireland and the United Kingdom, having further contacts throughout the world.

Our aim is to establish a sound database and a simple depletion model to be available to all interested parties, so that they may properly inform themselves of this vital issue, free of all the vested interests and political obfuscation that has so far clouded it.

Oil supplies about 40% of total energy needs and is set to start to decline within about ten years. It is evident that the world will have to learn to use less, which should not be difficult given the current waste. Furthermore declining oil supply will have an impact on the emissions perceived to be causing climate change, albeit on the basis of the flimsiest of scientific evidence. There is a great deal at stake as solutions have long lead times and call for difficult adjustments, but much could be done if governments can be alerted in time.

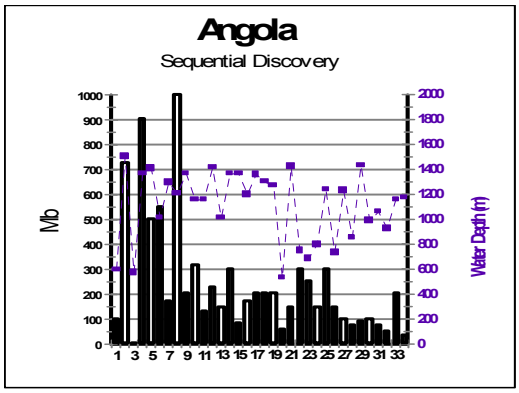
Yours sincerely,

C.J.Campbell

The UK Cabinet Office remains in the dark

Despite having received representations from ODAC, the final energy report of the UK Policy Initiative Unit (PIU) makes depressing flat-earth reading.
http://www.piu.gov.uk/2002/energy/summary.shtml
The authors evidently succumbed to Establishment pressures to provide a misleading impression of an abundant supply of oil and gas without a cloud on the horizon. The closest the report could come to recognising the peak and decline of UK oil and gas production was an oblique admission that imports are set to rise, and that supply lines will lengthen, carrying geopolitical risks. Missing the essence of the matter, the best it could do was to offer the pathetic suggestion that we should at least try to be friendly to these distant suppliers.

Exploration Highlights



We await with interest the results of discovery for 2001. There was a flurry of comment about some large alleged discoveries in Tibet, of which little has since been heard. Otherwise, the picture seems to have been dominated by two rather unexpected late stage discoveries in mature areas in the UK and Trinidad, which together probably add not more than 500 Mb. Shell also found an oil accumulation testing 8000 b/d beneath the Malampaya gasfield in the Philippines. It sounds as if we return to the underlying falling trend of finding about one barrel for every four that we consume, after the spikes of last year and the spate of deepwater finds as the prime prospects were tested during the early phases of exploration. The plot of declining sequential discovery in deepwater Angola certainly confirms this picture.

When Recession become Depression

Peter Bernstein, a premier Wall Street analyst, has written a book "Against the Gods – the remarkable story of risk". It contains a chapter about discontinuity. It seems that the general advice to investors has been to try to track the Mean over a long period. This is seemingly

confirmed by statistics showing that, although individual sectors gave differing results, the average performance of all mutual funds has been constant over long periods.

Business activity had fallen in only seven years between 1869 and 1929, and so it was understandable that President Hoover dismissed the downturn that heralded the Great Depression as a temporary event with the words "Prosperity is just around the corner". But GDP fell by 55% between the 1929 peak and the low of June 1932. A second more subtle discontinuity came in 1959 in the relative performance of stocks and bonds. The ratio of bond interest to bond price soared whereas the ratio of dividend to share price collapsed. It took the economic stimulus of the Second World War to end the Great Depression, and it has been suggested that US plans to invade Iraq have the same objective, (see Saddle Up – 20.02.02.- ljmweir@hotmail.com)

Bernstein points out that "when discontinuities threaten, it is perilous to base decisions on established trends that have always seemed to make perfect sense but suddenly do not". He mentions climate change as a possible looming discontinuity. But the present recession, combined with the amazing changes in US foreign policy, which stem directly and indirectly from the supply of oil, may indeed prove to have marked the onset of an unparalleled discontinuity.

The editor of the Newsletter very much welcomes contributions from members and other readers, who may wish to draw attention to items of interest or comment on the progress of their own research.

Compiled by C.J.Campbell, Staball Hill, Ballydehob, Co. Cork, Ireland

	Base Case Scenario				**CONVENTIONAL OIL ENDOWMENT**											**2001**
	Unit:Gb (billion barrels)				(Excl. heavy, deepwater, polar, LNG)					Revised	25-01-02					
		PRODUCTION			**RESERVES**					**DISCOVERED**				%	Dep.	MP	Peak
			Cum.		Reported				**Assessed**		**YET-TO-FIND**			Disc	Rate	Dep	Prod
		kb/d	**Prod.**	5yr	World	O&GJ	Adjust	Factor	**Field**			**YET-TO-PRODUCE**					
	Country	2001	Gb	Trend	Oil		+/-		**Reserves**				**ULTIMATE**				
1	Saudi Arabia	6470	**91**	-4%	263.00	259.25	0.00	0.80	**207**	299	**21.4**	229	**320**	93%	1.0%	2019	2014
2	Russia	6895	**121**	3%	52.66	48.57	-4.83	1.50	**66**	187	**12.9**	78.5	**200**	94%	3.1%	1992	1987
3	US-48	4430	**169**	-2%	21.33	22.05	-9.00	1.50	**20**	189	**6.4**	26.0	**195**	97%	5.9%	1971	1971
4	Iraq	1960	**27**	14%	115.00	112.50	-3.34	0.87	**95**	121	**13.5**	108	**135**	90%	0.7%	2030	2021
5	Iran	3130	**53**	-3%	96.40	112.50	-3.77	0.82	**70**	123	**6.6**	77	**130**	95%	1.5%	2010	1973
6	Venezuela	2406	**45**	-2%	47.62	77.69	-30.00	0.90	**43**	88	**6.7**	49.6	**95**	93%	1.7%	2003	1970
7	Kuwait	1440	**30**	-4%	96.50	94.00	-6.01	0.63	**55**	86	**4.4**	60	**90**	95%	0.9%	2019	2019
8	Abu Dhabi	1555	**17**	-3%	61.92	92.20	-7.35	0.70	**59**	77	**3.3**	63	**80**	96%	0.9%	2026	2015
9	Mexico	3100	**29**	1%	26.94	26.94	0.00	0.95	**26**	54	**7.6**	33.2	**62**	88%	3.3%	2003	2003
10	China	3295	**27**	1%	34.10	24.00	-13.34	2.30	**25**	52	**5.2**	29.7	**57**	91%	3.9%	2002	2003
11	Nigeria	2100	**22**	-2%	24.50	24.00	-4.42	1.45	**28**	50	**1.9**	30.3	**52**	96%	2.5%	2008	1979
12	Libya	1360	**22**	-1%	29.50	29.50	-2.01	0.93	**26**	48	**3.0**	28.6	**51**	94%	1.7%	2007	1970
13	Kazakhstan	787	**6**	11%	6.42	5.42	-0.53	5.00	**24**	30	**9.9**	34.3	**40**	75%	0.8%	2026	2026
14	Norway	3133	**15**	-0%	10.03	9.45	-2.32	2.25	**16**	31	**2.8**	18.9	**34**	92%	5.5%	2003	2000
15	UK	2260	**19**	-2%	5.00	4.93	0.00	2.25	**11**	30	**2.1**	13.2	**32**	93%	6.1%	1998	1999
16	Indonesia	1200	**19**	-2%	9.67	5.00	0.00	1.80	**9**	28	**1.6**	10.6	**30**	95%	4.0%	1992	1977
17	Algeria	820	**12**	-1%	13.00	9.20	-2.88	2.40	**15**	27	**3.0**	18.2	**30**	90%	1.6%	2011	1978
18	Canada	1055	**18**	-1%	5.62	4.86	0.00	1.80	**8.74**	27	**0.9**	9.6	**28**	97%	3.8%	1990	1973
19	Azerbaijan	300	**8.01**	13%	-	0.00	-0.21	7.00	**6.78**	15	**3.2**	10.0	**18**	82%	1.1%	2005	2007
20	N.Zone	540	**6.42**	0%	4.65	5.00	-1.81	2.65	**8.45**	15	**0.6**	9.1	**15.5**	96%	2.1%	2006	2004
21	Oman	960	**6.65**	1%	5.85	5.51	-0.69	1.40	**6.74**	13	**1.61**	8.3	**15.0**	89%	4.0%	2003	2003
22	Egypt	755	**8.40**	-2%	3.77	2.95	-0.57	2.00	**4.75**	13	**0.85**	5.6	**14.0**	94%	4.7%	1996	1994
23	Qatar	574	**6.49**	-2%	5.55	15.21	-10.00	1.10	**5.73**	12	**0.79**	6.5	**13.0**	94%	3.1%	2001	2000
24	India	640	**5.34**	-1%	3.34	4.84	0.00	1.25	**6.05**	11	**0.61**	6.7	**12.0**	95%	3.4%	2004	1997
25	Australia	640	**5.55**	3%	2.84	3.50	0.00	1.35	**4.73**	10	**0.73**	5.5	**11.0**	93%	4.1%	2001	2000
26	Argentina	760	**7.99**	-2%	2.96	2.97	0.00	0.95	**2.83**	11	**0.19**	3.0	**11.0**	98%	8.4%	1992	1998
27	Colombia	625	**5.54**	-1%	2.60	1.75	0.00	2.25	**3.94**	9.5	**0.53**	4.5	**10.0**	95%	4.9%	2001	1999
28	Malaysia	720	**5.02**	-1%	5.05	3.00	0.00	1.20	**3.60**	8.6	**1.38**	5.0	**10.0**	86%	5.0%	2001	1997
29	Angola	685	**4.29**	-1%	8.48	5.41	-8.16	-1.50	**4.12**	8.4	**1.08**	5.2	**9.50**	89%	4.6%	2000	1998
30	Romania	120	**5.71**	-3%	1.23	0.96	0.00	1.25	**1.19**	6.9	**0.60**	1.8	**7.50**	92%	2.4%	1973	1976
31	Ecuador	400	**3.14**	1%	3.10	2.12	-1.13	4.00	**3.95**	7.09	**0.41**	4.4	**7.50**	94%	3.2%	2007	2004
32	Brasil	360	**4.39**	-6%	8.47	8.46	-9.20	-2.20	**1.62**	6.0	**0.99**	2.6	**7.00**	86%	4.8%	1995	1989
33	Syria	515	**3.60**	-2%	2.15	2.50	-1.83	3.00	**2.01**	5.6	**0.39**	2.4	**6.00**	94%	7.3%	1998	1995
34	Turkmenistan	147	**2.87**	18%	-	0.55	-0.10	3.70	**1.63**	4.50	**1.50**	3.1	**6.00**	75%	1.7%	2003	1973
35	Dubai	230	**3.63**	-5%	0.93	4.00	-1.87	0.40	**0.85**	4.5	**0.27**	1.1	**4.75**	94%	6.9%	1987	1991
36	Brunei	180	**2.93**	5%	1.23	1.35	-0.64	2.10	**1.48**	4.4	**0.09**	1.6	**4.50**	98%	4.0%	1989	1978
37	Trinidad	112	**3.15**	-2%	0.72	0.72	0.00	1.40	**1.00**	4.15	**0.35**	1.35	**4.50**	92%	2.9%	1983	1978
38	Gabon	300	**2.75**	-4%	2.57	2.50	-1.48	1.00	**1.02**	3.77	**0.23**	1.25	**4.00**	94%	8.1%	1995	1996
39	Ukraine	74	**2.63**	-4%	-	0.40	-0.05	2.25	**0.77**	3.40	**0.60**	1.37	**4.00**	85%	1.9%	1984	1970
40	Peru	93	**2.29**	-2%	0.88	0.32	-0.60	-3.50	**0.97**	3.26	**0.74**	1.71	**4.00**	81%	1.9%	1994	1983
41	Yemen	350	**1.49**	-1%	2.10	4.00	-1.29	0.50	**1.36**	2.8	**0.65**	2.01	**3.50**	81%	6.0%	2003	1999
42	Vietnam	305	**0.77**	14%	1.75	0.60	-0.40	9.50	**1.91**	2.68	**0.32**	2.23	**3.00**	89%	4.8%	2008	2008
43	Uzbekistan	143	**1.00**	-3%	-	0.59	-0.11	3.40	**1.65**	2.65	**0.35**	2.00	**3.00**	88%	2.5%	1999	2009
44	Denmark	335	**1.19**	9%	1.11	1.11	0.00	1.10	**1.22**	2.4	**0.58**	1.81	**3.00**	81%	6.4%	2003	2000
45	Congo	260	**1.42**	1%	1.70	1.51	-1.81	-2.50	**0.76**	2.18	**0.32**	1.08	**2.50**	87%	8.1%	1999	2000
46	Germany	68	**1.90**	4%	0.31	0.36	0.00	1.05	**0.38**	2.3	**0.12**	0.50	**2.40**	95%	4.2%	1976	1966
47	Tunisia	66	**1.17**	-3%	0.31	0.31	-0.08	3.00	**0.68**	1.85	**0.35**	1.03	**2.20**	84%	2.3%	1995	1981
48	Italy	74	**0.85**	-7%	0.61	0.62	-0.10	1.50	**0.79**	1.6	**0.12**	0.90	**1.75**	93%	3.4%	2001	1997
49	Bahrain	103	**1.19**	-0%	-	0.12	0.00	1.50	**0.19**	1.38	**0.22**	0.41	**1.60**	86%	8.5%	1988	1993
50	Thailand	114	**0.38**	10%	0.52	0.52	0.00	1.60	**0.83**	1.20	**0.30**	1.12	**1.50**	80%	3.6%	2008	2008
51	Sudan	200	**0.16**	422%	0.60	0.56	0.00	1.40	**0.79**	0.95	**0.55**	1.34	**1.50**	63%	5.2%	2010	2005
52	Cameroon	75	**1.01**	-8%	-	0.40	-0.64	-1.10	**0.26**	1.27	**0.03**	0.29	**1.30**	97%	8.5%	1993	1986
53	Netherlands	27	**0.81**	-10%	0.09	0.11	-0.02	3.70	**0.32**	1.13	**0.12**	0.44	**1.25**	90%	2.3%	1991	1989
54	Bolivia	30	**0.41**	-1%	0.22	0.44	0.00	1.50	**0.66**	1.07	**0.13**	0.79	**1.20**	89%	1.4%	2013	2013
55	Turkey	56	**0.81**	-3%	0.28	0.30	-0.04	1.00	**0.25**	1.07	**0.13**	0.39	**1.20**	89%	5.0%	1992	1991
56	Croatia	21	**0.48**	-7%	0.08	0.09	-0.02	5.00	**0.38**	0.86	**0.14**	0.52	**1.00**	86%	1.5%	2003	1988
57	France	28	**0.71**	-5%	0.15	0.14	0.00	1.15	**0.16**	0.88	**0.07**	0.24	**0.95**	92%	4.0%	1987	1988
58	Austria	19	**0.77**	-2%	0.09	0.09	0.00	1.50	**0.13**	0.90	**0.05**	0.18	**0.95**	95%	3.6%	1971	1955
59	Papua	58	**0.32**	-5%	0.62	0.24	0.00	2.00	**0.48**	0.80	**0.10**	0.58	**0.90**	89%	3.5%	2008	1993
60	Hungary	24	**0.70**	-3%	0.06	0.11	0.00	1.00	**0.11**	0.81	**0.09**	0.20	**0.90**	90%	4.1%	1983	1994
61	Albania	6	**0.53**	-2%	-	0.17	-0.04	1.50	**0.19**	0.72	**0.08**	0.27	**0.80**	90%	0.8%	1986	1982
62	Sharjah	45	**0.45**	-7%	-	1.50	0.00	0.10	**0.15**	0.60	**0.20**	0.35	**0.80**	76%	4.5%	1998	1998
63	Pakistan	59	**0.44**	3%	0.30	0.30	0.00	0.90	**0.27**	0.71	**0.32**	0.31	**0.75**	94%	6.4%	1998	1992
64	Chile	7	**0**	-4%	0	0	-0.02	0.30	**0.04**	0.5	**0.04**	0.08	**0.50**	91%	3.0%	1979	1982

RESOURCE BASED PRODUCTION FORECAST

Revised 04-02-02 *Base Case Scenario*

Conventional Oil Mb/d	**2000**	**2005**	**2010**	**2020**
Saudi Arabia	8.00	7.03	11.85	7.92
Russia	6.33	8.38	6.71	4.30
US-48	4.45	3.84	2.72	1.37
Iraq	2.57	2.38	3.04	4.95
Iran	3.68	3.54	4.51	3.55
Venezuela	2.57	2.32	2.12	1.77
Kuwait	1.77	1.63	2.08	3.19
Abu Dhabi	1.90	1.89	2.41	2.30
Mexico	3.01	2.88	2.41	1.68
China	3.24	3.02	2.43	1.57
Nigeria	2.03	2.11	1.99	1.46
Libya	1.41	1.37	1.29	1.07
Kazakhstan	0.68	0.96	1.22	1.99
Norway	3.21	2.73	1.96	1.01
UK	2.51	1.77	1.31	0.72
Indonesia	1.27	1.02	0.83	0.56
Algeria	0.81	0.82	0.82	0.69
Canada	1.08	0.90	0.74	0.50
Azerbaijan	0.28	0.68	0.82	0.82
N.Zone	0.63	0.55	0.53	0.41
Oman	0.93	0.88	0.70	0.45
Egypt	0.81	0.62	0.49	0.30
Qatar	0.69	0.51	0.43	0.31
India	0.65	0.61	5.02	0.34
Australia	0.70	0.54	0.44	0.29
Argentina	0.75	0.53	0.34	0.14
Colombia	0.69	0.51	0.40	0.24
Malaysia	0.69	0.59	0.45	0.27
Angola	0.74	0.57	0.45	0.28
Romania	0.12	0.11	0.10	0.08
Ecuador	0.40	0.41	0.36	0.24
Brasil	0.36	0.30	0.23	0.14
Syria	0.52	0.38	0.26	0.12
Turkmenistan	0.14	0.16	0.14	0.12
Dubai	0.28	0.17	0.12	0.06
Brunei	0.18	0.15	0.12	0.08
Trinidad	0.12	0.10	0.09	0.06
Gabon	0.33	0.21	0.14	0.06
Ukraine	0.07	0.07	0.06	0.05
Peru	0.10	0.09	0.08	0.06
Yemen	0.35	0.31	0.22	0.11
Vietnam	0.30	0.30	0.26	0.13
Uzbekistan	0.16	0.17	0.20	0.12
Denmark	0.36	0.28	0.20	0.09
Congo	0.27	0.19	0.12	0.05
Germany	0.06	0.06	0.04	0.03
Tunisia	0.08	0.06	0.05	0.04
Italy	0.09	0.07	0.06	0.04
Bahrain	0.10	0.07	0.05	0.02
Thailand	0.11	0.14	0.14	0.07
Sudan	0.19	0.19	0.19	0.07
Cameroon	0.09	0.05	0.03	0.01
Netherlands	0.03	0.02	0.02	0.02
Bolivia	0.03	0.04	0.05	0.04
Turkey	0.06	0.05	0.04	0.02
Croatia	0.02	0.03	0.02	0.02
France	0.03	0.02	0.02	0.01
Austria	0.02	0.02	0.01	0.01
Papua	0.07	0.05	0.05	0.03
Hungary	0.03	0.02	0.02	0.01
Albania	0.01	0.01	0.03	0.03
Sharjah	0.05	0.04	0.03	0.02
Pakistan	0.04	0.05	0.03	0.02
Chile	0.01	0.01	0.01	0.00

CONVENTIONAL OIL **By Region**	**2000**	**2005**	**2010**	**Mb/d 2020**
MEGulf	18.5	17.0	24.4	22.3
Eurasia	11.1	13.6	11.8	9.1
N.America	5.5	4.7	3.5	1.9
L.America	8.0	7.2	6.1	4.4
Africa	6.7	6.2	5.6	4.0
Europe	6.3	5.0	3.6	1.9
Far East	4.0	3.4	2.8	1.8
ME Other	3.0	2.4	1.8	1.1
Other	0.6	0.7	0.6	0.4
Unforeseen	0.0	0.0	0.1	0.2
Non-Swing	45	43	36	25
Swing %	29%	28%	41%	47%
WORLD	**64**	**60**	**60**	**47**
NON-CONVENTIONAL HYDROCARBONS				
Oil				**Mb/d**
Heavy Oils	**1.4**	**2.8**	**3.6**	**4.6**
Canada	1.0	1.3	2.0	2.8
Venezuela I	0.5	0.4	0.5	0.6
Venezuela II	0.0	0.7	0.7	0.7
Other		0.3	0.4	0.5
Deepwater	**1.0**	**5.6**	**8.3**	**4.0**
G. Mexico	0.3	1.9	2.5	0.7
Brasil	0.8	1.8	1.8	0.8
Angola	0.0	0.9	1.7	0.8
Nigeria	0.0	0.4	1.2	0.6
Other	0.0	0.7	1.1	1.1
Polar	**1.0**	**0.8**	**0.6**	**0.4**
Alaska	1.0	0.8	0.5	0.2
Other	0.0	0.0	0.1	0.2
Other	0.6	0.9	1.2	1.5
Subtotal	**4**	**10**	**14**	**10**
GAS & GAS LIQUIDS				
Gas (by value at 10Tcf = 1 Gboe)				
Gas	24	27	32	33
Non-con gas	4	5	5	7
Subtotal	**29**	**31**	**37**	**40**
Gas Liquids				
NGL	**7**	**7**	**9**	**9**
ALL HYDROCARBONS				
Gas	**29**	**31**	**37**	**40**
Liquids	**75**	**78**	**83**	**67**
Total	**103**	**109**	**120**	**106**

BALANCE				
Liquids Mb/d	At flat demand			
Supply	75	78	83	67
Demand	75	75	75	75
Balance	0.0	2.8	8.0	-8.2

NOTES

Conventional Oil here excludes:
Oil from coal & "shale"; bitumen; Extra-Heavy Oil; Heavy Oil (<17 API); Deepwater (>500m) & Polar Oil and NGL from gasfields

Base Case Scenario assumes flat demand & production until Swing Share reaches 24 Mb/d (perceived capacity limit by 2010)

Abu Dhabi, Iram, Iraq, NZ & Saudi Arabia are treated as Swing Producers (ME Gulf)